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Factory Workshop Manual

Make

Ford

Model

Ranger 4wd

Engine and year

V6-245 4.0L (1991)

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This manual was submitted by

Anonymous

Date

1st January 2018

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 11 - 20: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 21 - 30: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 31 - 40: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 41 - 50: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 51 - 60: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 61 - 70: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 71 - 80: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 81 - 90: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

6.0 TRUCK 2-DIGIT SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	NC2	—	—	—	—	—
19 GO to ▶	Replace Processor									
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DH2	DQ1	DH2
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25		DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	FF1	—	—	—	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	—	DC20	DC20	TC40	—	TC40	TC40	TC40
57 GO to ▶	KP1	—	—	—	KP1	—	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	DC10	DC10	TC50	—	TC50	TC50	TC50
67 GO to ▶	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1	TA1
79 GO to ▶	KM40	—	—	KM40	KM40	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	TC18	TC18	TC18	TC18	TC18
91 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
92 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
93 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
94 GO to ▶	—	—	—	—	—	TC18	TC18	TC18	TC18	TC18
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
99 GO to ▶	—	—	—	—	—	TC20	TC20	TC20	TC20	TC20
NO CODES CODES NOT LISTED	Go To Pinpoint Test Step QA1									

Code 91 - 100: Testing and Inspection

KOEO Service Code Chart 6.0 *** Updated by TSB# 9111B2 ***

8.0 TRUCK 2-DIGIT SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	PB1	PA1	PA1	PA1	PC1	PA1	PA1	PA1	—	PA1
21 GO to ▶	DA1	DA1	DA	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	—	DF7	DF7	DF1	DF1	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	—	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	—	DC1	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
42 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	—	—	—	FF5	—	—	—
56 GO to ▶	DC20	—	—	DC20	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD1	FD1	FD1	FD1	FD1	FD1	—	FD1	FD1	FD1
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

KOER Service Code Chart 8.0

10.0 TRUCK 2-DIGIT SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	3.0L EFI	3.0L MA EFI	4.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	NB1	NA1	NA1	NA1	NC1	NA1	NA1	NA1	DJ1	NA1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Ign. Testing	NA3	NA3	NA3	NC2	NA3	NA3	NA3	—	NA3
19 GO to ▶	Ign. Testing	—	—	—	—	—	—	—	—	—
22 GO to ▶	—	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H1	H1	H1	H1	H1	H1	H1	H1	—	H1
45 GO to ▶	—	—	—	H1	Ign. Testing	—	—	—	—	—
48 GO to ▶	NB3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	—	DC20	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	—	DC10	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	TA1	TA1	TA1	—	TA1	TC90	—	TC90	TC90	TC90
69 GO to ▶						TC90		TC90	TC90	TC90
81 GO to ▶	—	—	—	—	—	—	DF11	—	—	—
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	NB20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES CODES NOT LISTED	Go to Pinpoint Test Step QA1									

Continuous Memory Code Chart 10.0 *** Updated by TSB# 9111B2 ***

RABS MODULE (ECU) SERVICE CHART

MODEL YEAR	VEHICLE LINE	SERVICE PART NUMBER
1987-91	F-SRW	F3PZ-2C018-A
1992-93	F-SRW	F3PZ-2C018-C
1987-91	F-DRW	F3PZ-2C018-B
1992-93	F-DRW	F3PZ-2C018-D
1987-91	BRONCO	F3PZ-2C018-A
1992 ONLY	BRONCO	F3PZ-2C018-C
1990-91	E-SRW	F3PZ-2C018-E
1992-93	E-SRW	F3UZ-2C018-A
1990-91	E-DRW	F3PZ-2C018-F
1992-93	E-DRW	F3UZ-2C018-B
1990-93	AEROSTAR	F29Z-2C018-A
1989-93	RANGER	F29Z-2C018-A
1991-92	EXPLORER	F29Z-2C018-A
1987-88	BRONCO II	F3PZ-2C018-G
1989-90	BRONCO II	F29Z-2C018-A

PART NUMBER	PART NAME	CLASS
F3PZ-2C018-A	RABS Module	B
F3PZ-2C018-B	RABS Module	B
F3PZ-2C018-C	RABS Module	B
F3PZ-2C018-D	RABS Module	B
F3PZ-2C018-E	RABS Module	B
F3UZ-2C018-A	RABS Module	B
F3PZ-2C018-F	RABS Module	B
F3UZ-2C018-B	RABS Module	B
F29Z-2C018-A	RABS Module	B
F3PZ-2C018-G	RABS Module	B

Electronic Brake Control Module: Technical Service Bulletins Antilock Brakes - Service Tips

Article No. 93-15-16

07/21/93

^ BRAKES - REAR ANTI-LOCK BRAKE SYSTEM (RABS) - ADVERSE BRAKING CHARACTERISTICS - RABS WARNING LIGHT NOT ON, MAY OCCUR WHEN INCORRECT RABS MODULE IS INSTALLED - SERVICE TIP

^ BRAKES - REAR ANTI-LOCK BRAKE SYSTEM (RABS) - INCORRECT (RABS I) ELECTRONIC CONTROL UNIT INSTALLED IN RABS II EQUIPPED VEHICLES - SERVICE TIP

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 BRONCO 1987-93 F-150 1989-93 RANGER 1990-93 AEROSTAR, E SERIES 1991-92 EXPLORER

ISSUE: Adverse braking characteristics and failure of the RABS light to indicate a RABS failure may be caused by improper servicing of RABS II equipped vehicles with RABS I electronic control units.

ACTION:

When replacing a RABS electronic control unit, refer to the following RABS Module Chart for correct parts usage.

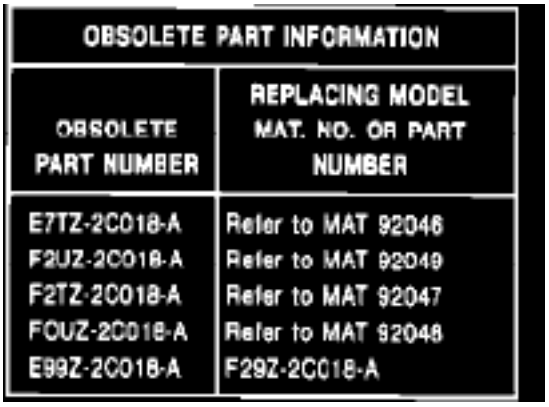
RABS II modules have been designed with Keep Alive Memory and are to be used to service all prior year RABS I systems, except for 1987 and 1988 Bronco II vehicles.

SRW = SINGLE REAR WHEEL; DRW = DUAL REAR WHEEL

Parts Block

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000



OBSOLETE PART INFORMATION	
OBSOLETE PART NUMBER	REPLACING MODEL MAT. NO. OR PART NUMBER
E7TZ-2C018-A	Refer to MAT 92046
F2UZ-2C018-A	Refer to MAT 92049
F2TZ-2C018-A	Refer to MAT 92047
FOUZ-2C018-A	Refer to MAT 92048
E99Z-2C018-A	F29Z-2C018-A

Electronic Brake Control Module: Technical Service Bulletins Brake Computer Module - Obsolete Service Part Return

Article No. 93-17-13

08/18/93

SERVICE PARTS RETURN OF BRAKE COMPUTER MODULE

LIGHT TRUCK: 1987-93 F-150-350 SERIES 1989-93 BRONCO, RANGER 1990-93 AEROSTAR 1991-92 EXPLORER

ISSUE: The subject Module - Brake Computer (E7TZ-2C018-A, F2UZ-2C018-A, F2TZ-2C018-A, FOUZ-2C018-A and E99Z-2C018-A) are being replaced by different part numbers. They should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

ACTION: Remove and return the obsolete parts from your dealership's inventory.

1. Return obsolete parts (Noted above) to your facing PDC using the least expensive transportation.

2. If claim is processed electronically via DOES II use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

3. In the Remarks Section write "Returned per TSB 93-17-13".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

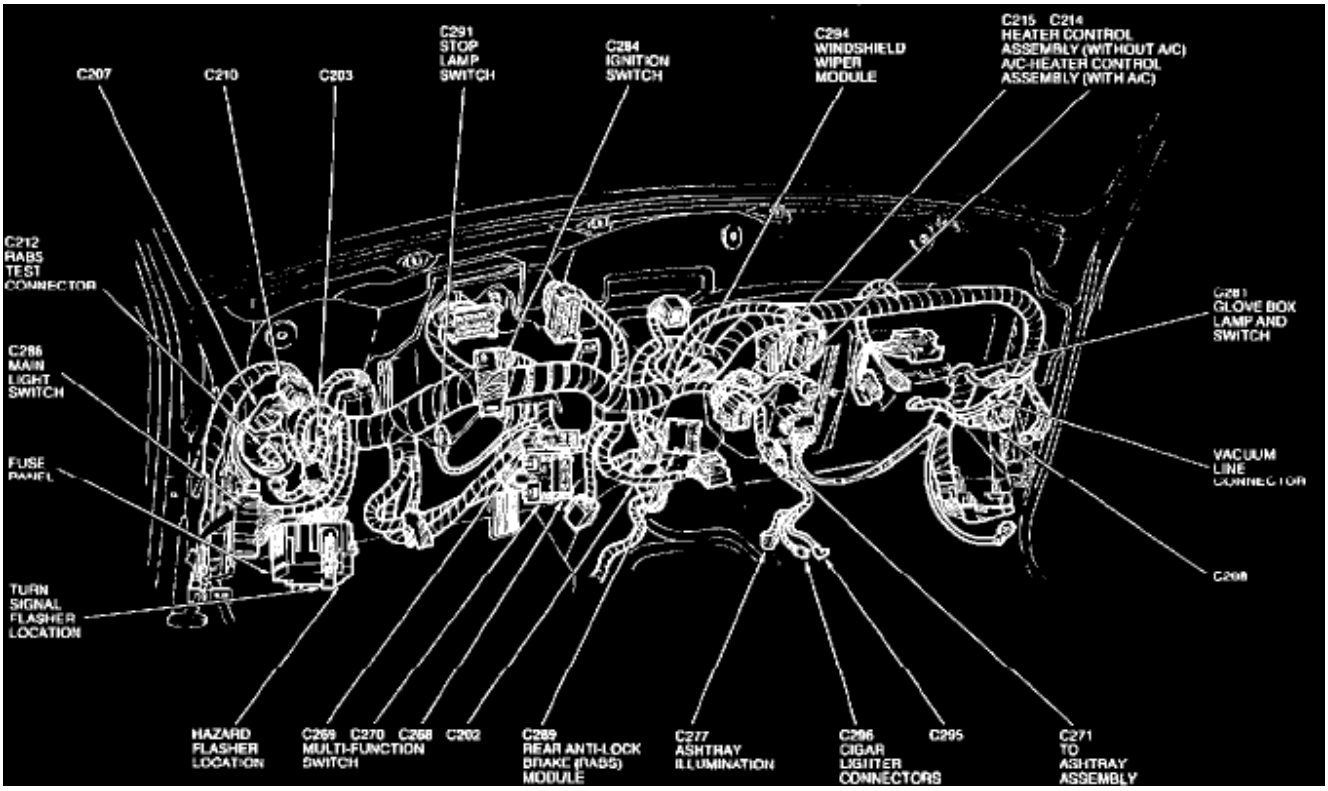
^ The parts returned must have been purchased from FPSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000



Electronic Brake Control Module: Locations

I/P Components

Behind Center Of I/P, LH Side Of Ashtray

Electronic Brake Control Module: Service and Repair

1. Disconnect battery ground cable.

2. Disconnect wiring harness from RABS module.

3. On Bronco, Bronco II, F-Series, Ranger and Explorer models, remove module to instrument panel retaining screws behind center of instrument panel.

4. On Aerostar models, remove module to instrument panel anti-skid plate retaining screws on lefthand side of engine cover under instrument panel.

5.

On E-Series models, remove parking brake actuator assembly as follows: a.

Loosen adjusting nut at equalizer.

b. From inside engine compartment, remove nuts attaching actuator assembly to cowl.

c. From under instrument panel, remove one bolt attaching actuator assembly to lower flange of instrument panel.

d. Remove parking brake cable from actuator assembly by compressing conduit end fitting prongs using a 1/2 inch box wrench.

e. Remove actuator assembly.

6. On Aerostar and E-Series models, remove two module attaching screws, then the module.

7. On all models, reverse procedure to install, then check system for proper operation.

Cruise Control Module: Customer Interest Radio - AM Band Noise With Speed Control ON

Article No. 91-8-21

04/17/91

RADIO - NOISE WHILE IN AM MODE WHEN SPEED CONTROL IS ON

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: Radio static on weak to moderate strength AM radio stations only when both the radio and speed control are on, may be caused by the speed control module.

ACTION: Replace the speed control module with a new speed control module when vehicles exhibit this concern.

PART NUMBER PART NAME CLASS

F0TZ-9D843-A Module Speed Control B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

910821A Replace Speed Control 0.2 Hr.

Module

DEALER CODING

BASIC PART NO. CONDITION CODE

9D843 53

OASIS CODES: 207000

Cruise Control Module: All Technical Service Bulletins Radio - AM Band Noise With Speed Control ON

Article No. 91-8-21

04/17/91

RADIO - NOISE WHILE IN AM MODE WHEN SPEED CONTROL IS ON

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: Radio static on weak to moderate strength AM radio stations only when both the radio and speed control are on, may be caused by the speed control module.

ACTION: Replace the speed control module with a new speed control module when vehicles exhibit this concern.

PART NUMBER PART NAME CLASS

F0TZ-9D843-A Module Speed Control B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

910821A Replace Speed Control 0.2 Hr.

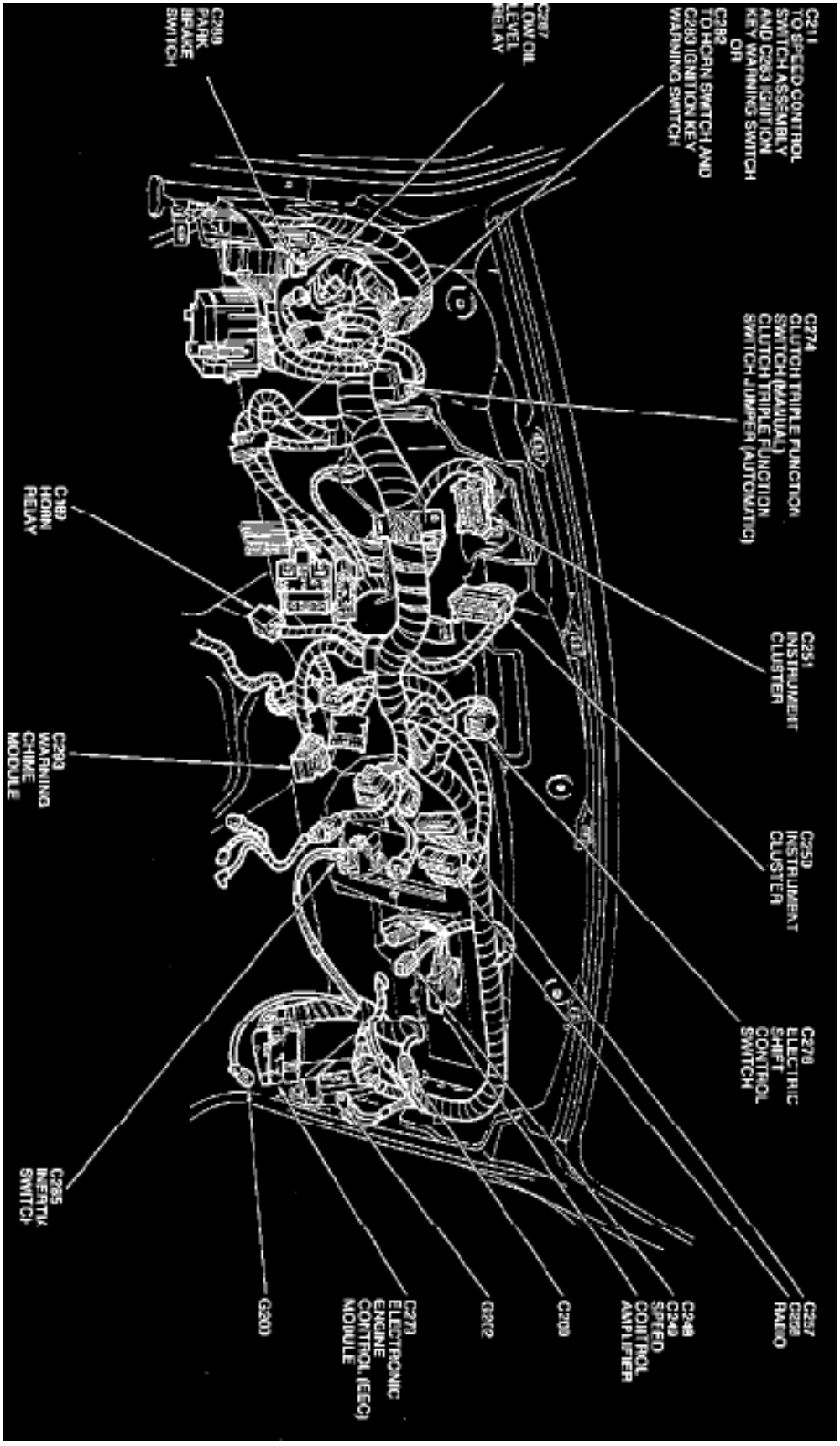
Module

DEALER CODING

BASIC PART NO. CONDITION CODE

9D843 53

OASIS CODES: 207000


C211
TO SPEED CONTROL
SWITCH ASSEMBLY
AND C263 IGNITION
KEY WARNING SWITCH
OR
C282
TO HORN SWITCH AND
C263 IGNITION KEY
WARNING SWITCH
C274
CLUTCH TRIPLE FUNCTION
SWITCH (MANUAL)
CLUTCH TRIPLE FUNCTION
SWITCH JUMPER (AUTOMATIC)
C289
PARK
BRAKE
SWITCH
C287
TOW OIL
LEVEL
RELAY
C189
HORN
RELAY
C251
INSTRUMENT
CLUSTER
C250
INSTRUMENT
CLUSTER
C278
ELECTRIC
SHIFT
CONTROL
SWITCH
C293
WARNING
CHIME
MODULE
C265
INERTIA
SWITCH
G200
C277
ELECTRONIC
ENGINE
CONTROL (EEC)
MODULE
G202
C209
C248
C249
SPEED
CONTROL
AMPLIFIER
C257
C256
RADIO

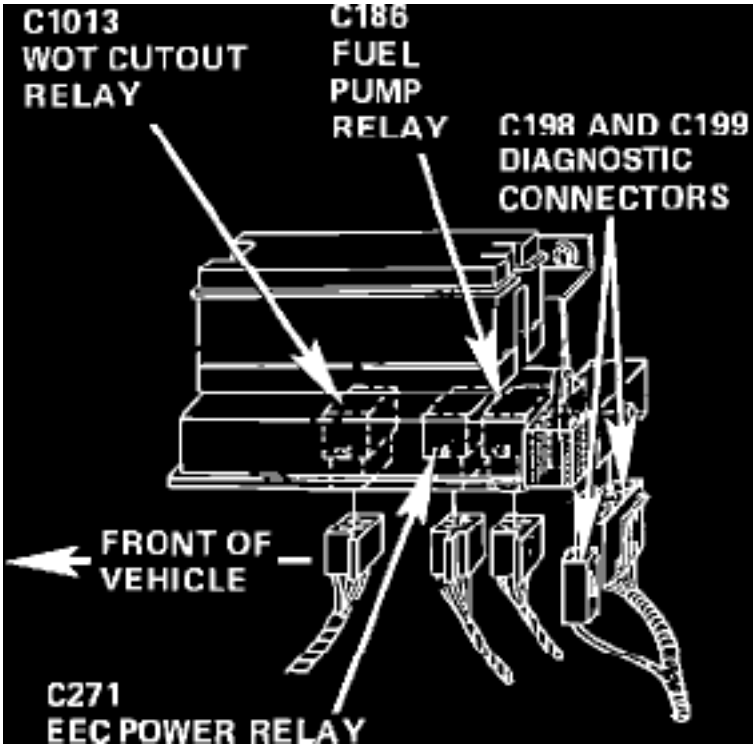
Cruise Control Module: Locations

I/P Components

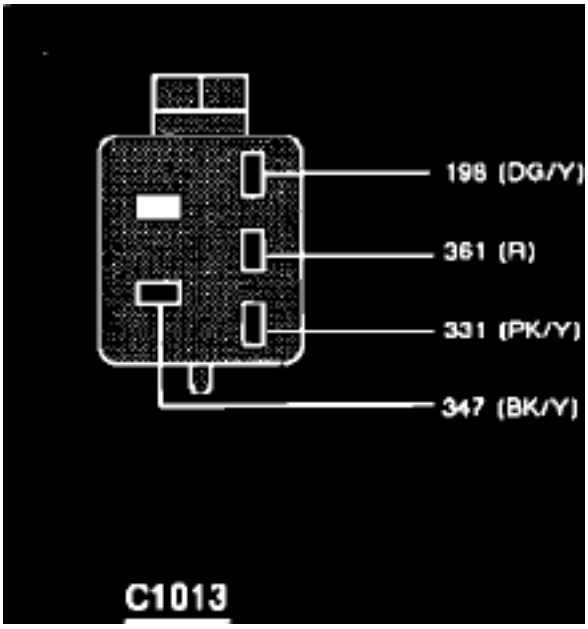
Behind RH Side Of I/P, Near Glove Box

Cruise Control Module: Testing and Inspection

For amplifier test, substitute with a known good amplifier.



Relay And Diagnostic Connectors



Wide Open Throttle (WOT) Cutout Relay Connector

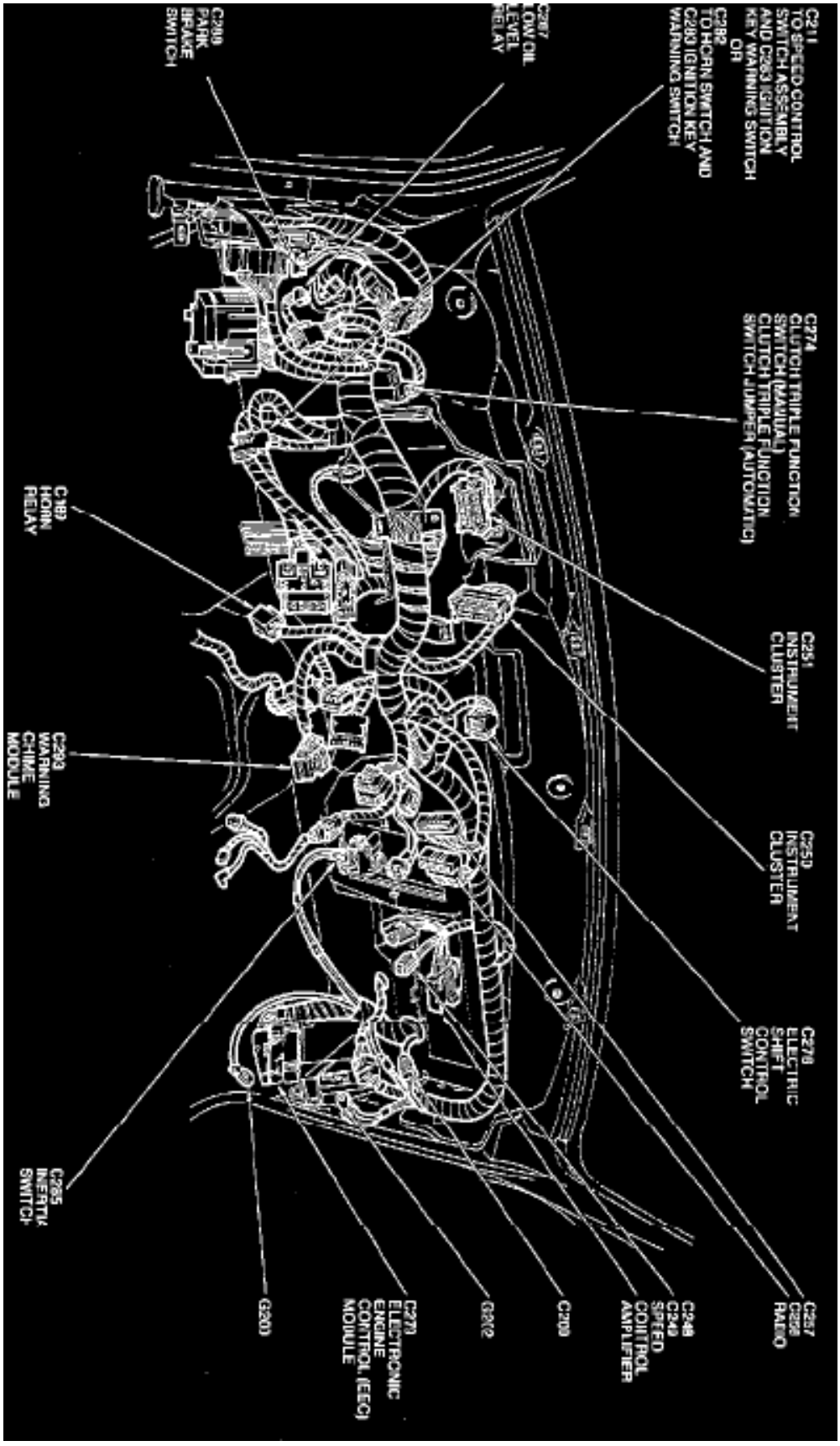
Compressor Clutch Relay: Description and Operation

When the vehicle operator goes to Wide Open Throttle (WOT), the Wide open throttle A/C (WAC) relay opens, suspending A/C operation until normal vehicle operation resumes. This is done to allow maximum power to the drive wheels under heavy acceleration or load.

• Compressor Clutch doesn't operate.	• No voltage at Clutch Cycling Pressure Switch.	• Fuse 7 blown. • Remove Connector from Cluich Cycling Pressure Switch. With the A/C-Heater Control Assembly Switch in the ON position, check for battery voltage at the 348 (P) wire.
	• Inoperative Clutch Cycling Pressure Switch.	• Check the Clutch Cycling Pressure Switch for continuity. No continuity indicates low refrigerant, or an inoperative Clutch Cycling Pressure Switch. Check refrigerant system.
	• No voltage at A/C Clutch Field Coil.	• Remove connector from the A/C Clutch Field Coil. Check the wire connector for battery voltage. Check the EEC Module (including Throttle Position Sensor and Coolant Temperature Sensor) and the WOT Cutout Relay for correct operation.
	• Inoperative A/C Clutch Field Coil.	• Repair A/C Clutch Field Coil or terminals as required.
• Compressor Clutch won't shut off.	• A/C Switch or Defrost Switch in A/C-Heater Control Assembly is stuck closed.	• Remove connector from the A/C Clutch Field Coil. Ensure correct voltage for each switch position.
• No cooling or not enough cooling (compressor operates).	• Clutch plates have no air gap. • Loose A/C Compressor drive belt. • Temperature Blend door out of adjustment. • Too much or too little Refrigerant in system.	• If compressor continues to run with connector disconnected, repair clutch air gap • Check drive belt tension. • Check operation of temperature control cable • Perform refrigerant system diagnosis and problem evaluation

Troubleshooting Hints - Compressor

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Instrument Panel > Audible Warning Device Control Module > Component Information > Locations



Audible Warning Device Control Module: Locations

I/P Components

Behind Center Of I/P, Below Ashtray Assembly

Campaign - Running Light Module, Extended Coverage

92M78

OWNER NOTIFICATION PROGRAM

Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

Dealer Letter

Attachment I ^

Administrative Information

^ Refunds

Attachment II ^

Labor Allowances Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

^ Daytime Running Lamp Module Locations

Customer Notification Letter

Attachment I - Admin. and Refund Information

Administrative Information

OASIS OASIS will not contain this Owner Notification Program. Verify through OASIS if a vehicle, involved in this program, has any other outstanding Recalls or Programs. Complete all uncompleted Recall and Program service actions during a single visit by the owner.

Promptly Perform Program On: Affected vehicles with the program condition which are brought to your dealership.

Dealership Responsibilities Promptly perform this program service, if required, on all eligible vehicles. Promptly report to the "Customer Assistance Centre" at Oakville any instance in which an owner will not allow you to complete this program because of objections in scheduling or for any other reason. Advise the Company of any vehicle's ownership status change (refer Warranty and Policy Manual - Section 3.3).

Reimbursement For Program Completion And Claims Preparation Instructions Claim reimbursement through the Direct Warranty Entry (DWE) system using the RECALLS screen only (PF3 Recall Entry/Retrieval on the DWE Menu Screen). If the claim number contains more than six digits, enter only the last six digits.

NOTE:

Claim Form 1864 is no longer mailed to owners. Use a Form 6125-2, an authorized computer generated claim form or a Form 1864 as an internal repair order to support DWE Entry through the RECALLS screen. Ensure that only the RECALLS screen is used when inputting completion and reimbursement information.

Dealers without DWE capability must mail a completed Form 1864 (Company Claim Copy No. 2) to Warranty Claims Processing at Oakville for reimbursement. Forms submitted must show labor times, all parts used and their costs, the parts handling allowance, and be imprinted, dated and signed by authorized dealership personnel. All claims must show 92M78 in the Recall box.

Refunds Refund requests must be submitted on a separate claim from the program completion claim. Refund requests are governed by the following guidelines:

^

Refunds are provided only for dealer and/or owner-paid repairs directly related to this program (DRL module replacement only - parts and labor) and performed within the program coverage provision. The original copy of the paid repair order or parts invoices must be presented to any Ford or Mercury dealership.

^ Using the DWE Recall Screen, enter the following:

Administrative Allowance ..... 0.3 Hrs. Labor Code.....A Recall Code.....R92M78 Enter "REFUND INV # _____ " in the area on the claim designated for PARTS USED. Enter the owner refund amount as a "MISCELLANEOUS" cost. ^

Provide prompt refund to all eligible owners having proper documentation regardless of the source of the original service.

^ Retain the copy of the paid repair or parts invoice with a copy of the refund request in your service file for reference.

^ Dealers without DWE capability must mail their refund requests on a separate completed Form 1864 with the owner's original paid repair order or parts purchase receipt to Warranty Claims Processing. Enter the 0.3 Hrs. in Box A and "R92M78" in the Recall box of the Form. Include all amounts in the TOTAL CLAIM box.

Attachment II - Labor and Parts Information

Labour Allowance Replace DRL Module (Includes Verification of DRL System Function).

VEHICLE LINE LABOR TIME LABOR CODE

Thunderbird, Cougar, Tempo, Topaz, Escort, Mustang, 0.3 Hrs. B

Ranger, Explorer and Econoline.

Taurus, Sable and Medium/Heavy F-Series Cab 0.5 Hrs. B

All Other Involved Vehicles 0.4 Hrs. B

Parts Ordering Information DRL modules will not be direct shipped for this Program. Order required parts through your Servicing Parts Distribution Centre.

PART NUMBER VEHICLE APPLICATION

FOVY-15A272-A ^ 1991 Cougar

E9SZ-15A272-B ^ 1989-90 Cougar

^ 1989-91 Thunderbird

FODZ-15A272-B ^ 1990 Escort

^ 1990-91 Taurus/Sable, Tempo/Topaz, Mustang, Econoline,

^ Aerostar, Ranger, Bronco II, Bronco, F-Series Light Trucks

^ (150-250-350), F-Super Duty and Explorer

FOHZ-15A272-A ^ 1990-91 Medium/Heavy Trucks (with single headlights)

Attachment III - Tech. Instruct./Daytime Lamp Module Locations

Technical Instructions

Correction of wiring connections and/or replacement of burned out fuses and bulbs is not covered by this program.

Description of Daytime Running Light (DRL) System Operation

The DRL System is designed to turn the Hi beam headlights ON with a reduced light output, and without illuminating the high beam indicator lamp in the instrument panel when the following conditions are met: ^

The vehicle is running.

^ The parking brake is fully released.

^ The headlight switch is in OFF position.

NOTE:

If the vehicle is equipped with an automatic lighting system, the DRL System is active until the automatic system turns on the headlights.

DRL Module Removal and Installation Procedure (Refer to Daytime Running Light Module Location Table.) Refer to the Vehicle's 1990 or 1991 Shop Manual, Section 32 "Lighting System", for Removal and Installation instructions. Mutilate and scrap the removed DRL module.

NOTE:

For the 1989 Thunderbird and Cougar cars refer to the 1990 Model Year Shop Manual.

After Installing The Replacement DRL Module Verify DRL System Function As Follows Ensure the vehicle's road wheels are blocked to preclude inadvertent vehicle movement. ^

Manual transmission in NEUTRAL.

^ Automatic Transmission in PARK. (Neutral on Heavy Trucks with Allison automatic.)

1. Parking brake applied and headlight switch OFF, start engine.

^ The headlights (Hi or Lo beam) should not be illuminated.

2. Parking brake released and headlight switch OFF, engine running.

^ The high beams should be ON at reduced intensity.

NOTE:

A comparison check for full intensity can be made using flash-to-pass or by putting headlight switch ON and switching to high beams.

a. Turn on Park Lights.

The high beams should be ON at reduced intensity.

The high beam indicator should NOT be ON.

b. Turn on headlights (LOW BEAMS).

The low beams should be ON at full intensity. The high beams should be OFF. The high beam indicator should NOT be ON.

c. Turn on headlights (HIGH BEAMS).

The high beams should be ON at full intensity. The high beam indicator should be ON.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Daytime Running Light Module Locations

1989 MODEL YEAR (CARS/LIGHT TRUCKS) LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

1990-1991 MODEL YEAR LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

Tempo/Topaz Inside on the RH side radiator support, vertically mounted below radiator cap.

Ford Mustang Under the LH front fender apron, directly below the battery.

Taurus/Sable On the LH front fender apron, directly under the battery. (Remove LH side fender liner for access.)

Ford Escort (1190 MY Only) On the RH side of the radiator support.

Ranger/Bronco II/Explorer Inside on the LH side radiator support, at top near washer fluid reservoir.

F-Series Light Truck/Super Duty/Bronco Inside the LH radiator support below the horn assembly.

Aerostar Inside the LH front fender apron, behind the battery.

Econoline Inside the LH radiator support.

1990/91 MEDIUM/HEAVY TRUCK SERIES LOCATION

"F" (Cab and Cowl) Behind RH side instrument panel.

"C" Behind RH side instrument panel.

"CL" (Single Headlights) Behind instrument panel RH side.

"CF" (Cargo) Under hood beside windshield washer bottle.

"L" Inside engine compartment left side bulkhead.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Dealer Letter

To: All Ford of Canada Dealers

Attention: Dealer Principal, Service Manager, Parts Manager

Subject: Owner Notification Program 92M78 - Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

In OASIS NO

Listings NO

Return Removed Parts NO (Mutilate and Scrap). Program Coverage Available for 36 months or 60,000 kilometers, whichever occurs first, from original warranty start date or through July 31, 1992, whichever provides greatest coverage.

Refund Provisions YES

NOTE:

Please read and circulate this bulletin to your Service and Parts Personnel. They should become familiar with this program and be able to respond to owner inquiries.

Vehicles Affected

^ All 1989-90-91 Thunderbird and Cougar

^ All 1990 Escort

^ All 1990-91 Taurus, Sable, Tempo, Topaz, Mustang, Econoline, Aerostar, Bronco, F-Series Light Trucks, F-Super Duty, Ranger, Bronco II, Explorer and Medium/Heavy Trucks (except LL/LTL and CL with quad rectangular headlights)

Reason For This Program The Daytime Running Lights (DRL) control module may malfunction. A malfunctioning DRL module can result in Daytime Running Lights that dim, flicker or go off and in some instances may remain on after the ignition is turned OFF. Normal manual Lo and Hi beam headlight operation is not affected.

Service Action Replace the Daytime Running Light (DRL) module if the customer is experiencing any of the above described symptoms.

NOTE:

Replacement of headlight bulbs or sealed beams is not covered by this program.

Refunds If all or a portion of the repair covered by the program (DRL module replacement only - parts and labor) has been paid by the owner and/or the dealer, within program coverage provisions, both the owner and/or the dealer are eligible for a refund. Company Contacts: (Dealer use only)

CONCERN NATURE CONTACT ACTIVITY

Technical Technical Assistance Hotline for your Region

Claiming Procedures Warranty Claims Hotline for your Region

Owner Concerns Customer Assistance Centre Hotline for your Region

General Administrative Christine Murray - Recall Administrator

^ Telephone: (416) 845-2511 Ext. 1495

^ Facsimile: (416) 845-7069

Attachments

Attachment I ^

Administrative

^ Refunds

Attachment II ^

Labor Allowance Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

Owner Letter

Mailing Date

Mr. John Sample 123 Main Street Anywhere, Prov. ANA NAN Ford Motor Company of Canada, Limited (Ford) is providing an Extended Coverage Program, number "92M78", for the Daytime

Running Lights (DRL) control module. This Program provides extended coverage to owners of certain 1989 through 1991 Model Year cars and trucks. Our records show you own the 19xx (vehicle) with the serial number shown above your name and address.

Reason For This Program And Program Period: Ford is extending the coverage for the Daytime Running Lights module in your vehicle.

This extended coverage will be provided for 3 years or 60,000 kilometers, whichever occurs first, from your vehicle's Original Warranty Start Date, or until July 31, 1992, whichever gives you the

greater coverage.

Description Of DRL System Operation: The DRL System is designed to turn the Hi beam headlights ON with a reduced light output. This is accomplished when the following conditions are met: ^

the vehicle is running.

^ the parking brake is fully released.

^ the headlight switch is in OFF position.

Symptoms Of Abnormal DRL System Operation: Symptoms associated with an improperly operating DRL module, normally include reduced, flickering or no DRL illumination. In some instances, the DRL may remain on when the ignition is turned OFF. Normal Lo and Hi beam headlight operation is not affected.

No Cost Service: Should you encounter symptoms such as described above, contact your Ford or Mercury dealer. Your dealer will replace the DRL control module on your vehicle under the terms of this program at no cost to you.

NOTE:

Headlight bulb or sealed beam replacement is not covered by this program.

How Long Will It Take? The time needed for this service is less than one hour. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call Your Dealer: Call your dealer should your vehicle experience any of the above described conditions. Ask your dealer for a service appointment and if parts are in stock. Also ask your dealer to check the OASIS system for any other recalls or programs that may be required on your vehicle. If you have leased this vehicle to another person or organization, please immediately inform the lessee of the program. When you bring your vehicle in, show the dealer this letter. If you lose the letter your dealer will still do the work, free of charge.

Refunds: A full refund is available if you paid for the service covered by this Program (Daytime Running Light Control Module replacement only - parts and labor). Please give the original copy of your paid work-order or parts receipt to your dealer. Your dealer will arrange for the refund (which could take about one month).

Changed Name, Address, Or Sold The Vehicle? If you have changed your name or address, or have sold the vehicle, please fill out the enclosed prepaid postcard. Sign and date it, and mail the card to Ford. If you cannot get the service performed, contact the Ford "Customer Assistance Centre" at the address identified in the letterhead of this letter. Please identify your vehicle's serial number in any correspondence. We are taking this action as part of our efforts to ensure your long term satisfaction with the DRL feature in your vehicle. We hope this program will confirm your continued satisfaction with your Ford built vehicle.

Campaign - Running Light Module, Extended Coverage

92M78

OWNER NOTIFICATION PROGRAM

Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

Dealer Letter

Attachment I ^

Administrative Information

^ Refunds

Attachment II ^

Labor Allowances Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

^ Daytime Running Lamp Module Locations

Customer Notification Letter

Attachment I - Admin. and Refund Information

Administrative Information

OASIS OASIS will not contain this Owner Notification Program. Verify through OASIS if a vehicle, involved in this program, has any other outstanding Recalls or Programs. Complete all uncompleted Recall and Program service actions during a single visit by the owner.

Promptly Perform Program On: Affected vehicles with the program condition which are brought to your dealership.

Dealership Responsibilities Promptly perform this program service, if required, on all eligible vehicles. Promptly report to the "Customer Assistance Centre" at Oakville any instance in which an owner will not allow you to complete this program because of objections in scheduling or for any other reason. Advise the Company of any vehicle's ownership status change (refer Warranty and Policy Manual - Section 3.3).

Reimbursement For Program Completion And Claims Preparation Instructions Claim reimbursement through the Direct Warranty Entry (DWE) system using the RECALLS screen only (PF3 Recall Entry/Retrieval on the DWE Menu Screen). If the claim number contains more than six digits, enter only the last six digits.

NOTE:

Claim Form 1864 is no longer mailed to owners. Use a Form 6125-2, an authorized computer generated claim form or a Form 1864 as an internal repair order to support DWE Entry through the RECALLS screen. Ensure that only the RECALLS screen is used when inputting completion and reimbursement information.

Dealers without DWE capability must mail a completed Form 1864 (Company Claim Copy No. 2) to Warranty Claims Processing at Oakville for reimbursement. Forms submitted must show labor times, all parts used and their costs, the parts handling allowance, and be imprinted, dated and signed by authorized dealership personnel. All claims must show 92M78 in the Recall box.

Refunds Refund requests must be submitted on a separate claim from the program completion claim. Refund requests are governed by the following guidelines:

^

Refunds are provided only for dealer and/or owner-paid repairs directly related to this program (DRL module replacement only - parts and labor) and performed within the program coverage provision. The original copy of the paid repair order or parts invoices must be presented to any Ford or Mercury dealership.

^ Using the DWE Recall Screen, enter the following:

Administrative Allowance ..... 0.3 Hrs. Labor Code.....A Recall Code.....R92M78 Enter "REFUND INV # _____ " in the area on the claim designated for PARTS USED. Enter the owner refund amount as a "MISCELLANEOUS" cost. ^

Provide prompt refund to all eligible owners having proper documentation regardless of the source of the original service.

^ Retain the copy of the paid repair or parts invoice with a copy of the refund request in your service file for reference.

^ Dealers without DWE capability must mail their refund requests on a separate completed Form 1864 with the owner's original paid repair order or parts purchase receipt to Warranty Claims Processing. Enter the 0.3 Hrs. in Box A and "R92M78" in the Recall box of the Form. Include all amounts in the TOTAL CLAIM box.

Attachment II - Labor and Parts Information

Labour Allowance Replace DRL Module (Includes Verification of DRL System Function).

VEHICLE LINE LABOR TIME LABOR CODE

Thunderbird, Cougar, Tempo, Topaz, Escort, Mustang, 0.3 Hrs. B

Ranger, Explorer and Econoline.

Taurus, Sable and Medium/Heavy F-Series Cab 0.5 Hrs. B

All Other Involved Vehicles 0.4 Hrs. B

Parts Ordering Information DRL modules will not be direct shipped for this Program. Order required parts through your Servicing Parts Distribution Centre.

PART NUMBER VEHICLE APPLICATION

FOVY-15A272-A ^ 1991 Cougar

E9SZ-15A272-B ^ 1989-90 Cougar

^ 1989-91 Thunderbird

FODZ-15A272-B ^ 1990 Escort

^ 1990-91 Taurus/Sable, Tempo/Topaz, Mustang, Econoline,

^ Aerostar, Ranger, Bronco II, Bronco, F-Series Light Trucks

^ (150-250-350), F-Super Duty and Explorer

FOHZ-15A272-A ^ 1990-91 Medium/Heavy Trucks (with single headlights)

Attachment III - Tech. Instruct./Daytime Lamp Module Locations

Technical Instructions

Correction of wiring connections and/or replacement of burned out fuses and bulbs is not covered by this program.

Description of Daytime Running Light (DRL) System Operation

The DRL System is designed to turn the Hi beam headlights ON with a reduced light output, and without illuminating the high beam indicator lamp in the instrument panel when the following conditions are met: ^

The vehicle is running.

^ The parking brake is fully released.

^ The headlight switch is in OFF position.

NOTE:

If the vehicle is equipped with an automatic lighting system, the DRL System is active until the automatic system turns on the headlights.

DRL Module Removal and Installation Procedure (Refer to Daytime Running Light Module Location Table.) Refer to the Vehicle's 1990 or 1991 Shop Manual, Section 32 "Lighting System", for Removal and Installation instructions. Mutilate and scrap the removed DRL module.

NOTE:

For the 1989 Thunderbird and Cougar cars refer to the 1990 Model Year Shop Manual.

After Installing The Replacement DRL Module Verify DRL System Function As Follows Ensure the vehicle's road wheels are blocked to preclude inadvertent vehicle movement. ^

Manual transmission in NEUTRAL.

^ Automatic Transmission in PARK. (Neutral on Heavy Trucks with Allison automatic.)

1. Parking brake applied and headlight switch OFF, start engine.

^ The headlights (Hi or Lo beam) should not be illuminated.

2. Parking brake released and headlight switch OFF, engine running.

^ The high beams should be ON at reduced intensity.

NOTE:

A comparison check for full intensity can be made using flash-to-pass or by putting headlight switch ON and switching to high beams.

a. Turn on Park Lights.

The high beams should be ON at reduced intensity.

The high beam indicator should NOT be ON.

b. Turn on headlights (LOW BEAMS).

The low beams should be ON at full intensity. The high beams should be OFF. The high beam indicator should NOT be ON.

c. Turn on headlights (HIGH BEAMS).

The high beams should be ON at full intensity. The high beam indicator should be ON.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Daytime Running Light Module Locations

1989 MODEL YEAR (CARS/LIGHT TRUCKS) LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

1990-1991 MODEL YEAR LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

Tempo/Topaz Inside on the RH side radiator support, vertically mounted below radiator cap.

Ford Mustang Under the LH front fender apron, directly below the battery.

Taurus/Sable On the LH front fender apron, directly under the battery. (Remove LH side fender liner for access.)

Ford Escort (1190 MY Only) On the RH side of the radiator support.

Ranger/Bronco II/Explorer Inside on the LH side radiator support, at top near washer fluid reservoir.

F-Series Light Truck/Super Duty/Bronco Inside the LH radiator support below the horn assembly.

Aerostar Inside the LH front fender apron, behind the battery.

Econoline Inside the LH radiator support.

1990/91 MEDIUM/HEAVY TRUCK SERIES LOCATION

"F" (Cab and Cowl) Behind RH side instrument panel.

"C" Behind RH side instrument panel.

"CL" (Single Headlights) Behind instrument panel RH side.

"CF" (Cargo) Under hood beside windshield washer bottle.

"L" Inside engine compartment left side bulkhead.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Dealer Letter

To: All Ford of Canada Dealers

Attention: Dealer Principal, Service Manager, Parts Manager

Subject: Owner Notification Program 92M78 - Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

In OASIS NO

Listings NO

Return Removed Parts NO (Mutilate and Scrap). Program Coverage Available for 36 months or 60,000 kilometers, whichever occurs first, from original warranty start date or through July 31, 1992, whichever provides greatest coverage.

Refund Provisions YES

NOTE:

Please read and circulate this bulletin to your Service and Parts Personnel. They should become familiar with this program and be able to respond to owner inquiries.

Vehicles Affected

^ All 1989-90-91 Thunderbird and Cougar

^ All 1990 Escort

^ All 1990-91 Taurus, Sable, Tempo, Topaz, Mustang, Econoline, Aerostar, Bronco, F-Series Light Trucks, F-Super Duty, Ranger, Bronco II, Explorer and Medium/Heavy Trucks (except LL/LTL and CL with quad rectangular headlights)

Reason For This Program The Daytime Running Lights (DRL) control module may malfunction. A malfunctioning DRL module can result in Daytime Running Lights that dim, flicker or go off and in some instances may remain on after the ignition is turned OFF. Normal manual Lo and Hi beam headlight operation is not affected.

Service Action Replace the Daytime Running Light (DRL) module if the customer is experiencing any of the above described symptoms.

NOTE:

Replacement of headlight bulbs or sealed beams is not covered by this program.

Refunds If all or a portion of the repair covered by the program (DRL module replacement only - parts and labor) has been paid by the owner and/or the dealer, within program coverage provisions, both the owner and/or the dealer are eligible for a refund. Company Contacts: (Dealer use only)

CONCERN NATURE CONTACT ACTIVITY

Technical Technical Assistance Hotline for your Region

Claiming Procedures Warranty Claims Hotline for your Region

Owner Concerns Customer Assistance Centre Hotline for your Region

General Administrative Christine Murray - Recall Administrator

^ Telephone: (416) 845-2511 Ext. 1495

^ Facsimile: (416) 845-7069

Attachments

Attachment I ^

Administrative

^ Refunds

Attachment II ^

Labor Allowance Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

Owner Letter

Mailing Date

Mr. John Sample 123 Main Street Anywhere, Prov. ANA NAN Ford Motor Company of Canada, Limited (Ford) is providing an Extended Coverage Program, number "92M78", for the Daytime

Running Lights (DRL) control module. This Program provides extended coverage to owners of certain 1989 through 1991 Model Year cars and trucks. Our records show you own the 19xx (vehicle) with the serial number shown above your name and address.

Reason For This Program And Program Period: Ford is extending the coverage for the Daytime Running Lights module in your vehicle.

This extended coverage will be provided for 3 years or 60,000 kilometers, whichever occurs first, from your vehicle's Original Warranty Start Date, or until July 31, 1992, whichever gives you the

greater coverage.

Description Of DRL System Operation: The DRL System is designed to turn the Hi beam headlights ON with a reduced light output. This is accomplished when the following conditions are met: ^

the vehicle is running.

^ the parking brake is fully released.

^ the headlight switch is in OFF position.

Symptoms Of Abnormal DRL System Operation: Symptoms associated with an improperly operating DRL module, normally include reduced, flickering or no DRL illumination. In some instances, the DRL may remain on when the ignition is turned OFF. Normal Lo and Hi beam headlight operation is not affected.

No Cost Service: Should you encounter symptoms such as described above, contact your Ford or Mercury dealer. Your dealer will replace the DRL control module on your vehicle under the terms of this program at no cost to you.

NOTE:

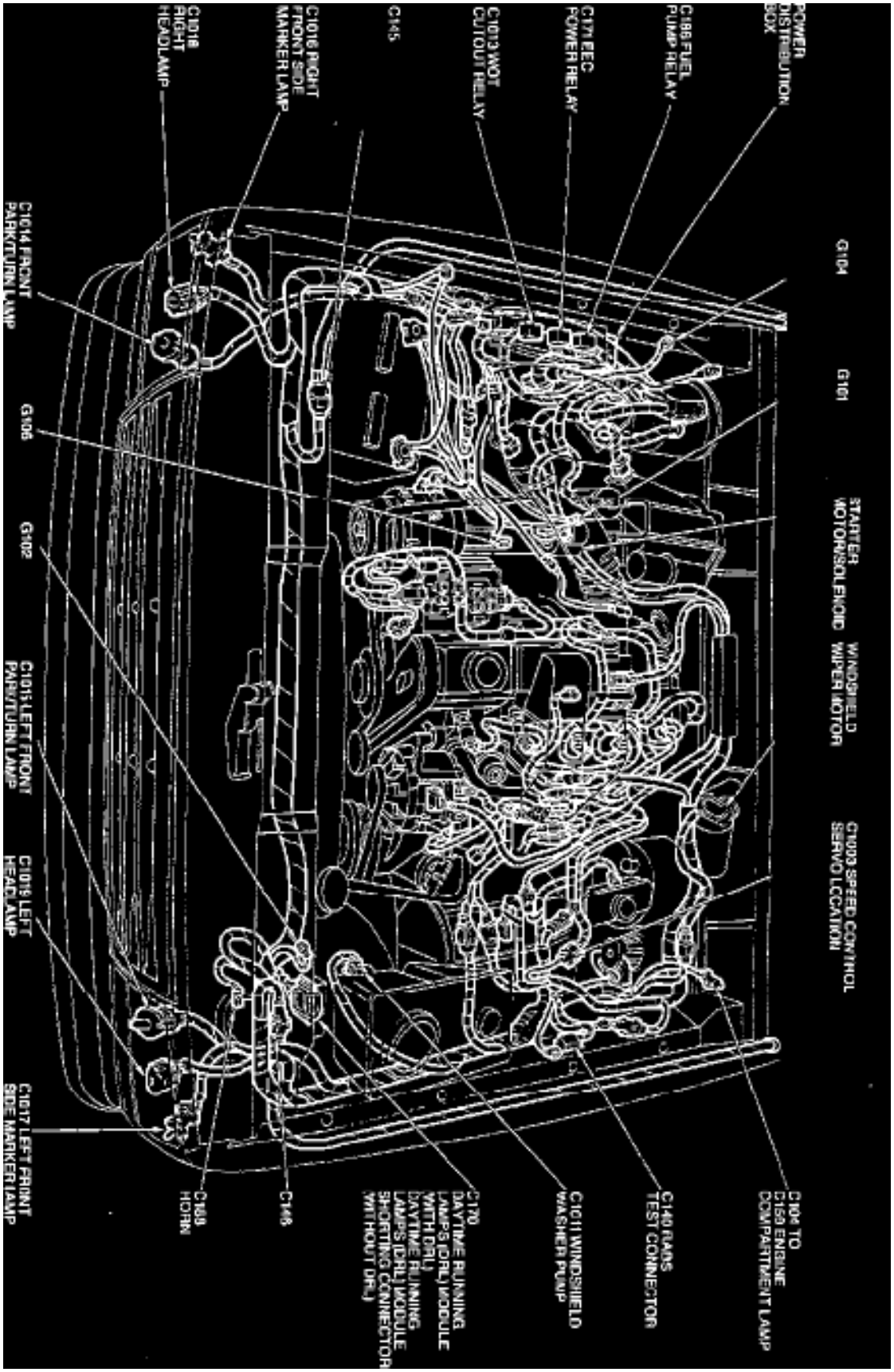
Headlight bulb or sealed beam replacement is not covered by this program.

How Long Will It Take? The time needed for this service is less than one hour. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call Your Dealer: Call your dealer should your vehicle experience any of the above described conditions. Ask your dealer for a service appointment and if parts are in stock. Also ask your dealer to check the OASIS system for any other recalls or programs that may be required on your vehicle. If you have leased this vehicle to another person or organization, please immediately inform the lessee of the program. When you bring your vehicle in, show the dealer this letter. If you lose the letter your dealer will still do the work, free of charge.

Refunds: A full refund is available if you paid for the service covered by this Program (Daytime Running Light Control Module replacement only - parts and labor). Please give the original copy of your paid work-order or parts receipt to your dealer. Your dealer will arrange for the refund (which could take about one month).

Changed Name, Address, Or Sold The Vehicle? If you have changed your name or address, or have sold the vehicle, please fill out the enclosed prepaid postcard. Sign and date it, and mail the card to Ford. If you cannot get the service performed, contact the Ford "Customer Assistance Centre" at the address identified in the letterhead of this letter. Please identify your vehicle's serial number in any correspondence. We are taking this action as part of our efforts to ensure your long term satisfaction with the DRL feature in your vehicle. We hope this program will confirm your continued satisfaction with your Ford built vehicle.

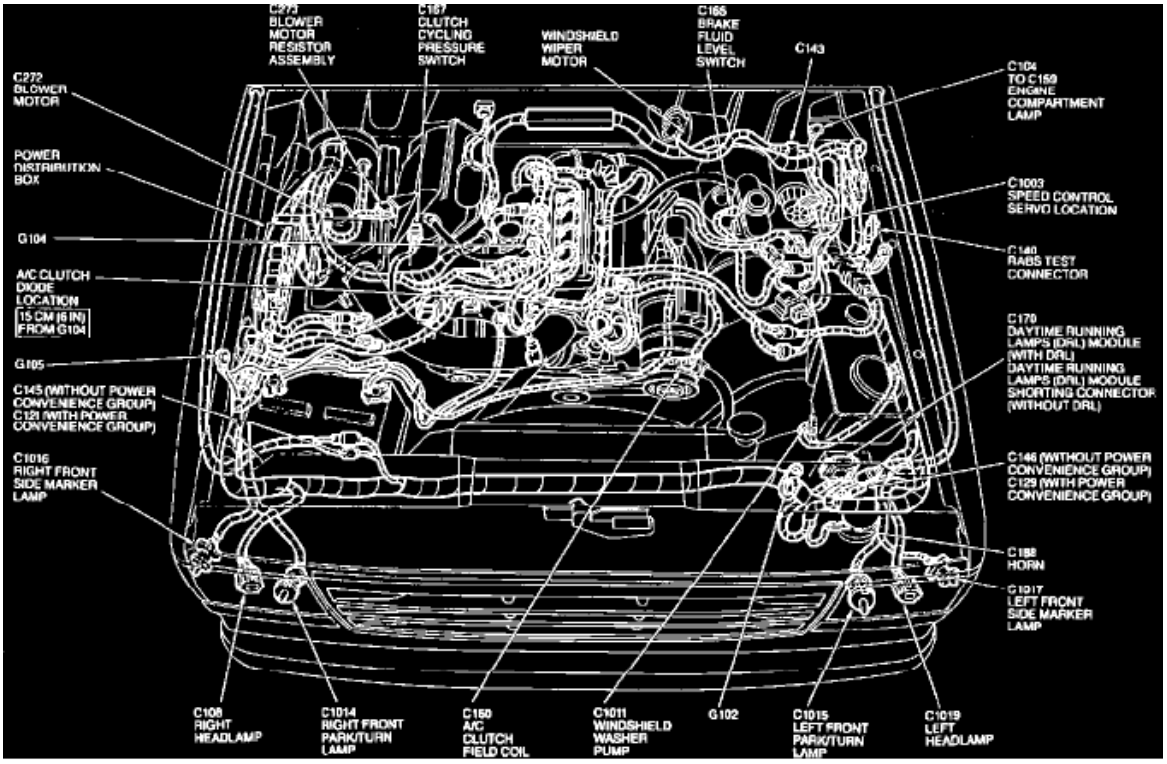

G104
G101
STARTER MOTOR/SOLENOID
WINDSHIELD WIPER MOTOR
C1003 SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C188 FUEL PUMP RELAY
C171 EEC POWER RELAY
C1013 WOT CUTOUT RELAY
C145
C1016 RIGHT FRONT SIDE MARKER LAMP
C1018 RIGHT HEADLAMP
C1014 FRONT PARK/TURN LAMP
G106
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP
C1017 LEFT FRONT SIDE MARKER LAMP
C169 HORN
C146
C170 DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL) DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C1011 WINDSHIELD WASHER PUMP
C140 RAIRS TEST CONNECTOR
C104 TO C150 ENGINE COMPARTMENT LAMP

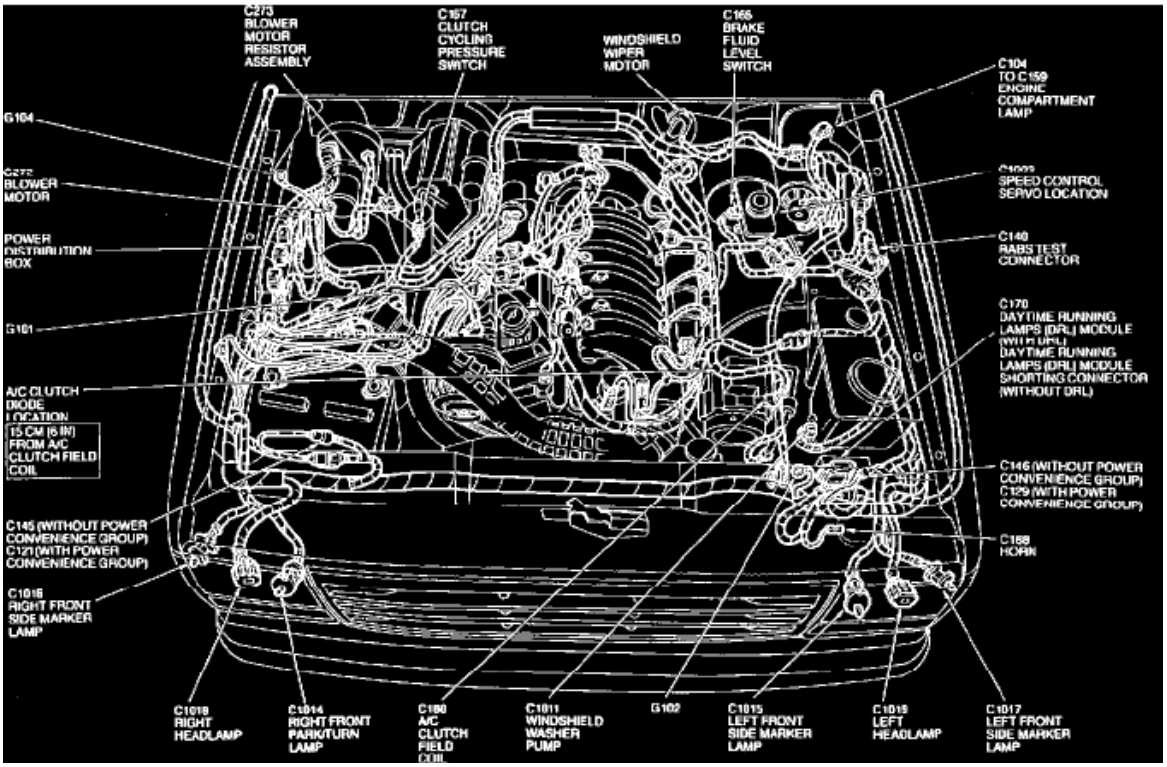
Daytime Running Lamp Control Unit: Locations

Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

Applicable to: 2.3L/4-140


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C167
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C272
BLOWER MOTOR
C104
TO C159
ENGINE COMPARTMENT LAMP
POWER DISTRIBUTION BOX
C1003
SPEED CONTROL SERVO LOCATION
G104
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM G104
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
G105
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C158
HORN
C1017
LEFT FRONT SIDE MARKER LAMP
C108
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C167
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C158
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Engine Compartment Components.

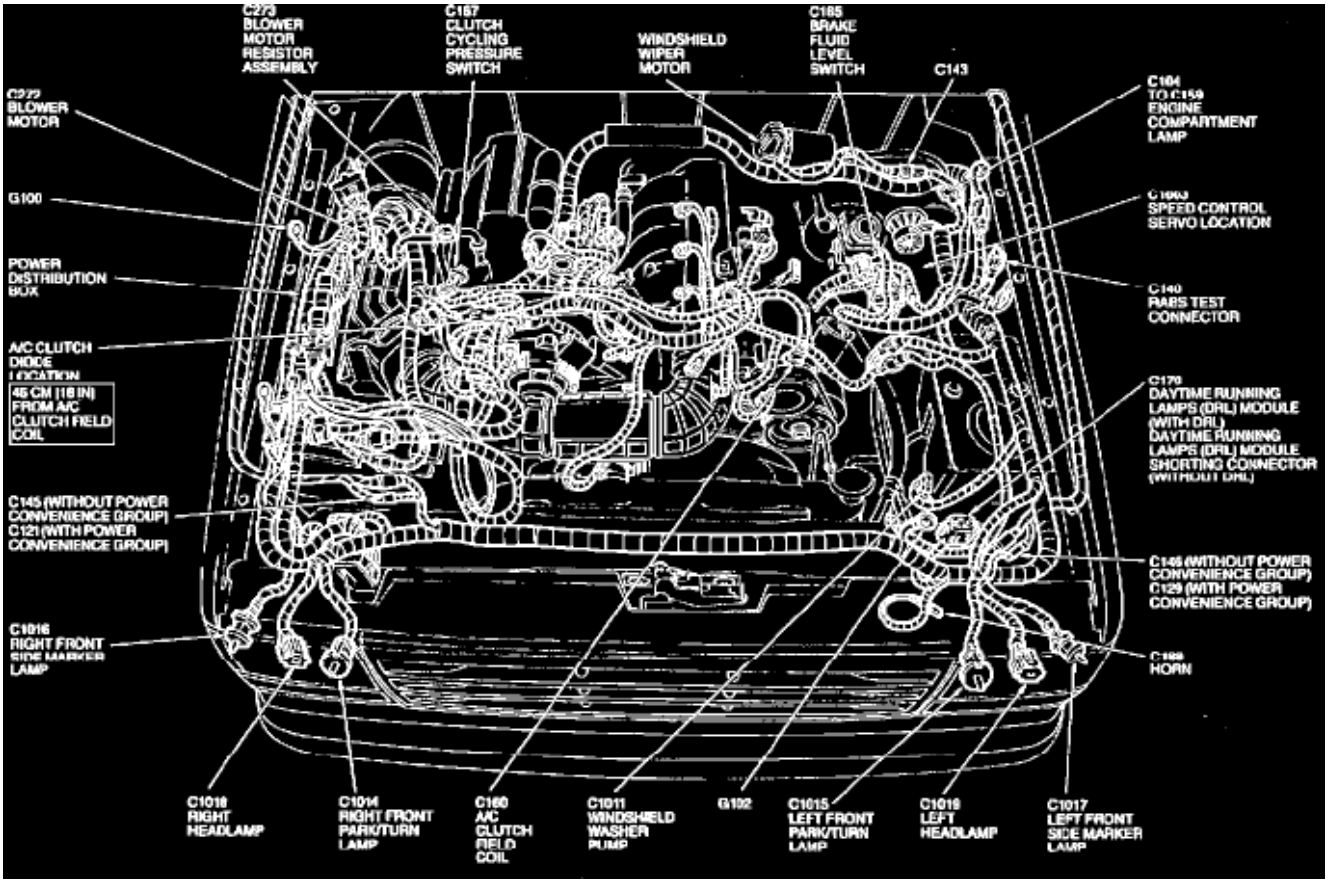
LH Side Of Upper Radiator Support, Near G102

Applicable to: 2.9L/V6-179

Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

Applicable to: 3.0L/V6-181

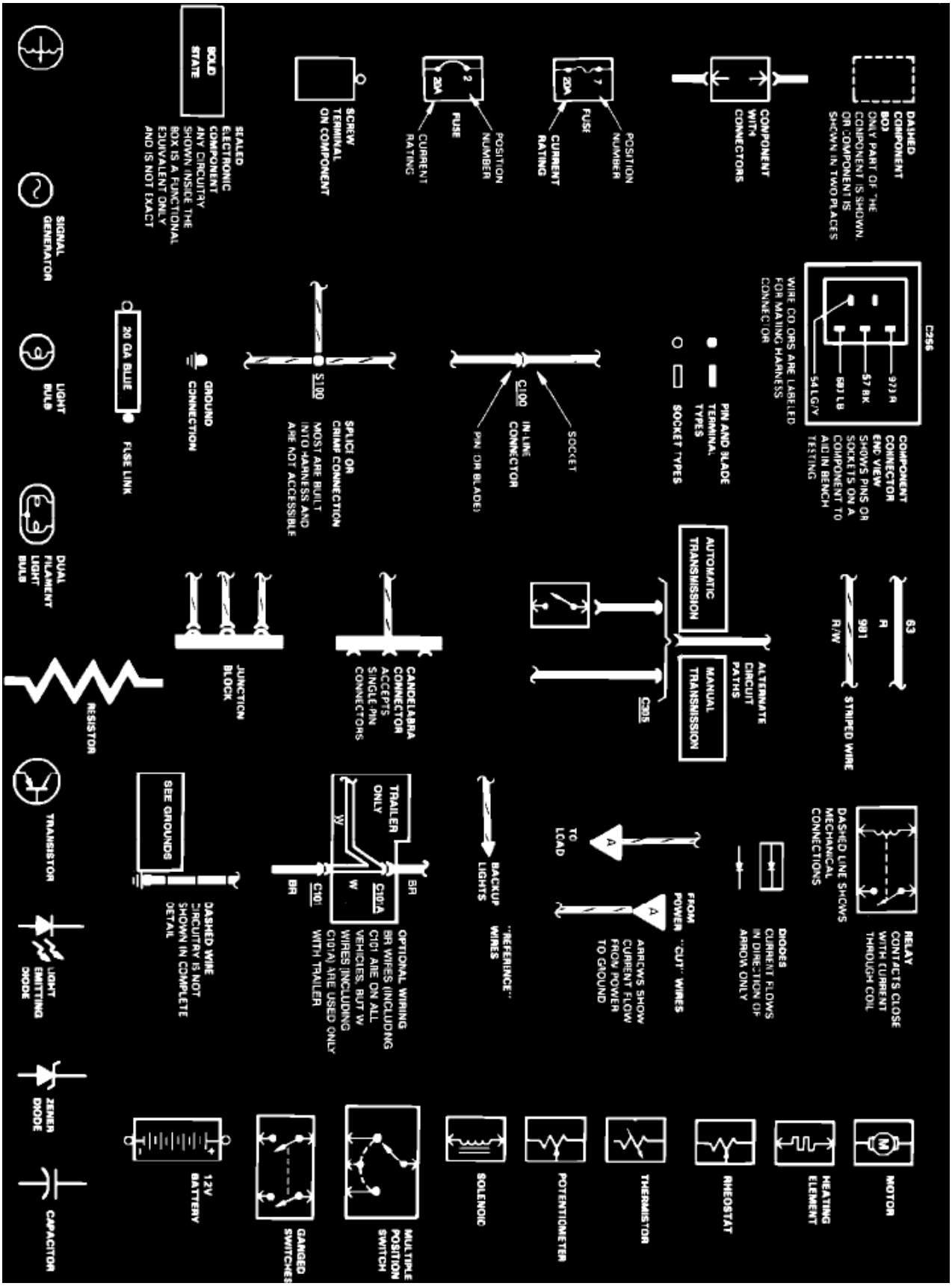


Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

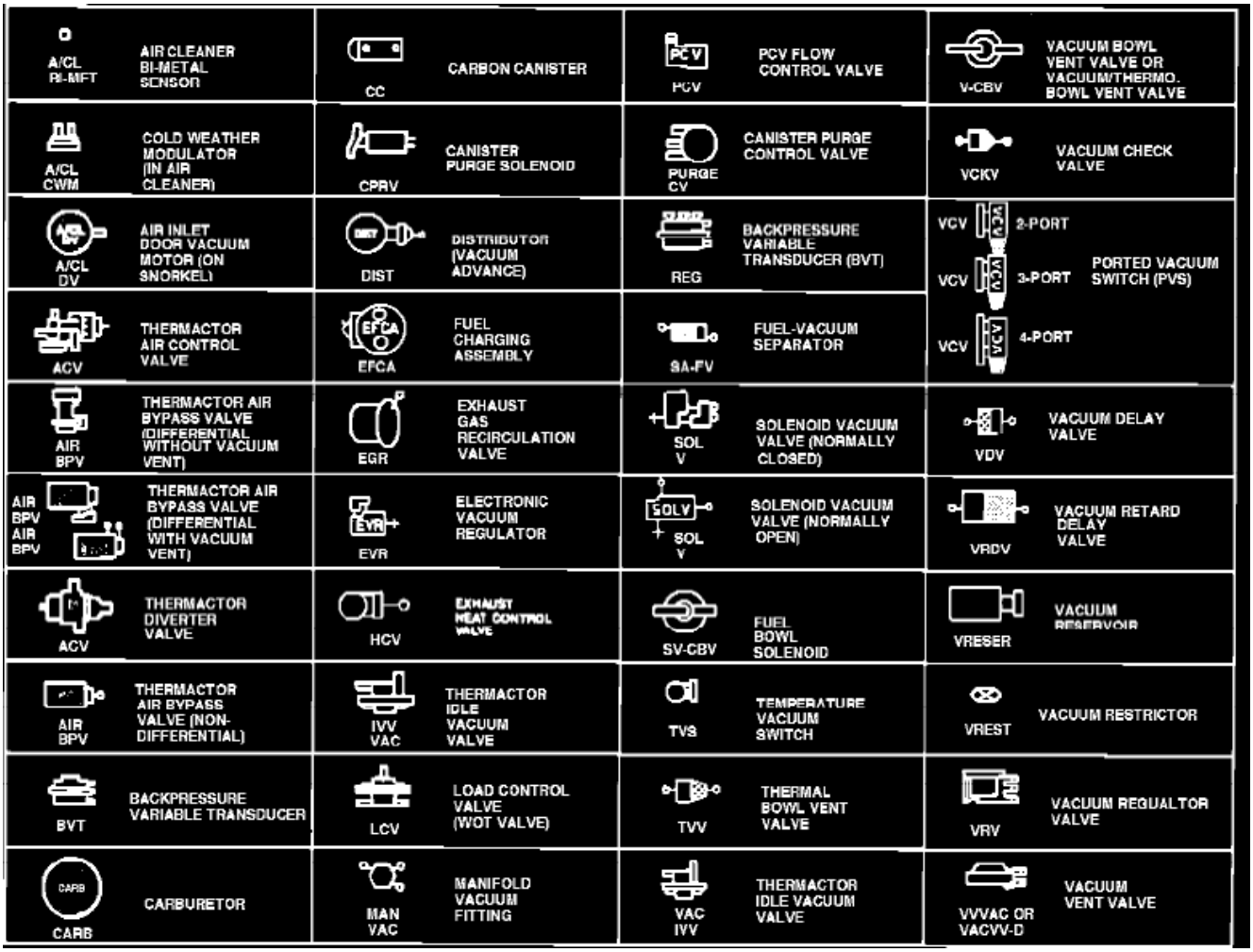
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Lighting and Horns > Daytime Running Lamp Control Unit > Component Information > Diagrams > Diagram Information and Instructions

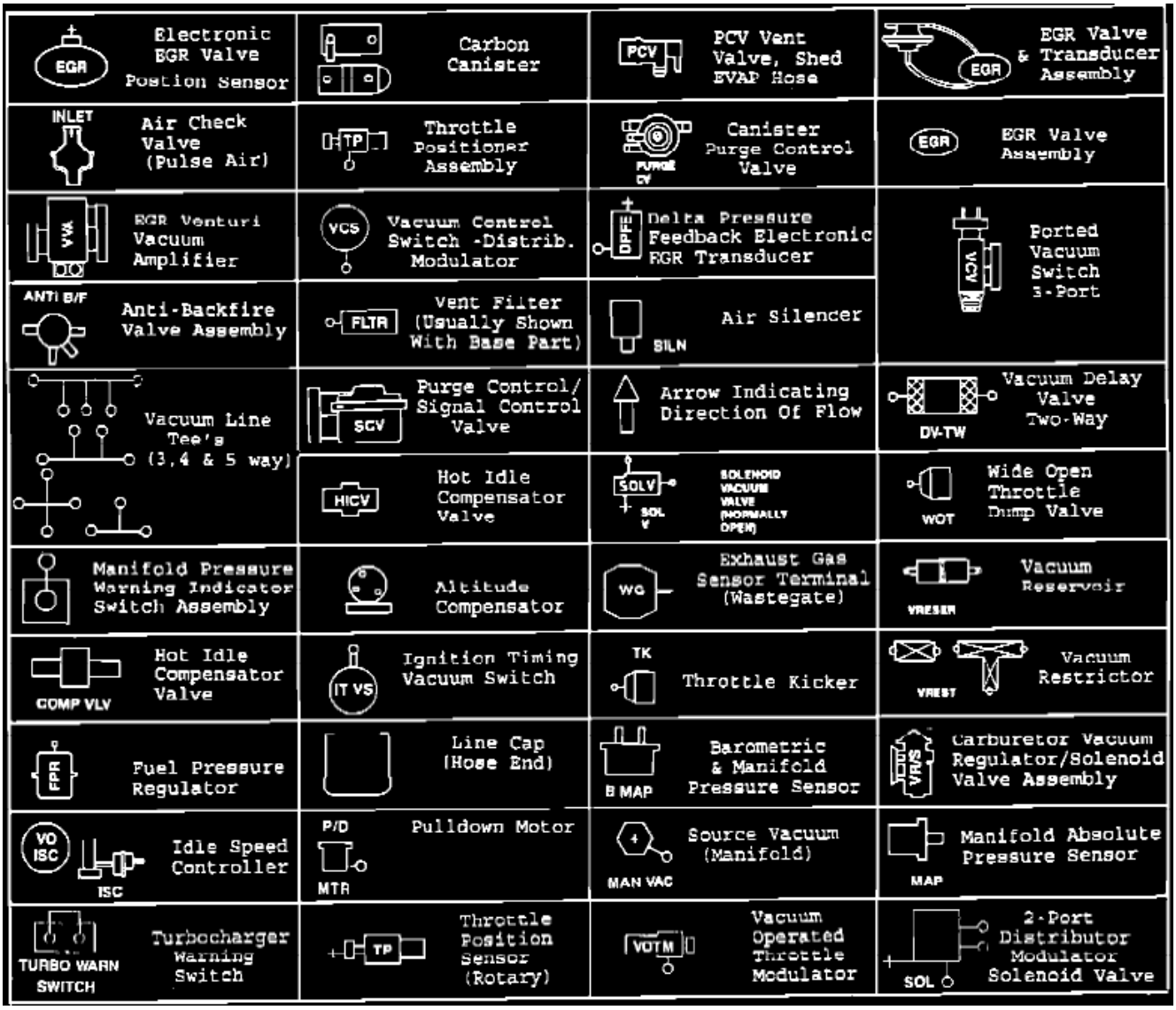


Daytime Running Lamp Control Unit: Diagram Information and Instructions

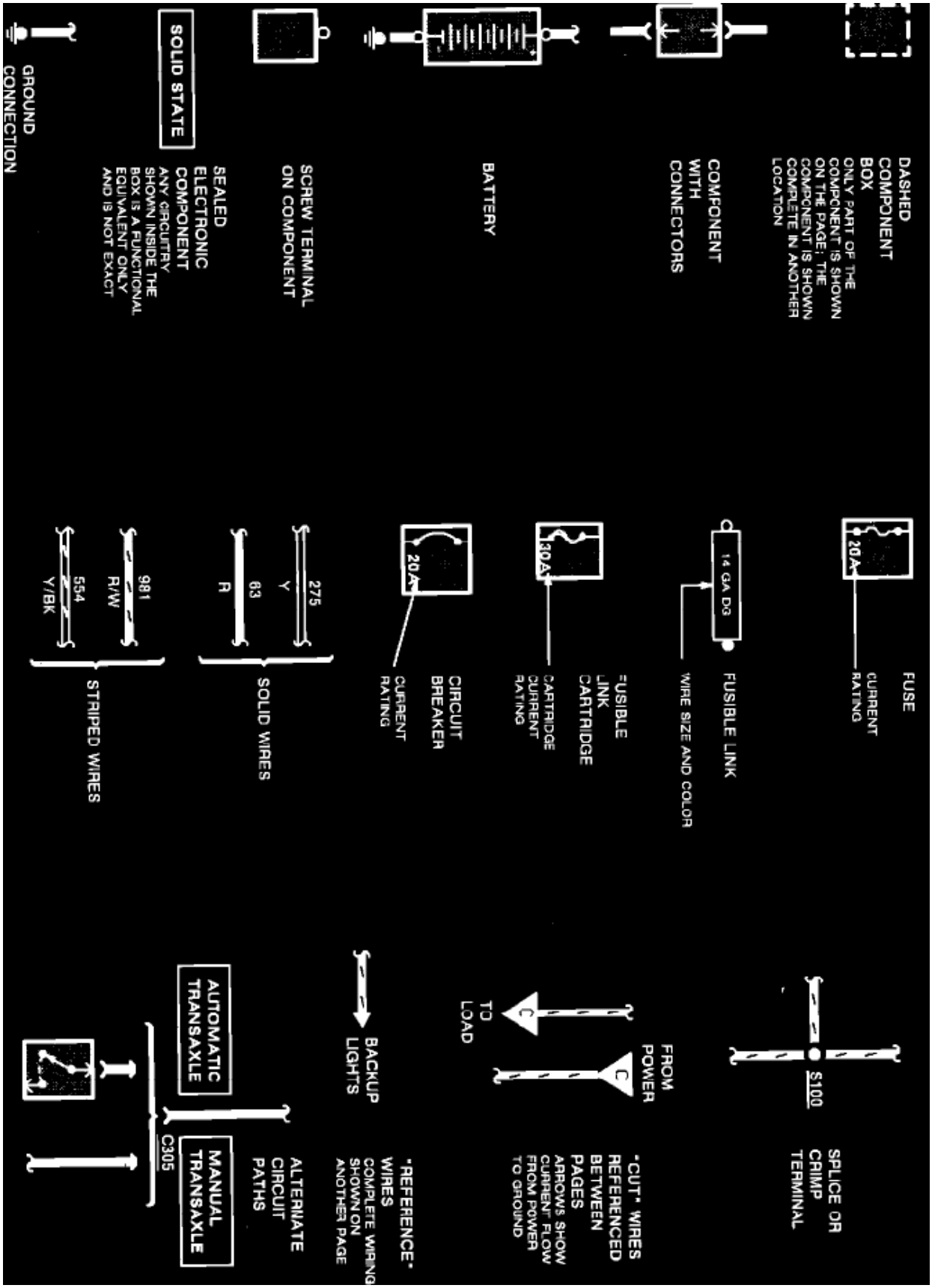
Symbol Identification



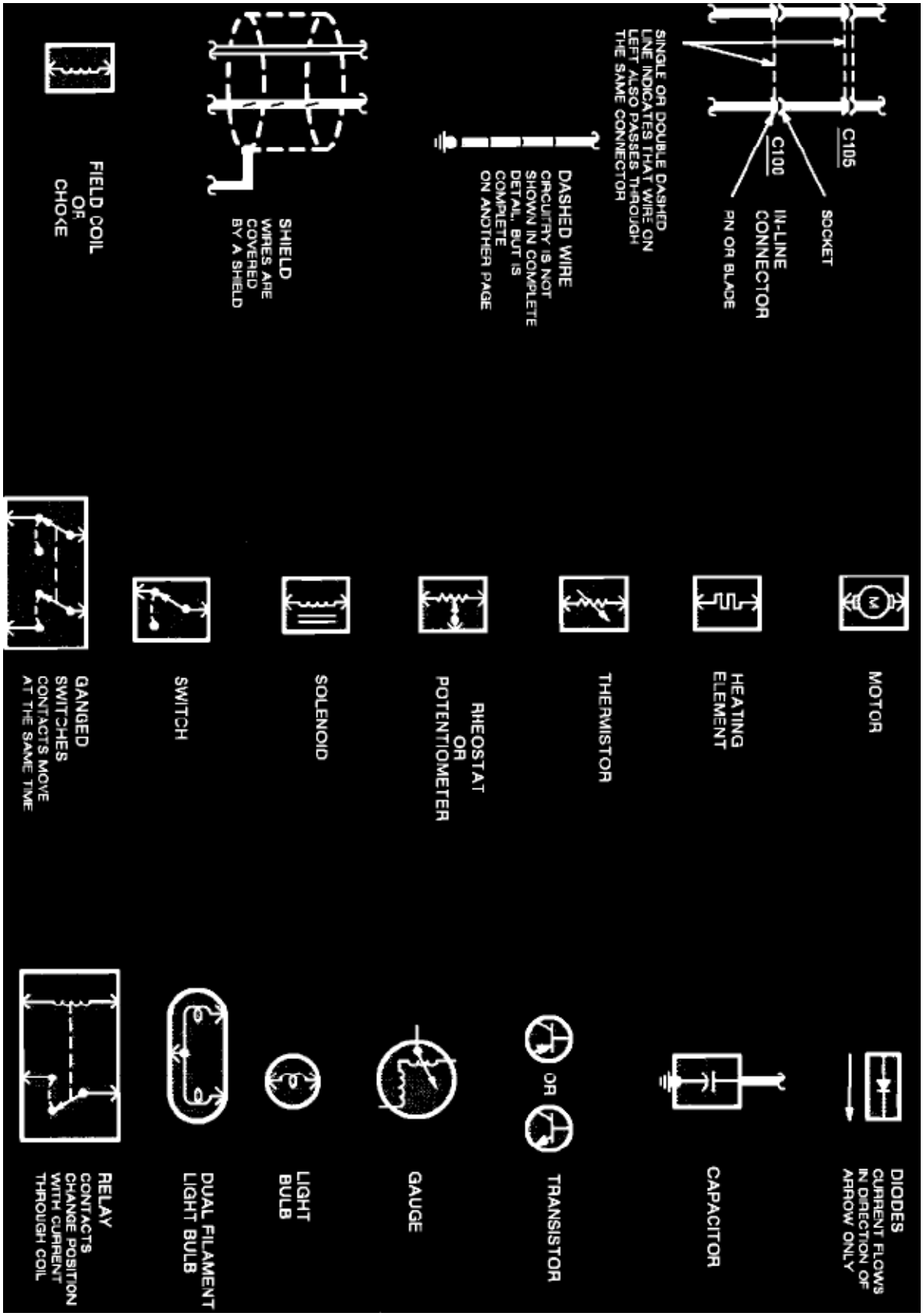
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

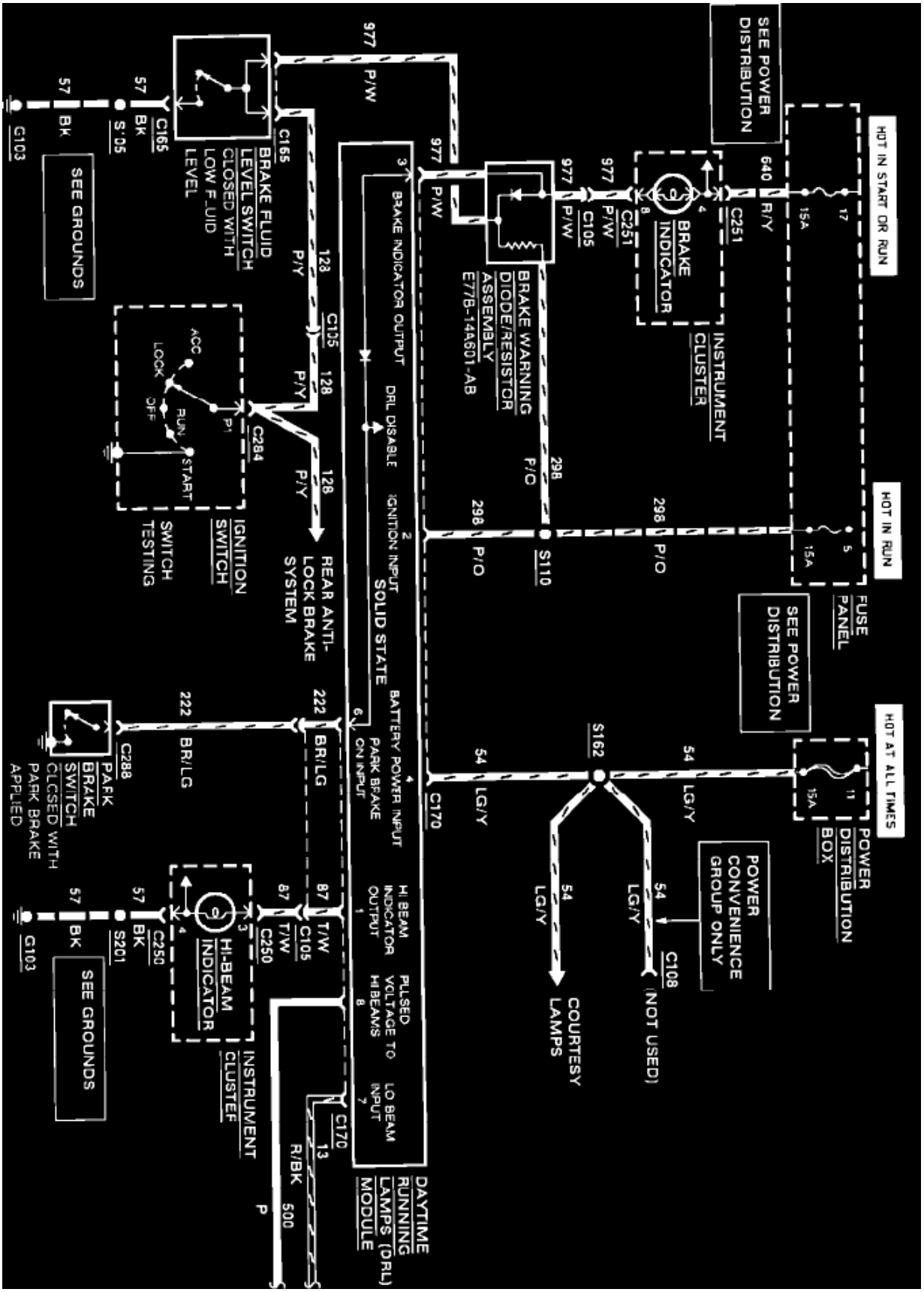
P: Purple

T: Tan

V: Violet

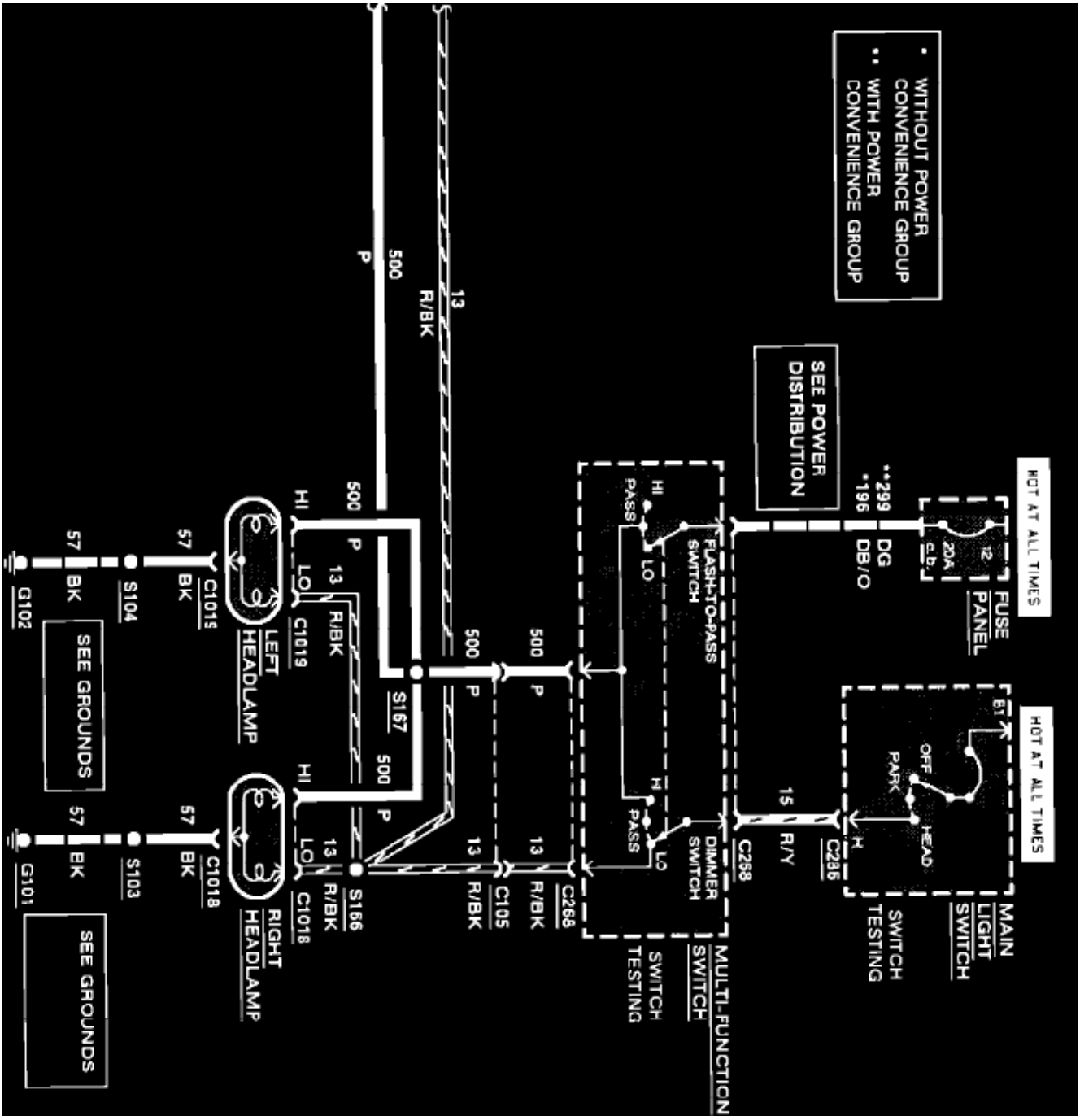
W: White

Y: Yellow


HOT IN START OR RUN
HOT IN RUN
HOT AT ALL TIMES
SEE POWER DISTRIBUTION
FUSE PANEL
POWER DISTRIBUTION BOX
BRAKE INDICATOR
INSTRUMENT CLUSTER
BRAKE WARNING DIODE/RESISTOR ASSEMBLY E77B-14A601-AB
BRAKE FLUID LEVEL SWITCH CLOSED WITH LOW FLUID LEVEL
SEE GROUNDS
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
SOLID STATE
BRAKE INDICATOR OUTPUT
DRL DISABLE
IGNITION INPUT
BATTERY POWER INPUT
PARK BRAKE CKT INPUT
PARK BRAKE SWITCH CLOSED WITH PARK BRAKE APPLIED
HI BEAM INDICATOR OUTPUT
PULSED VOLTAGE TO HI BEAMS
LO BEAM INPUT
HI-BEAM INDICATOR
POWER CONVENIENCE GROUP ONLY
(NOT USED)
COURTESY LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE

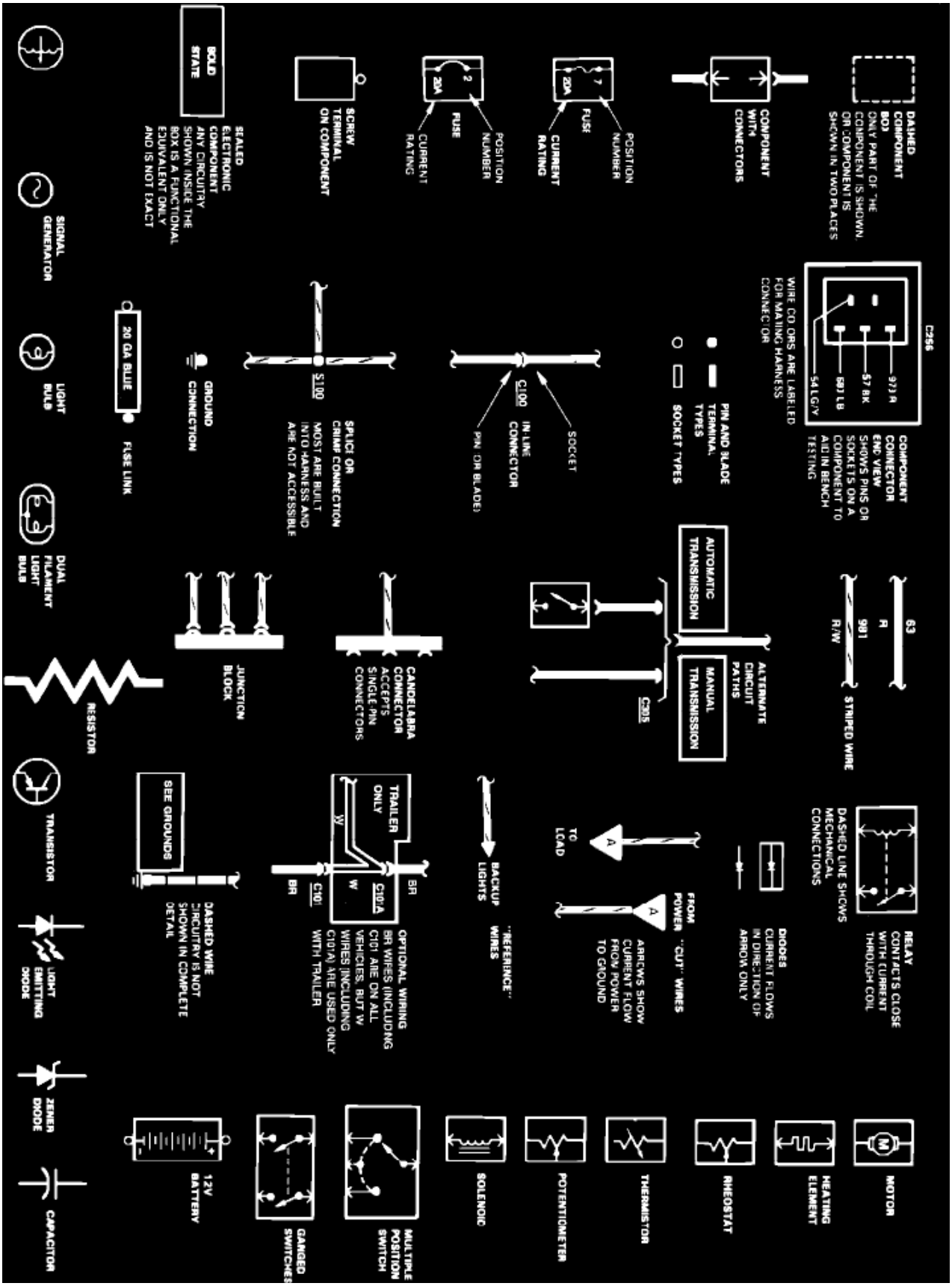
Daytime Running Lamp Control Unit: Electrical Diagrams

Daytime Running Lamps (Canada)



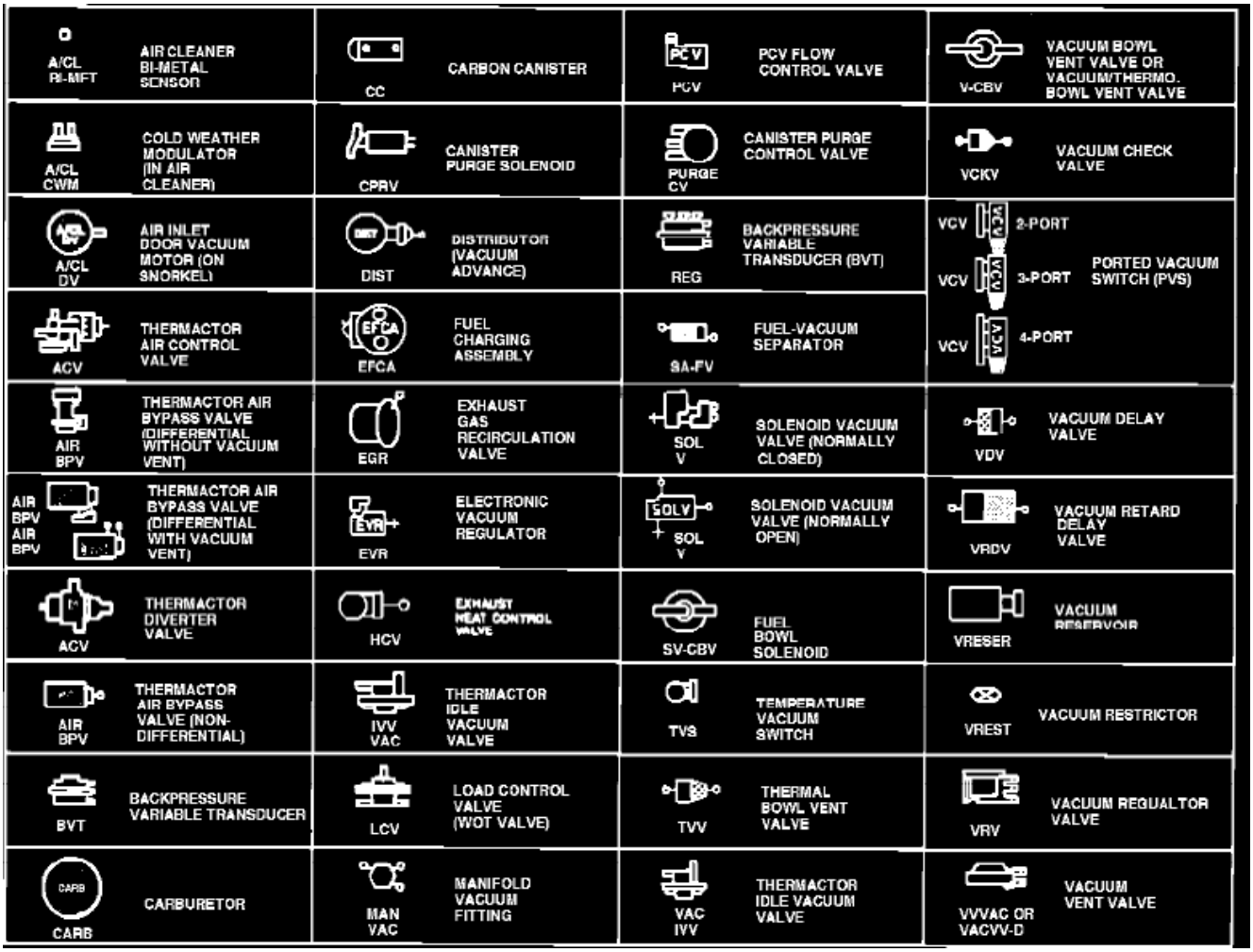
Daytime Running Lamps (Canada)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Lighting and Horns > Headlamp Control Module > Component Information > Diagrams > Diagram Information and Instructions

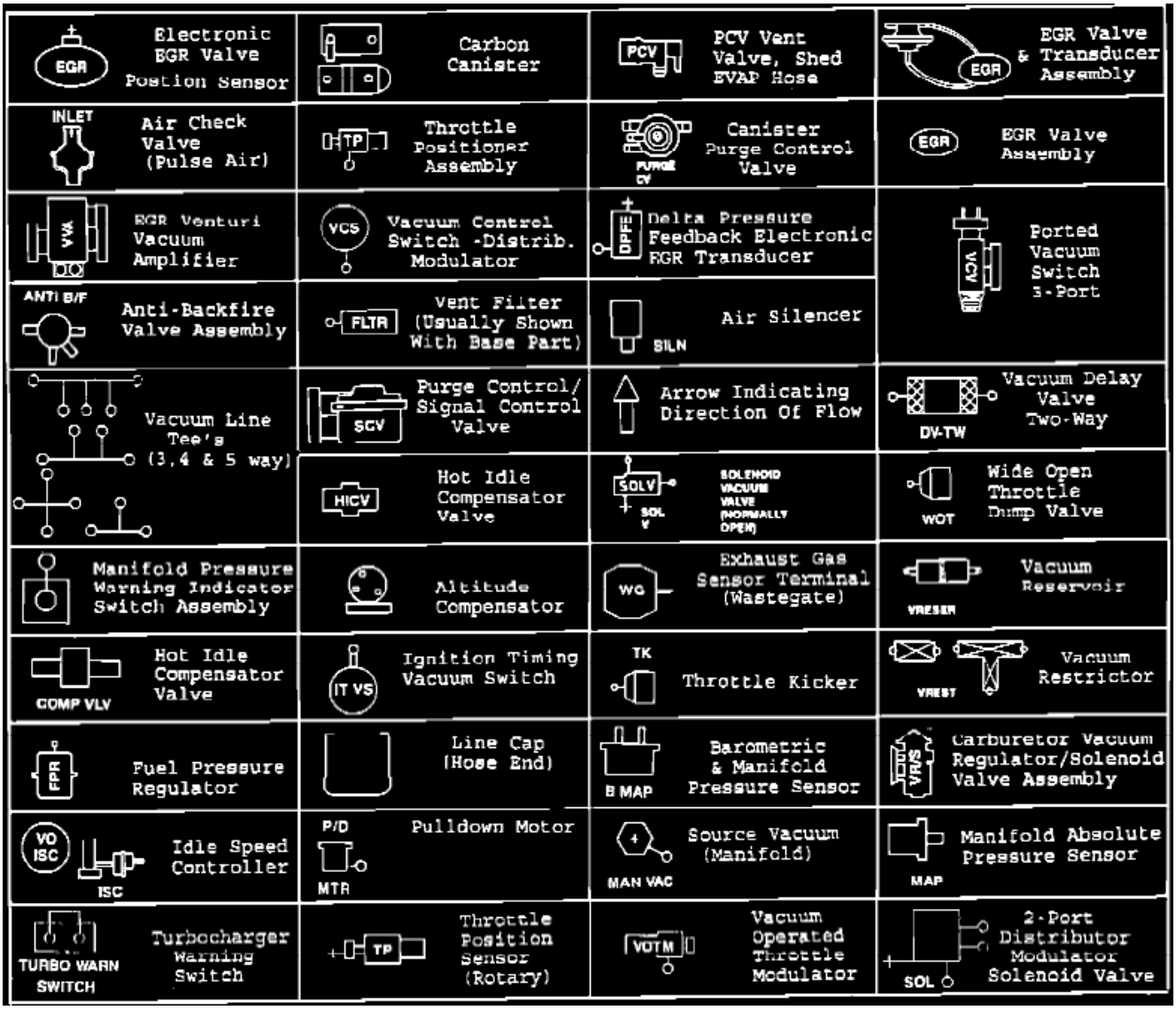


Headlamp Control Module: Diagram Information and Instructions

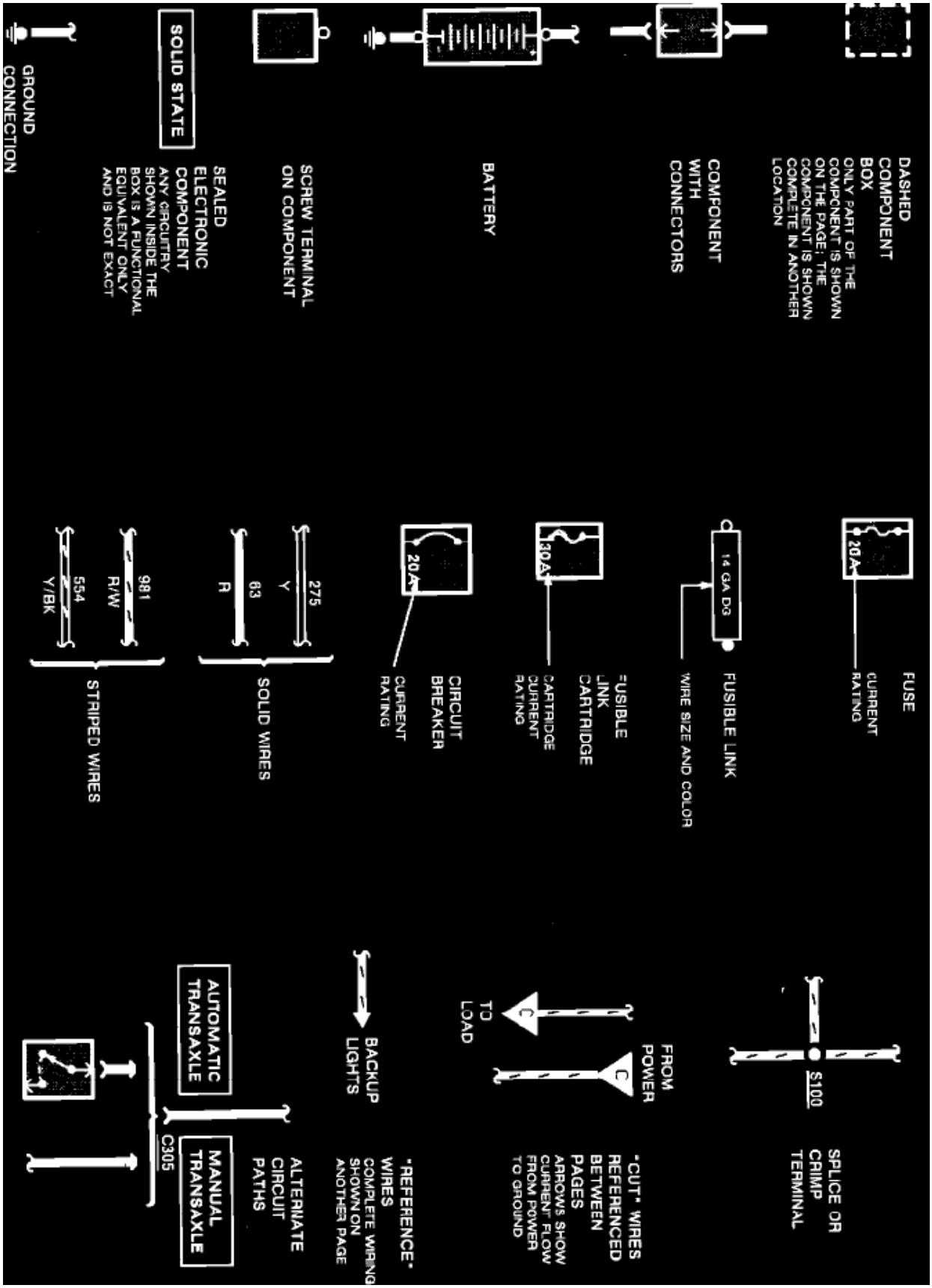
Symbol Identification



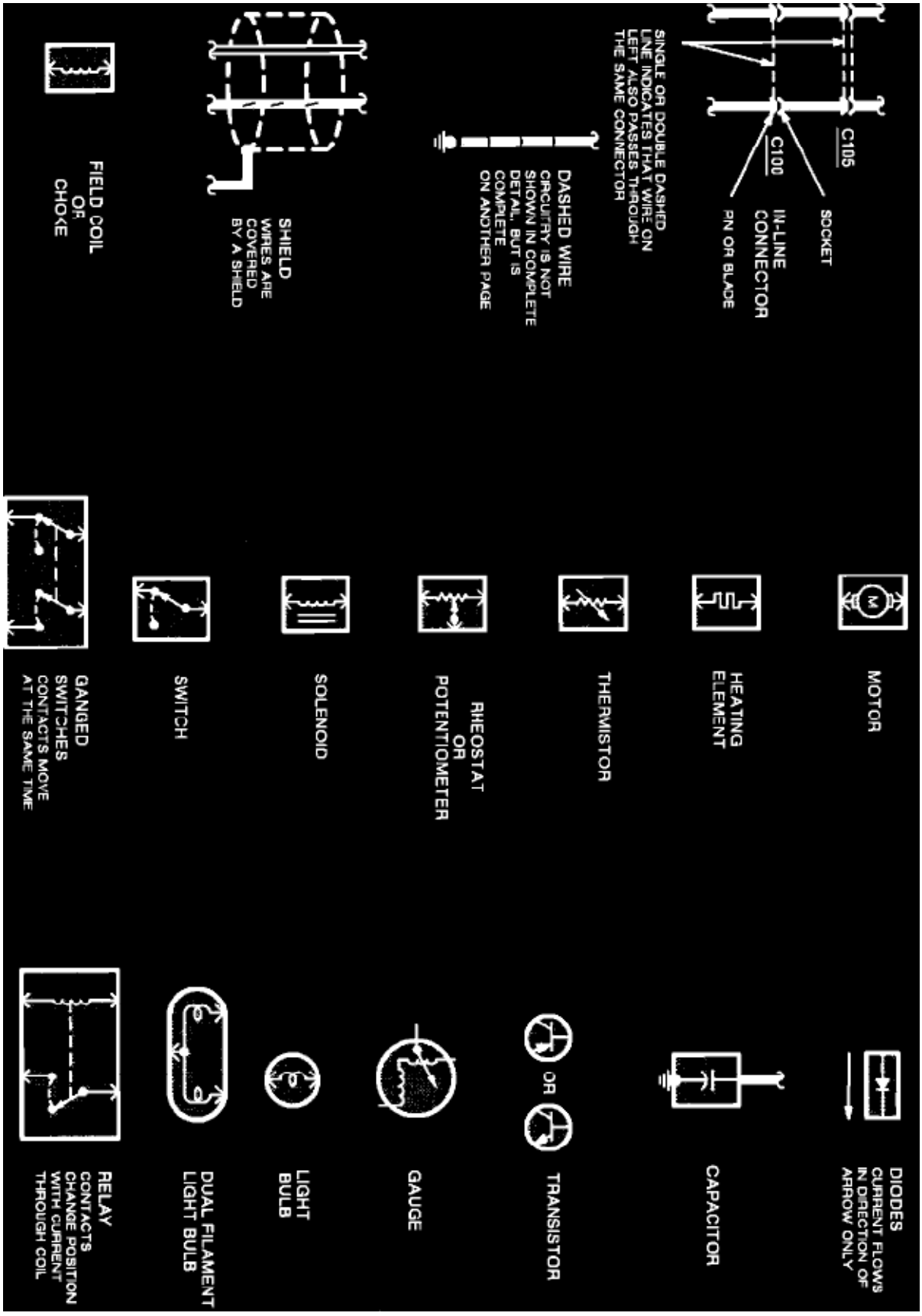
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

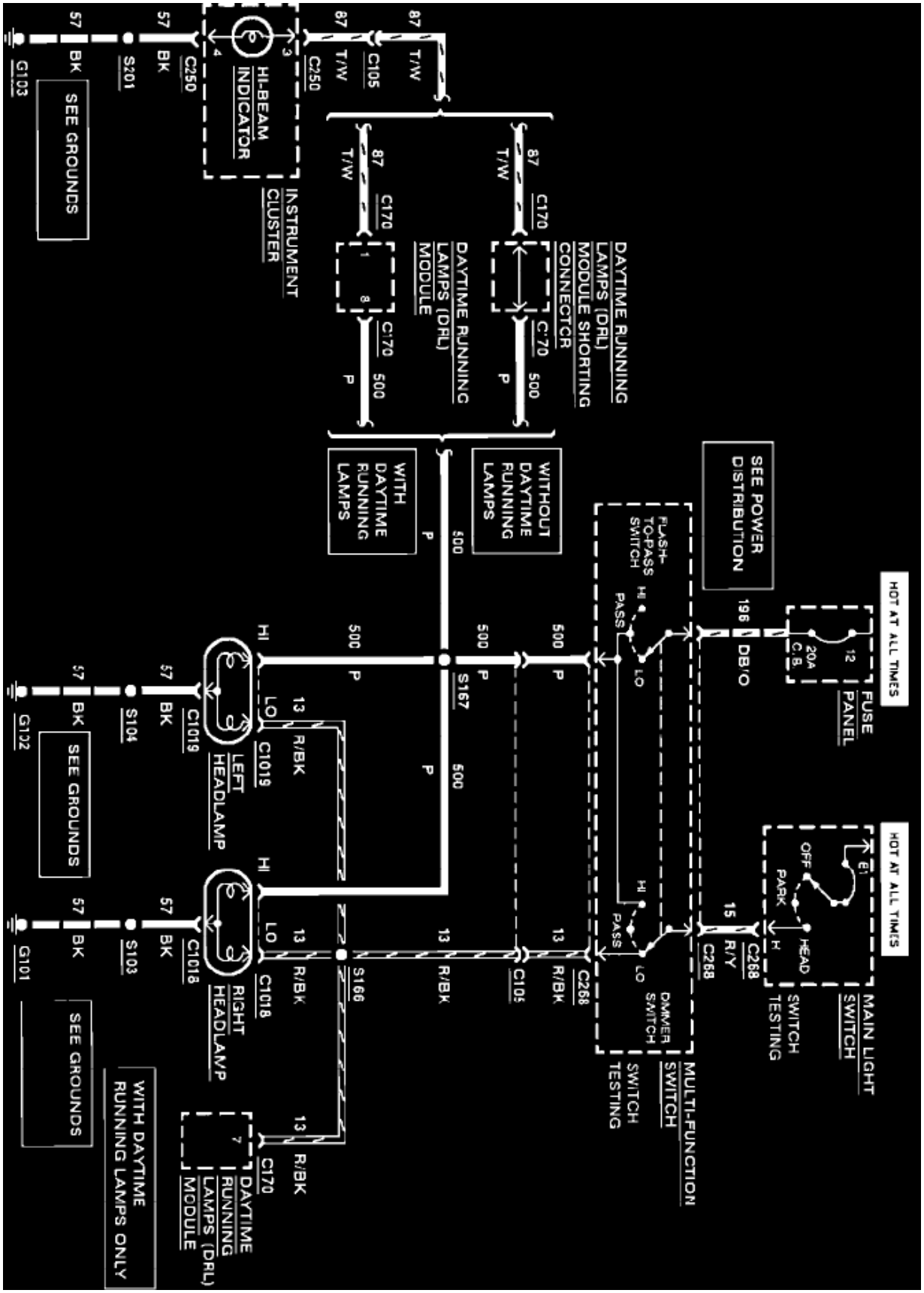
P: Purple

T: Tan

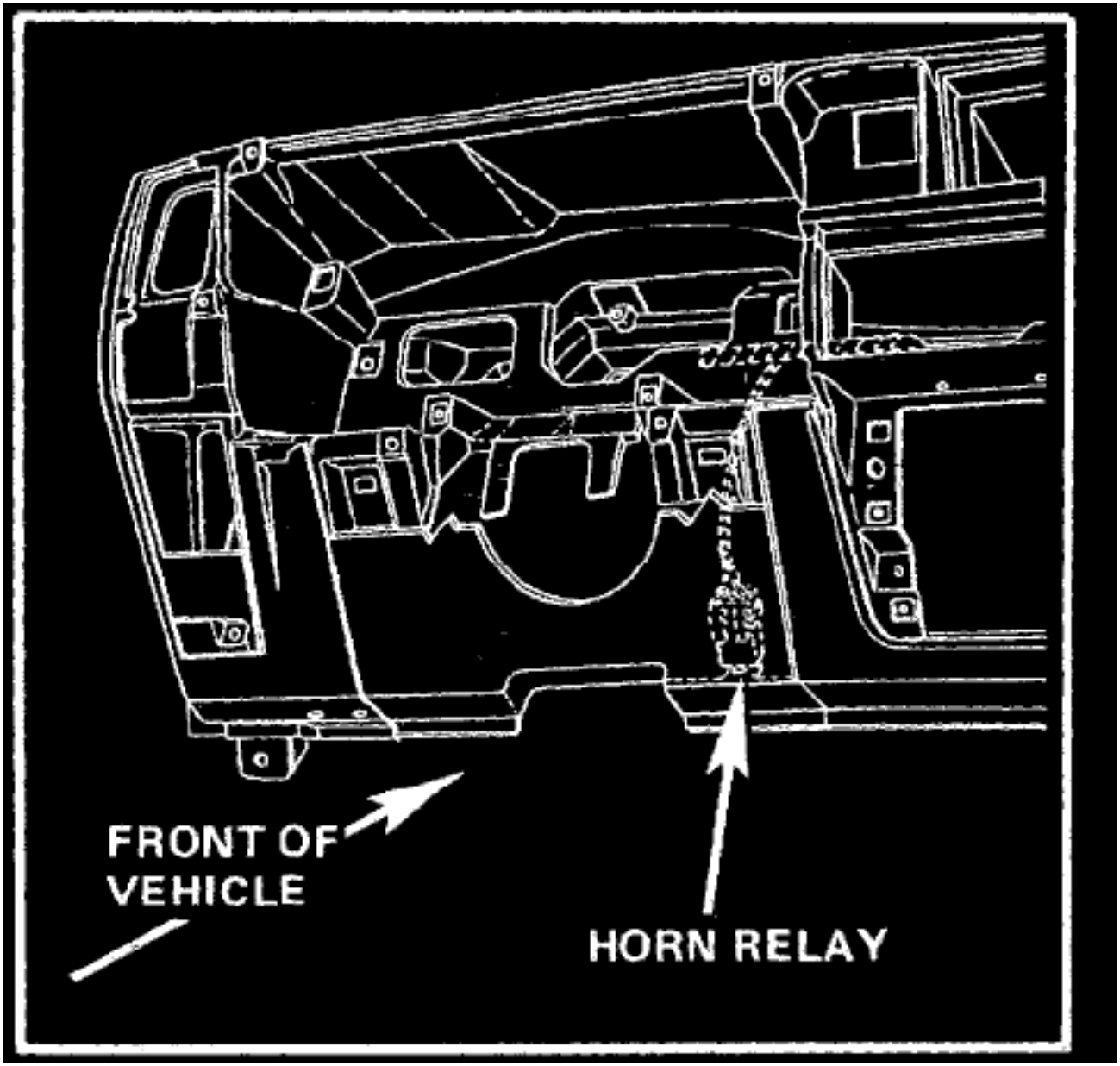
V: Violet

W: White

Y: Yellow


HOT AT ALL TIMES
FUSE PANEL
12
20A C.B.
HOT AT ALL TIMES
E1
MAIN LIGHT SWITCH
OFF
PARK
HEAD
SWITCH TESTING
SEE POWER DISTRIBUTION
196
DB/O
15
R/Y
C268
H
LO
HI
PASS
FLASH-TO-PASS SWITCH
MULTI-FUNCTION SWITCH
DIMMER SWITCH
SWITCH TESTING
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
C170
87
T/W
P
500
DAYTIME RUNNING LAMPS (DRL) MODULE
WITH DAYTIME RUNNING LAMPS
WITHOUT DAYTIME RUNNING LAMPS
C105
S167
S166
13
R/BK
INSTRUMENT CLUSTER
HI-BEAM INDICATOR
C250
S201
57
BK
G103
SEE GROUNDS
LEFT HEADLAMP
C1019
RIGHT HEADLAMP
C1018
S104
S103
G122
G101
WITH DAYTIME RUNNING LAMPS ONLY

Headlamps



Horn Relay: Locations

The horn relay is located behind the lower left side of the instrument panel, to the right of the steering column. It is attached to the speed control amplifier bracket. Vehicles not equipped with speed control do not use a horn relay.

Horn Relay: Testing and Inspection

Connectors should remain connected during following test.

1. Measure voltage between circuit 460 (yellow/light blue) and ground. If 12 volts are not indicated, check fuse F20A and repair or replace as required.

2. If circuit 460 (yellow/light blue) is as indicated, depress horn switch. Voltage at circuit 460 (horn relay terminal No. 4) should drop to about zero volts and horn should sound. If horn does not sound and circuit 460 remains at 12 volts, proceed to step 3.

3. Check for 12 volts at circuit 6 (yellow/light green) at horn relay terminals No. 2, if voltage is not present, replace relay, then repeat step 2.

4. If 12 volts are indicated at horn relay terminal No. 2, connect terminal No. 2 to ground. If horn sounds replace horn pad or buttons. If horn does not sound, check for 12 volts at circuit 1 (dark blue) at horn relay terminal No. 3 with terminal No. 2 grounded. If voltage is not indicated, replace relay and repeat step 2. If voltage is indicated, check horn connectors and function.

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: Customer Interest Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

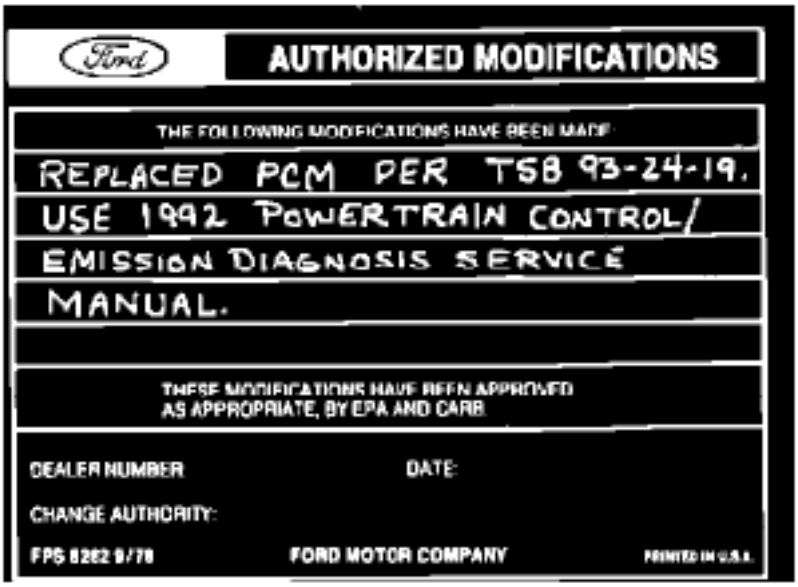
b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART		
APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000

EEC IV PROCESSOR REFERENCE CHART

APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

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CATALYTIC CONVERTER REFERENCE CHART

APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
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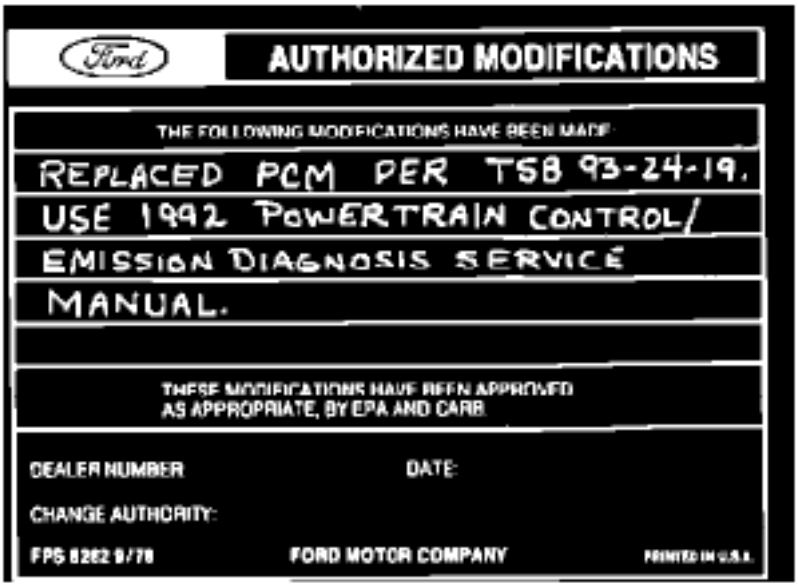
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

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Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

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932419C Replace Catalytic Converter 1.0 Hr.

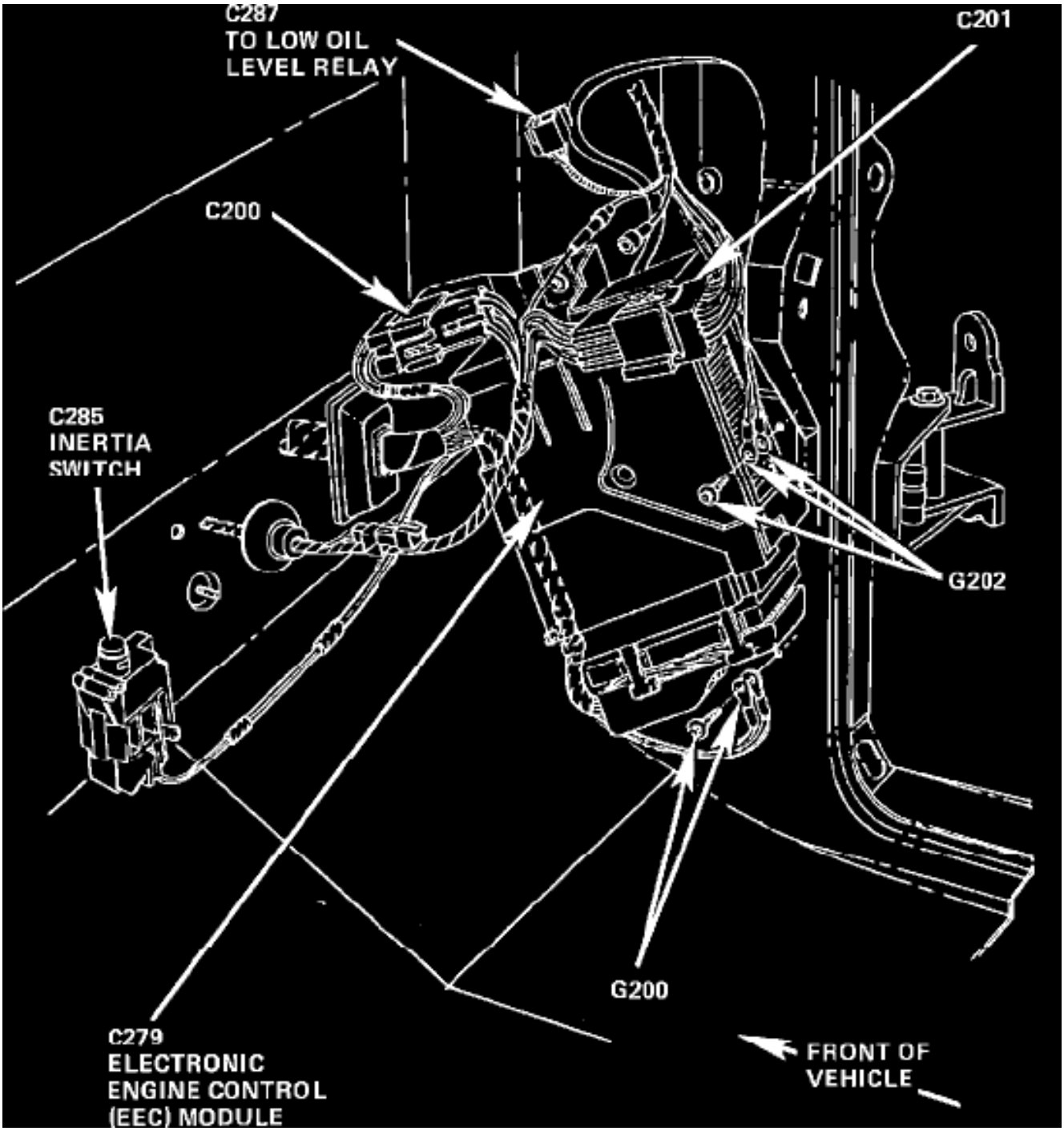
- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

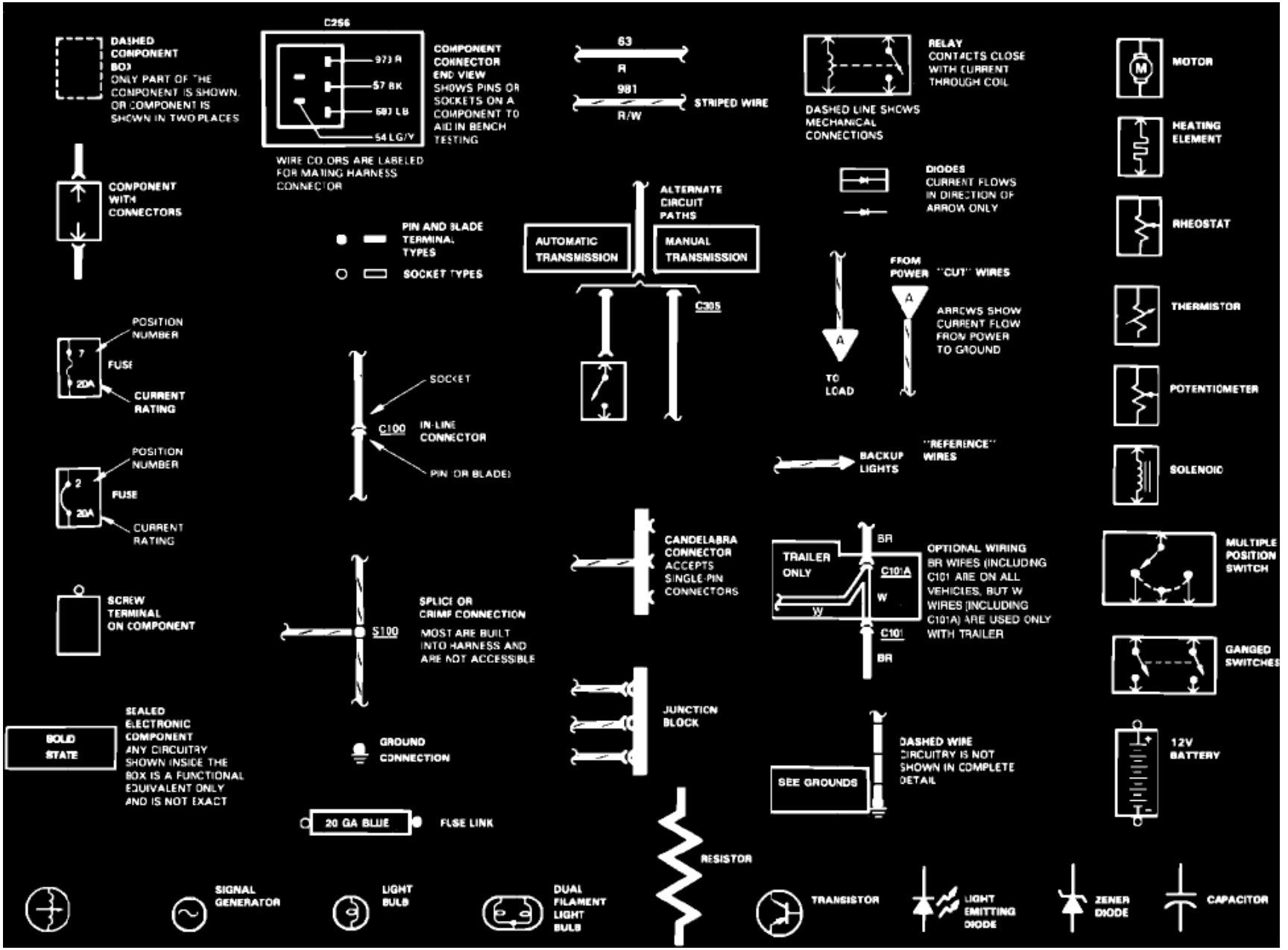
BASIC PART NO. CONDITION CODE

ODOR 08

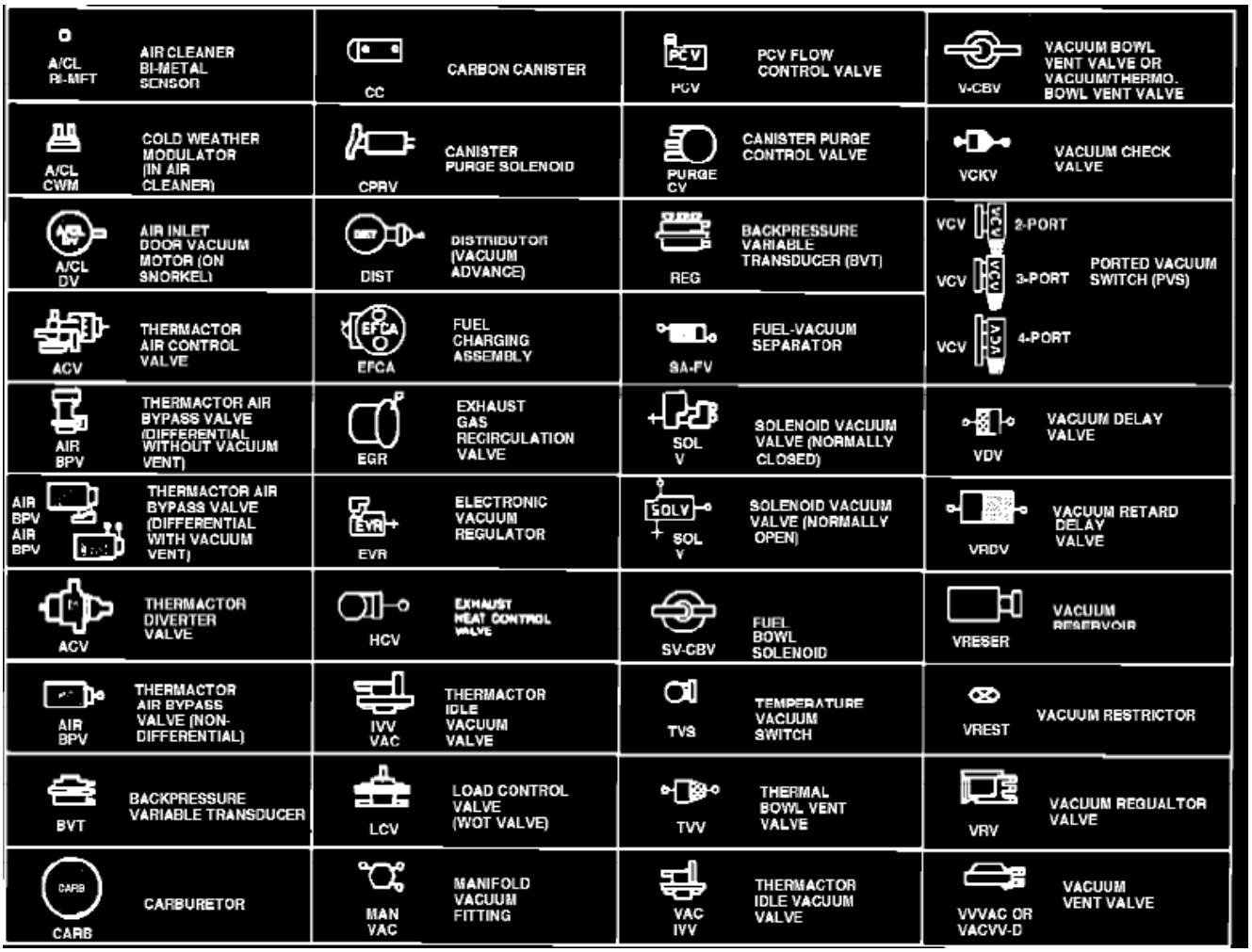
OASIS CODES: 403000, 623000



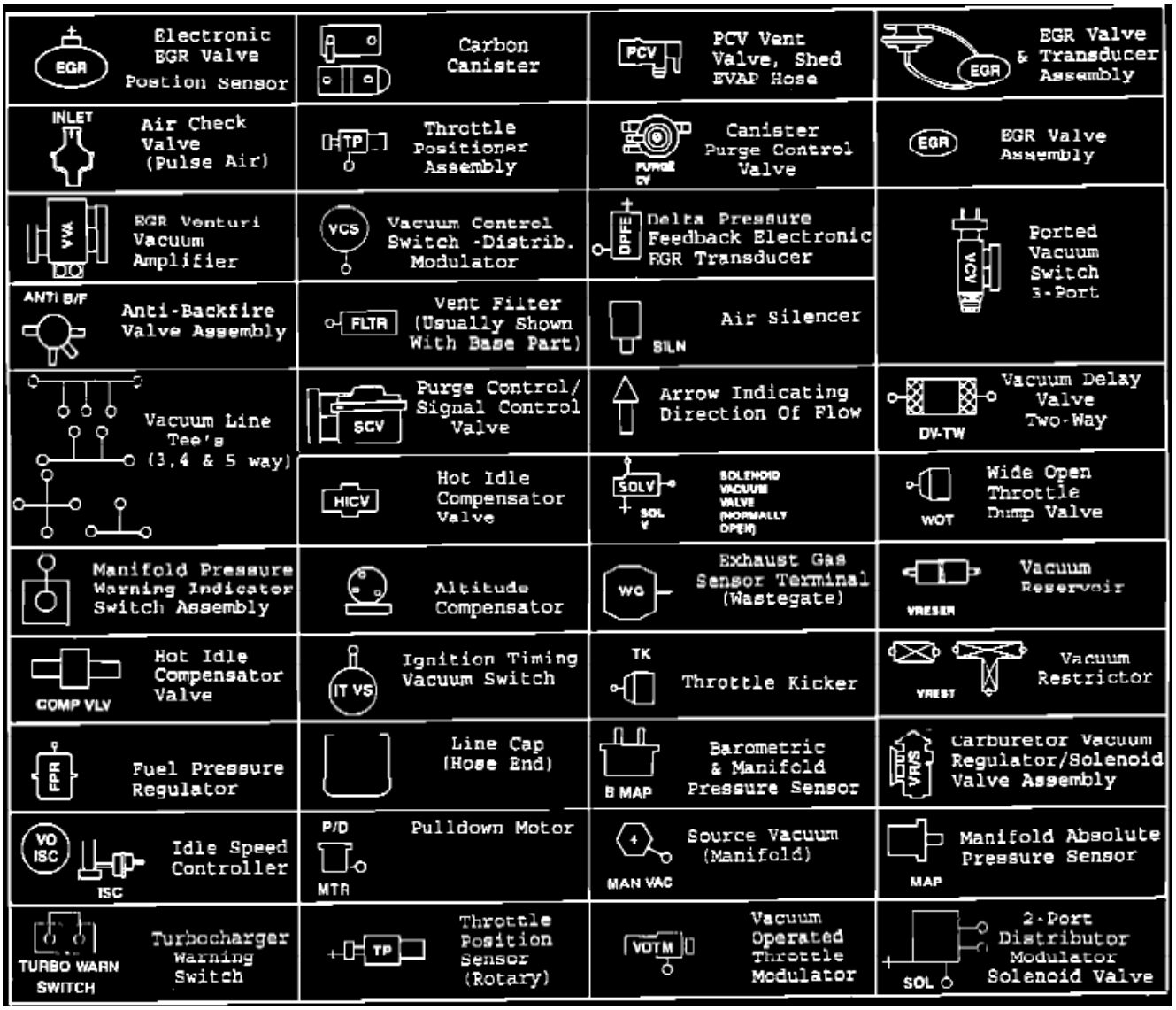
Engine Control Assembly (ECA)


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN, OR COMPONENT IS SHOWN IN TWO PLACES
C256
973 R
57 BK
581 LB
54 LG/Y
COMPONENT CONNECTOR END VIEW SHOWS PINS OR SOCKETS ON A COMPONENT TO AID IN BENCH TESTING
WIRE COLORS ARE LABELED FOR MATING HARNESS CONNECTOR
63
R
981
R/W
STRIPED WIRE
RELAY
CONTACTS CLOSE WITH CURRENT THROUGH COIL
DASHED LINE SHOWS MECHANICAL CONNECTIONS
MOTOR
HEATING ELEMENT
COMPONENT WITH CONNECTORS
PIN AND BLADE TERMINAL TYPES
SOCKET TYPES
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSMISSION
MANUAL TRANSMISSION
C305
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
RHEOSTAT
FROM POWER
"CUT" WIRES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
TO LOAD
THERMISTOR
POTENTIOMETER
POSITION NUMBER
FUSE
CURRENT RATING
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
BACKUP LIGHTS
"REFERENCE" WIRES
SOLENOID
POSITION NUMBER
FUSE
CURRENT RATING
CANDELABRA CONNECTOR ACCEPTS SINGLE-PIN CONNECTORS
TRAILER ONLY
BR
C101A
W
W
C101
BR
OPTIONAL WIRING
BR WIRES (INCLUDING C101 ARE ON ALL VEHICLES, BUT W WIRES (INCLUDING C101A) ARE USED ONLY WITH TRAILER
MULTIPLE POSITION SWITCH
SCREW TERMINAL ON COMPONENT
S100
SPLICE OR CRIMP CONNECTION
MOST ARE BUILT INTO HARNESS AND ARE NOT ACCESSIBLE
GANGED SWITCHES
JUNCTION BLOCK
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
SEE GROUNDS
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL
12V BATTERY
20 GA BLUE
FUSE LINK
RESISTOR
SIGNAL GENERATOR
LIGHT BULB
DUAL FILAMENT LIGHT BULB
TRANSISTOR
LIGHT EMITTING DIODE
ZENER DIODE
CAPACITOR

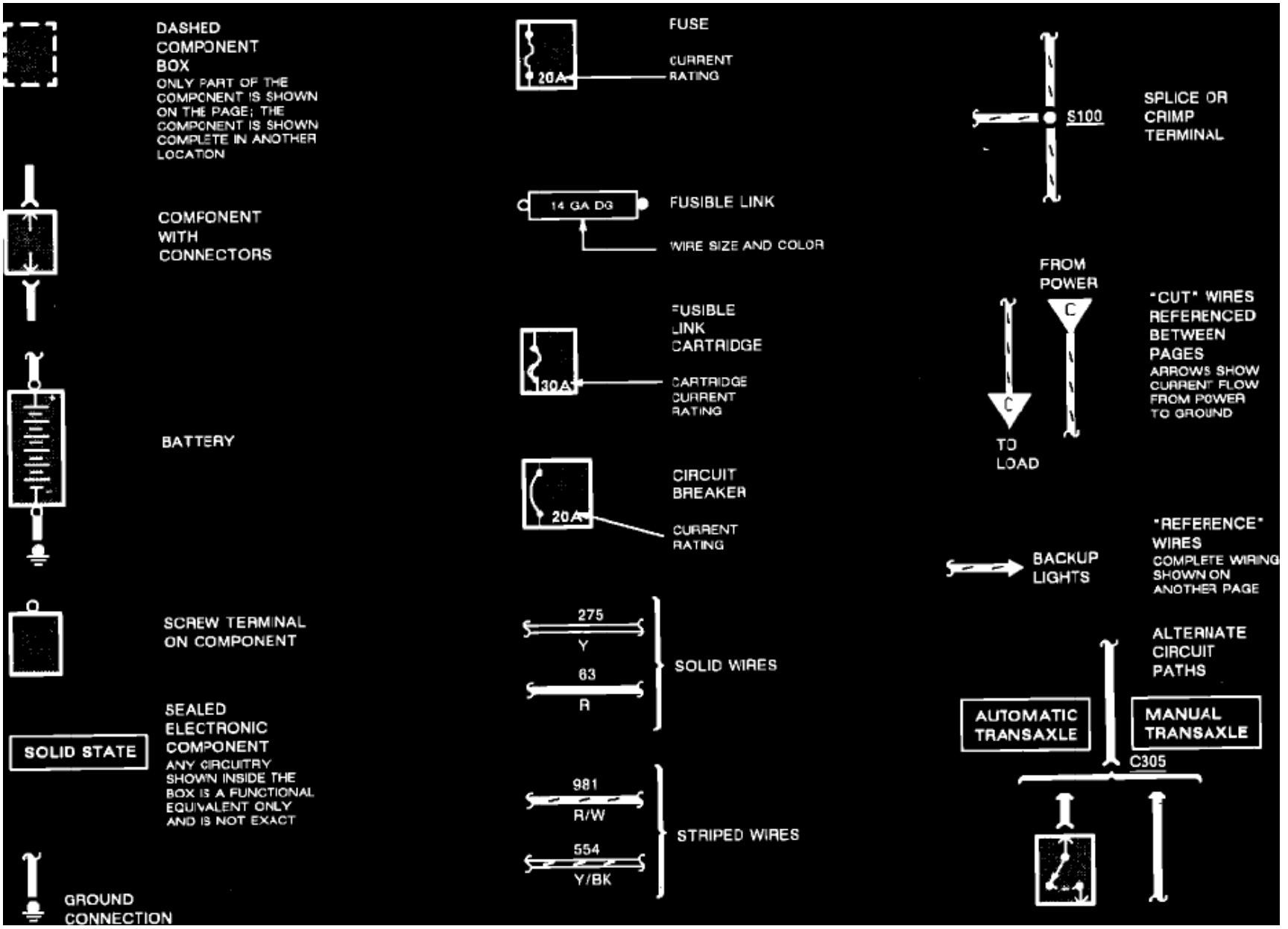
Symbol Identification

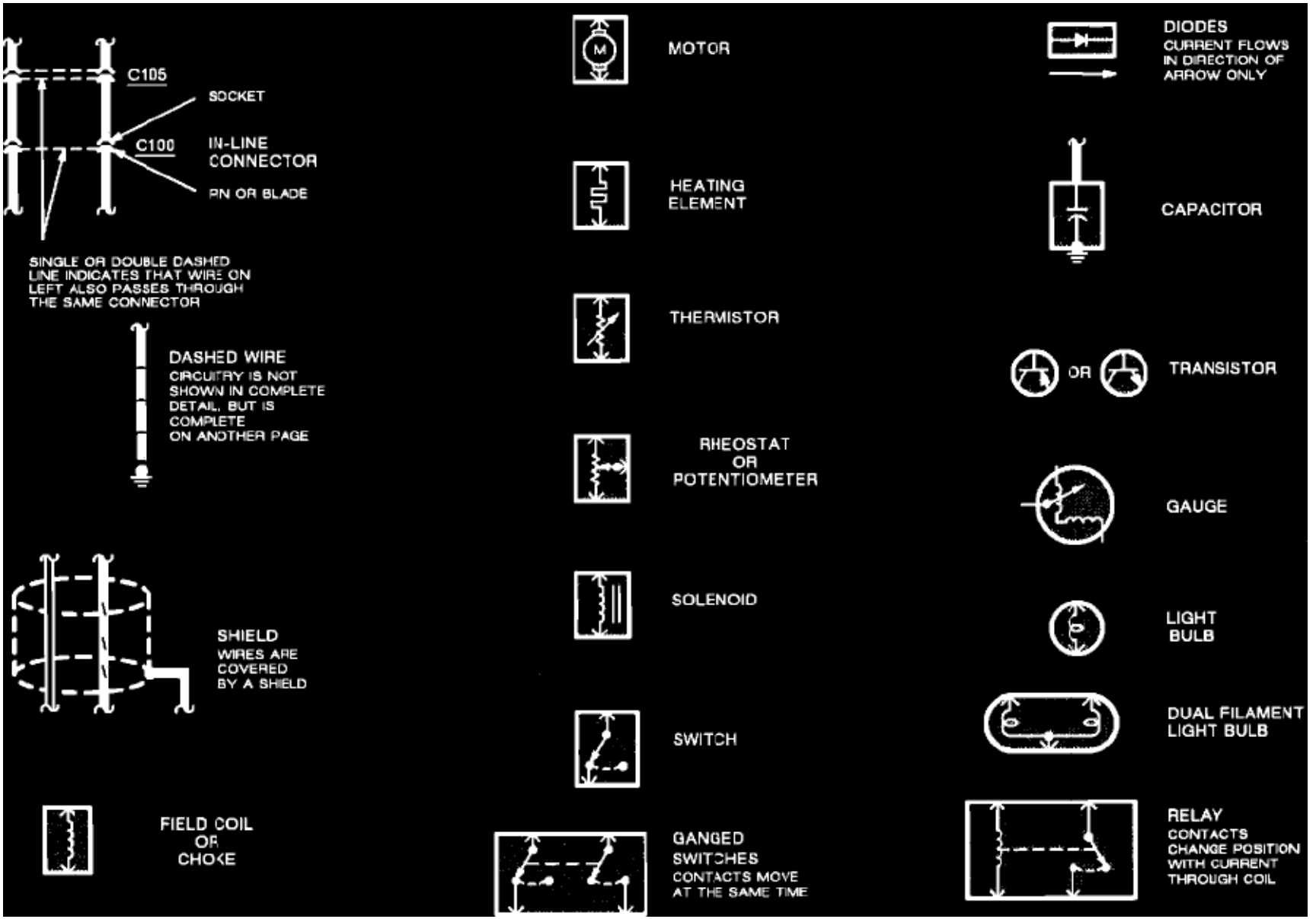


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

V: Violet

W: White

Y: Yellow

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (A/T only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
5	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
9	915	PK/LB	Data Communications Link (-)	DATA (-)
10	198	DG/O	A/C Cycling Switch	ACCS
14	967	LB/R	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Sensor Return	MAF RTN
16	259	O/R	Ignition Ground	IGN GND
17	656	PK/LG	Self-Test Output/Malfunction Indicator Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air) Solenoid	ISC
22	926	LB/O	Fuel Pump	FP
25	743	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
28	914	T/O	Data Communications Link (+)	DATA (+)
29	74	GY/LB	Heated Exhaust Gas Oxygen Sensor	HEGO
30	199	LB/Y	Clutch Interlock Switch (M/T Only)	CIS
30	199	LB/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge Solenoid	CANP
36	929	PK	Spark Angle Width	SAW
37	361	R	Vehicle Power	VPWR
40	570	BK/W	Power Ground	PWR GND
44	242	DG	Octane Adjust	OCT ADJ
45	358	LG/BK	Barometric Pressure Sensor	BP
46	350	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	99	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	237	O/Y	Shift Solenoid (A/T Only)	SS
53	480	P/Y	Clutch Converter Override (A/T Only)	CCO
54	331	PK/Y	WOT A/C Cut-Off	WAC
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 - Controls Engine Cylinder Numbers 1, 2, and 3)	INJ BANK 1
59	556	W	Injector (Bank 2 - Controls Engine Cylinder Numbers 4, 5, and 6)	INJ BANK 2
60	570	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.

ECA Connector Pin Identification

Engine Control Module: Description and Operation Electronic Control Assembly (ECA)

The Electronic Control Assembly (ECA) receives ignition ground and Profile Ignition Pickup (PIP) signals from the EDIS module then generates a Spark Angle Word (SAW) output signal based on fuel, air and other sensor information. An IDM signal is received from the EDIS module to determine if a failure mode should be recorded. For diagnosis and testing of the ECA refer to "COMPUTERIZED ENGINE CONTROLS".

Engine Control Module: Description and Operation Failure Mode Effects Management

PURPOSE

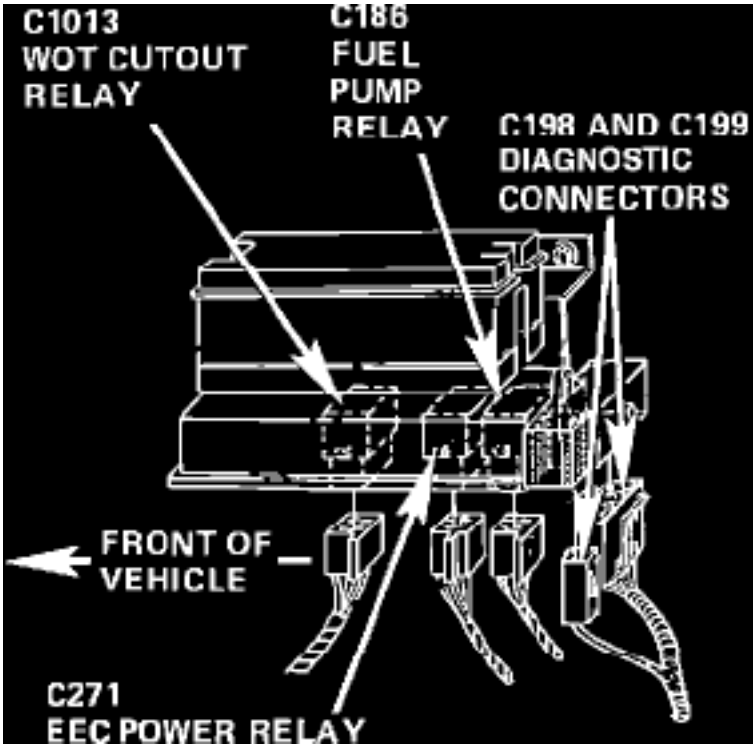
Operating mode that attempts to keep the vehicle driveable in the event of certain Electronic Engine Control (EEC) or ignition system failures.

Engine Control Module: Service and Repair

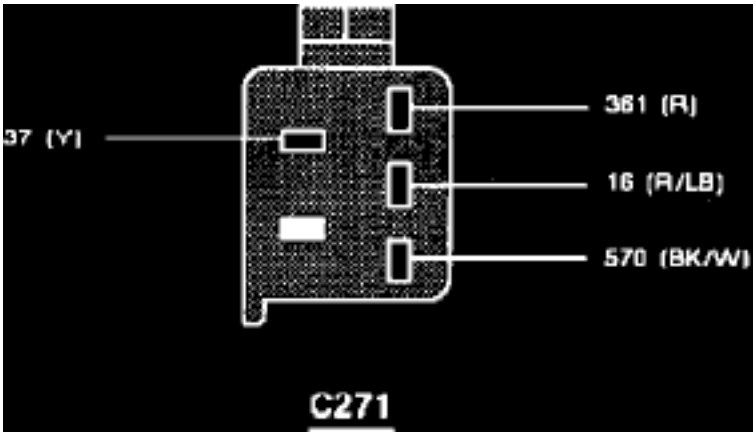
The processor stores data about vehicle operating conditions and uses this information to compensate for component tolerances. When an emission related component is replaced, Keep Alive Memory (KAM) should be cleared to erase the data stored by the processor from the original component.

1. With the ignition switch OFF, disconnect the negative battery cable for a minimum of five minutes, then reconnect the cable.

2. Operate the vehicle for a minimum of ten miles to allow the Engine Control Assembly (ECA) to relearn values for optimum driveability and performance. NOTE: Distance varies with vehicle application.



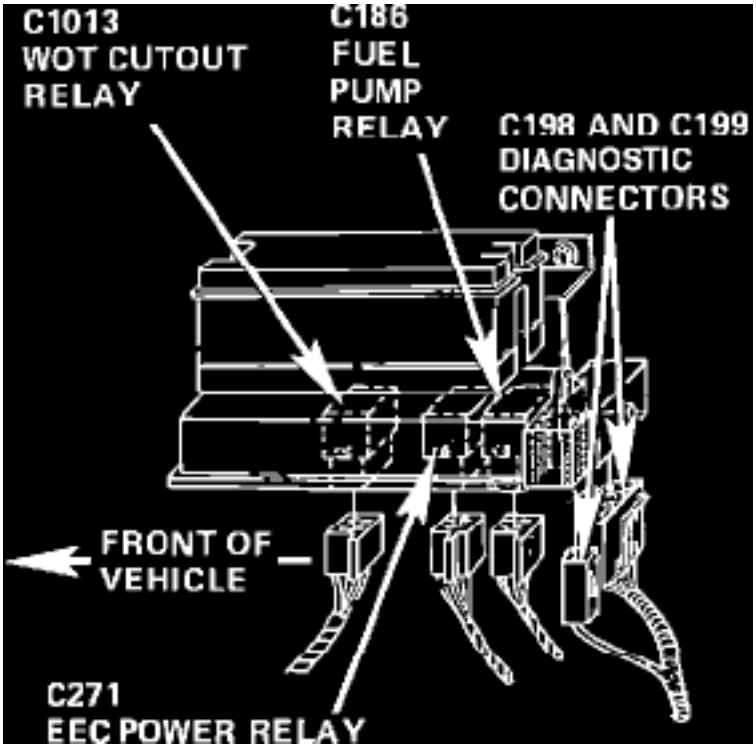
Relay And Diagnostic Connectors



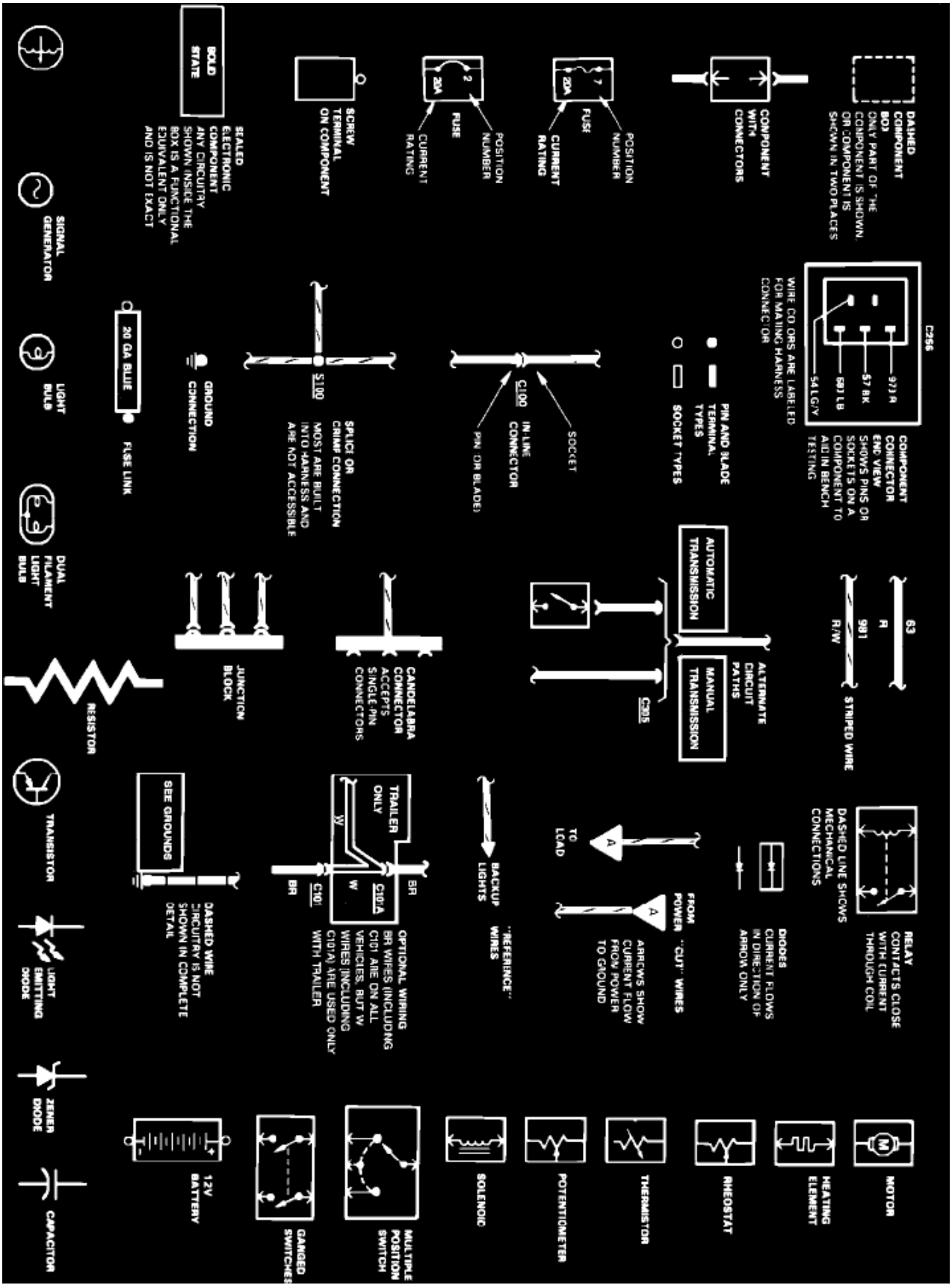
EEC-IV Power Relay Connector

Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.

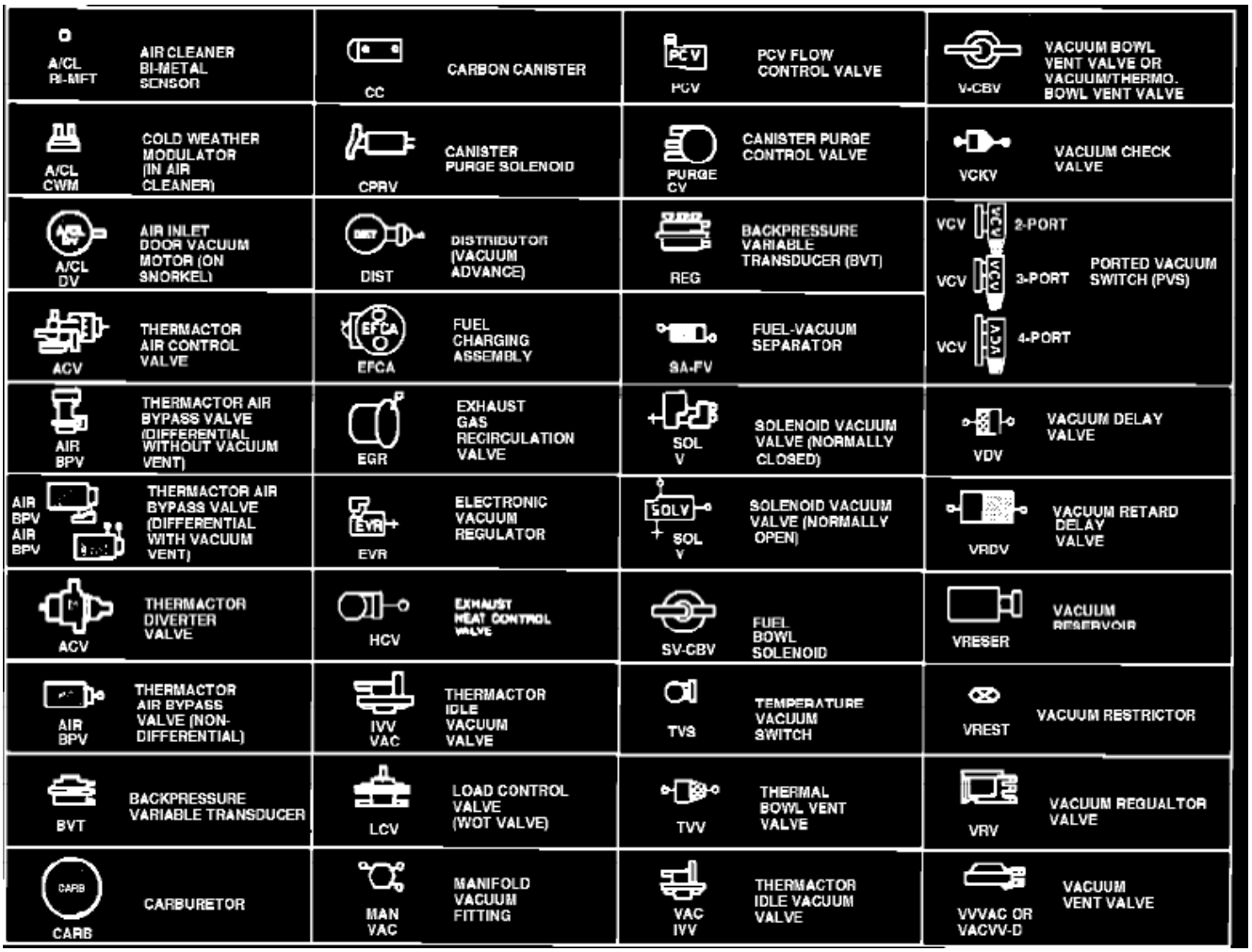


Relay And Diagnostic Connectors

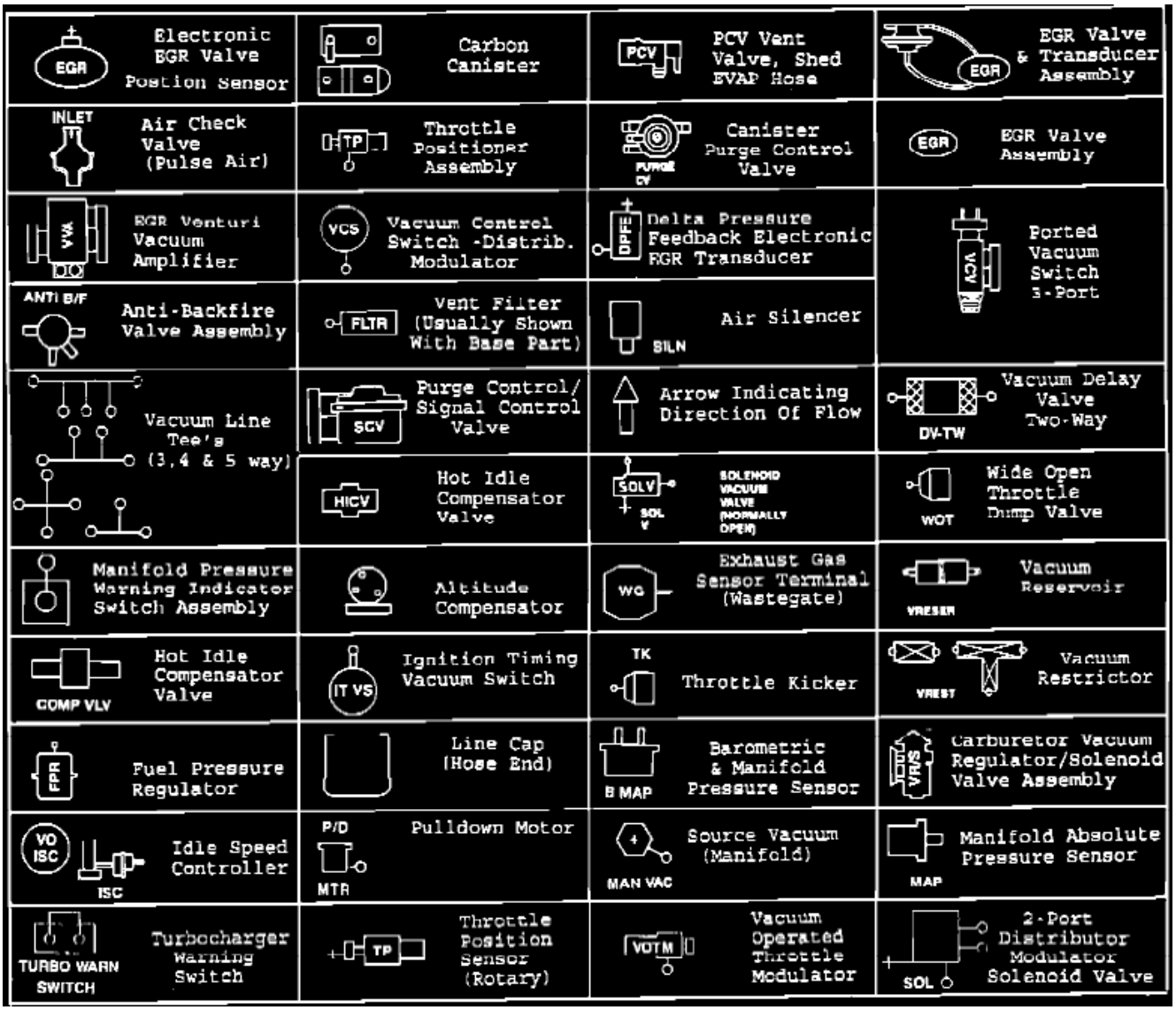


Fuel Pump Relay: Diagram Information and Instructions

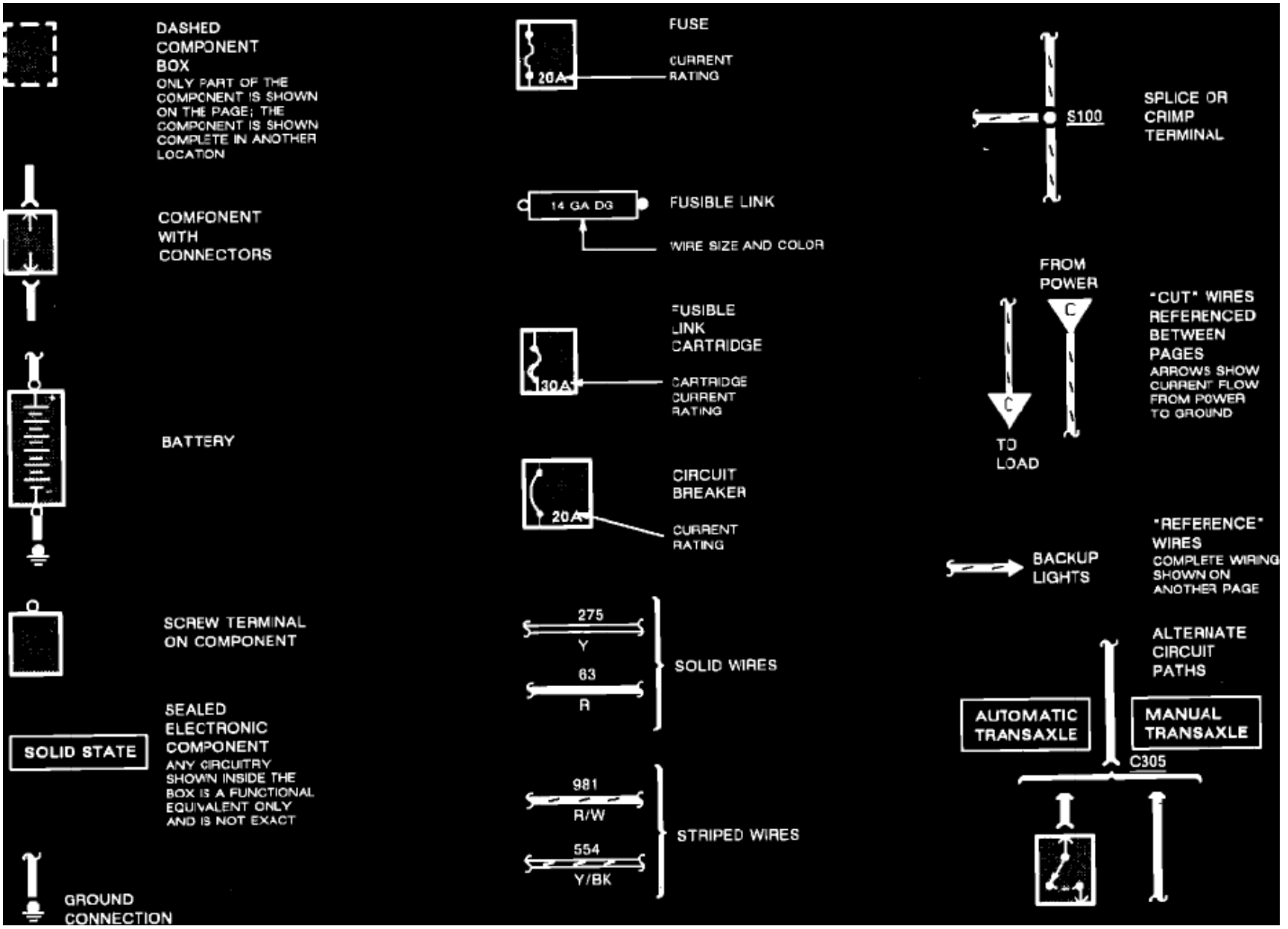
Symbol Identification

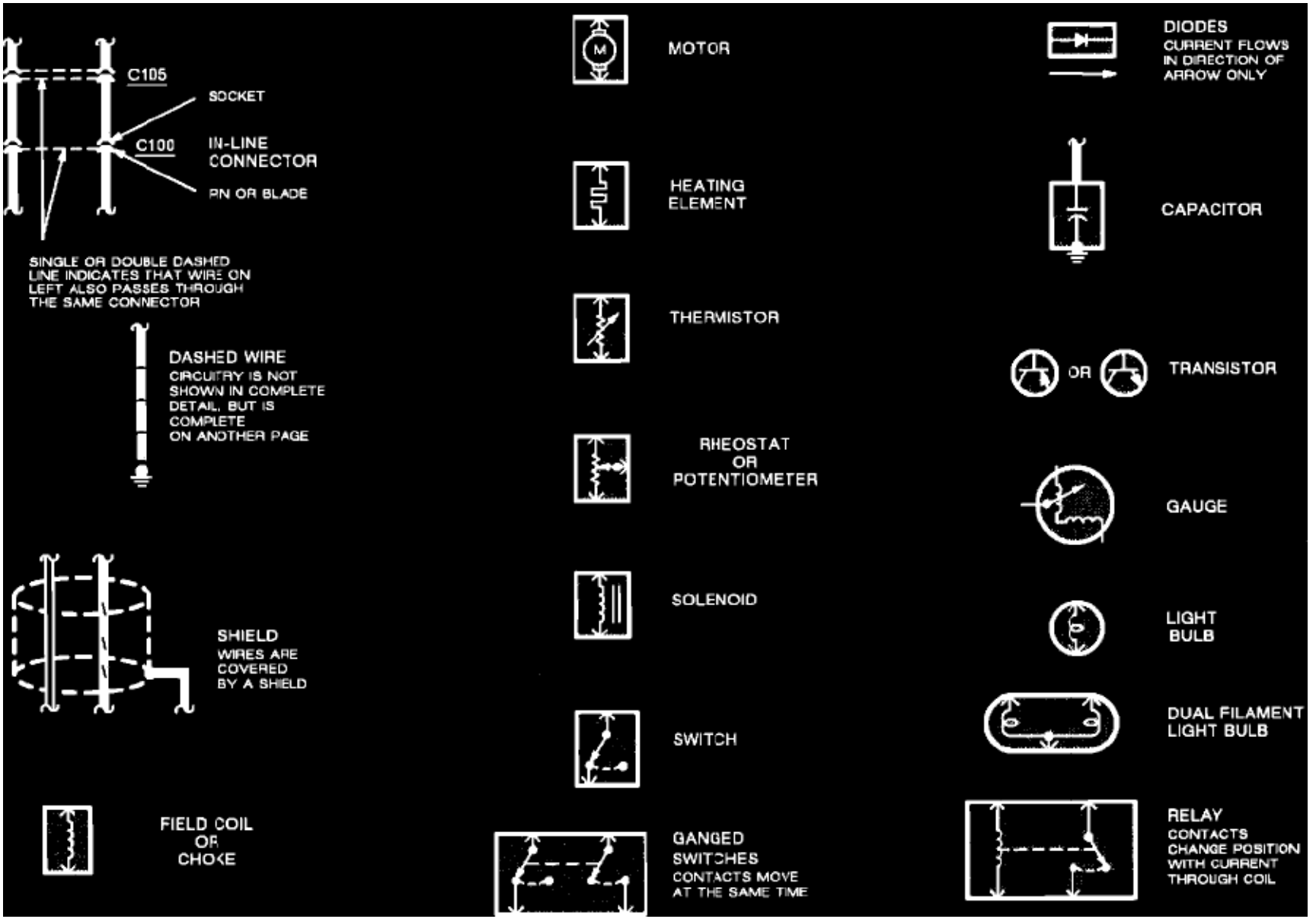


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

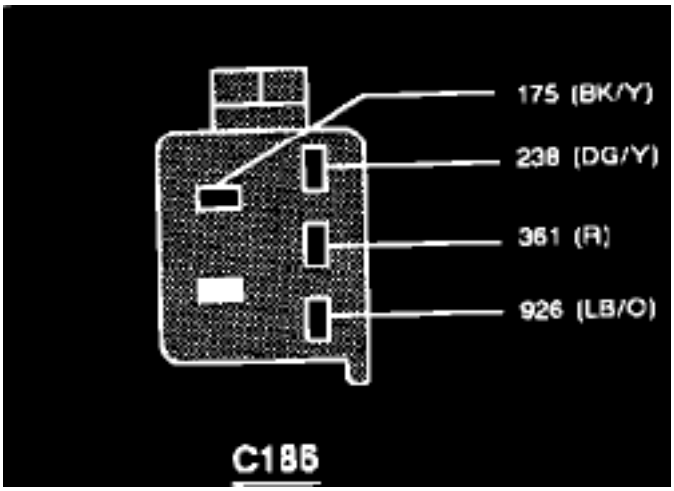
P: Purple

T: Tan

V: Violet

W: White

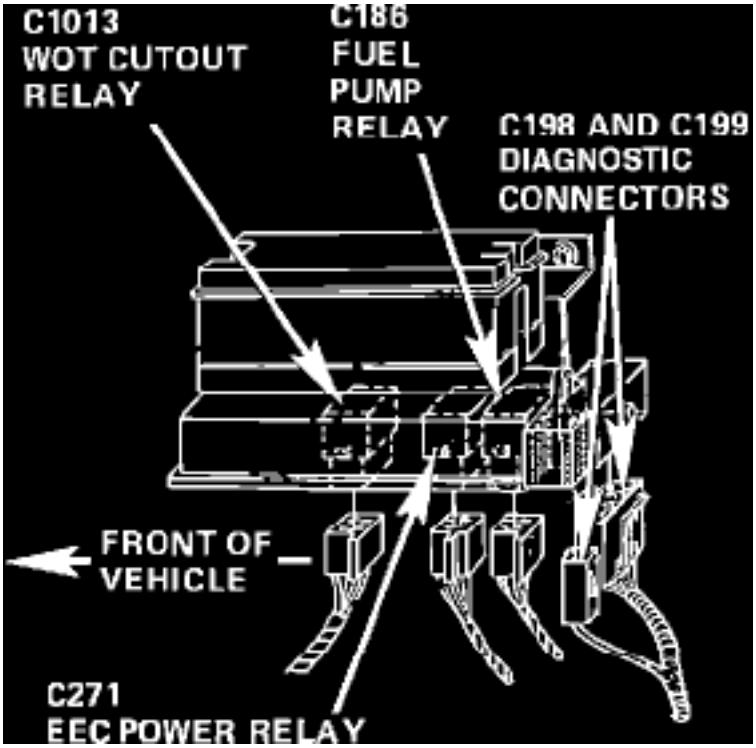
Y: Yellow



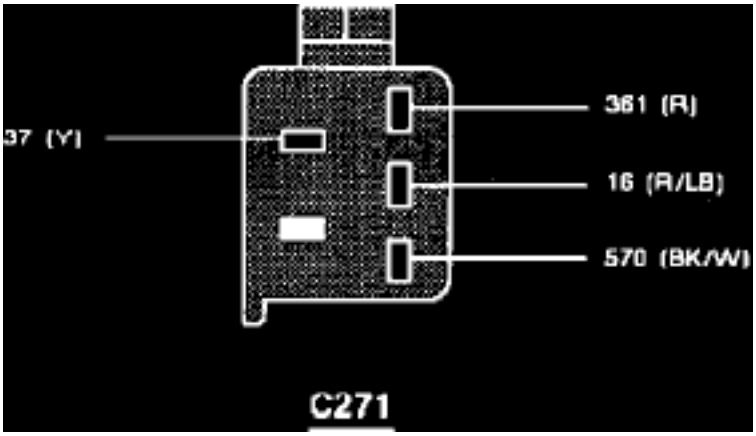
Fuel Pump Relay Connector

Fuel Pump Relay: Description and Operation

When the ignition switch is turned ON, the Electronic Engine Control (EEC) power relay is ENERGIZED, providing power to the fuel pump relay. Fuel pump power is provided through the fuel pump relay contacts and an inertia switch. If the ignition switch is not turned to the START position in approximately one second, a timer circuit in the Engine Control Assembly (ECA) will open the ground circuit to the fuel pump relay, causing the fuel pump relay contacts to OPEN. This action stops the power supply to the fuel pump. When the ignition switch is turned to the START position, the ECA closes the ground circuit to the fuel pump relay, resuming operation of the fuel pump. After the engine switch is returned to the ON position, power to the fuel pump is supplied through the fuel pump relay. The ECA monitors engine speed and OPENS the fuel pump relay ground circuit if the engine speed drops below 120 rpm.



Relay And Diagnostic Connectors



EEC-IV Power Relay Connector

Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.

Ignition Control Module: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: All Technical Service Bulletins Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

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AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

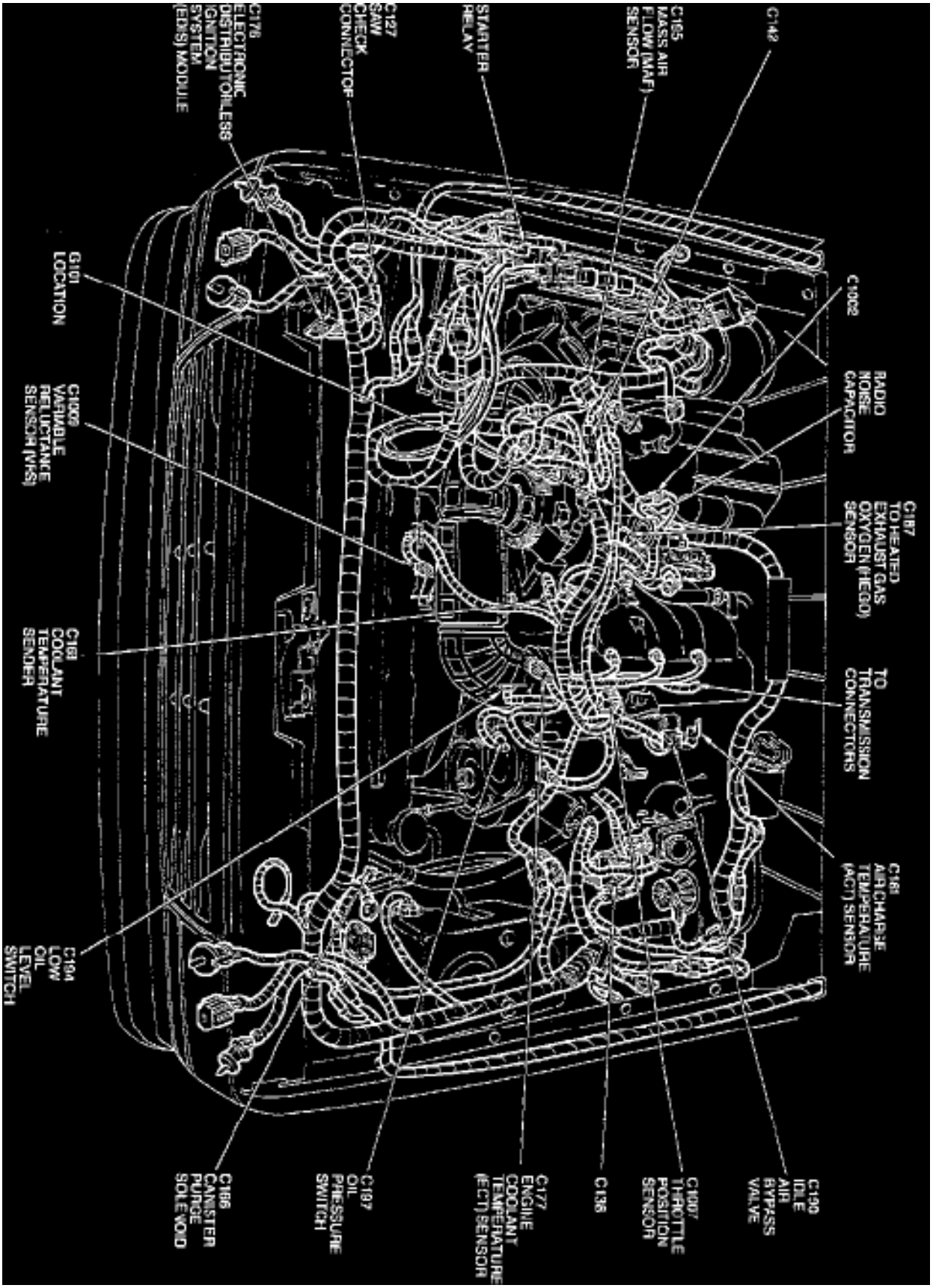
12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: Specifications

TORQUE VALUES:

Ignition Module Mounting Bolts ..... 22-31 lb.in. (2.5-3.5 Nm)

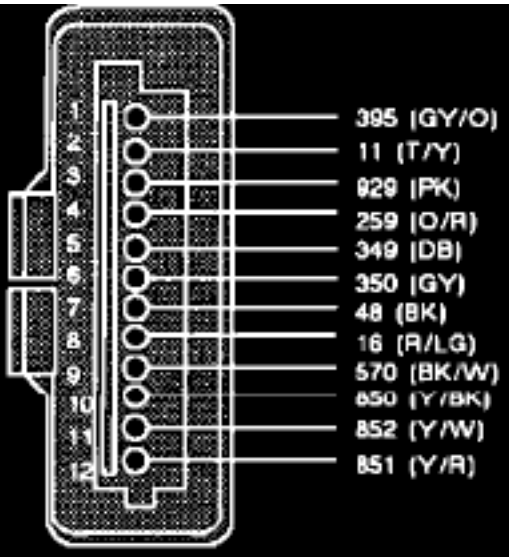

C142
C165
MASS AIR
FLOW (MAF)
SENSOR
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
STARTER
RELAY
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
C161
COOLANT
TEMPERATURE
SENDER
TO
TRANSMISSION
CONNECTORS
C166
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C190A
LOW
OIL
LEVEL
SWITCH
C136
C1007
THROTTLE
POSITION
SENSOR
C190
IDLE
AIR
BYPASS
VALVE
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C197
OIL
PRESSURE
SWITCH
C186
CANISTER
PURGE
SOLENOID

Ignition Control Module: Locations

Engine Compartment Components.

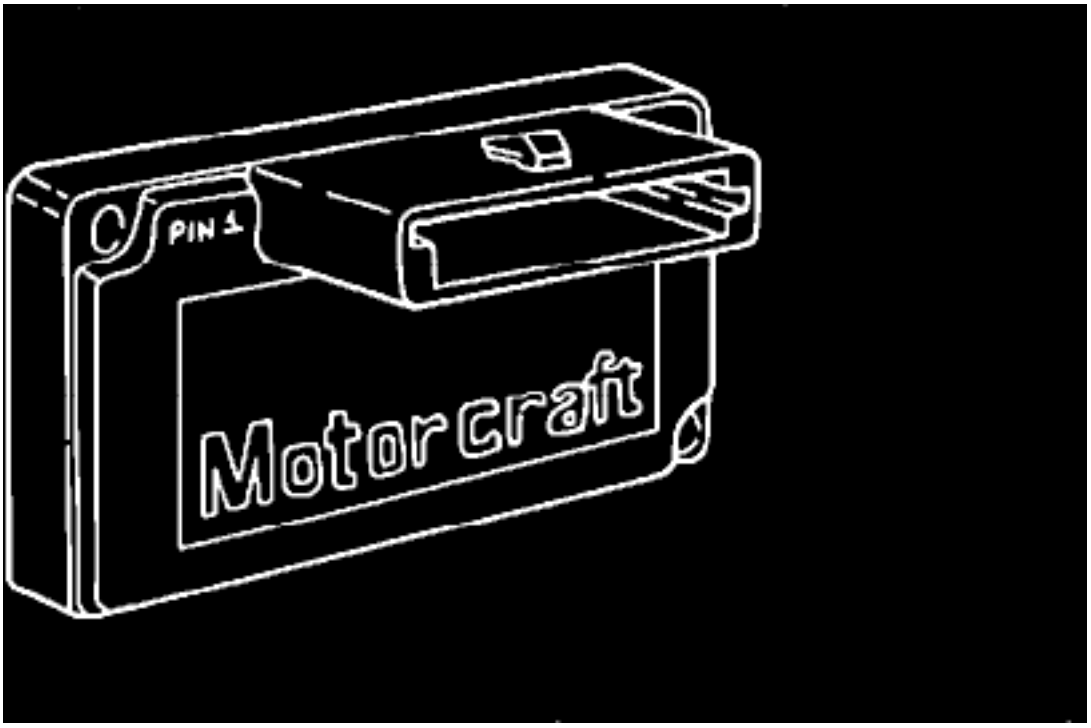
RH Front Corner Of Engine Compartment, Mounted On Upper Radiator Support

Applicable to: 4.0L/V6-244



PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	395 (GY/O)	Profile Ignition Pickup (PIP)
2	11 (T/Y)	Electronic Diagnostic Monitor (EDM)
3	929 (PK)	Spark Advance Word (SAW)
4	259 (O/R)	Ignition Ground To EEC Module
5	349 (DB)	Variable Reluctance Sensor (-)
6	350 (GY)	Variable Reluctance Sensor (+)
7	48 (BK)	VRS and EDIS Ignition Shield
8	16 (R/LG)	Power
9	570 (BK/W)	Power Ground
10	850 (Y/BK)	Drive for Ignition Coil "A"
11	852 (Y/W)	Drive for Ignition Coil "C"
12	851 (Y/R)	Drive for Ignition Coil "B"

Electronic Distributorless Ignition System (EDIS) Module Connector

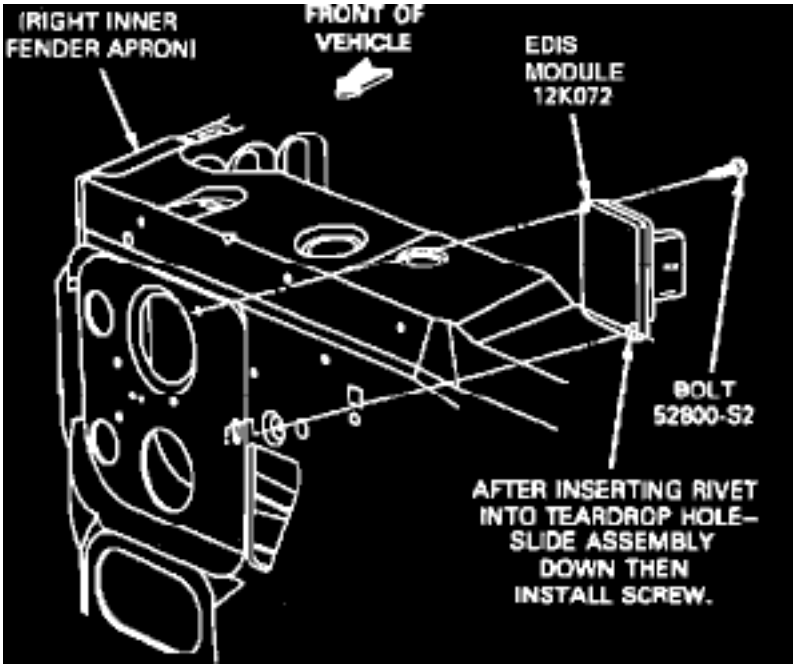


Ignition Control Module: Description and Operation

Module And Pin-Out

The EDIS module receives the Variable Reluctance Sensor (VRS) signal from the crankshaft sensor and the Spark Advance Word (SAW) signal from the EEC IV module. During normal operation, Profile Ignition Pickup (PIP) is sent to the EEC IV module from the EDIS module, providing base timing and RPM information. The VRS signal provides the EDIS module with the information required to synchronize the ignition coils for proper firing sequence. The Spark Angle Word (SAW) signal is a pulse width modulated signal and contains the optimum spark timing information. Spark angle is determined by the EDIS module using a zero excess dwell control routine.

PIN 1 PIP PIN 2 IDM (IGNITION DIAGNOSTIC MONITOR) PIN 3 SAW (SPARK ADVANCE WORD) PIN 4 IGN GRD (IGNITION GROUND) PIN 5 VRS- (VARIABLE RELUCTOR SENSOR NEGATIVE) PIN 6 VRS+ (VARIABLE RELUCTOR SENSOR POSITIVE) PIN 7 VRS SHIELD PIN 8 VBAT (IGNITION POWER TO COMPONENT) PIN 9 GND (BATTERY NEGATIVE) PIN 10 COIL 1 (CYL 1 and 5) PIN 11 COIL 2 (CYL 2 and 6) PIN 12 COIL 3 (CYL 3 and 4)



Ignition Control Module: Service and Repair

REMOVAL:

Ignition Module

1. Disconnect both battery cables, then remove the battery from the vehicle. 2. Disconnect the electrical connector from the ignition module.

NOTE: To disconnect the module connector, push on the connector where it says PUSH, then slide the connector from the module.

3. Remove the ignition module retaining bolt and remove the module by sliding the assembly up until it is released from the teardrop shaped hole in

the sheet metal.

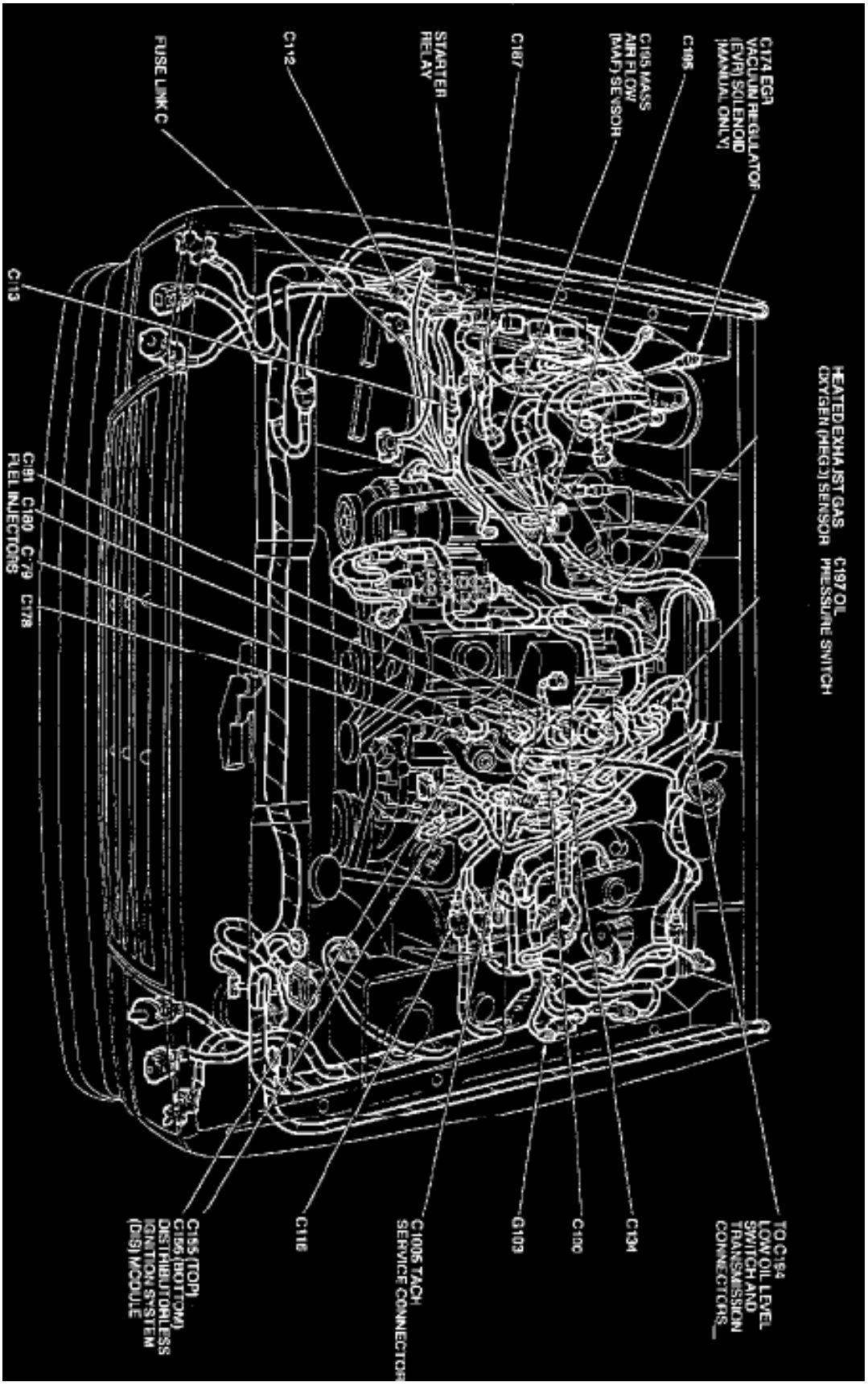
INSTALLATION:

1. Place the module on the sheet metal so the retaining rivet passes through the hole, then slide the module down into position. Install the retaining

bolt. Torque to 22-31 in lb (2.2-3.5 Nm).

2. Connect the electrical connector to the module. 3. Install the battery and cables.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Starting and Charging > Starter Relay > Component Information > Locations

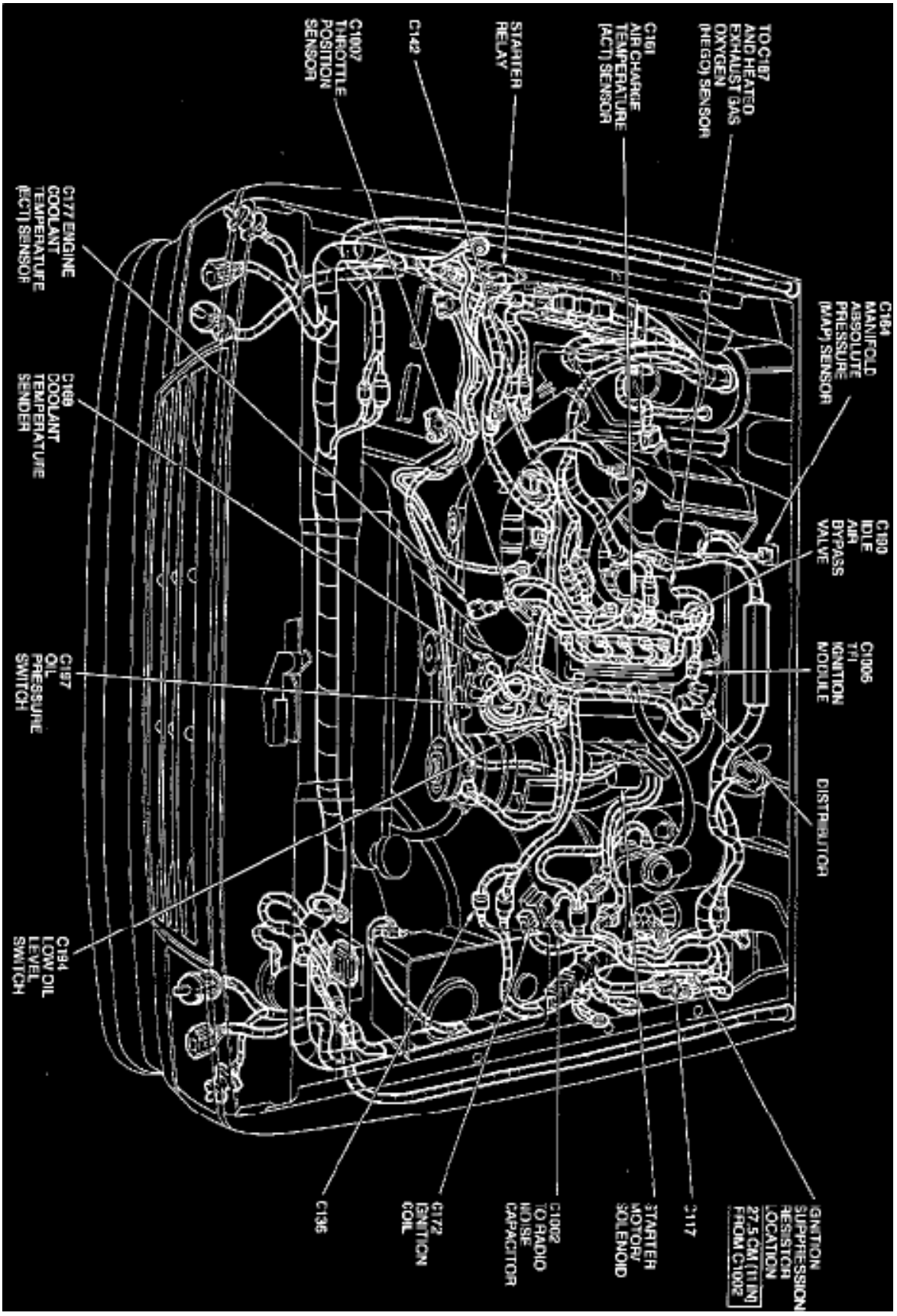


Starter Relay: Locations

Engine Compartment Components.

RH Fender Apron, Near Battery

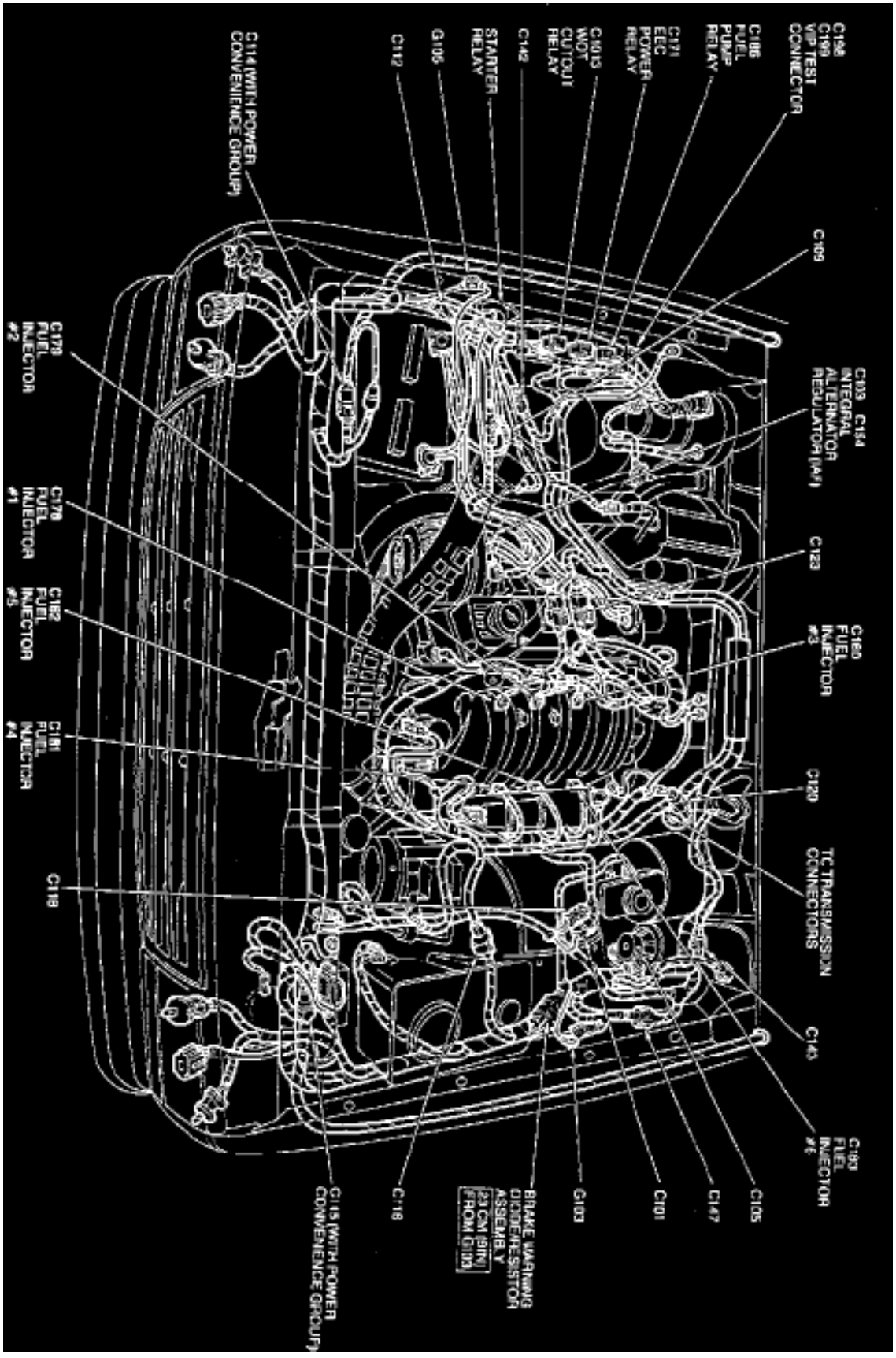
Applicable to: 2.3L/4-140


C184 MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
C180 IDLE AIR BYPASS VALVE
C1005 TFI IGNITION MODULE
DISTRIBUTOR
TO C187 AND HEATED EXHAUST GAS OXYGEN (HEGO) SENSOR
C161 AIR CHARGE TEMPERATURE (ACT) SENSOR
STARTER RELAY
C1007 THROTTLE POSITION SENSOR
C142
C177 ENGINE COOLANT TEMPERATURE (ECT) SENSOR
C189 COOLANT TEMPERATURE SENDER
C197 OIL PRESSURE SWITCH
C194 LOW OIL LEVEL SWITCH
C136
C172 IGNITION COIL
C1002 TO RADIO NOISE CAPACITOR
STARTER MOTOR SOLENOID
C117
IGNITION SUPPRESSION RESISTOR LOCATION 27.5 CM (11 IN) FROM C1002

Engine Compartment Components.

RH Fender Apron, Near Battery

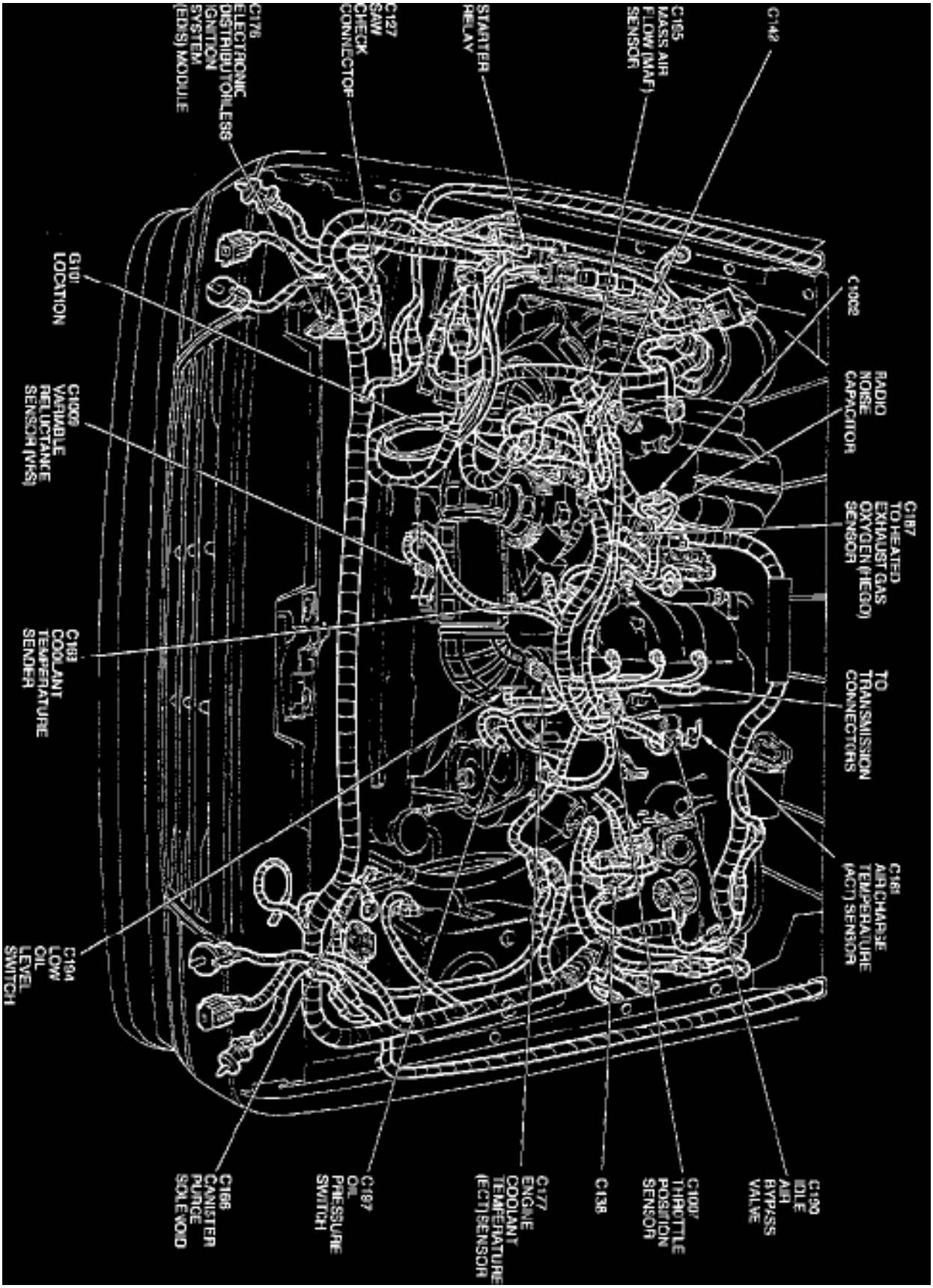
Applicable to: 2.9L/V6-179


C158
C199
VIP TEST
CONNECTOR
C186
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
WOT
CUTOUT
RELAY
C142
STARTER
RELAY
G105
C112
C114 (WITH POWER
CONVENIENCE GROUP)
C109
C103 C154
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
C123
C160
FUEL
INJECTOR
#3
C120
TC TRANSMISSION
CONNECTORS
C145
C193
FUEL
INJECTOR
#6
C105
C147
C101
G103
BRAKE WARNING
DIODE/RESISTOR
ASSEMBLY
23 CM (9IN)
FROM G103
C115 (WITH POWER
CONVENIENCE GROUP)
C118
C178
FUEL
INJECTOR
#2
C179
FUEL
INJECTOR
#1
C182
FUEL
INJECTOR
#5
C181
FUEL
INJECTOR
#4
C118

Engine Compartment Components.

RH Fender Apron, Near Battery

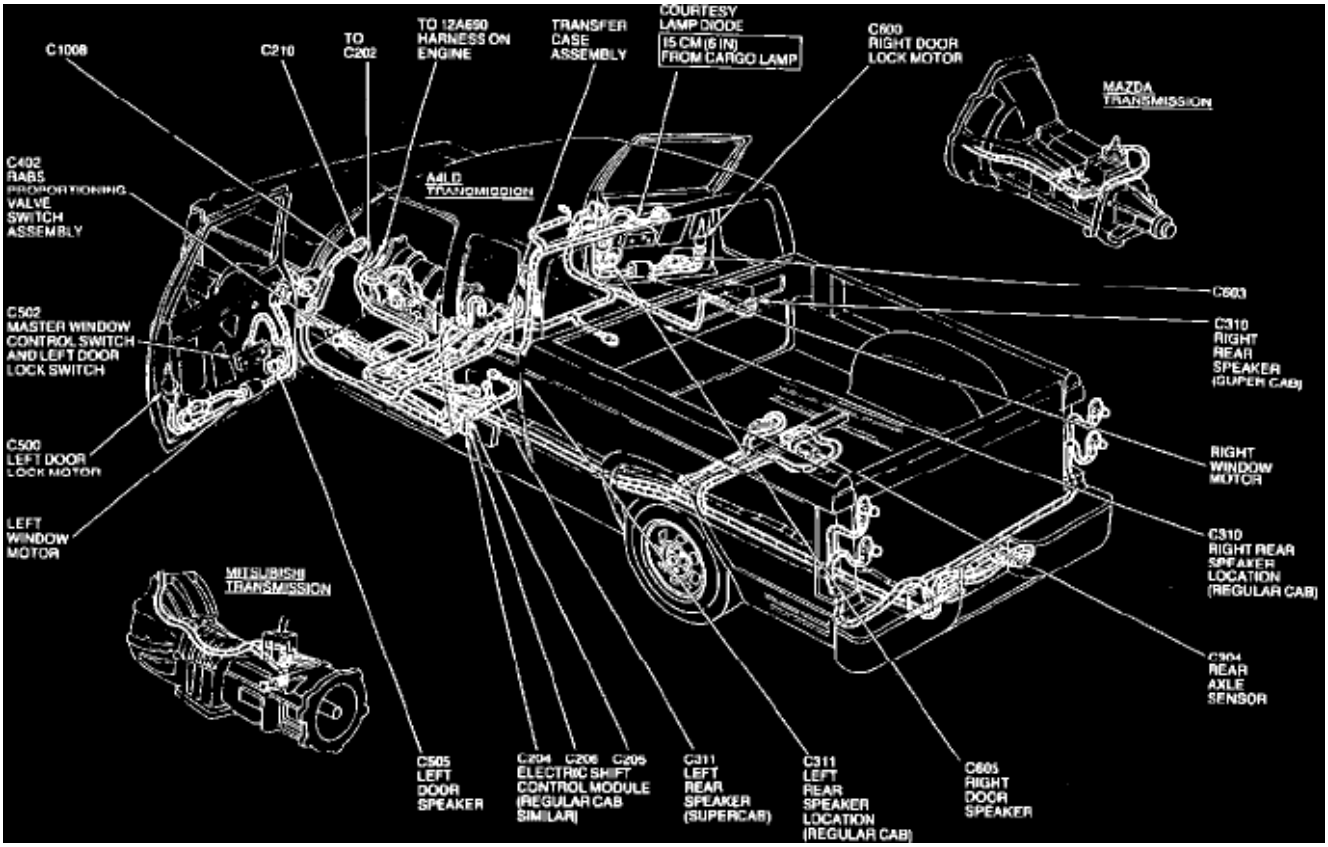
Applicable to: 3.0L/V6-181


C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C163
COOLANT
TEMPERATURE
SENDER
C190
LOW
OIL
LEVEL
SWITCH
C166
CANISTER
PURGE
SOLENOID
C187
OIL
PRESSURE
SWITCH
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C138
C1007
THROTTLE
POSITION
SENSOR
C190
IDLE
AIR
BYPASS
VALVE

Engine Compartment Components.

RH Fender Apron, Near Battery

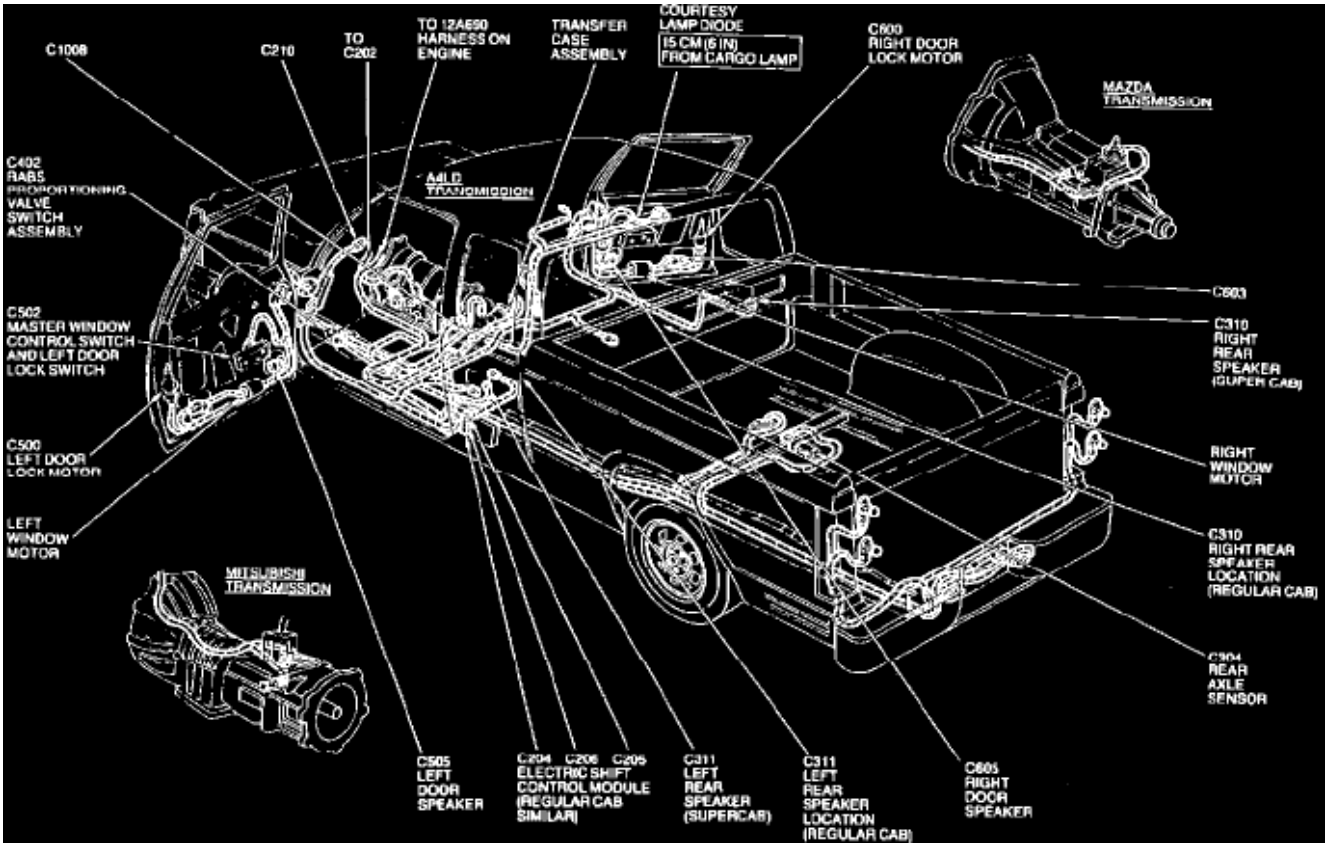
Applicable to: 4.0L/V6-244



Control Module: Locations Regular Cab

Body Components

Lower LH Rear Corner Of Cab



Control Module: Locations Supercab

Body Components

Between Bottom Of LH ``B'' Pillar & Rear Of Cab

Electronic Shift Control Module: Technical Service Bulletins Transfer Case - Revised Shift Procedures

Article No. 90-18-10

^ ELECTRONIC SHIFT MODULE (4X4) - MODIFIED OPERATION

^ TRANSFER CASE - 4X4 ELECTRONIC SHIFT MODULE - REVISED OPERATION PROCEDURE

LIGHT TRUCK: 1986-90 BRONCO II

1986-91 BRONCO, RANGER 1991 EXPLORER

ISSUE: The shift procedures into and out of LOW RANGE are revised for Ranger, Bronco and Explorer trucks built after 8/1/90 due to module changes. The new module will also be used to service prior model year trucks.

ACTION: If service is required on models built prior to 8/1/90, advise the customers of the following changes made to their vehicles.

Operation of the 1991 modules have been changed as follows:

To shift into 4 LOW: ^

Truck must be in 4x4 HIGH by previously pressing the 4x4 switch

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press LOW RANGE switch

To shift out of 4 LOW:

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press the LOW RANGE switch to shift back into 4x4 HIGH

^ Press the 4x4 HIGH switch to shift into 2 HIGH if desired

Previously, the module would respond to the LOW RANGE input from any mode (2H, 4H, 4L). If conditions A and B above are not met, the module would respond by flashing the 4 LOW indicator and wait until conditions A and B are met before completing the shift into or out of LOW RANGE. If LOW RANGE was selected while in 2 HIGH mode, the module would shift to 4 HIGH before flashing the indicator.

PART NUMBER PART NAME CLASS

F1TZ-7E453-A 4X4 Electronic Shift Module B

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

508000

Electronic Shift Control Module: Technical Service Bulletins Electric Shift Module Wiring Schematic - Correction

Article No. 91-3-11

02/02/91

0GTRANSFER CASE - 4X4 ELECTRIC SHIFT MODULE - EVTM WIRING CORRECTIONS

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Some of the wiring schematics shown in the EVTMs contain errors which make circuit tracing difficult. A complete update of these schematics will be made in the near future.

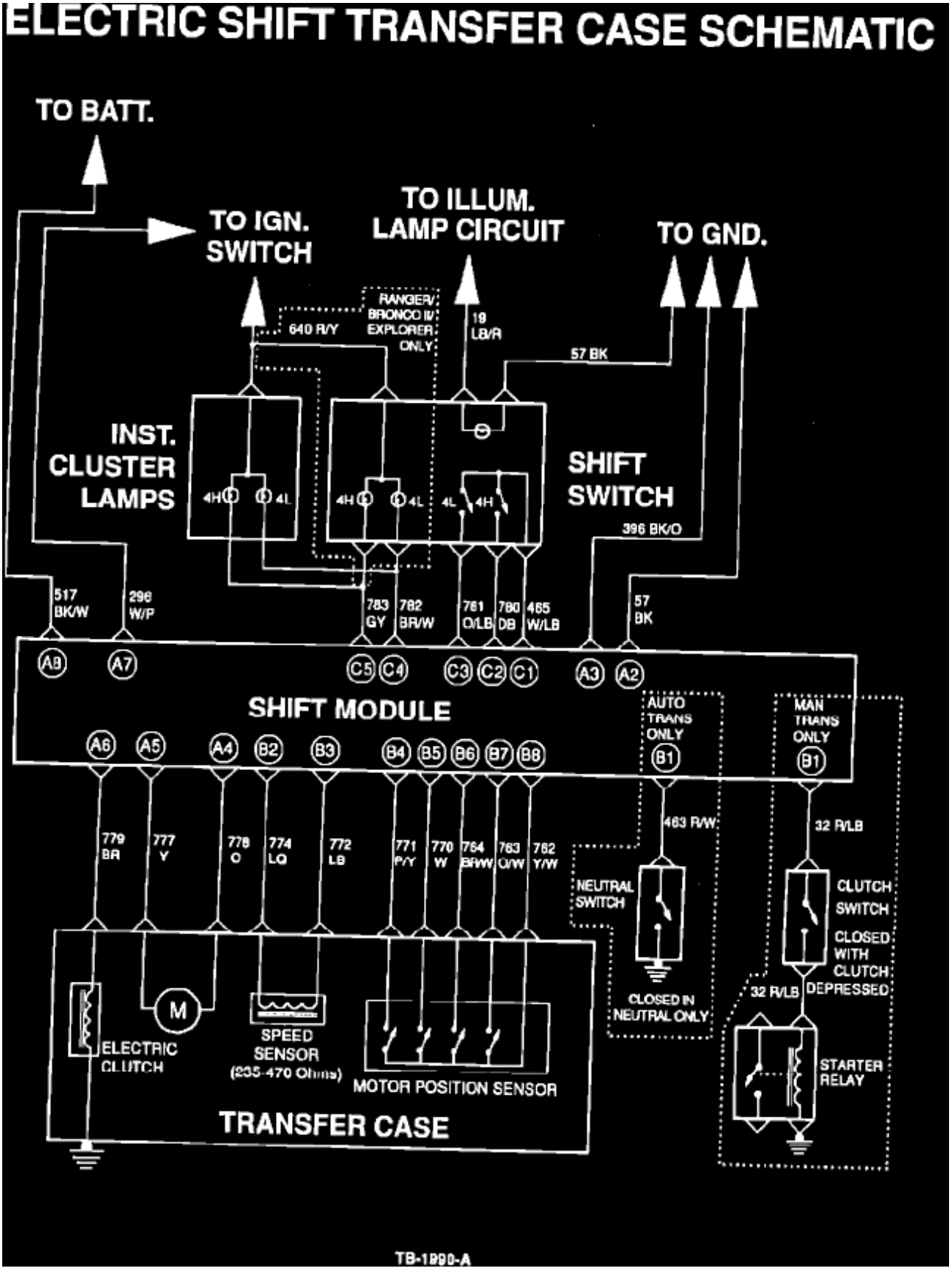

ELECTRIC SHIFT TRANSFER CASE SCHEMATIC
TO BATT.
TO IGN. SWITCH
TO ILLUM. LAMP CIRCUIT
TO GND.
RANGER/ BRONCO II/ EXPLORER ONLY
640 R/Y
19 LB/R
57 BK
INST. CLUSTER LAMPS
4H
4L
SHIFT SWITCH
396 BK/O
517 BK/W
296 W/P
783 GY
782 BR/W
781 O/LB
780 DB
485 W/LB
57 BK
A8
A7
C5
C4
C3
C2
C1
A3
A2
SHIFT MODULE
A6
A5
A4
B2
B3
B4
B5
B6
B7
B8
AUTO TRANS ONLY
B1
MAN TRANS ONLY
B1
779 BR
777 Y
778 O
774 LG
772 LB
771 P/Y
770 W
764 BR/W
763 O/W
762 Y/W
463 R/W
32 R/LB
NEUTRAL SWITCH
CLUTCH SWITCH
CLOSED WITH CLUTCH DEPRESSED
32 R/LB
CLOSED IN NEUTRAL ONLY
M
ELECTRIC CLUTCH
SPEED SENSOR (235-470 Ohms)
MOTOR POSITION SENSOR
STARTER RELAY
TRANSFER CASE
TB-1990-A

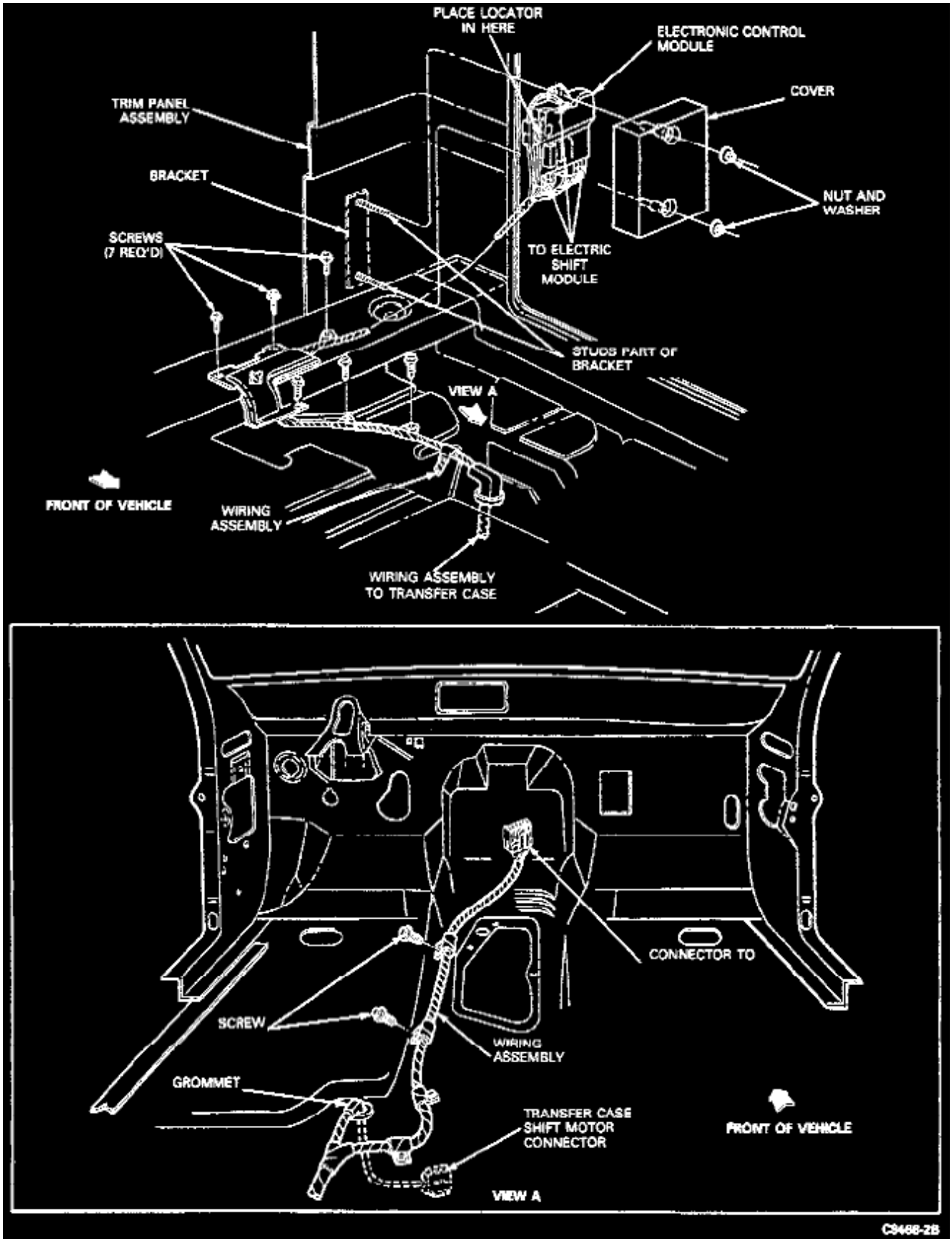
Figure 1

ACTION: In the interim, refer to the simplified schematic, Figure 1. It shows the electrical circuitry for the transfer case shift mechanism while deleting connectors and interconnects with other circuits for clarity.

OTHER APPLICABLE ARTICLES: None

WARRANTY STATUS: INFORMATION ONLY

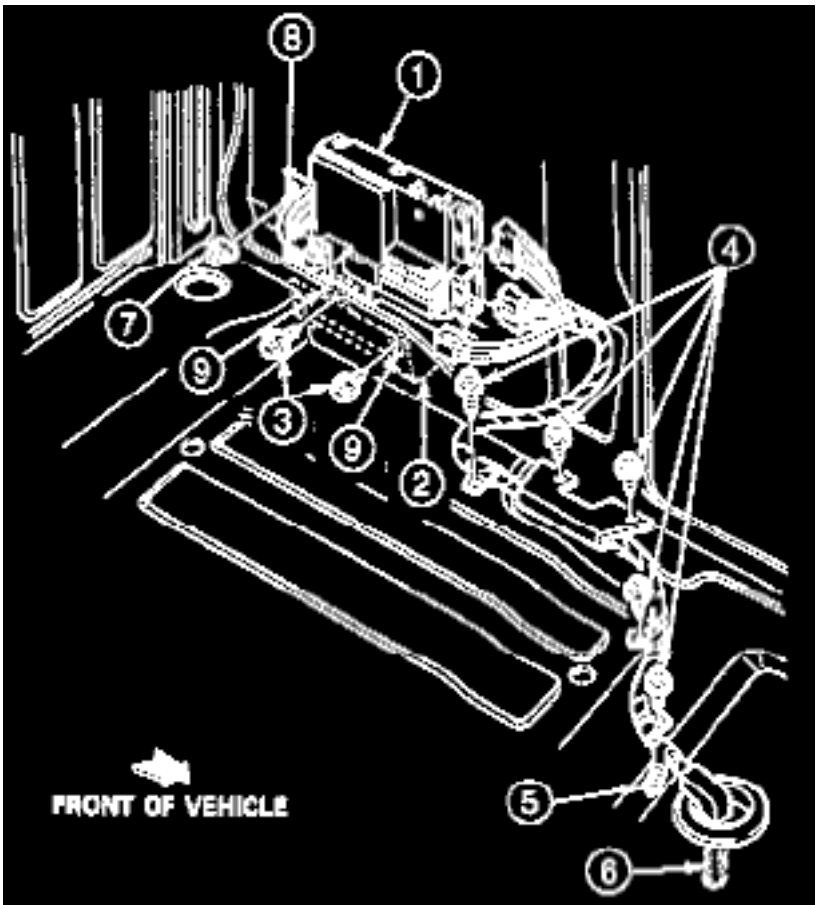
OASIS CODES: 203200, 290000, 508000, 590000



Electronic Shift Control Module: Locations Regular Cab

Electronic Control Module Location

The Electric Shift Control Module is located at the lower Left Hand rear corner of cab.



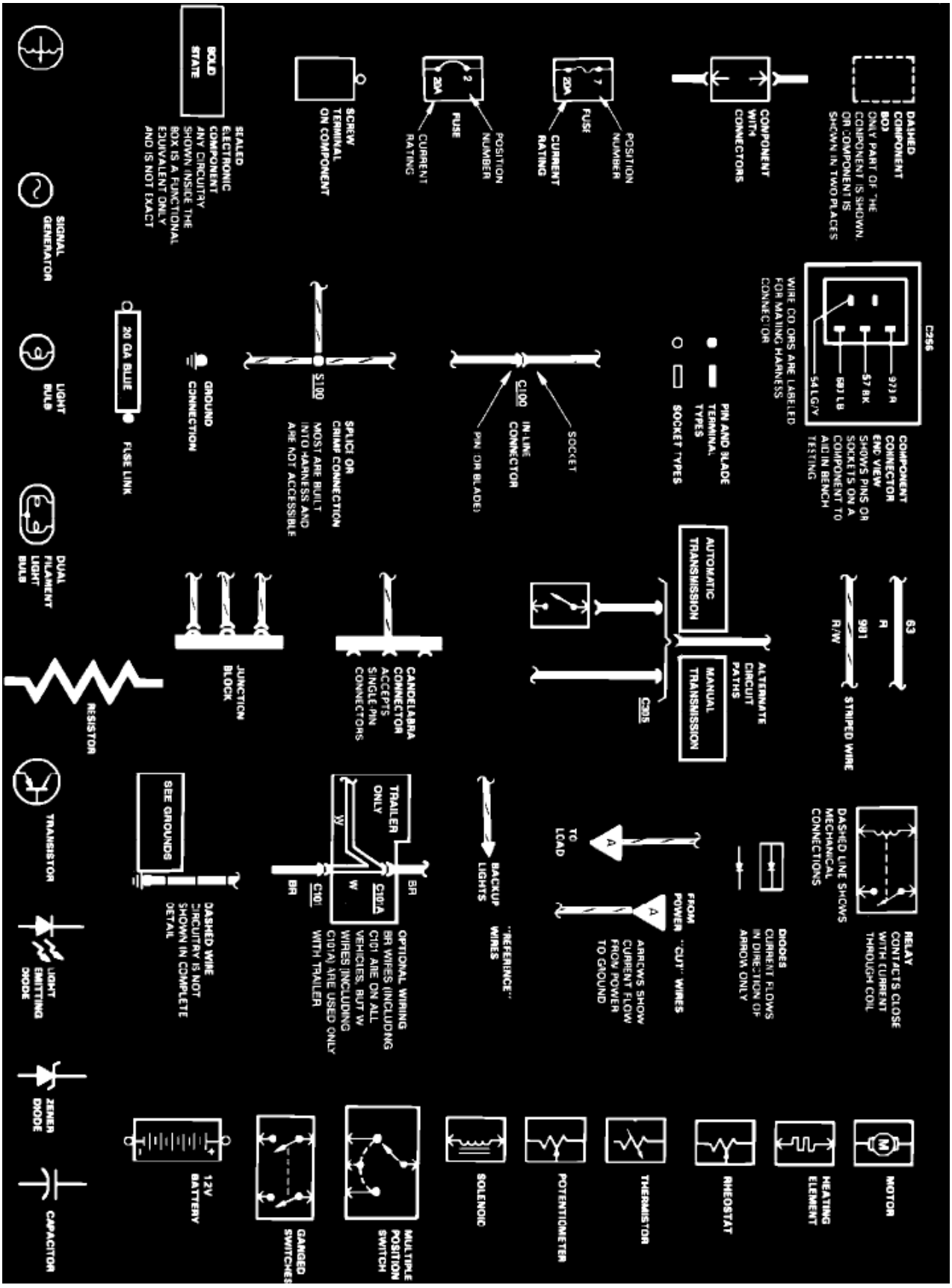
Item No.	Description
1	Electronic Control Module
2	Bracket, Shift Module
3	Screw (2 Req.)
4	Screw (5 Req.)
5	Wiring Assembly
6	Wiring Assembly
7	Nut and Washer Assembly
8	Stud Part for Module Bracket
9	Nut Assembly (2 Req.)

CC10860-A

Electronic Shift Control Module: Locations Supercab

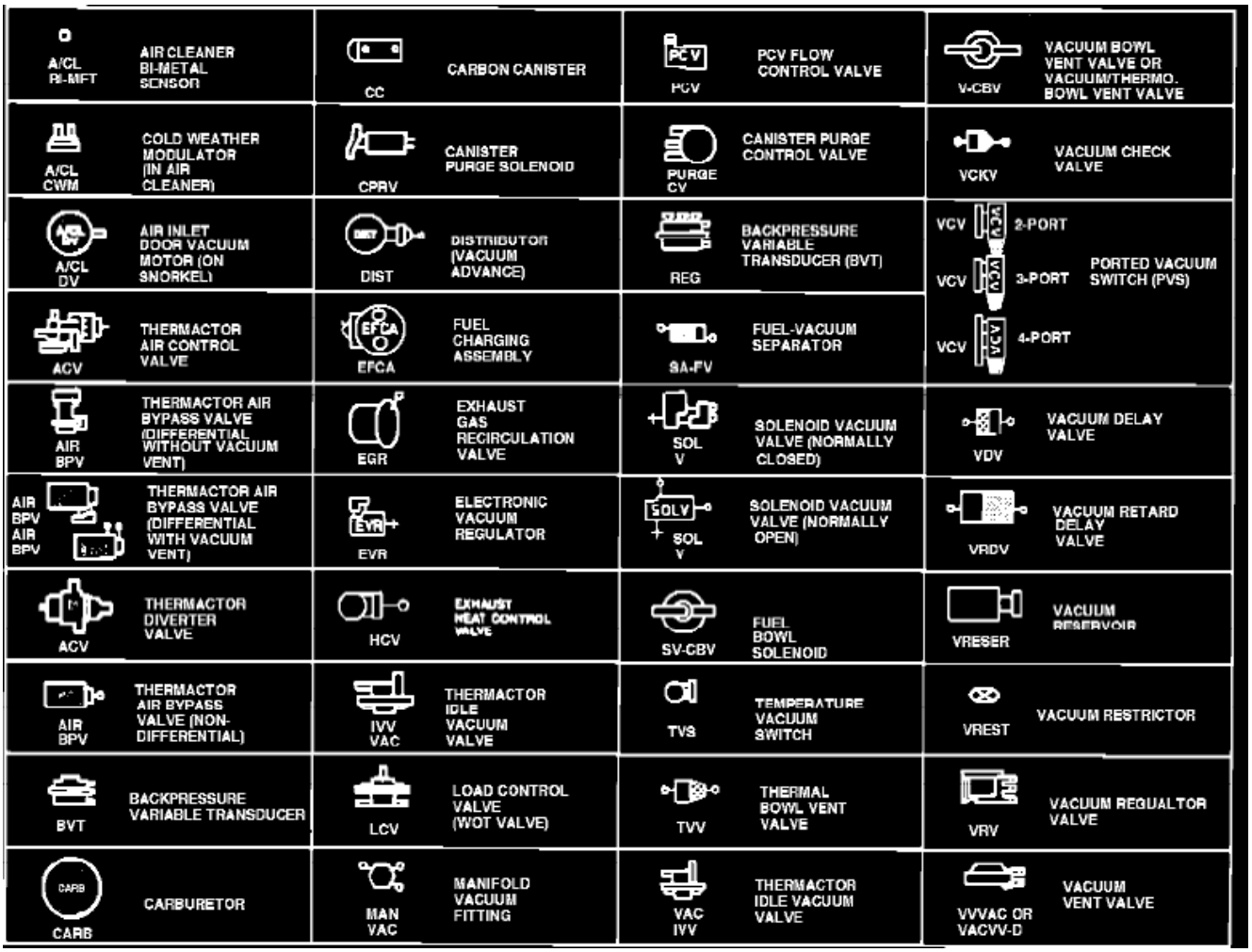
Control Module Circuits, Ranger SuperCab

The Electric Shift Control Module is located between the bottom of the Left Hand "B" pillar and the rear of the cab.

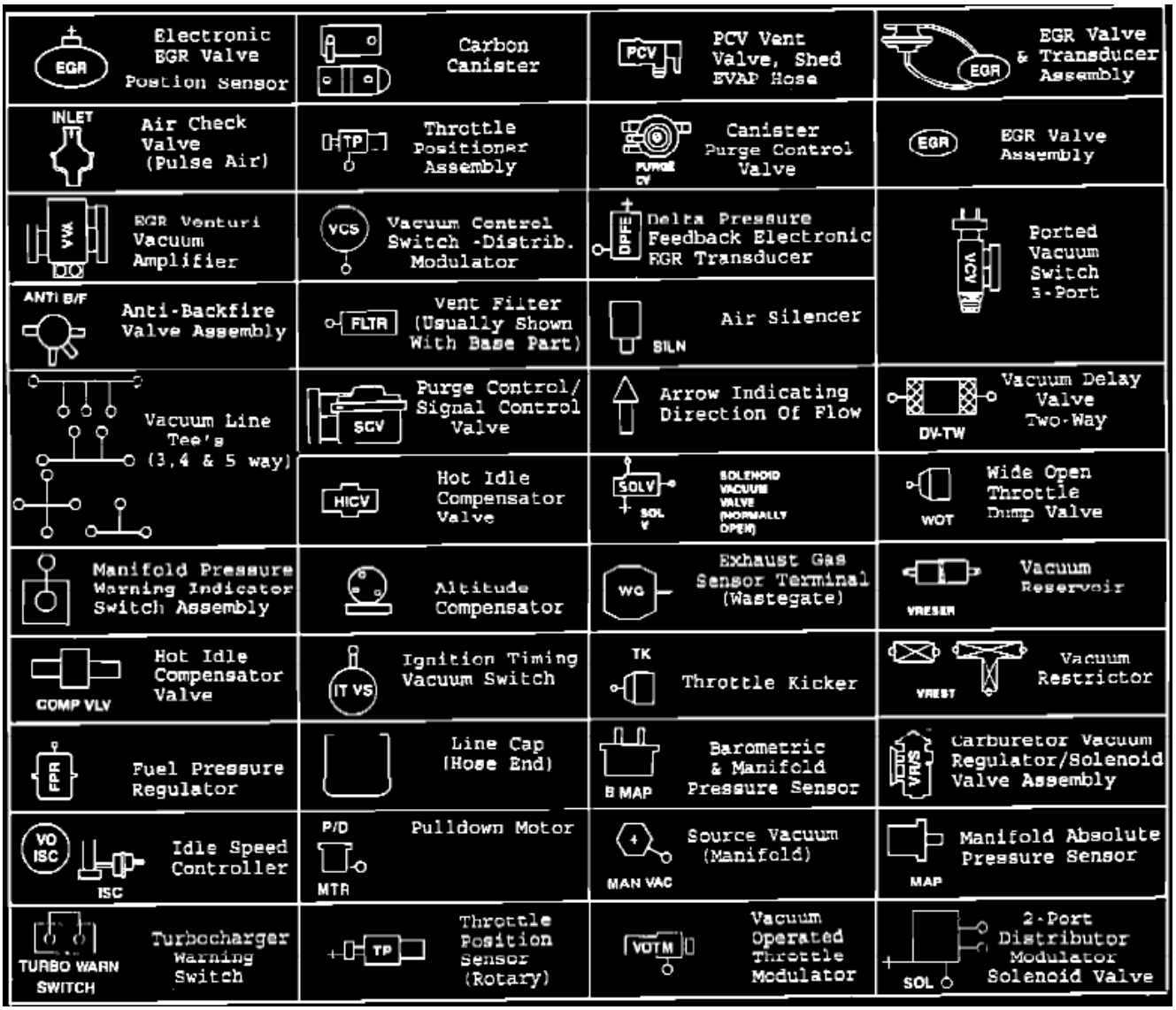


Electronic Shift Control Module: Diagram Information and Instructions

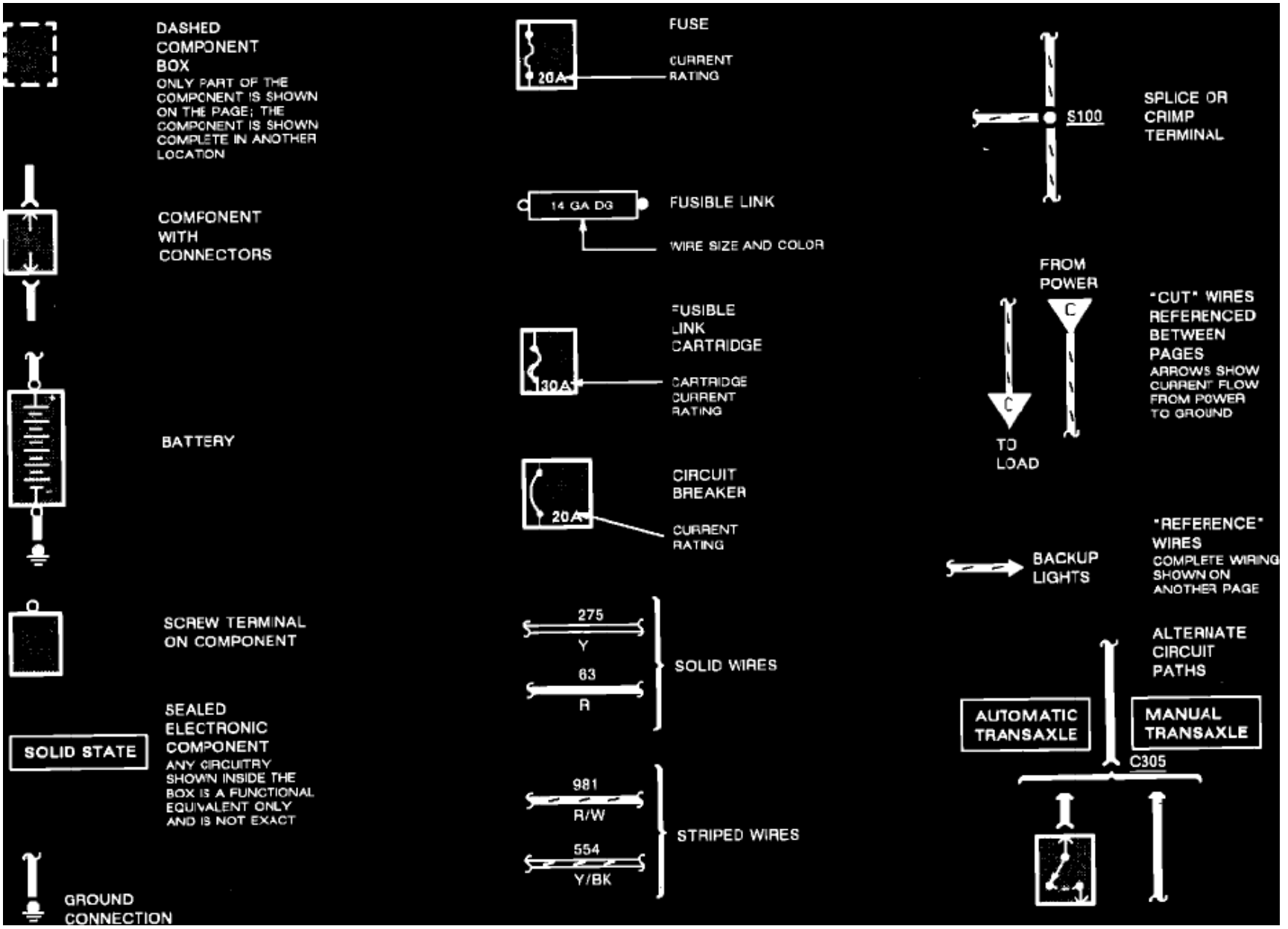
Symbol Identification

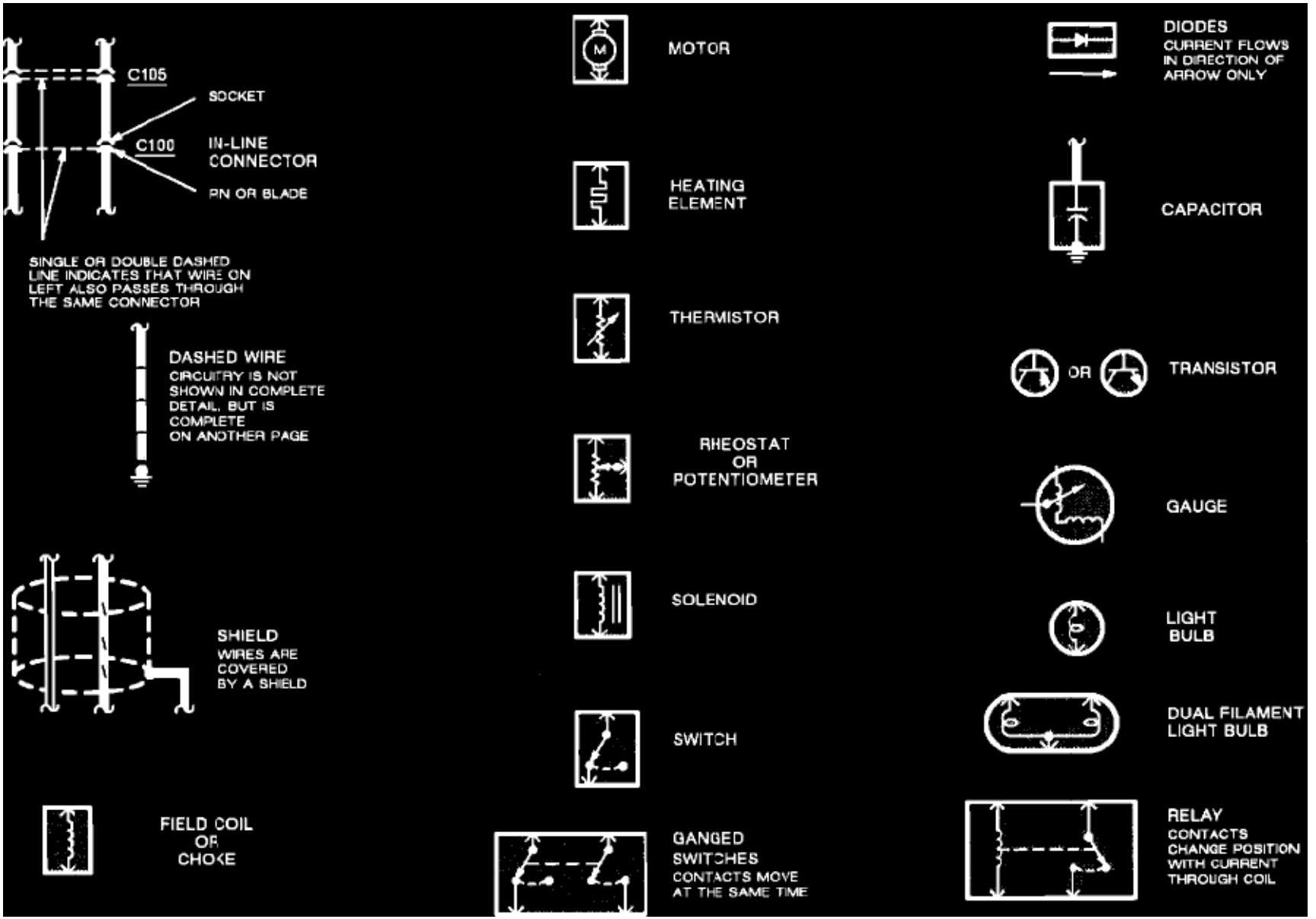


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

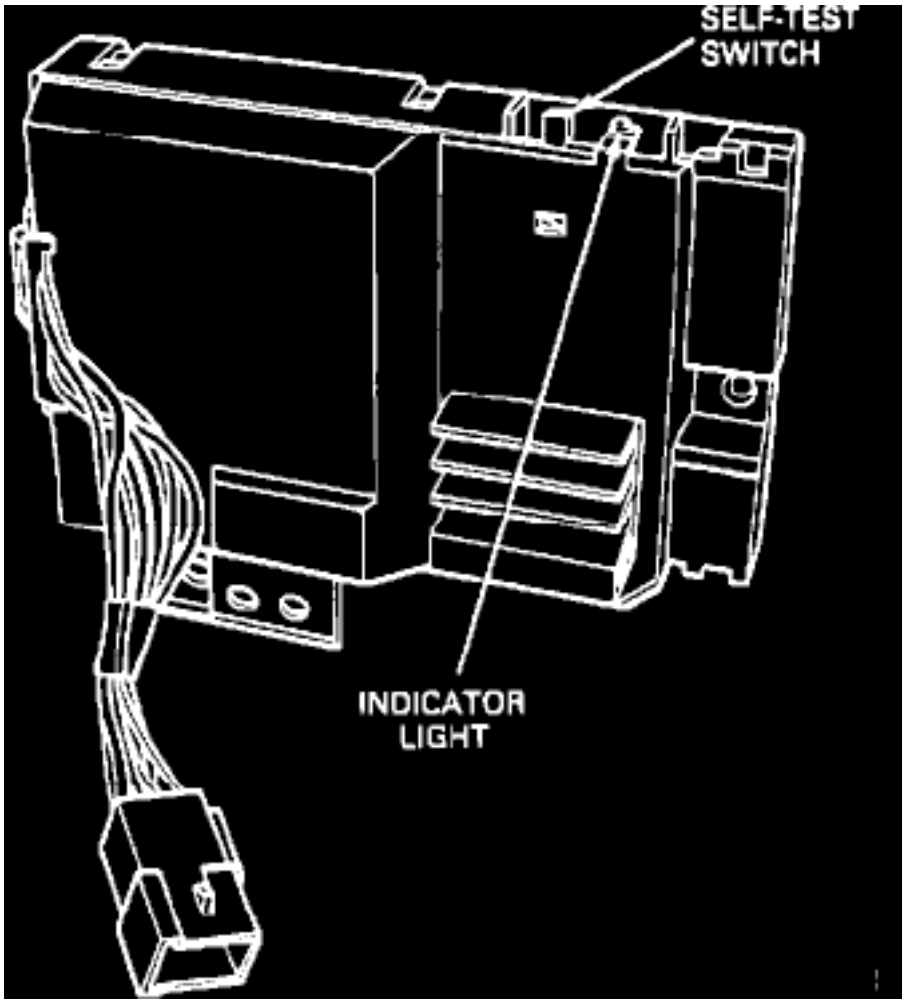
V: Violet

W: White

Y: Yellow

Electronic Shift Control Module: Description and Operation

The electronic control module conducts transfer case operation in response to inputs from the vehicle speed sensor, neutral start switch and clutch interlock switch and push-button actuation made by the operator.



Electronic Shift Control Module: Testing and Inspection

The electronic control module has a diagnostic capability of its internal circuitry. Self test procedure is as follows:

1. Disconnect five-wire and eight wire connectors from electronic control module.

2. Turn ignition switch to the RUN position.

3. Activate the self test switch and note result:

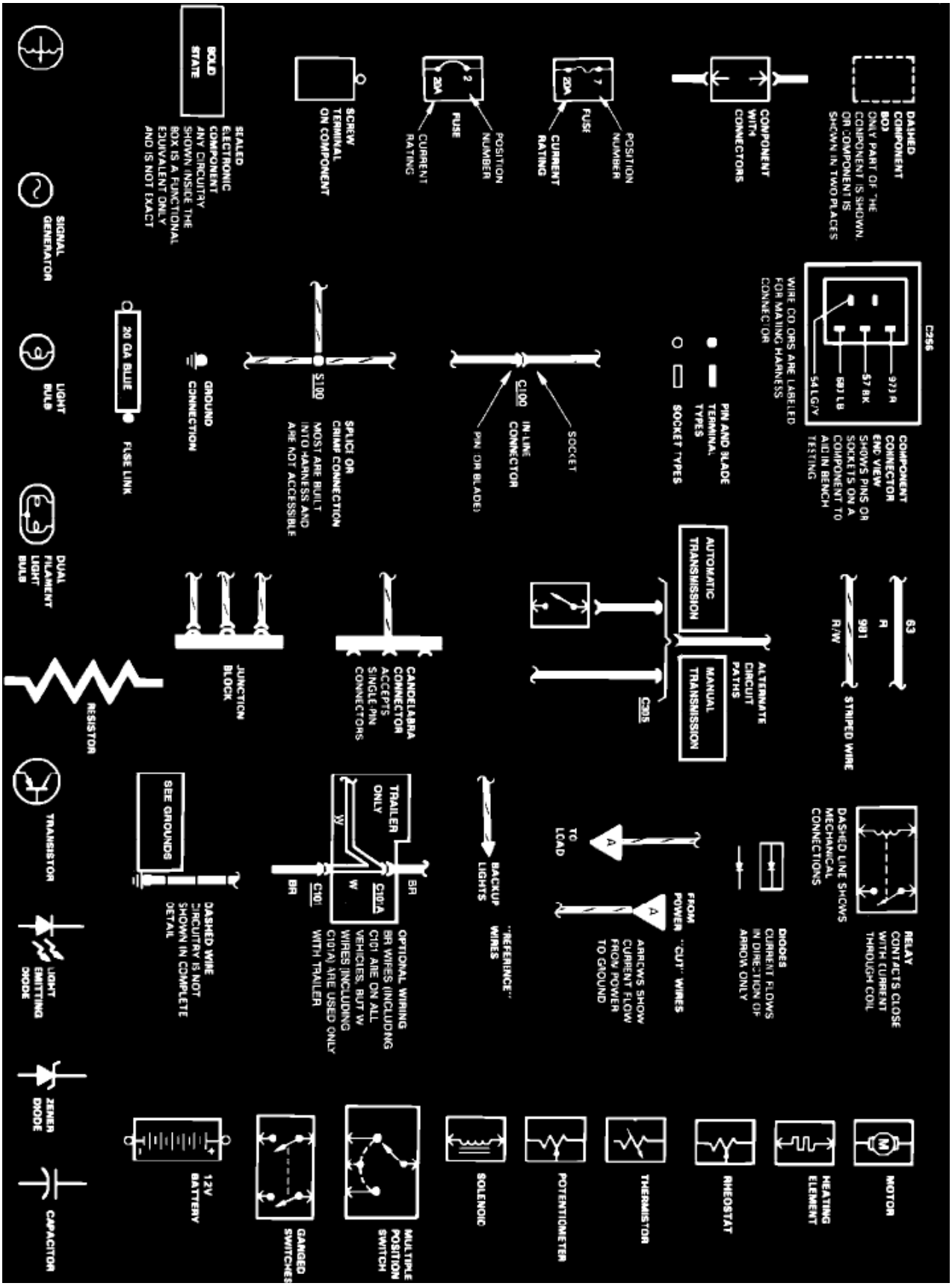
Control Module Self Test

NOTE: The self test switch and indicator light is located on the Electronic Control Module.

A FLASHING INDICATOR LAMP, (approximately one flash per second), indicates control module is functioning properly.

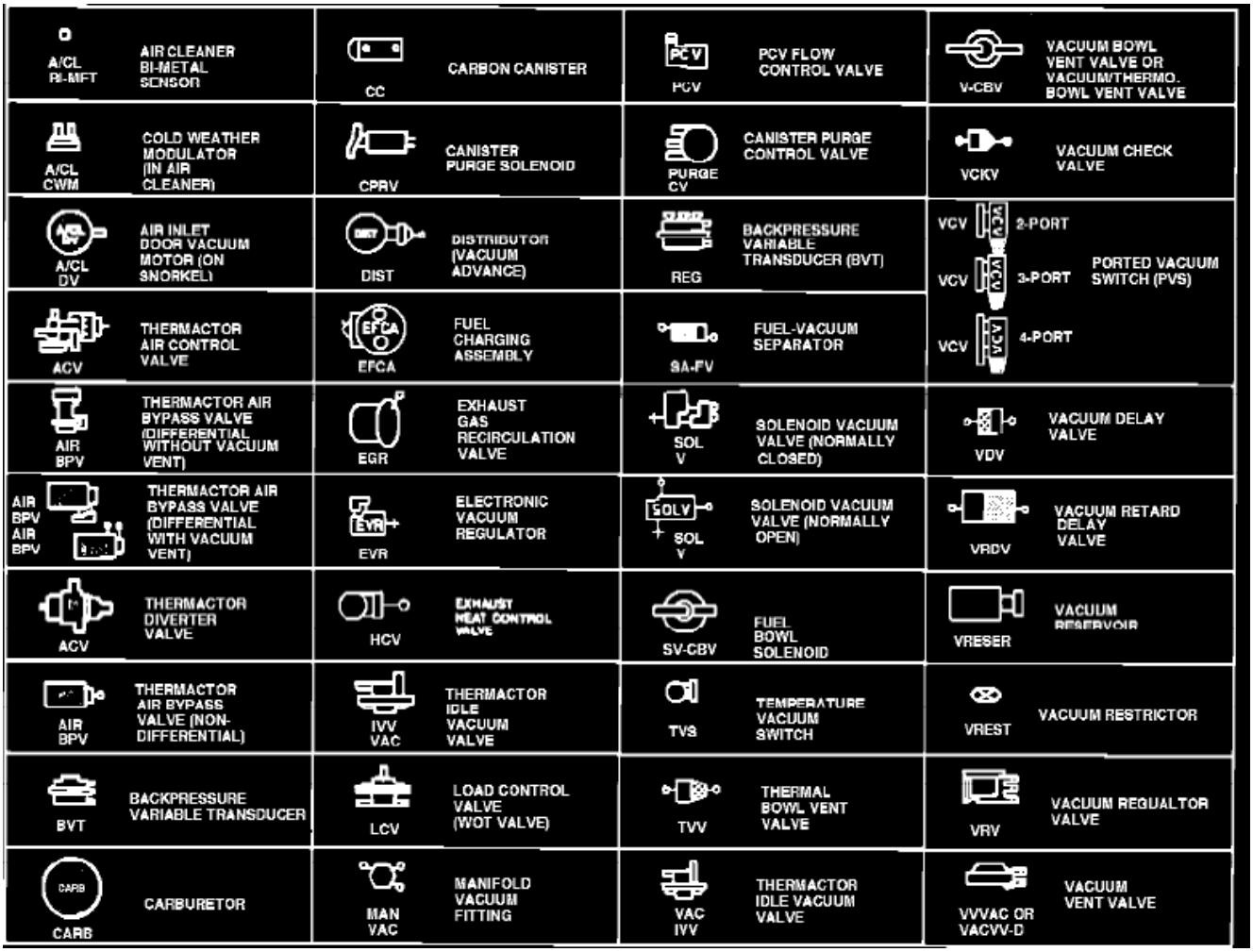
A STEADY INDICATOR LIGHT, indicates that control module is inoperative and must be replaced.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Windows and Glass > Power Window Relay > Component Information > Diagrams > Diagram Information and Instructions

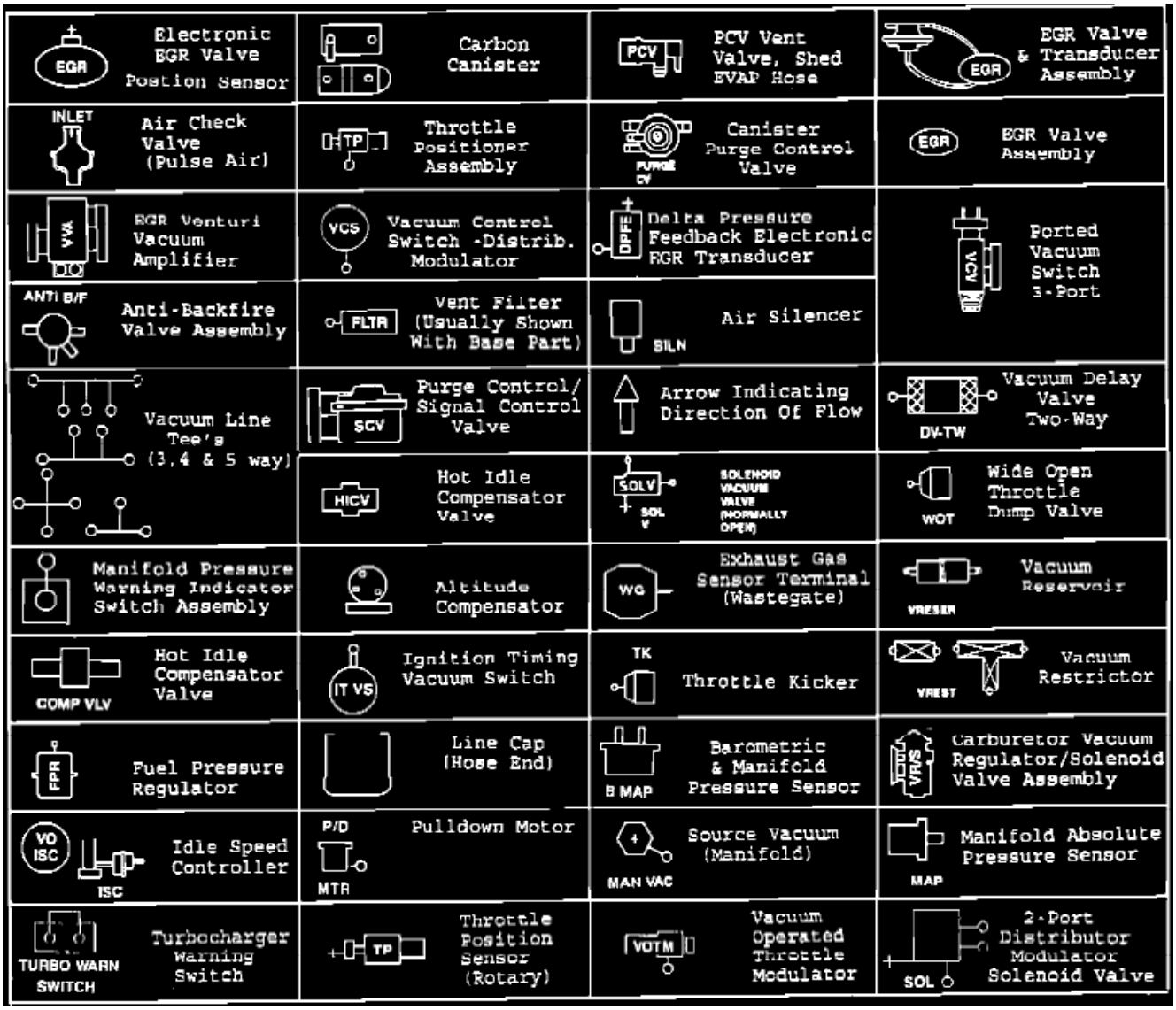


Power Window Relay: Diagram Information and Instructions

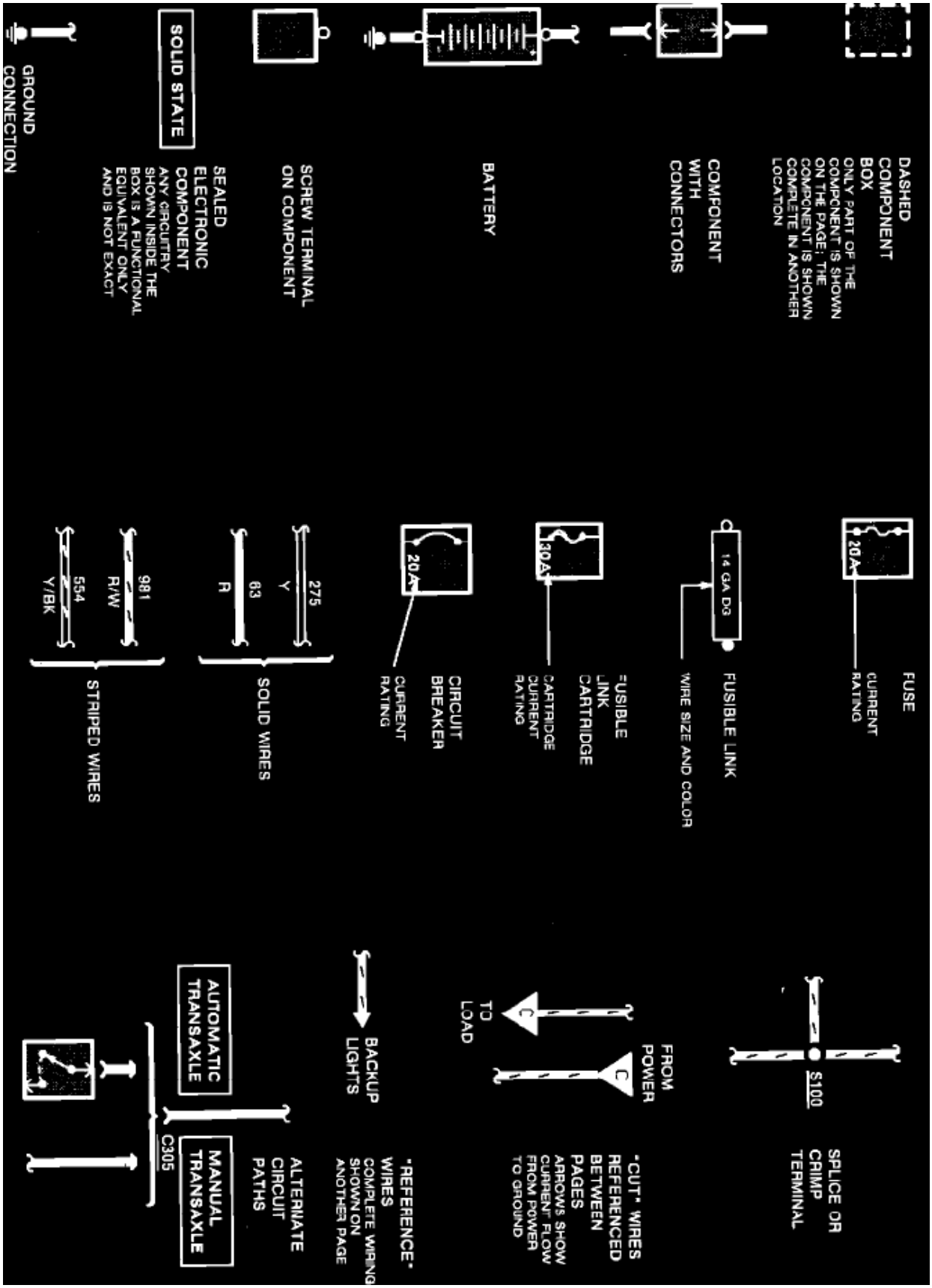
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
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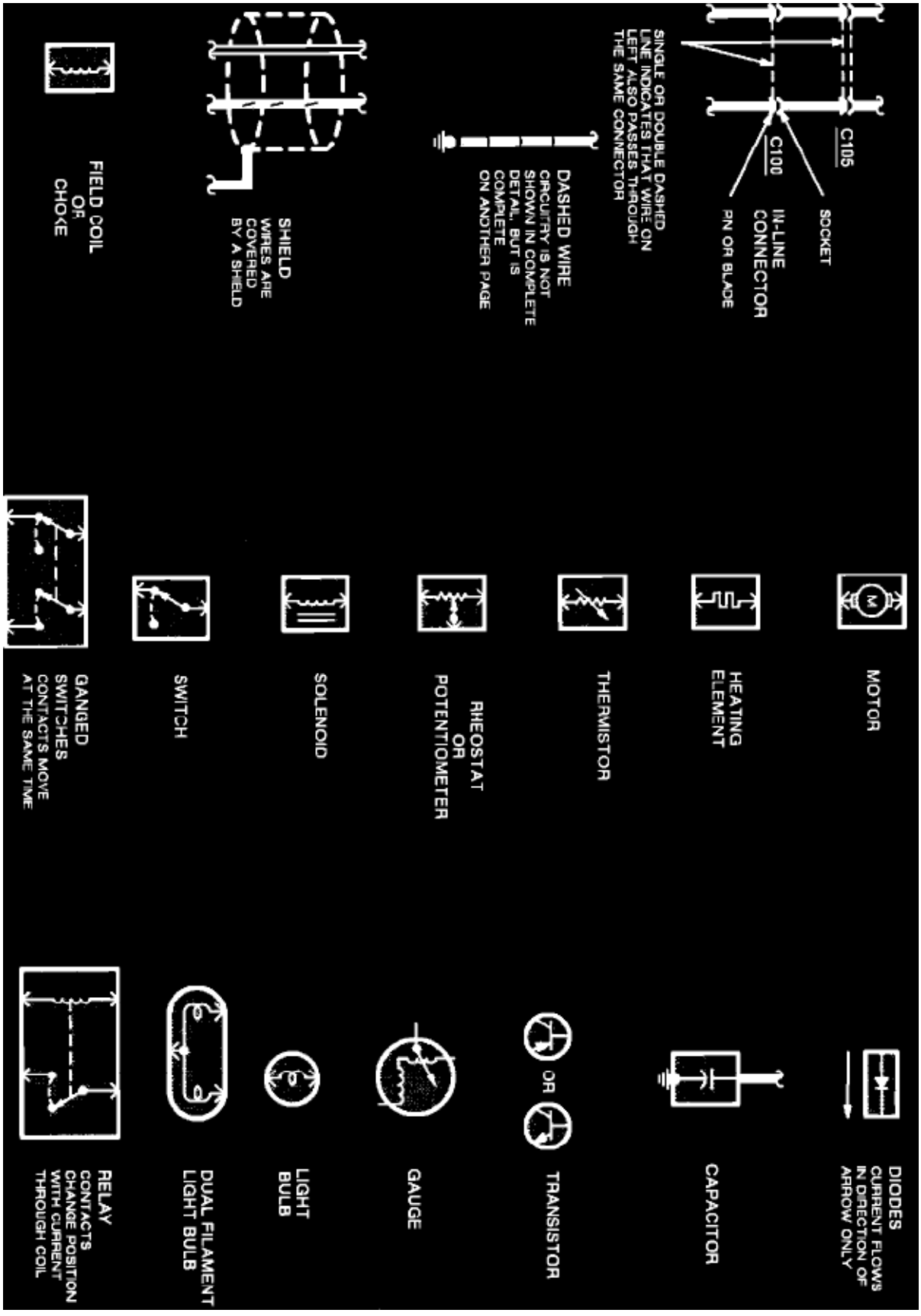
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

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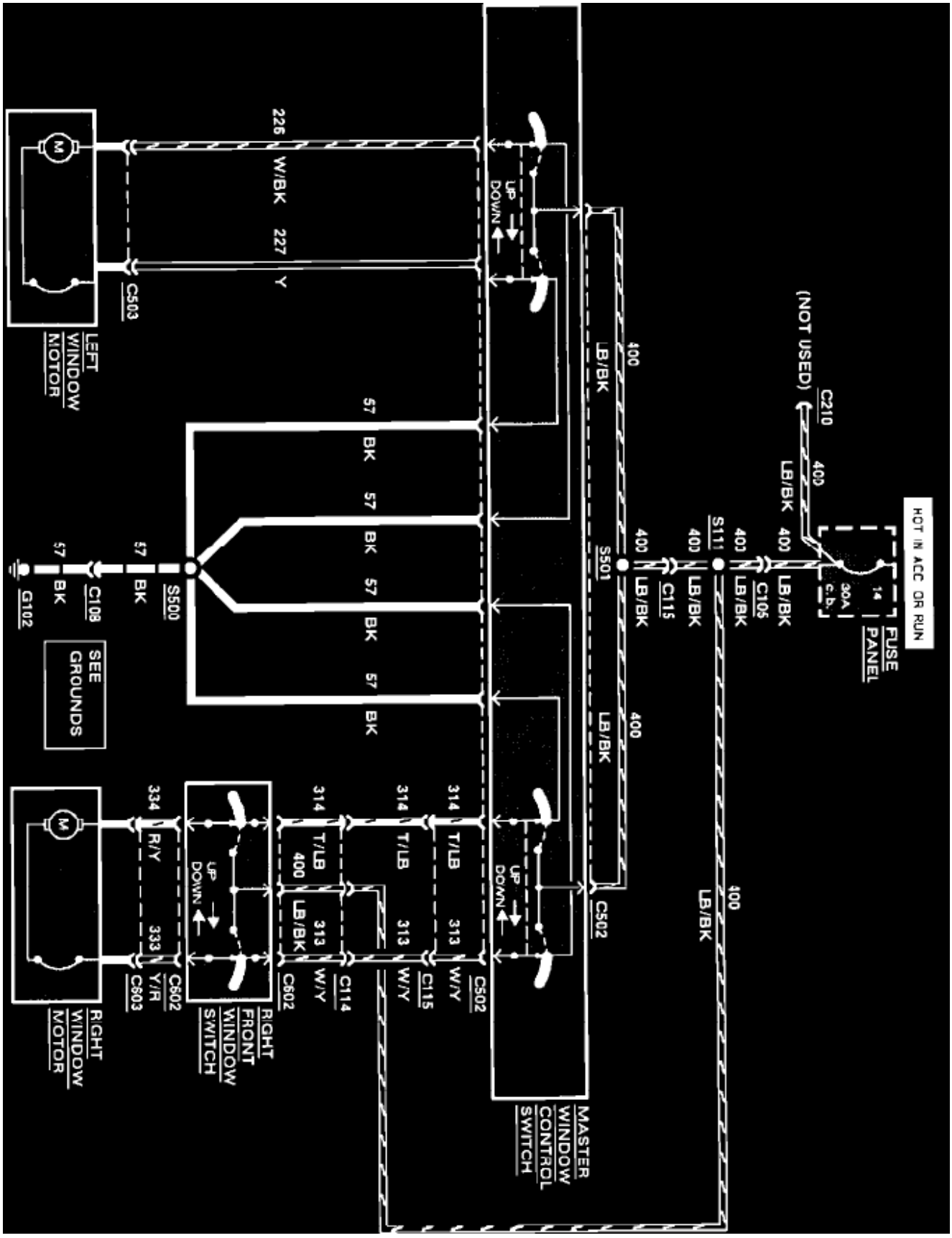
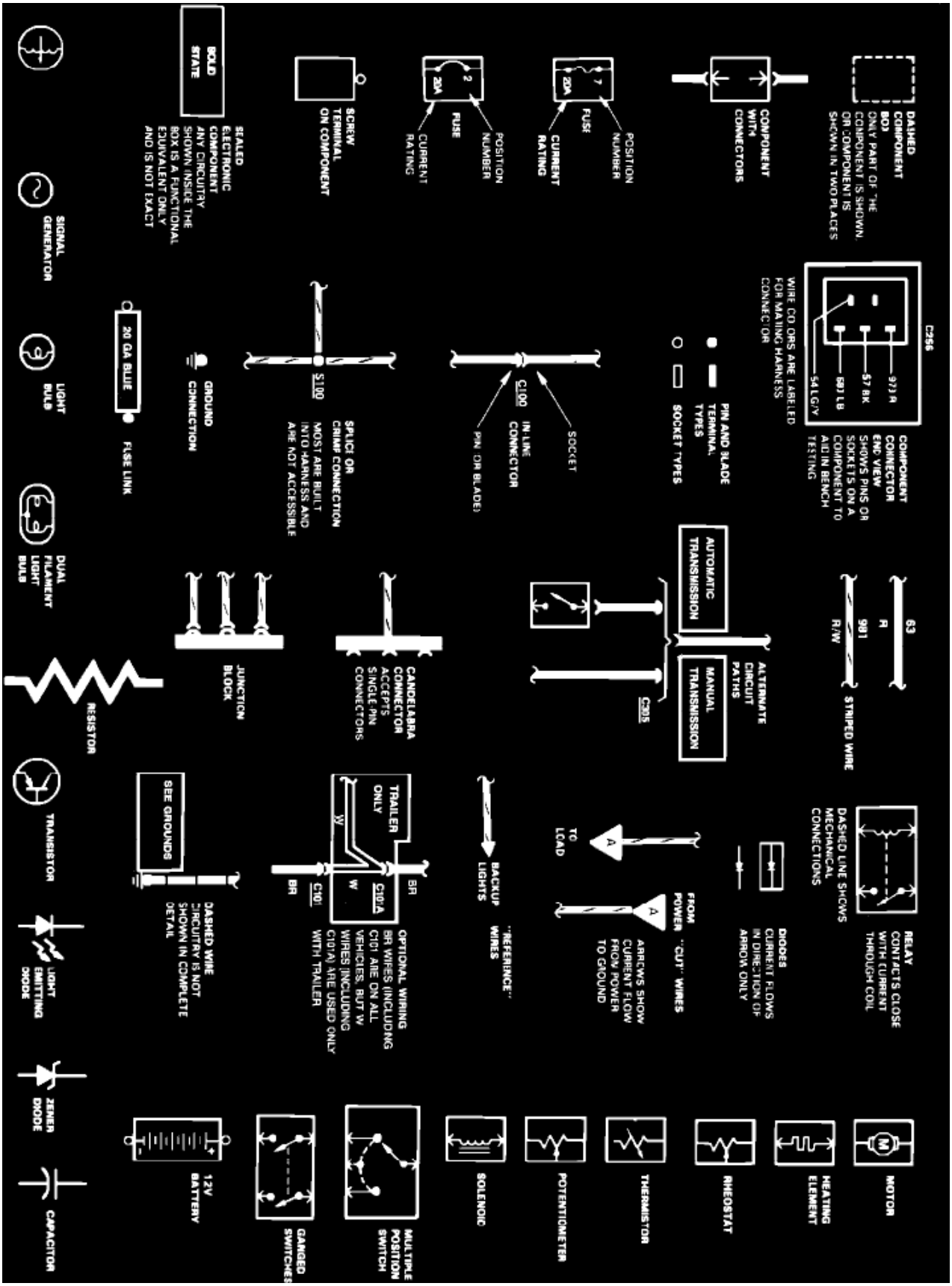

HOT IN ACC OR RUN
FUSE PANEL
14
30A C.B.
(NOT USED)
C210
400
LB/BK
C105
S111
C115
S501
C502
MASTER WINDOW CONTROL SWITCH
UP
DOWN
226 W/BK
227 Y
C503
LEFT WINDOW MOTOR
57 BK
S500
C108
G102
SEE GROUNDS
314 T/LB
313 W/Y
314 T/LB
313 W/Y
C114
C115
C502
334 R/Y
333 Y/R
C602
C603
RIGHT FRONT WINDOW S'WITCH
RIGHT WINDOW MOTOR

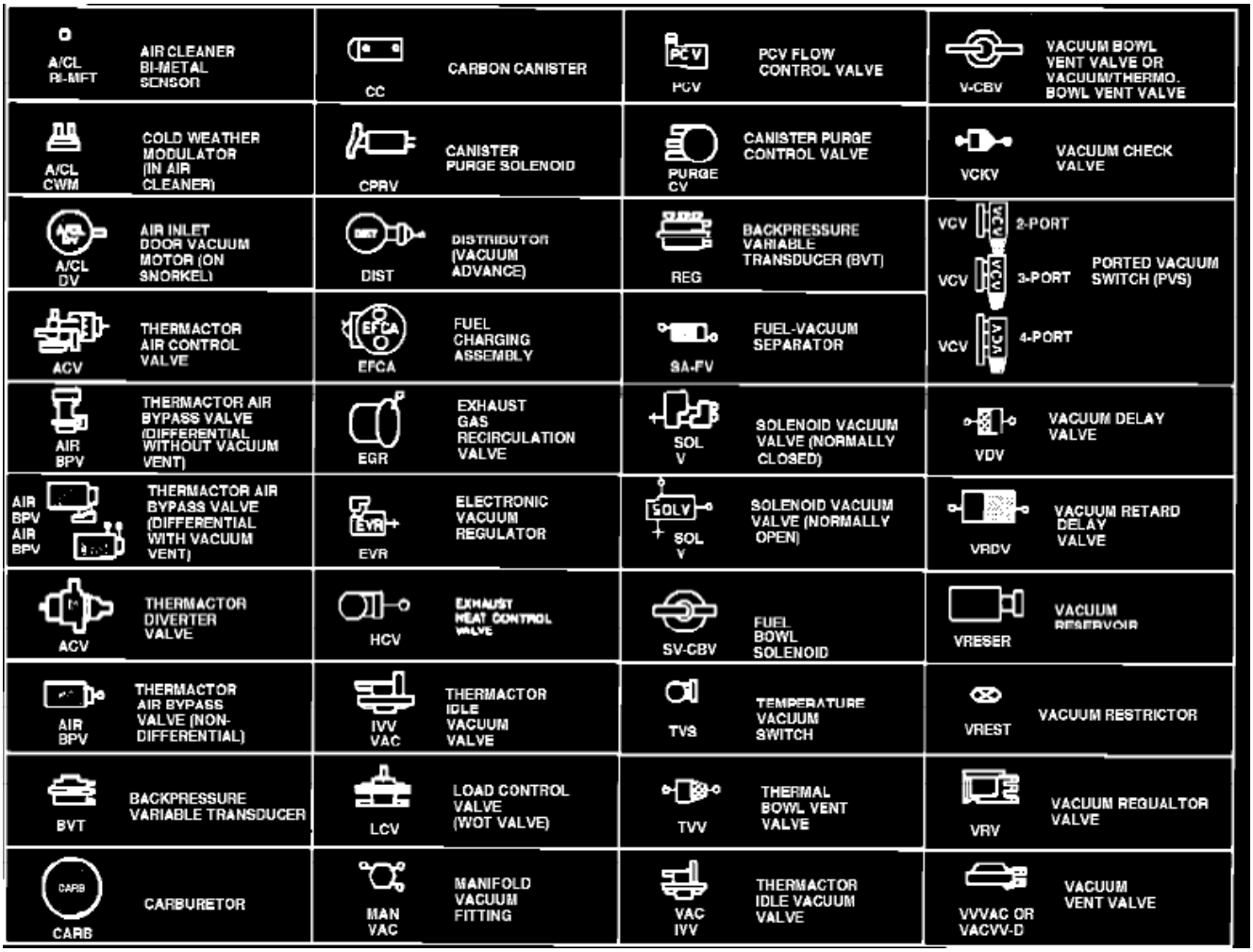
Power Windows

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Wiper and Washer Systems > Windshield Washer Relay > Component Information > Diagrams > Diagram Information and Instructions

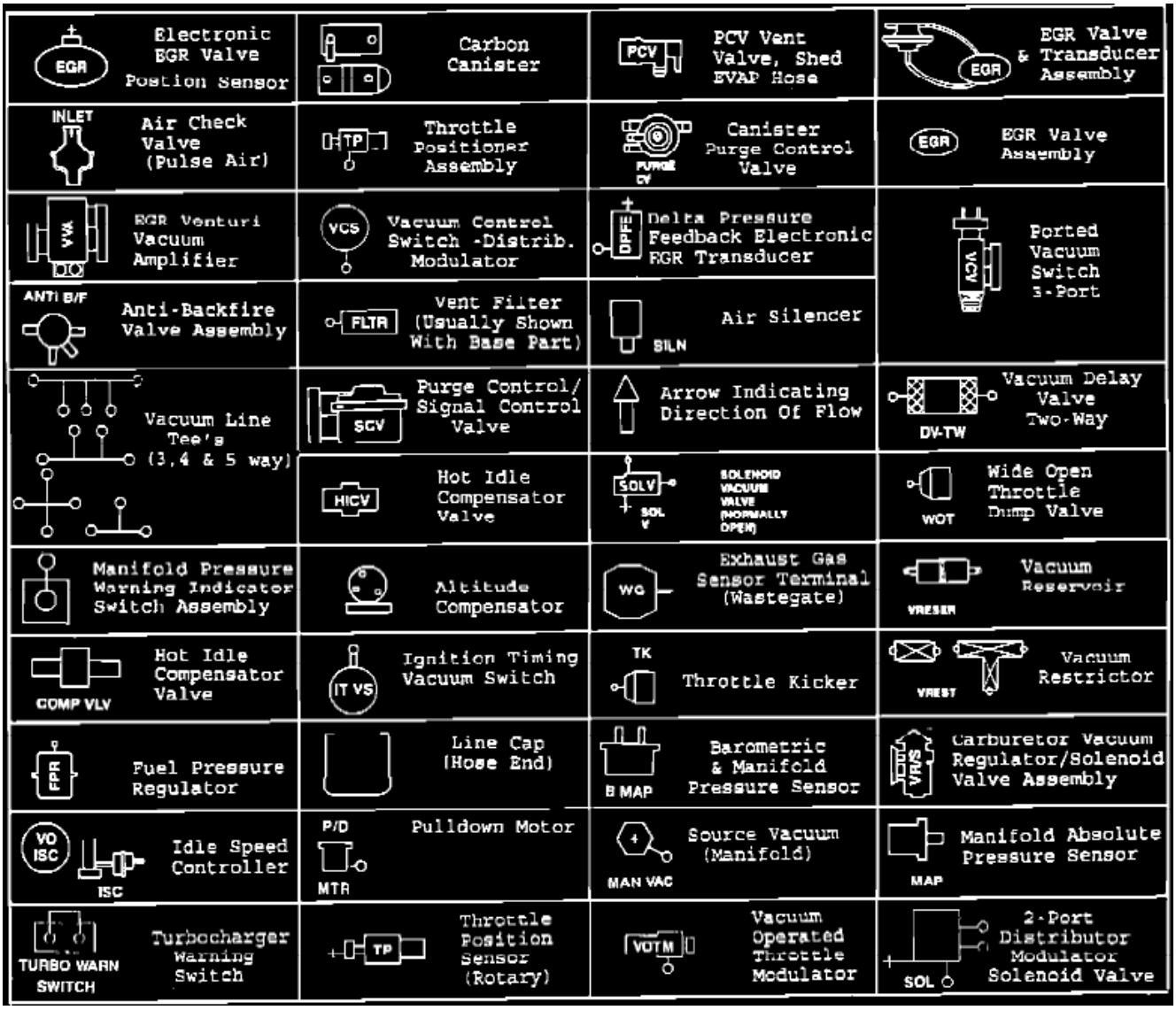


Windshield Washer Relay: Diagram Information and Instructions

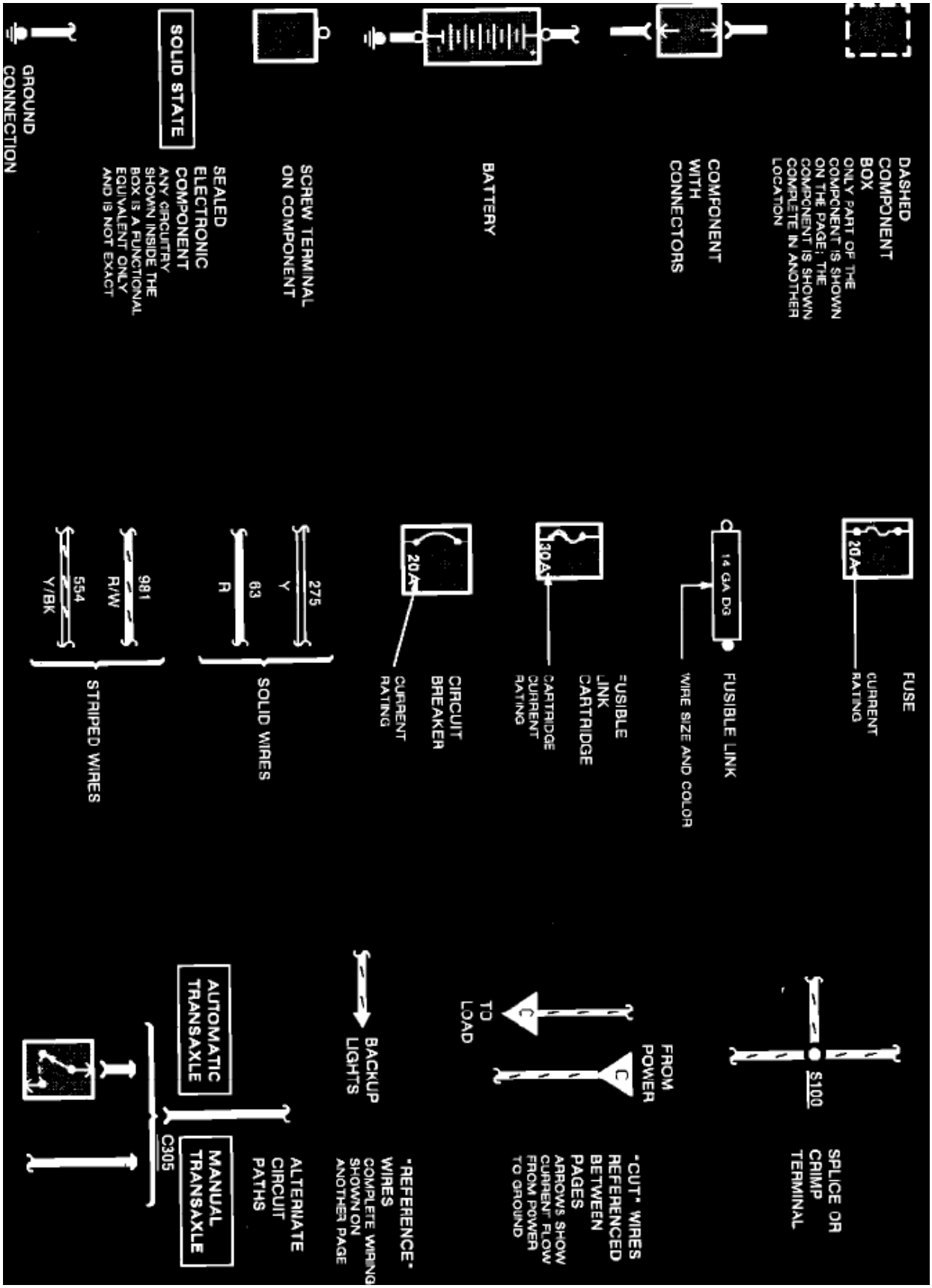
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
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BATTERY
SCREW TERMINAL ON COMPONENT
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GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
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CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
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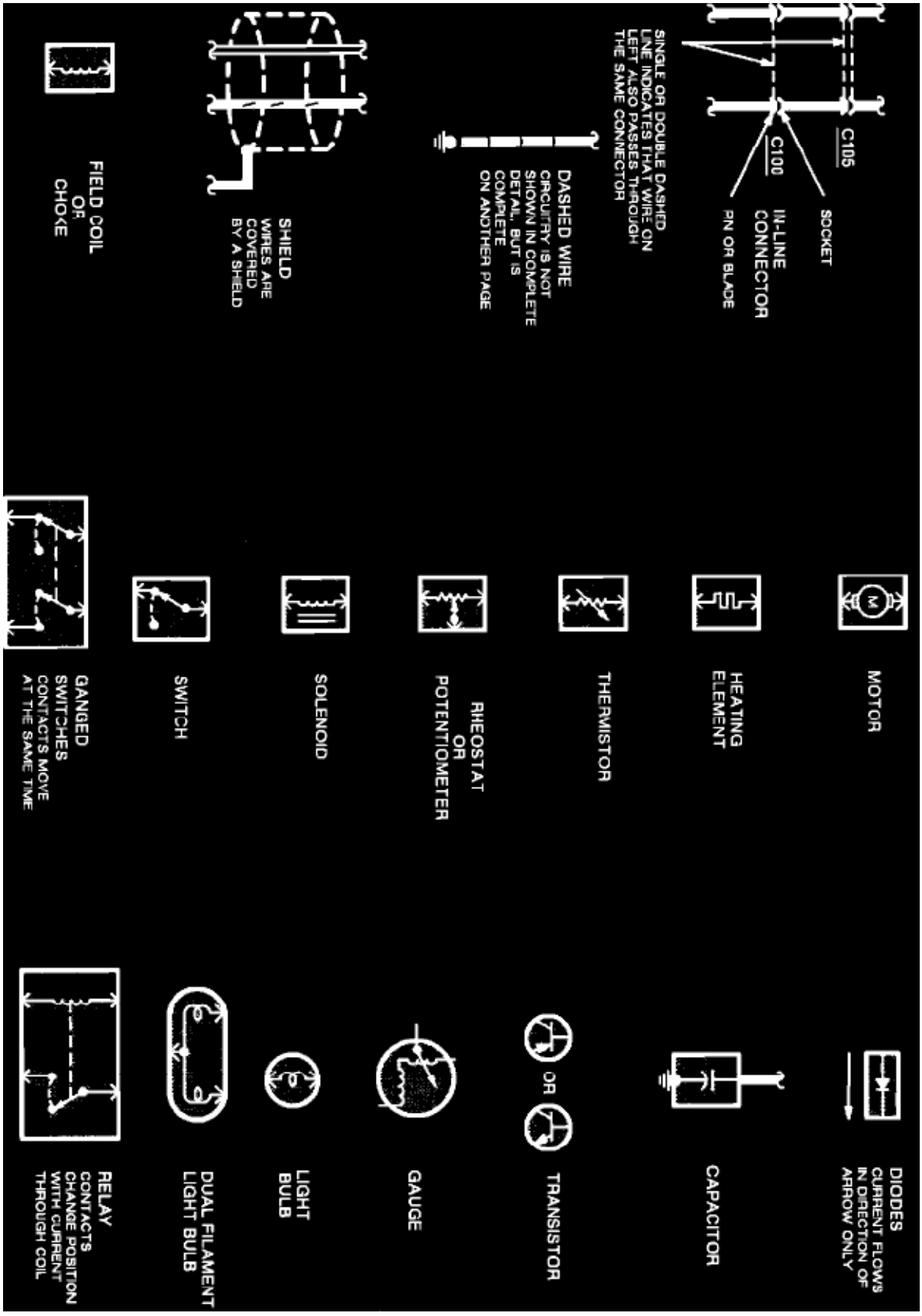
S100
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
FROM POWER
C
TO LOAD
C
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
BACKUP LIGHTS
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305

Electrical Symbols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C100
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THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

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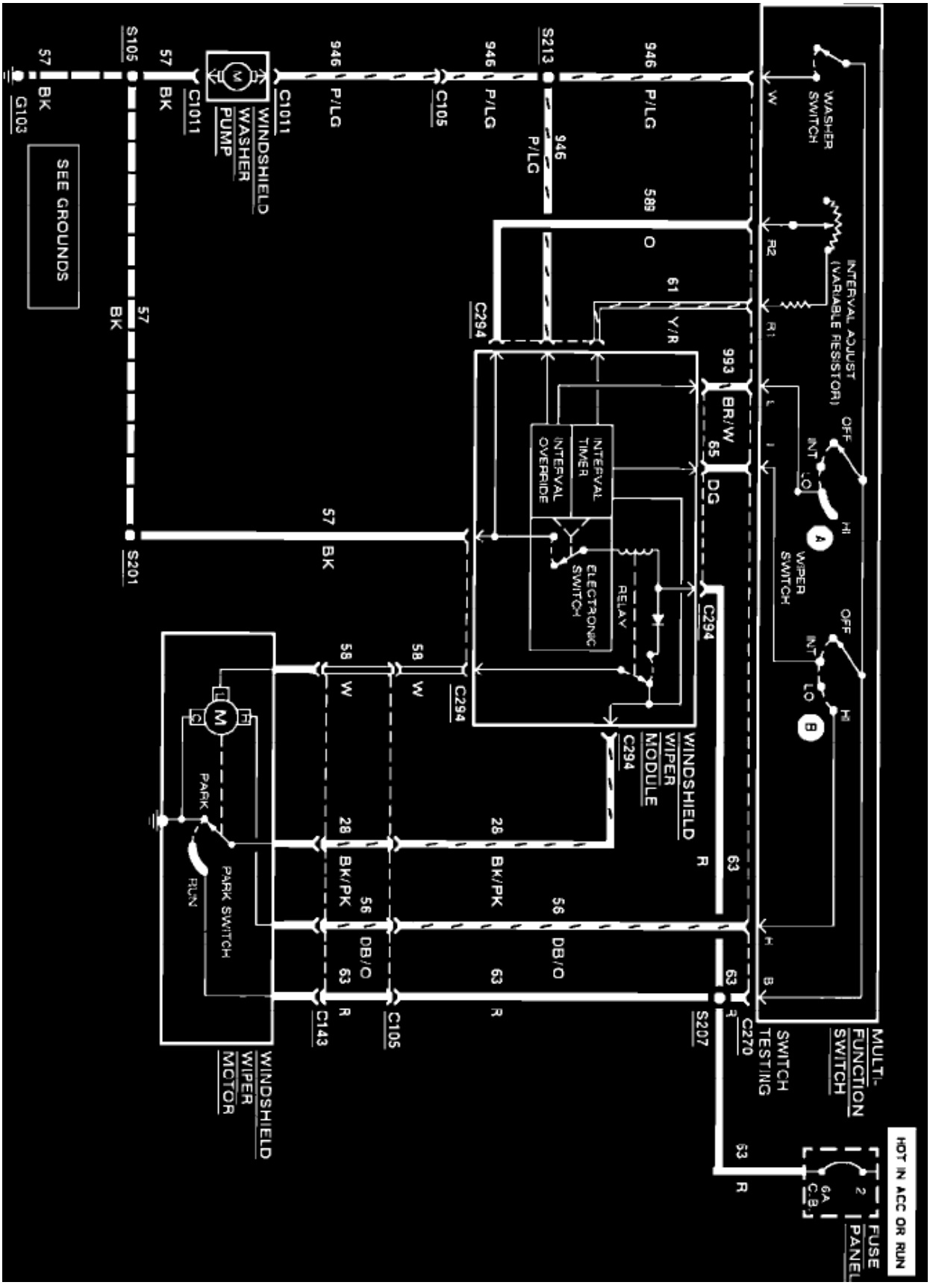
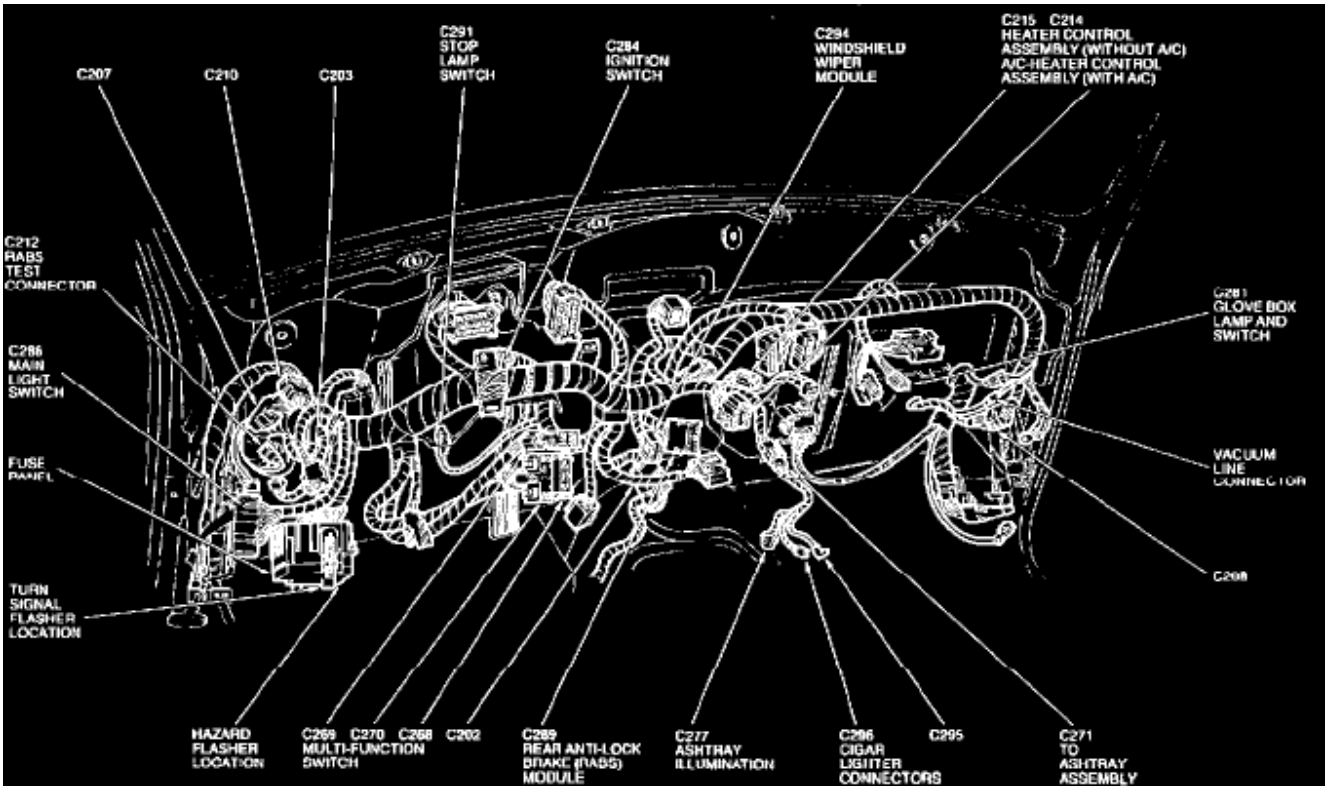
W: White

Y: Yellow


HOT IN ACC OR RUN
FUSE PANEL
2
6A C.B.
MULTI-FUNCTION SWITCH
C270
SWITCH TESTING
WASHER SWITCH
INTERVAL ADJUST (VARIABLE RESISTOR)
OFF
INT
LO
HI
WIPER SWITCH
S207
S213
S105
S201
G103
SEE GROUNDS
WINDSHIELD WASHER PUMP
C1011
C105
C294
C143
INTERVAL TIMER
INTERVAL OVERRIDE
ELECTRONIC SWITCH
RELAY
WINDSHIELD WIPER MODULE
WINDSHIELD WIPER MOTOR
PARK
PARK SWITCH
RUN
W
R2
R1
L
I
B
946 P/LG
589 O
61 Y/R
993 BR/W
65 DG
57 BK
58 W
28 BK/PK
56 DB/O
63 R
53 R

Wiper/Washer

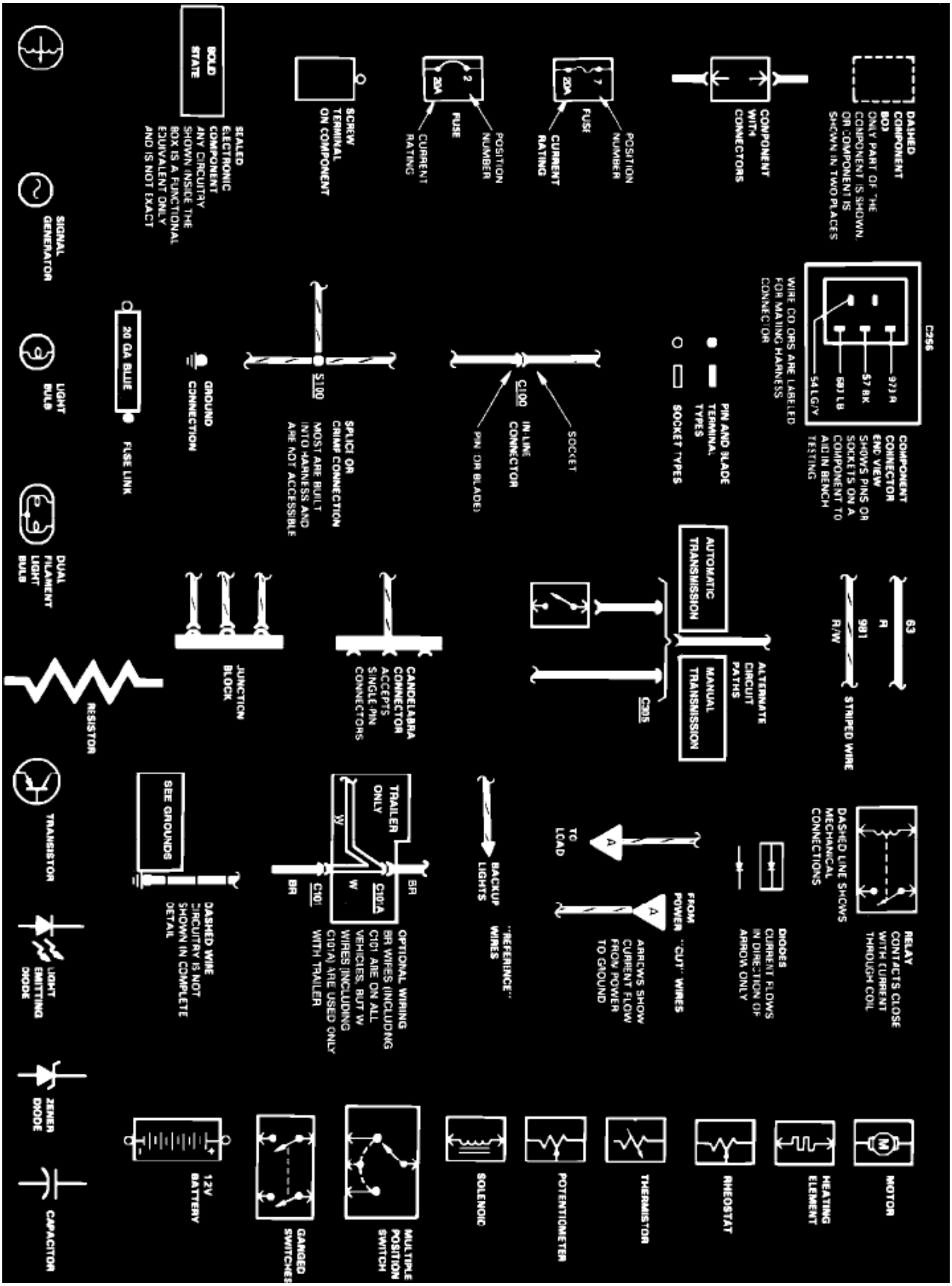


Wiper Control Module: Locations

I/P Components

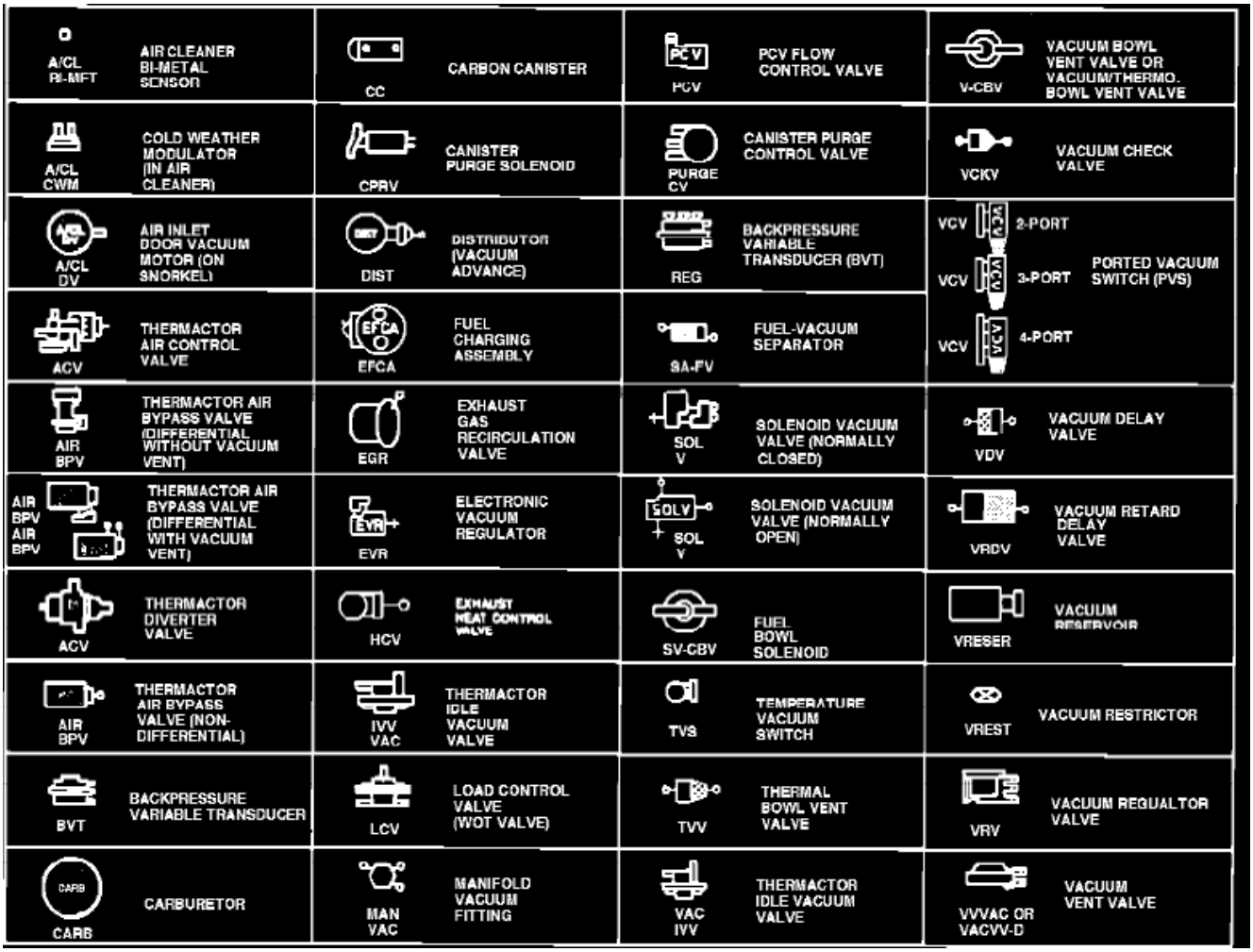
Behind Center Of I/P, LH Side Of Ashtray Assembly

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Relays and Modules > Relays and Modules - Wiper and Washer Systems > Wiper Relay > Component Information > Diagrams > Diagram Information and Instructions

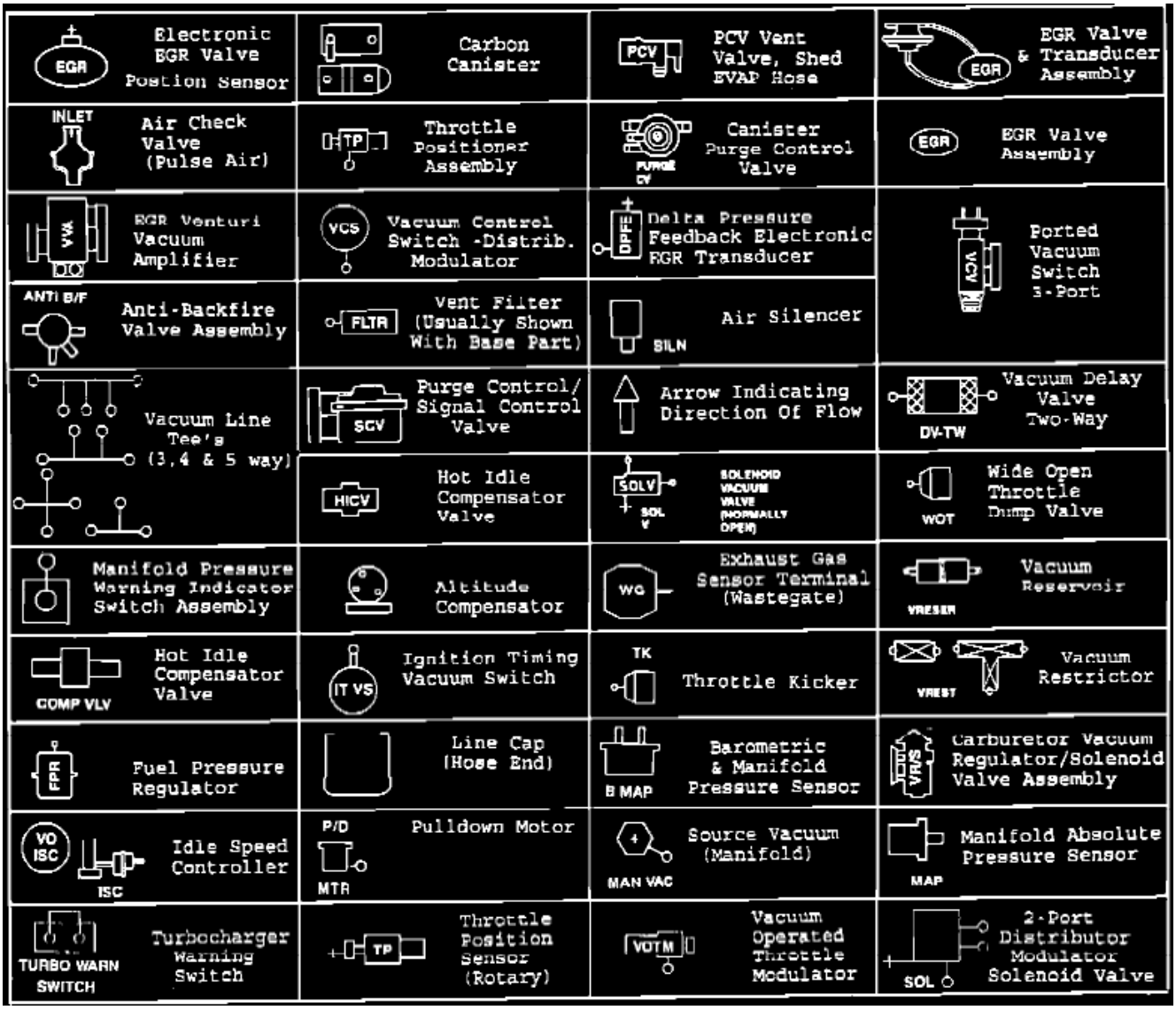


Wiper Relay: Diagram Information and Instructions

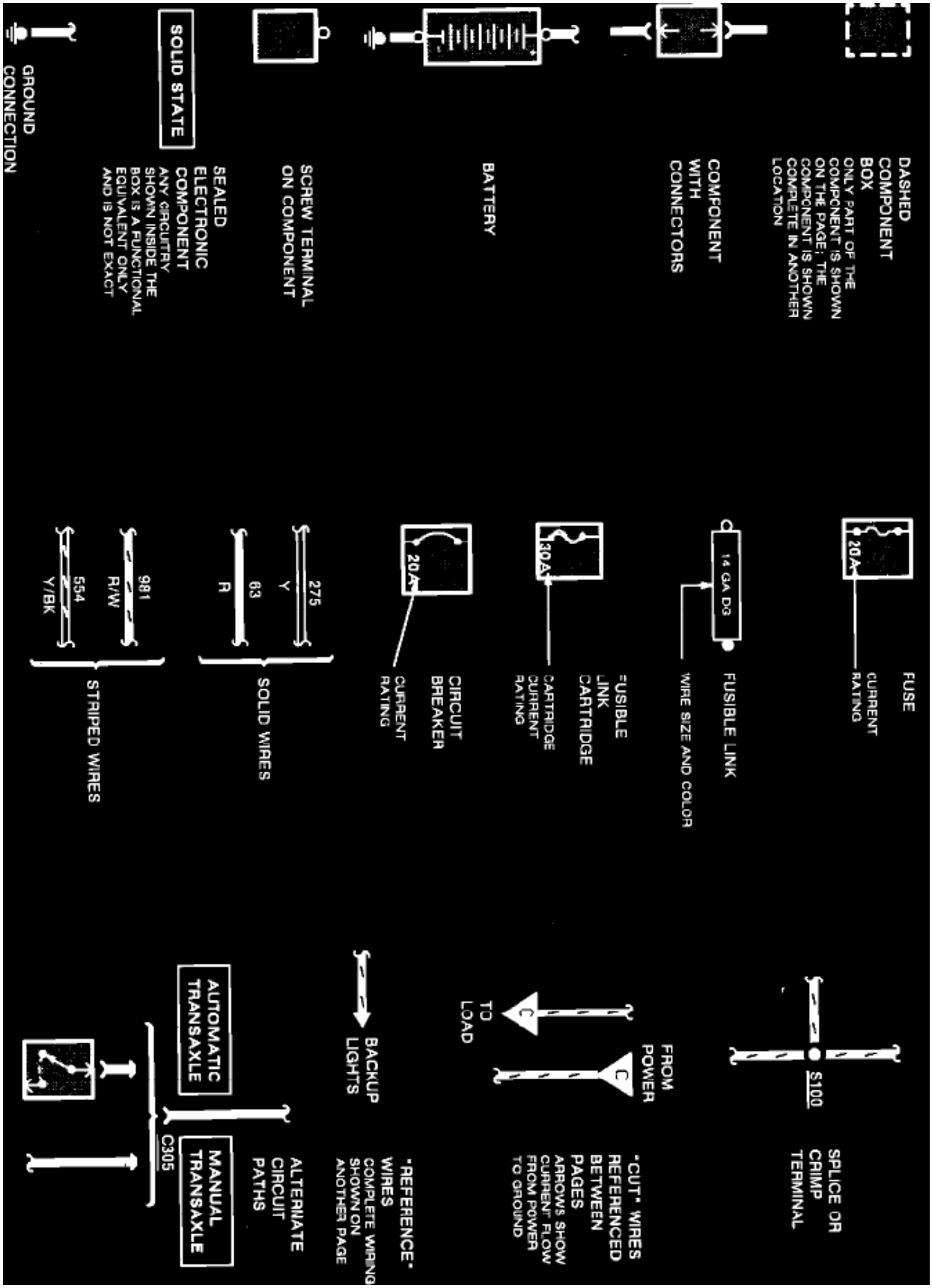
Symbol Identification



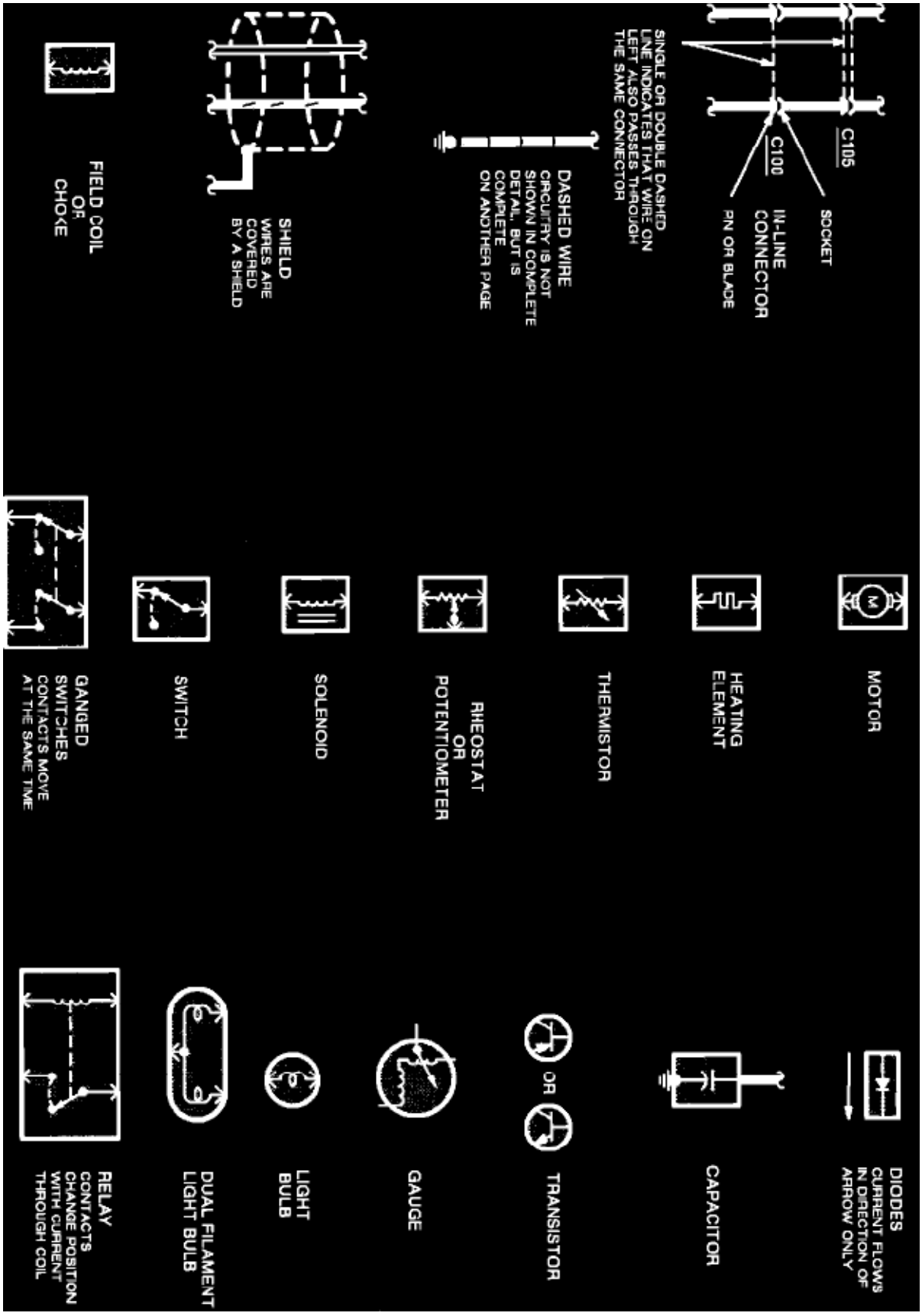
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

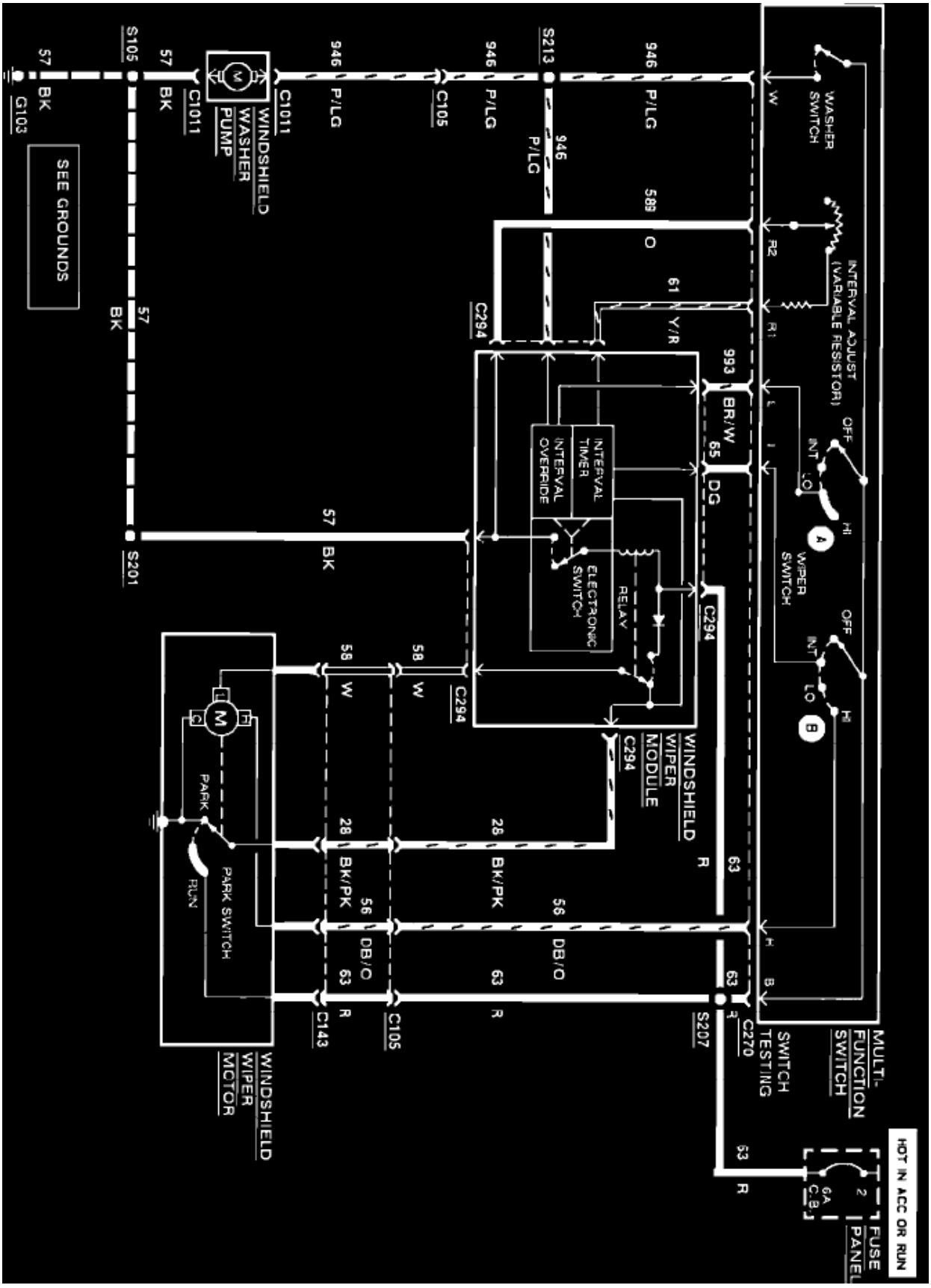
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow


HOT IN ACC OR RUN
FUSE PANEL
2
6A C.B.
MULTI-FUNCTION SWITCH
C270
SWITCH TESTING
WASHER SWITCH
INTERVAL ADJUST (VARIABLE RESISTOR)
OFF
INT
LO
HI
WIPER SWITCH
A
B
W
R2
R1
L
I
H
B
53
R
946
P/LG
589
O
61
Y/R
993
BR/W
65
DG
C294
S213
S207
INTERVAL TIMER
INTERVAL OVERRIDE
ELECTRONIC SWITCH
RELAY
WINDSHIELD WIPER MODULE
C294
63
R
28
BK/PK
56
DB/O
58
W
C105
C143
S201
57
BK
S105
G103
C1011
WINDSHIELD WASHER PUMP
SEE GROUNDS
PARK
RUN
PARK SWITCH
WINDSHIELD WIPER MOTOR

Wiper/Washer

Old Service Part Number	New Service Part Number
F6TZ-15702-AA E7DZ-15702-A	1U5Z-15702-AA 1U5Z-15702-AA

PART NUMBER	PART NAME
1U5Z-15702-AA	27 degree Mechanical Hood Lamp Switch

Underhood Lamp Switch: Technical Service Bulletins Hood Lamp Switch - Revised

Article No. 01-21-6

10/29/01

ELECTRICAL - REVISED MECHANICAL HOOD LAMP SWITCH TO REPLACE OLD STYLE MERCURY HOOD LAMP SWITCH

FORD: 1987-1995 TAURUS 1988-1991 CROWN VICTORIA 1989 THUNDERBIRD 1989-1996 MUSTANG 1994-1996 THUNDERBIRD 1990 BRONCO II 1990-1996 RANGER 1991-1996 BRONCO 1994-2001 EXPLORER 1997-2001 F-150 2000-2001 EXCURSION 2002 EXPEDITION

LINCOLN: 1989-1994 CONTINENTAL 1990-1992 MARK VII 1990-1996 TOWN CAR 1993-1995 MARK VIII 2002 NAVIGATOR

MERCURY: 1987-1995 SABLE 1988-1991 GRAND MARQUIS 1989 COUGAR 1994-1996 COUGAR 1997-2001 MOUNTAINEER

ISSUE

This article is to provide information on replacement hood lamp switches. The 27 degree Mercury style hood switches will no longer be available. Replacement 27 degree Mechanical switches will be available as a service replacement.

ACTION

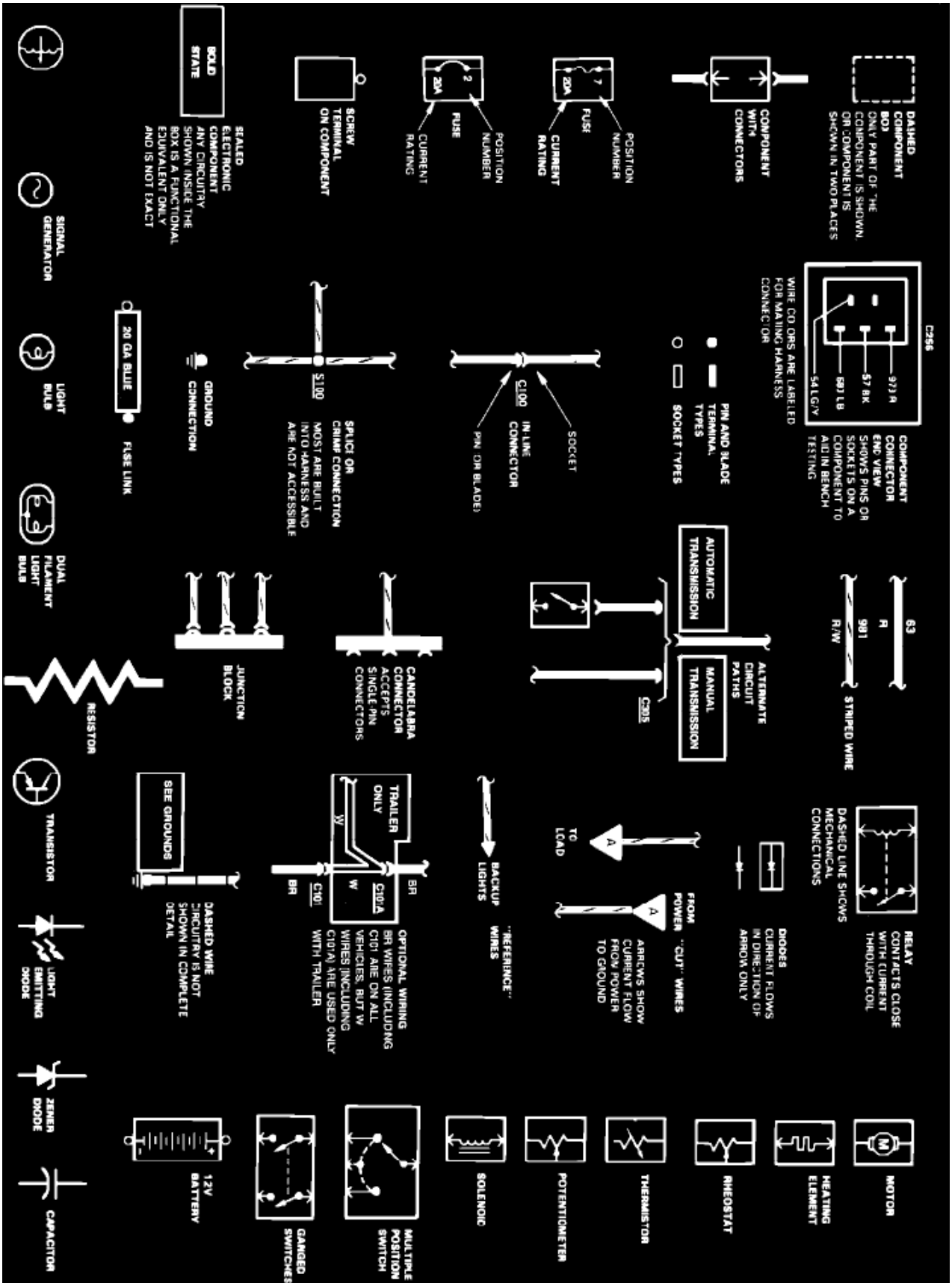
For vehicles requiring hood lamp switch replacement, replace the 27 degree Mercury switch with new 27 degree Mechanical switch. Replace hood lamp switch per the appropriate model year Workshop Manual as needed.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

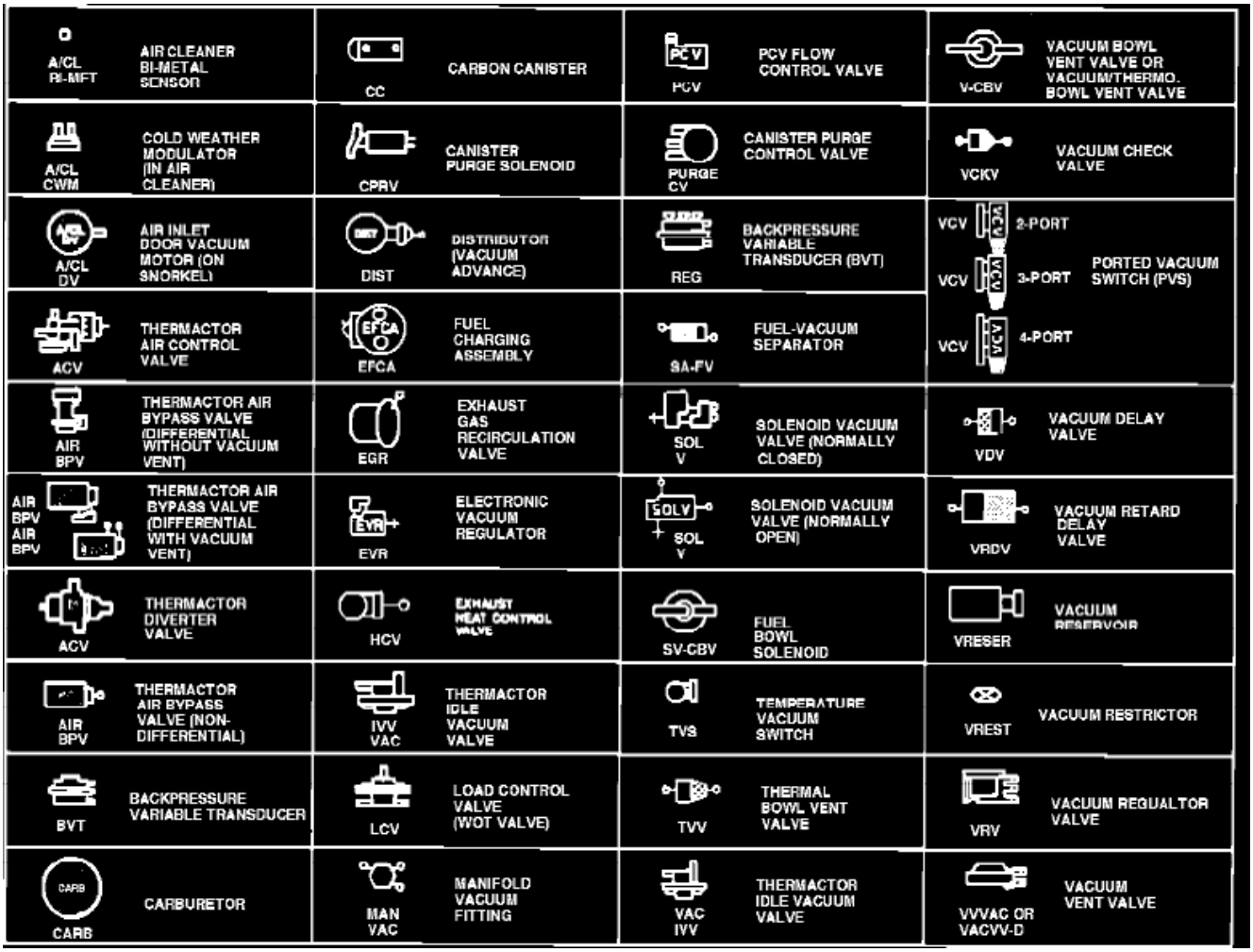
OASIS CODES: 201000, 201200

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Body and Frame > Power Door Lock Switch > Component Information > Diagrams > Diagram Information and Instructions

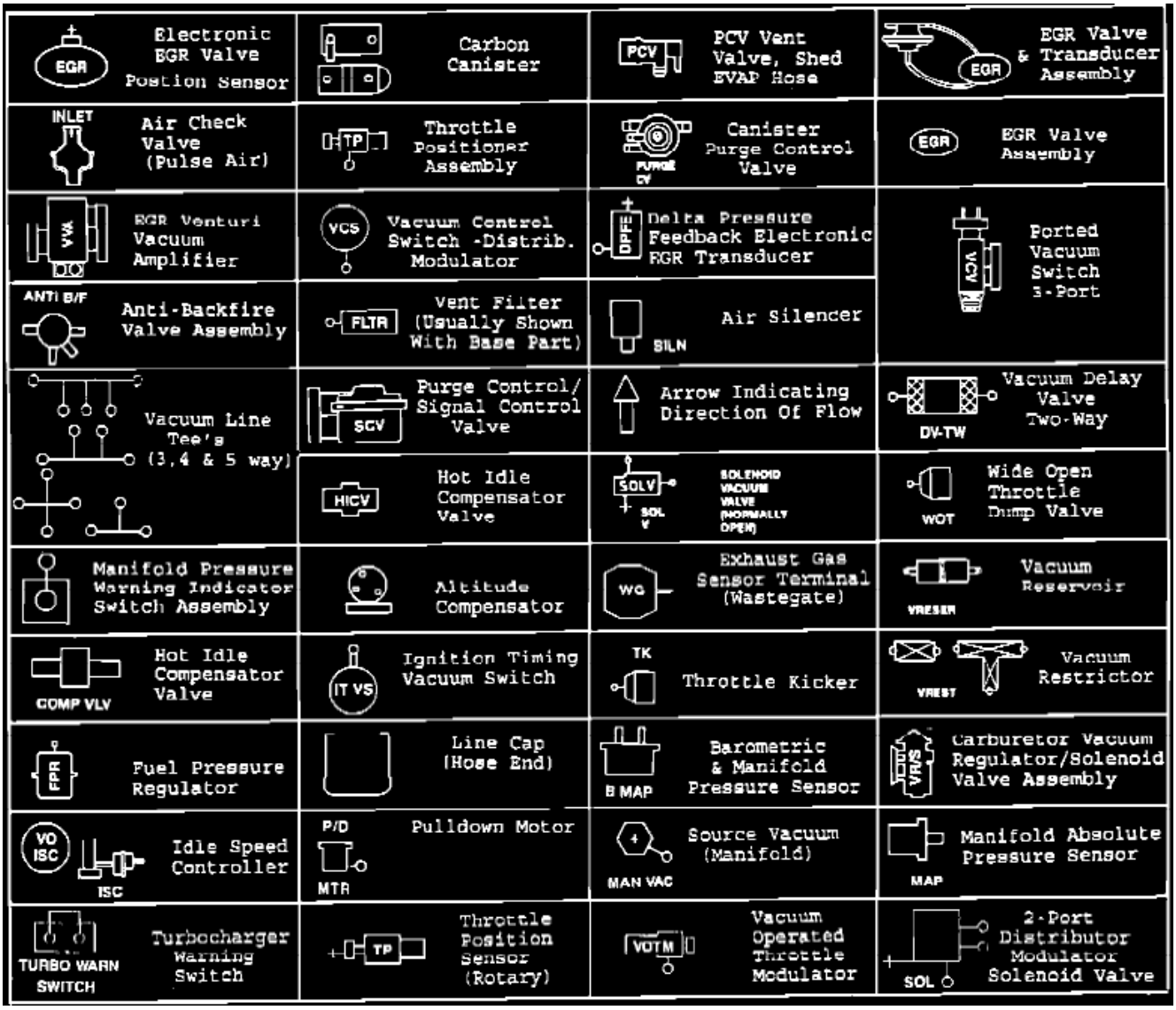


Power Door Lock Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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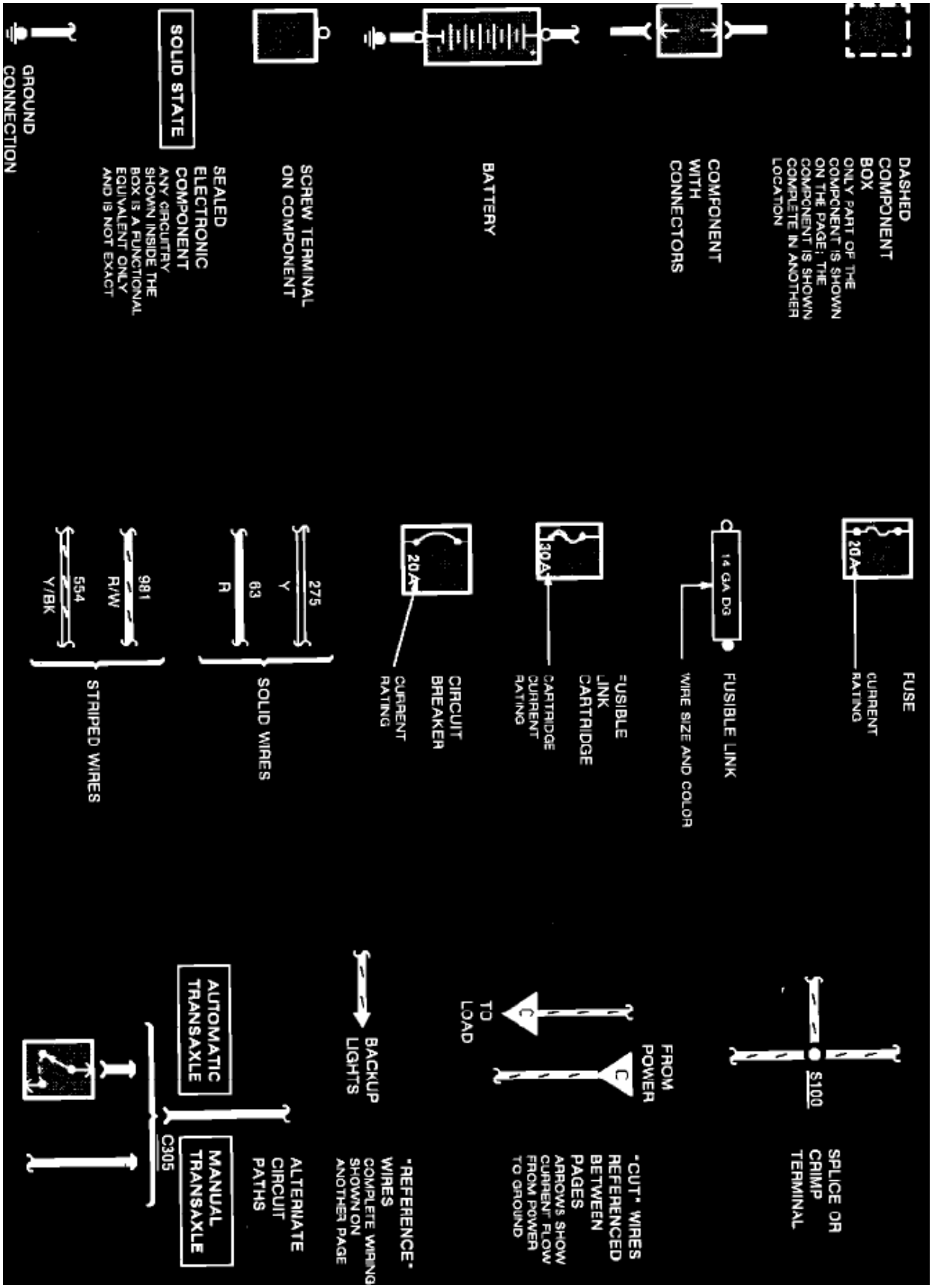
DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
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SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
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R
SOLID WIRES
981
R/W
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Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
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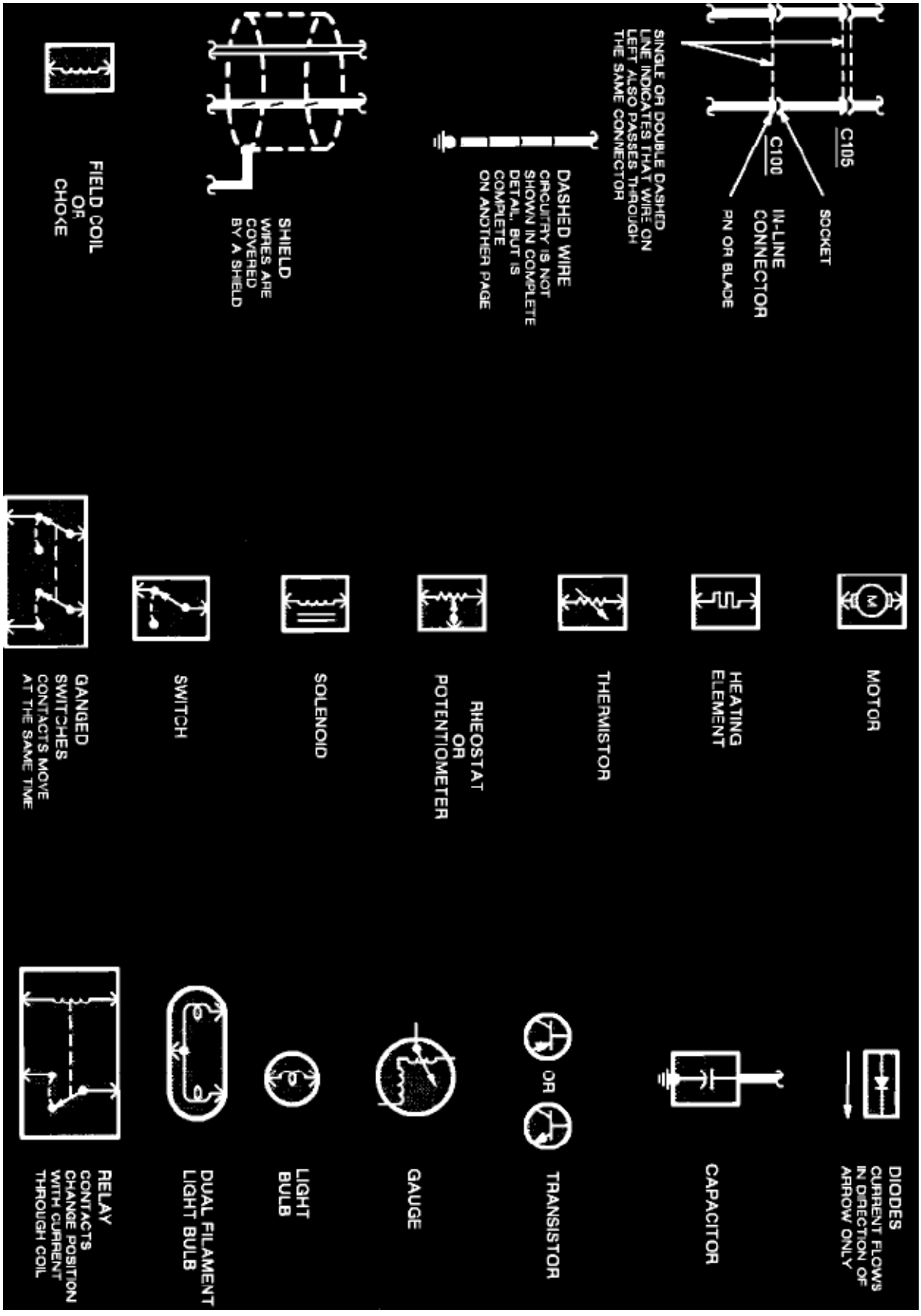
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

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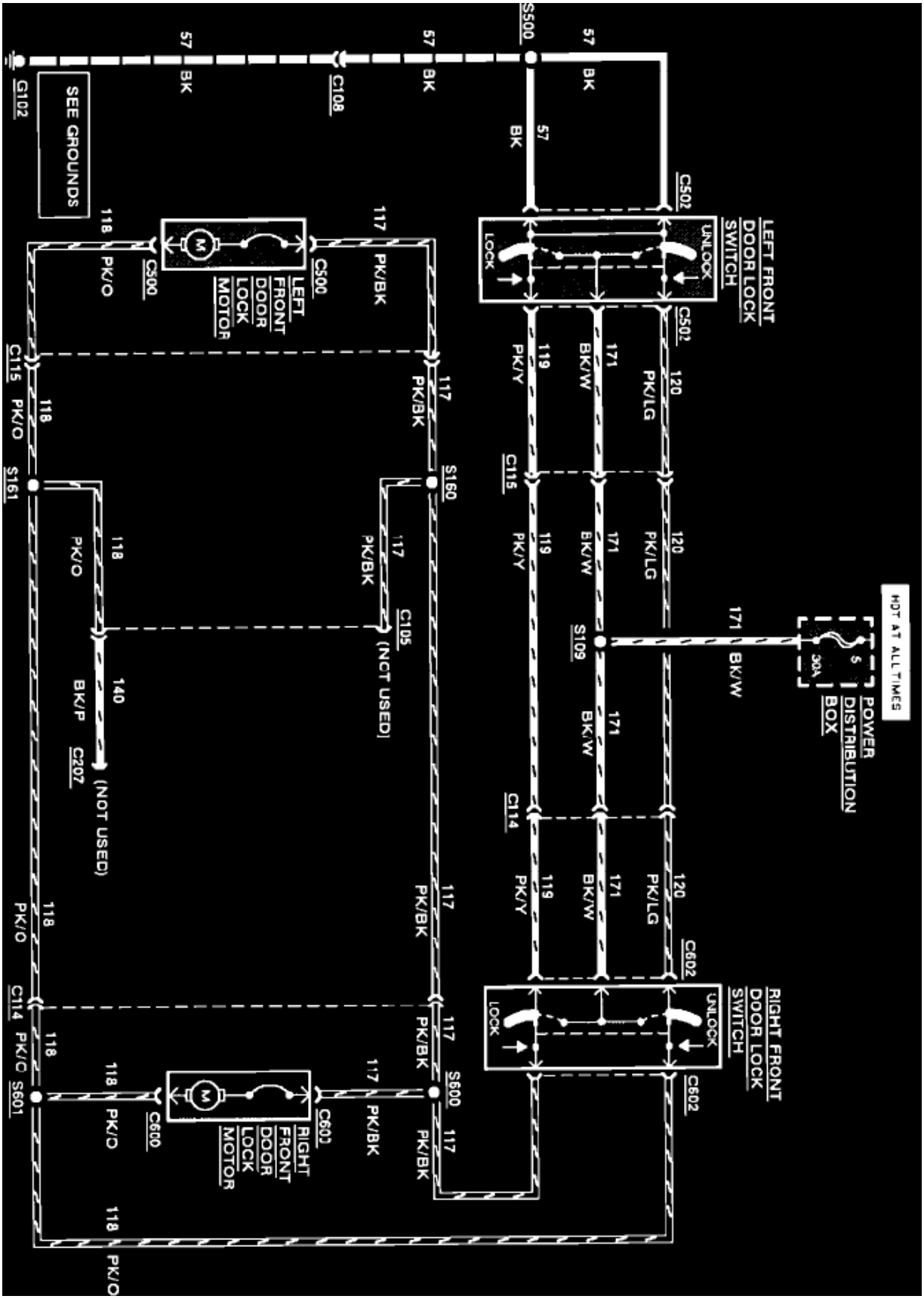
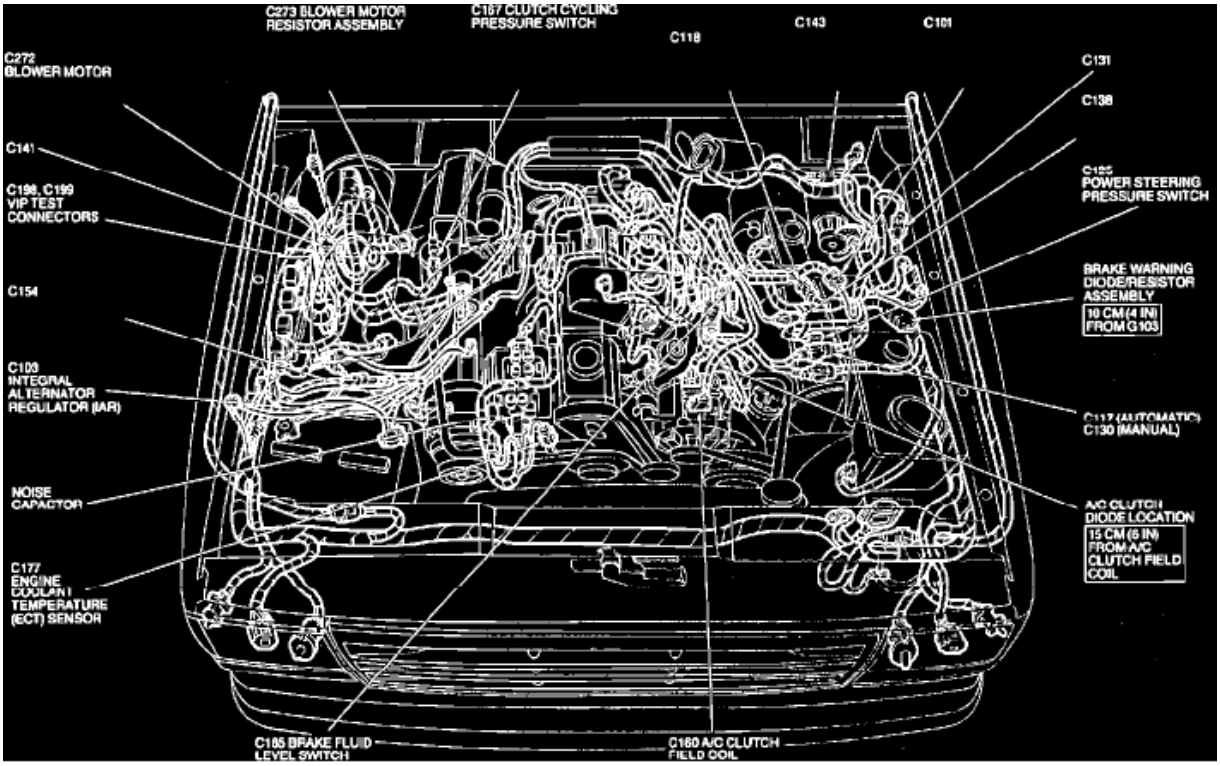
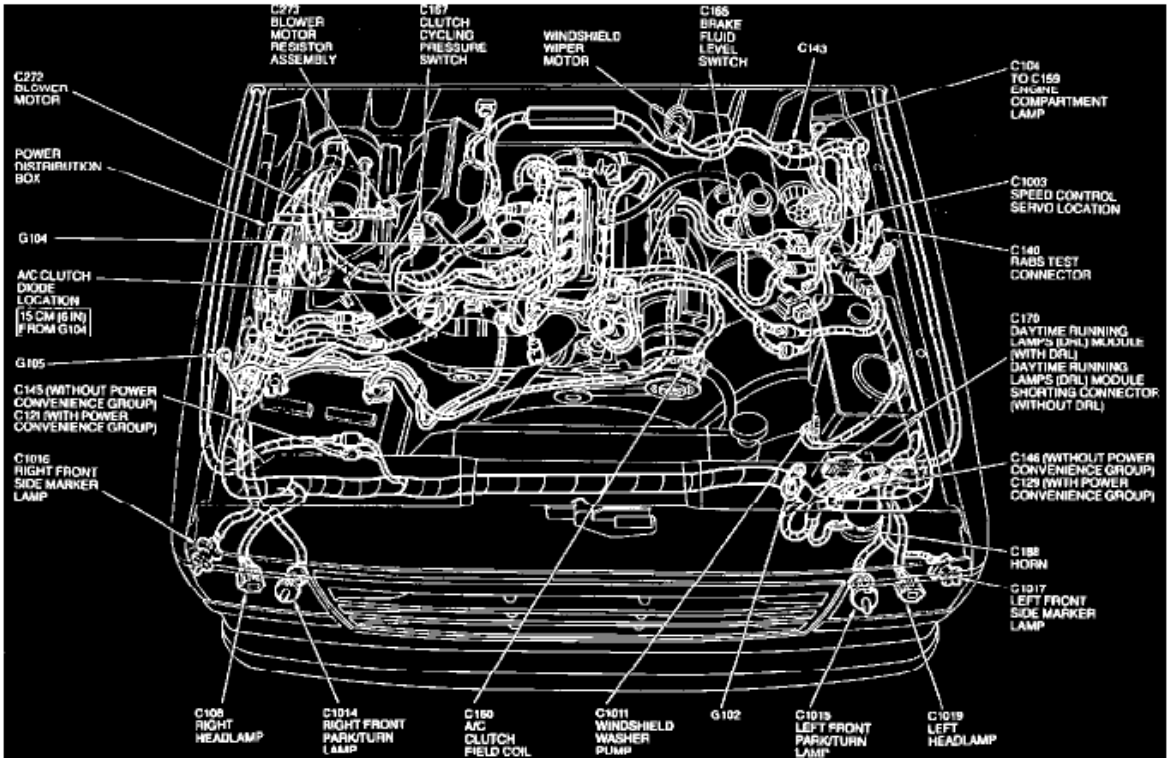
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Body and Frame > Power Door Lock Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 304



Power Door Locks

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Brakes and Traction Control > Brake Fluid Level Sensor/Switch > Component Information > Locations





Brake Fluid Level Sensor/Switch: Locations

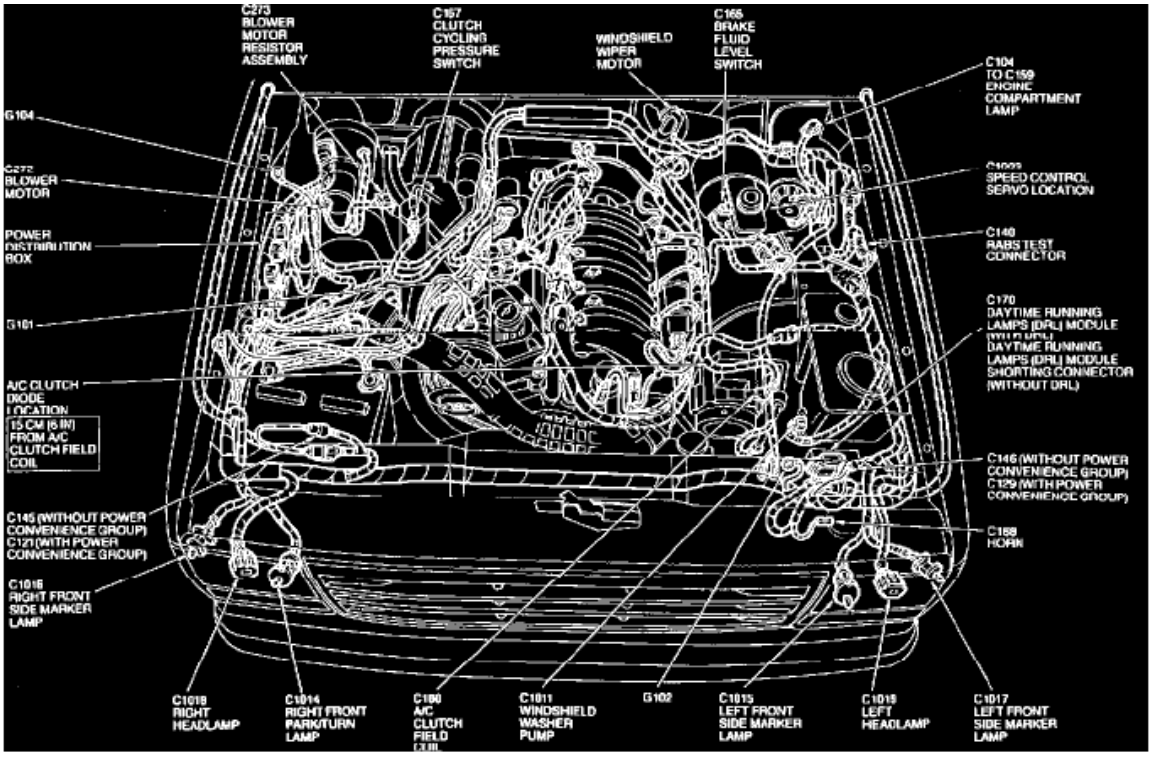
Engine Compartment Components.

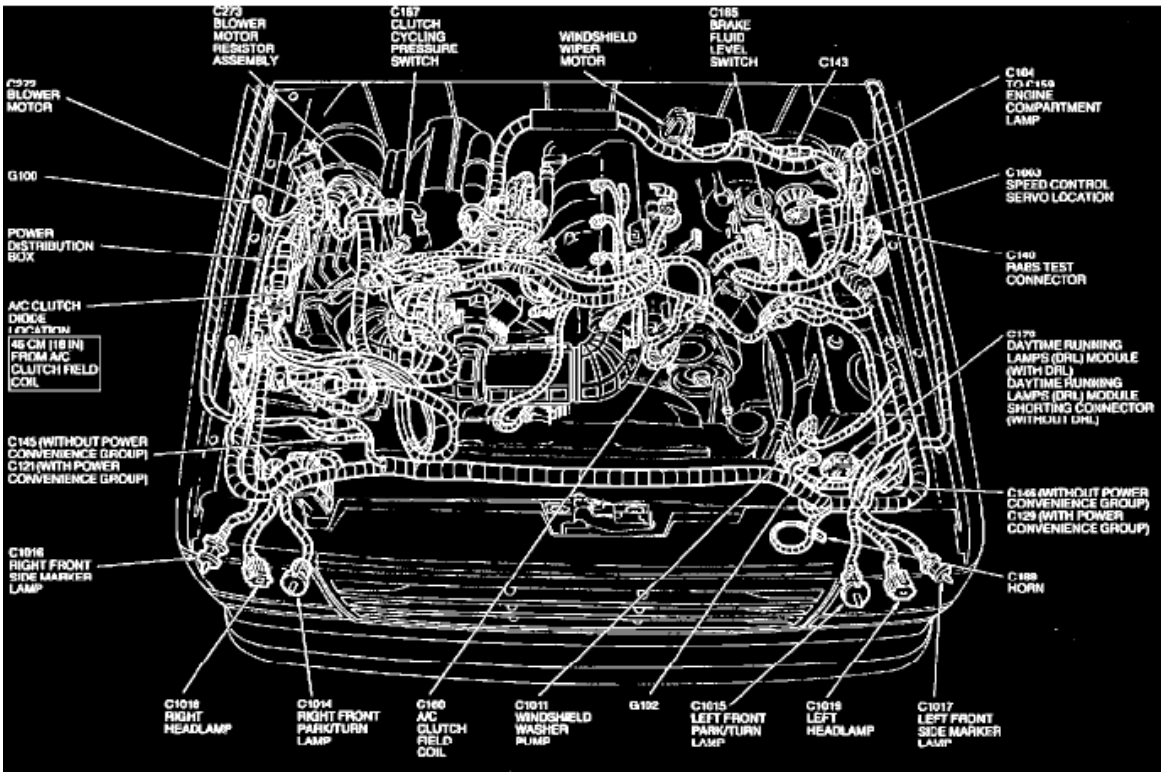
Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 2.3L/4-140

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C104
TO C159
ENGINE COMPARTMENT LAMP
C272
BLOWER MOTOR
G100
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
46 CM (18 IN) FROM A/C CLUTCH FIELD COIL
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

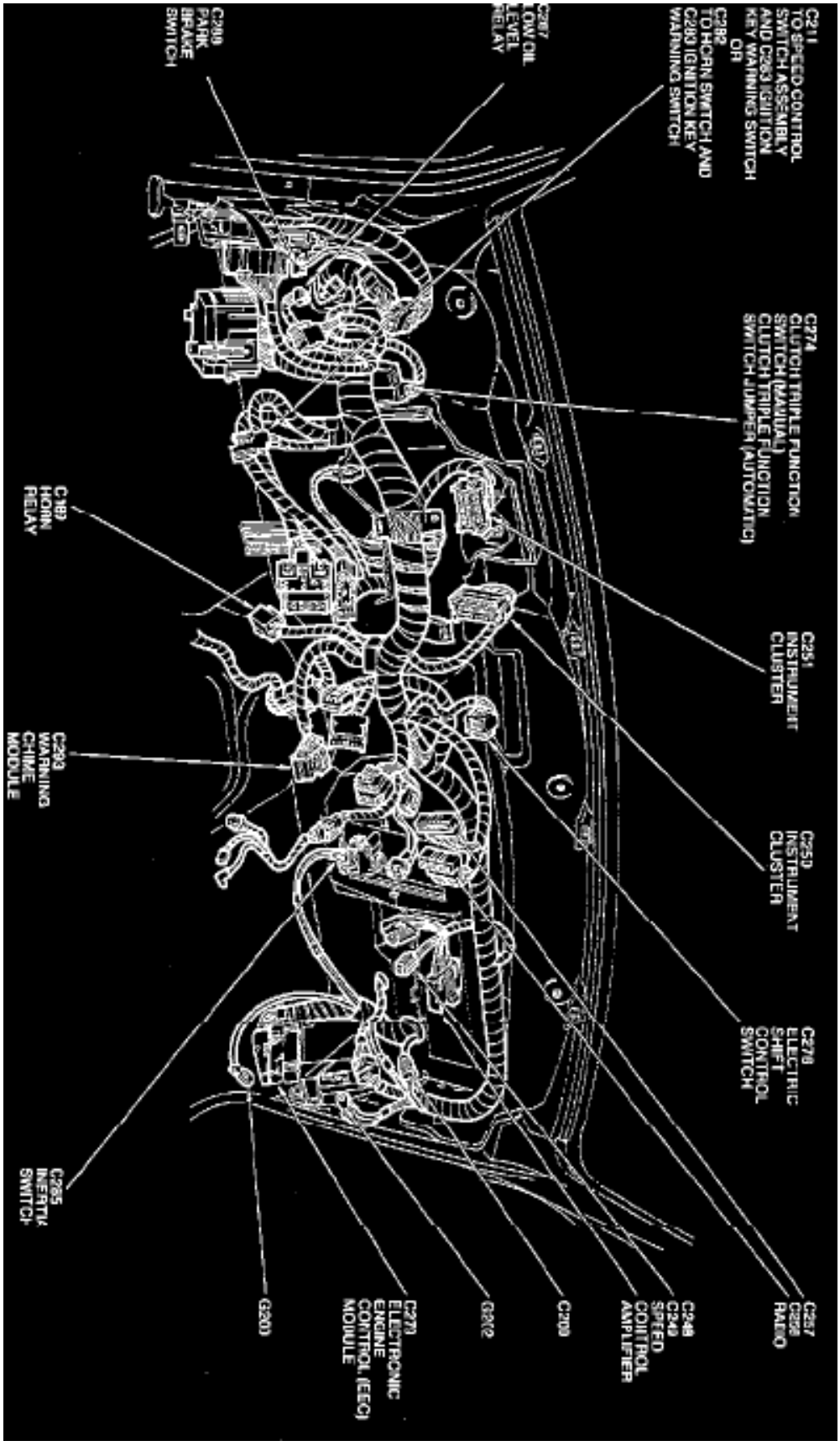
Applicable to: 3.0L/V6-181

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 4.0L/V6-244

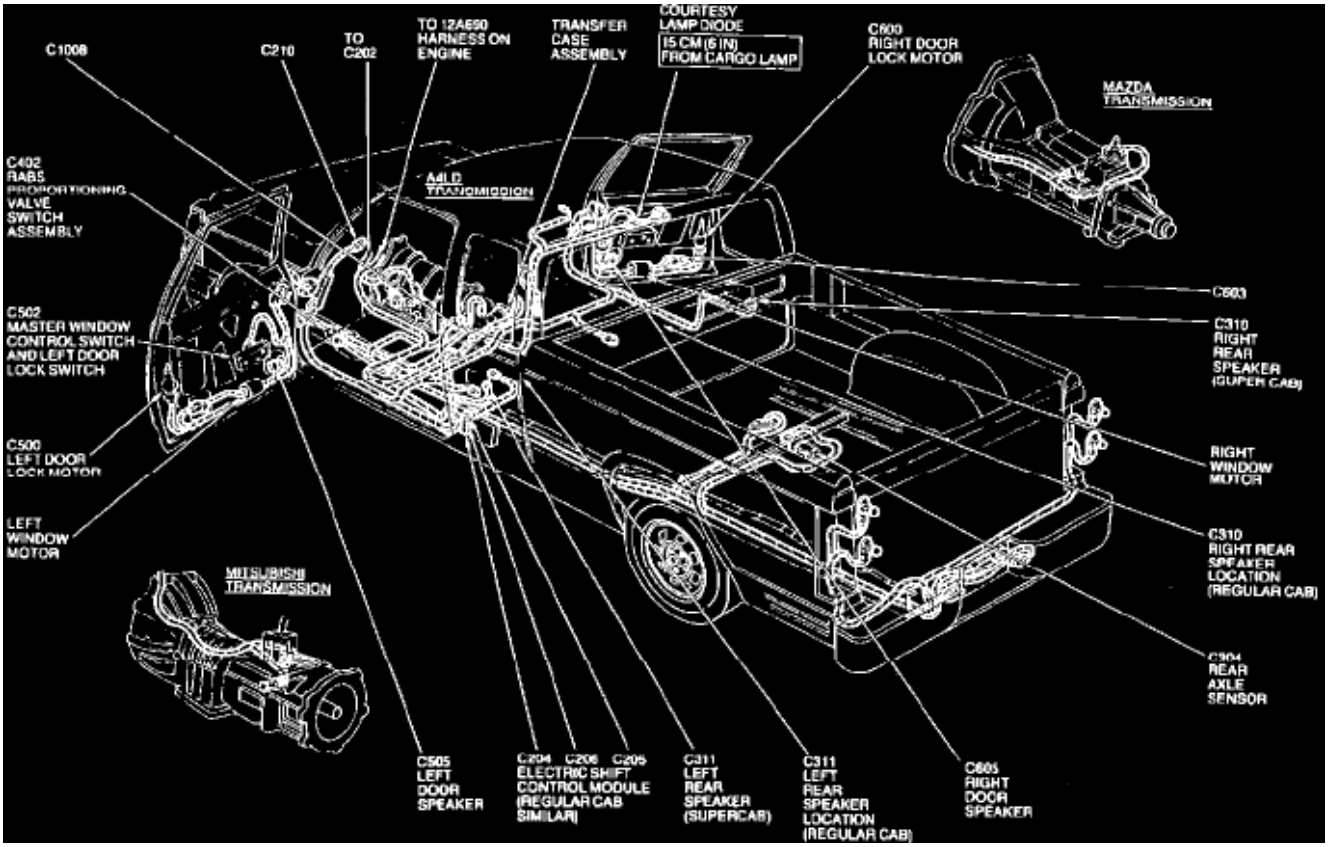
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Brakes and Traction Control > Parking Brake Warning Switch > Component Information > Locations



Parking Brake Warning Switch: Locations

I/P Components

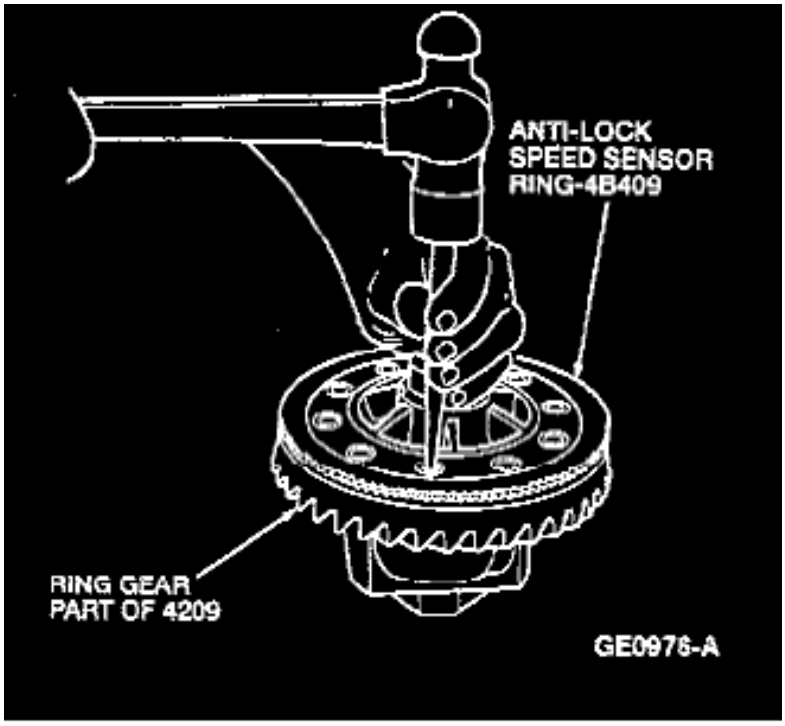
Below LH Side Of I/P, On Park Brake Assembly

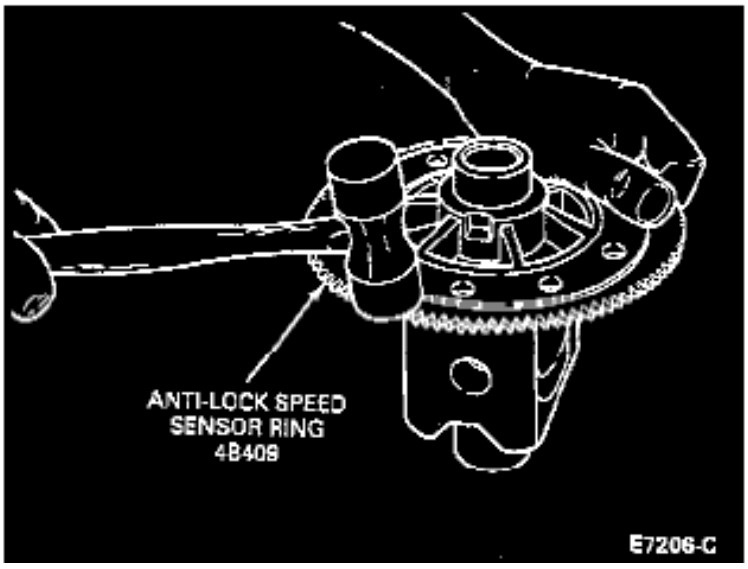


Wheel Speed Sensor: Locations

Body Components

Top Of Rear Differential


ANTI-LOCK
SPEED SENSOR
RING-4B409
RING GEAR
PART OF 4209
GE0976-A


ANTI-LOCK SPEED
SENSOR RING
4B409
E7206-C

Wheel Speed Sensor: Service and Repair Toothed Ring

NOTE: To service the speed sensor ring, the differential case must be removed from the axle housing.

REMOVAL

1. Remove the bolts retaining the ring gear to the differential case. Remove the ring gear by striking at alternate holes around the gear.

CAUTION: Extreme care should be taken not to scratch, dent, chip or otherwise cause damage to anti-lock brake sensor ring teeth while handling or during assembly.

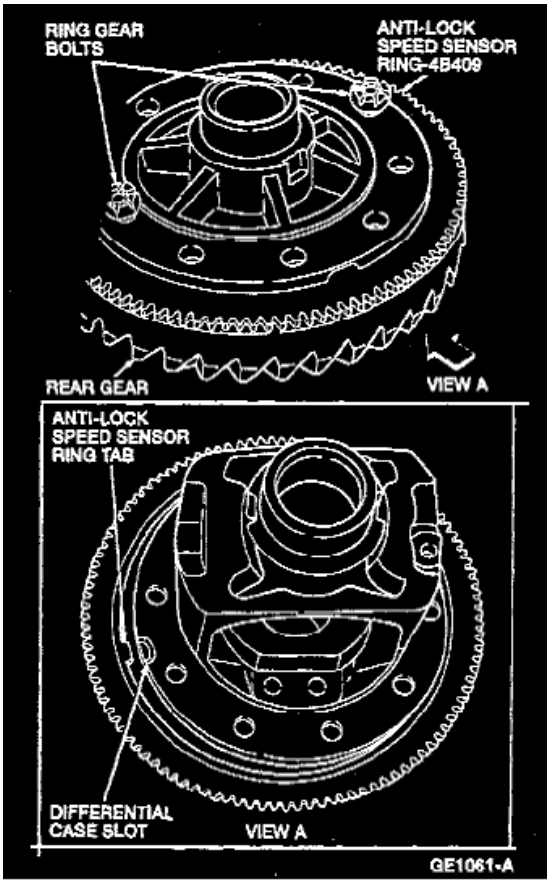
NOTE:

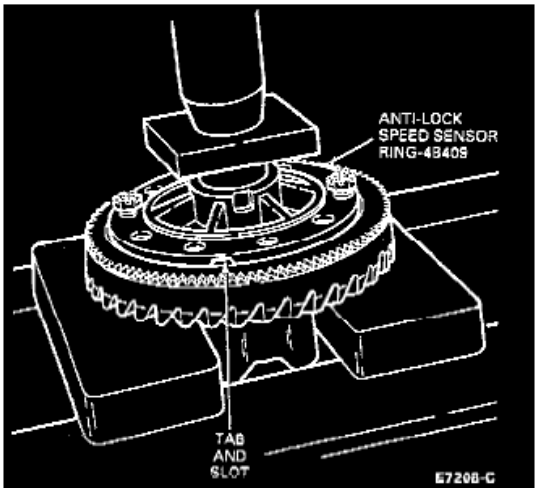
^ Before removing ring gear inspect it and determine if ring runout check is necessary.

^ Do not remove anti-lock speed sensor ring unless replacement is required. It does not have to be removed for ring gear replacement.

2. If replacement is required remove the anti-lock brake sensor ring by tapping with a soft-faced hammer. Discard the anti-lock speed sensor ring.

CAUTION: The anti-lock speed sensor ring must be discarded upon removal. If removed, a new anti-lock brake sensor ring must be installed.


RING GEAR BOLTS
ANTI-LOCK SPEED SENSOR RING-4B409
REAR GEAR
VIEW A
ANTI-LOCK SPEED SENSOR RING TAB
DIFFERENTIAL CASE SLOT
VIEW A
GE1061-A


ANTI-LOCK SPEED SENSOR RING-4B409
TAB AND SLOT
E7208-C

INSTALLATION

1. Position the ring gear and anti-lock speed sensor ring on the differential case. The tab on the anti-lock speed sensor ring must be aligned with the

slot in the differential case as shown. Start two ring gear retaining bolts through the differential case into the ring gear to make sure case-to-ring gear bolt hole alignment is achieved.

CAUTION:

^ Extreme care should be taken not to scratch, dent, chip or otherwise cause damage to anti-lock speed sensor ring teeth while handling or during assembly.

^ The tab on the anti-lock speed sensor ring must be aligned with the slot in the differential case.

2. Press the ring gear and anti-lock speed sensor ring on the differential case using the ring gear as a pilot.

3. Coat the threads of the ring gear retaining bolts with Stud and Bearing Mount EOAZ-19554-BA or equivalent meeting Ford specification

WSK-M2G349-A1. Install the bolts and alternately and evenly tighten to 95-115 Nm (70-85 ft. lbs.).

Wheel Speed Sensor: Service and Repair Wheel Speed Sensor

REMOVAL

1. At the rear axle housing pull the wiring harness connector from the speed sensor. 2. Remove the speed sensor hold down bolt and remove the speed sensor from the rear axle housing.

INSTALLATION

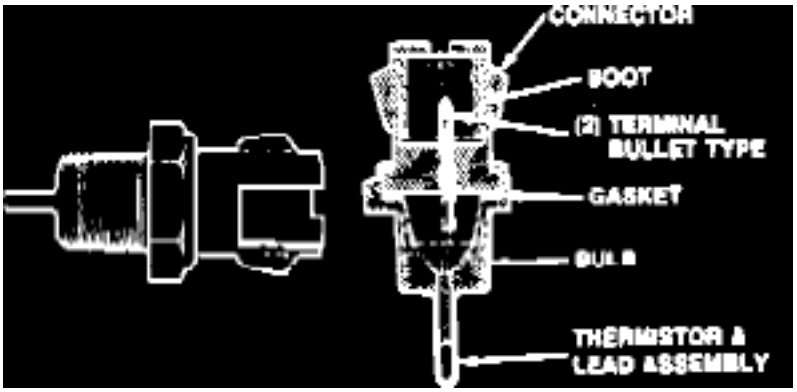
1. Clean the rear axle housing mounting surface. Use care to prevent dirt from entering the rear axle housing. 2. Inspect and clean the magnetized sensor pole piece to make sure that it is free from loose metal particles which could cause erratico■ system

operation. Inspect the speed sensor O-ring for damage and replace if necessary.

3. Lightly lubricate the speed sensor O-ring with motor oil, align the bolt hole, and install.

NOTE: Do not apply force to the plastic sensor connector. The sensor flange should slide to the mounting surface. This will make sure the air gap setting is between 0.127-1.143 mm (0.005-0.045 inches).

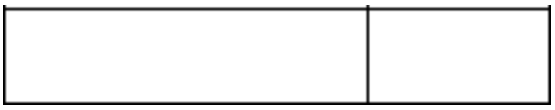
4. Install the speed sensor hold-down bolt and tighten to 34-40 Nm (25-29 ft. lbs.). 5. Push the connector on the speed sensor.



Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.



Radiator Cooling Fan Temperature Sensor / Switch: Specifications Switch Torque

Switch Torque

Cooling Fan Switch 8-18 ft.lb

Temperature Sensor (Gauge): Technical Service Bulletins Temperature Gauge - Reads Low/Erratic

Article No. 95-13-2

07/03/95

^ GAUGE - TEMPERATURE-READS IN LOW RANGE - ERRATIC READINGS

^ SERVICE PARTS - RETURN OF OBSOLETE TEMPERATURE SENDERS

FORD: 1981-94 ESCORT 1981-95 MUSTANG, THUNDERBIRD 1983-95 CROWN VICTORIA 1984-94 TEMPO 1986-95 TAURUS

LINCOLN-MERCURY: 1981-92 TOWN CAR 1981-95 COUGAR 1983-95 GRAND MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-95 SABLE 1987-89 TRACER 1991-94 TRACER 1993-95 MARK VIII

LIGHT TRUCK: 1982-95 BRONCO 1983-95 RANGER 1986-94 AEROSTAR 1990-95 F-150-350 SERIES 1991-95 EXPLORER 1992-95 ECONOLINE 1995 WINDSTAR

ISSUE: Temperature Sender F1SZ-10884-A with a build date code prior to 2774 (277th day of 1994) should be purged from your inventory and returned to your facing PDC. These parts are being made obsolete because of an incorrect crimp during assembly. Installing these parts on a vehicle could result in early loss of temperature sender function.

ACTION: Remove and return the suspect parts from your dealership's inventory. The obsolete parts should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

NOTE:

USE TSB ARTICLE 93-24-8 FOR DIAGNOSIS PROCEDURE IN DETERMINING IF LOW GAUGE READINGS COULD BE ASSOCIATED WITH A TEMPERATURE SENDER CONCERN.

1. Perform 100% sort of all stock on hand.

2. Suspect stock has a build date code prior to 2774. Usable stock will have a build date code of 2774 or later.

NOTE:

DATE CODES ARE LOCATED ON THE SIDE OF THE SENDER HEX.

3. Usable stock can be returned to your inventory and released for normal sales.

4. Return suspect part (F1SZ-10884-A) to your facing PDC using the least expensive transportation.

5. If claim is processed electronically via DOES II, use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

6. In the Remarks Section, write "Returned per TSB 95-13-2".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts returned must have been purchased from FCSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

Replacement stock is available for ordering

PART NUMBER PART NAME

F1SZ-10884-A Temperature Sender

OTHER APPLICABLE ARTICLES: 93-24-8

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203000, 203200, 204000, 204200, 402000

Brake Switch (Cruise Control): Testing and Inspection

Perform this test only when brake application will not disconnect the speed control system.

1. Check operation of stop lamps by applying approximately 6 lbs. of pressure to brake pedal. If more than 6 lbs. is required, check brake pedal actuation and stop lamp switch.

2. If stop lamps do not function properly, check bulbs, circuit fuse or stop lamp switch.

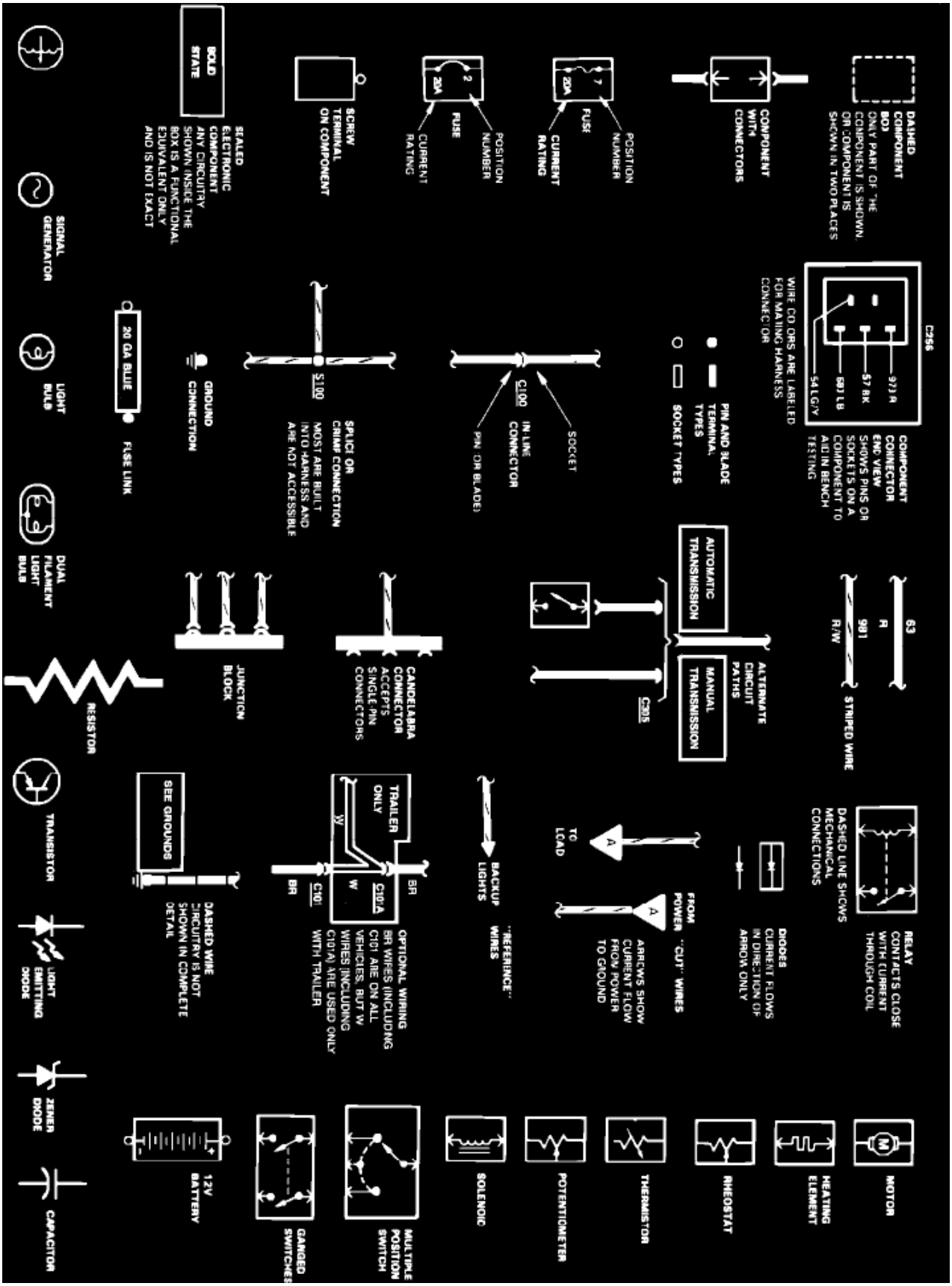
3. If stop lamps function properly, check for battery voltage at 6-way connector using white wire w/purple stripe.

4. Depress brake pedal until stop lamps are illuminated. Check voltage at red wire w/black stripe on E-Series models, or the light green wire on Bronco and F-Series and Ranger, Bronco II, Explorer and Aerostar. The difference between the two voltage readings must not exceed 1.5 volts. If voltage is greater, a high resistance exists in the circuit and must be and corrected.

Clutch Switch: Service and Repair

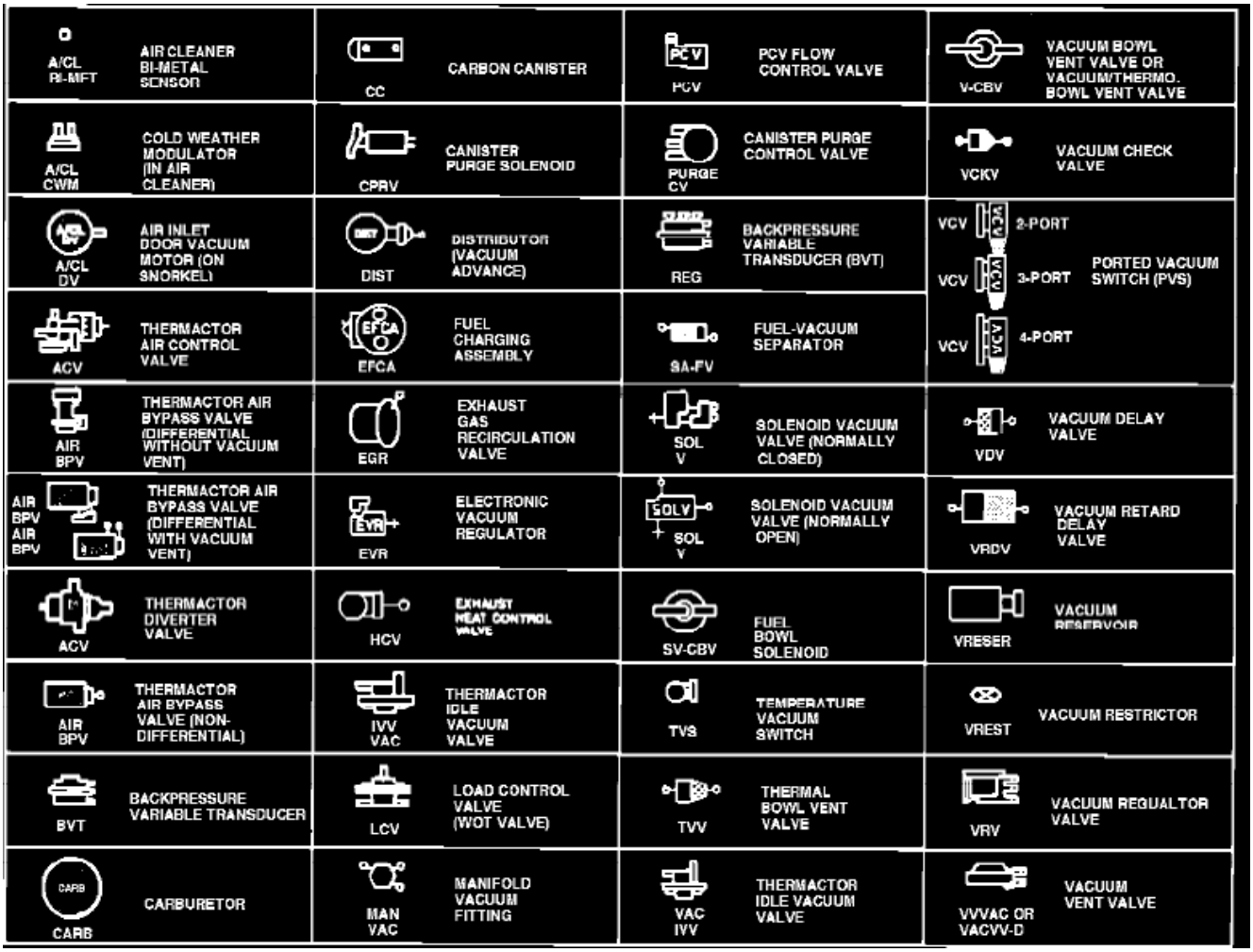
1. Remove bracket mounting screw(s).
2. Disconnect electrical connector and remove switch and bracket assembly.
3. Remove switch from bracket.
4. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Cruise Control > Cruise Control Switch > Component Information > Diagrams > Diagram Information and Instructions

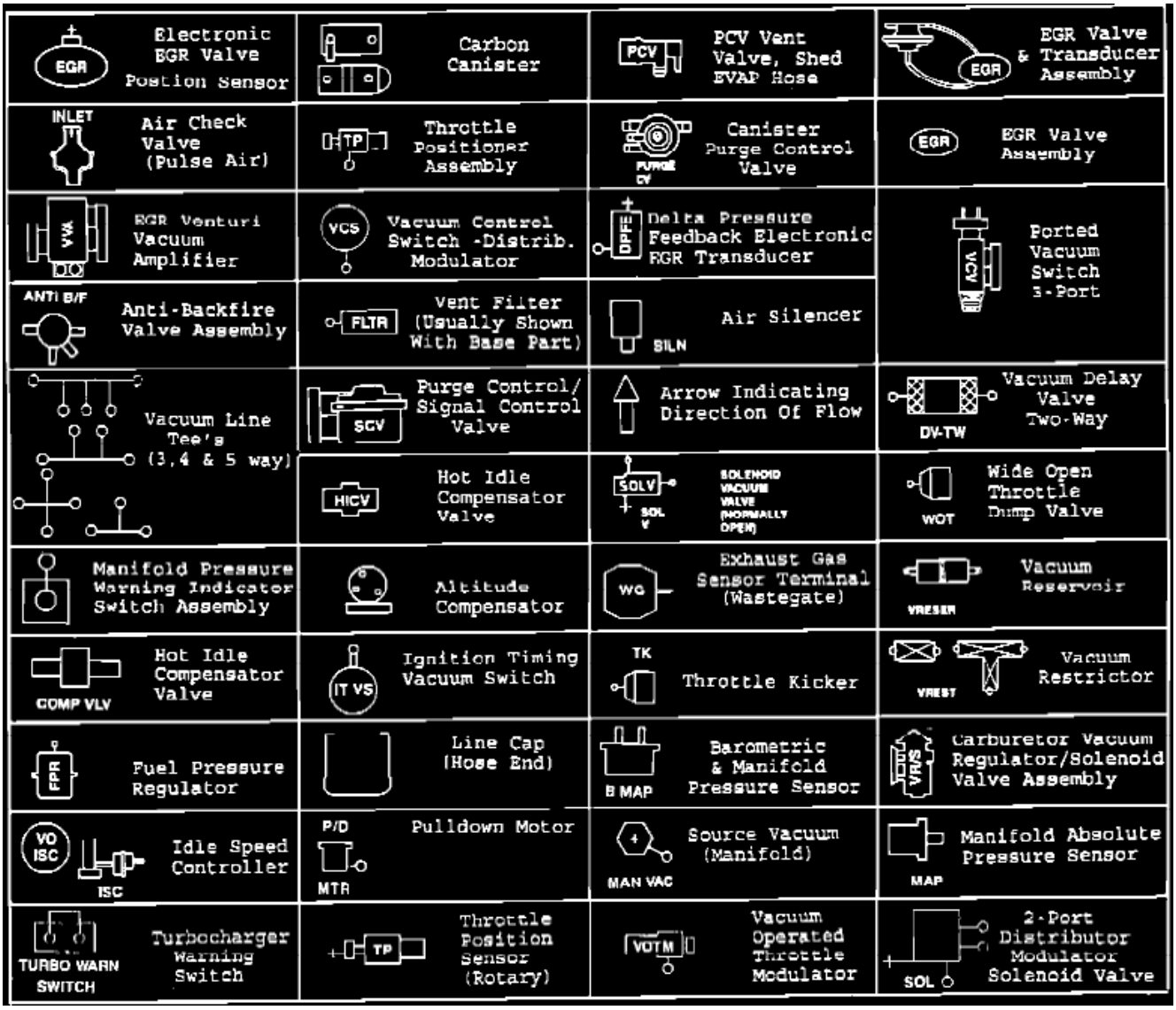


Cruise Control Switch: Diagram Information and Instructions

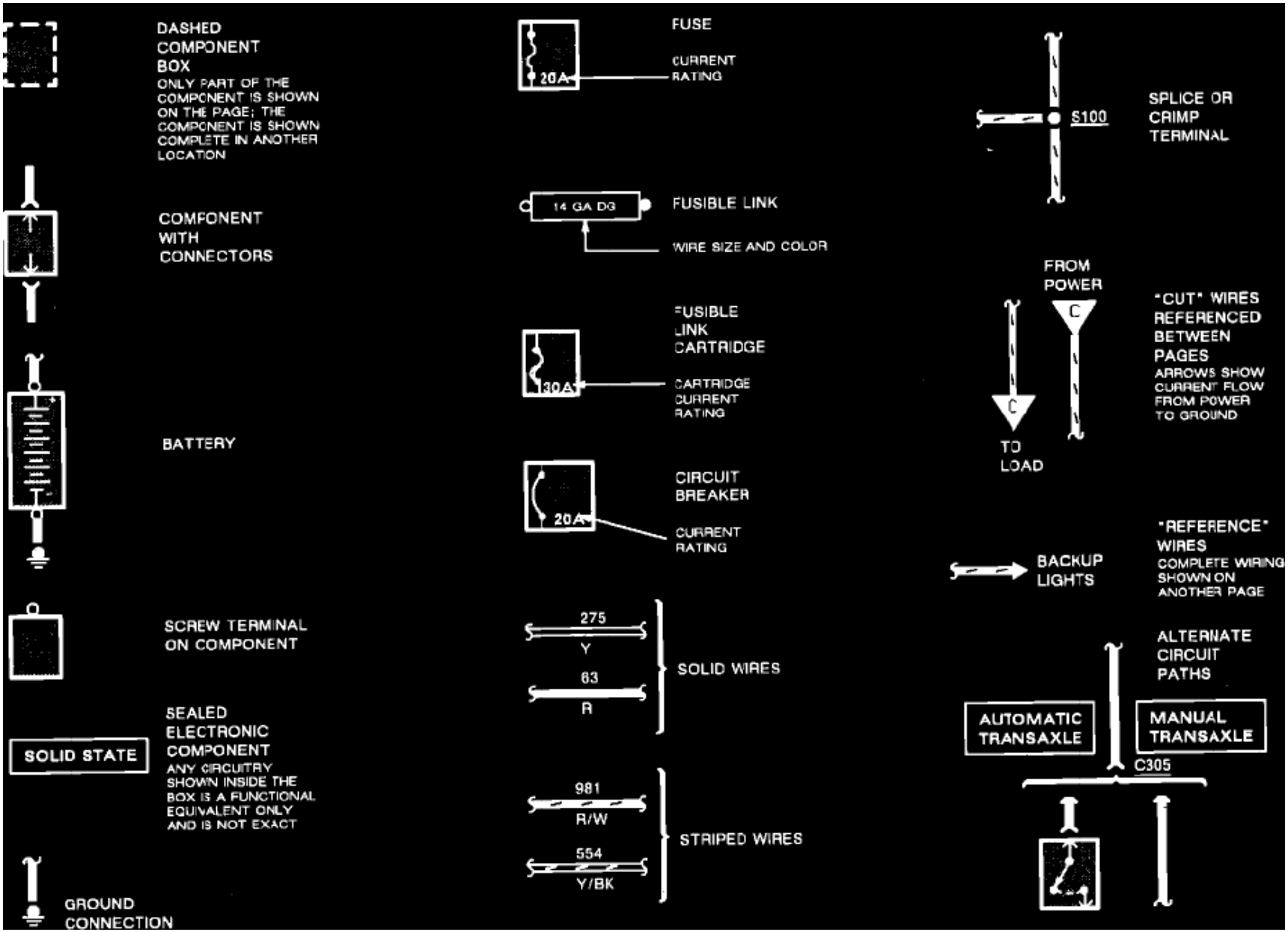
Symbol Identification



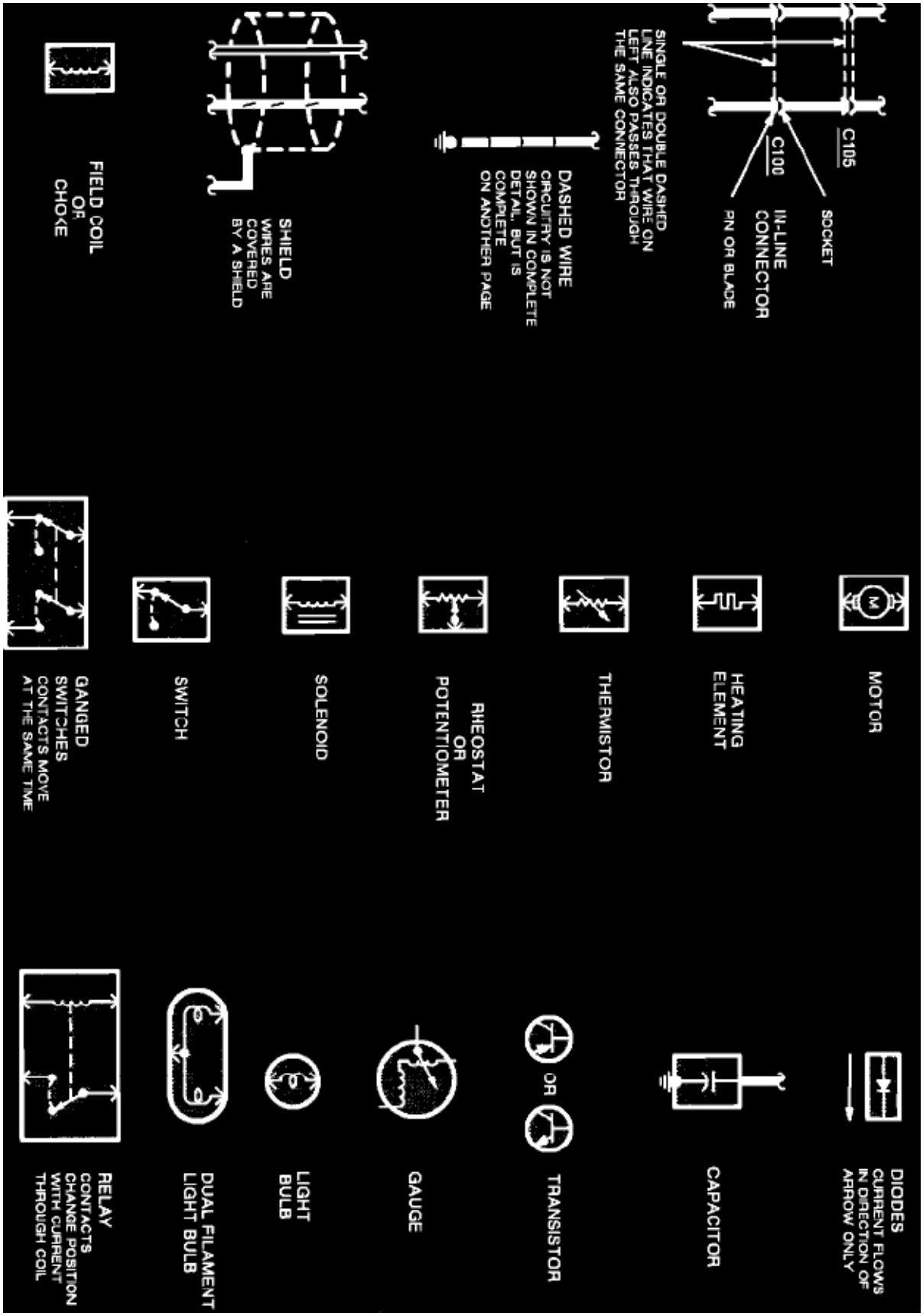
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

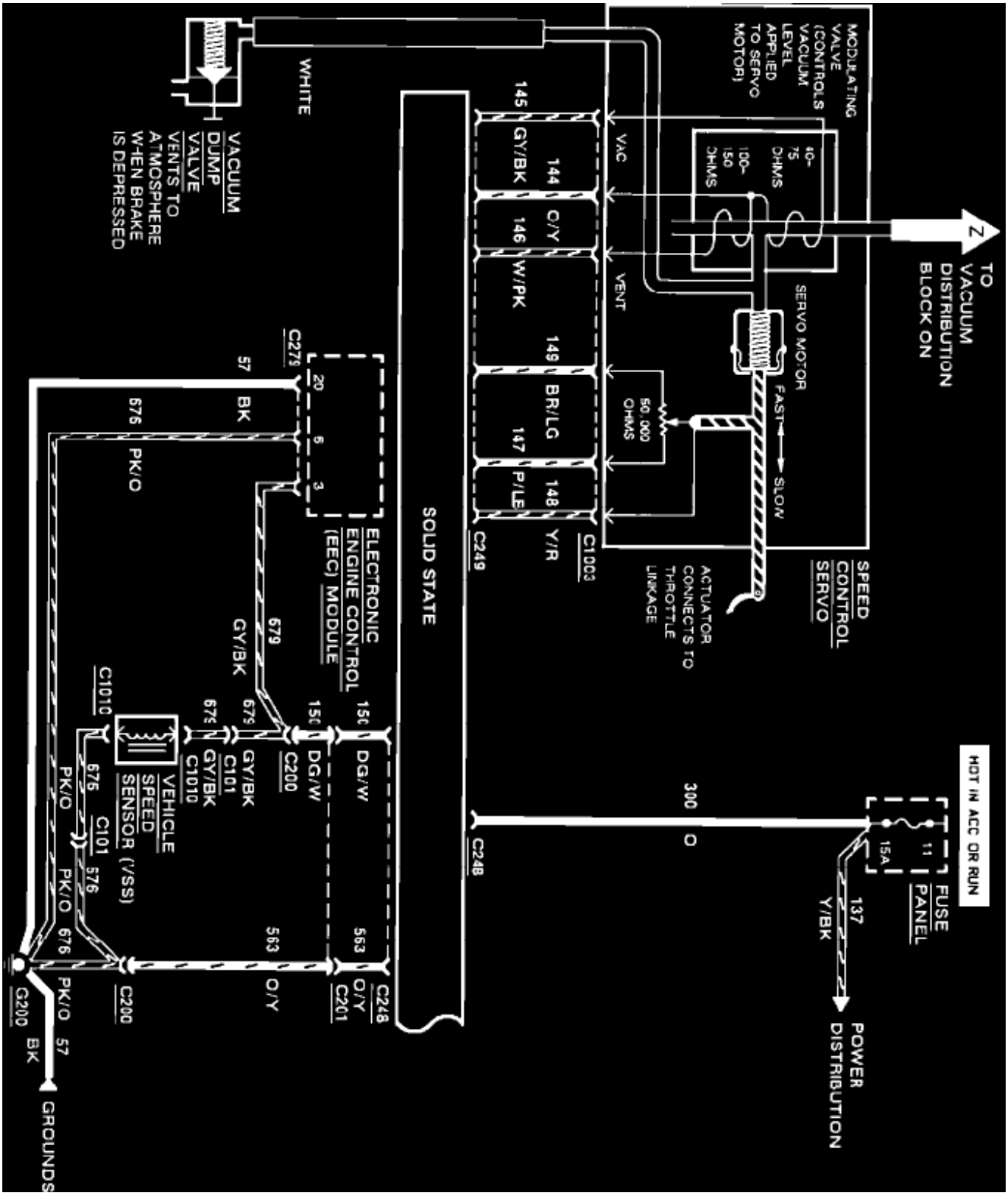
P: Purple

T: Tan

V: Violet

W: White

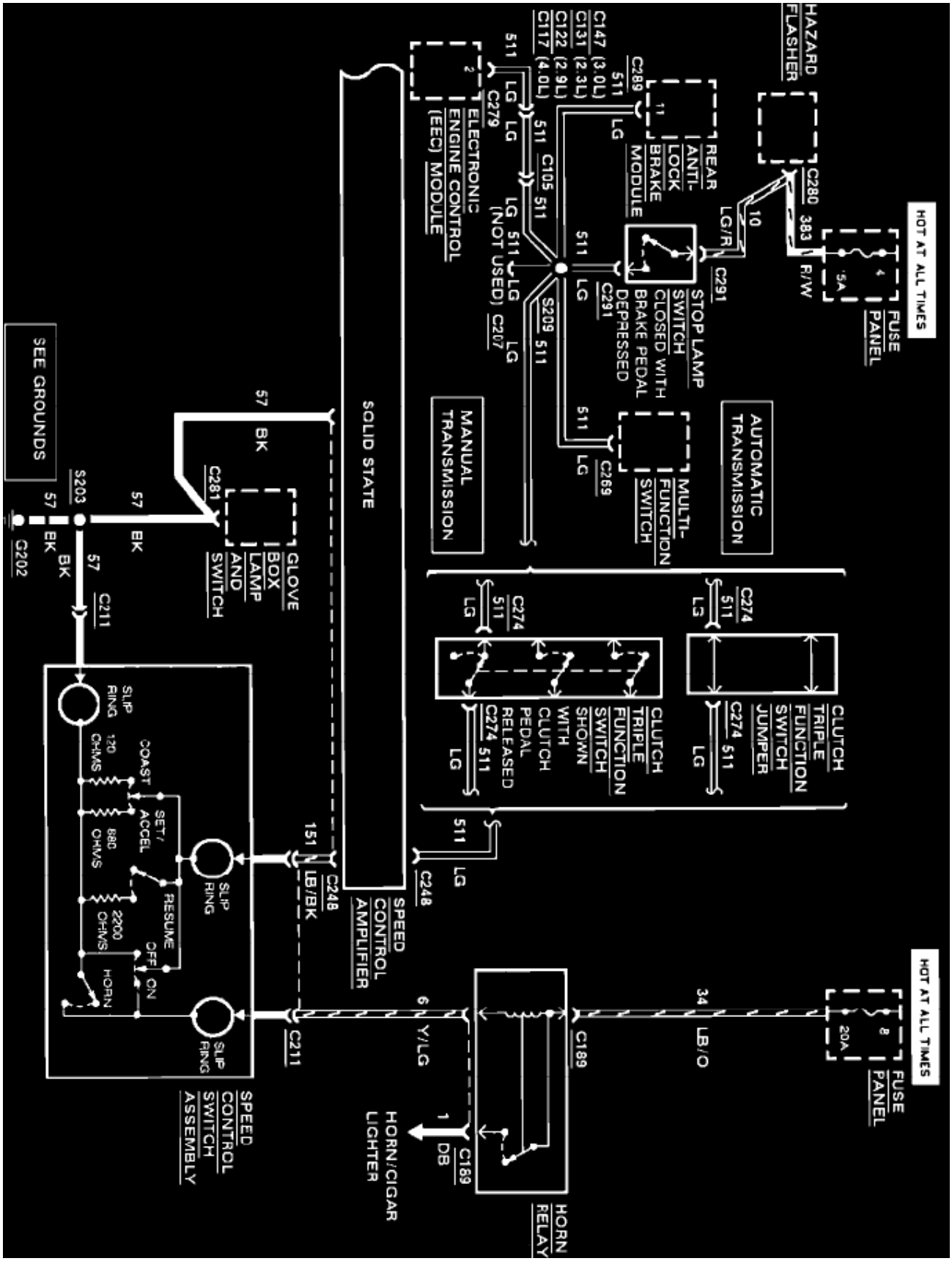
Y: Yellow



Cruise Control Switch: Electrical Diagrams

Cruise Control

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Cruise Control > Cruise Control Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 351



Cruise Control

Cruise Control Switch: Testing and Inspection

1. Apply brake pedal and ensure brake lights operate. If found satisfactory, proceed to step 2. If found unsatisfactory, check stop lamps circuit.

2. Press horn pad to sound horn. If found satisfactory, proceed to step 3. If found unsatisfactory, check horn circuit.

3. Locate 6-pin connector at speed control amplifier.

4. With ignition Off and 6-pin connector still connected to amplifier, connect an ohmmeter between black wire and ground on Ranger, Bronco II, Explorer and Aerostar with mechanical cluster or black-white wire on Aerostar with electronic cluster.

5. Check resistance to ground to ensure amplifier is grounded. If amplifier is not grounded, repair and retest. If amplifier is properly grounded, turn ignition to On position while making the following voltage checks: a.

Check circuit 296 (white/purple wire) on Aerostar models or circuit 302 (dark blue wire) on Bronco II, Explorer and Ranger models. If 12 volts are present, proceed to step b. If not present, check speed control fuse and 296 circuit wire continuity.

b. Apply brake pedal and check circuit 511 (light green wire) for 12 volts on Ranger, Bronco II and Explorer or circuit 810 (red/light green wire) on Aerostar. If 12 volts is not present, check continuity between stop lamp switch and amplifier and repair as necessary. If there is continuity, replace amplifier.

c. Check circuit 151 (light blue/black wire) for approximately 7.8 volts. If 7.8 volts is not present with amplifier properly grounded and 12 volts at circuit 296 white/purple wire on Aerostar models or 302 dark blue wire on Bronco II, Explorer and Ranger models, verified, check for On button sticking. If 12 volts is present or a short circuit to ground on circuit 151 (light blue/black wire) between amplifier and steering column brush assembly. If zero volts is present and both the On button and 151 wire are functioning properly, replace amplifier and repeat test. If 7.8 volts is present, proceed to step 6.

6. Check following voltages between circuit 151 (light blue/black wire) and amplifier ground while rotating the steering wheel with horn pad switch depressed making the following checks: a.

No button pressed, 7.8 volts.

b. On, 12.0 volts.

c. Off, 0.0 volts.

d. Resume, 6.5 volts.

e. Accel, 4.5 volts.

f. Coast, 1.5 volts.

7. If values are incorrect or fluctuate, proceed to Step 8. If values are correct, horn pad switches are operating properly. Proceed to step 17.

8. With ignition Off, disconnect the 6-pin connector from amplifier, then check following resistances between circuit 151 (light blue/black wire) and amplifier ground with horn pad switch depressed while rotating steering wheel. Ohmmeter readings should as follows with switch positions as indicated: a.

Off, 0--1 ohm.

b. Accel, 646-714 ohms,

c. Coast, 114-126 ohms.

d. Resume, 2090-2310 ohms.

9. If values are incorrect or fluctuate, proceed to step 10. If values are correct, replace amplifier and repeat step 4.

10. On models except 1992 Aerostar, remove steering wheel horn pad attaching screws in back cover, then disconnect electrical connectors from wheel.

11. On 1992 Aerostar, disable airbag system as outlined in MAINTENANCE PROCEDURES Remove airbag module, then disconnect clockspring contact electrical connector at upper center area of steering wheel.

12. On all models, connect suitable ohmmeter between circuit 151 (yellow/light blue wire) and circuit 6 (dark/blue wire) on horn pad on all models, except 1992 Aerostar or black wire connector on 1992 Aerostar models. Depress On switch and check for a reading of 0-1 ohms.

12. If reading is not correct, replace switch assembly.

13. Pull steering wheel, then check for continuity of circuit 151 (light blue/black wire) and circuit 57 (black wire) between amplifier 6-pin connector and brush assembly on models except 1992 Aerostar or clockspring on 1992 Aerostar models.

14. If there is no continuity, check for continuity between 3-pin brush assembly wiring connector and brushes or clockspring at steering wheel, then between mating 3-pin connector and amplifier 6-pin connector. Repair or replace brush or clockspring assembly as necessary.

15. If there is continuity for both circuits, clean brush assembly and slip rings in a suitable solvent and lubricate with suitable lubricant.

16. Install wheel and horn pad and repeat step 4.

17. Connect a suitable ohmmeter between circuit 150 (green/white wire) and speed sensor ground circuit 563 (orange/yellow wire) on Ranger, Bronco II and Explorer or 397 (black/white wire) on Aerostar.

18. If resistance is not between 180-250 ohms, check continuity between 6-pin connector at amplifier and 2-pin speed sensor connector at transmission and repair as necessary.

19. If resistance is correct, the speed sensor wiring is functioning properly. Not all speed sensor problems can be identified by a resistance check. Replacement with a known good sensor may be required.

Cruise Control Switch: Service and Repair

1. Remove steering wheel pad attaching screws from behind steering wheel.

2. While pulling pad away from steering wheel, disconnect horn and speed control wire connectors and remove pad.

3. Remove retaining nuts securing the speed control switches and trim plate retainer to the steering wheel pad.

4. Disconnect wiring connector on rear of steering wheel pad assembly, then remove switch and trim retainer assembly.

5. Remove speed control switches by snapping out of plastic retainer.

6. To remove the ground brush, remove steering wheel for access.

7. Snap the ground brush assembly out of the turn signal switch.

8. Reverse procedure to install.

Vehicle Speed Sensor/Transducer - Cruise Control: Testing and Inspection

1. Disconnect speed sensor connector, then connect an ohmmeter between dark green/white and black wires.

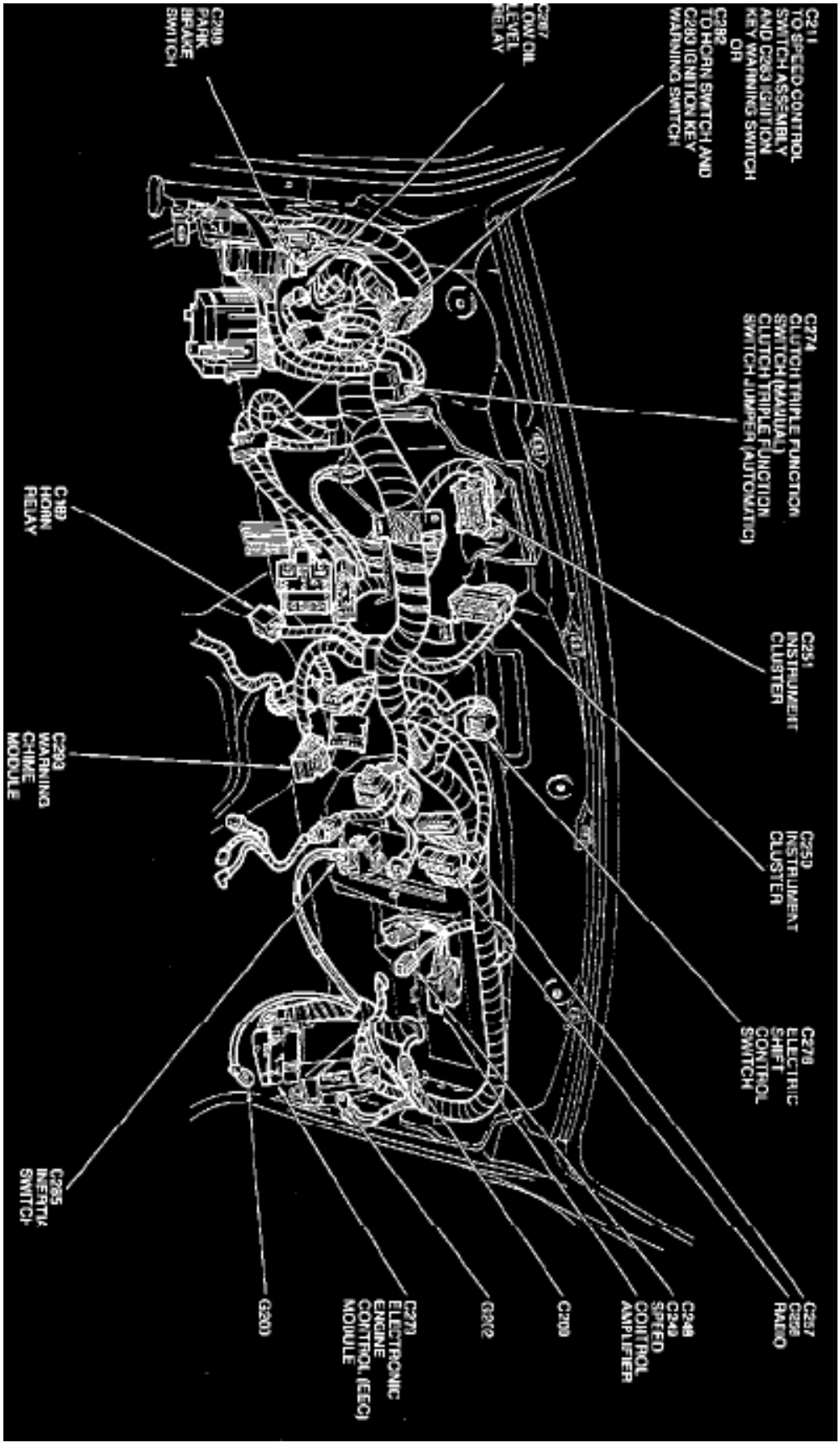
2. A reading of 180-250 ohms should be obtained. A reading of 0 ohms indicates a shorted coil and an infinity reading indicates an open coil.

3. Replace sensor if a proper reading has not been obtained.

Oil Level Sensor: Specifications

Low Oil Level Sensor ..... 17-21 Nm (13-20 ft lb)

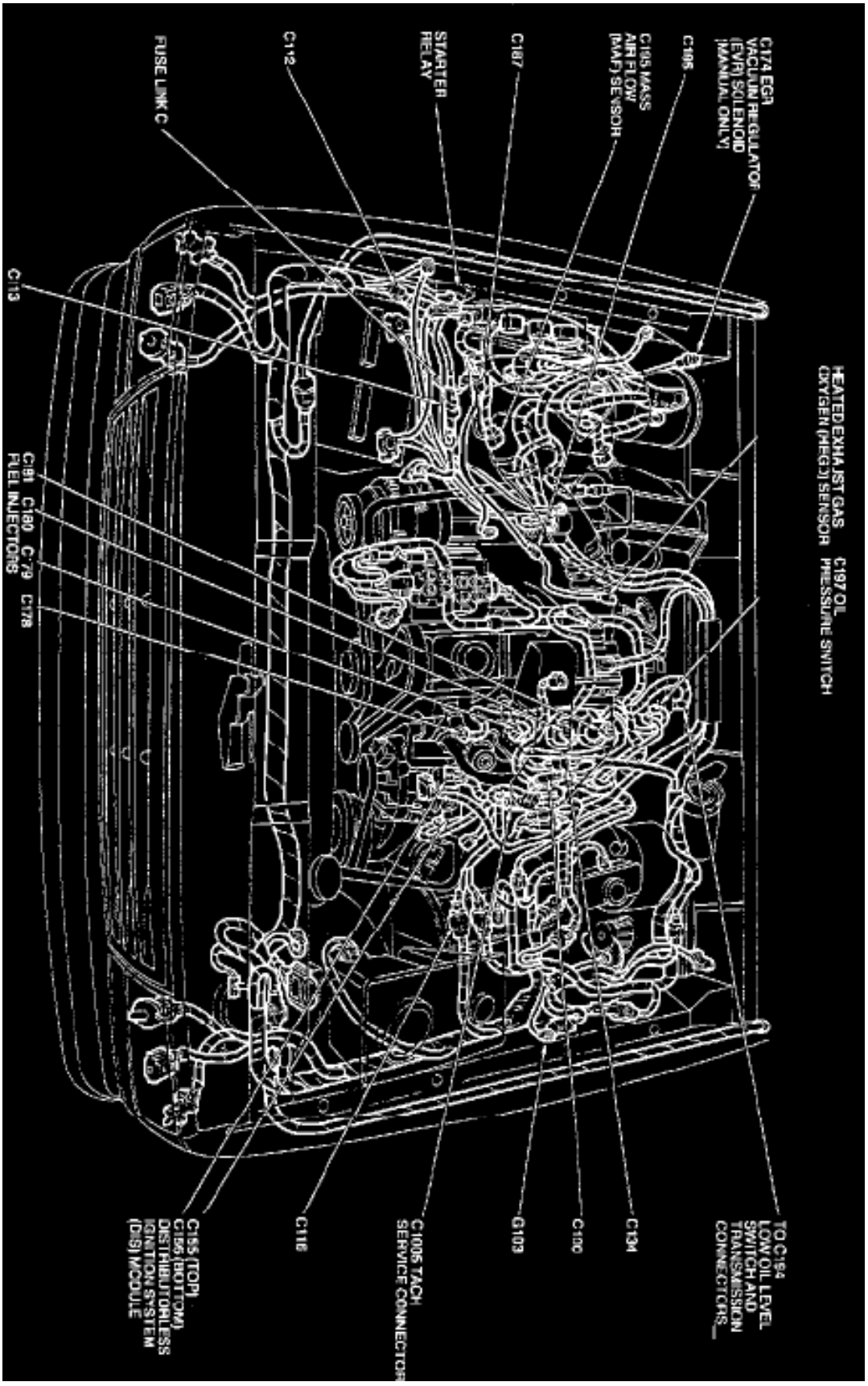
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Engine > Oil Level Sensor > Component Information > Locations > Low Oil Level Relay



Oil Level Sensor: Locations Low Oil Level Relay

I/P Components

Behind Lower RH Side Of I/P, On Bracket

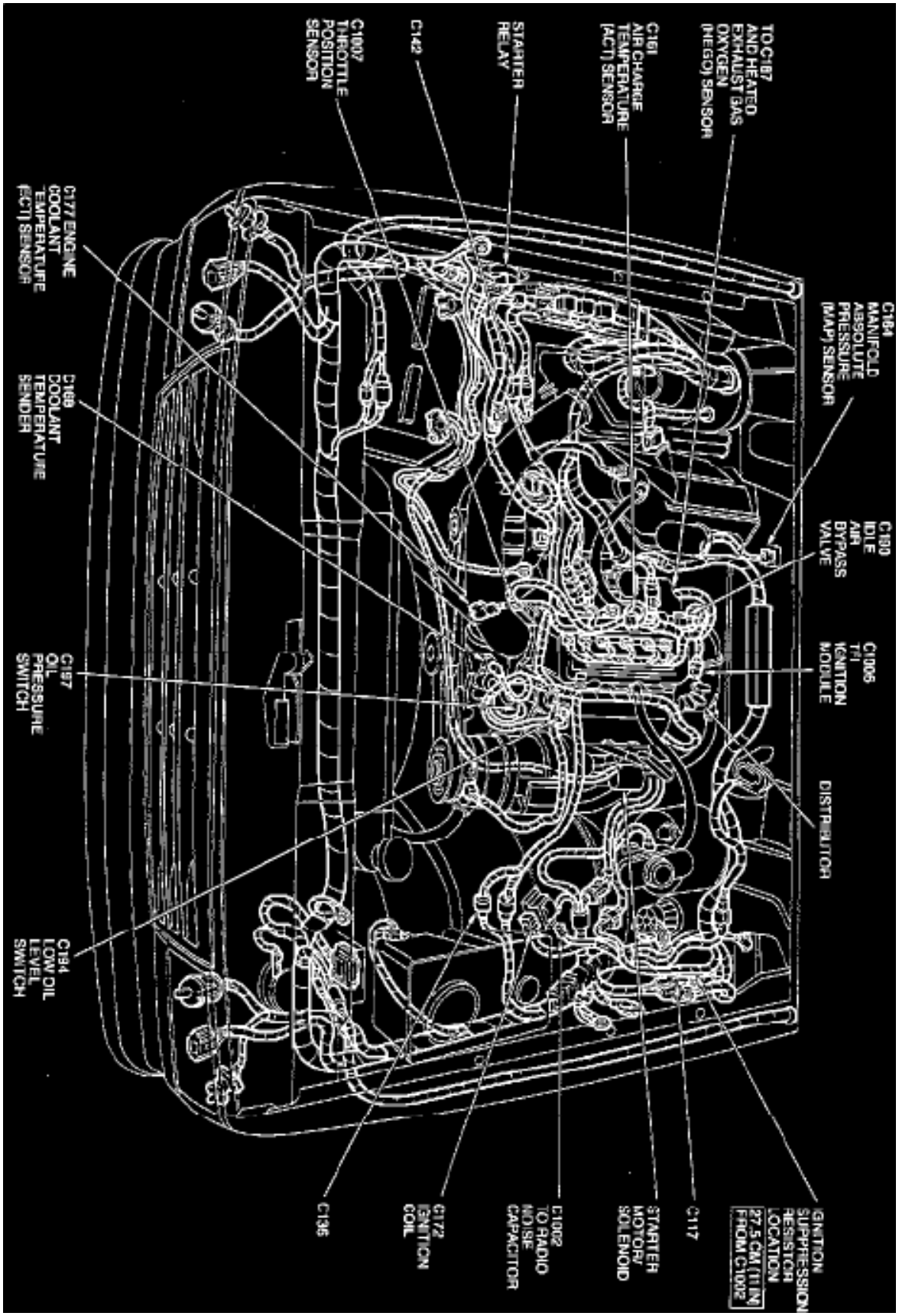

C174 EGR VACUUM REGULATOR (EVR) SOLENOID (MANUAL ONLY)
C105
C195 MASS AIR FLOW (MAF) SENSOR
C187
STARTER RELAY
C112
FUSE LINK C
C13
C181 C180 C179 C178 FUEL INJECTORS
HEATED EXHAUST GAS OXYGEN (HEGO) SENSOR
C197 OIL PRESSURE SWITCH
TO C194 LOW OIL LEVEL SWITCH AND TRANSMISSION CONNECTORS
C134
C100
G103
C1005 TACH SERVICE CONNECTOR
C116
C155 (TOP) C156 (BOTTOM) DISTRIBUTORLESS IGNITION SYSTEM (DIS) MODULE

Oil Level Sensor: Locations Low Oil Level Switch (2.3L/4-140)

Engine Compartment Components.

Lower LH Rear Of Engine, Below Oil Filter

Applicable to: 2.3L/4-140

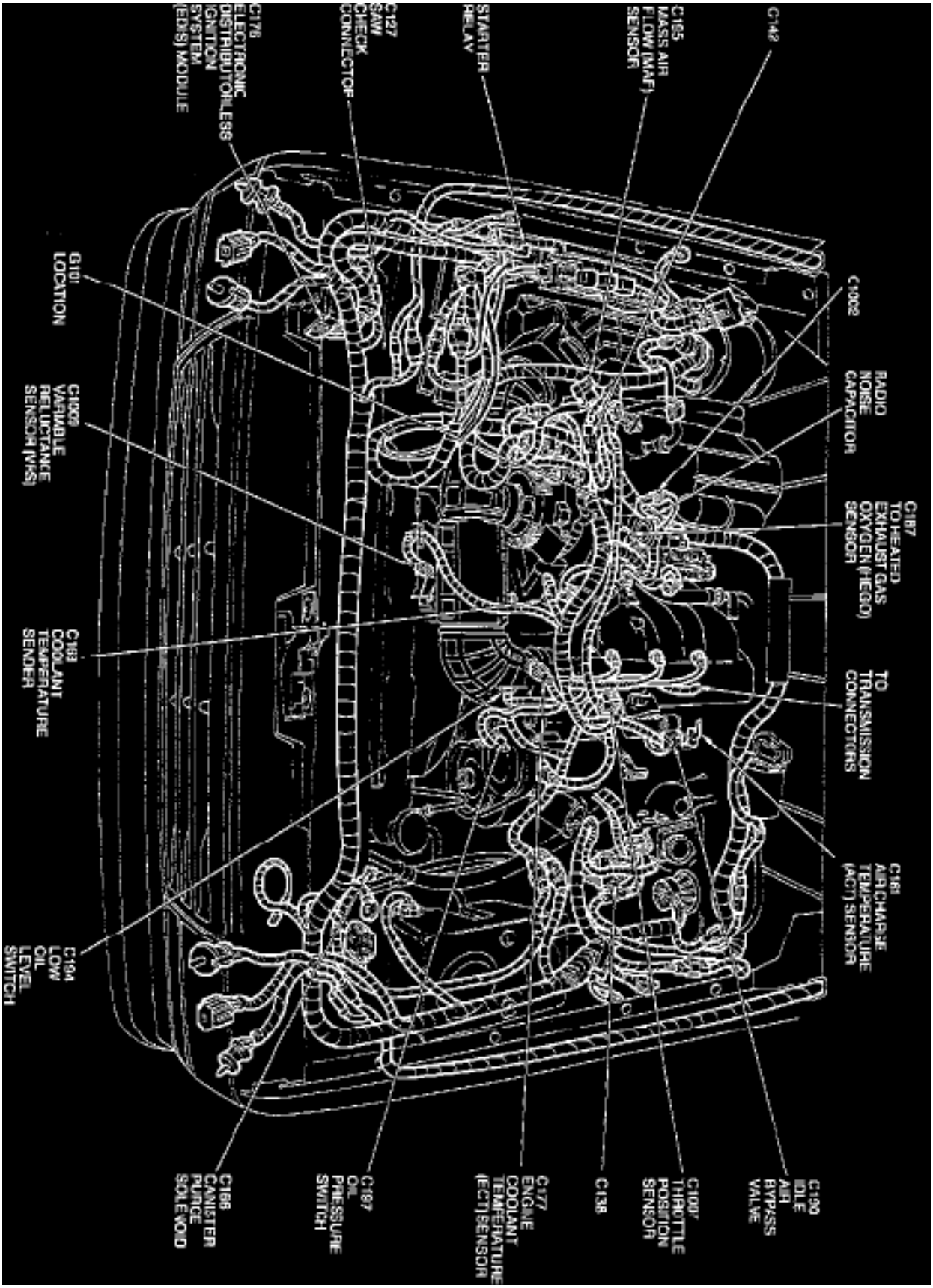

C184 MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
C100 IDLE AIR BYPASS VALVE
C1006 TFI IGNITION MODULE
DISTRIBUTOR
TO C187 AND HEATED EXHAUST GAS OXYGEN (HEGO) SENSOR
C161 AIR CHARGE TEMPERATURE (ACT) SENSOR
STARTER RELAY
C142
C1007 THROTTLE POSITION SENSOR
C177 ENGINE COOLANT TEMPERATURE (ECT) SENSOR
C189 COOLANT TEMPERATURE SENDER
C197 OIL PRESSURE SWITCH
C194 LOW OIL LEVEL SWITCH
C136
C172 IGNITION COIL
C1002 TO RADIO NOISE CAPACITOR
STARTER MOTOR SOLENOID
C117
IGNITION SUPPRESSION RESISTOR LOCATION
27.5 CM (11 IN) FROM C1002

Oil Level Sensor: Locations Low Oil Level Switch (2.9L/V6-179 & 4.0L/V6-244)

Engine Compartment Components.

Lower LH Rear Of Engine

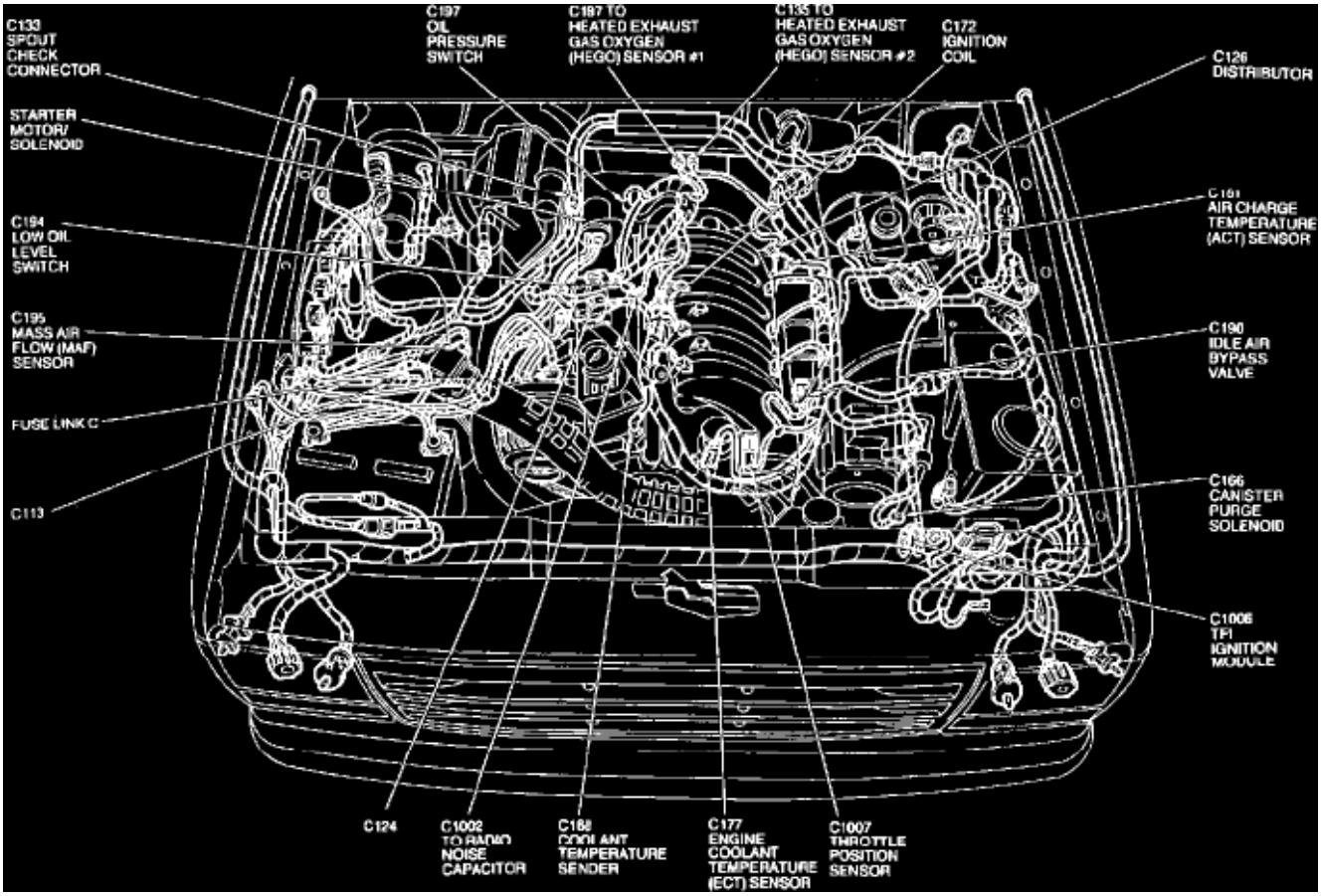
Applicable to: 2.9L/V6-179


C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C163
COOLANT
TEMPERATURE
SENDER
C190A
LOW
OIL
LEVEL
SWITCH
C166
CANISTER
PURGE
SOLENOID
C187
OIL
PRESSURE
SWITCH
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C138
C1007
THROTTLE
POSITION
SENSOR
C190
IDLE
AIR
BYPASS
VALVE

Engine Compartment Components.

Lower LH Rear Of Engine

Applicable to: 4.0L/V6-244



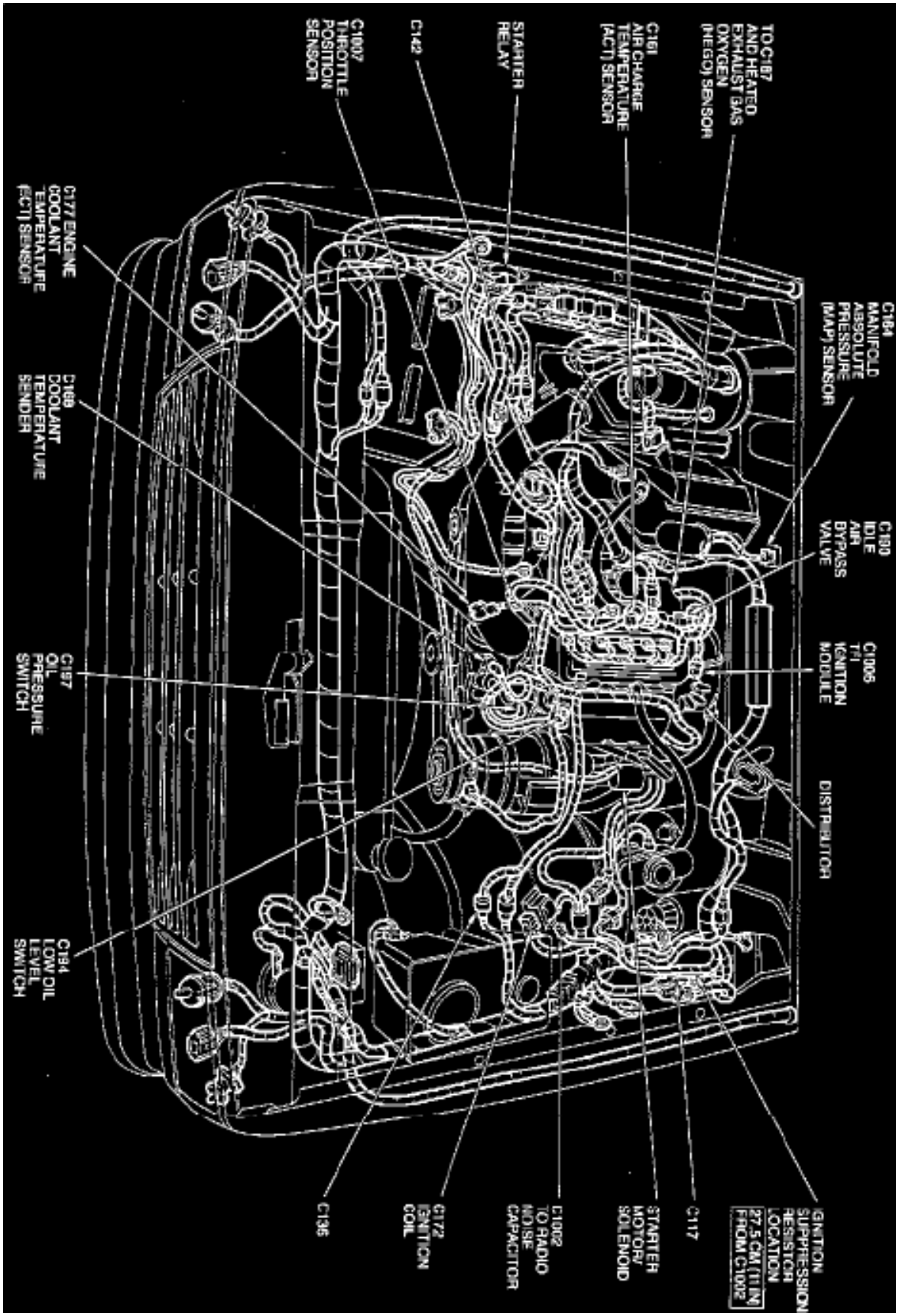
Oil Level Sensor: Locations Low Oil Level Switch (3.0L/V6-181)

Engine Compartment Components.

Lower RH Side Of Engine

Applicable to: 3.0L/V6-181

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Engine > Oil Pressure Switch <--> [Oil Pressure Sender] > Component Information > Locations



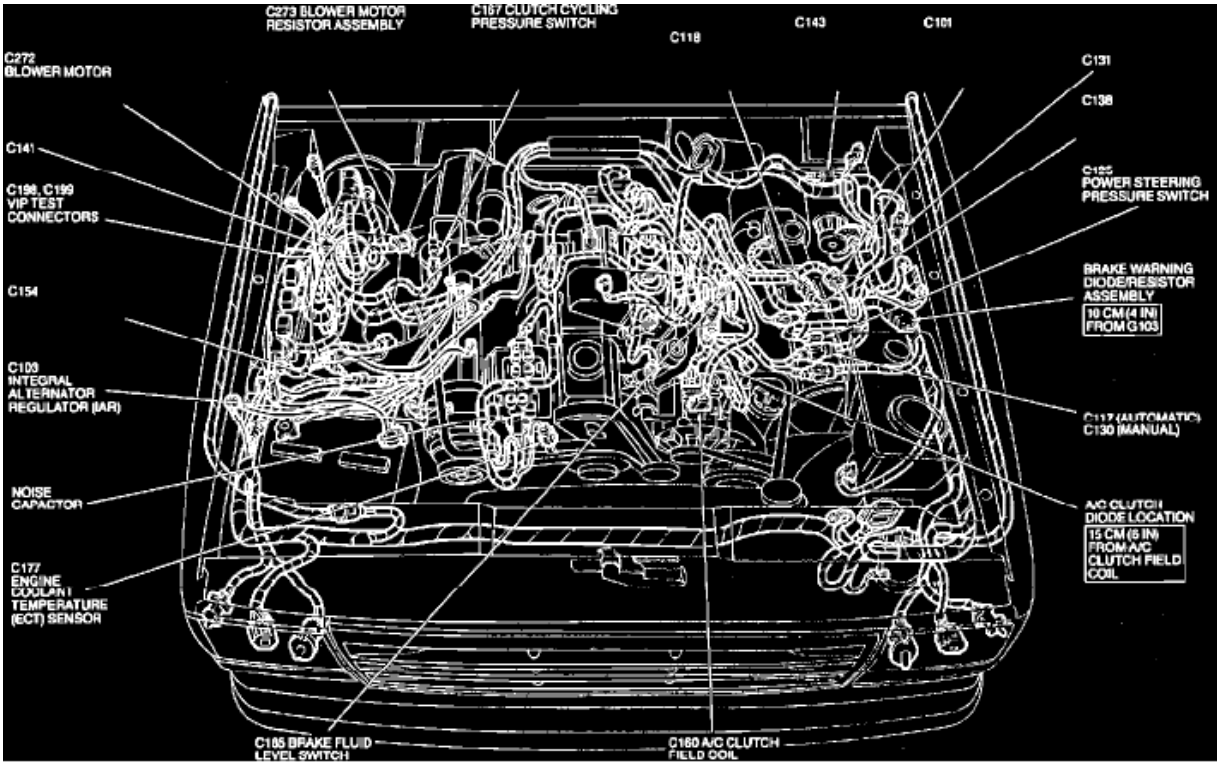
Oil Pressure Switch: Locations

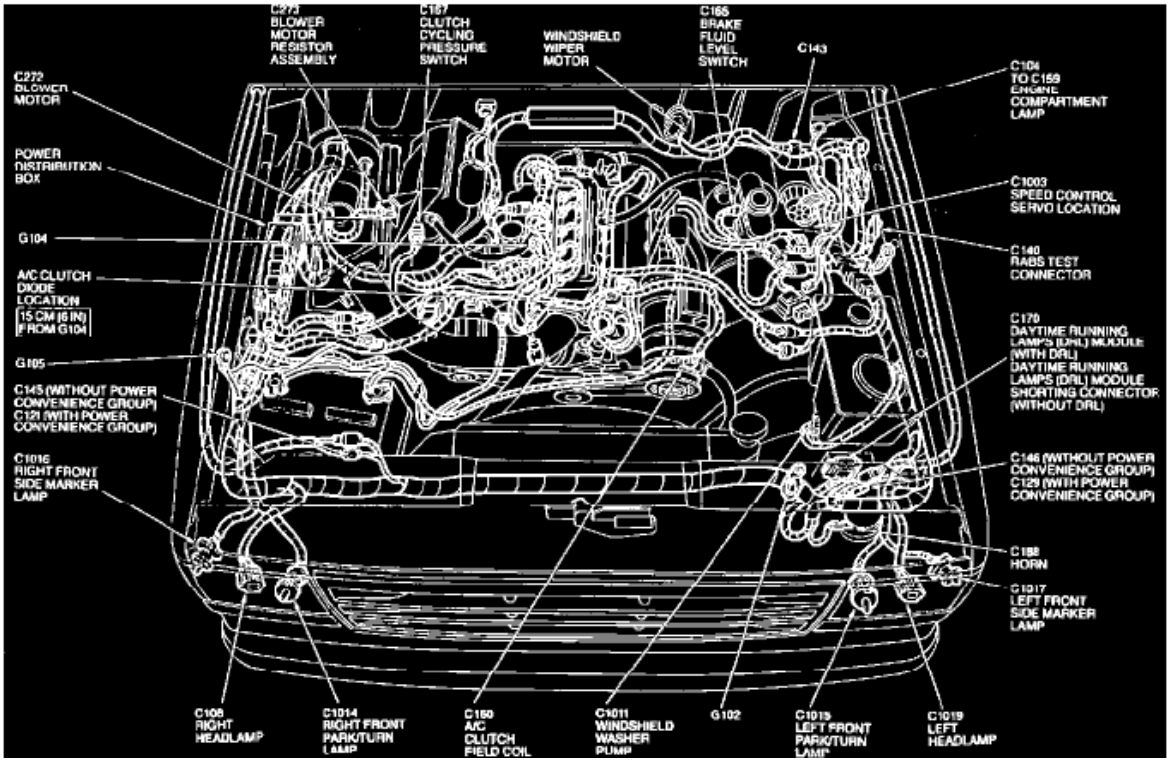
Engine Compartment Components.

Lower LH Rear Of Engine

Applicable to: 2.9L/V6-179

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - HVAC > Refrigerant Pressure Sensor / Switch, HVAC > Component Information > Locations





Refrigerant Pressure Sensor / Switch: Locations

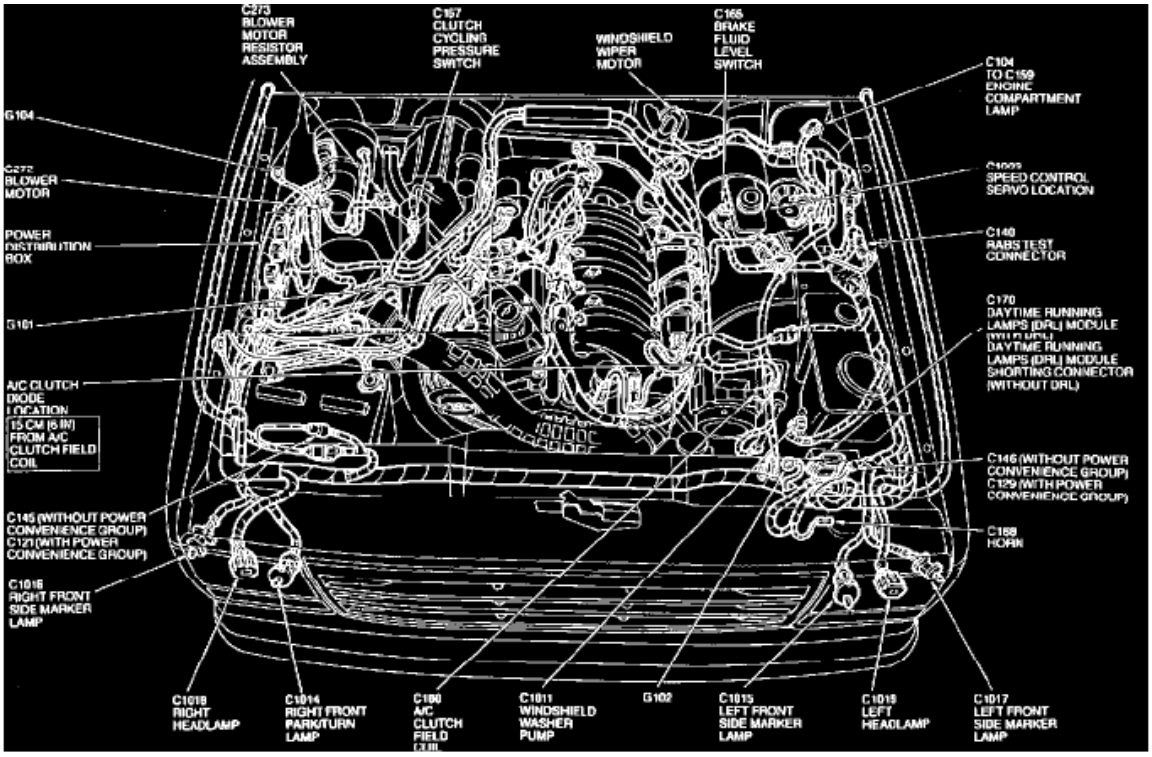
Engine Compartment Components.

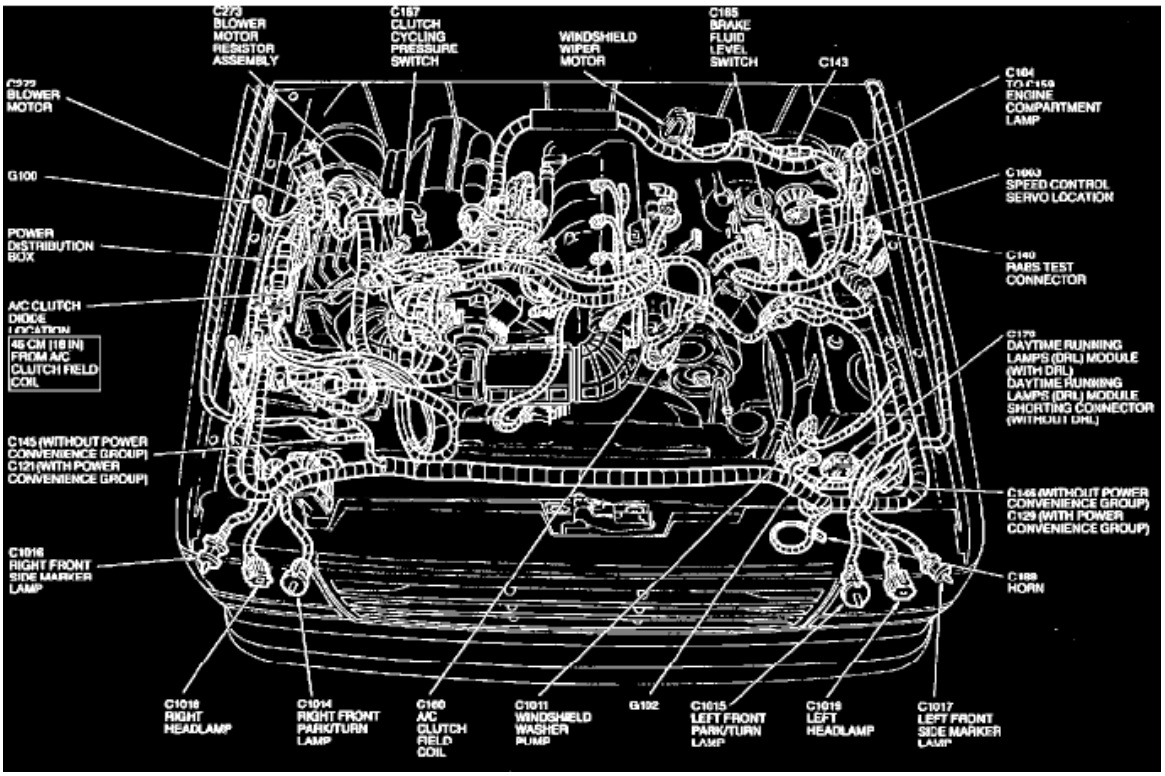
RH Side Of Engine Compartment, On A/C Accumulator

Applicable to: 2.3L/4-140

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
POWER DISTRIBUTION BOX
G101
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C1003
SPEED CONTROL SERVO LOCATION
C140
RABS TEST CONNECTOR
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C104
TO C159
ENGINE COMPARTMENT LAMP
G100
POWER DISTRIBUTION BOX
A/C CLUTCH DIODE LOCATION
46 CM (18 IN) FROM A/C CLUTCH FIELD COIL
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C1003
SPEED CONTROL SERVO LOCATION
C140
RABS TEST CONNECTOR
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator

Applicable to: 3.0L/V6-181

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator

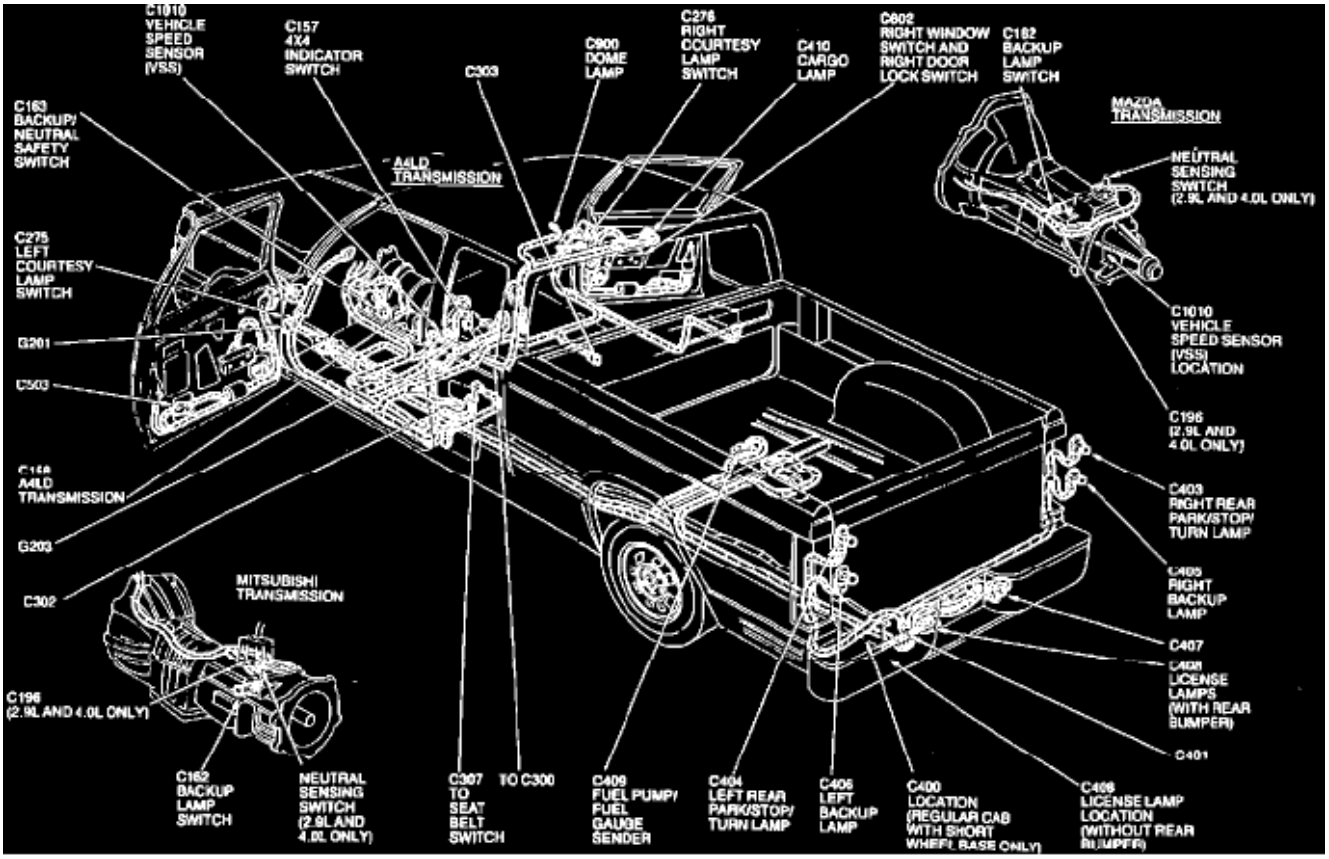
Applicable to: 4.0L/V6-244

• Compressor Clutch doesn't operate.	• No voltage at Clutch Cycling Pressure Switch. • Inoperative Clutch Cycling Pressure Switch. • No voltage at A/C Clutch Field Coil. • Inoperative A/C Clutch Field Coil.	• Fuse 7 blown. • Remove Connector from Cluich Cycling Pressure Switch. With the A/C-Heater Control Assembly Switch in the ON position, check for battery voltage at the 348 (P) wire. • Check the Clutch Cycling Pressure Switch for continuity. No continuity indicates low refrigerant, or an inoperative Clutch Cycling Pressure Switch. Check refrigerant system. • Remove connector from the A/C Clutch Field Coil. Check the wire connector for battery voltage. Check the EEC Module (including Throttle Position Sensor and Coolant Temperature Sensor) and the WOT Cutout Relay for correct operation. • Repair A/C Clutch Field Coil or terminals as required.
• Compressor Clutch won't shut off. • No cooling or not enough cooling (compressor operates).	• A/C Switch or Defrost Switch in A/C-Heater Control Assembly is stuck closed. • Clutch plates have no air gap. • Loose A/C Compressor drive belt. • Temperature Blend door out of adjustment. • Too much or too little Refrigerant in system.	• Remove connector from the A/C Clutch Field Coil. Ensure correct voltage for each switch position. • If compressor continues to run with connector disconnected, repair clutch air gap • Check drive belt tension. • Check operation of temperature control cable • Perform refrigerant system diagnosis and problem evaluation

Troubleshooting Hints - Compressor

Refrigerant Pressure Sensor / Switch: Service and Repair

The clutch cycling pressure switch is mounted on a schrader type fitting on the accumulator. Replacement of switch does not require discharge of refrigerant from system.



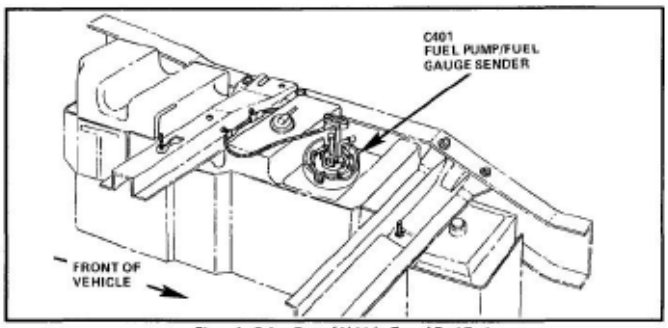


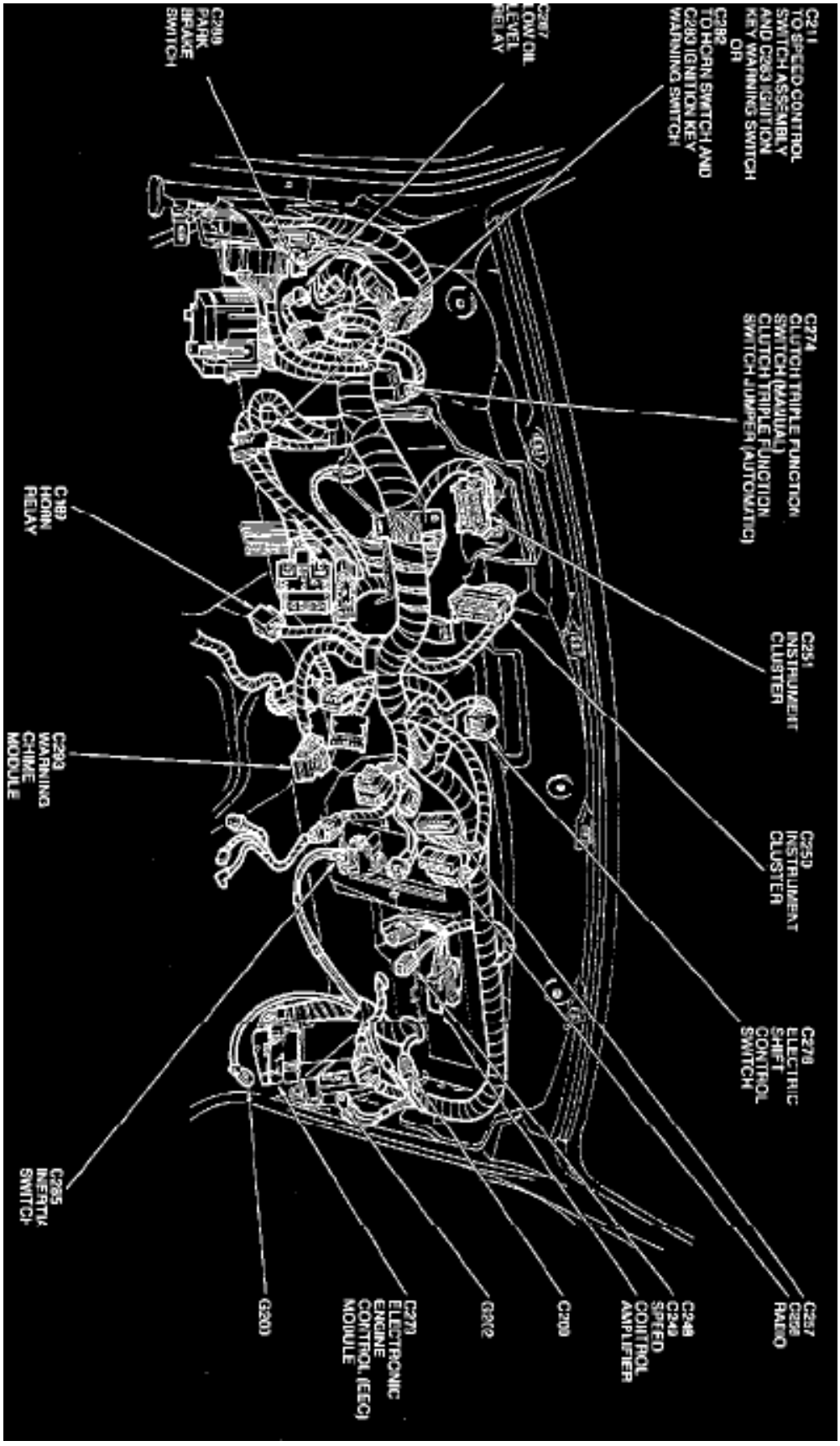
Figure 1 - Below Rear of Vehicle, Top of Fuel Tank

Fuel Gauge Sender: Locations

Body Components

Below Rear Of Vehicle, Top Center Of Fuel Tank

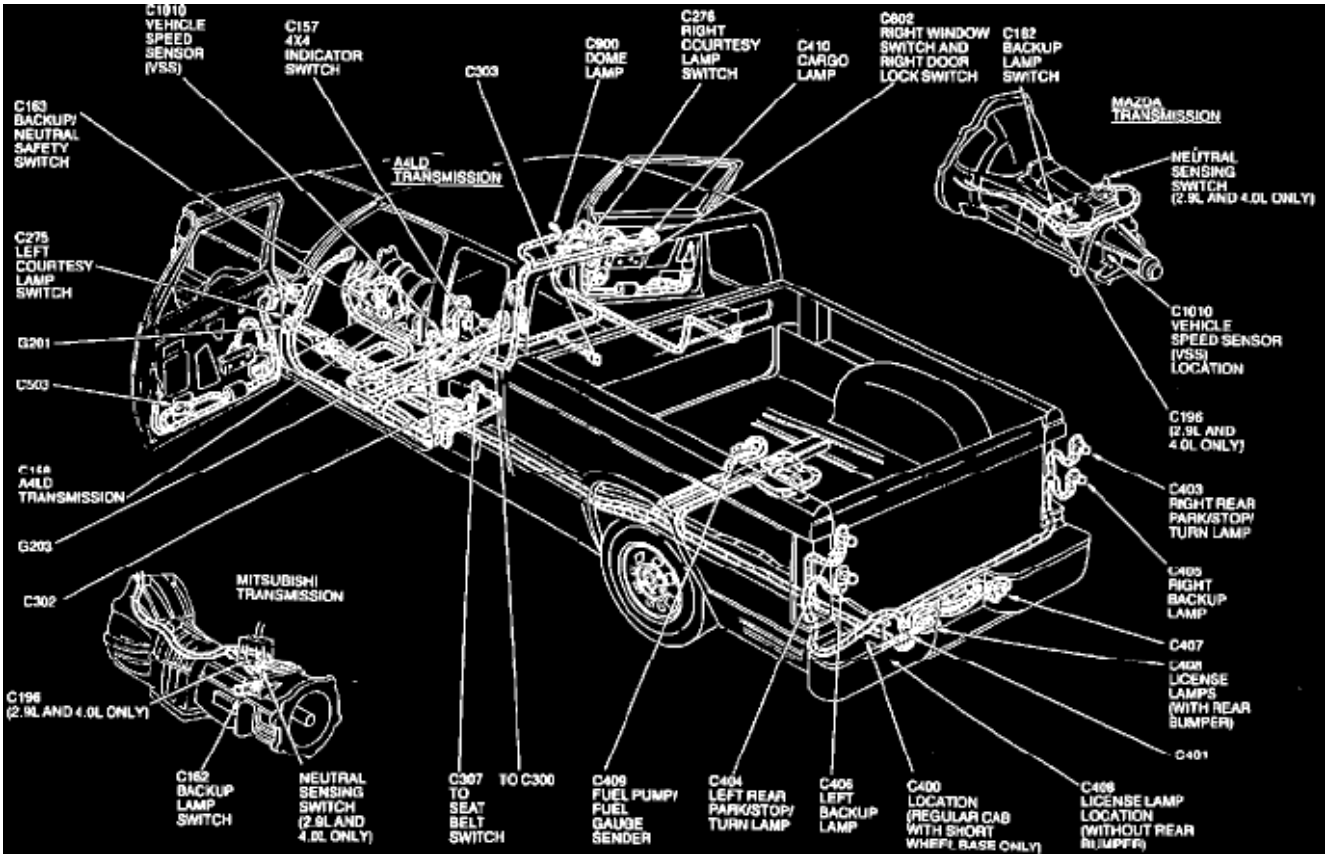
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Instrument Panel > Parking Brake Warning Switch > Component Information > Locations



Parking Brake Warning Switch: Locations

I/P Components

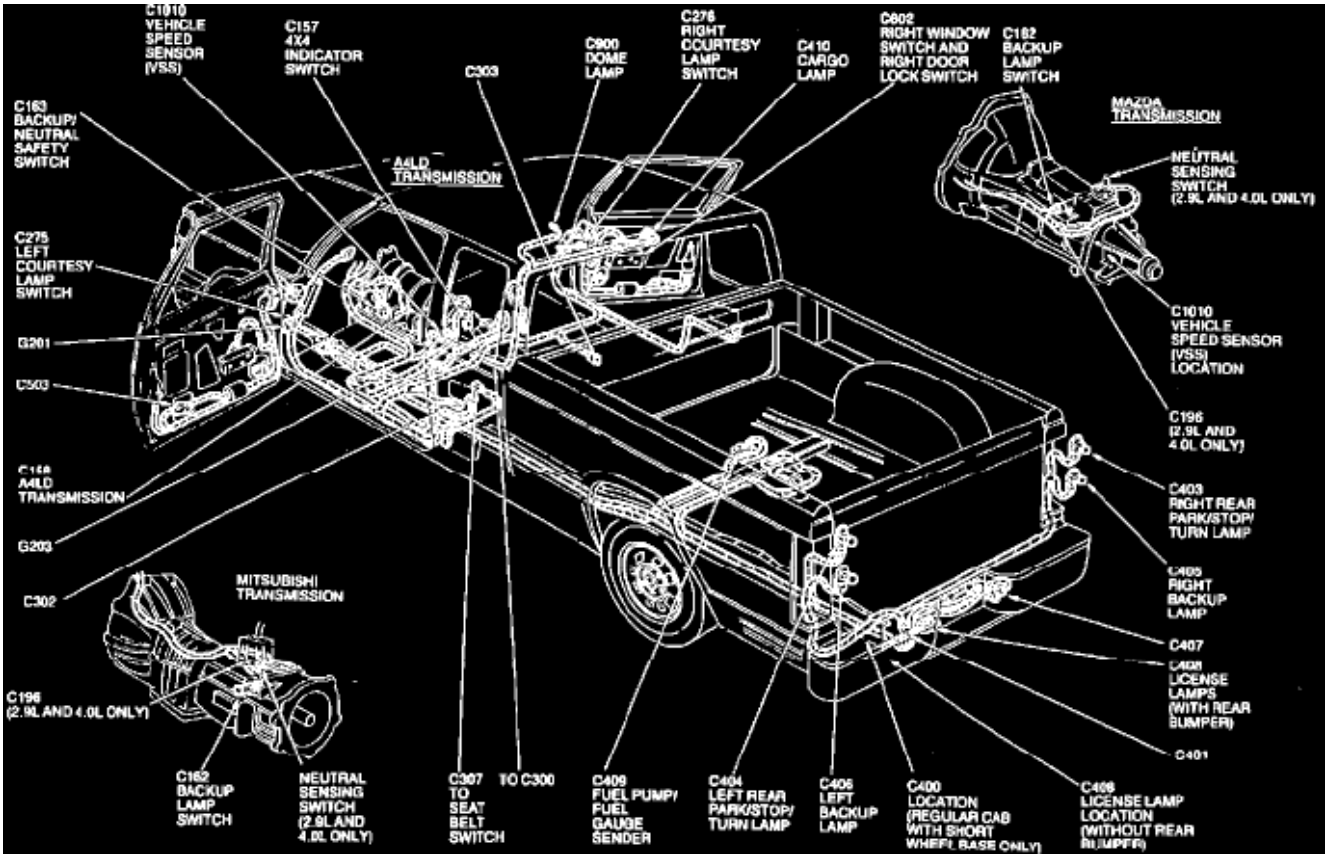
Below LH Side Of I/P, On Park Brake Assembly



Backup Lamp Switch: Locations Back-Up Lamp/Neutral Safety Switch

Body Components

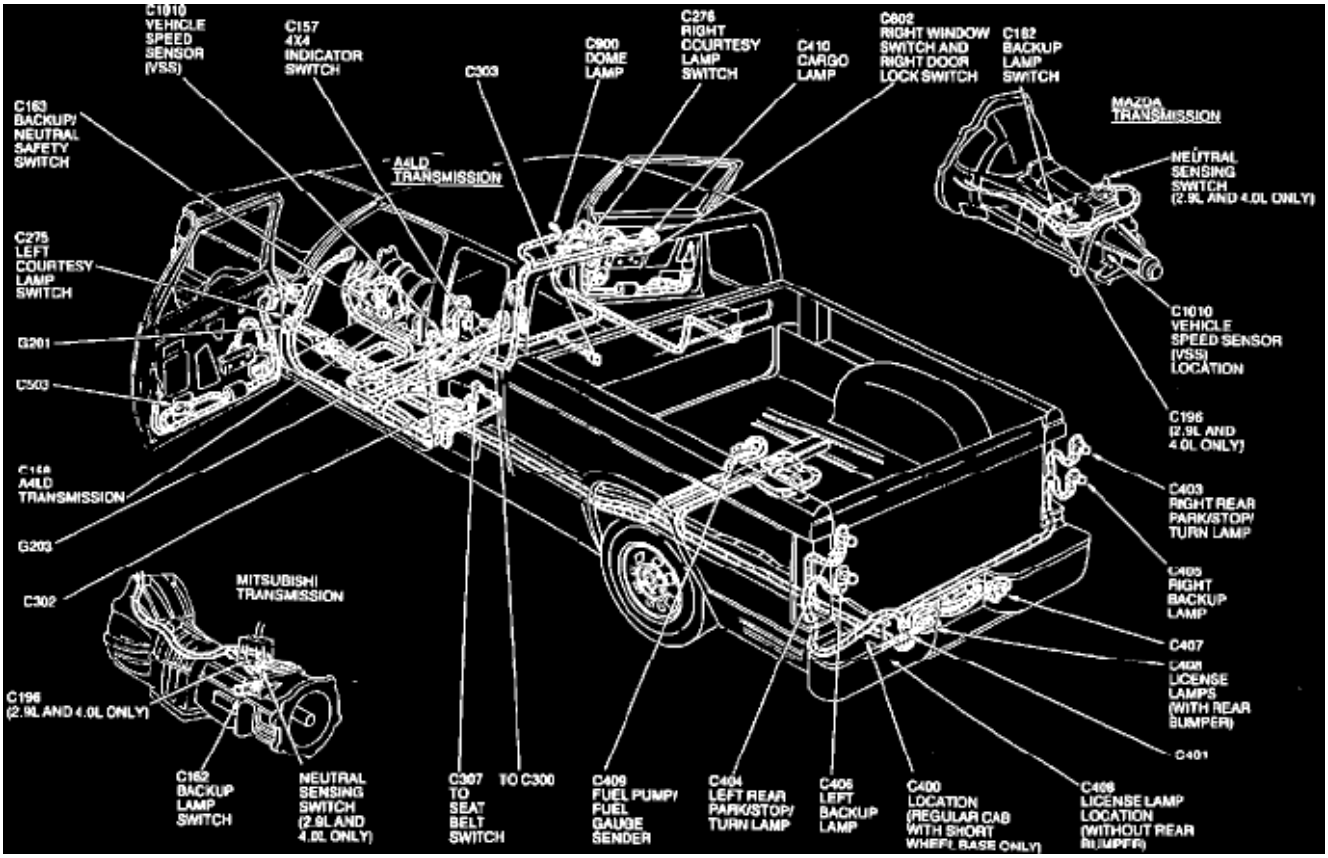
LH Side Of Transmission



Backup Lamp Switch: Locations Backup Lamp Switch (Mazda Transmission)

Body Components

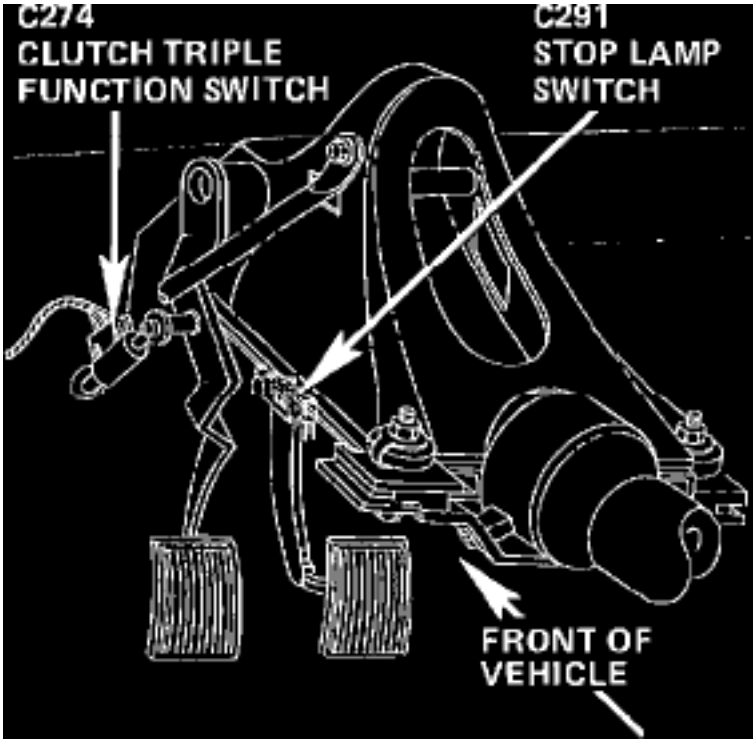
Top LH Side Of Transmission



Backup Lamp Switch: Locations Backup Lamp Switch (Mitsubishi Transmission)

Body Components

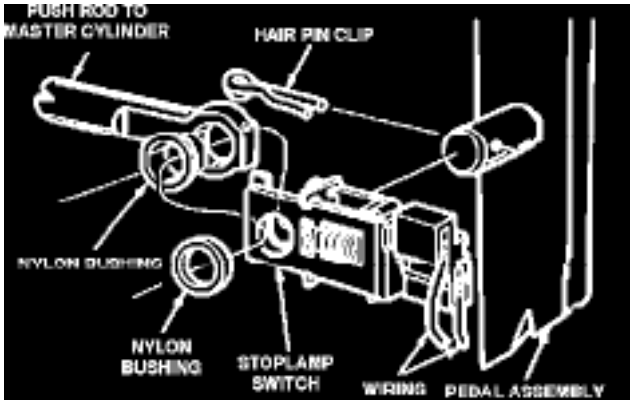
RH Side Of Transmission



Brake And Clutch Switches

Brake Light Switch: Description and Operation

The Brake On Off (BOO) signal is sent by the brake switch when the brakes are APPLIED. The Engine Control Assembly (ECA) uses this signal to modify the operation of the torque converter clutch (if equipped), A/C compressor (if equipped), and idle speed during periods of decel and idle with the brakes APPLIED.



Brake Light Switch: Service and Repair

Fig. 12 Stop Light Switch Replacement

REMOVAL

1. Disconnect electrical connector from switch, Fig. 12.

2. Remove hairpin clip, then slide switch, pushrod, nylon washer and bushings away from pedal.

3. Remove washer, then the switch by sliding switch up or down.

INSTALLATION

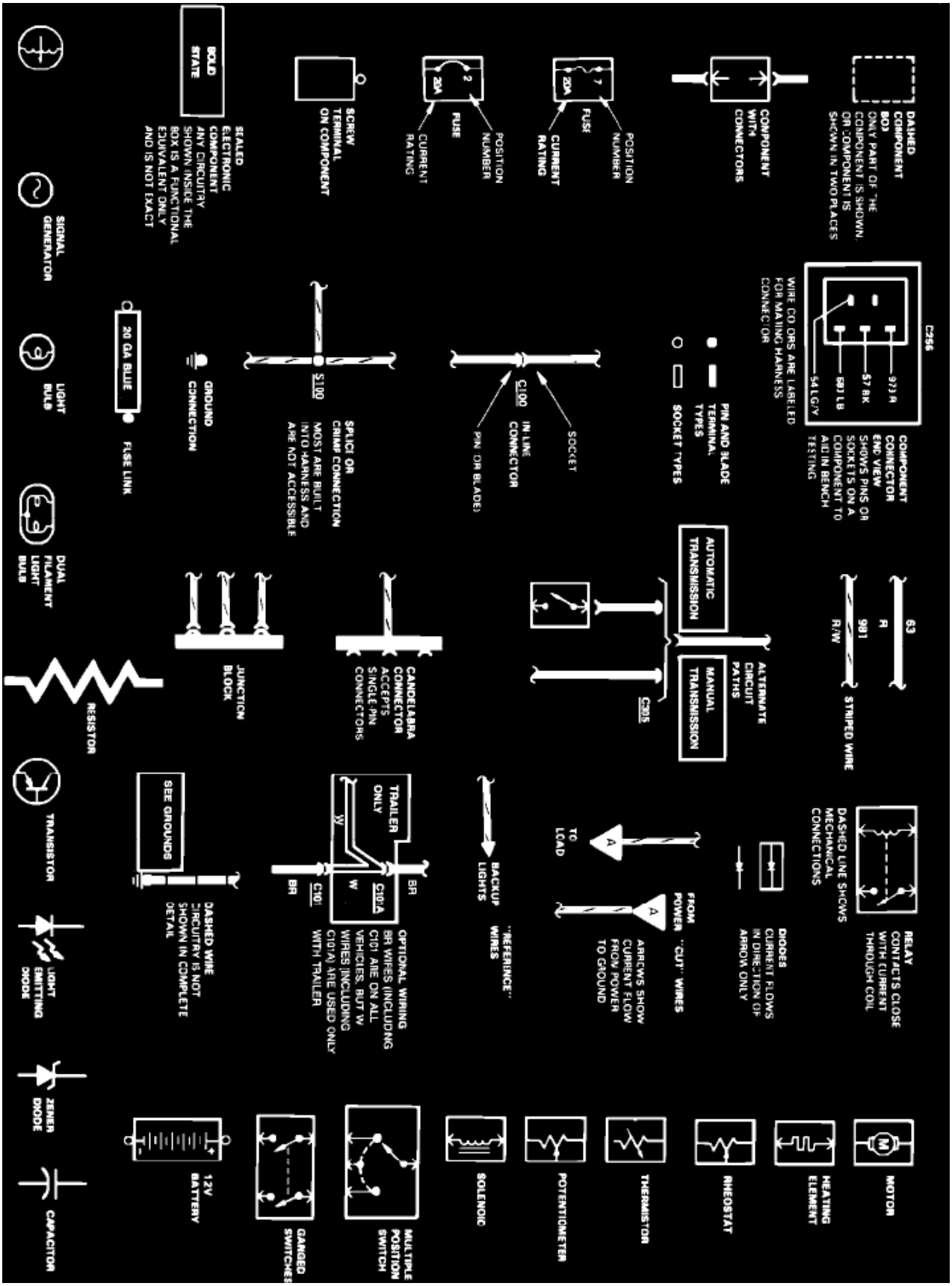
1. Position switch so that U-shaped side is nearest pedal and directly over or under pin.

2. Slide switch up or down, trapping vacuum booster input rod and bushing between switch side plates.

3. Push switch and push rod assembly toward brake pedal arm, then assemble plastic washer to pin and install hairpin clip to retain assembly.

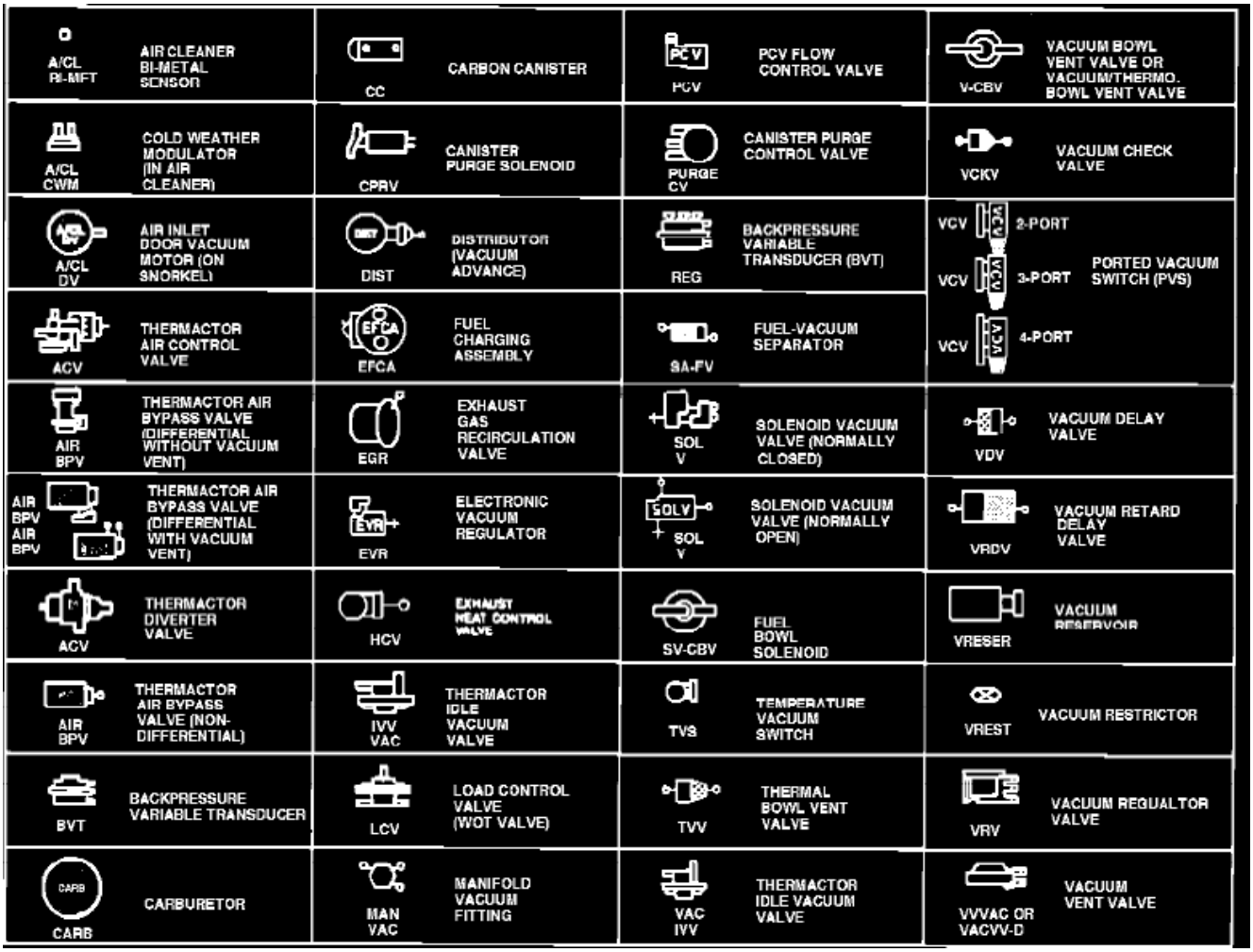
4. Connect electrical connector to switch, then check for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Lighting and Horns > Hazard Warning Switch > Component Information > Diagrams > Diagram Information and Instructions

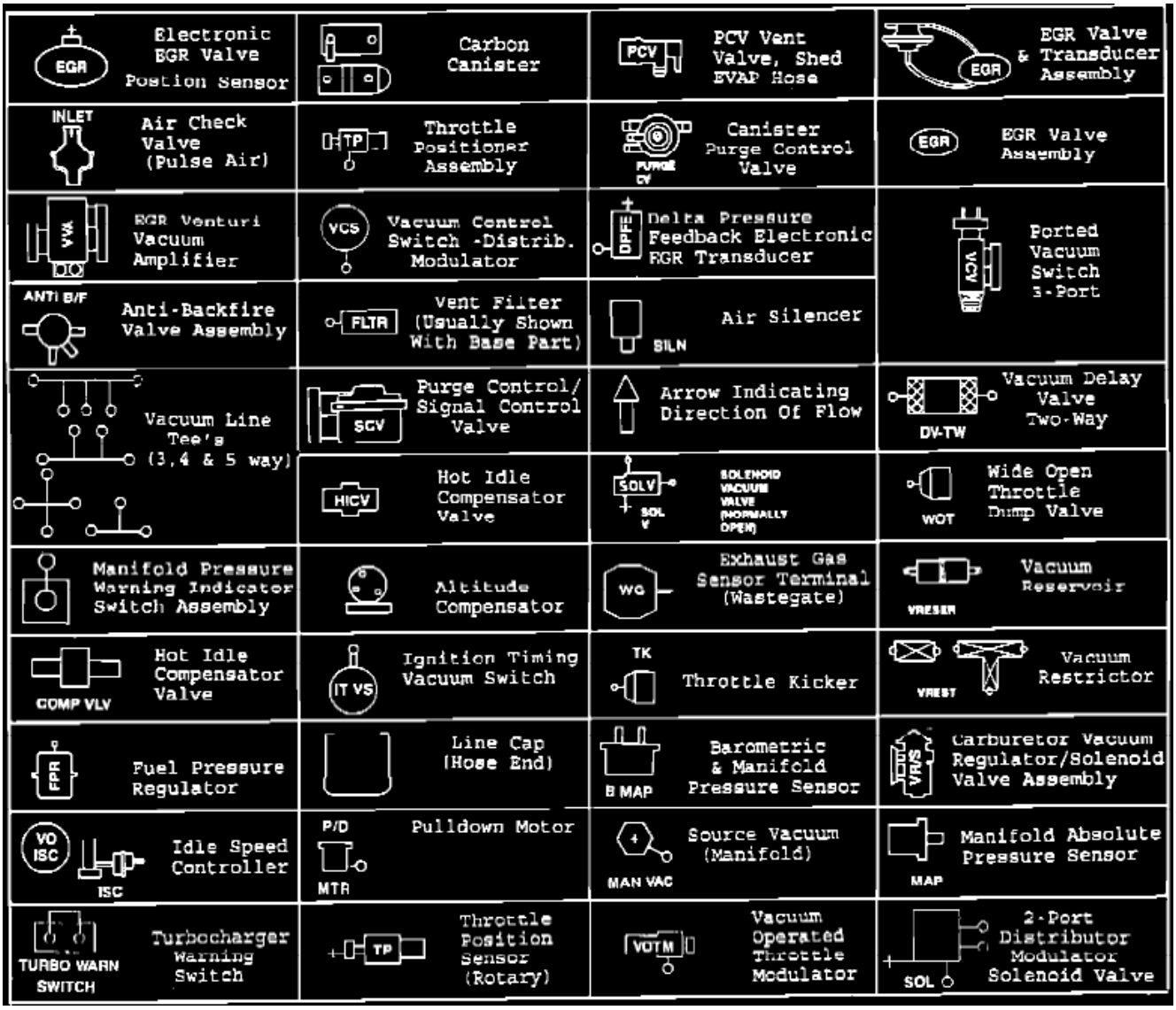


Hazard Warning Switch: Diagram Information and Instructions

Symbol Identification



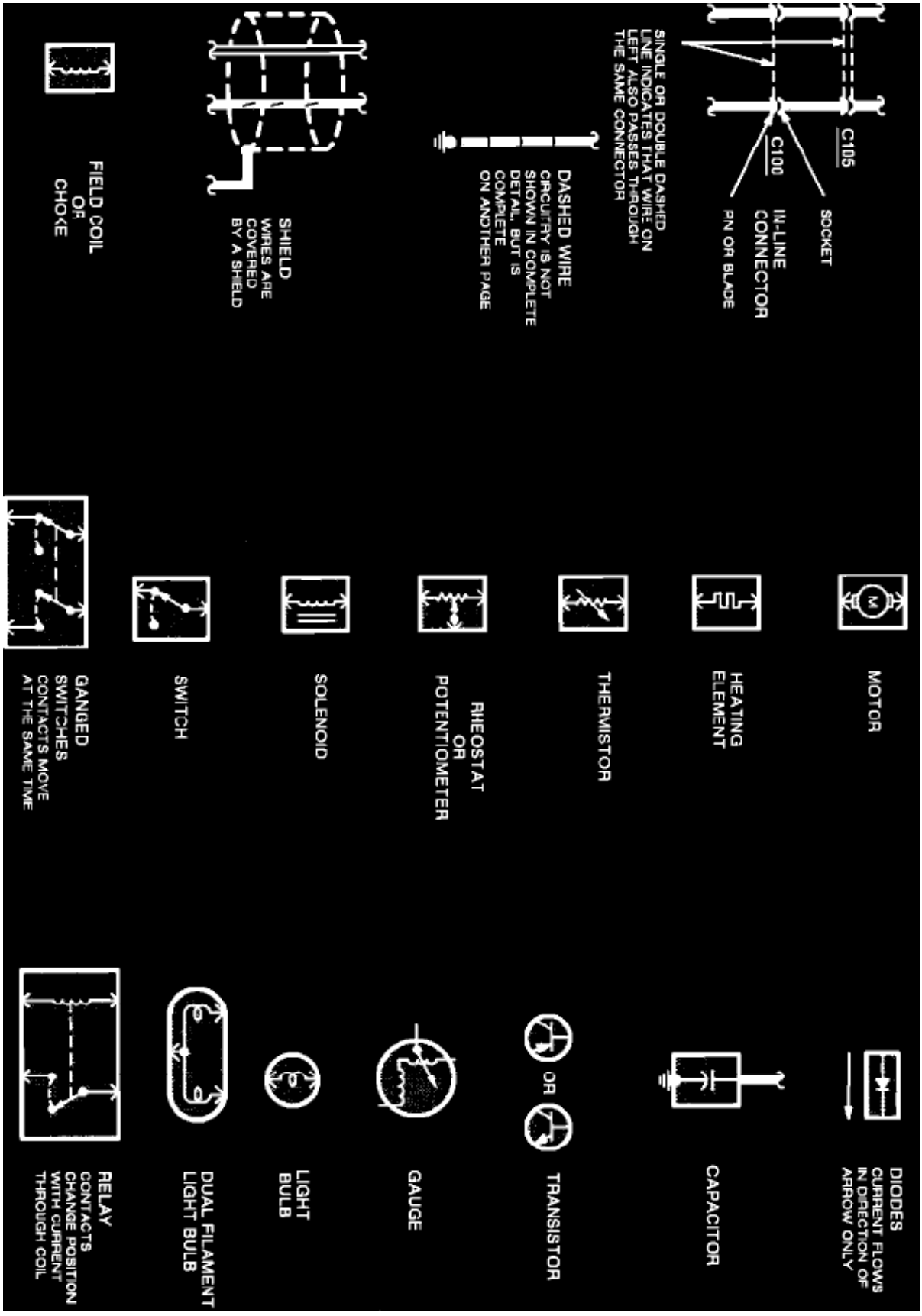
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

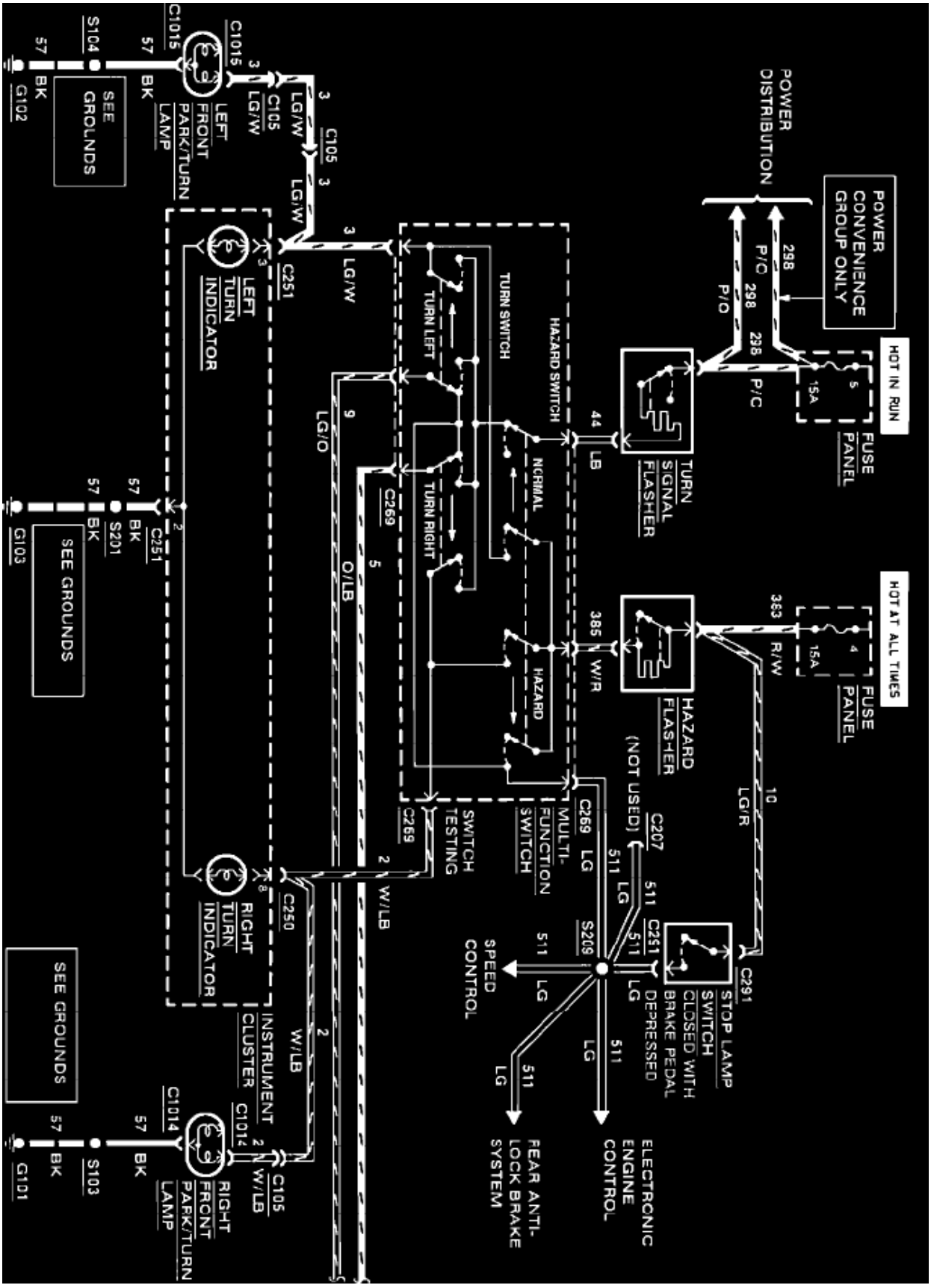
P: Purple

T: Tan

V: Violet

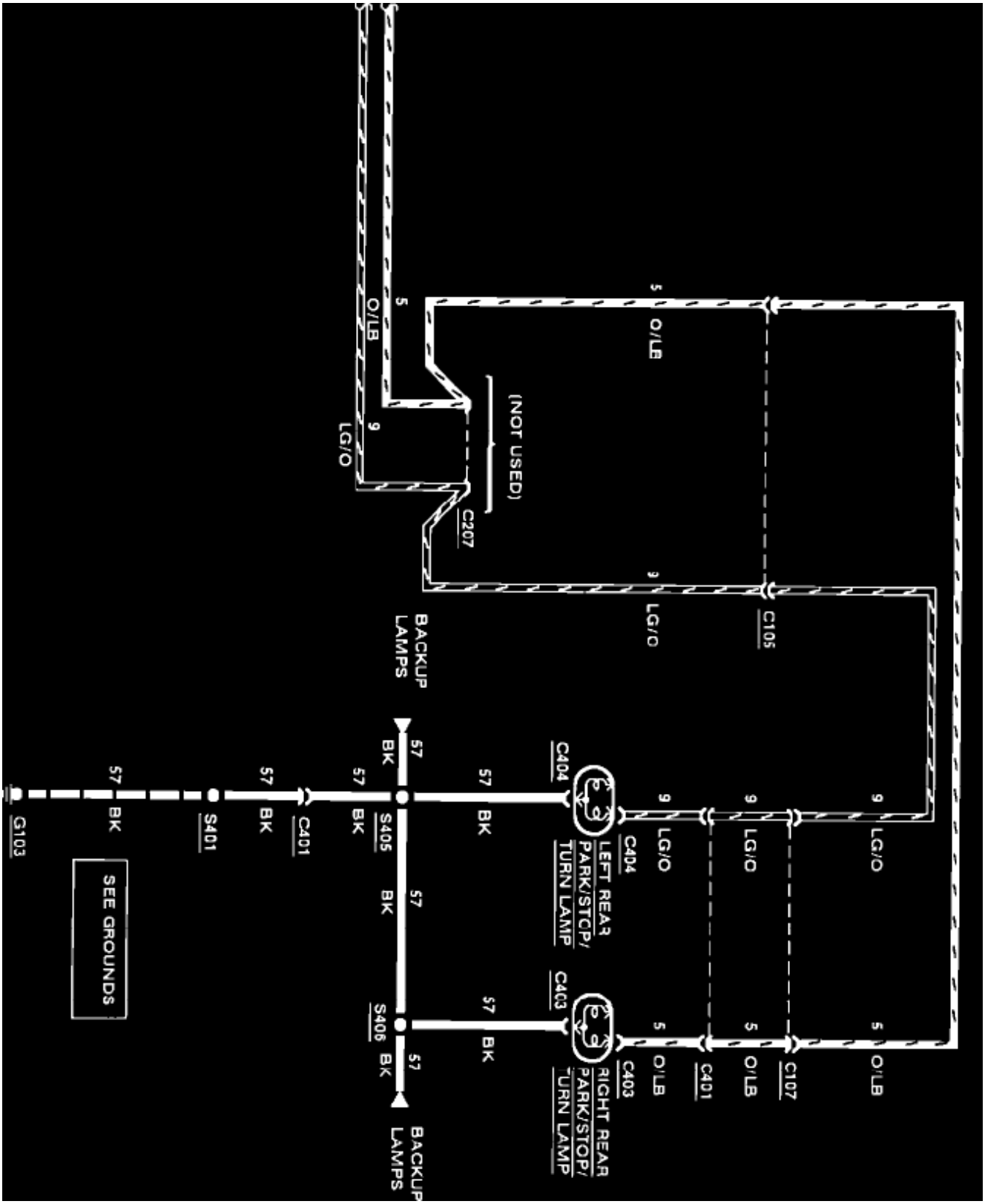
W: White

Y: Yellow


POWER DISTRIBUTION
POWER CONVENIENCE GROUP ONLY
HOT IN RUN
FUSE PANEL
HOT AT ALL TIMES
FUSE PANEL
TURN SIGNAL FLASHER
HAZARD FLASHER
(NOT USED)
HAZARD SWITCH
TURN SWITCH
NORMAL
TURN LEFT
TURN RIGHT
HAZARD
MULTI-FUNCTION SWITCH
SWITCH TESTING
STOP LAMP SWITCH
CLOSED WITH BRAKE PEDAL DEPRESSED
ELECTRONIC ENGINE CONTROL
SPEED CONTROL
REAR ANTI-LOCK BRAKE SYSTEM
INSTRUMENT CLUSTER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
LEFT FRONT PARK/TURN LAMP
RIGHT FRONT PARK/TURN LAMP
SEE GROUNDS
SEE GRDLNDS
298
P/C
P/O
15A
5
4
383
R/W
385
W/R
44
LB
10
LG/R
LG/W
C105
C251
C269
C207
C291
S209
511
LG
O/LB
W/LB
C250
C1015
C1014
S104
S201
S103
G102
G103
G101
57
BK

Hazard Warning Switch: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Hazard Warning Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

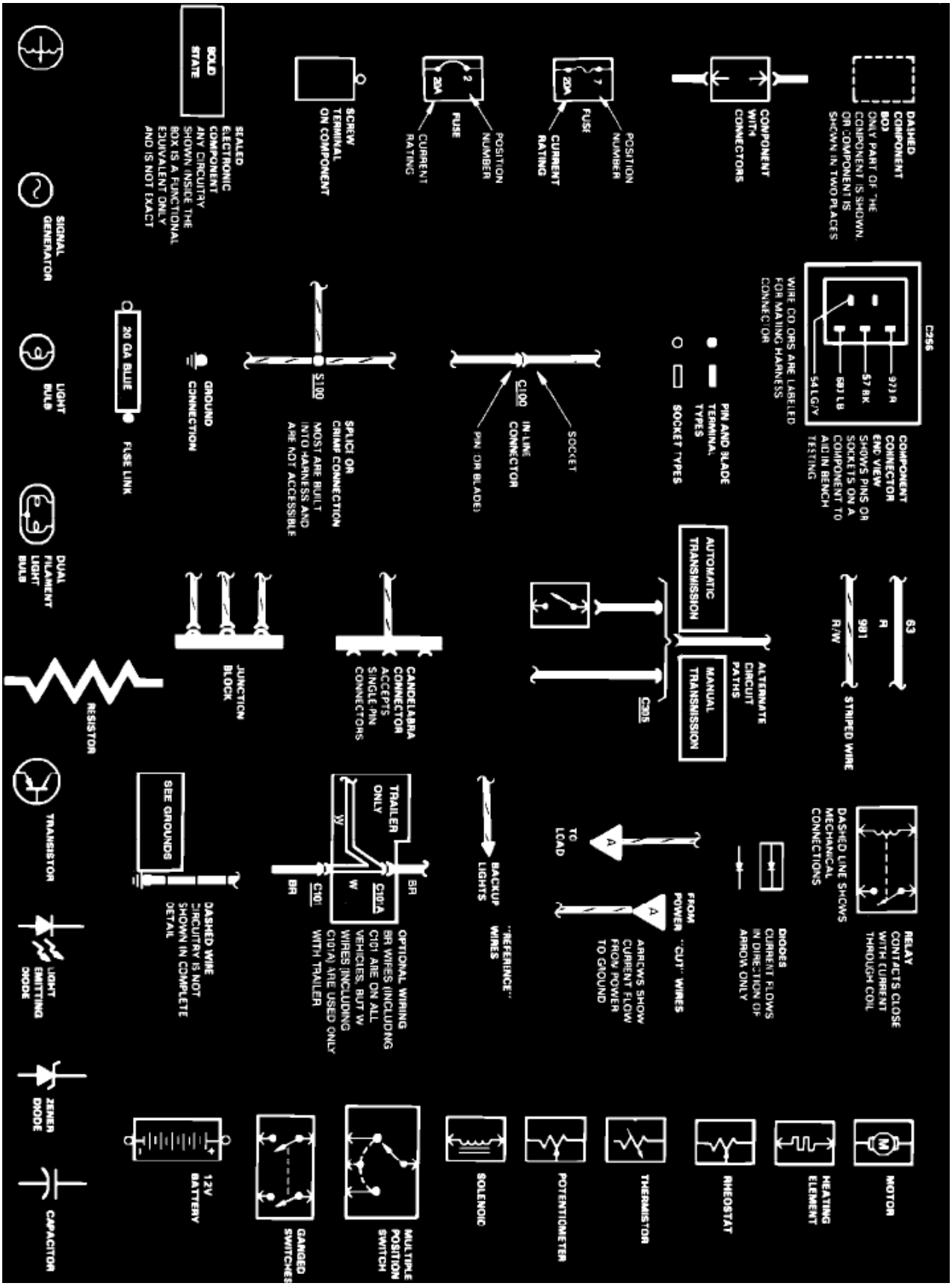
7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

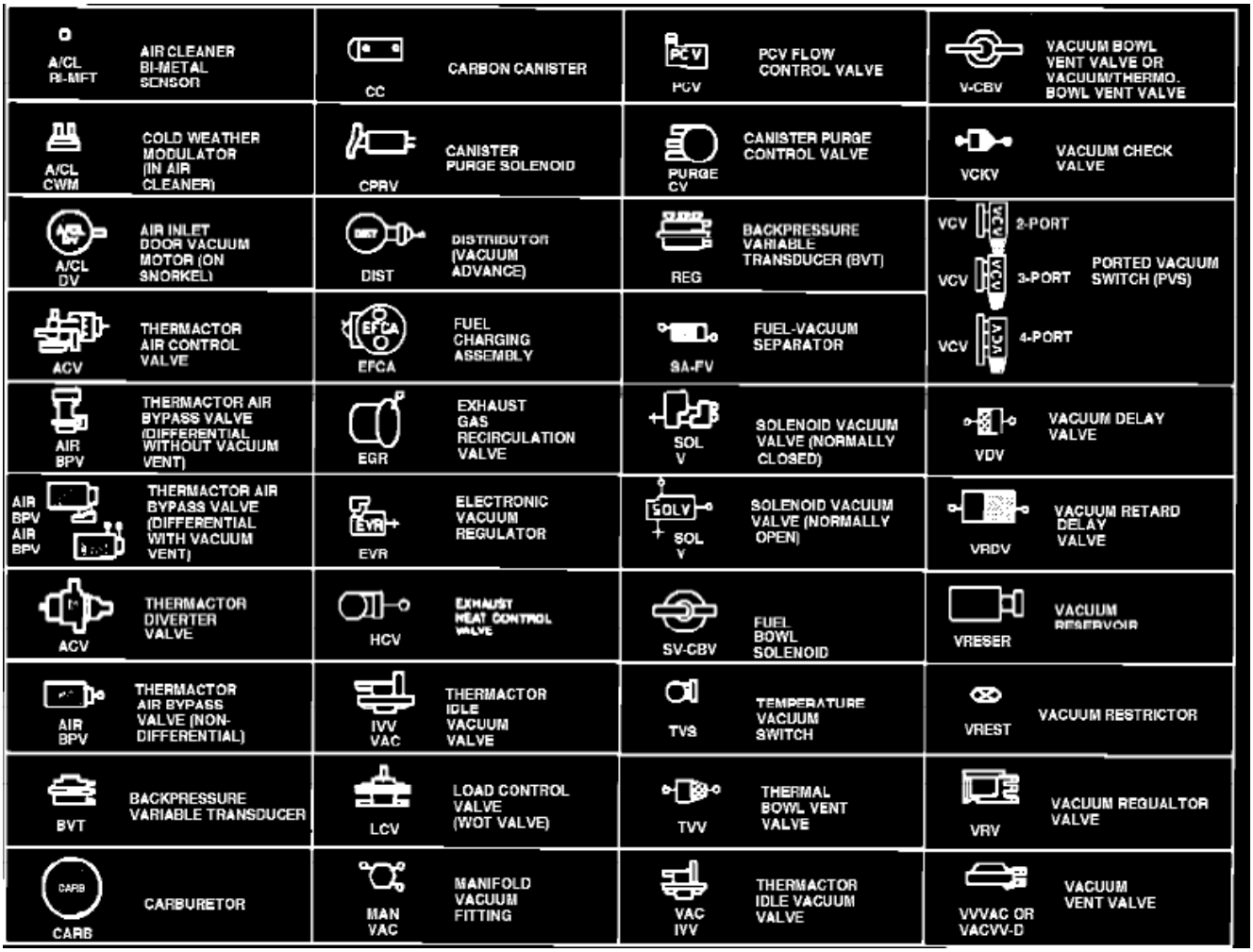
10. Check multi-function switch and steering column for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Lighting and Horns > Headlamp Dimmer Switch > Component Information > Diagrams > Diagram Information and Instructions

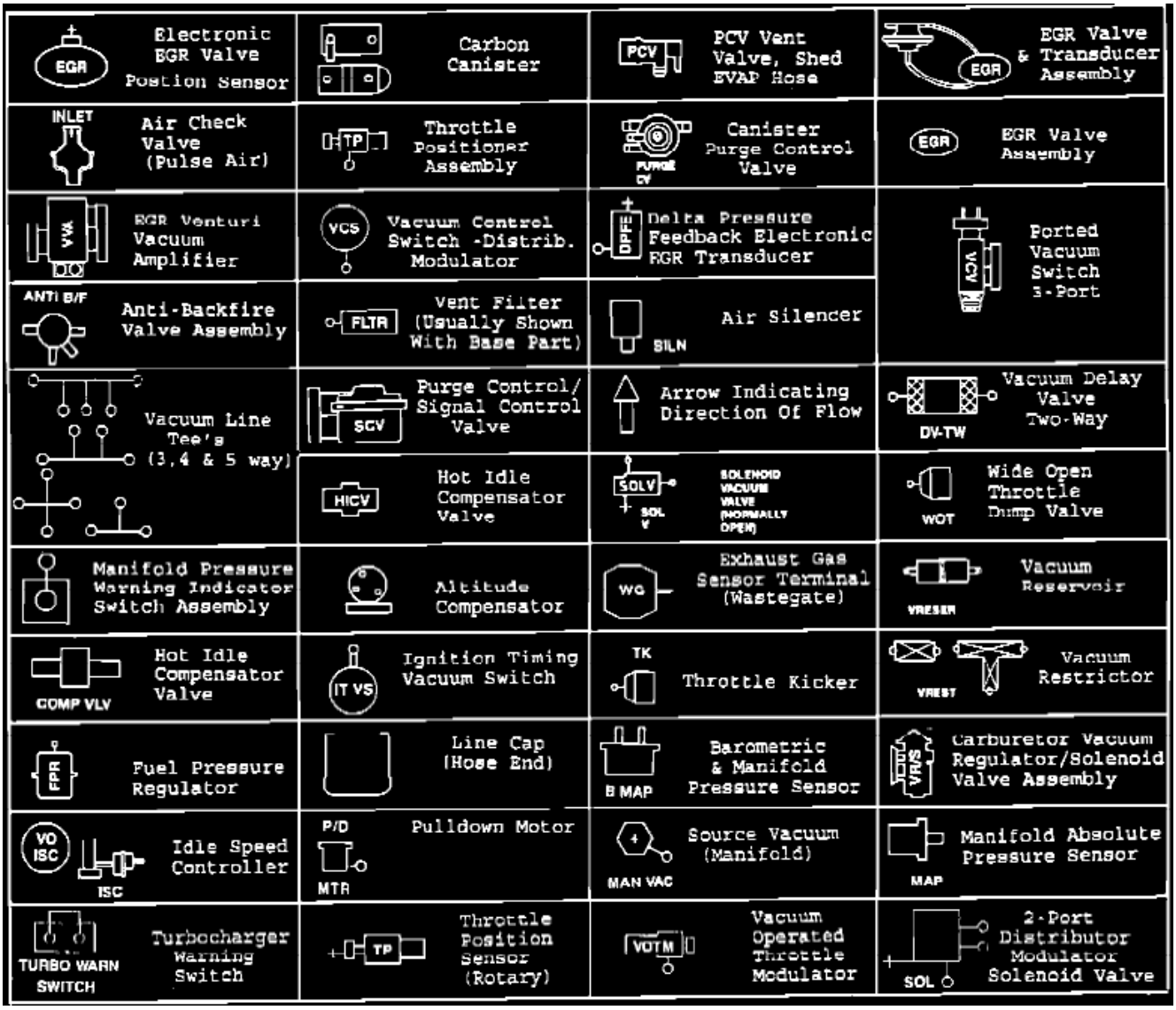


Headlamp Dimmer Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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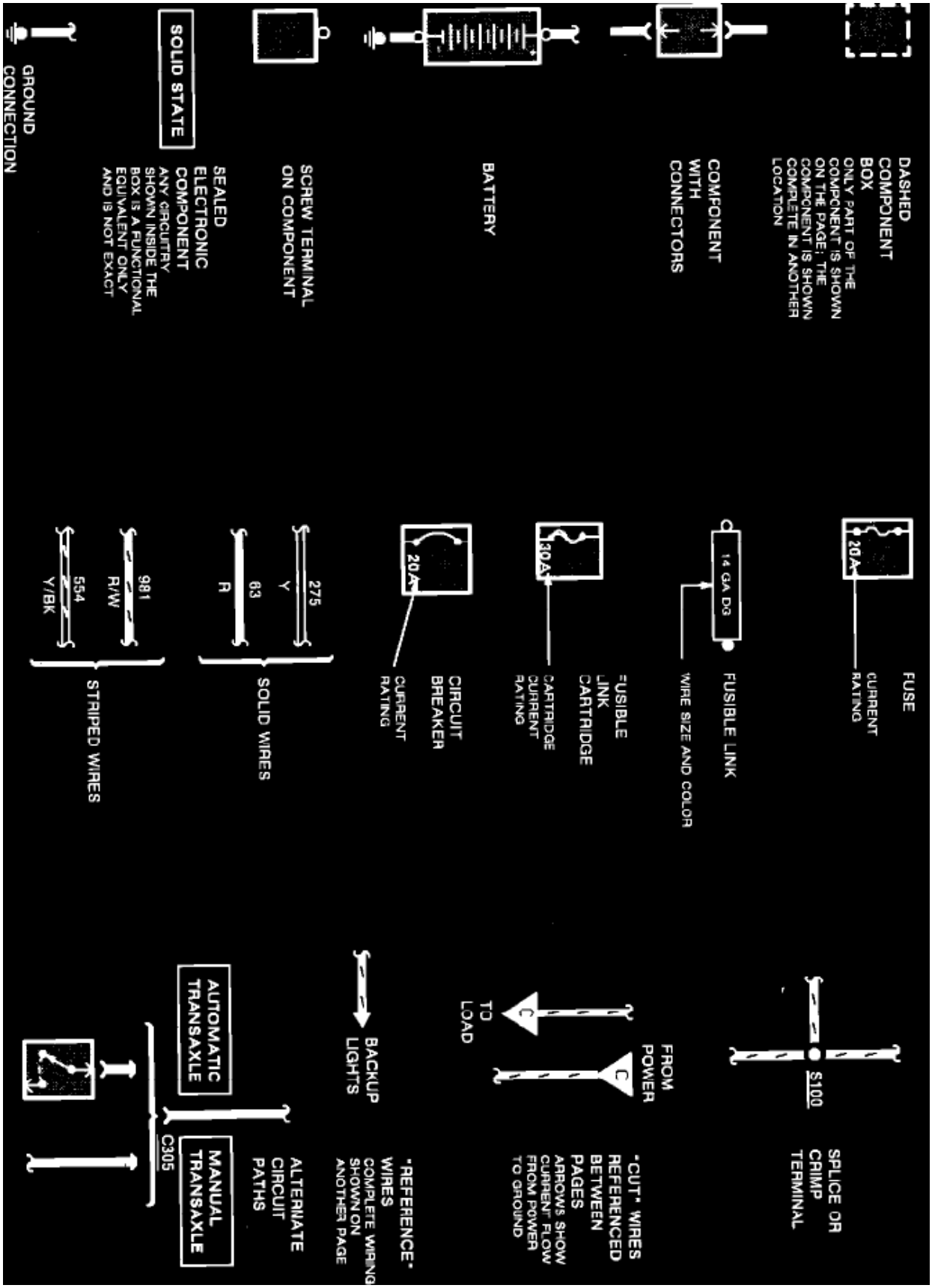
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C305
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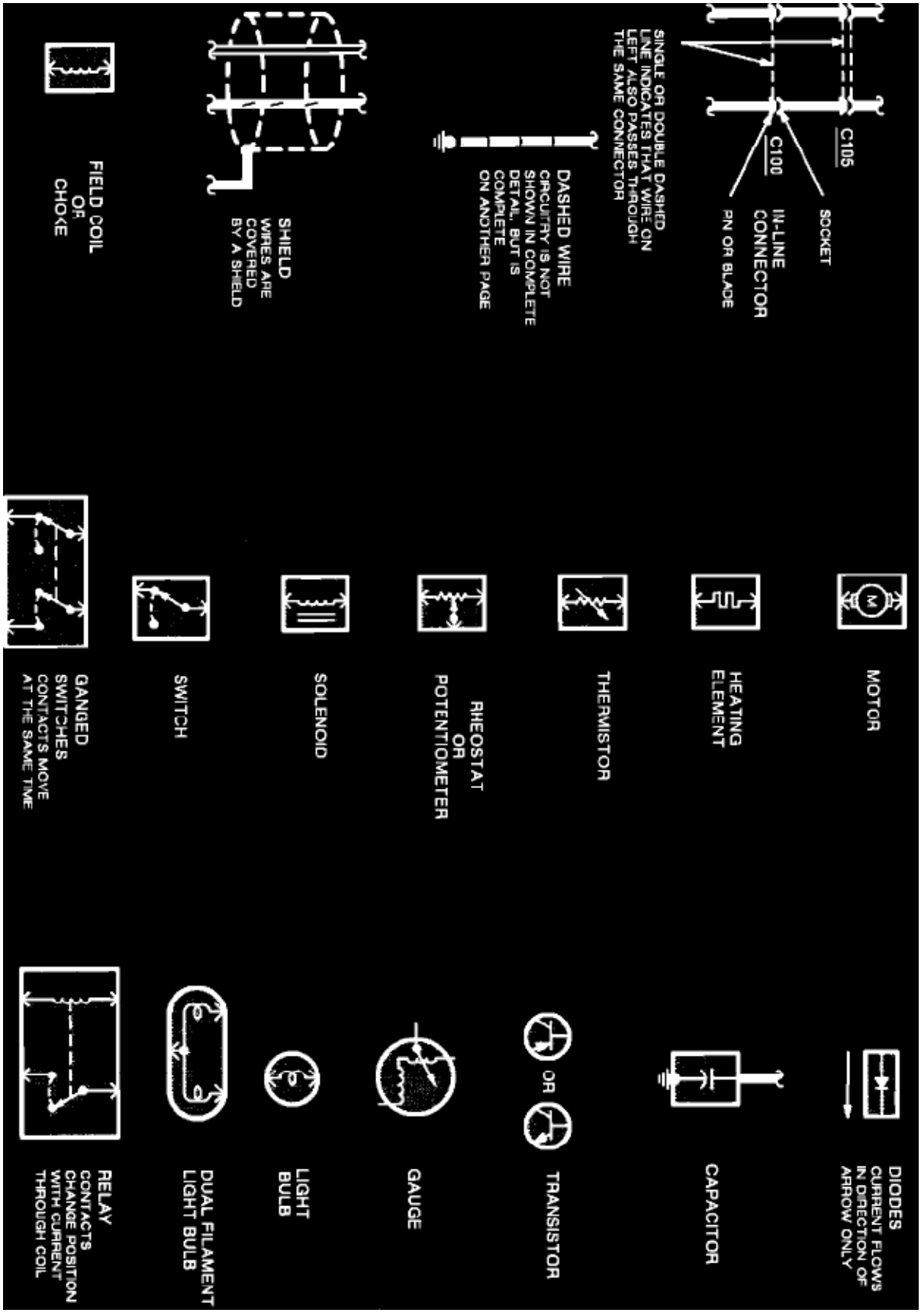
Electrical Symbols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CONTACTS MOVE AT THE SAME TIME
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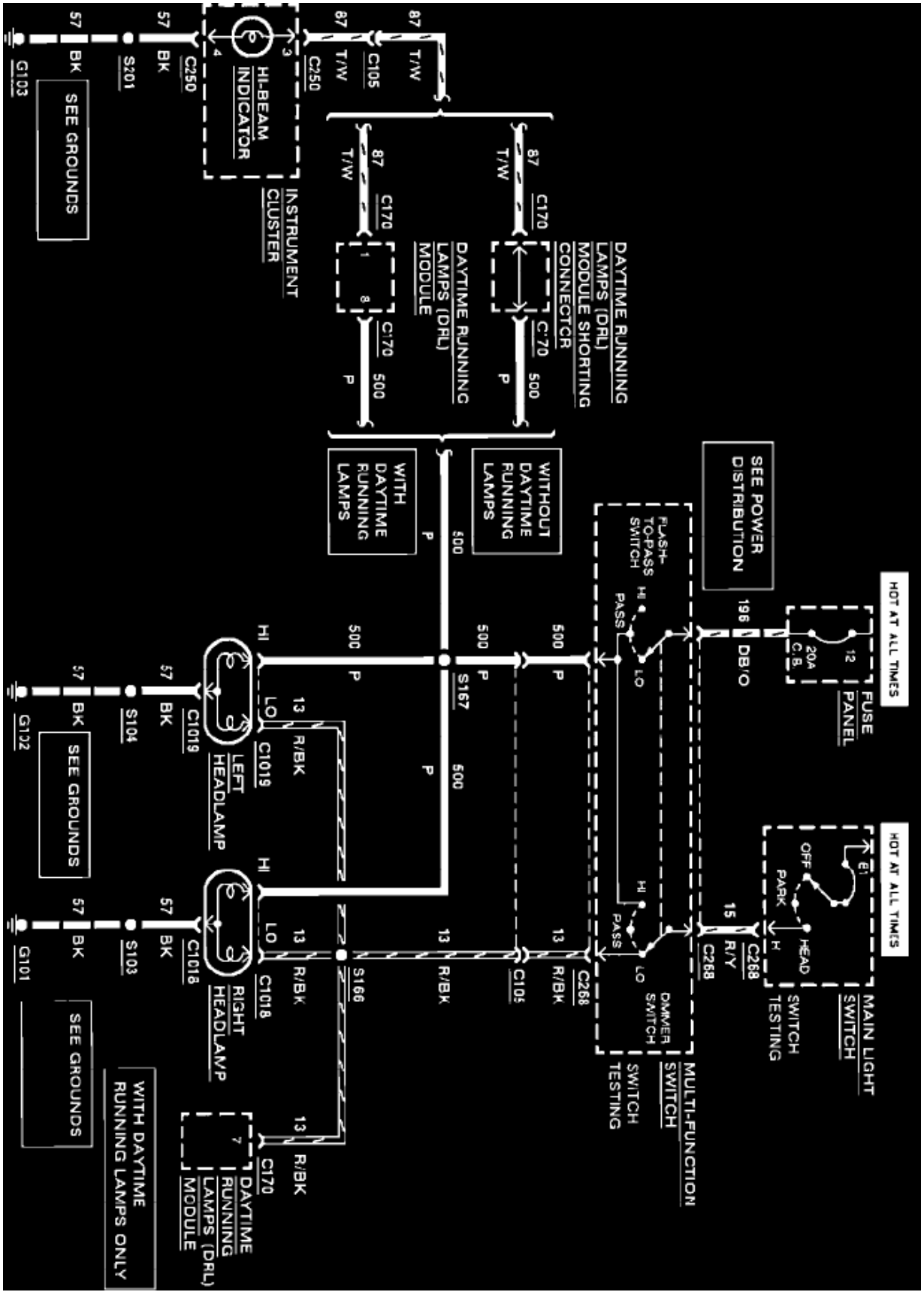
HOT AT ALL TIMES
FUSE PANEL
12
20A C.B.
196
DB/O
SEE POWER DISTRIBUTION
HOT AT ALL TIMES
E1
OFF
PARK
HEAD
H
15
R/Y
C268
MAIN LIGHT SWITCH
SWITCH TESTING
MULTI-FUNCTION SWITCH
DIMMER SWITCH
SWITCH TESTING
FLASH-TO-PASS SWITCH
HI
PASS
LO
C268
R/BK
13
C105
S166
S167
500
P
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
C170
87
T/W
C105
C250
INSTRUMENT CLUSTER
HI-BEAM INDICATOR
C250
BK
57
S201
G103
SEE GROUNDS
LEFT HEADLAMP
C1019
RIGHT HEADLAMP
C1018
S104
S103
S101
G122
G101
SEE GROUNDS
WITH DAYTIME RUNNING LAMPS ONLY
C170
DAYTIME RUNNING LAMPS (DRL) MODULE

Headlamps

Headlamp Dimmer Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

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6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

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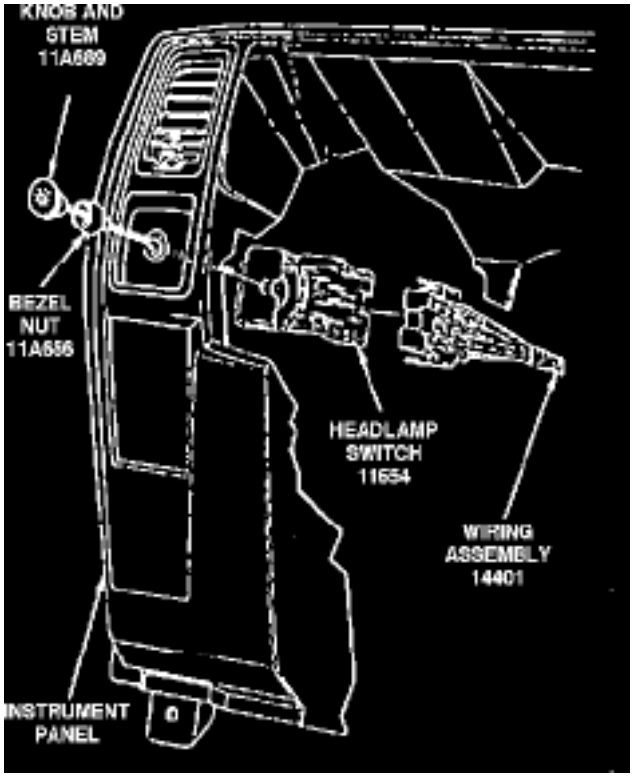
8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

10. Check multi-function switch and steering column for proper operation.



Headlamp Switch: Service and Repair

Fig. 11 Headlamp Switch Replacement.

1. Disconnect battery ground cable, remove ash tray assembly and two finish panel retaining screws, then the finish panel (snaps off).

2. On Bronco II or Explorer models, remove rear window wash/wipe and heated backlit switch assembly (snaps out).

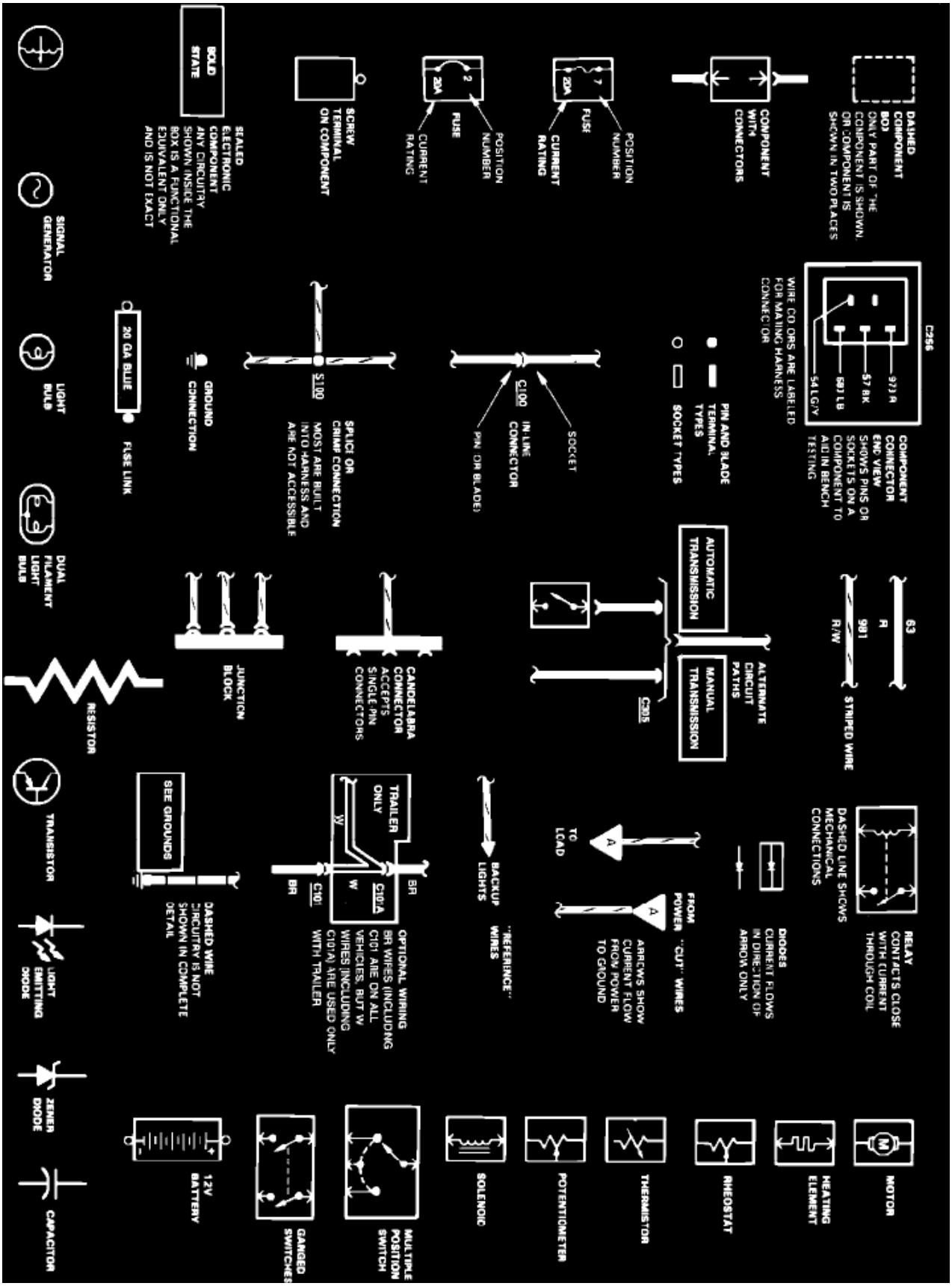
3. On Ranger models, remove storage bin (snaps out).

4. On all models, pull headlamp switch knob to ON position, then depress shaft release button on switch and remove knob and shaft assembly, Fig. 11.

5. Remove bezel nut, pull switch down through opening, disconnect electrical connector, then remove switch.

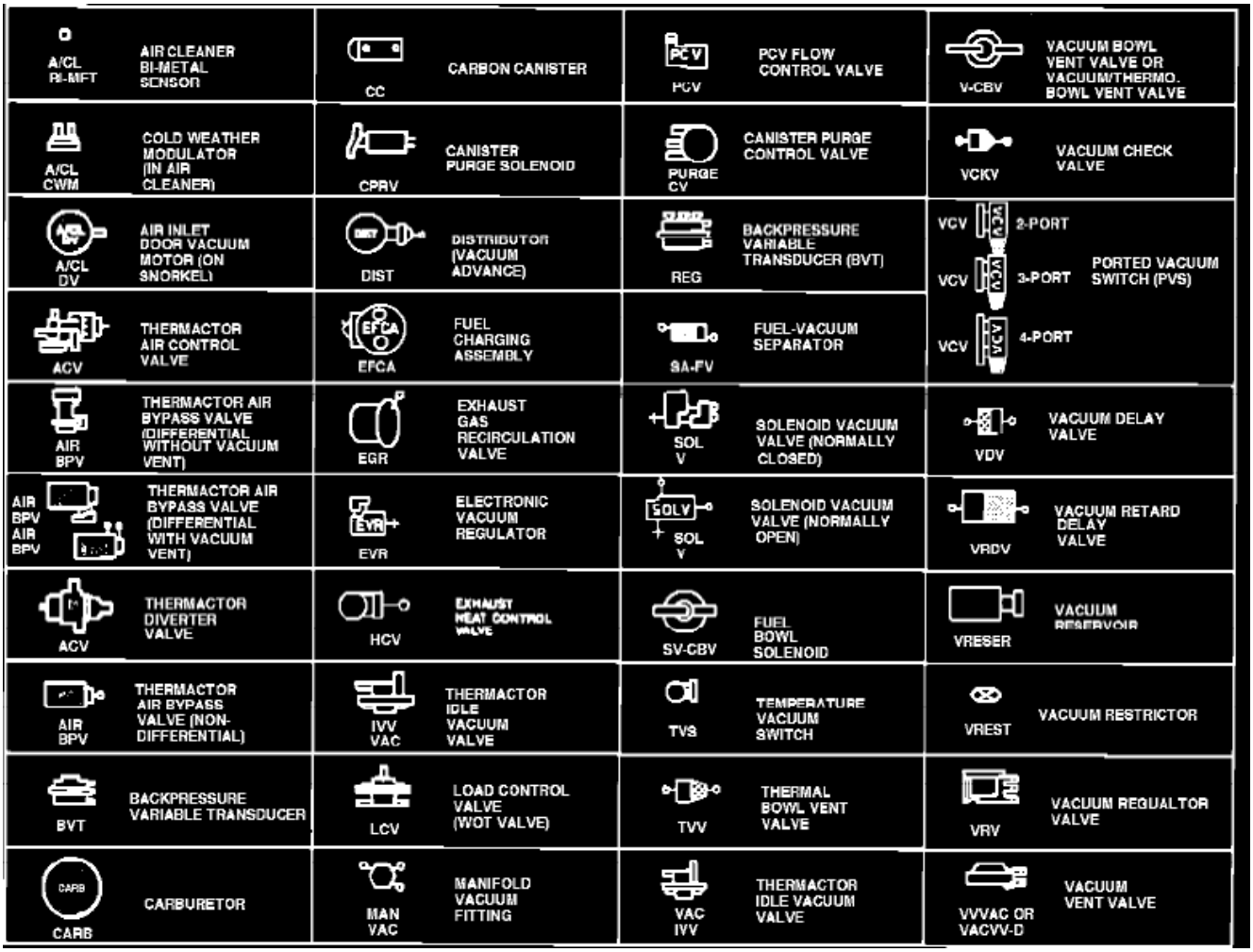
6. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Lighting and Horns > Turn Signal Switch > Component Information > Diagrams > Diagram Information and Instructions

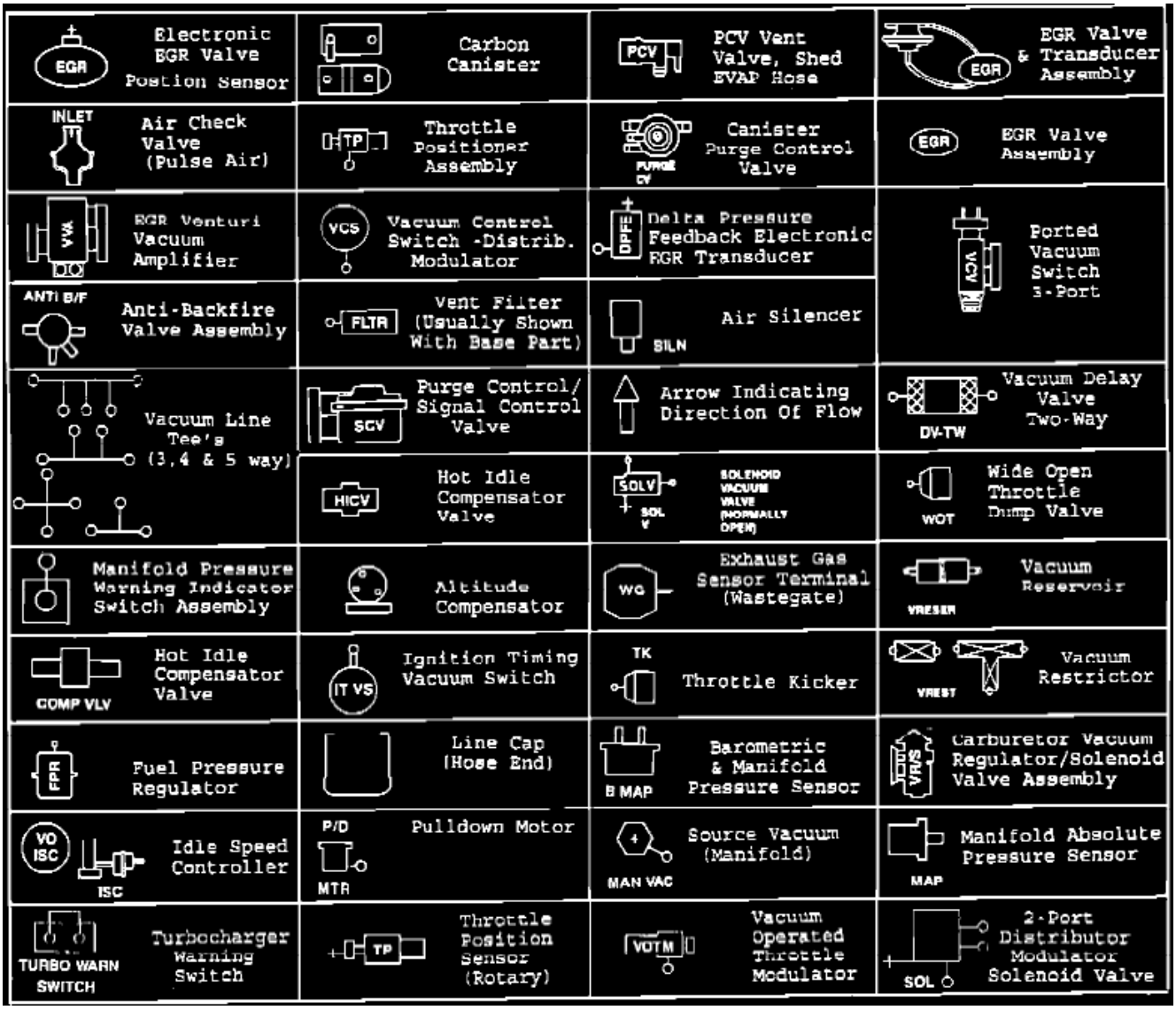


Turn Signal Switch: Diagram Information and Instructions

Symbol Identification



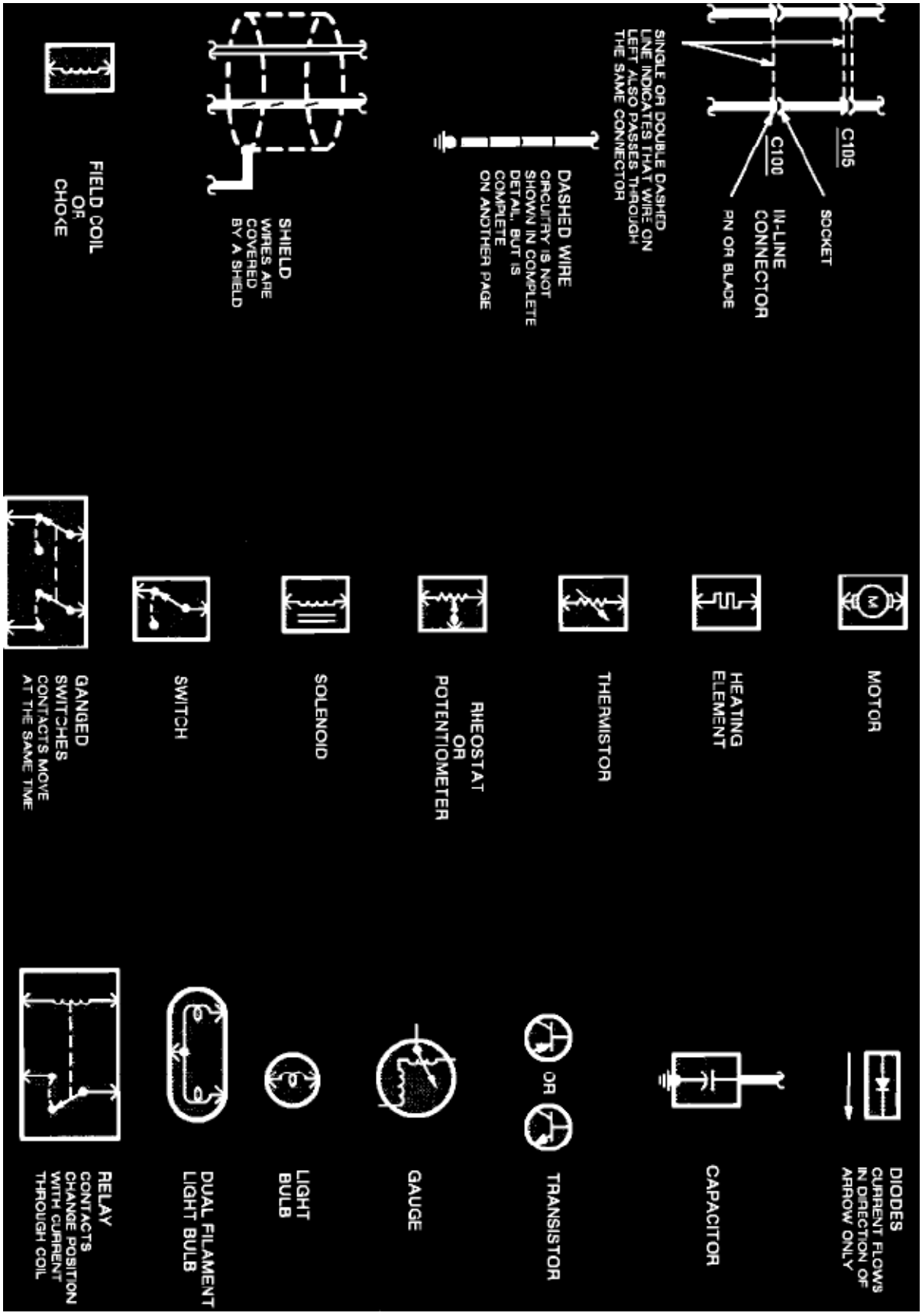
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

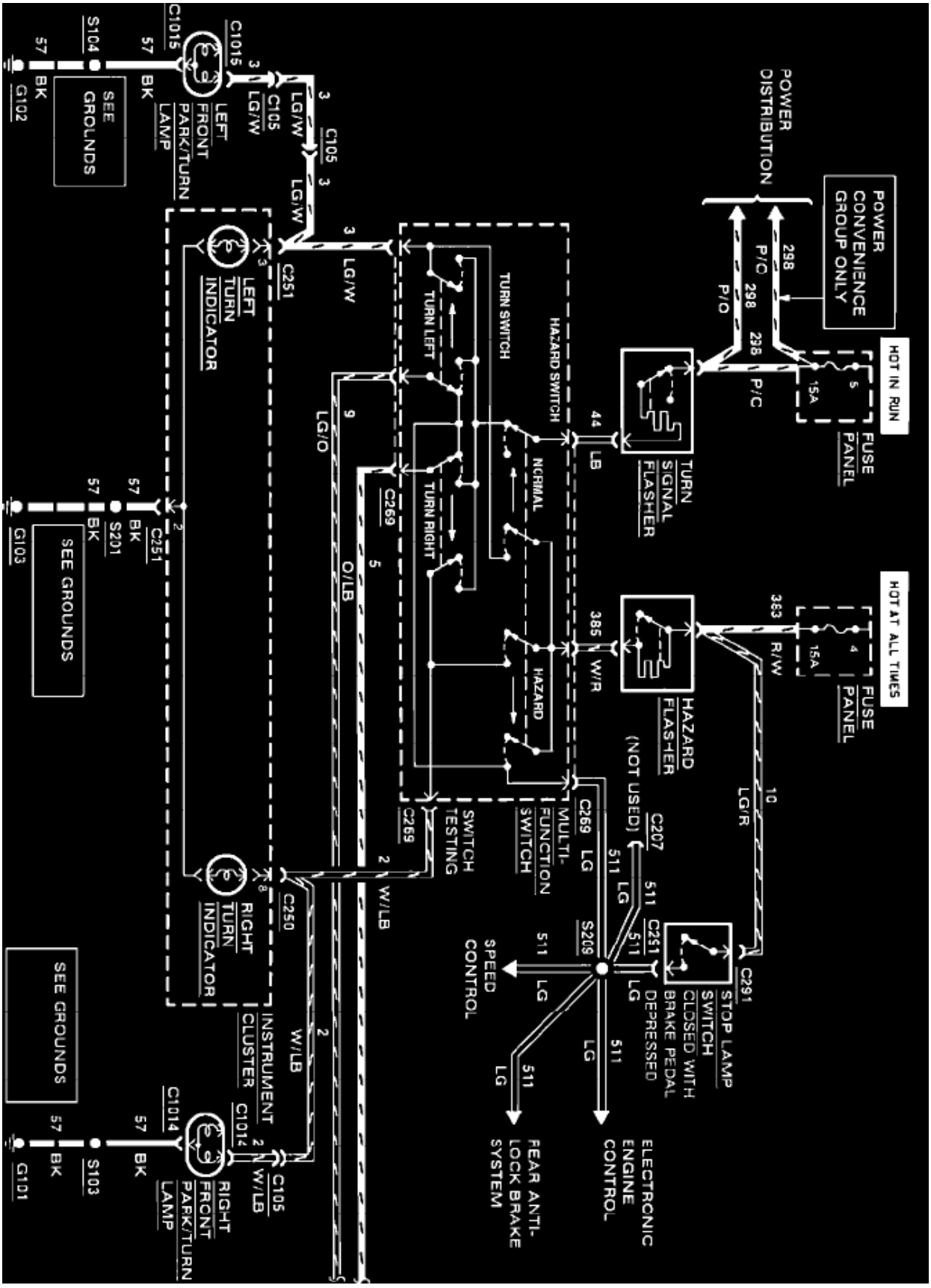
T: Tan

V: Violet

W: White

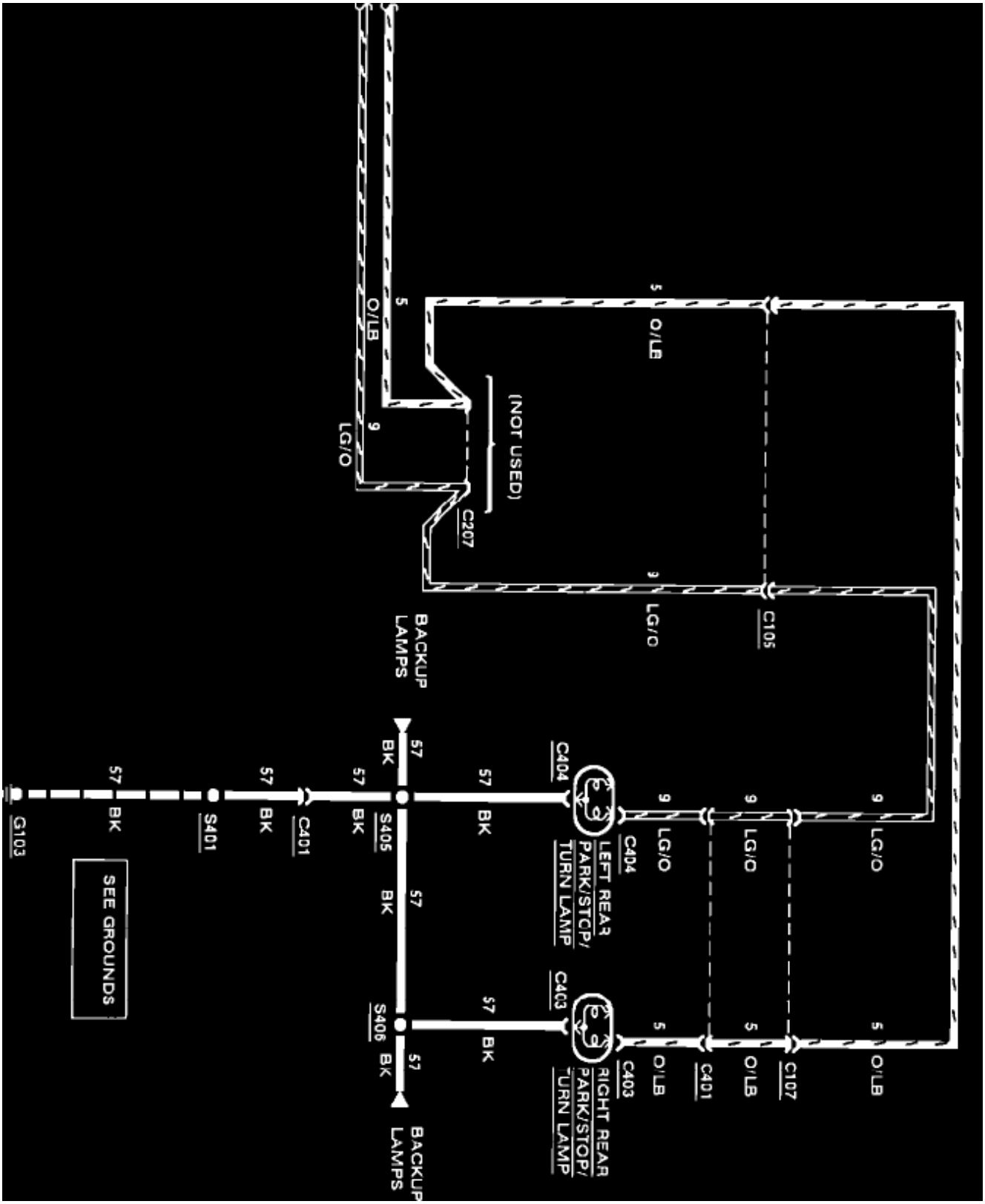
Y: Yellow

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Lighting and Horns > Turn Signal Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 432



Turn Signal Switch: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Turn Signal Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

10. Check multi-function switch and steering column for proper operation.

Old Service Part Number	New Service Part Number
F6TZ-15702-AA E7DZ-15702-A	1U5Z-15702-AA 1U5Z-15702-AA

PART NUMBER	PART NAME
1U5Z-15702-AA	27 degree Mechanical Hood Lamp Switch

Underhood Lamp Switch: Technical Service Bulletins Hood Lamp Switch - Revised

Article No. 01-21-6

10/29/01

ELECTRICAL - REVISED MECHANICAL HOOD LAMP SWITCH TO REPLACE OLD STYLE MERCURY HOOD LAMP SWITCH

FORD: 1987-1995 TAURUS 1988-1991 CROWN VICTORIA 1989 THUNDERBIRD 1989-1996 MUSTANG 1994-1996 THUNDERBIRD 1990 BRONCO II 1990-1996 RANGER 1991-1996 BRONCO 1994-2001 EXPLORER 1997-2001 F-150 2000-2001 EXCURSION 2002 EXPEDITION

LINCOLN: 1989-1994 CONTINENTAL 1990-1992 MARK VII 1990-1996 TOWN CAR 1993-1995 MARK VIII 2002 NAVIGATOR

MERCURY: 1987-1995 SABLE 1988-1991 GRAND MARQUIS 1989 COUGAR 1994-1996 COUGAR 1997-2001 MOUNTAINEER

ISSUE

This article is to provide information on replacement hood lamp switches. The 27 degree Mercury style hood switches will no longer be available. Replacement 27 degree Mechanical switches will be available as a service replacement.

ACTION

For vehicles requiring hood lamp switch replacement, replace the 27 degree Mercury switch with new 27 degree Mechanical switch. Replace hood lamp switch per the appropriate model year Workshop Manual as needed.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 201000, 201200

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Powertrain Management > Sensors and Switches - Computers and Control Systems > Mass Air Flow (MAF) Sensor <--> [Air Flow Meter/Sensor] > Component Information > Technical Service Bulletins > Customer Interest for Mass Air Flow (MAF) Sensor: > 98-23-10 > Nov > 98 > Engine - Lean Driveability Symptoms

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

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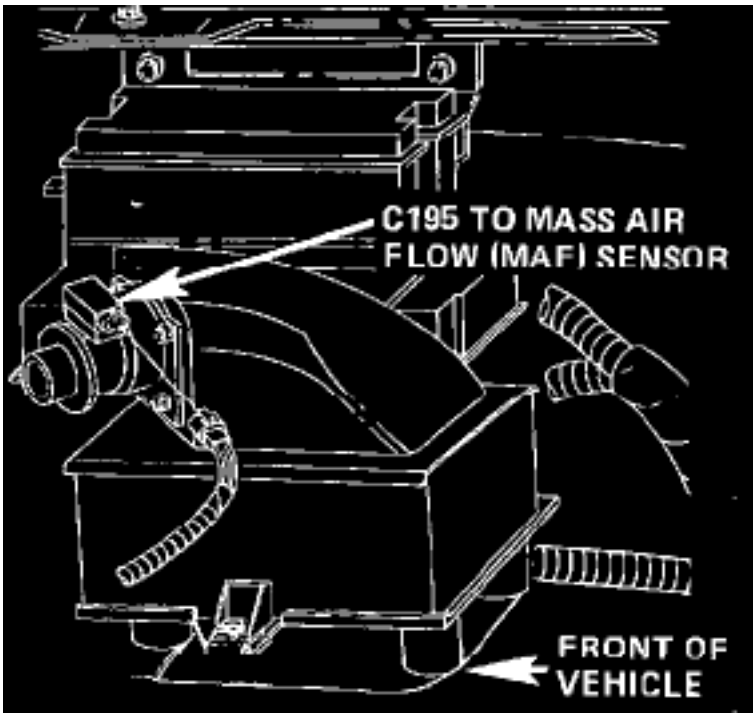
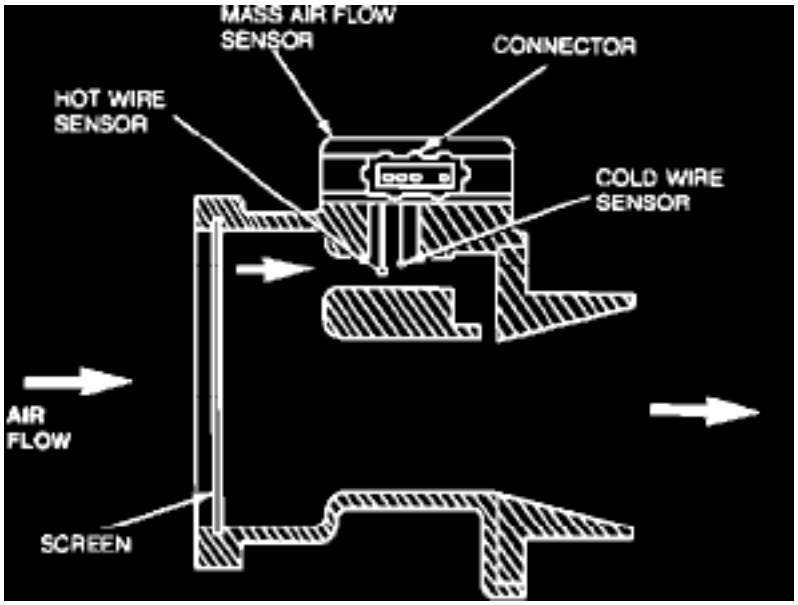
After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



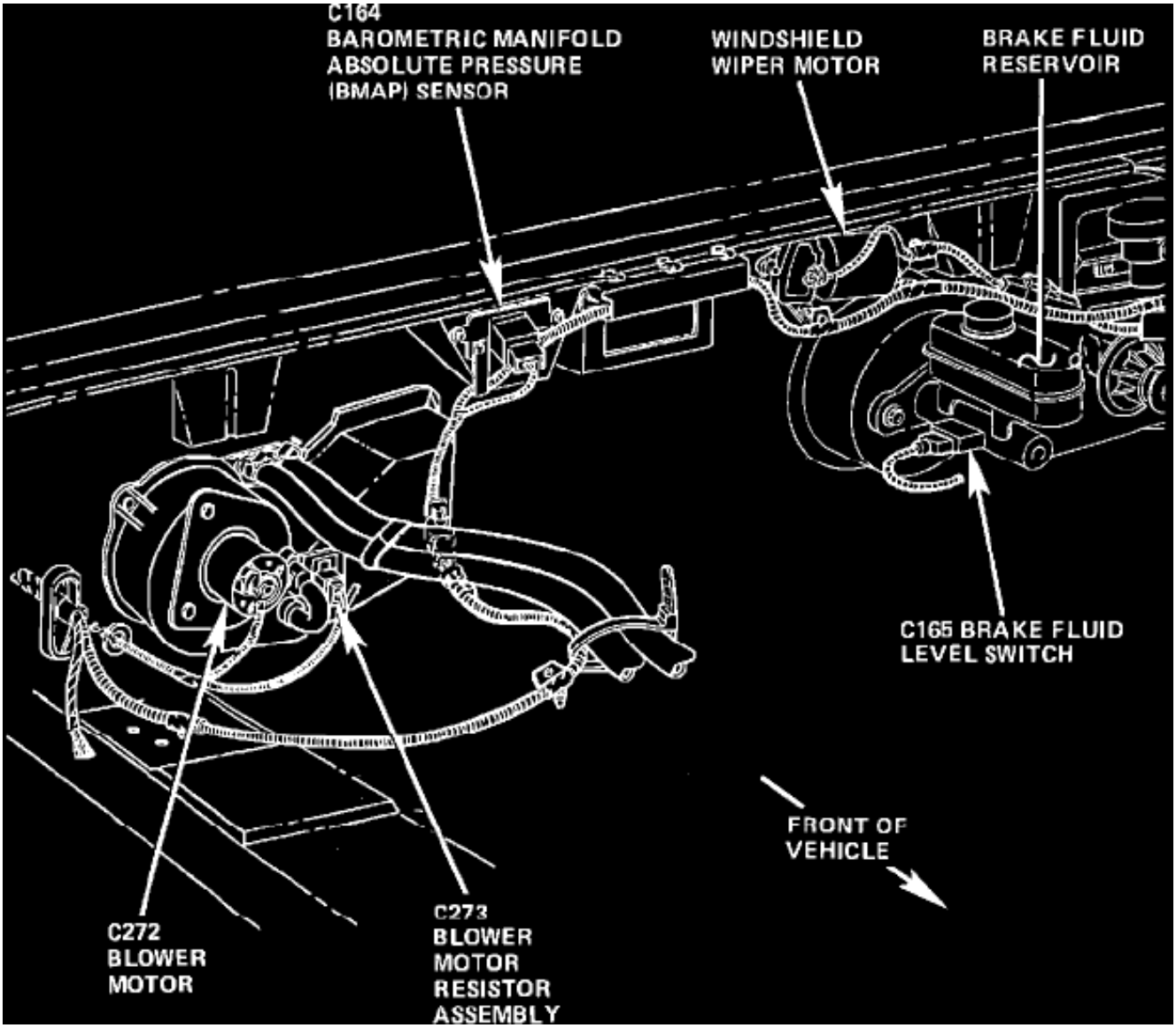
Mass Air Flow (MAF) Sensor



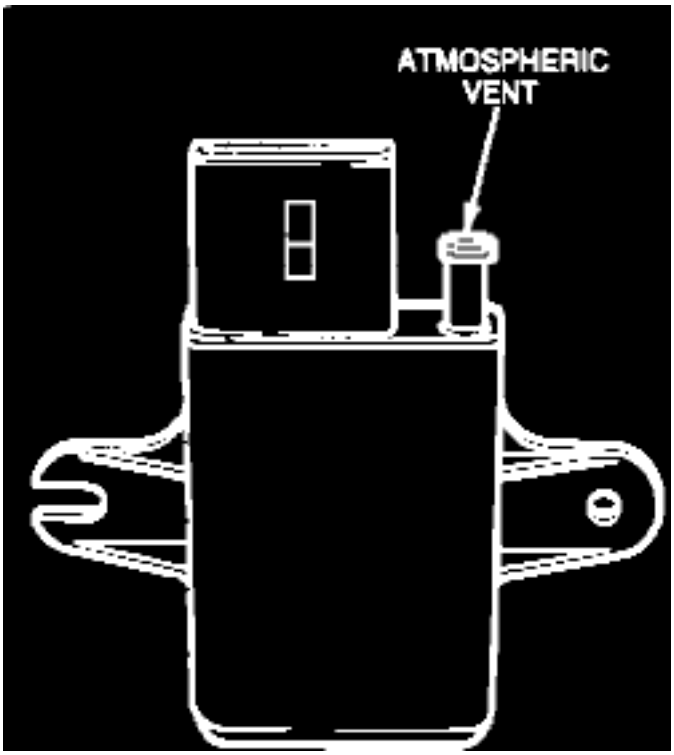
Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



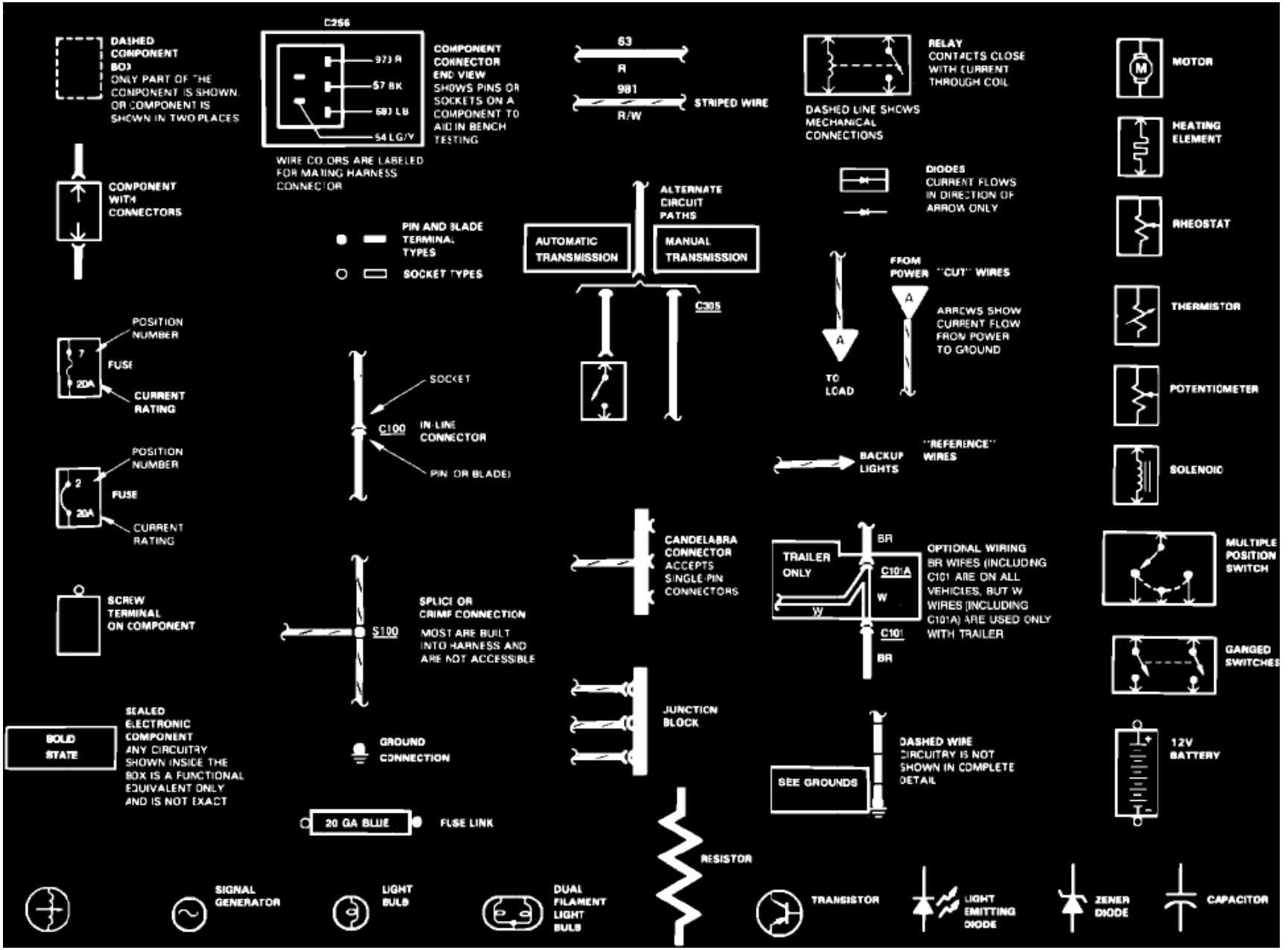
Barometric/manifold Absolute Pressure (BMAP) Sensor



Barometric Pressure Sensor: Description and Operation

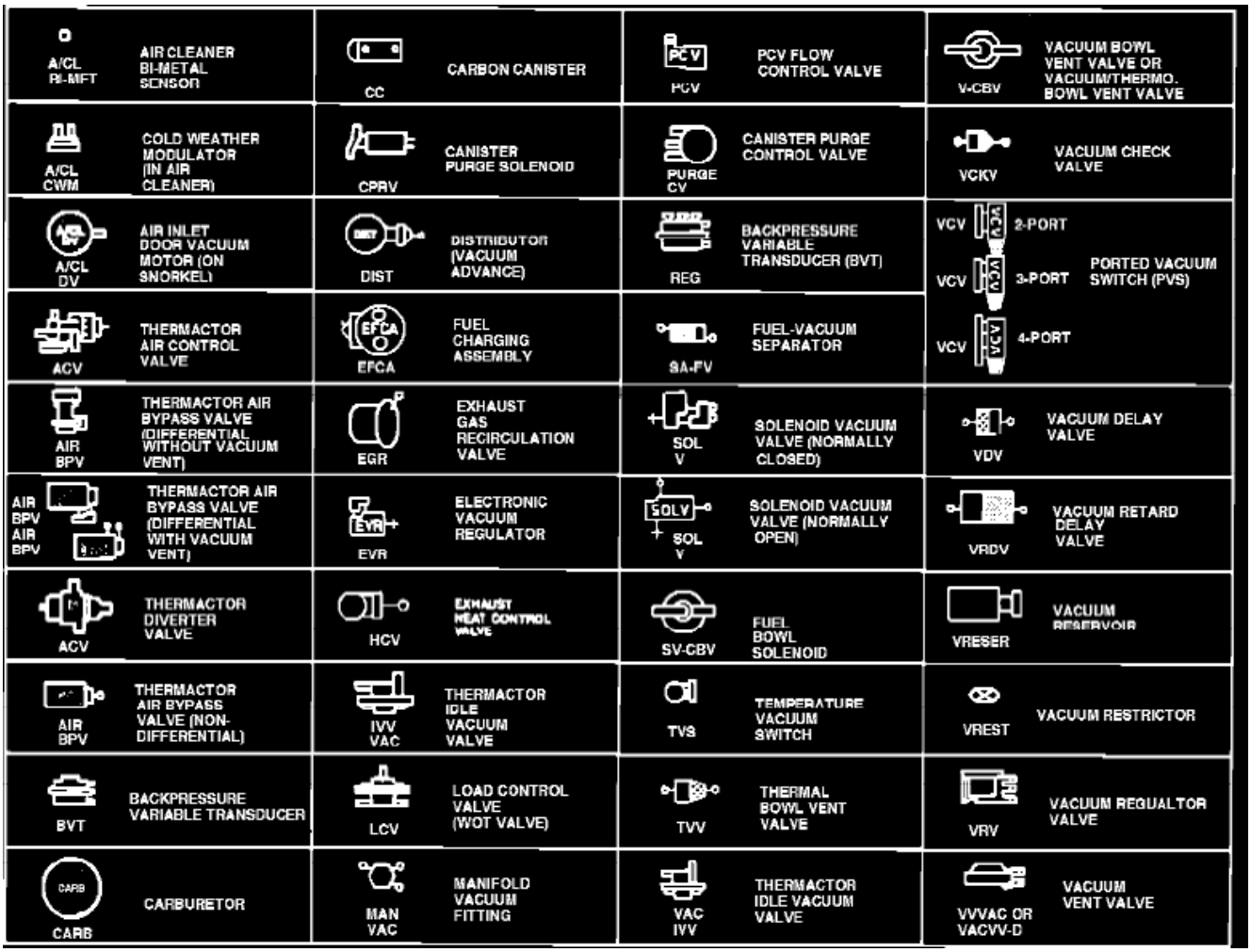
Barometric Pressure Sensor

The Barometric Pressure (BP) sensor is a frequency generating device that produces a varying signal depending on the amount of atmospheric (barometric) pressure. The Engine Control Assembly (ECA) monitors the frequency emitted from the BP sensor and converts the signal to atmospheric pressure. The ECA uses this reading to update the barometric pressure value stored in RAM memory. The ECA uses the input from the BP sensor to optimize the air/fuel ratio, ignition timing adjustment, and EGR flow control. The BP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

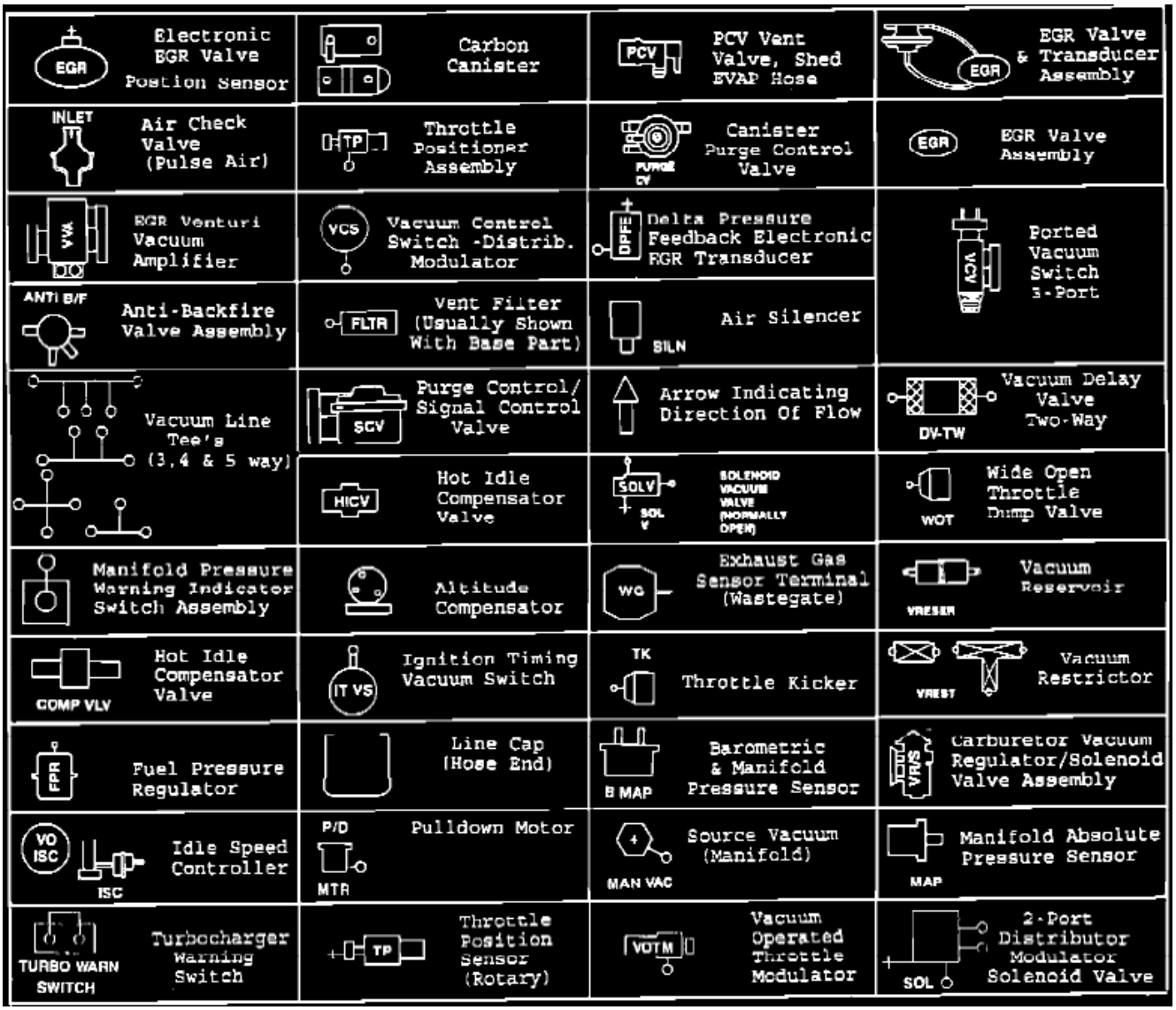


Camshaft Position Sensor: Diagram Information and Instructions

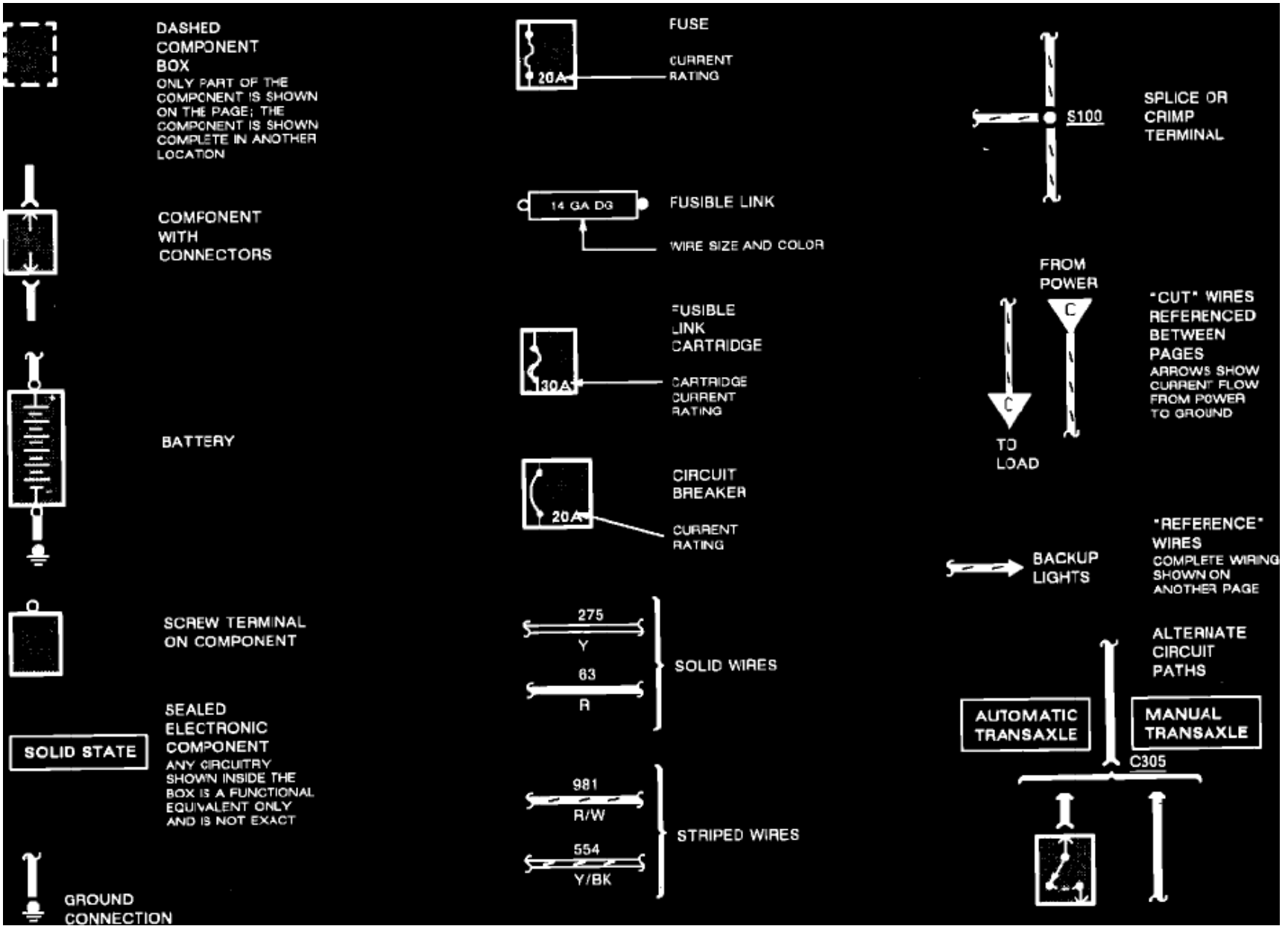
Symbol Identification

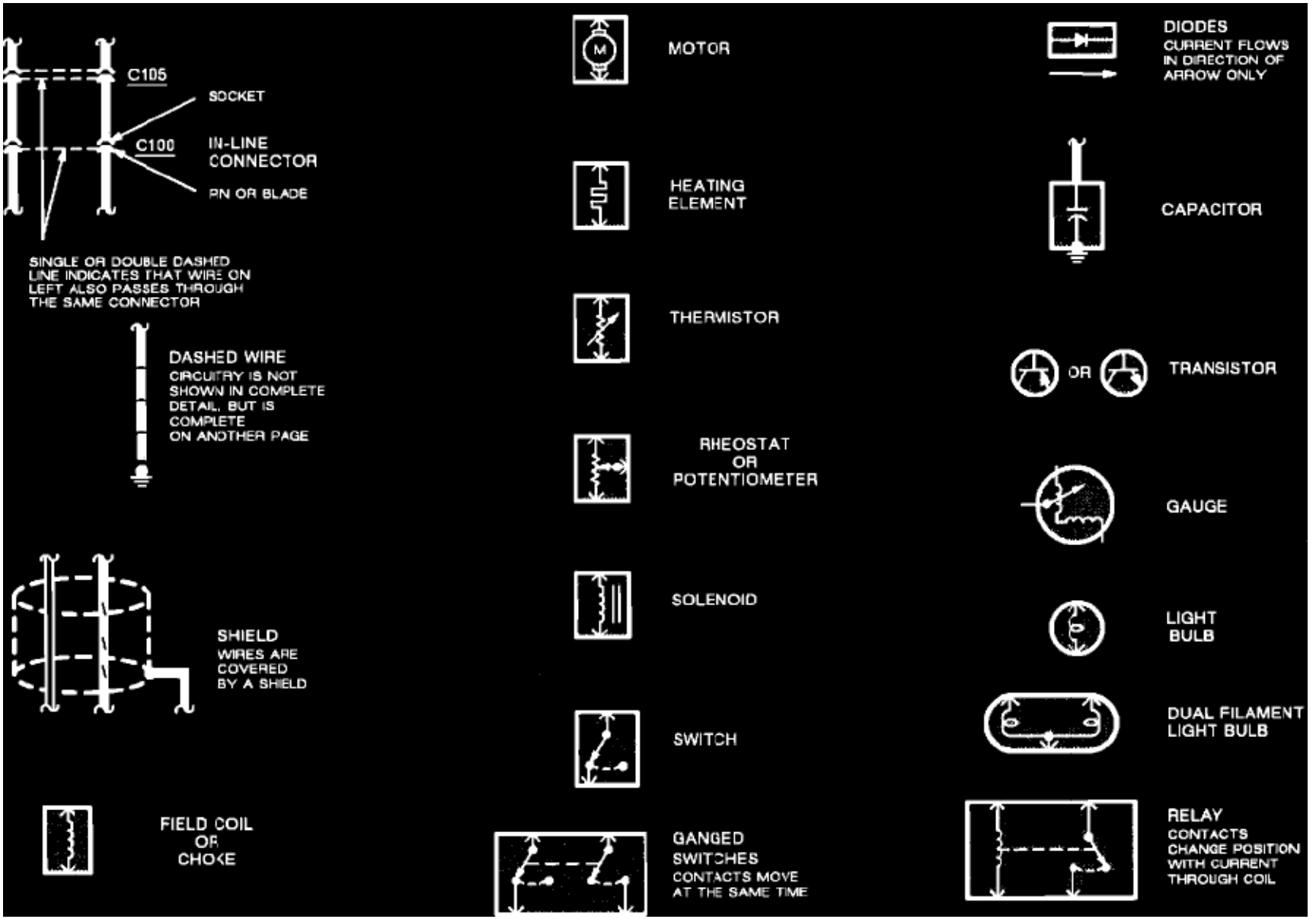


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

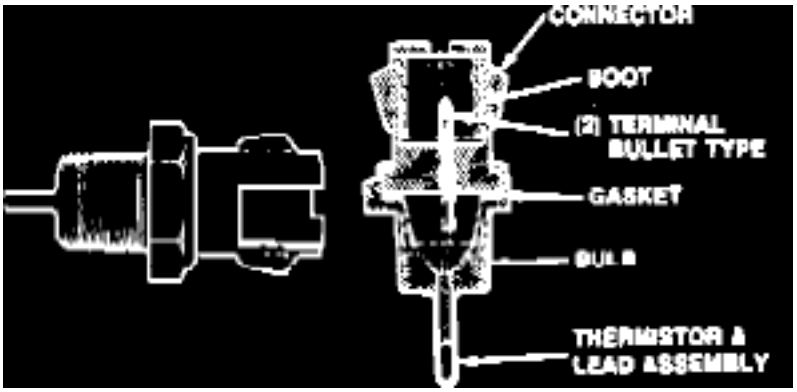
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

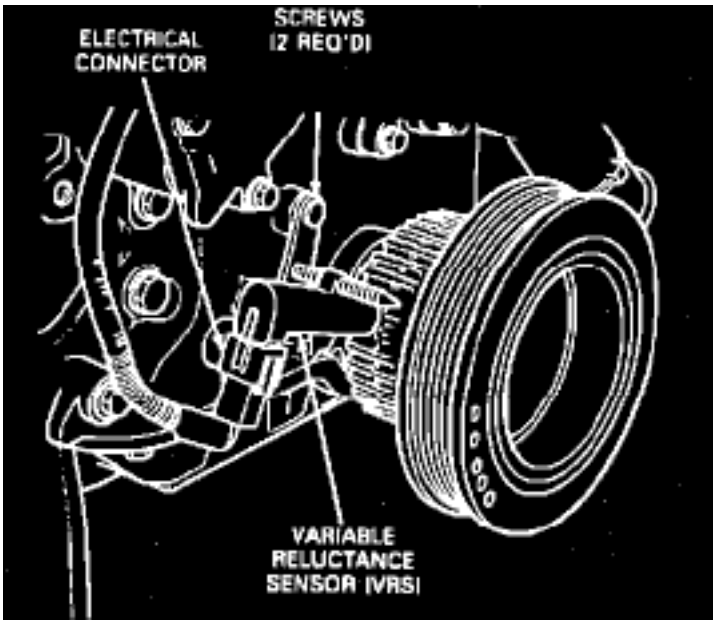
The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Crankshaft Position Sensor: Specifications

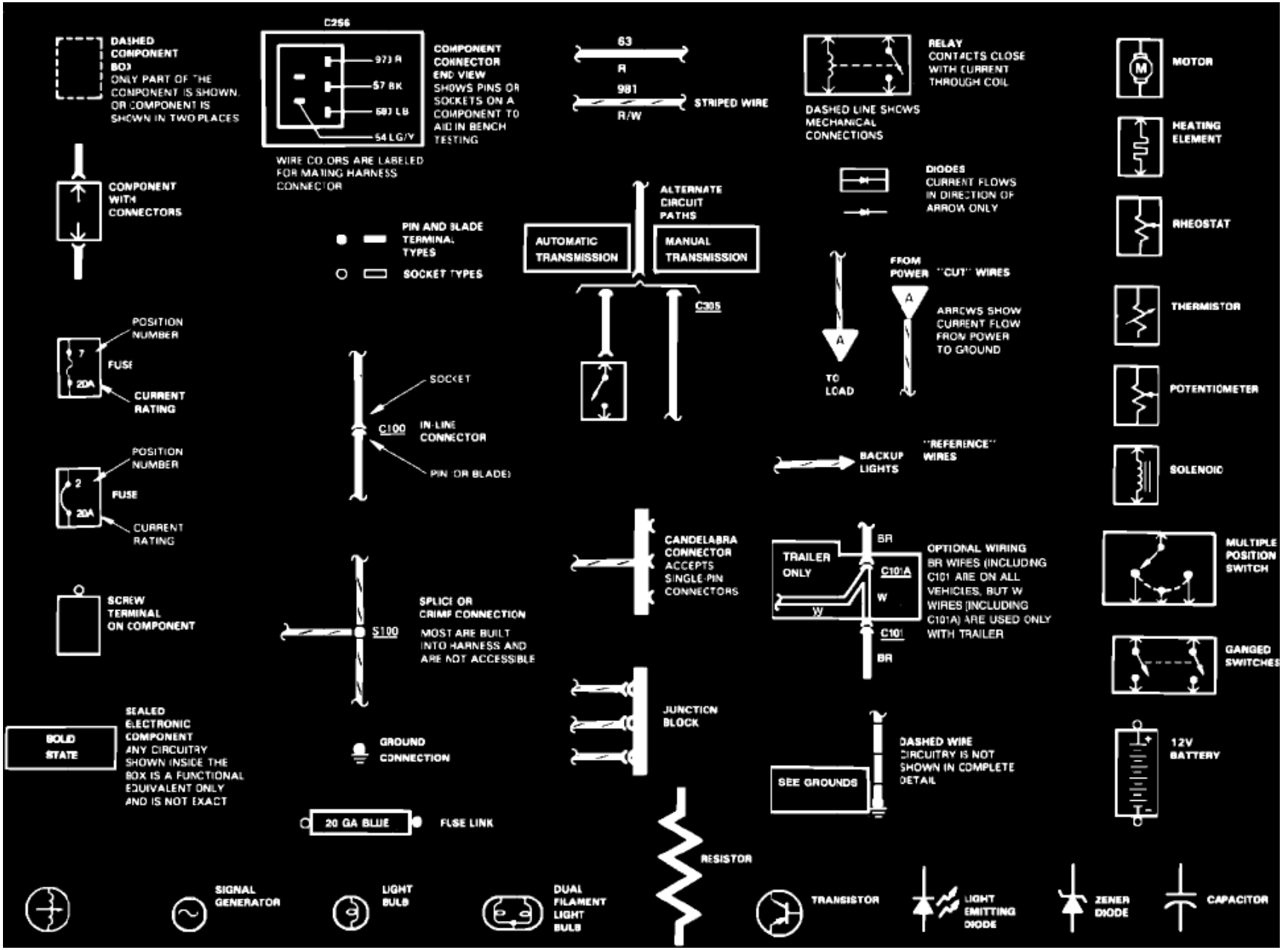
FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)

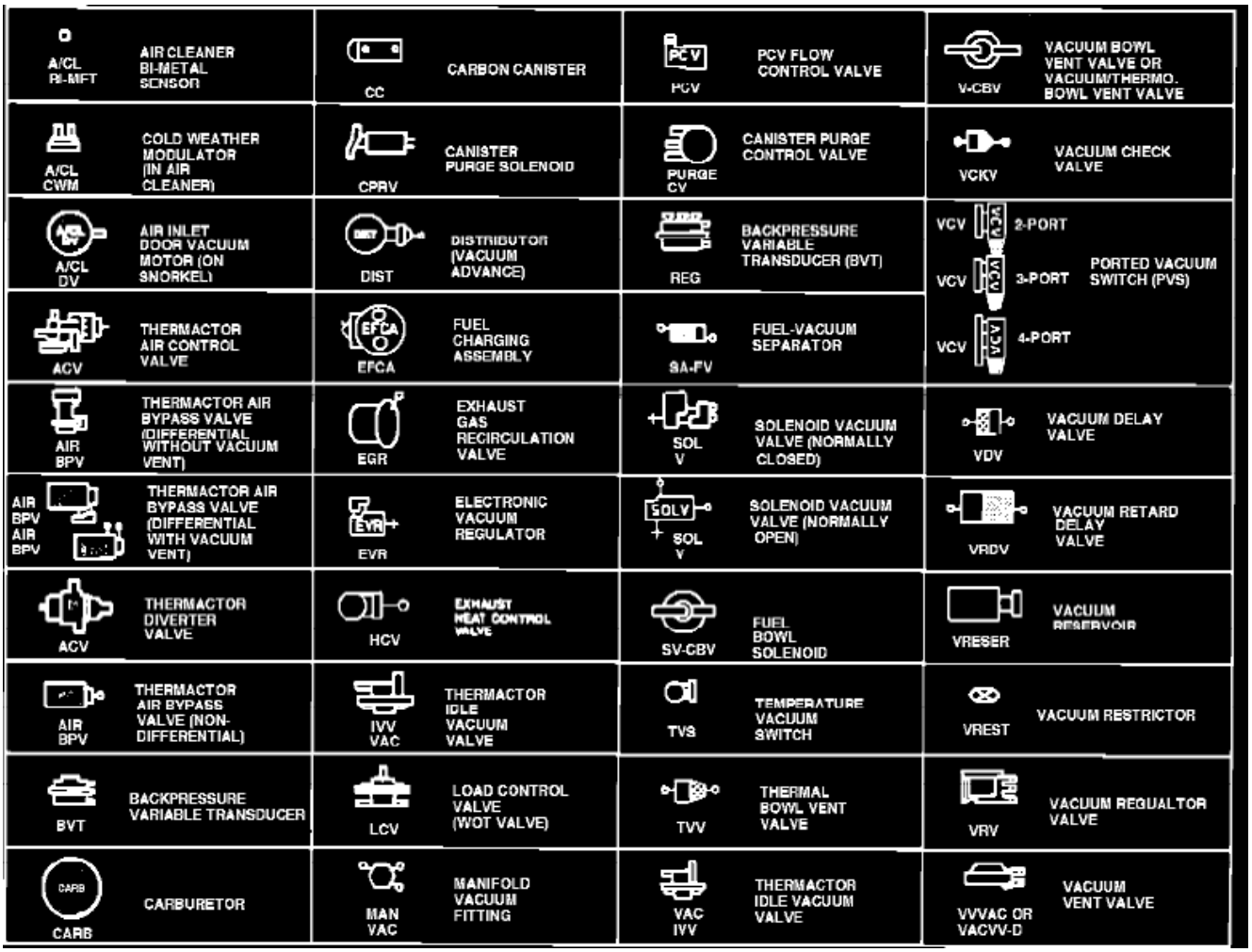


Variable Reluctance (Crankshaft Position) Sensor

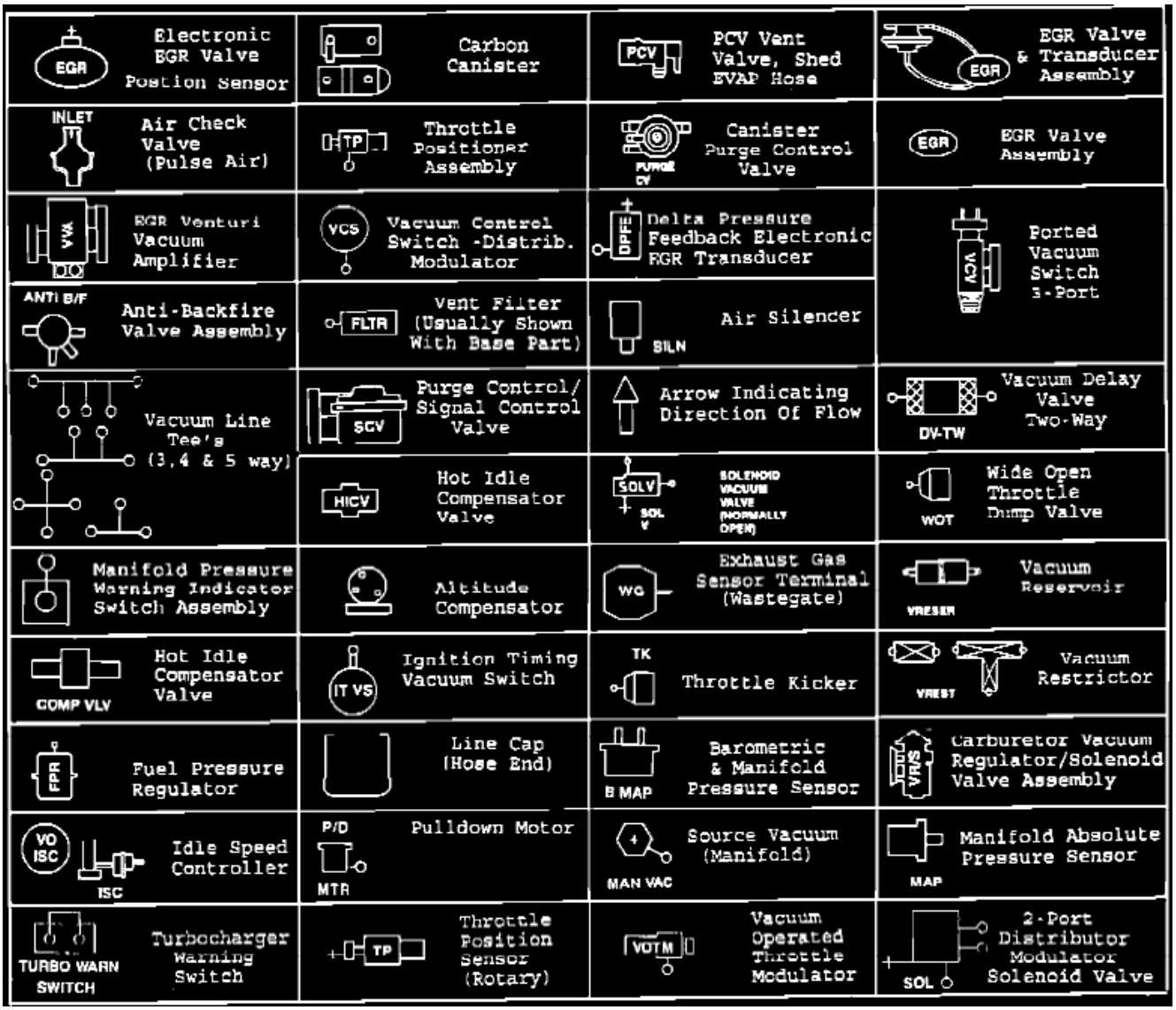


Crankshaft Position Sensor: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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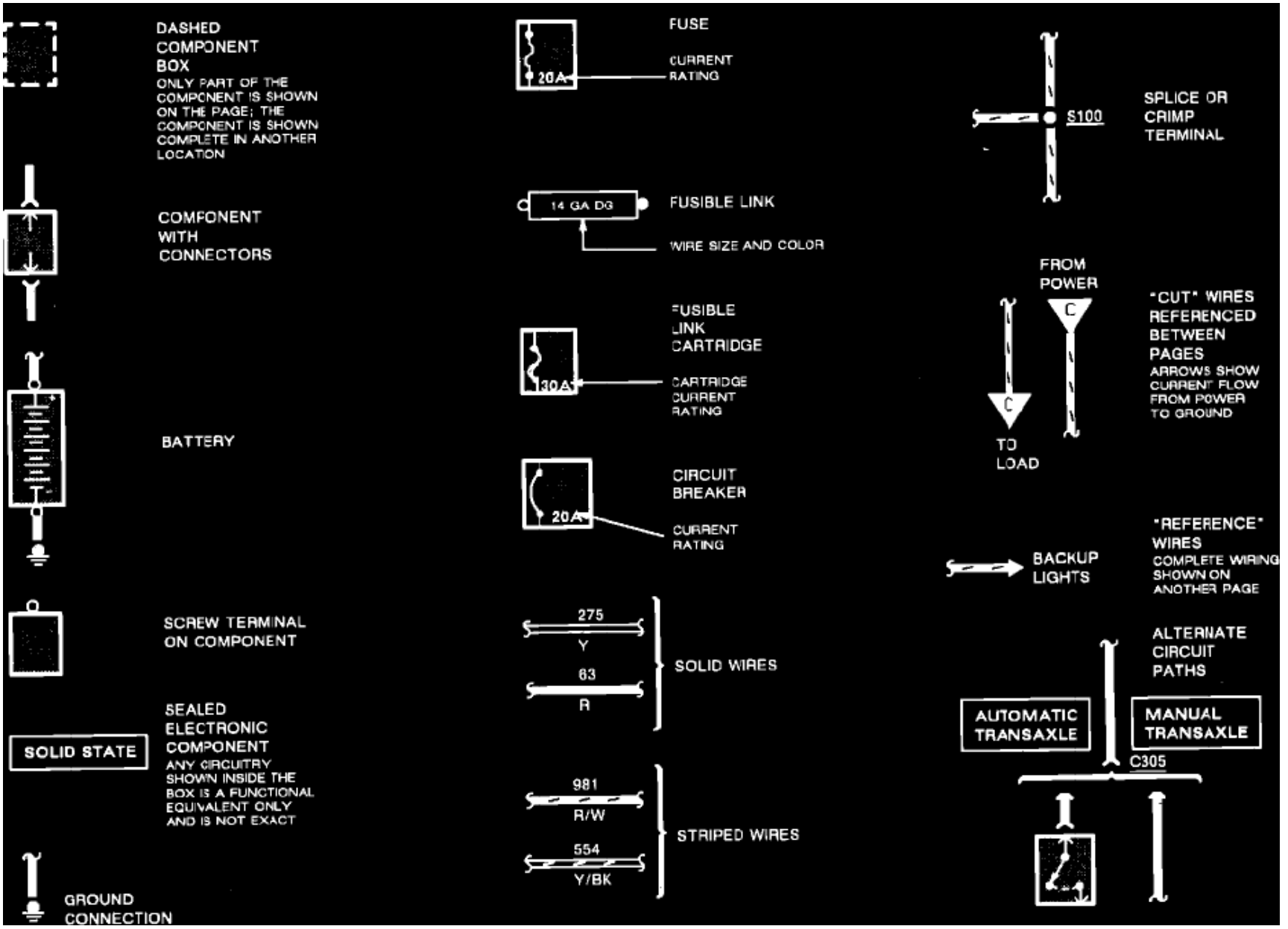
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CARTRIDGE CURRENT RATING
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CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
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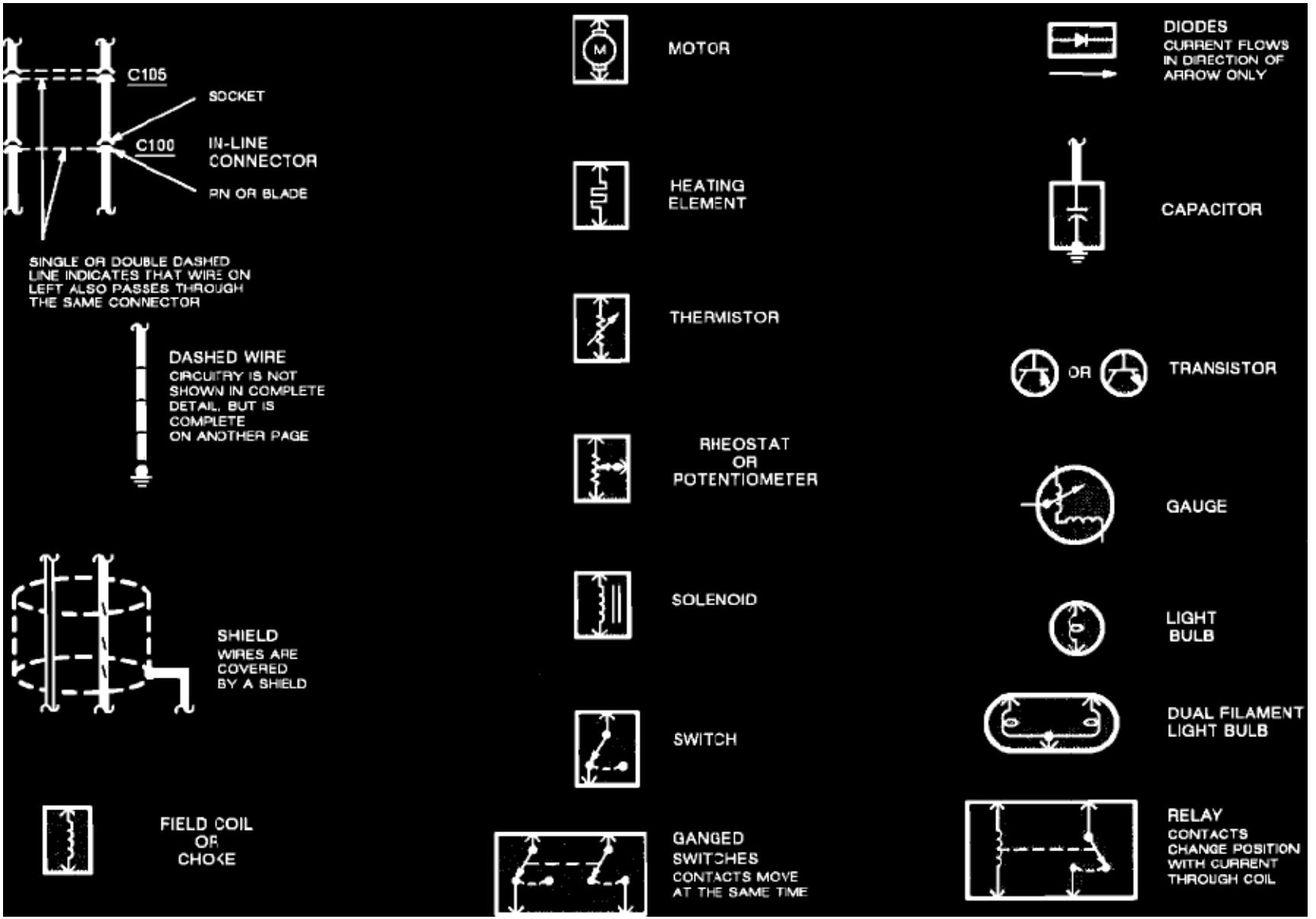

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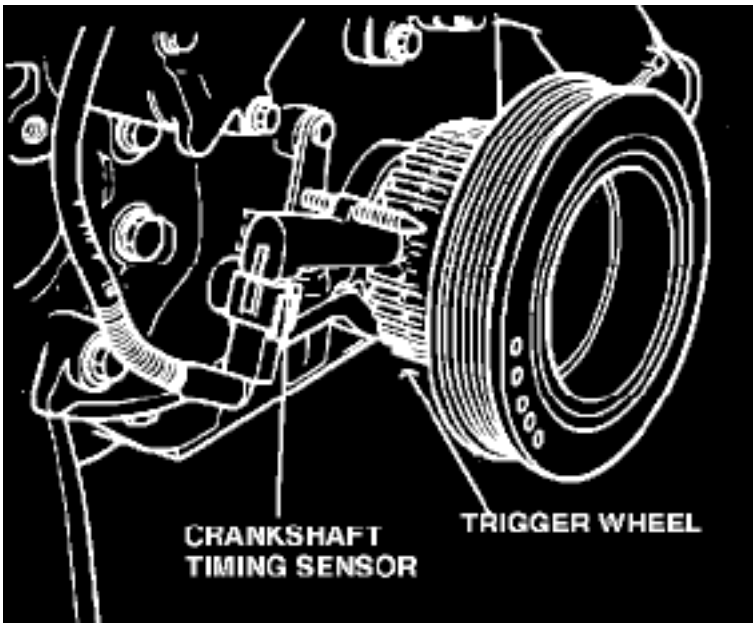
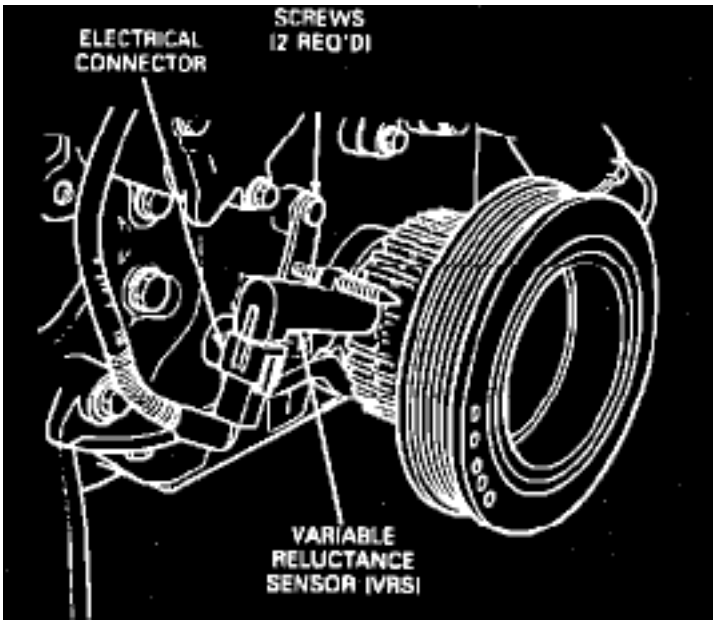


Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

INSTALLATION:

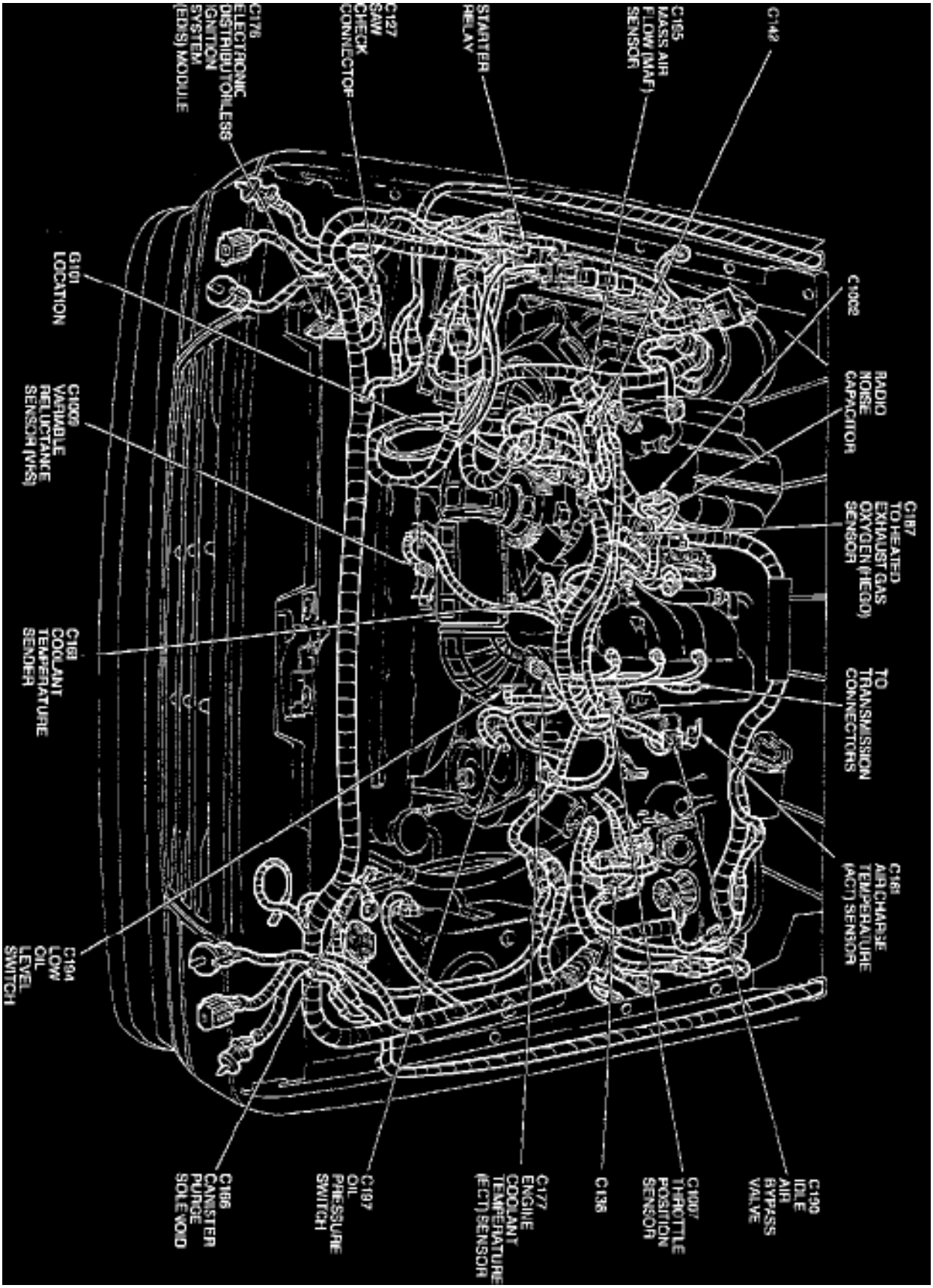
1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

4. Connect the negative battery cable.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Powertrain Management > Sensors and Switches - Computers and Control Systems > Intake Air Temperature Sensor > Component Information > Locations

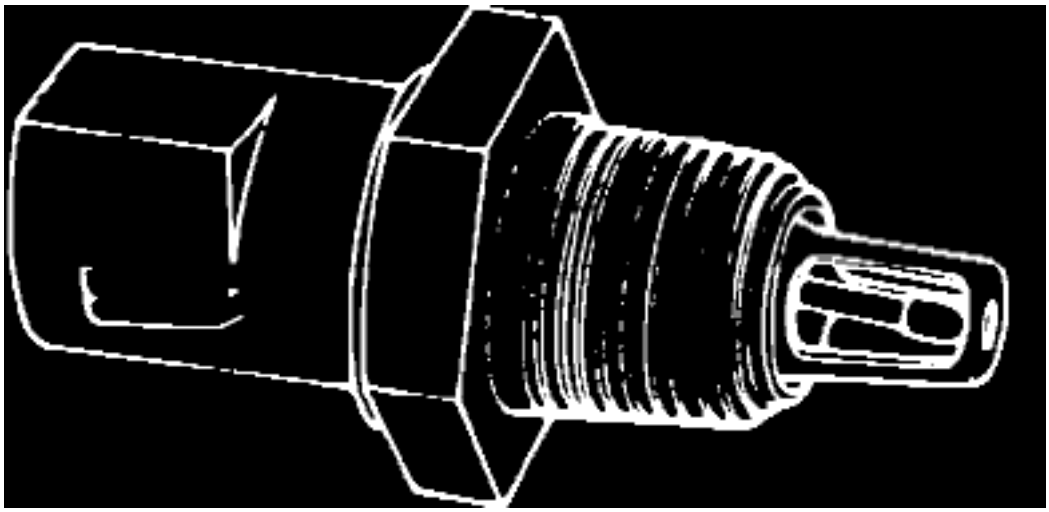


Intake Air Temperature Sensor: Locations

Engine Compartment Components.

Top LH Side Of Engine

Applicable to: 4.0L/V6-244



Intake Air Temperature Sensor: Description and Operation

Air Charge Temperature (ACT) Sensor

The Air Charge Temperature (ACT) sensor is threaded into the intake air passage with a sensing element extending into the air chamber. The ACT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) will also change. The ECA reads the varying sensor resistance and determines the air charge temperature, using this information to optimize the air/fuel mixture. The ACT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Technical Service Bulletins EGO Sensors - Silicone Contamination

Article No. 93-23-6

11/10/93

^ EGO SENSORS - SILICONE CONTAMINATION

^ ENGINE - SEALANTS, LOW VOLATILITY SILICONE REQUIRED

^ EXHAUST SYSTEM - SILICONE CONTAMINATION OF EXHAUST GAS OXYGEN (EGO) SENSORS

FORD: 1984-86 LTD 1984-88 EXP 1984-94 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-94 TAURUS 1988-93 FESTIVA 1989-94 PROBE 1994 ASPIRE

LINCOLN-MERCURY: 1984-86 CAPRI, MARQUIS 1984-87 LYNX 1984-92 MARK VII 1984-94 CONTINENTAL, COUGAR, GRAND MARQUIS, TOPAZ, TOWN CAR 1986-94 SABLE 1988-89 TRACER 1991-94 CAPRI, TRACER 1993-94 MARK VIII

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1983-94 RANGER 1984-90 BRONCO II 1984-94 BRONCO, ECONOLINE, F-150-350 SERIES 1986-94 AEROSTAR 1988-94 F-47, F-53 1991-94 EXPLORER 1993-94 VILLAGER

This TSB article is being republished in its entirety to update model applicability and to revise the part number of the Low Volatility Sealant.

ISSUE: EGO sensors can be contaminated if volatile types of silicone are used when servicing the engine. Volatile silicones can migrate throughout the system during the first one hundred hours of service. They are commonly found in liquid "silicone rubber" sealants and gasket material. These products are commonly sold in tubes and caulking-type cartridges.

ACTION: When service is performed on the engine, only use new low volatility silicone sealant (F1AZ-19662-A) where specified. Also replace the contaminated EGO sensor if required.

CAUTION: DO NOT SUBSTITUTE CONVENTIONAL SILICONE RUBBER SEALANTS WHEN LOW VOLATILITY SILICONE SEALANT IS SPECIFIED.

PART NUMBER PART NAME CLASS

F1AZ-19662-A Low Volatility RTV Sealant B

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 89-14-5

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 490000, 499000

Oxygen Sensor: Technical Service Bulletins Heated Exhaust Gas Oxygen Sensor - Application Chart

Article No. 94-16-9

08/10/94

EXHAUST - HEATED OXYGEN SENSOR (H02S) - APPLICATION CHART

FORD: 1991-94 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991-94 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1993-94 MARK VIII

LIGHT TRUCK: 1991-94 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F SUPER DUTY, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 F & B SERIES

ISSUE: Quick Reference Heated Oxygen Sensor (H02S) Application Charts have been developed to assist technicians and parts managers in correct parts usage.

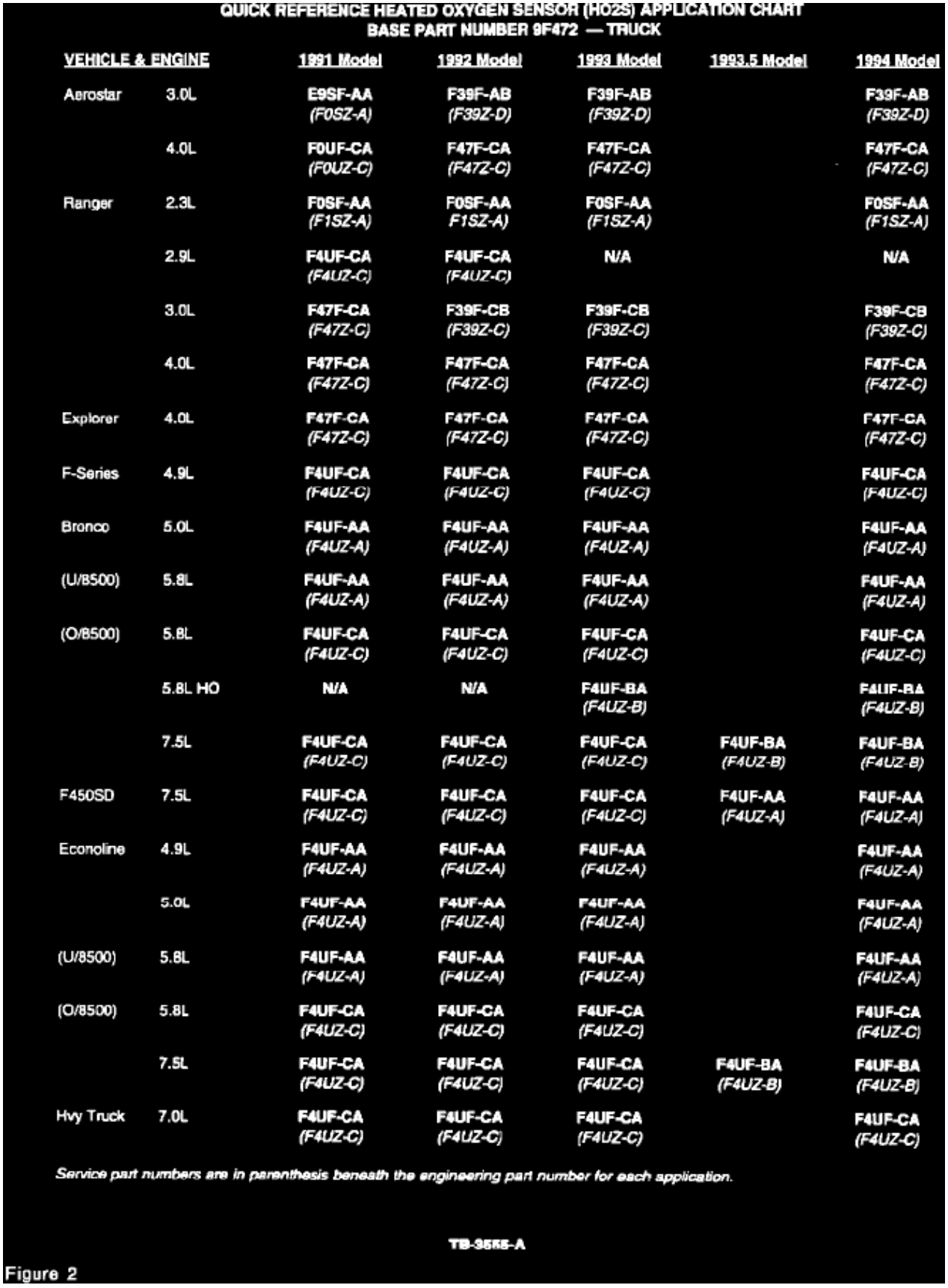
QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — CAR

VEHICLE & ENGINE		1991 Model	Qty	1992 Model	Qty	1993 Model	Qty	1994 Model	Qty
Escort	1.9L	E93F-AA *(F03Z-A)*	1	F09F-AA *(F09Z-A)*	1	F09F-AA *(F09Z-A)*	1	F0SF-AA *(F1SZ-A)*	1
Tempo/Topaz	2.3L	E9SF-BA *(F0SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1
	3.0L	N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
Taurus/Sable	2.5L	F0SF-AA *(F1SZ-A)*	1	N/A		N/A		N/A	
	3.0L	F0SF-AA *(F1SZ-A)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2
	3.8L	F4AF-AA *(F4AZ-A)*	2	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1
				# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1
	3.2L SHO	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
	3.0L SHO	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2
Mustang	2.3L DP	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	N/A	
	3.8L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
	5.0L HO+	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	F4SF-DA *(F4SZ-D)*	2
T/Bird/Cougar	3.8L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	3.8LSC	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	5.0L HO+	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A	
	4.6L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
Crown Vic/ Grand Marquis	4.6L;4BS	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2
	4.6L CAL	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-BA *(F4AZ-B)*	2
Continental	3.8L	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A/		N/A/	
	3.8L	N/A		@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1
		N/A		# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1
Town Car	4.6L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	N/A	
	4.6L LIMO	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L CAL	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L;4BS	N/A		N/A		N/A		F4AF-AA *(F4AZ-A)*	2
Mark VIII	4.6L 4V	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F4AF-AA *(F4AZ-A)*	2

NOTE: Boxed areas are recommended new parts for service (ITALICIZED numbers are service part numbers).
@ Engine control sensor located in rear manifold/exhaust pipe.
# Engine control sensor located in front manifold/exhaust pipe.

TB-3554-A

Figure 1



QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — TRUCK

VEHICLE & ENGINE		1991 Model	1992 Model	1993 Model	1993.5 Model	1994 Model
Aerostar	3.0L	E9SF-AA (F0SZ-A)	F39F-AB (F39Z-D)	F39F-AB (F39Z-D)		F39F-AB (F39Z-D)
	4.0L	F0UF-CA (F0UZ-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
Ranger	2.3L	F0SF-AA (F1SZ-A)	F0SF-AA F1SZ-A)	F0SF-AA (F1SZ-A)		F0SF-AA (F1SZ-A)
	2.9L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	N/A		N/A
	3.0L	F47F-CA (F47Z-C)	F39F-CB (F39Z-C)	F39F-CB (F39Z-C)		F39F-CB (F39Z-C)
	4.0L	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
Explorer	4.0L	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
F-Series	4.9L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
Bronco	5.0L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(U/B500)	5.8L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(O/B500)	5.8L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
	5.8L HO	N/A	N/A	F4UF-BA (F4UZ-B)		F4UF-BA (F4UZ-B)
	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-BA (F4UZ-B)	F4UF-BA (F4UZ-B)
F450SD	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)
Econoline	4.9L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
	5.0L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(U/8500)	5.8L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(O/8500)	5.8L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-BA (F4UZ-B)	F4UF-BA (F4UZ-B)
Hvy Truck	7.0L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)

Service part numbers are in parenthesis beneath the engineering part number for each application.

TB-3555-A

Figure 2

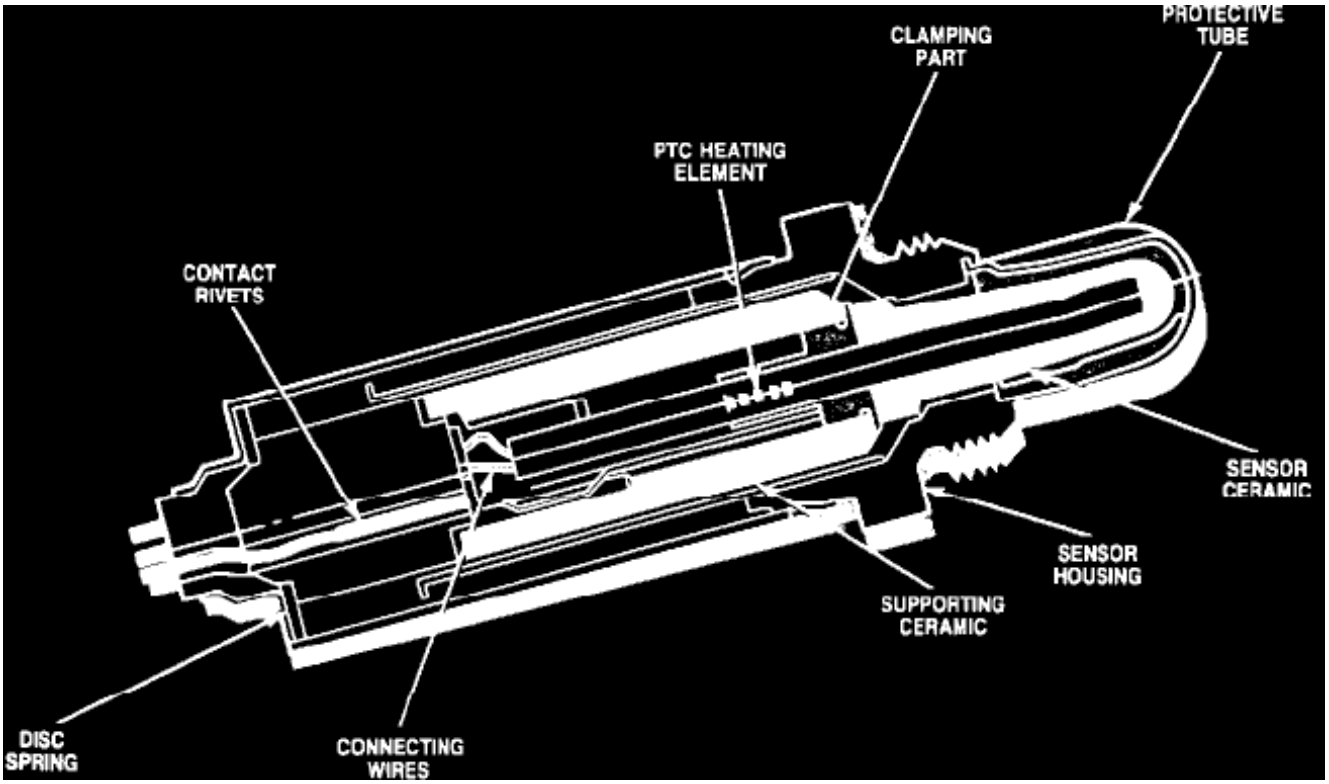
ACTION: Refer to the appropriate Quick Reference Heated Oxygen Sensor (HO2S) Application Chart for Passenger Car or Truck, Figures 1 and 2, to make sure that the correct service sensor is

installed. In some cases, new applications are shown.

PART NUMBER	PART NAME	CLASS
FOSZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-D	Heated Oxygen Sensor	A
FOUZ-9F472-C	Heated Oxygen Sensor	B
F47Z-9F472-C	Heated Oxygen Sensor	A
F1SZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-A	Heated Oxygen Sensor	A
F4UZ-9F472-B	Heated Oxygen Sensor	A
FO3Z-9F472-A	Heated Oxygen Sensor	B
FO9Z-9F472-A	Heated Oxygen Sensor	B
F1SZ-9F472-B	Heated Oxygen Sensor	B
F4AZ-9F472-A	Heated Oxygen Sensor	A
F4AZ-9F472-B	Heated Oxygen Sensor	A
F4ZZ-9F472-A	Heated Oxygen Sensor	A
F4SZ-9F472-D	Heated Oxygen Sensor	A
F4SZ-9F472-A	Heated Oxygen Sensor	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 623000



Oxygen Sensor: Description and Operation

Heated Oxygen Sensor

The Heated Exhaust Gas Oxygen (HEGO) sensor is threaded into the exhaust manifold with a sampling tip extending into the exhaust stream. The sensor is a zirconium dioxide ceramic thimble with platinum surface electrodes. The ceramic thimble is oxygen ion conductive and generates voltage due to the oxygen content difference between the atmosphere and the exhaust gas. The sensor will generate a voltage signal between 0 volts (lean condition) and 1.1 volts (rich condition). The ECU reads this signal to achieve an air/fuel ratio of 14.7:1 when operating in CLOSED LOOP. The HEGO sensor must operate above 600°F. To quickly heat up the sensor, a heating element is incorporated into the sensor. The HEGO sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Service and Repair

The oxygen sensor has a permanently attached wire and connector. This should not be removed, since the removal will affect proper operation of the oxygen sensor.

1. Disconnect electrical connector from oxygen sensor.

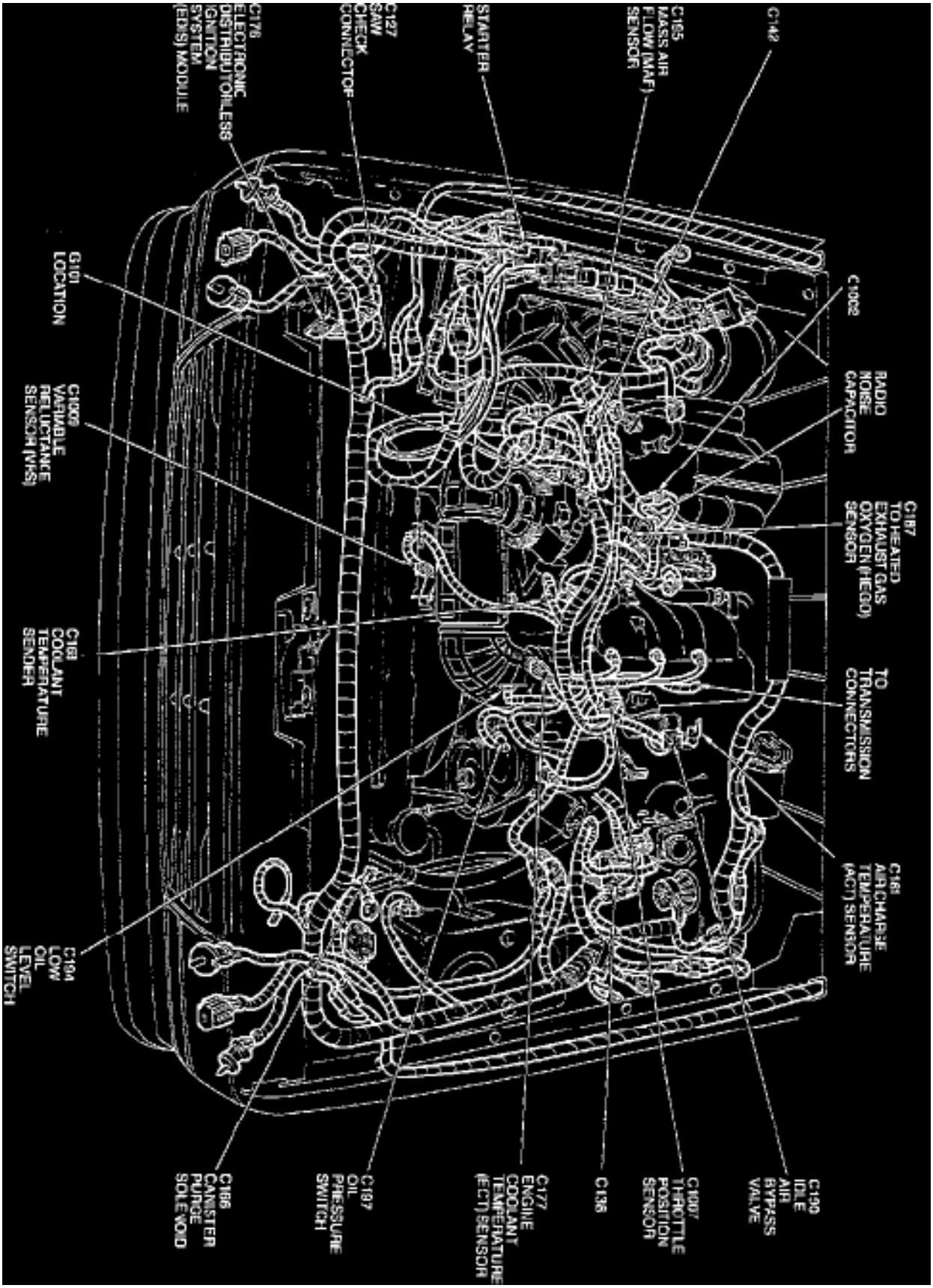
2. Using a suitable oxygen sensor wrench, carefully remove the sensor from exhaust manifold or pipe. The oxygen sensor may be difficult to remove when engine temperature is below 120°F. CAUTION: Excessive force may damage threads in exhaust manifold or pipe.

3. If a new sensor is being used, install the new sensor into the manifold or pipe.

4. If an old sensor is being reused, coat threads with anti-seize compound, then install the sensor into the manifold or pipe.

5. Torque the oxygen sensor to 30-36 lb. ft. (40-50 N-m), and reconnect the electrical connector.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Powertrain Management > Sensors and Switches - Computers and Control Systems > Throttle Position Sensor > Component Information > Locations

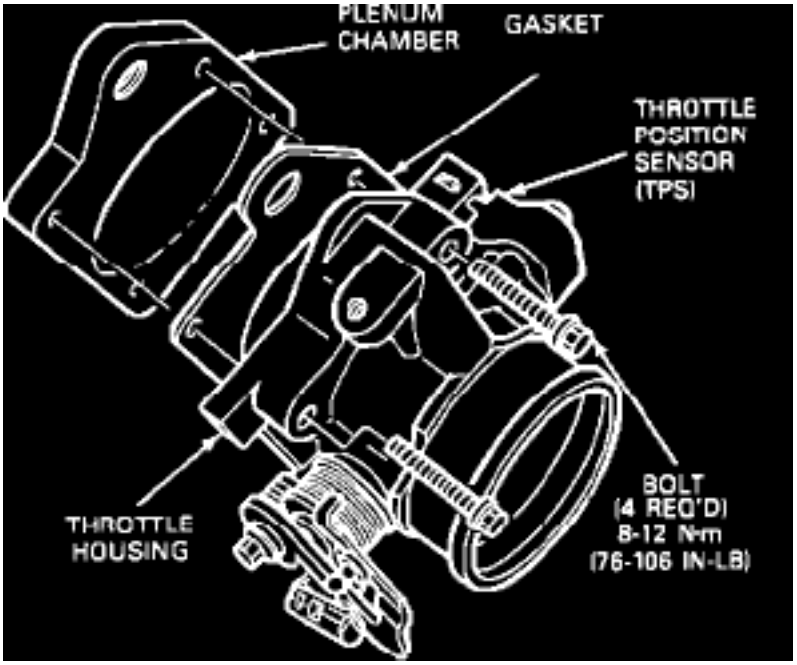


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



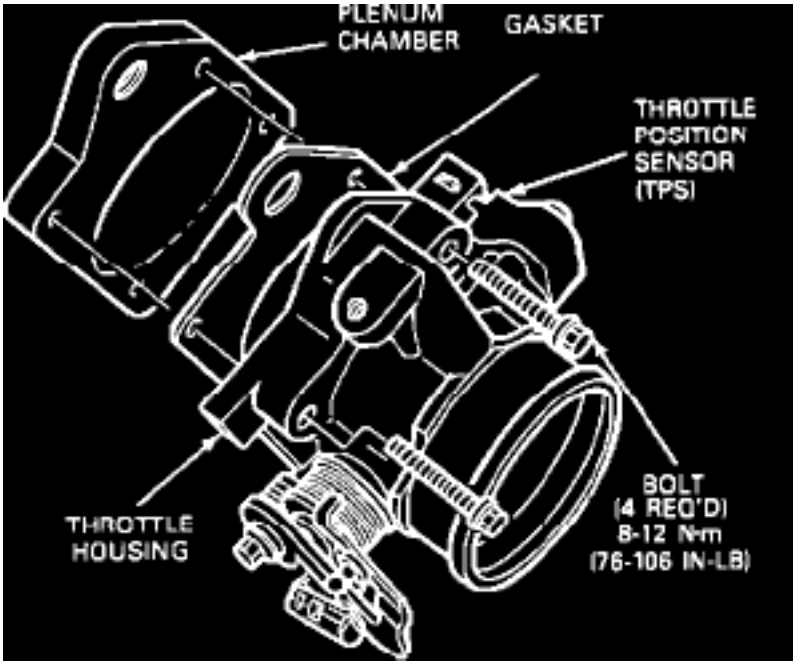
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

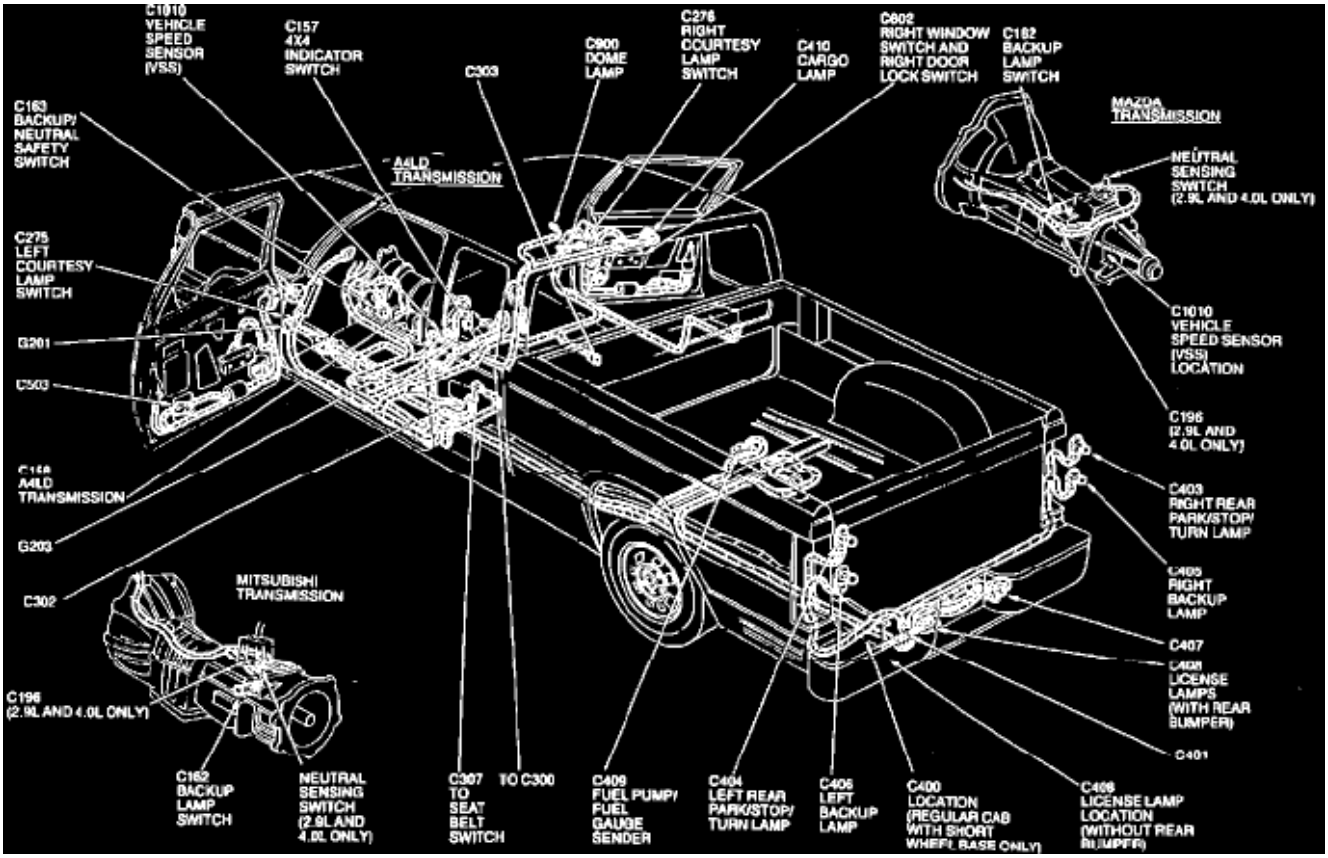
3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.



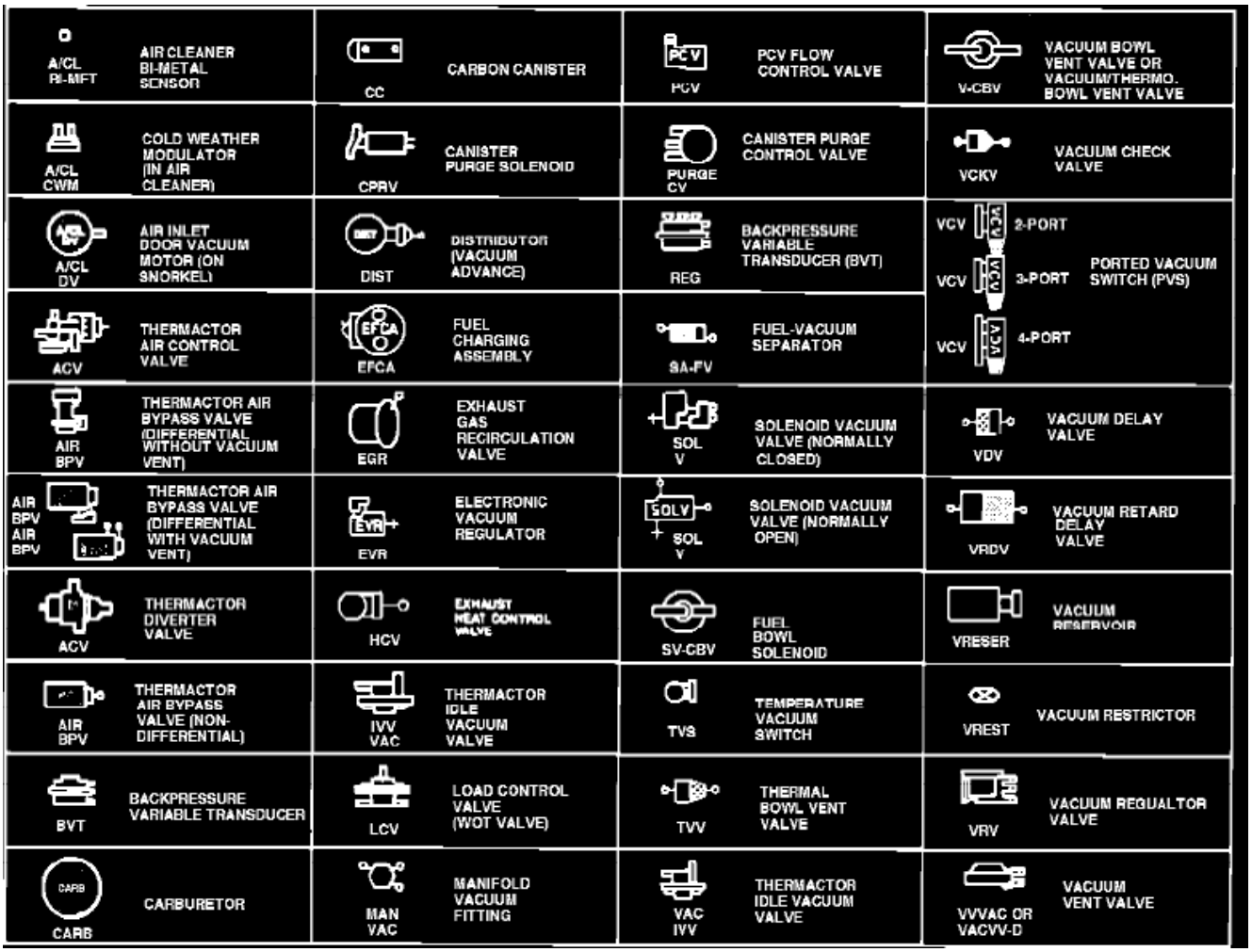
Vehicle Speed Sensor: Locations

Body Components

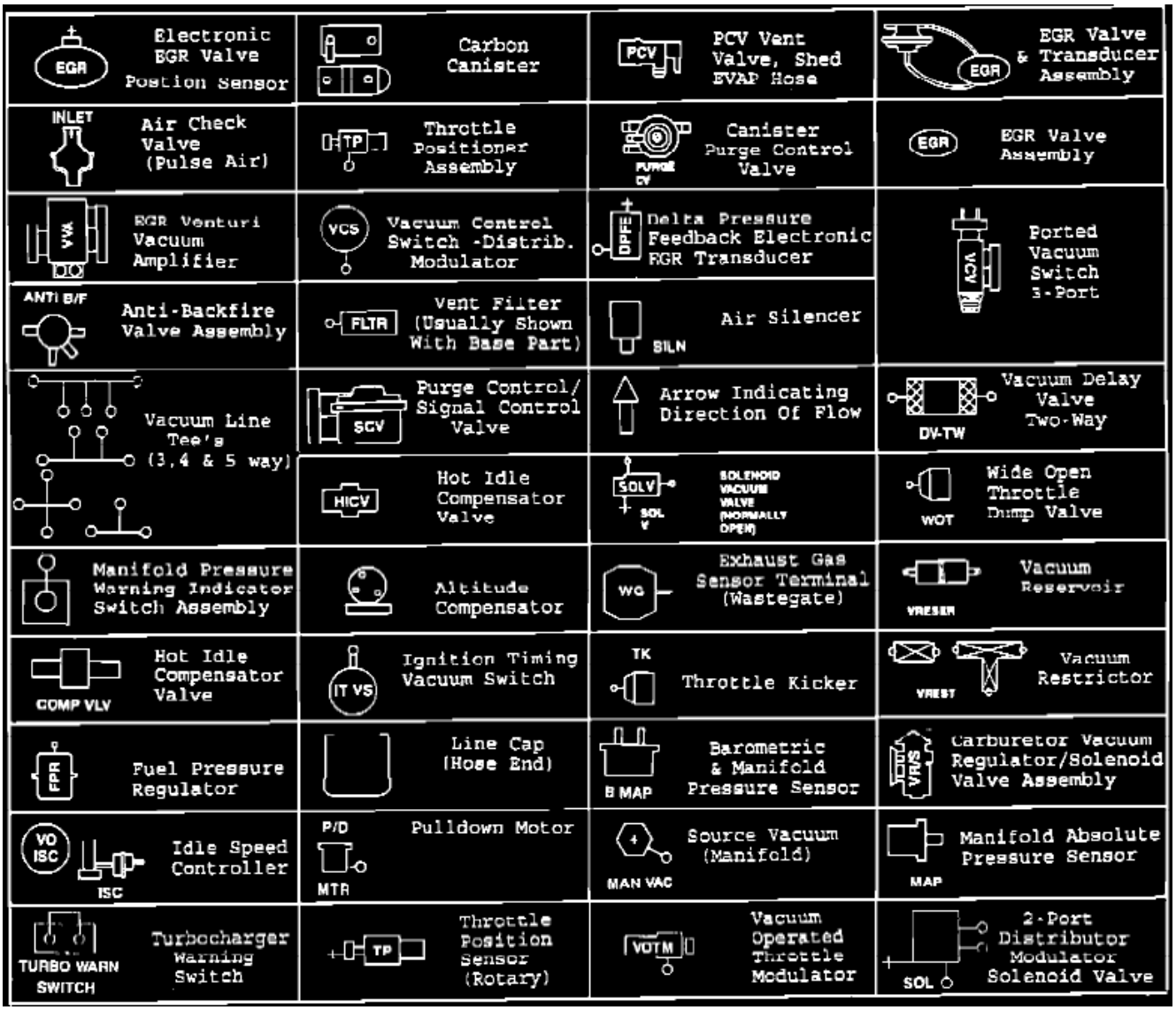
Top Of Transfer Case

Vehicle Speed Sensor: Diagram Information and Instructions

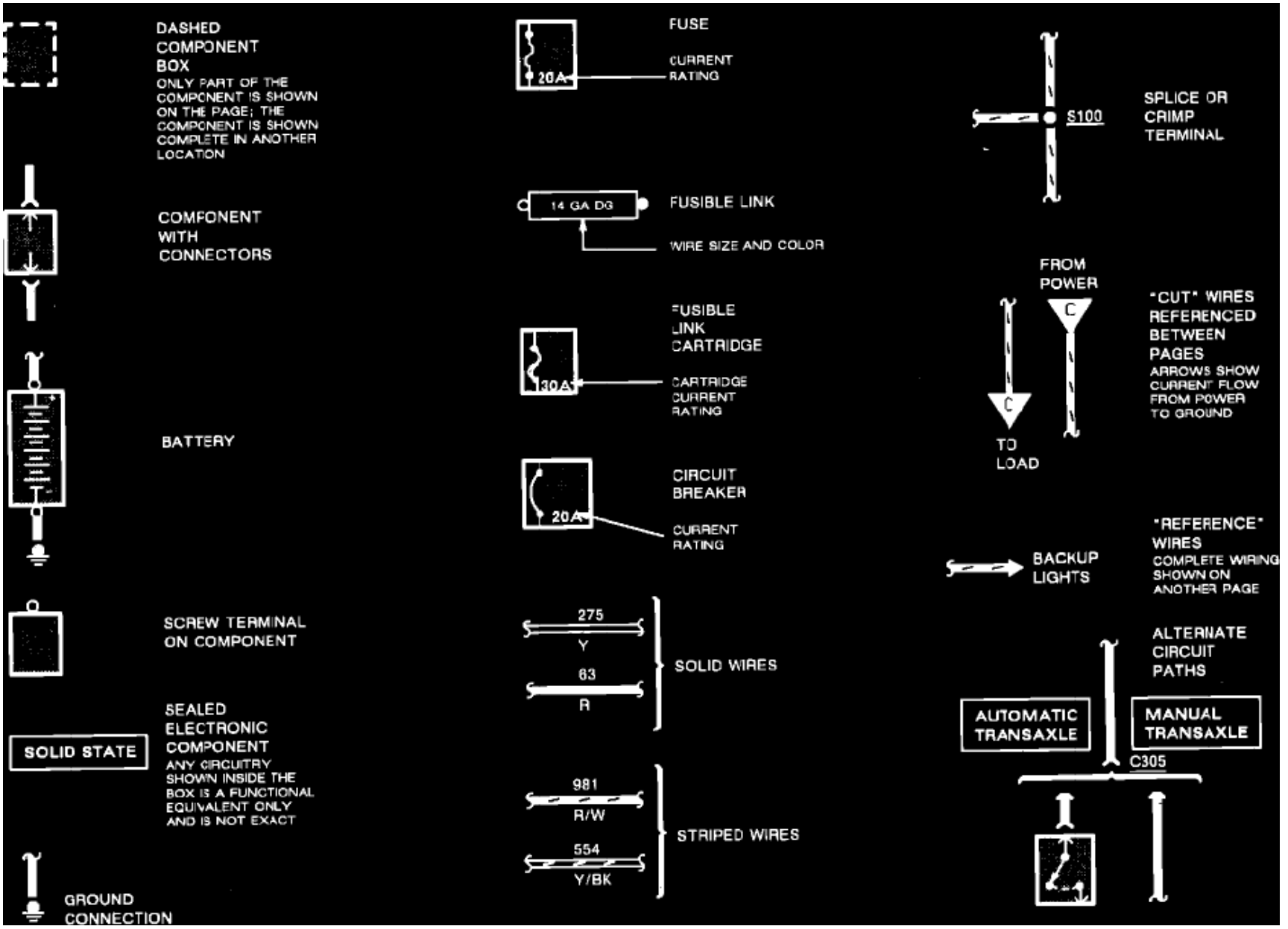
Symbol Identification

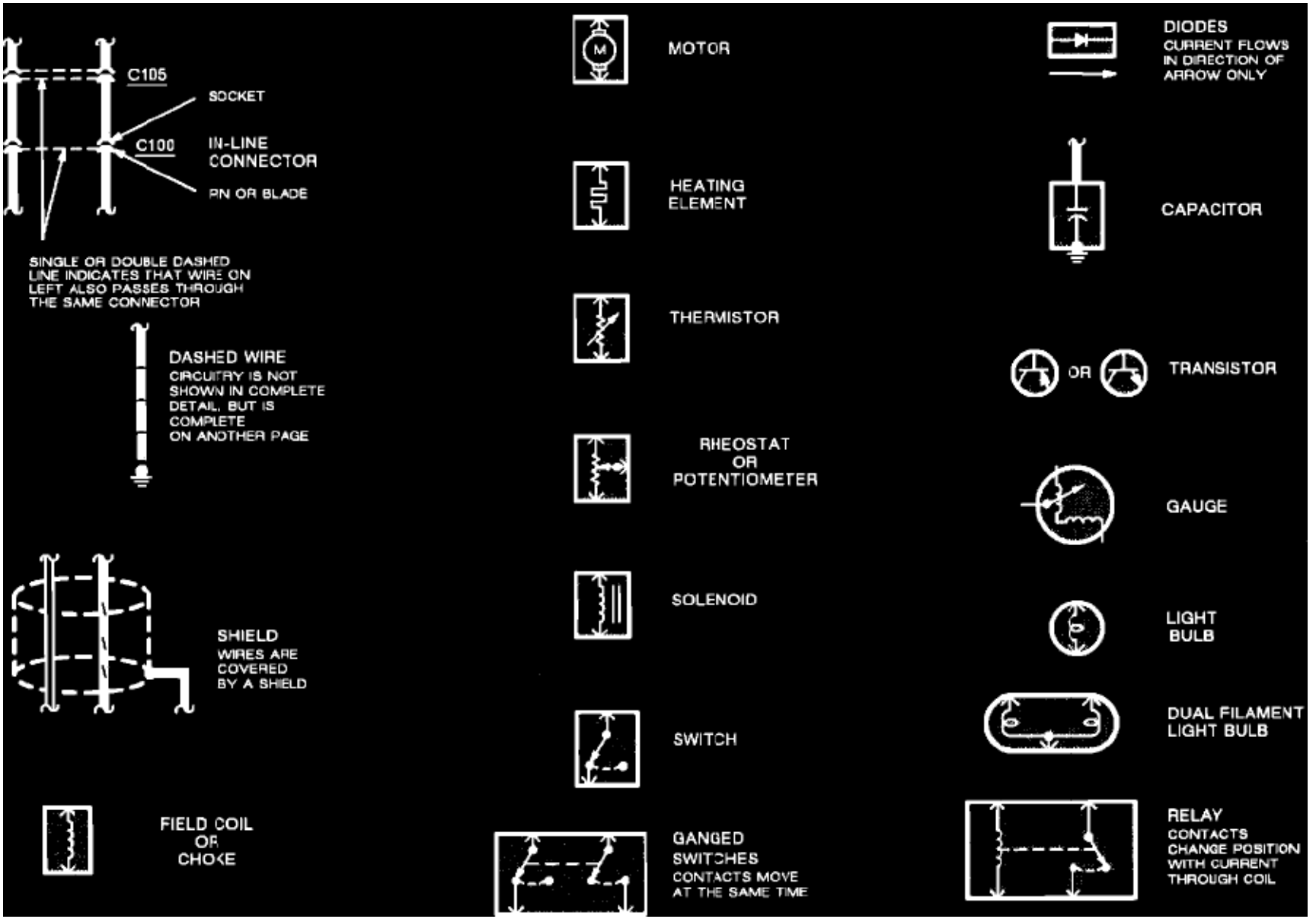


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

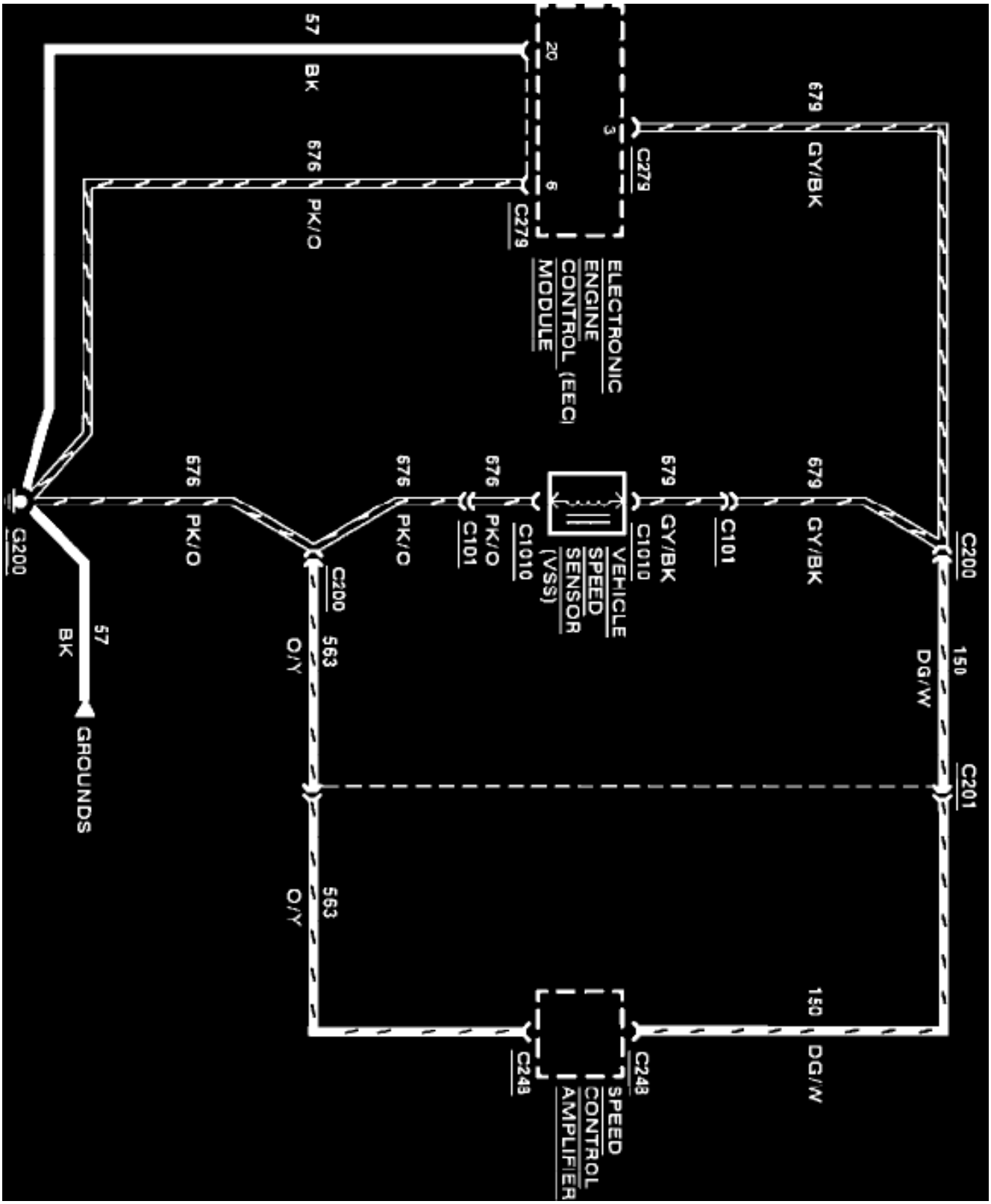
P: Purple

T: Tan

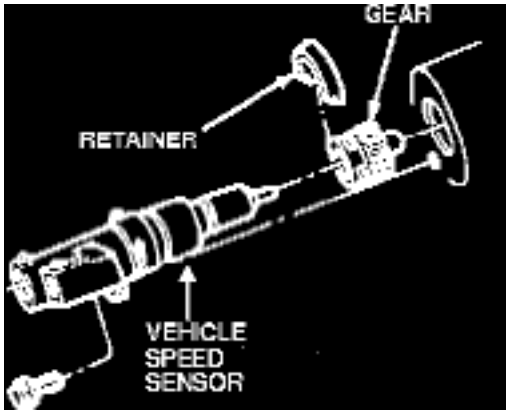
V: Violet

W: White

Y: Yellow



Vehicle Speed Sensor



Vehicle Speed Sensor: Description and Operation

Vehicle Speed Sensor

The Vehicle Speed Sensor (VSS) is a magnetic pulse generator driven by the transmission speedometer gear. The VSS produces 16 AC signals per revolution and sends this signal to the Engine Control Unit (ECA). The ECA converts this signal to a vehicle speed value and stores that value in RAM memory. The ECA uses this value to aid in controlling torque converter lock-up, coolant fan control, vehicle speed control, air/fuel ratio, and igniting timing.

Vehicle Speed Sensor: Service and Repair

1. Separate electrical connector leading to the amplifier assembly.

2. Disconnect upper and lower speedometer cables at the speed sensor. Remove speed sensor.

3. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Powertrain Management > Sensors and Switches - Fuel Delivery and Air Induction > Mass Air Flow (MAF) Sensor <--> [Air Flow Meter/Sensor] > Component Information > Technical Service Bulletins > Customer Interest for Mass Air Flow (MAF) Sensor: > 98-23-10 > Nov > 98 > Engine - Lean Driveability Symptoms

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

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FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

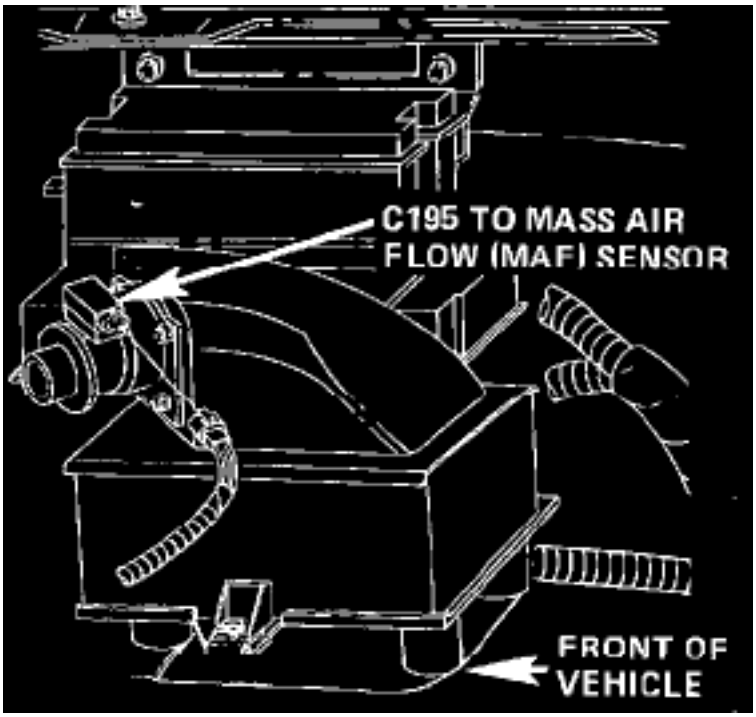
4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

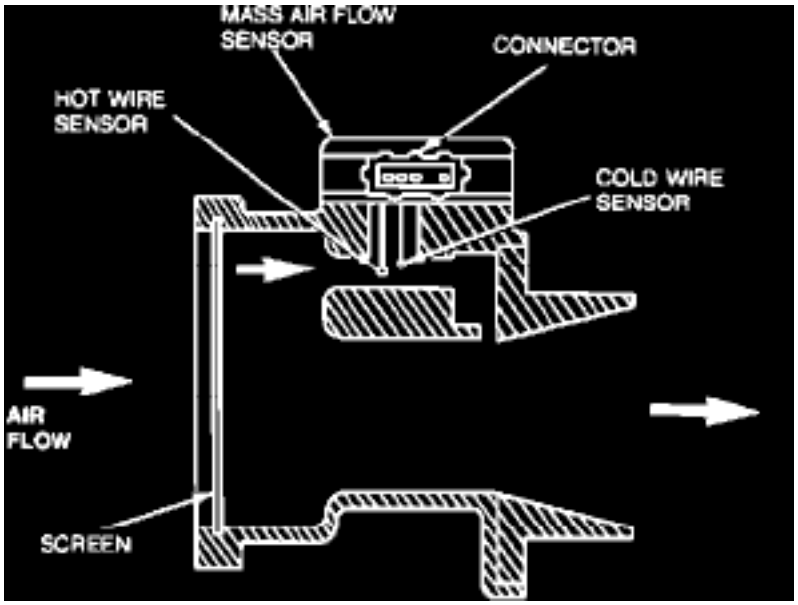
DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



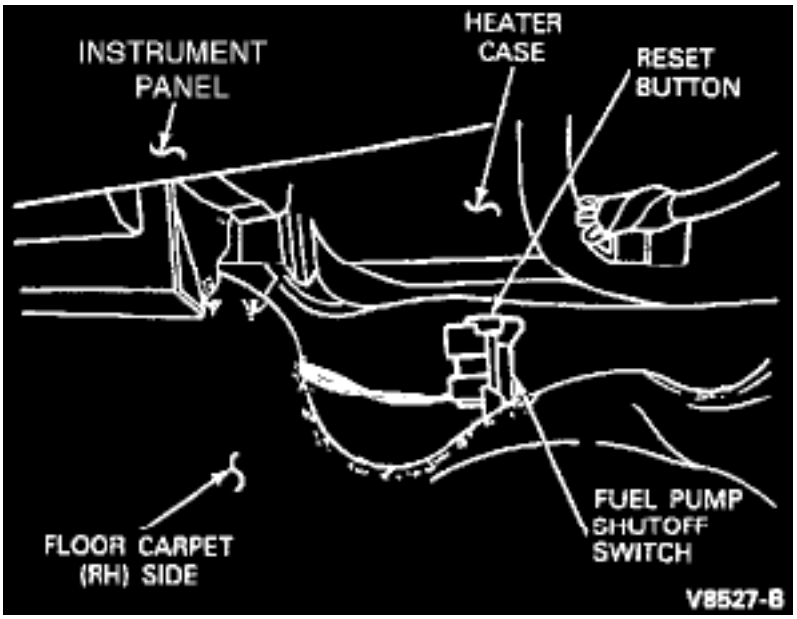
Mass Air Flow (MAF) Sensor



Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

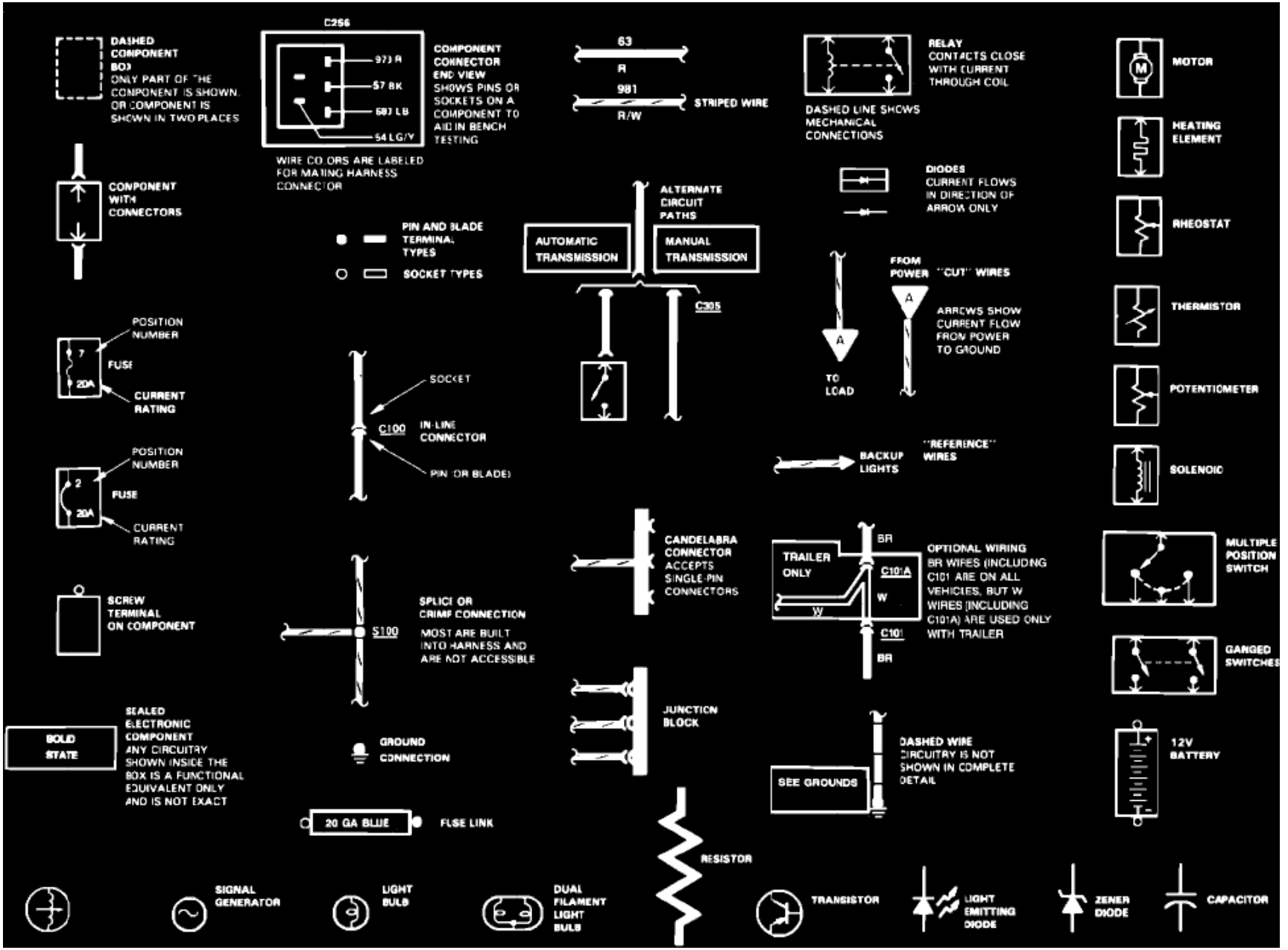
The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



Fuel Pump Inertia Switch: Locations

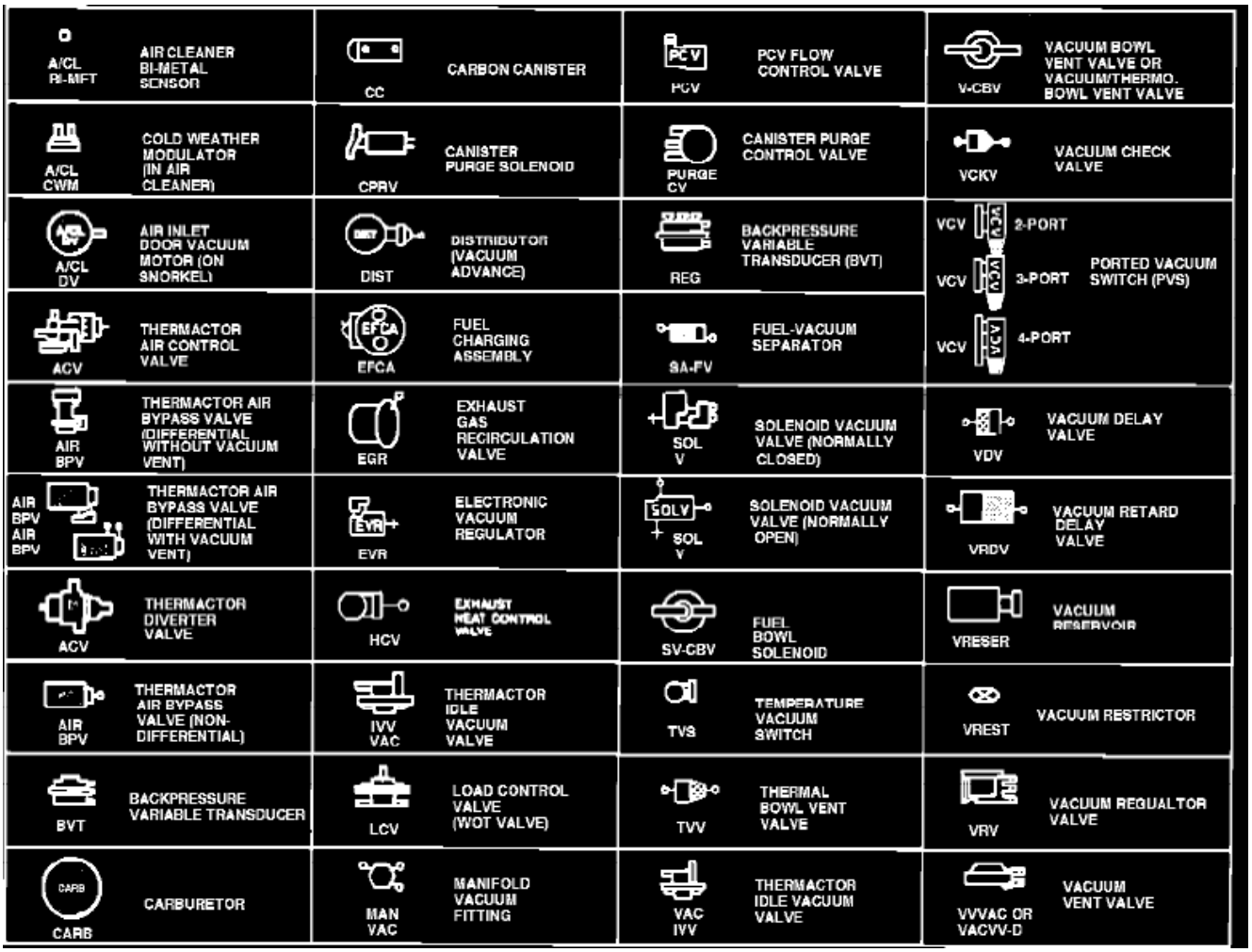
Inertia Switch

The inertia switch is located below the instrument panel, to the right of the transmission hump.

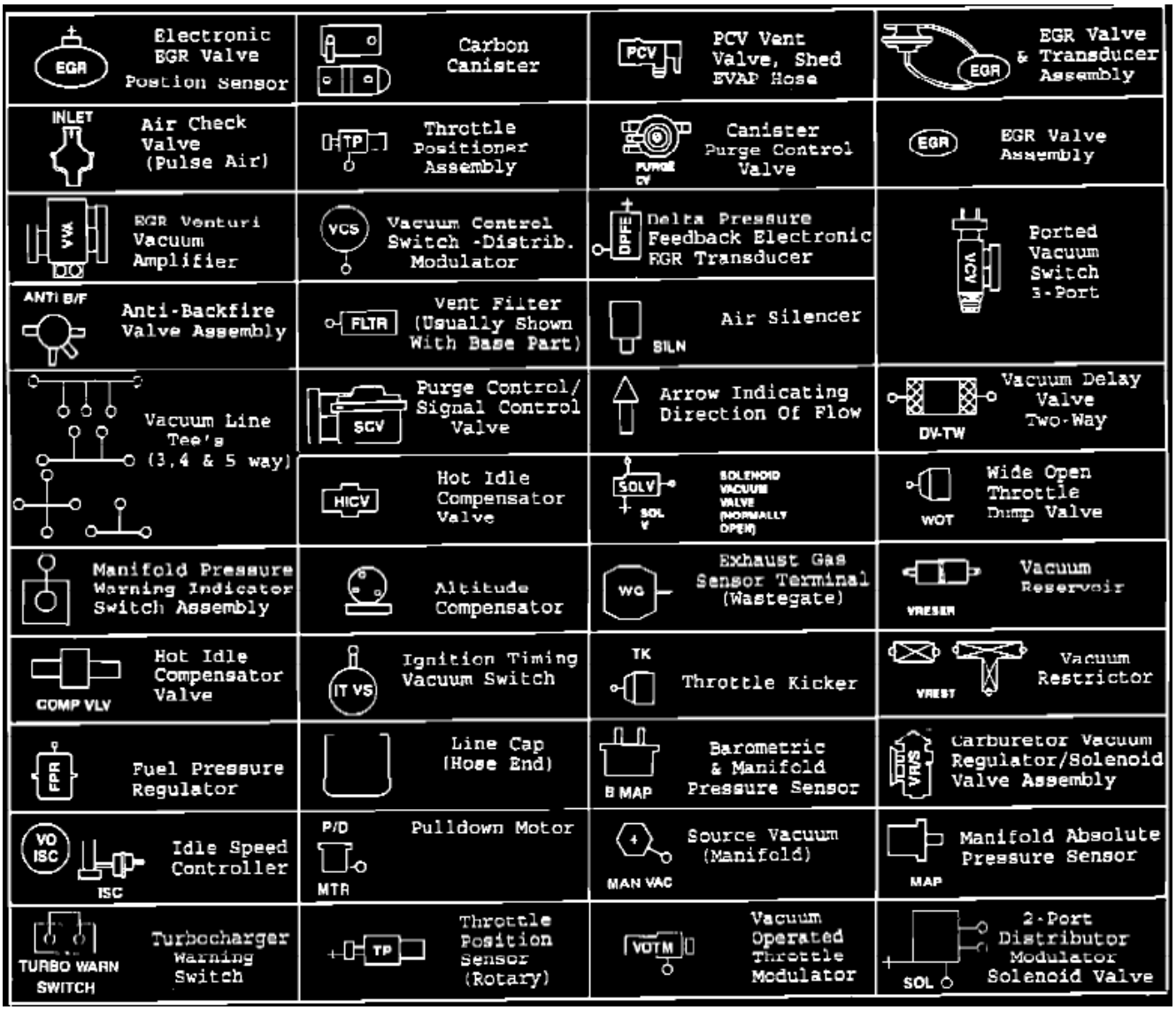


Fuel Pump Inertia Switch: Diagram Information and Instructions

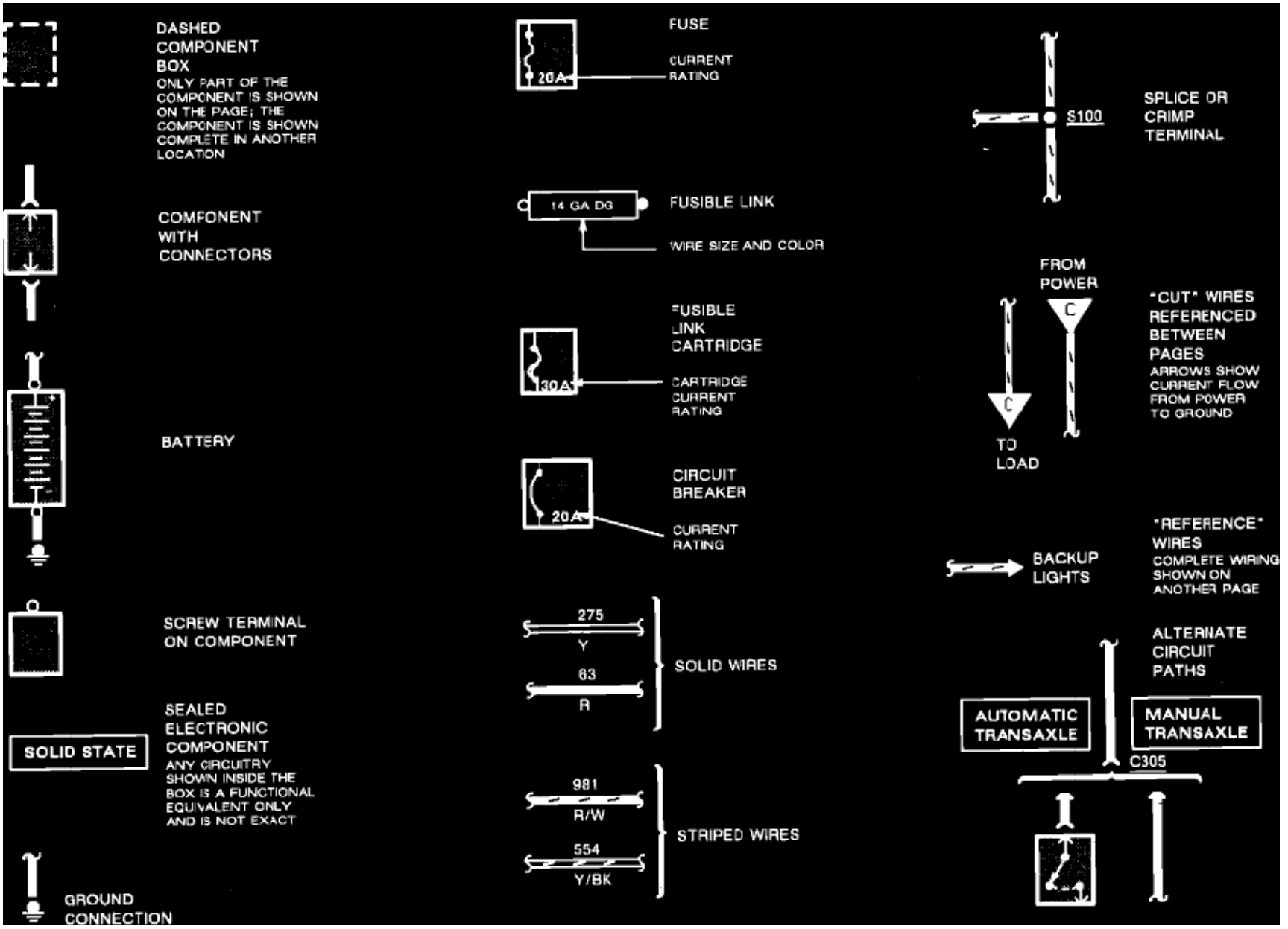
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols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14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
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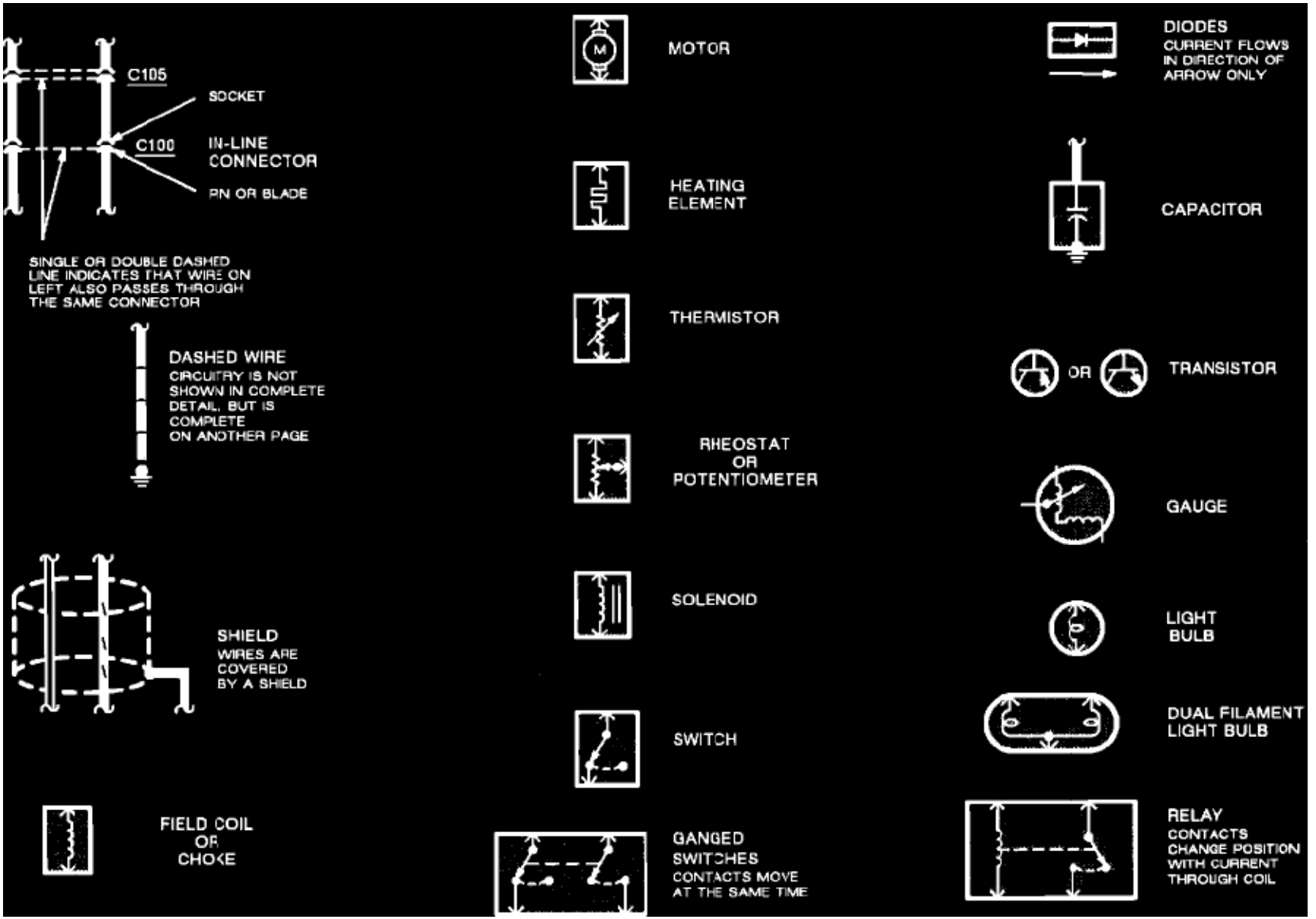

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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PK: Pink R:

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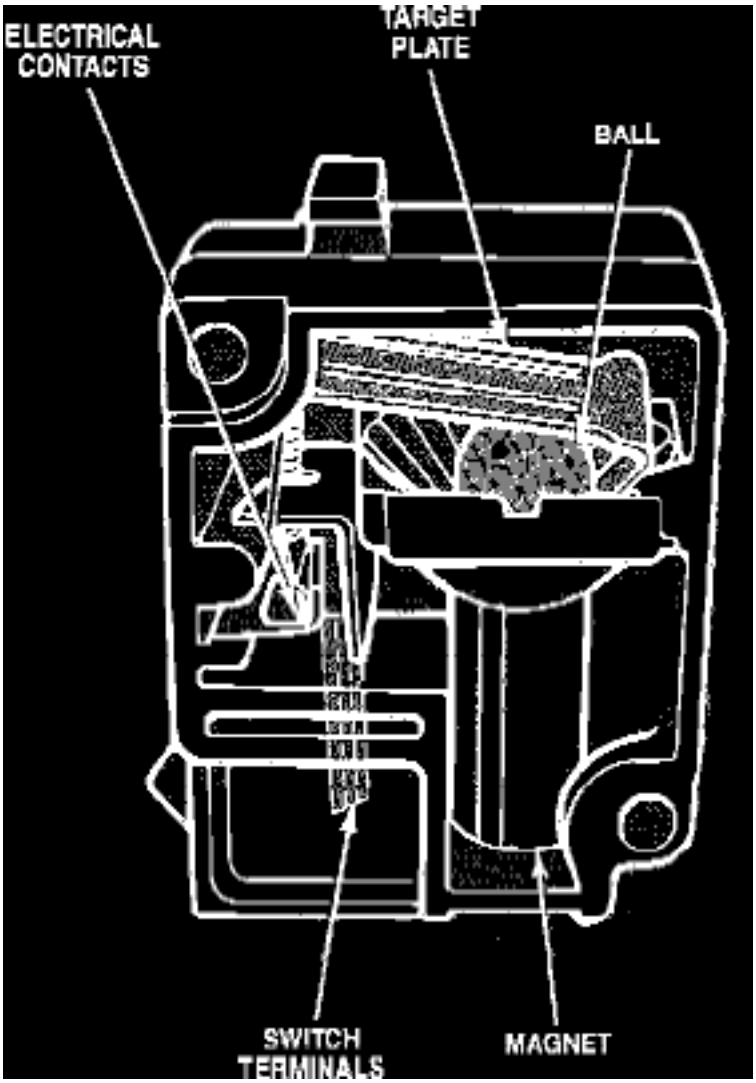


Fuel Pump Inertia Switch: Description and Operation

Typical Inertia Fuel Shut-Off Switch

The inertia switch is used to open the power circuit to the fuel pump, or the control circuit to the fuel pump relay, in case of an accident. The inertia switch must be manually reset by pushing the reset button located on top of the inertia switch.

Operation of the inertia switch is as follows:

A steel ball is held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate, which opens the electrical contacts.

Fuel Pump Inertia Switch: Service and Repair

TO RESET SWITCH 1.

Turn ignition switch to OFF.

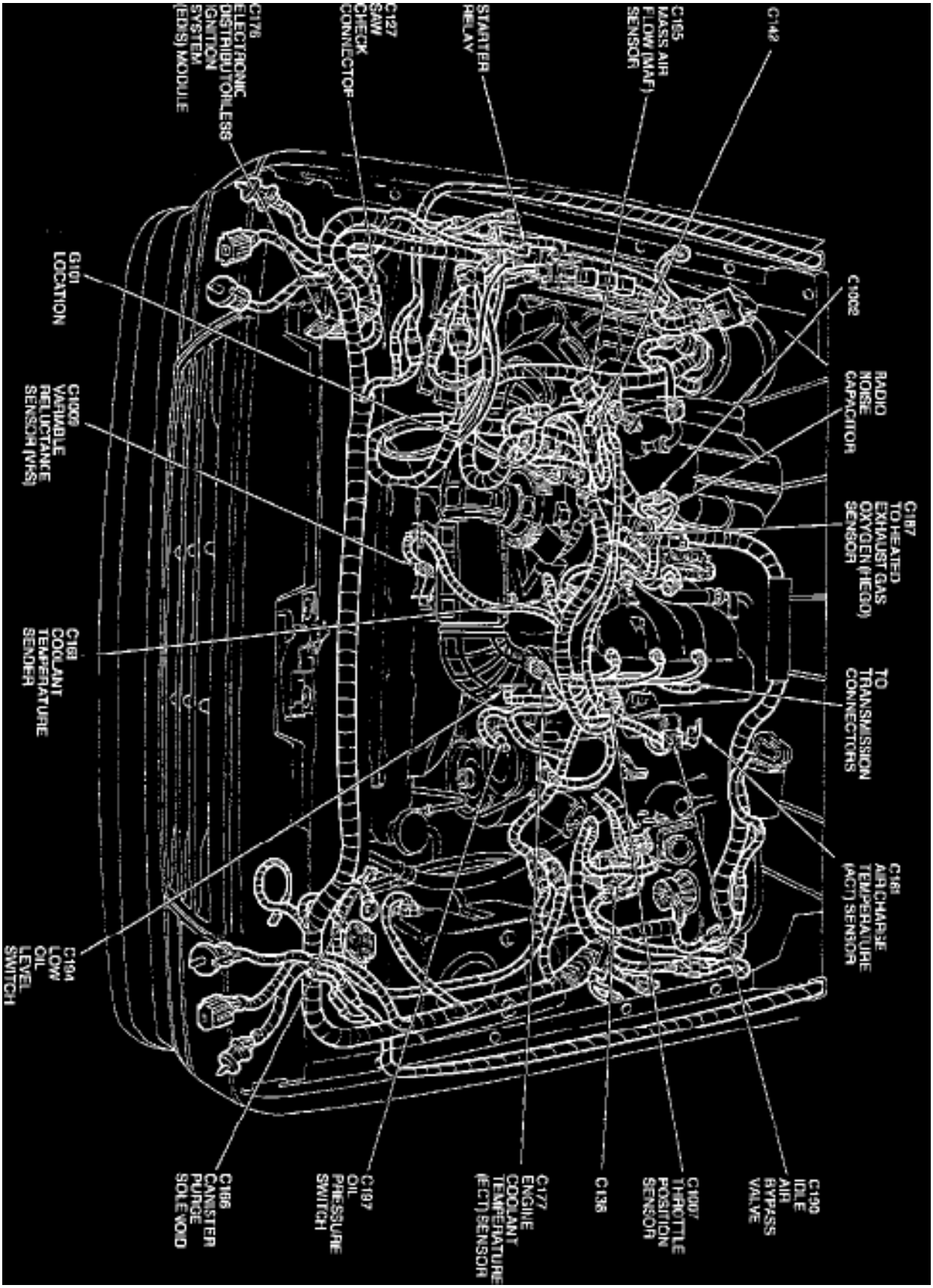
2. Check for leaking fuel in the engine compartment, fuel lines and tank(s).

3. If no fuel leak is apparent, reset the switch by pushing the reset button on the top of the switch.

4. Turn ignition switch to START for a few seconds, then to OFF.

5. Again, check for leaking fuel.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Powertrain Management > Sensors and Switches - Fuel Delivery and Air Induction > Throttle Position Sensor > Component Information > Locations

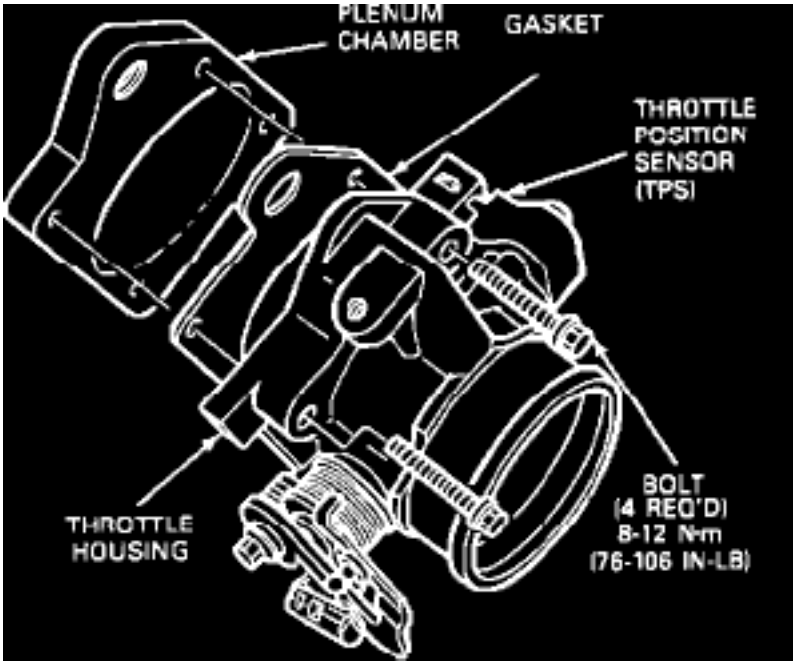


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



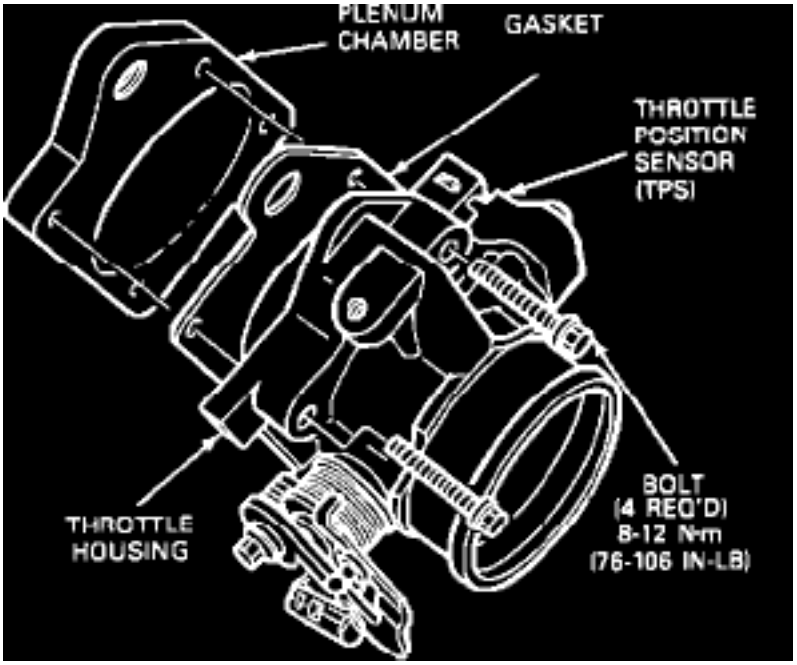
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

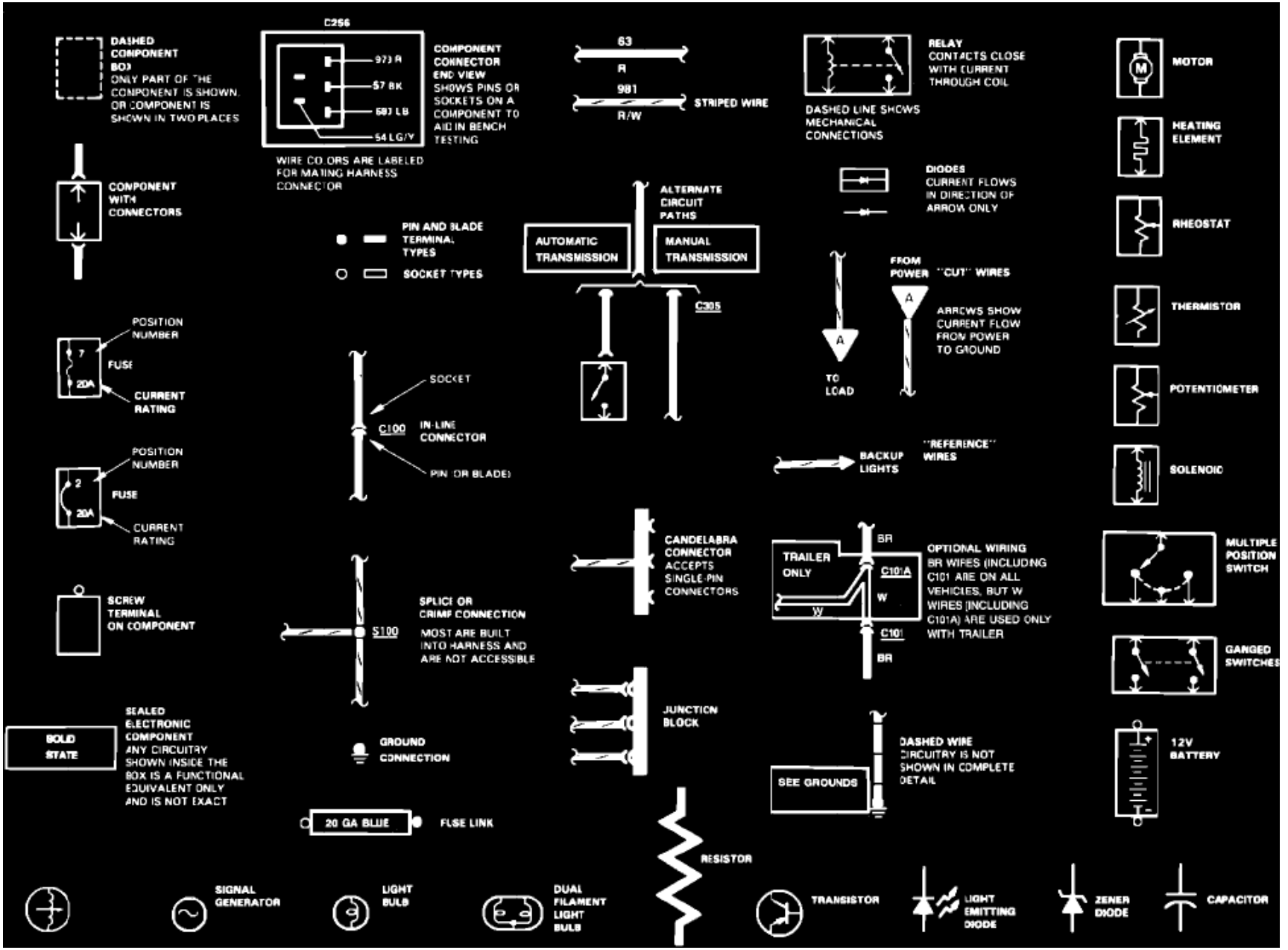
3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

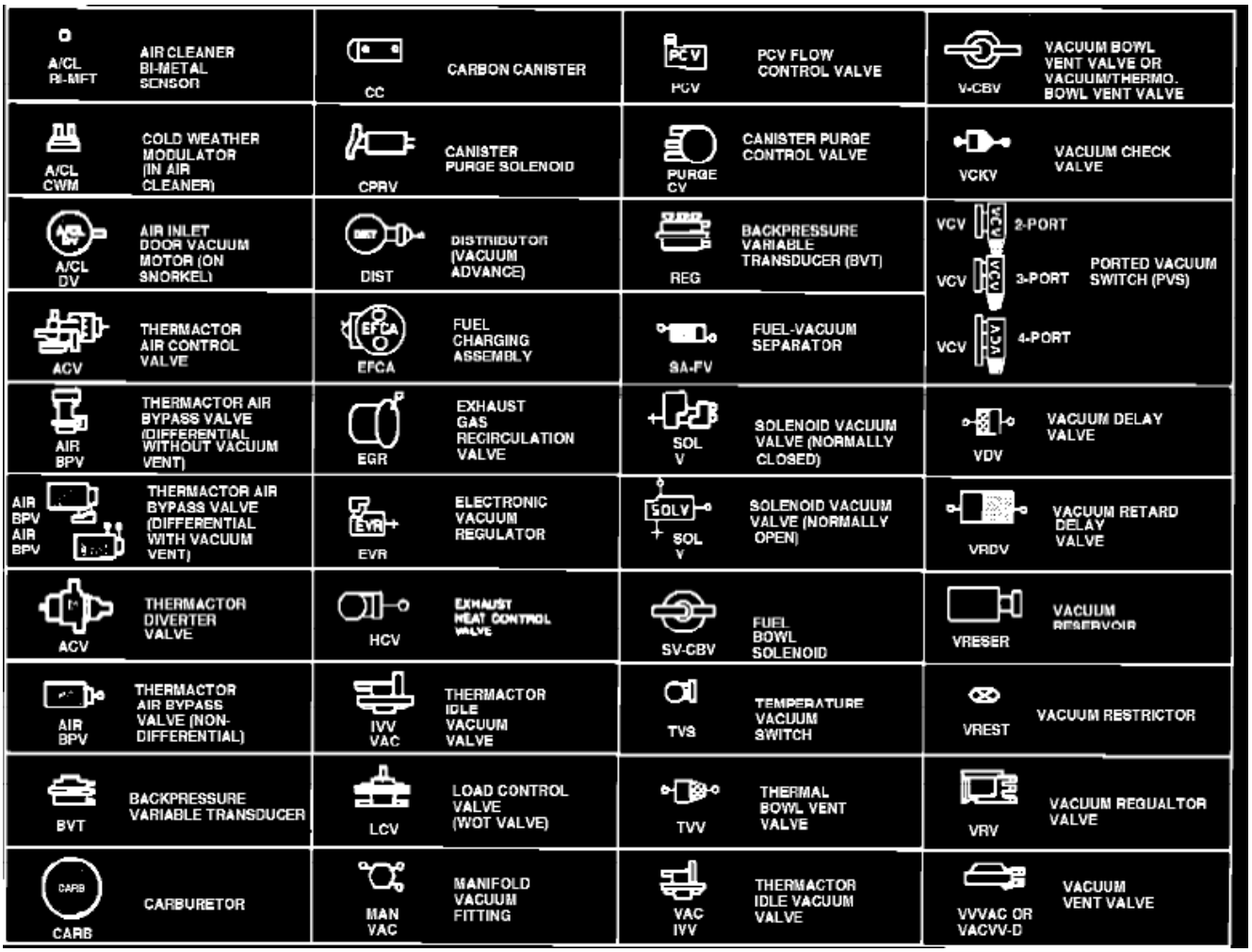
6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.

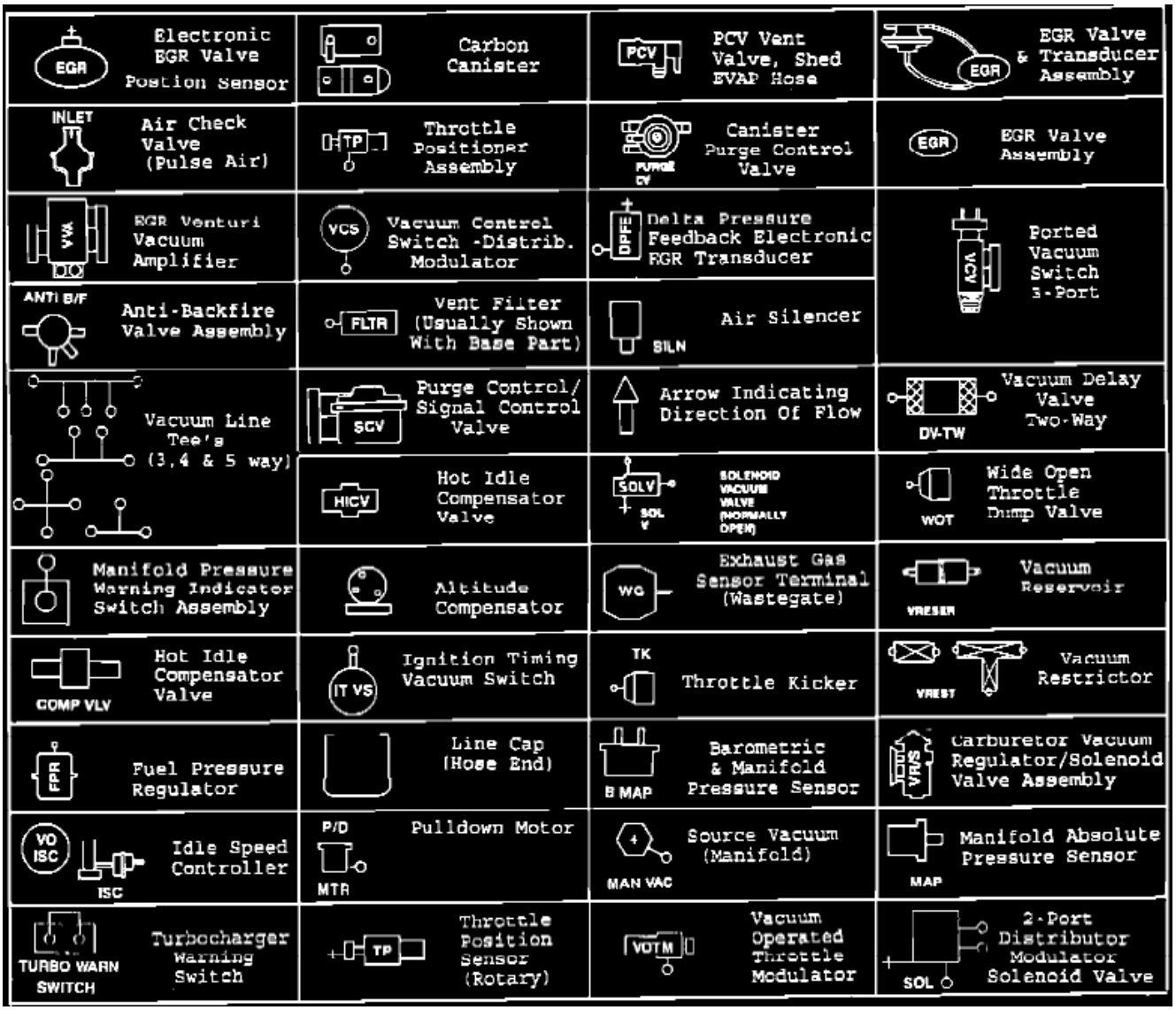


Camshaft Position Sensor: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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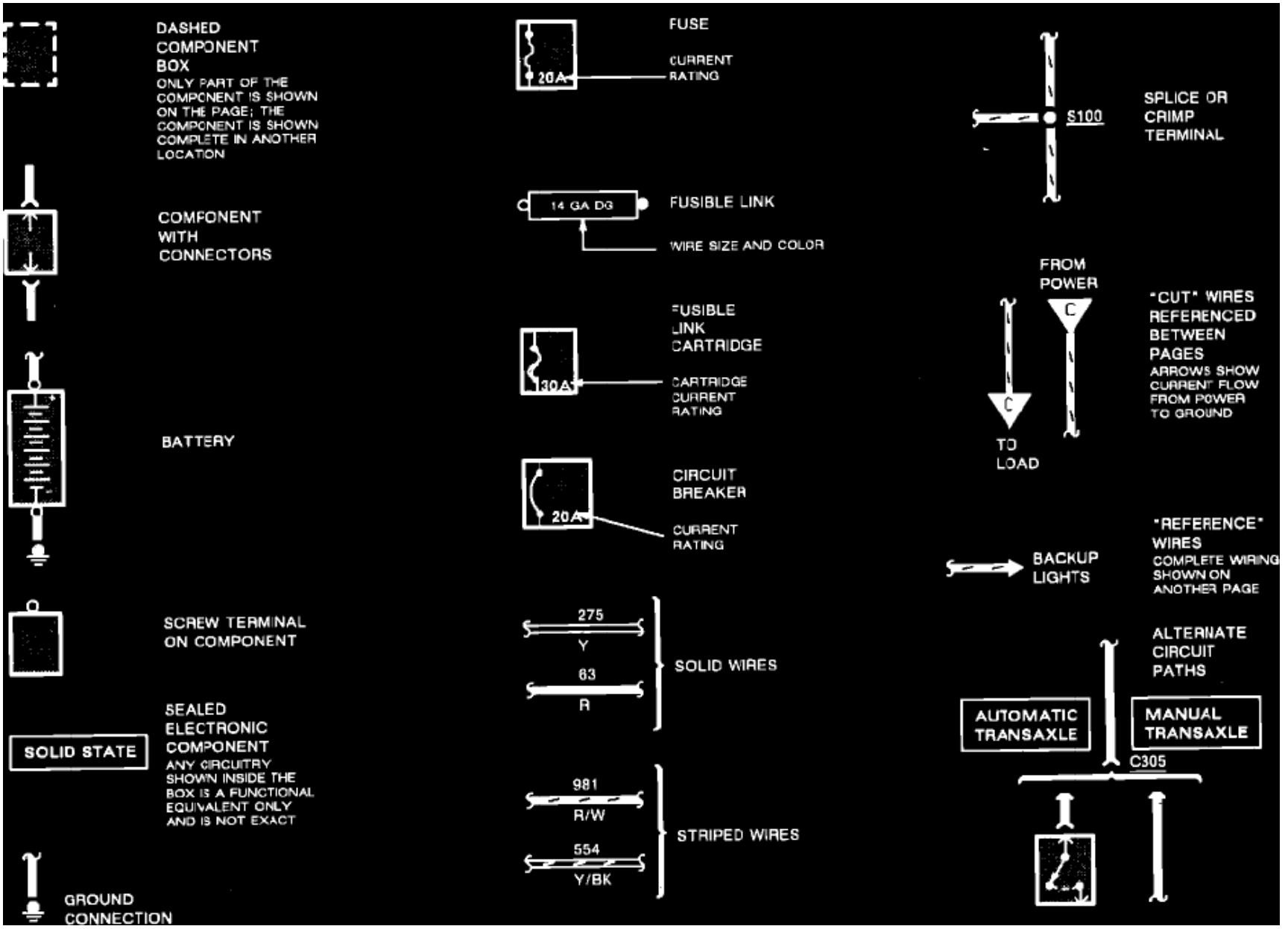
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20A
CIRCUIT BREAKER
CURRENT RATING
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Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
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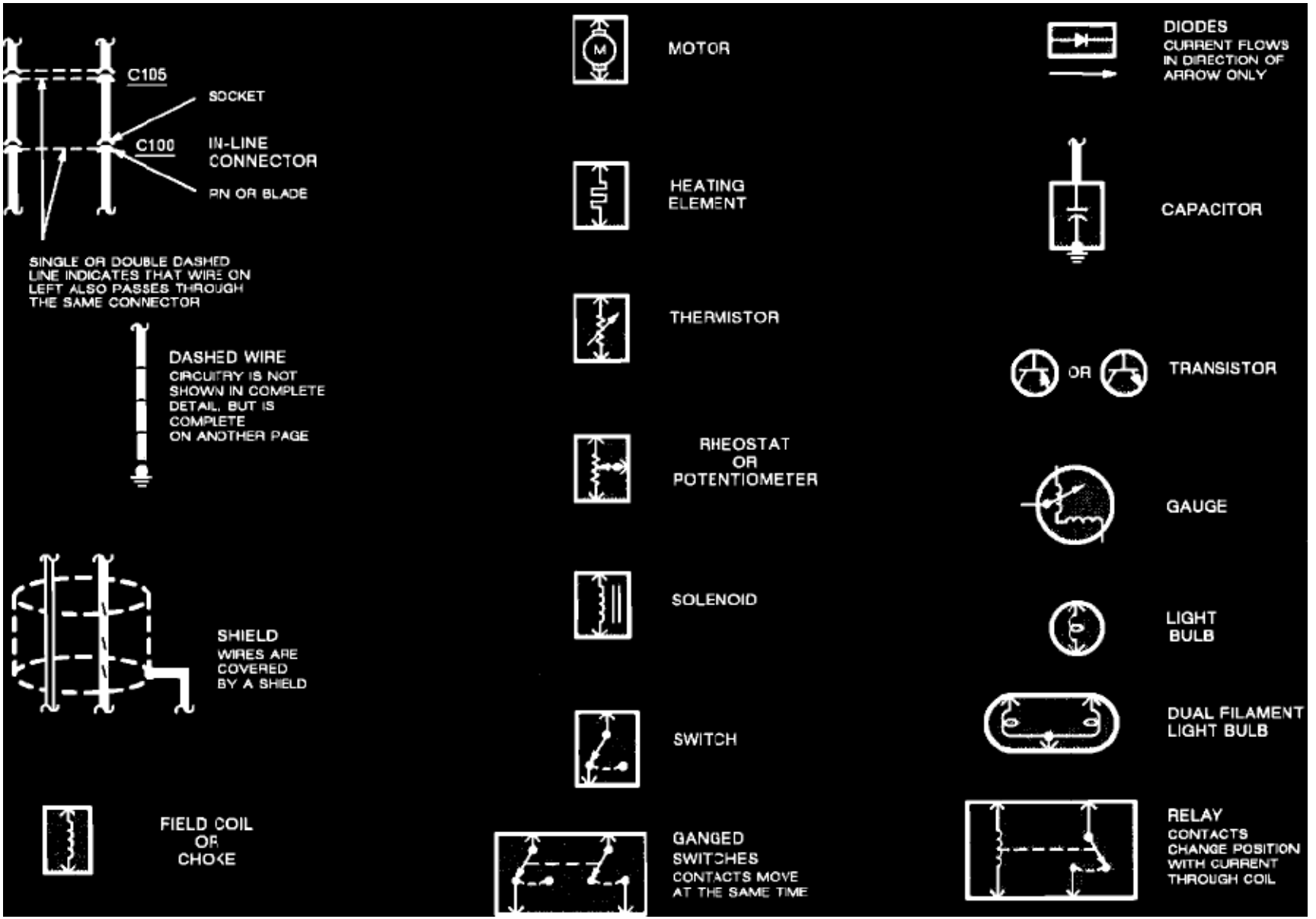

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Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

V: Violet

W: White

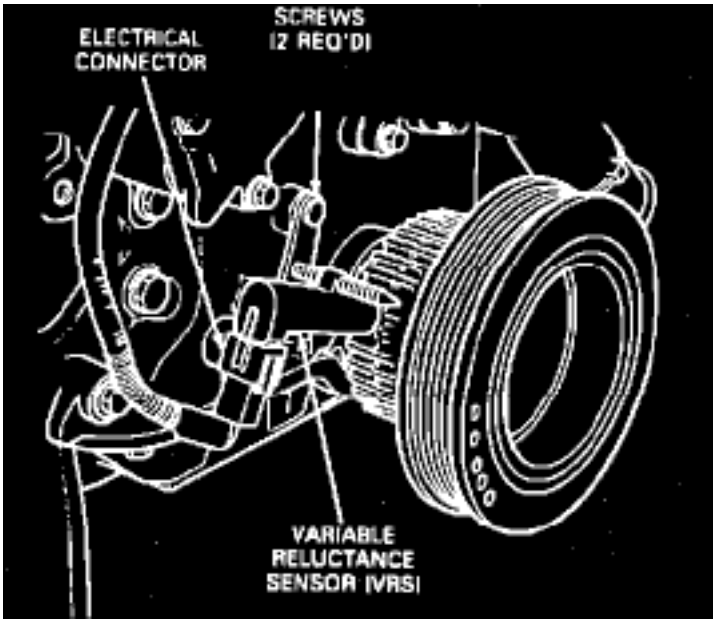
Y: Yellow

Crankshaft Position Sensor: Specifications

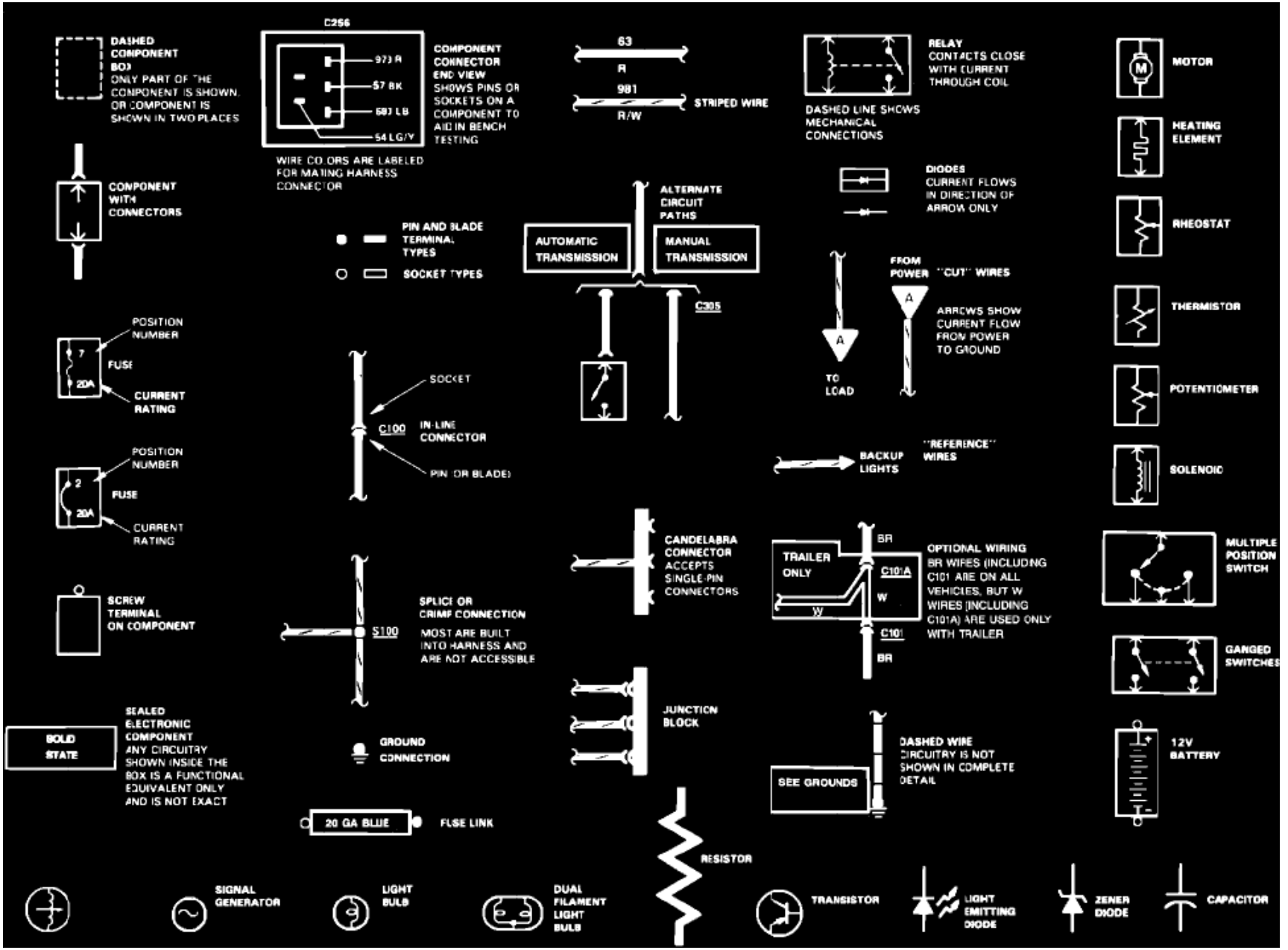
FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)

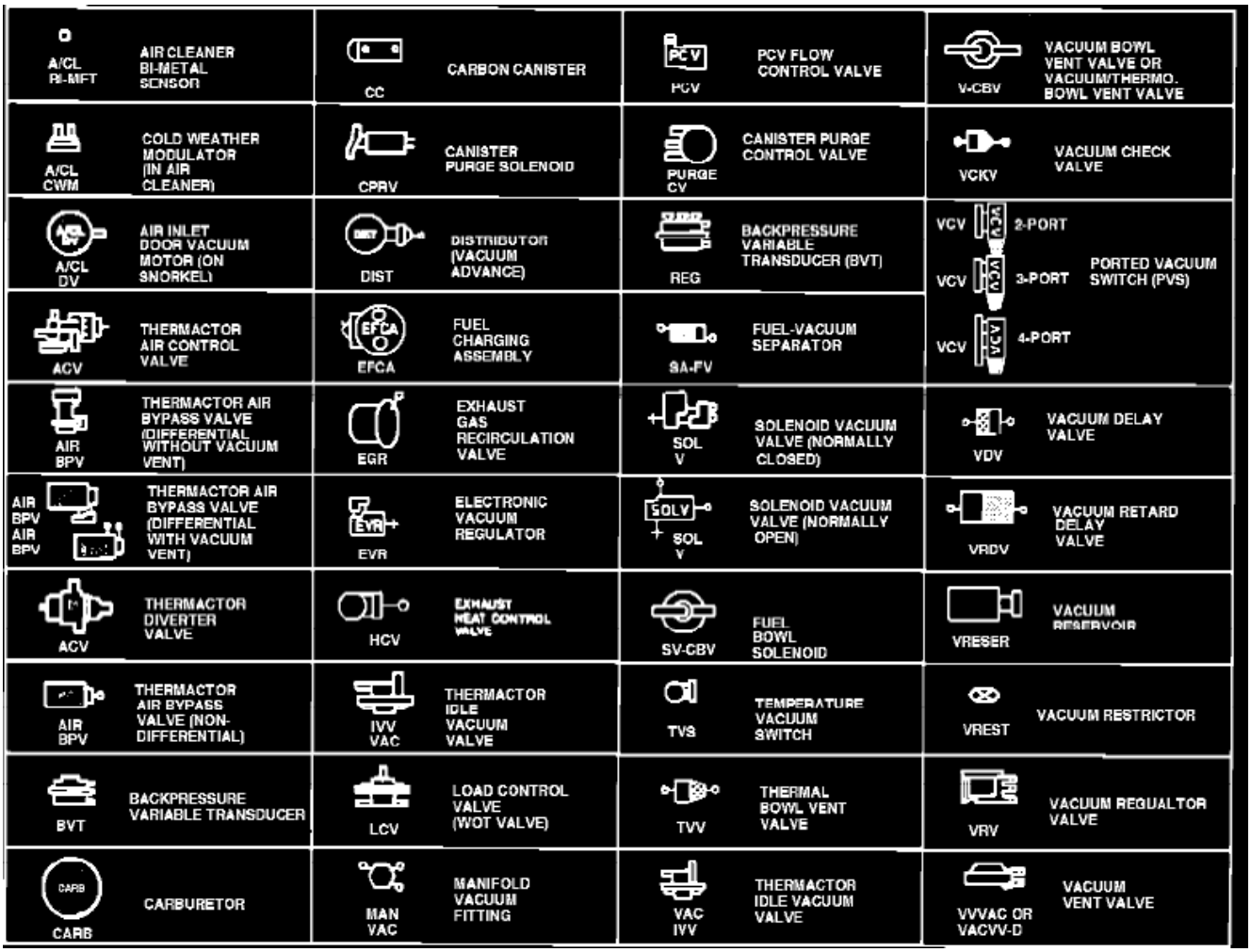


Variable Reluctance (Crankshaft Position) Sensor



Crankshaft Position Sensor: Diagram Information and Instructions

Symbol Identification



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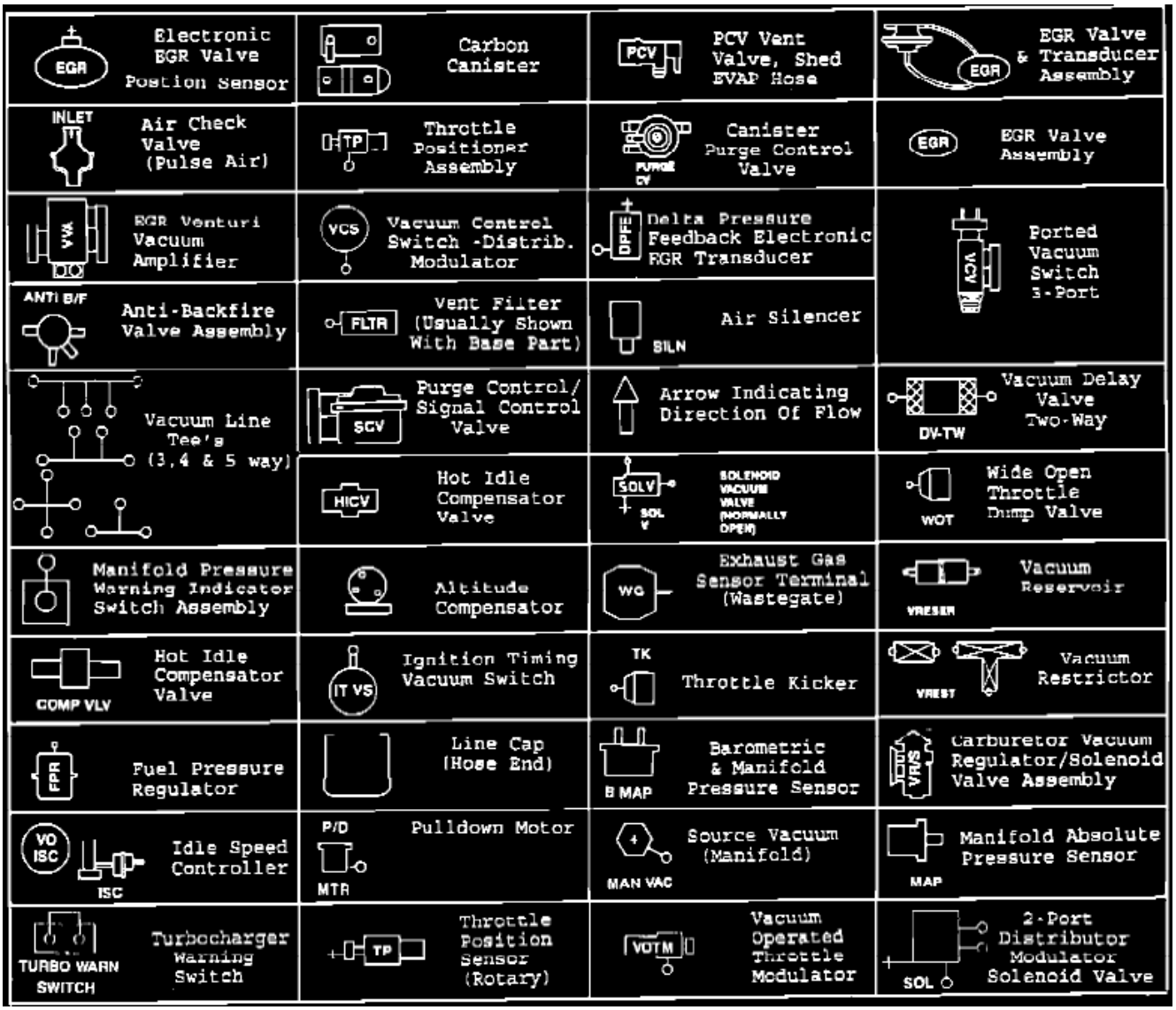
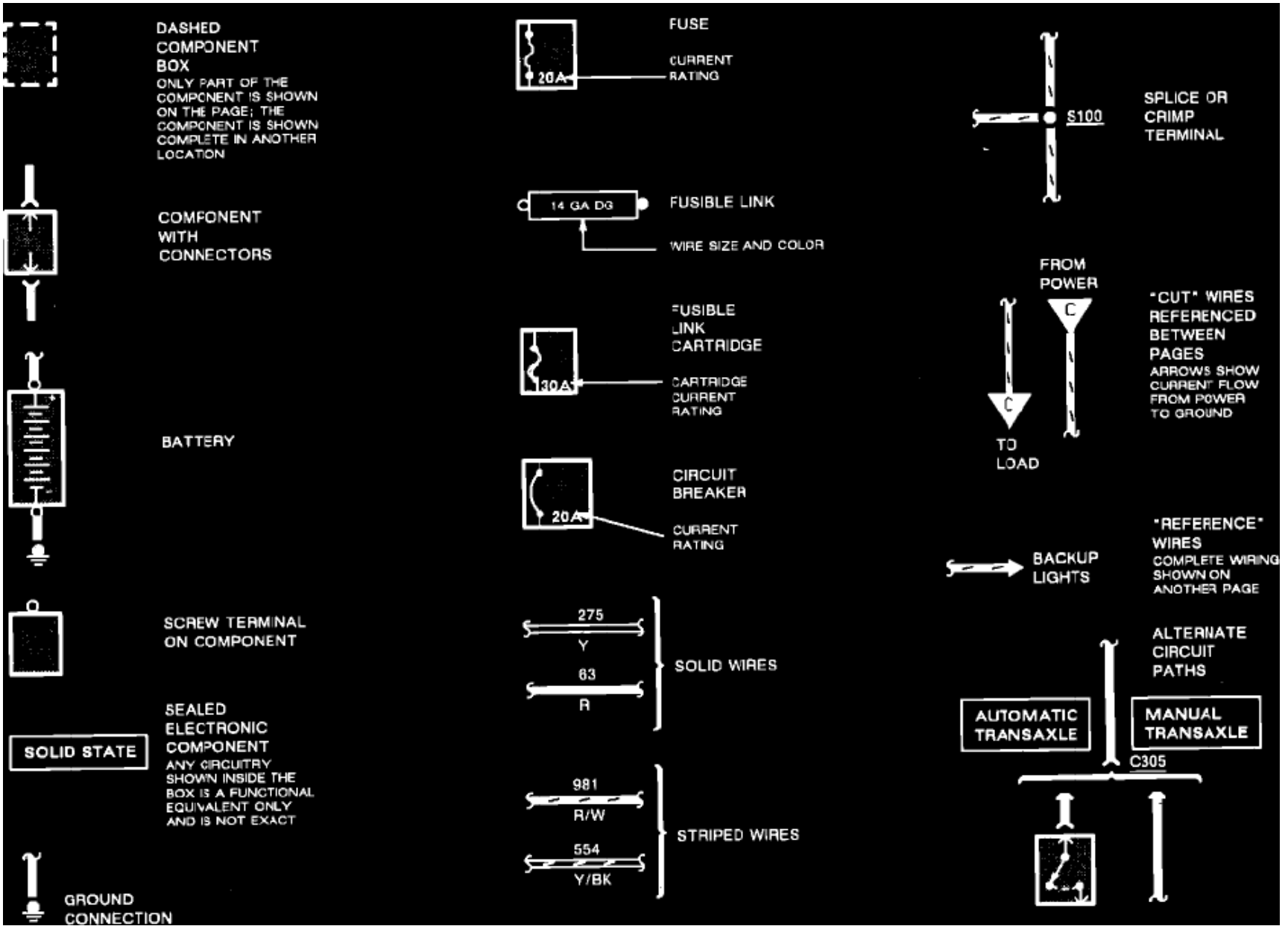
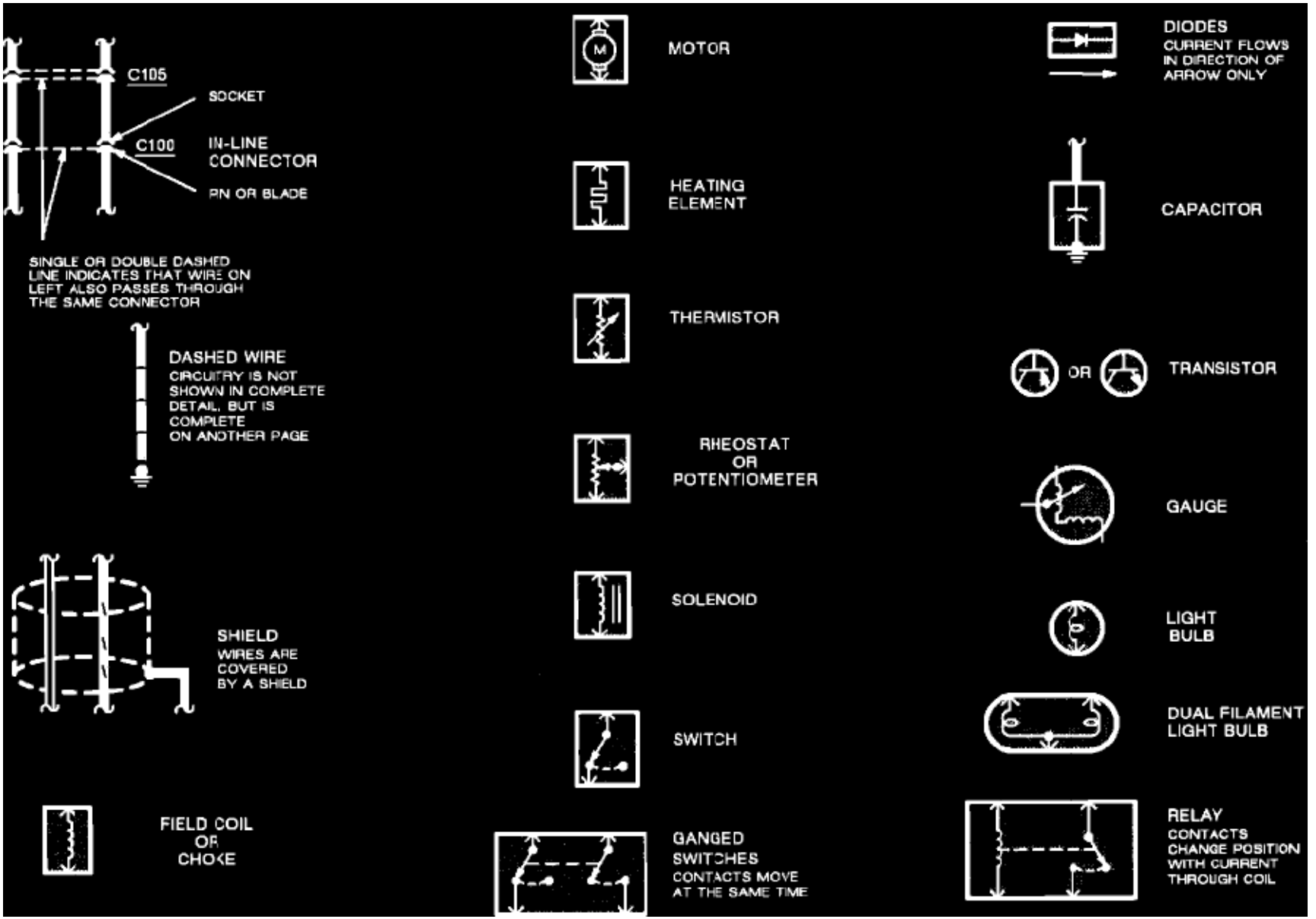


Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

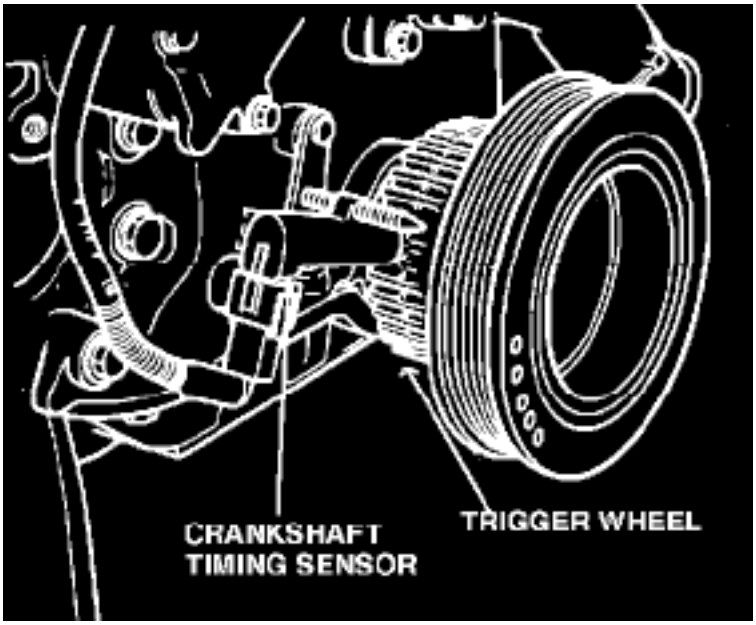
P: Purple

T: Tan

V: Violet

W: White

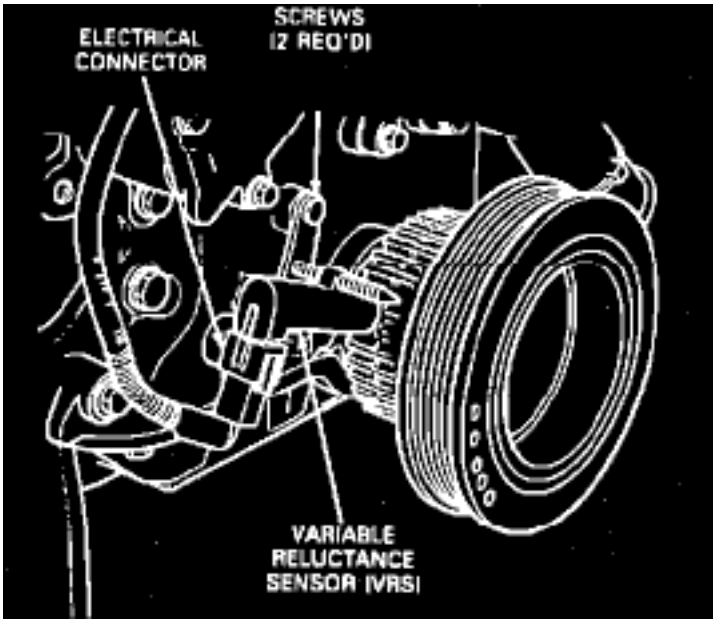
Y: Yellow



Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

INSTALLATION:

1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

4. Connect the negative battery cable.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

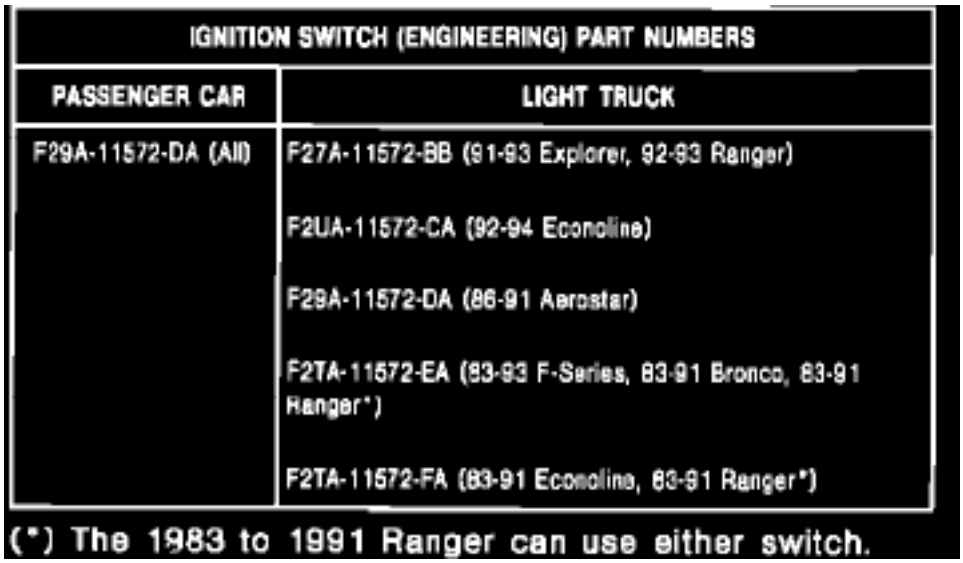
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

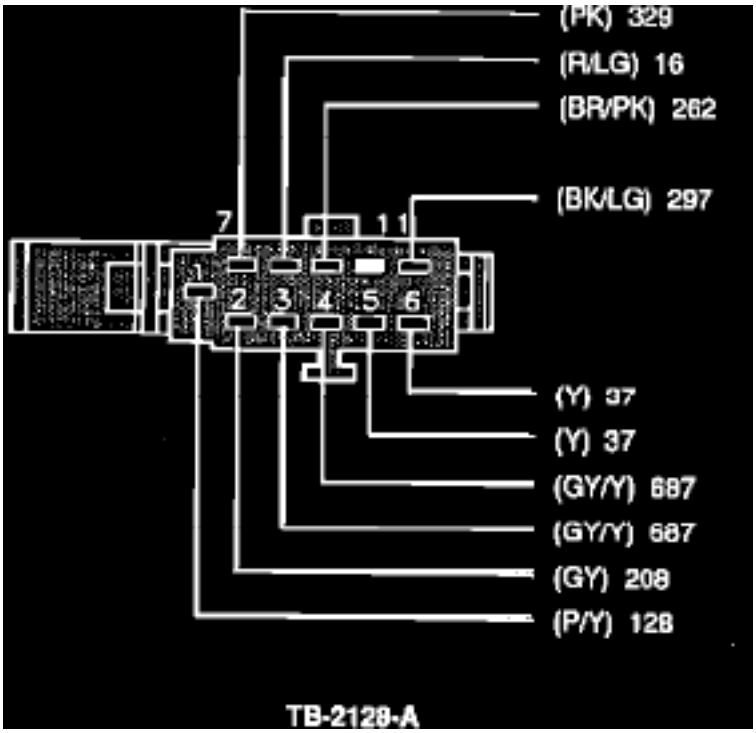
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: Customer Interest Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

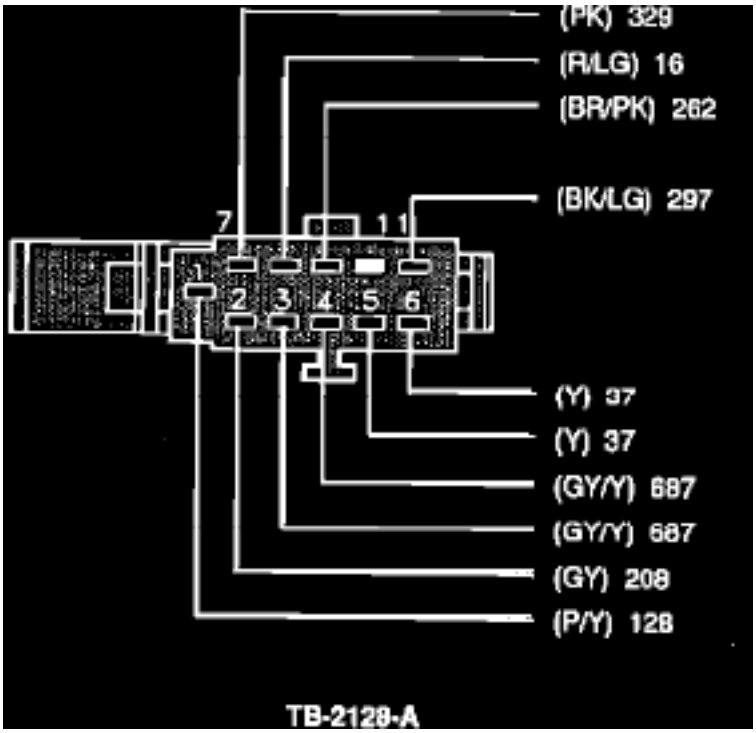
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

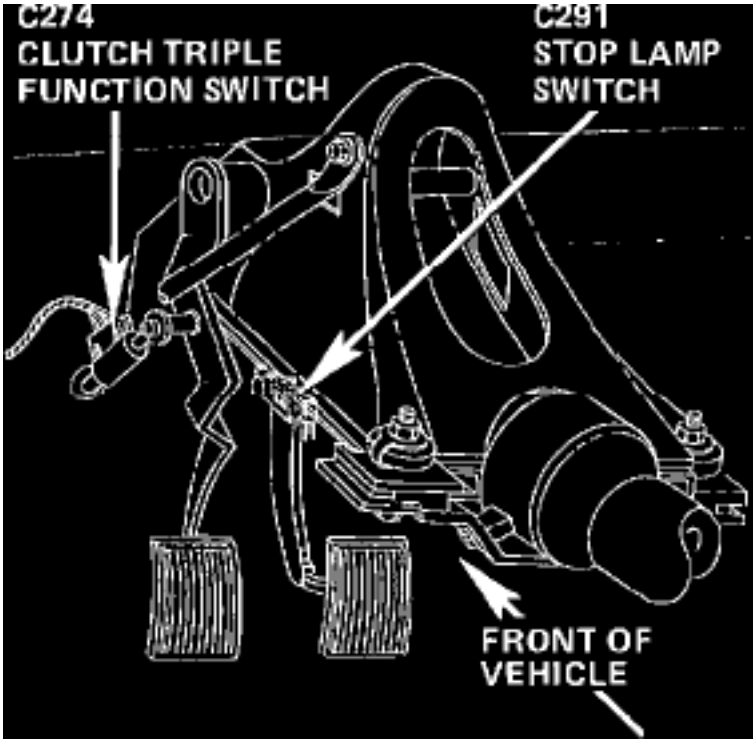
911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300



Brake And Clutch Switches

Clutch Pedal Position Switch: Testing and Inspection

This switch functions magnetically. Do not use magnetized tools near this switch.

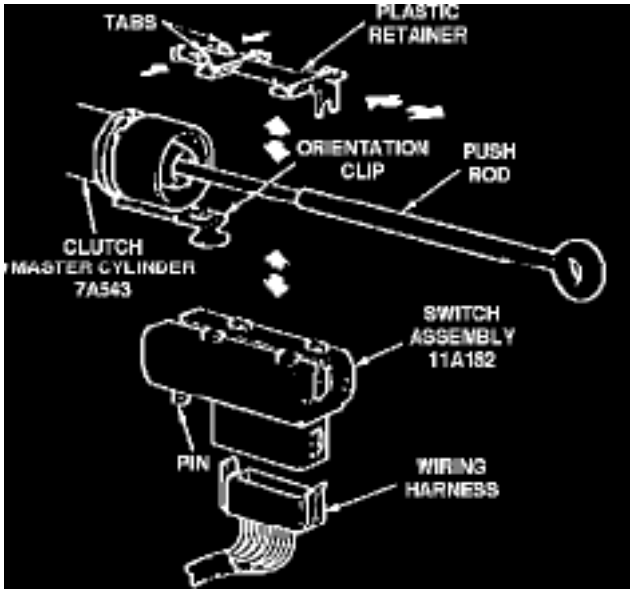
1. If the switch is open when the clutch pedal is released, speed control will not operate. This must be corrected before making any other tests. Use only a multimeter of 5000 ohm/volt rating or higher when performing the clutch switch test.

2. On all except 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, disconnect switch pigtail connector from speed control harness connector and connect an ohmmeter to the two switch connector terminals.

3. On all 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, connect suitable ohmmeter between two middle switch connector terminals.

4. On all models, with clutch pedal in the fully released position, the resistance should be less than 5 ohms. With clutch pedal fully depressed, the circuit should be open.

5. If switch does not function as described, remove and replace switch.



Clutch Pedal Position Switch: Service and Repair

Fig. 8 Clutch Interlock 3-way Switch

REMOVAL

1. Disconnect electrical connector from switch located on clutch master cylinder push rod, Fig. 8.

2. Pull orientation clip away from switch to separate pin, then rotate switch to expose plastic retainer.

3. Push tabs together to allow retainer to slide rearward and separate from switch.

4. Remove switch from push rod.

INSTALLATION

1. Install switch onto master cylinder push rod, ensuring that switch is properly seated.

2. Install plastic retainer, then rotate switch into position and attach orientation clip.

3. Connect electrical connector.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

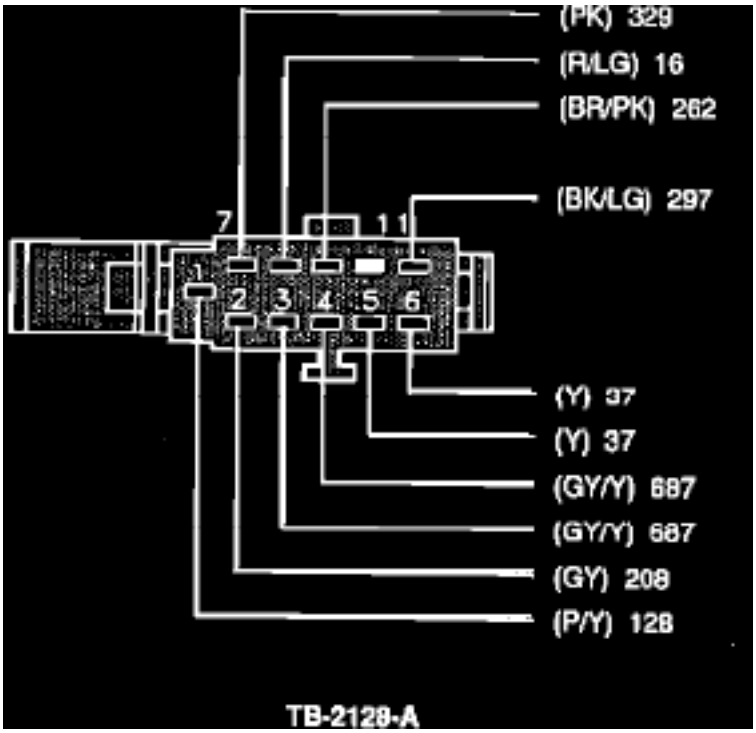
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: Customer Interest Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

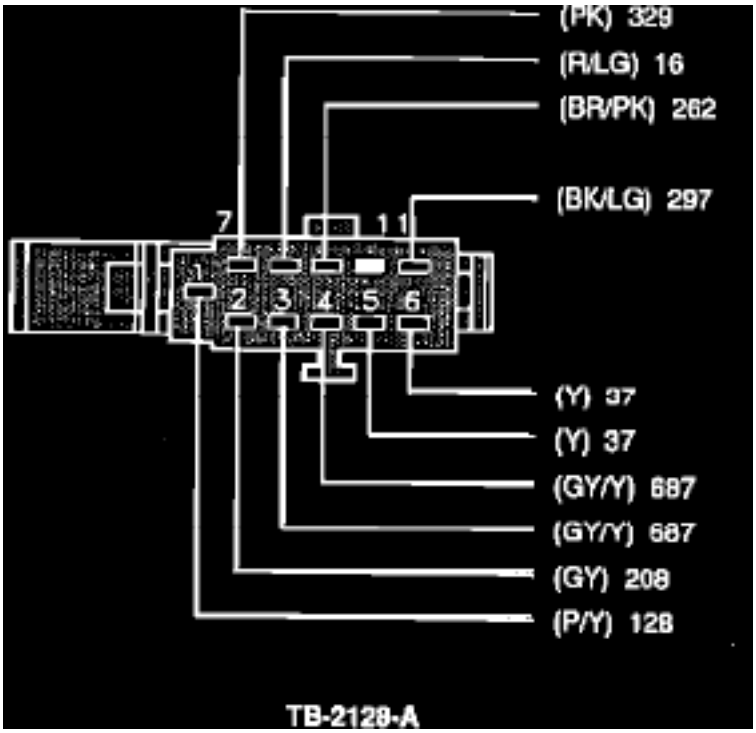
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

Cruise Control Module: All Technical Service Bulletins Radio - AM Band Noise With Speed Control ON

Article No. 91-8-21

04/17/91

RADIO - NOISE WHILE IN AM MODE WHEN SPEED CONTROL IS ON

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: Radio static on weak to moderate strength AM radio stations only when both the radio and speed control are on, may be caused by the speed control module.

ACTION: Replace the speed control module with a new speed control module when vehicles exhibit this concern.

PART NUMBER PART NAME CLASS

F0TZ-9D843-A Module Speed Control B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

910821A Replace Speed Control 0.2 Hr.

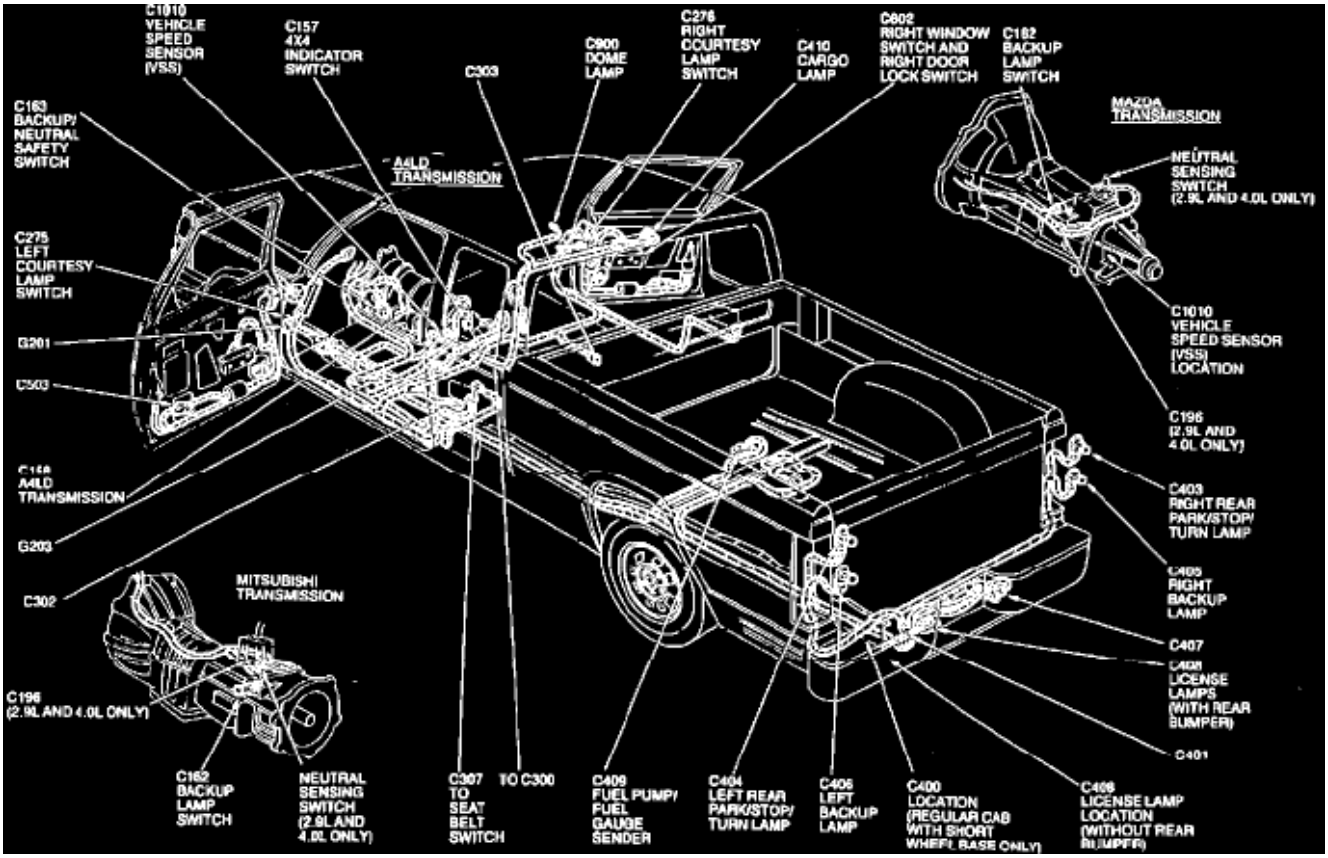
Module

DEALER CODING

BASIC PART NO. CONDITION CODE

9D843 53

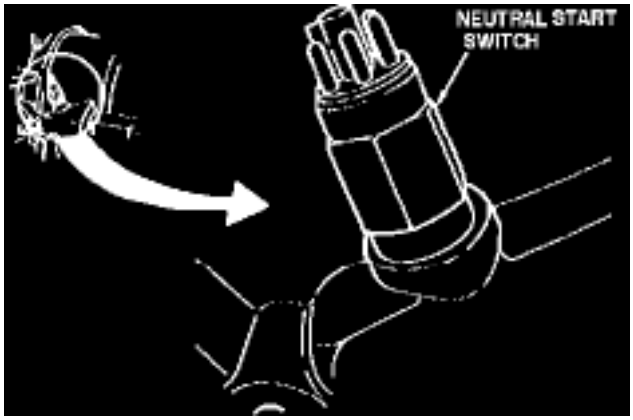
OASIS CODES: 207000



Neutral Safety Switch: Locations

Body Components

LH Side Of Transmission



Neutral Safety Switch: Service and Repair

Fig. 9 Neutral Start Switch

REMOVAL

1. Disconnect battery ground cable, then raise and support vehicle.

2. Disconnect electrical connector from switch, Fig. 9, then remove switch and O-ring using neutral start switch socket T74P-77247-A or equivalent. Neutral start switch socket is a thin wall socket, other types of sockets could puncture walls of switch.

INSTALLATION

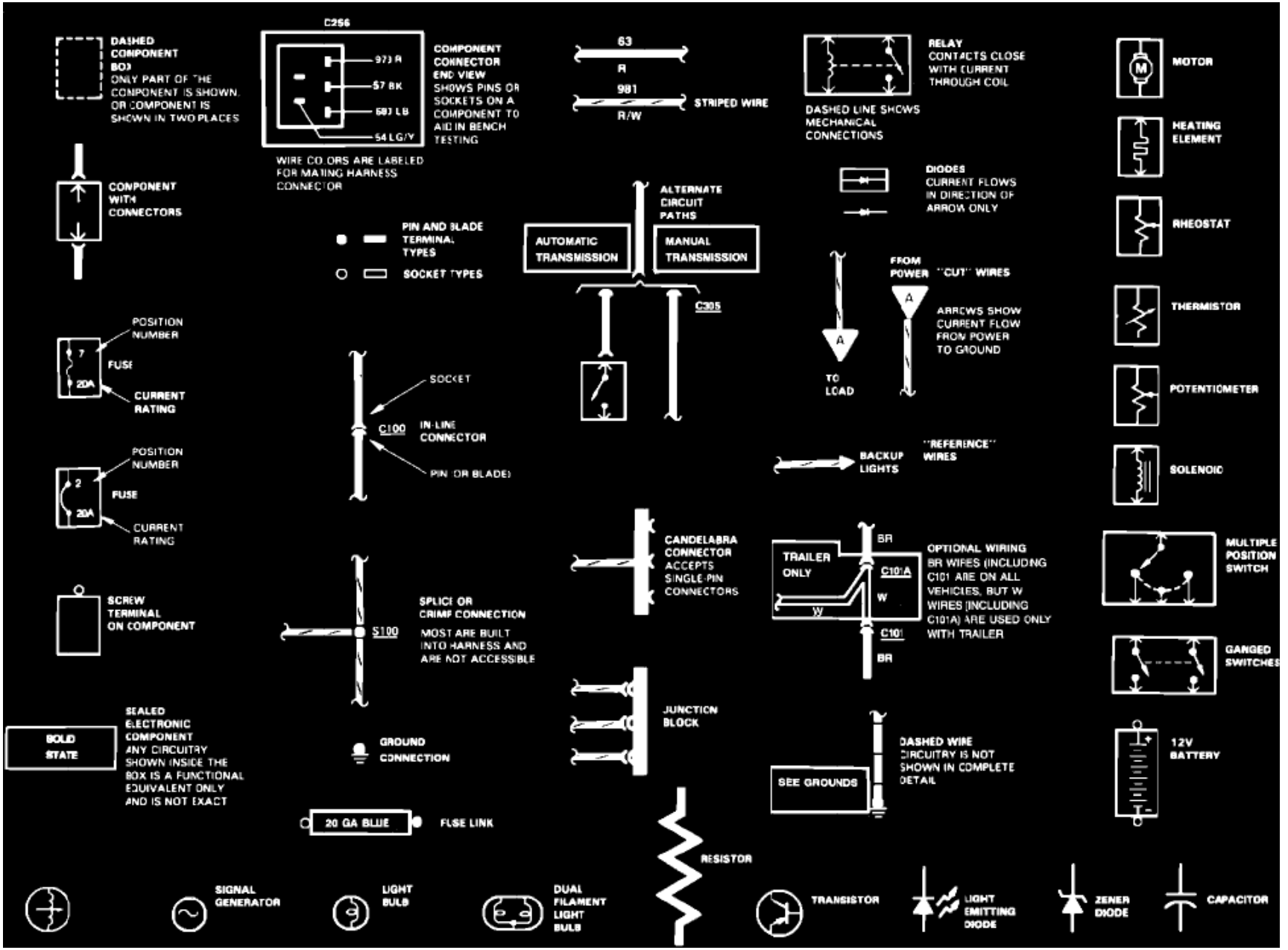
1. Install neutral start switch using socket and torque to 7-10 ft. lbs.

2. Connect electrical connector to switch, then lower vehicle.

3. Connect battery ground cable, then check operation of switch with parking brake engaged. Engine should start with selector lever in N or P only, and back-up lamps should illuminate with selector lever in R only.

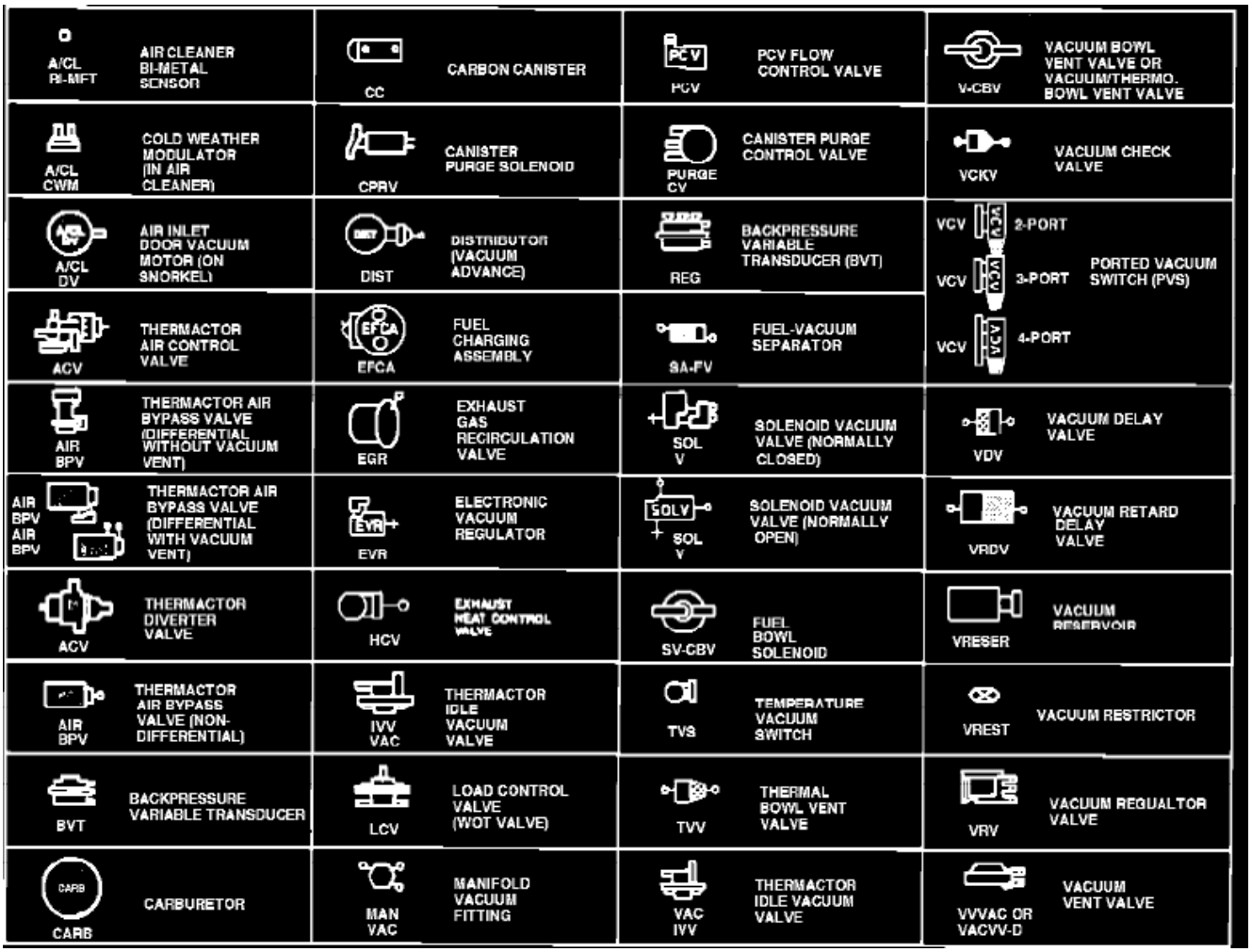
Transmission Temperature Sensor/Switch: Testing and Inspection

Pinpoint testing procedures for this component are located in the system level Testing and Inspection.

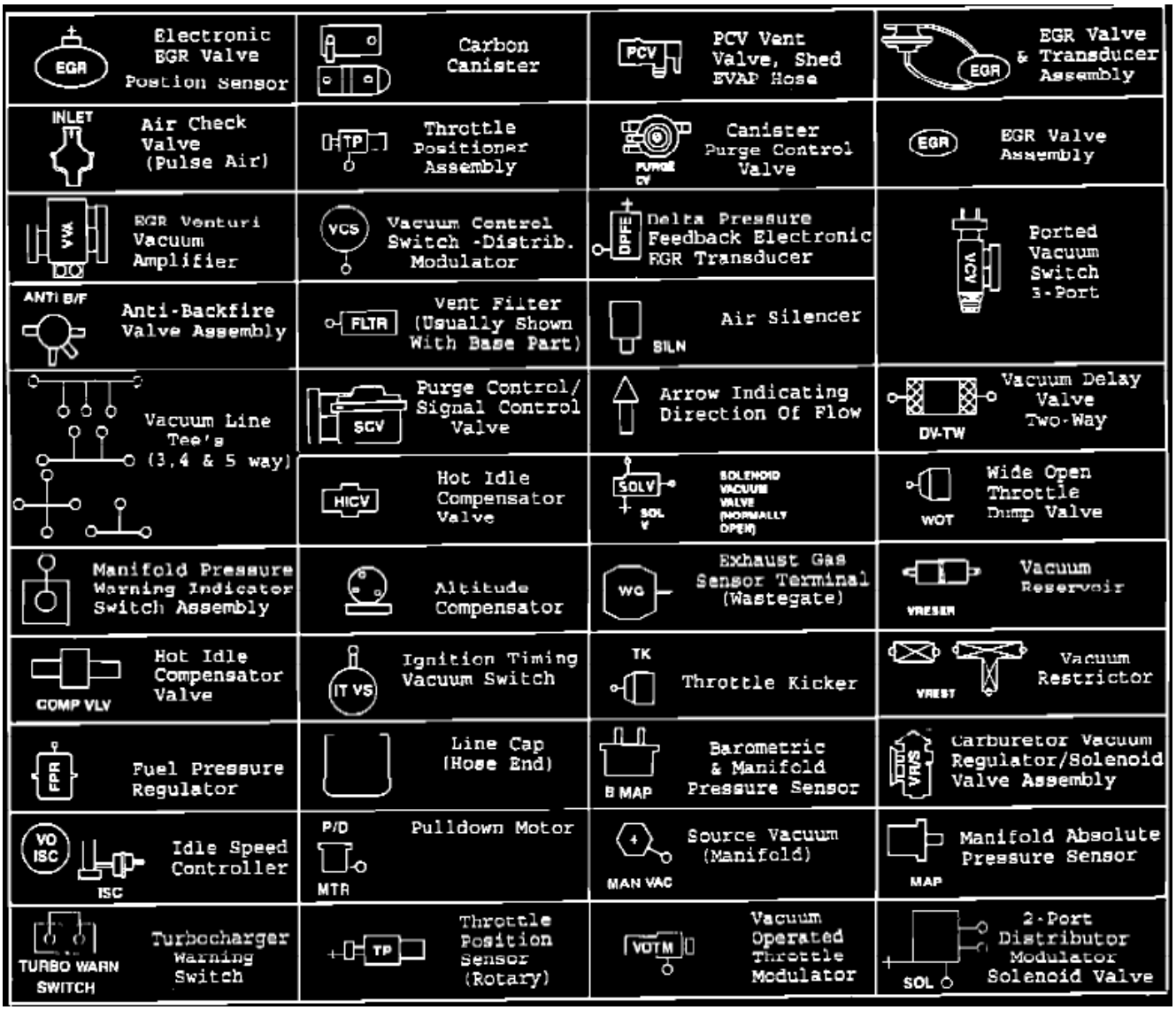


Four Wheel Drive Selector Switch: Diagram Information and Instructions

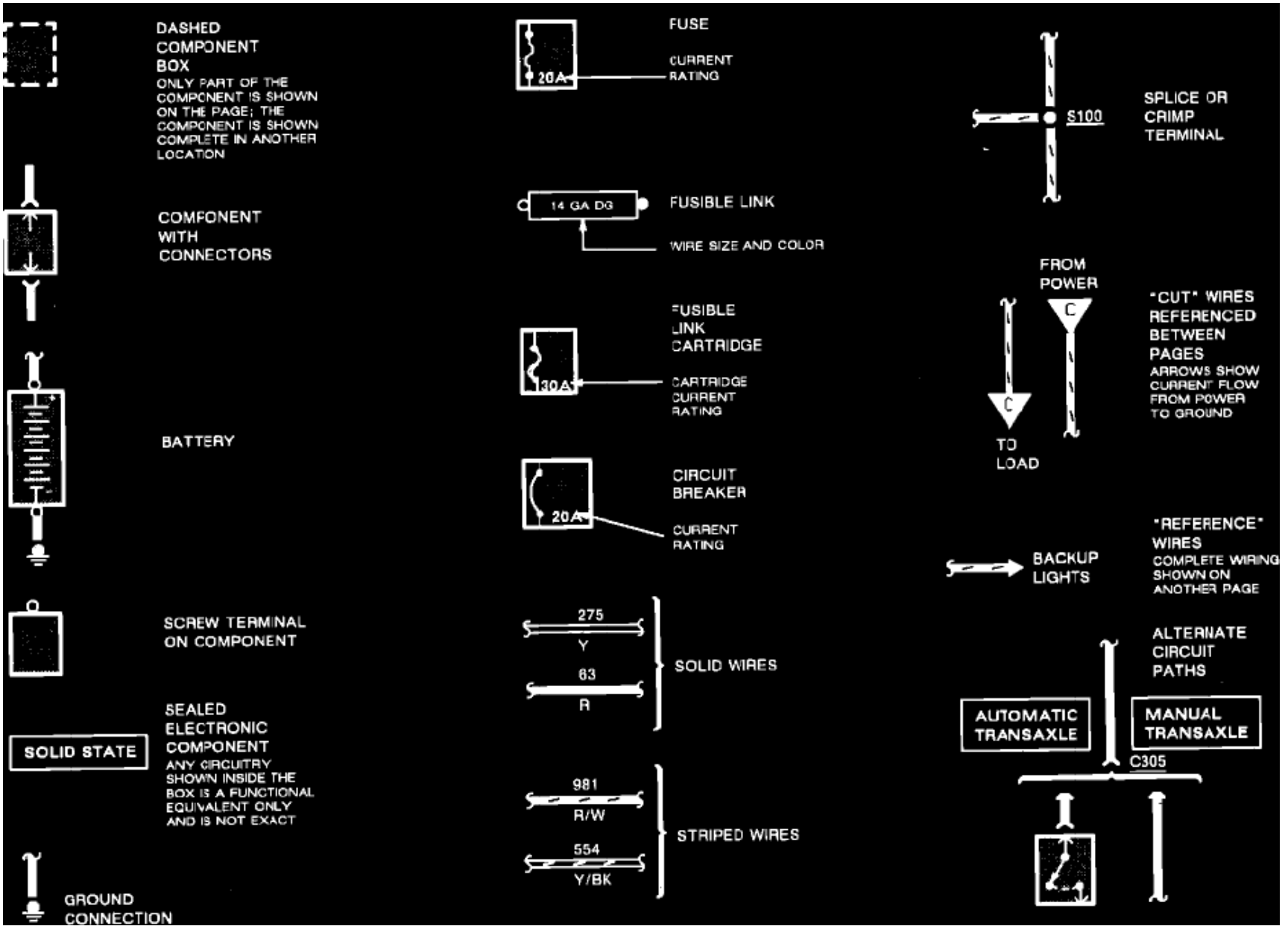
Symbol Identification

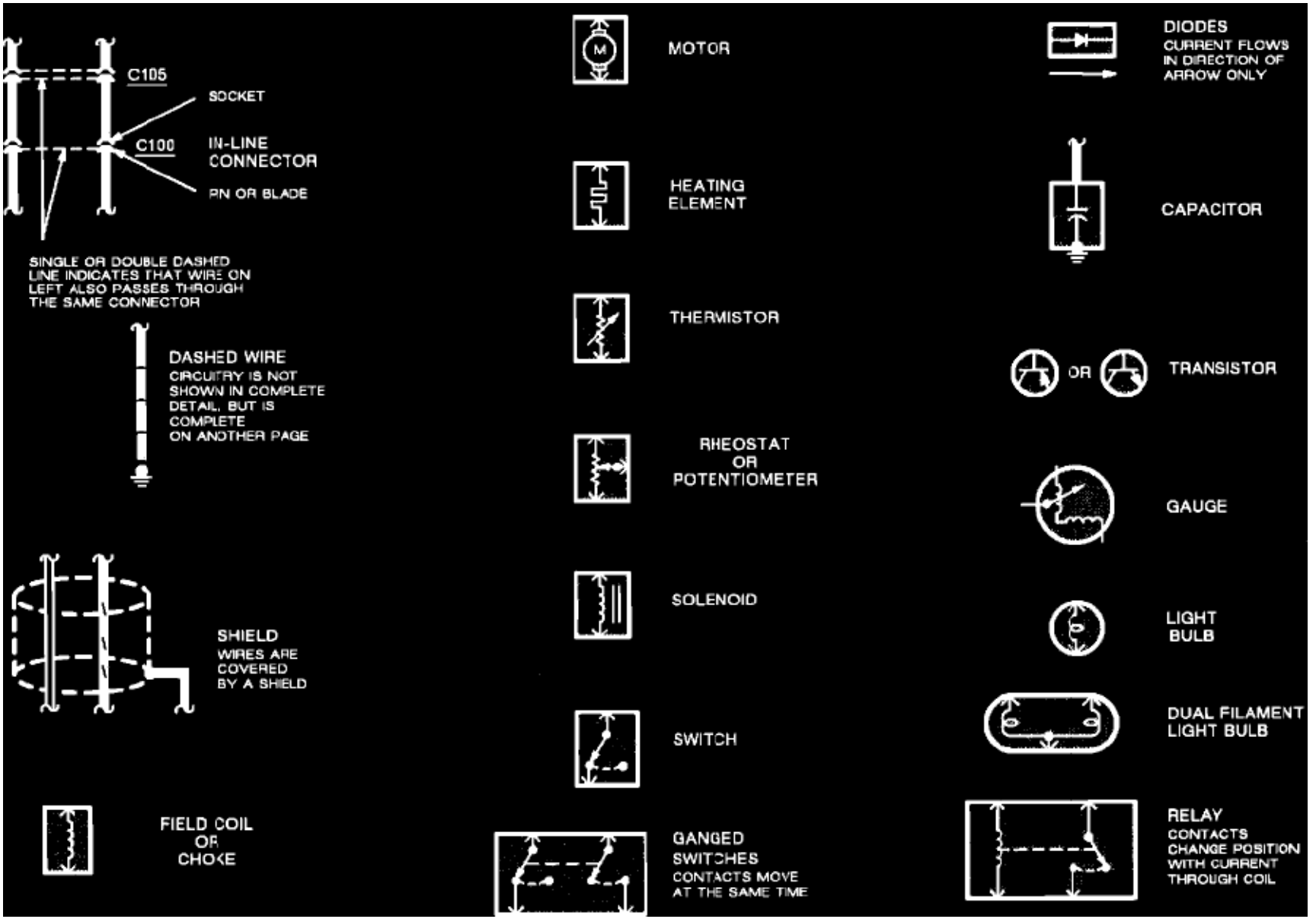


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

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Natural

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PK: Pink R:

Red

P: Purple

T: Tan

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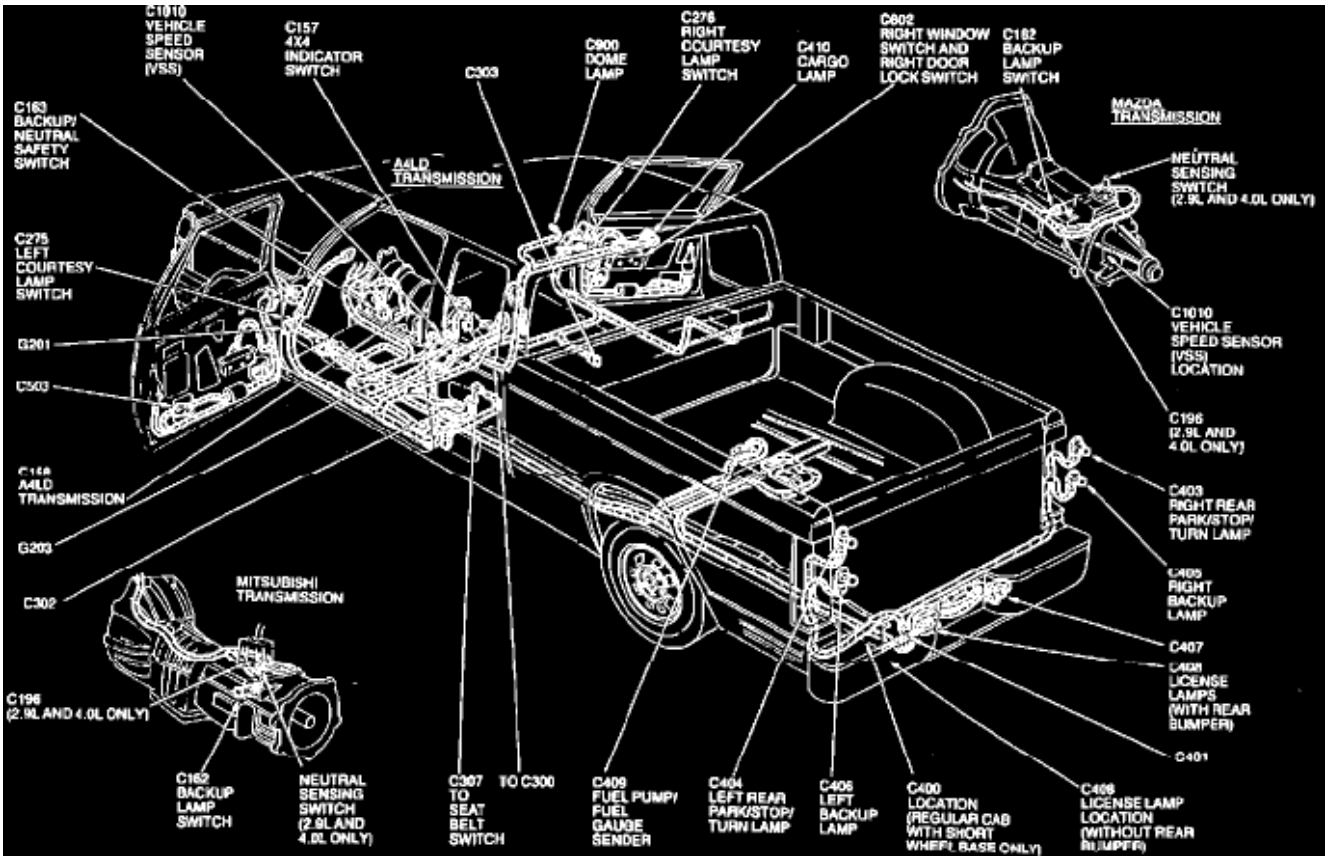
W: White

Y: Yellow



4 X 4 Indicator Switch: Locations

Body Components

Top Front Of Transfer Case

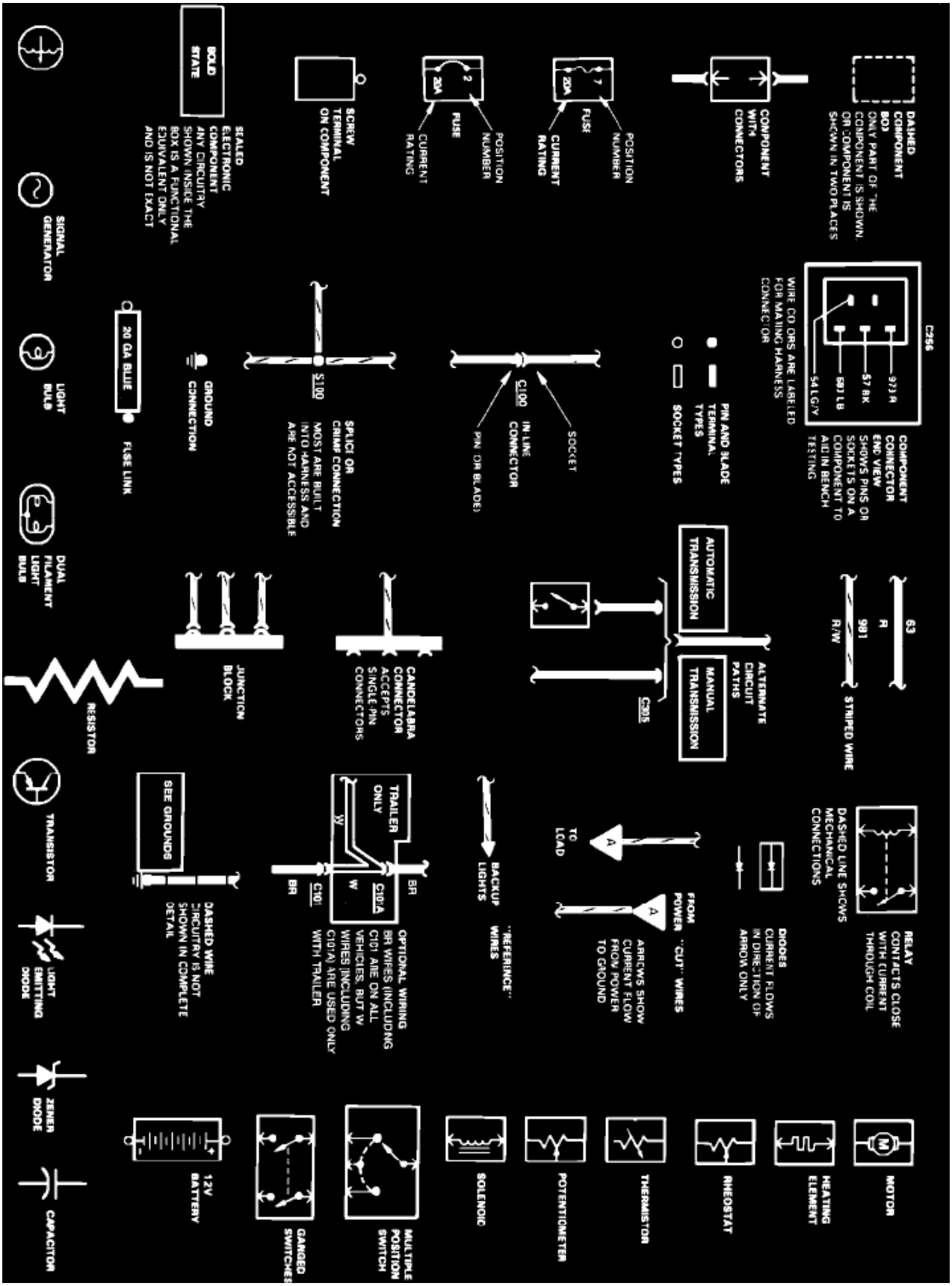
4 X 4 Indicator Switch: Description and Operation

The shift position sensor is an integral component of the electronic shift motor. The sensor inputs shift position of the transfer case to the electronic control module.

Speed Sensor: Description and Operation

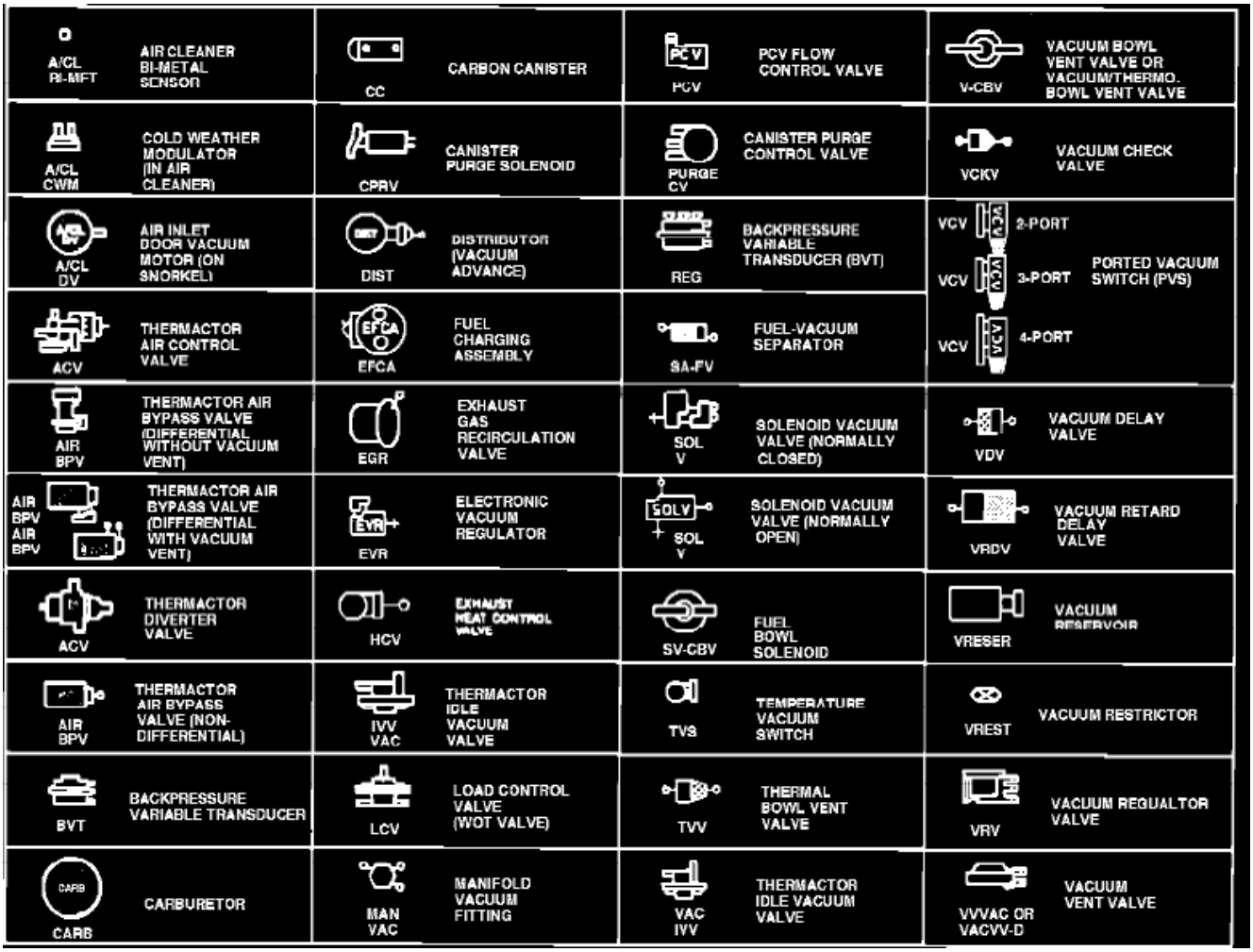
The speed sensor information to the electronic control module verifies the proper speed to allow range shifts (in or out of 4-Low) to occur.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Windows and Glass > Power Window Switch > Component Information > Diagrams > Diagram Information and Instructions

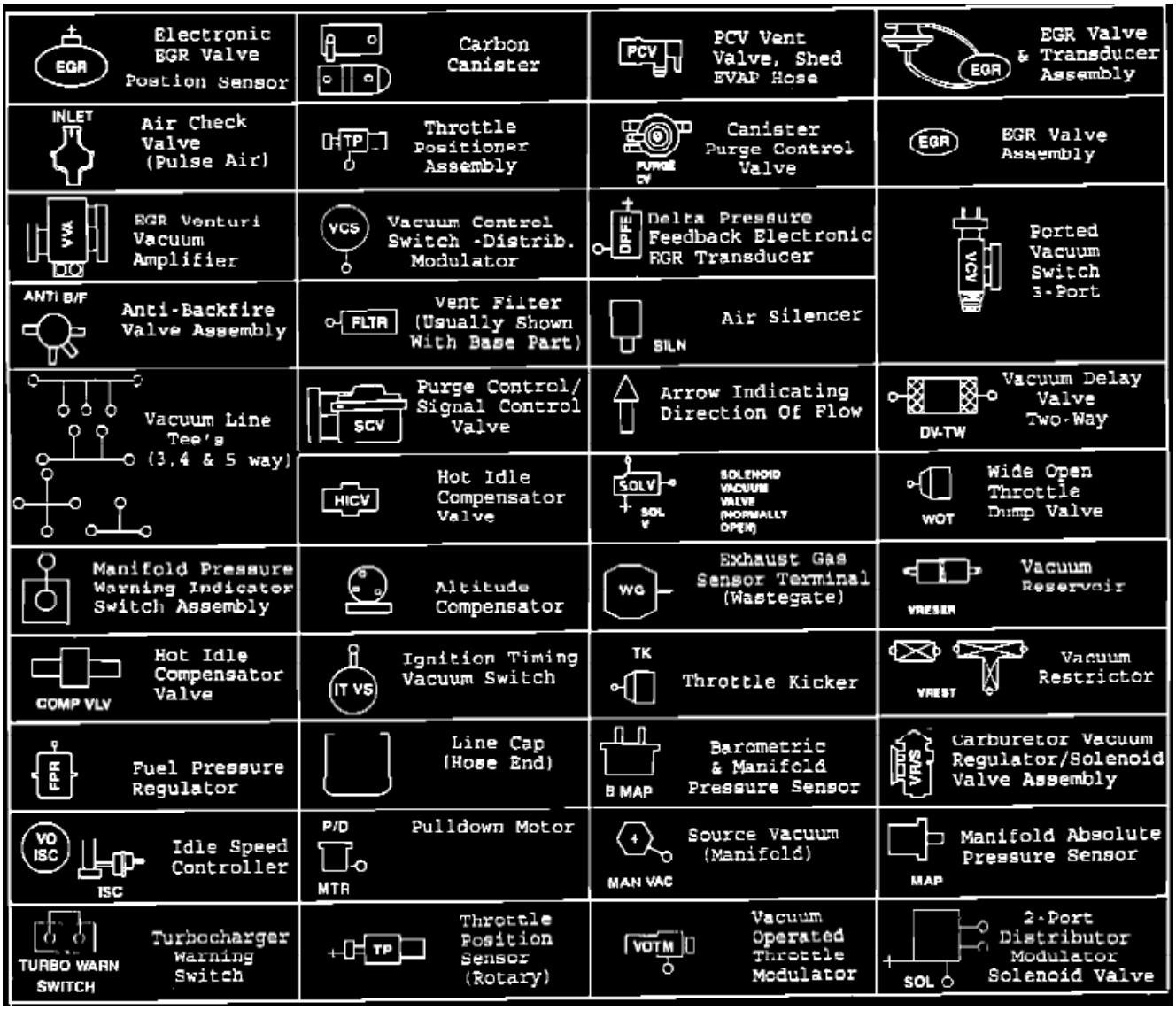


Power Window Switch: Diagram Information and Instructions

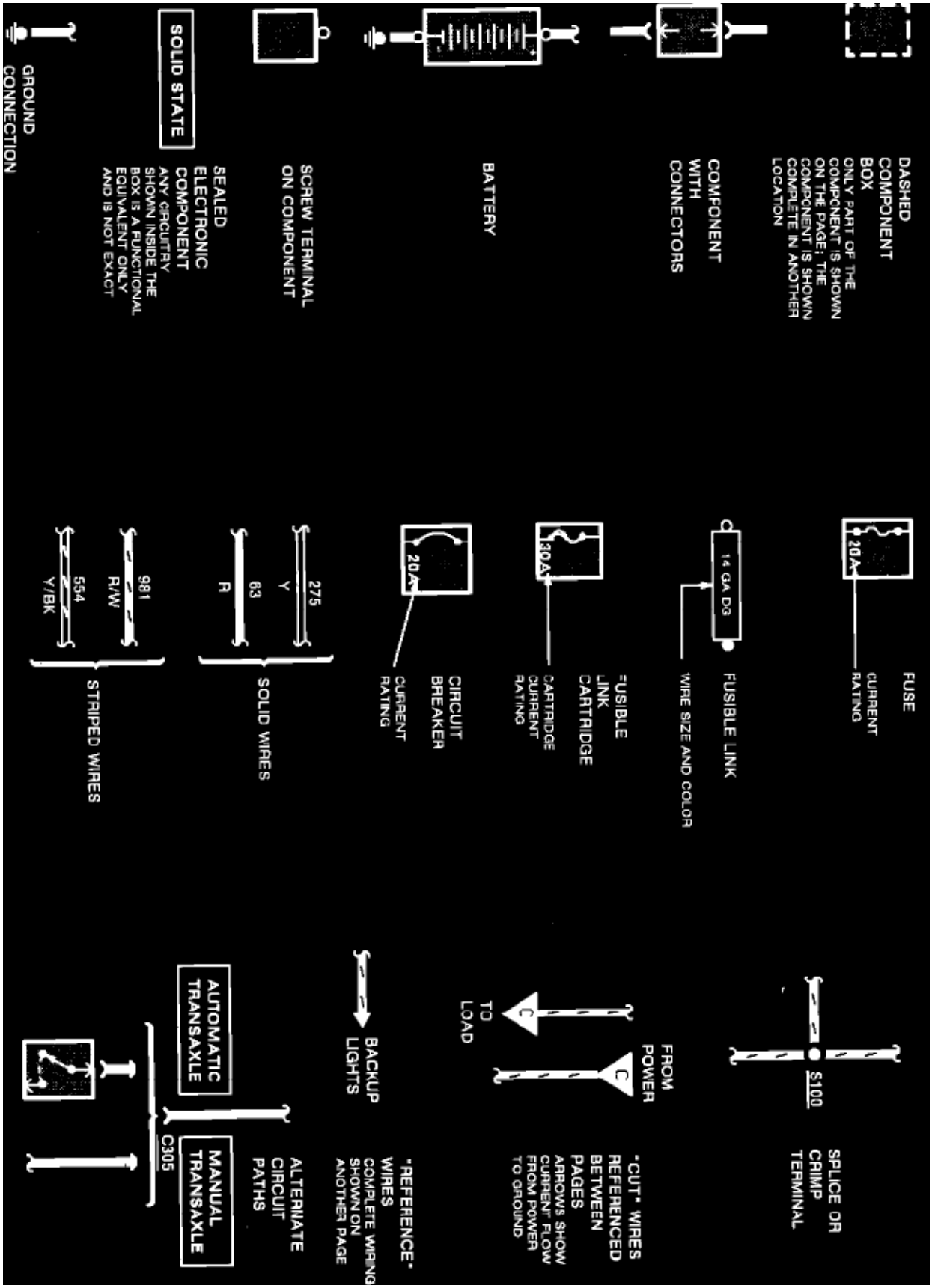
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols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BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
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GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
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30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
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Y
63
R
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S100
"CUT" WIRES REFERENCED BETWEEN PAGES
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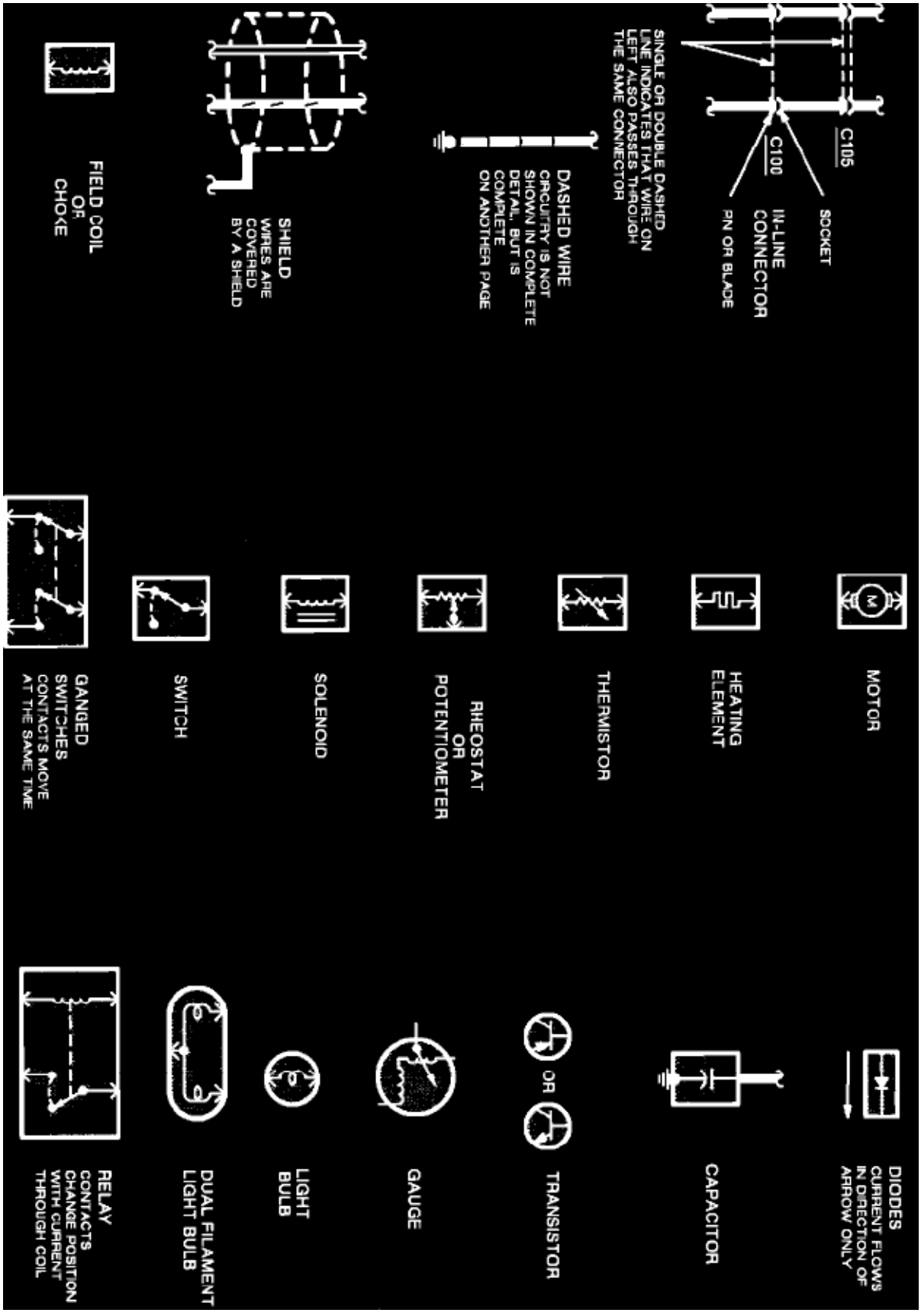
BACKUP LIGHTS
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
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WIRES ARE COVERED BY A SHIELD
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MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
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OR
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CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

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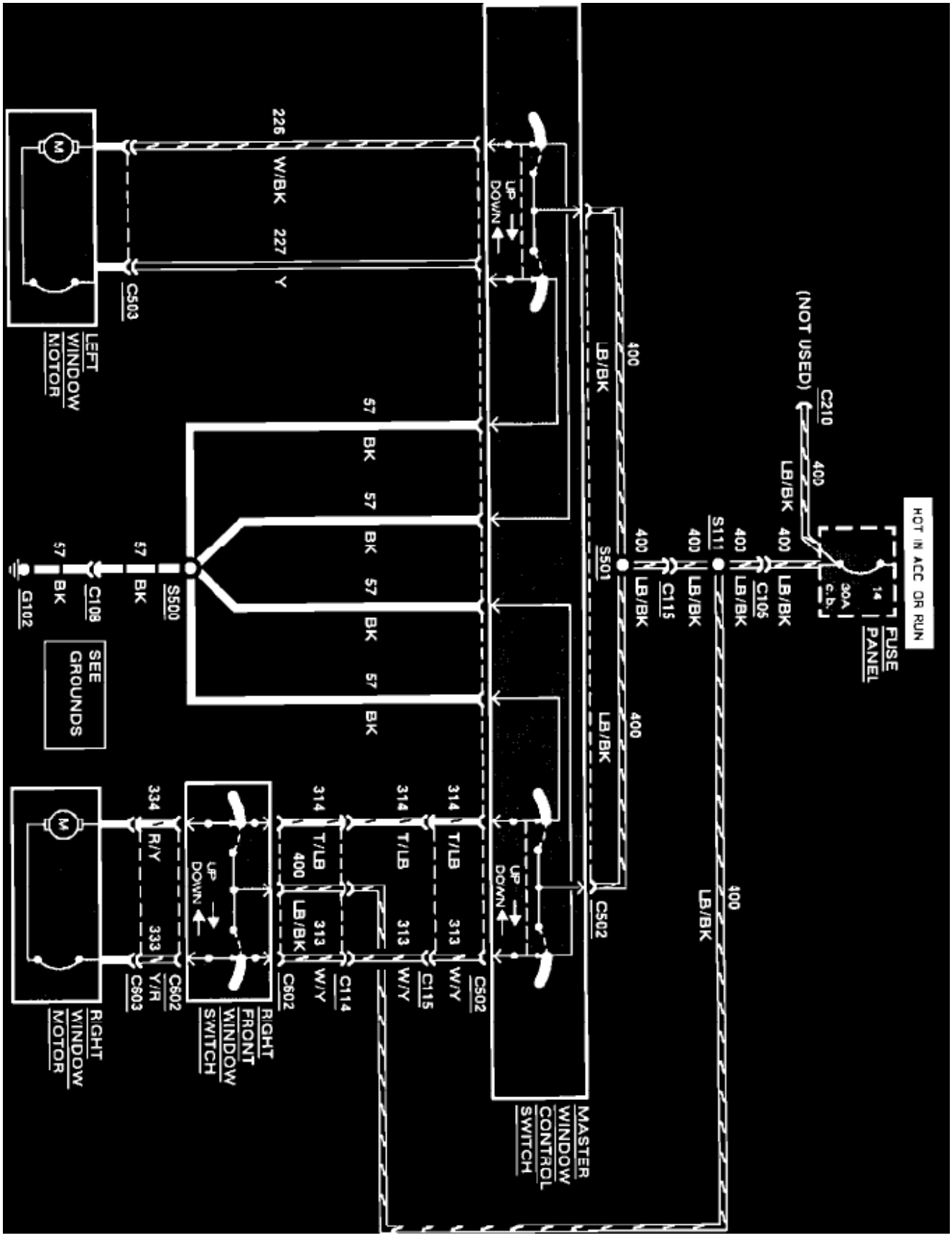
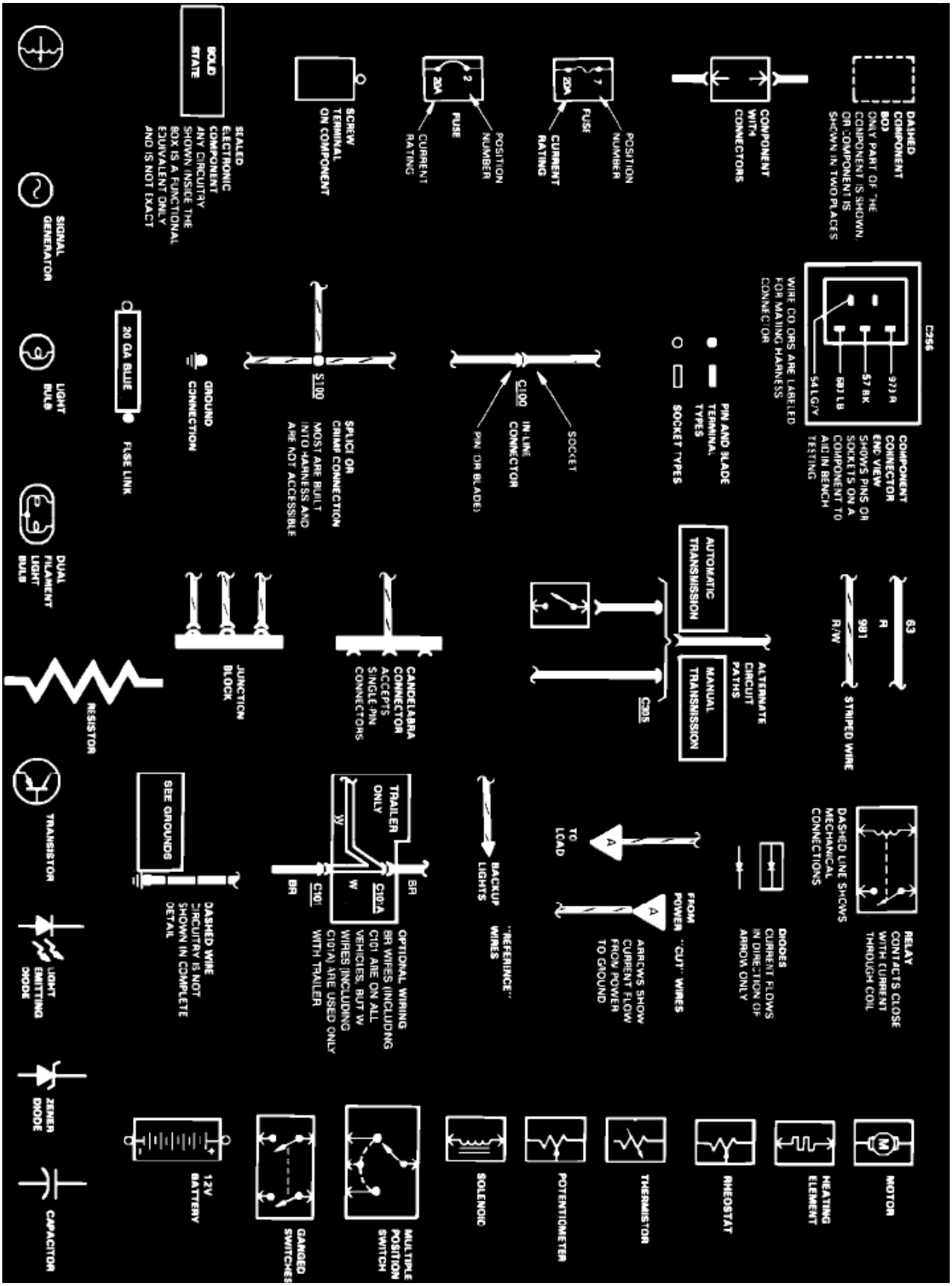
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Windows and Glass > Power Window Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 687



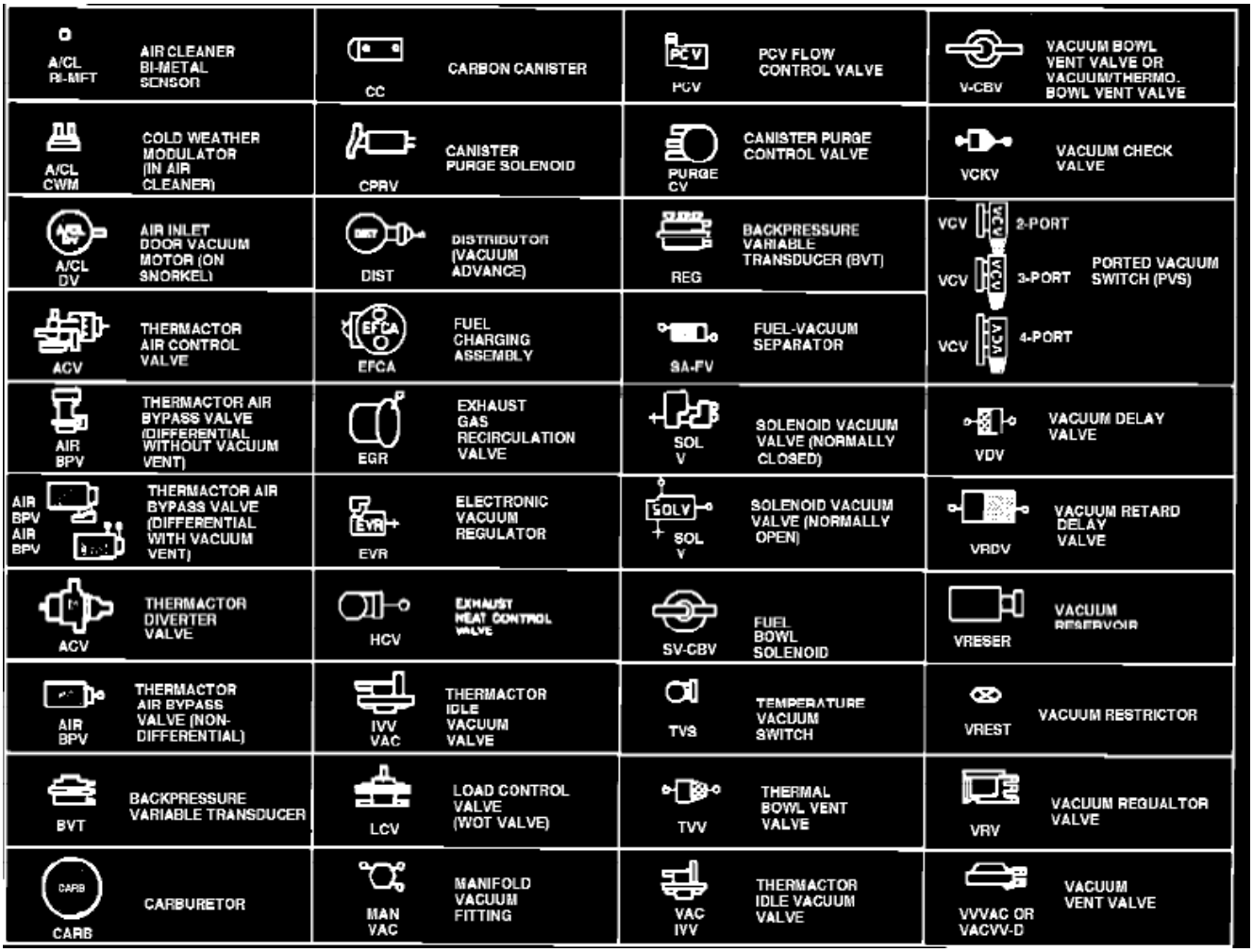
Power Windows

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Wiper and Washer Systems > Windshield Washer Switch > Component Information > Diagrams > Diagram Information and Instructions

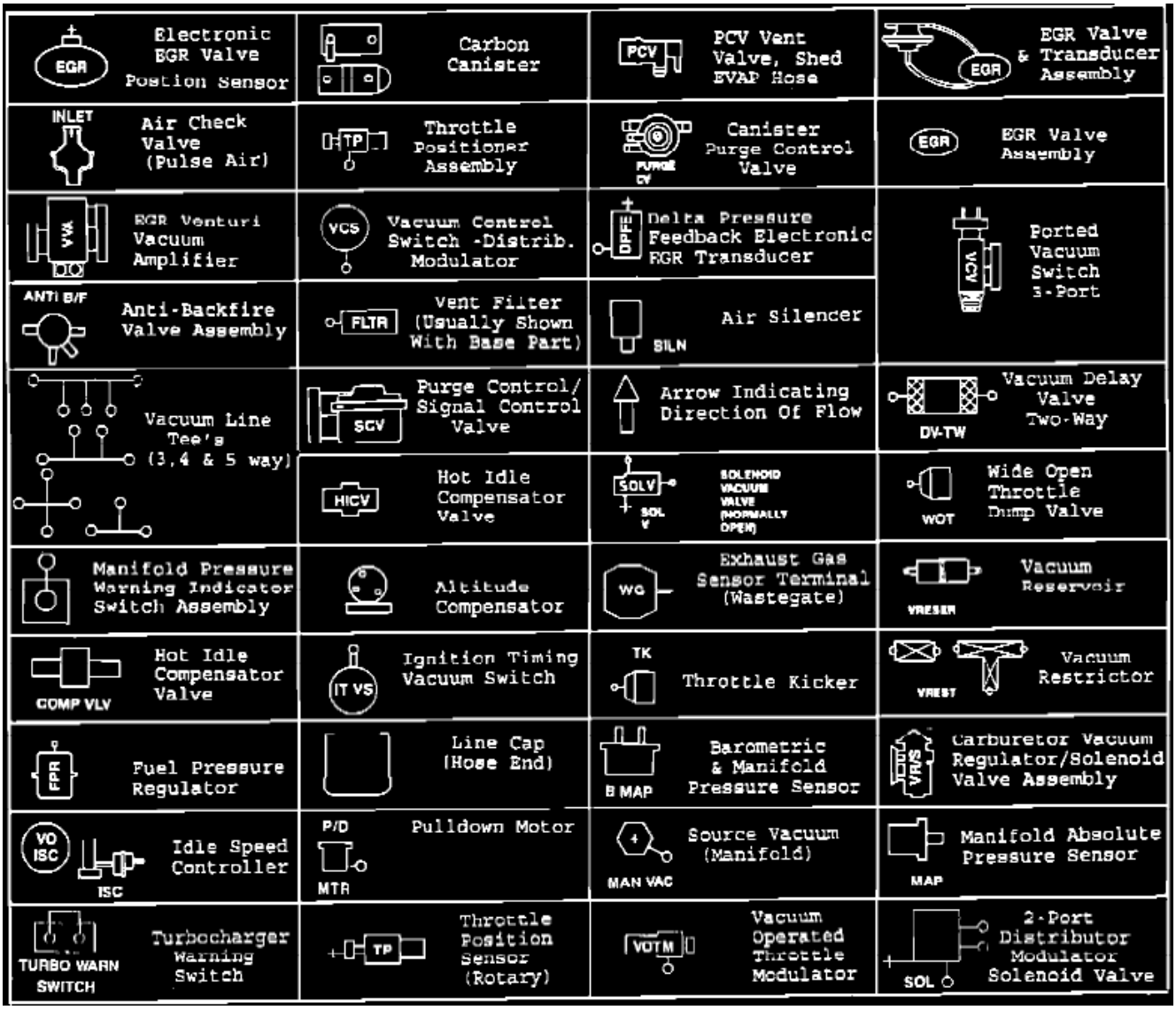


Windshield Washer Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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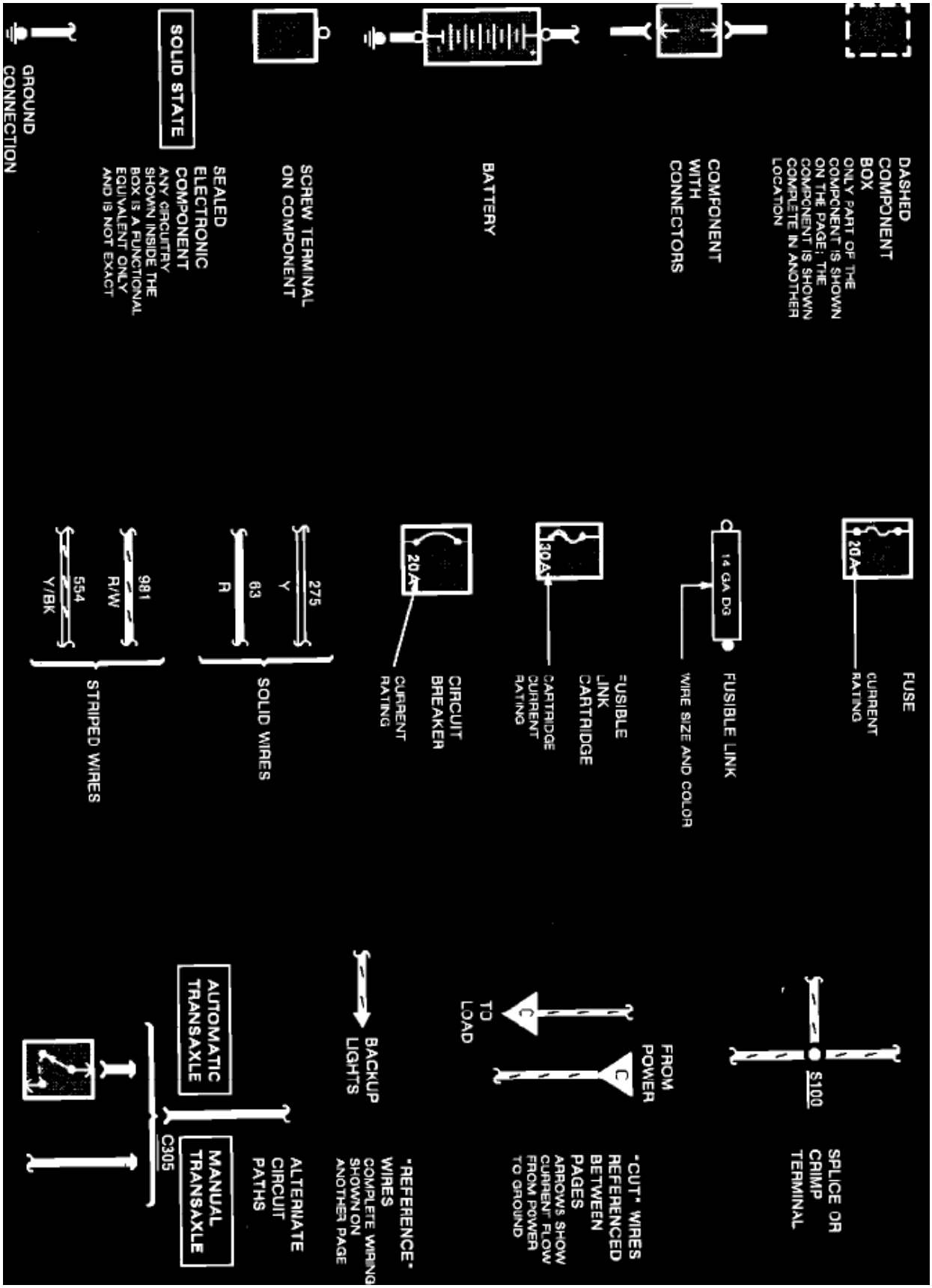
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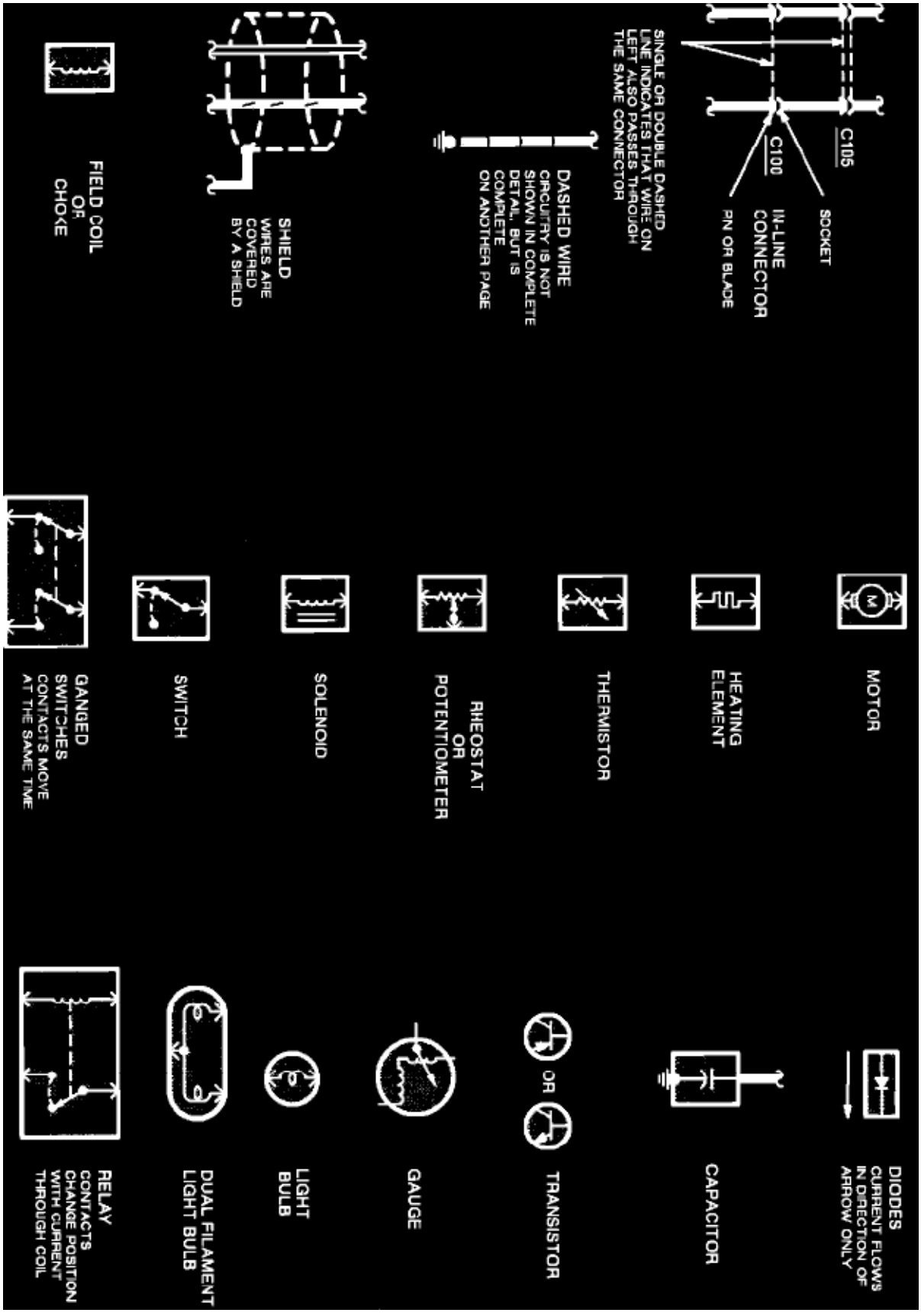
Electrical Symbols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LIGHT BULB
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RELAY
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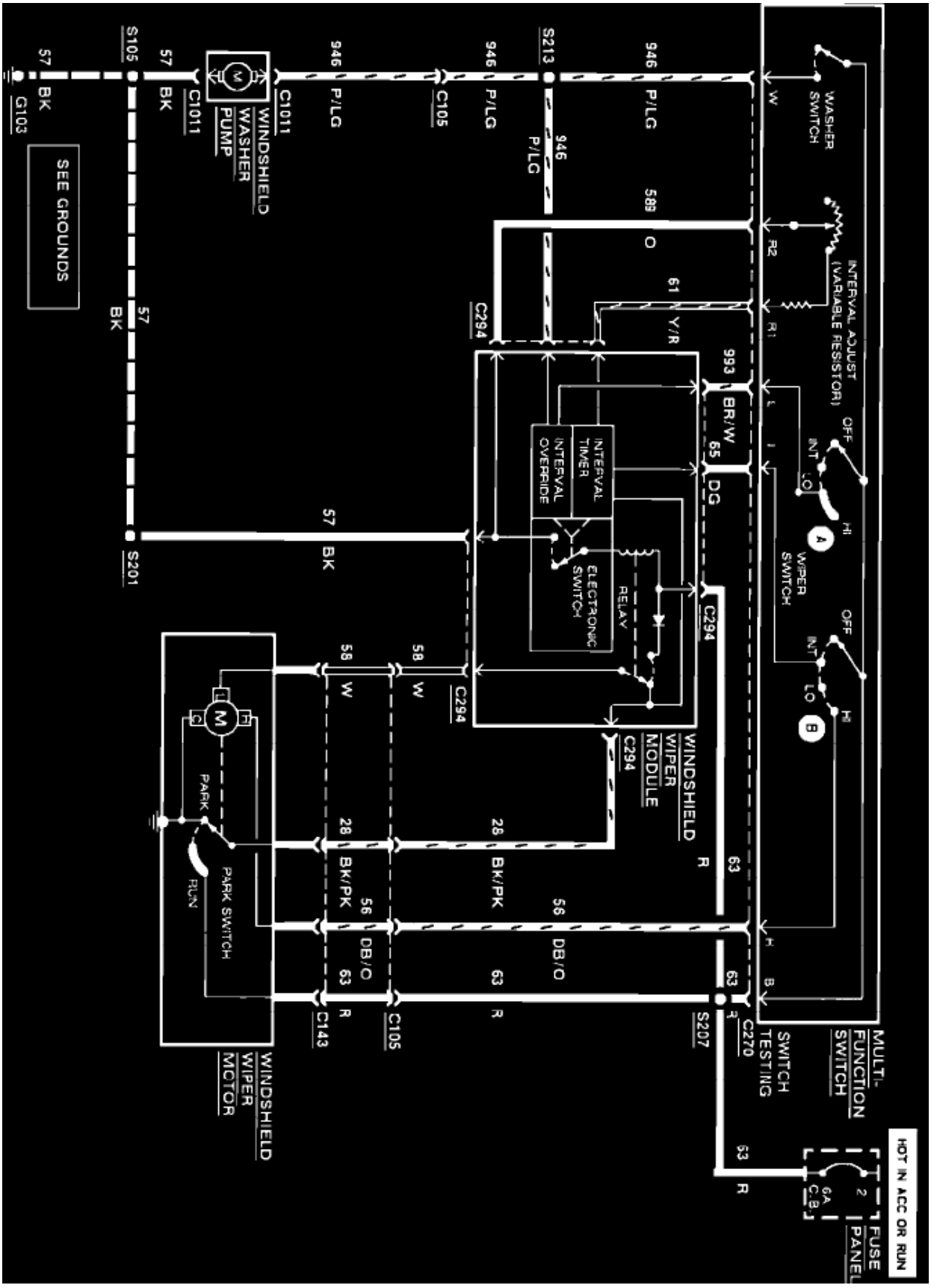
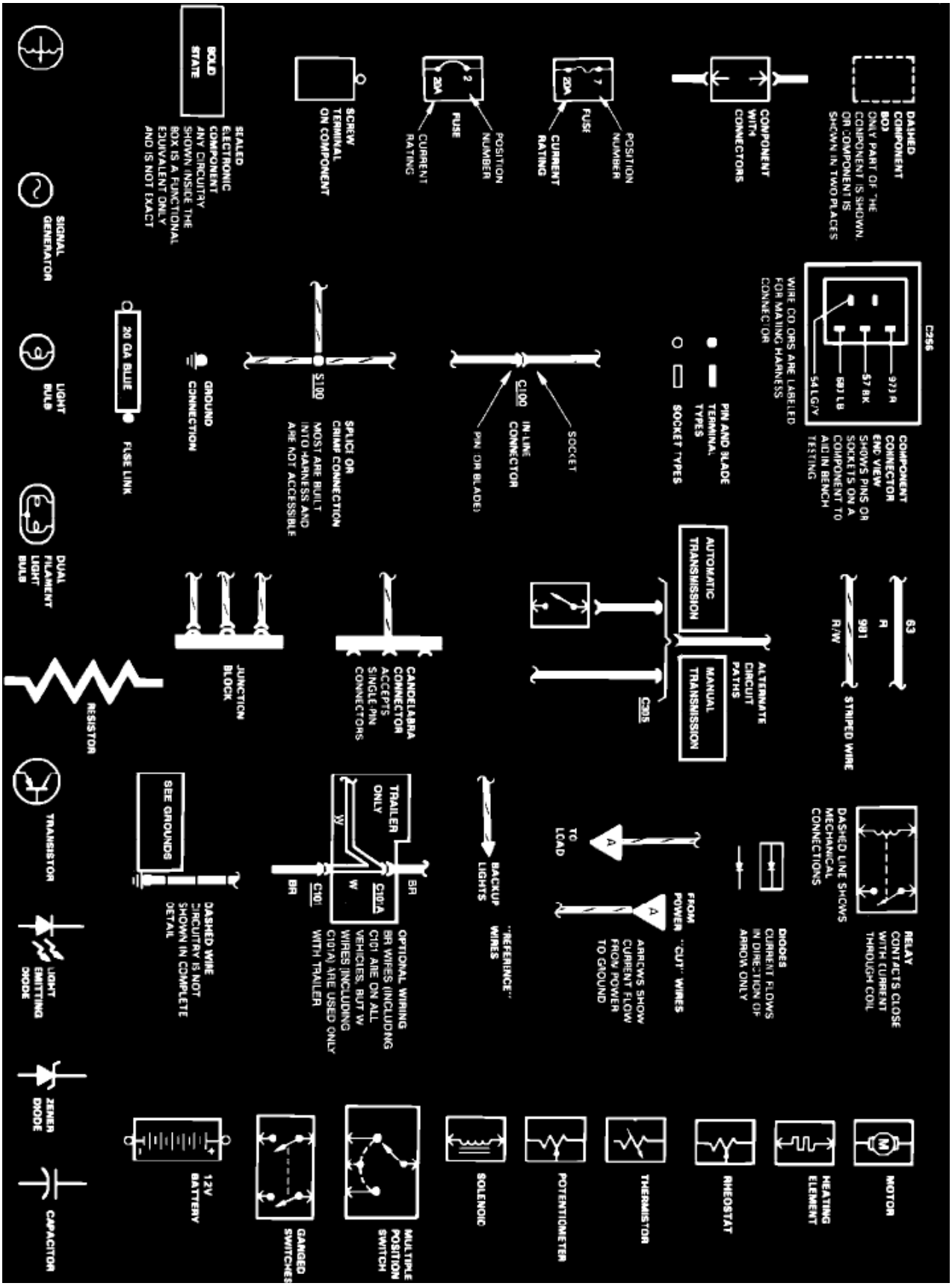
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Wiper and Washer Systems > Windshield Washer Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 698



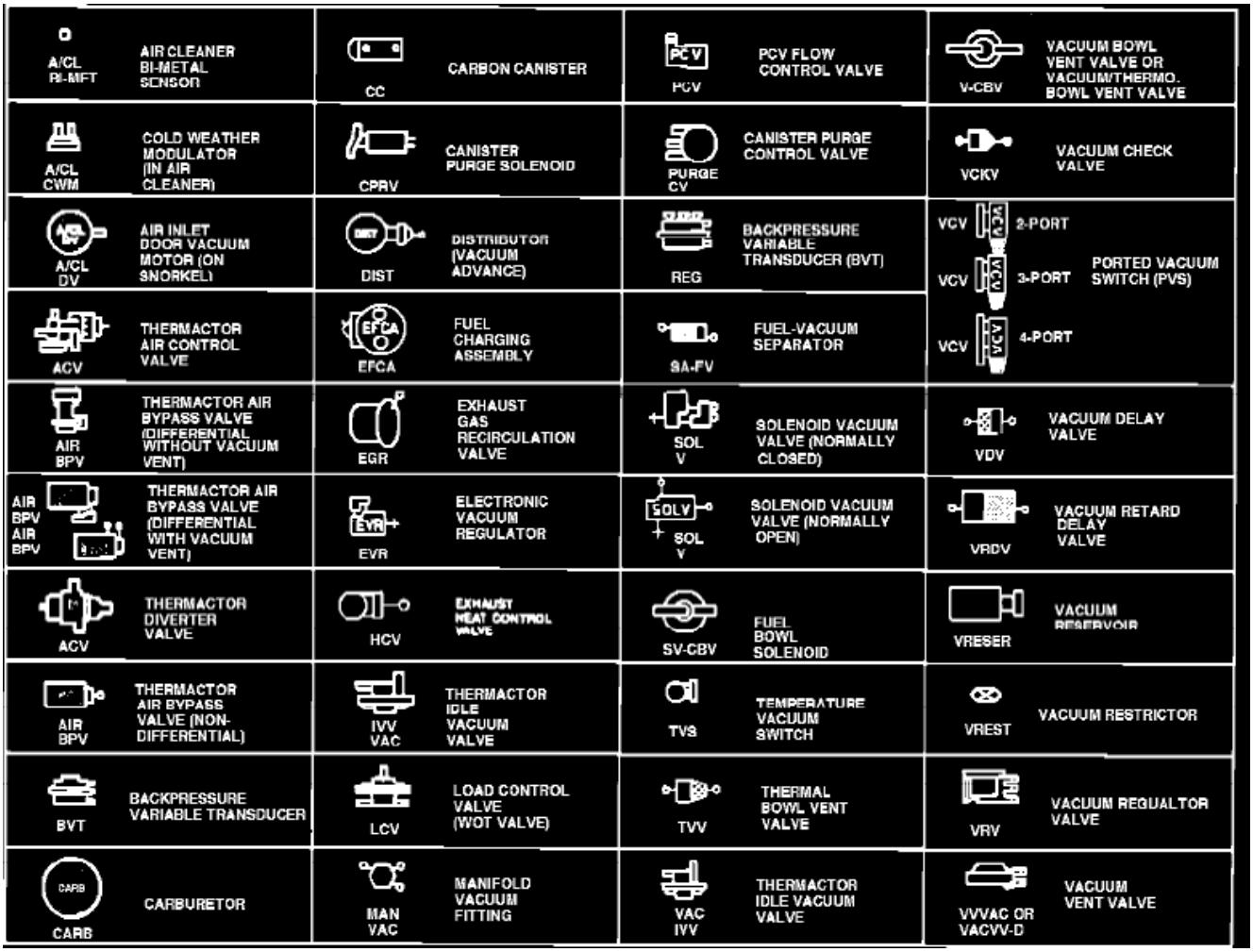
Wiper/Washer

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Sensors and Switches > Sensors and Switches - Wiper and Washer Systems > Wiper Switch > Component Information > Diagrams > Diagram Information and Instructions

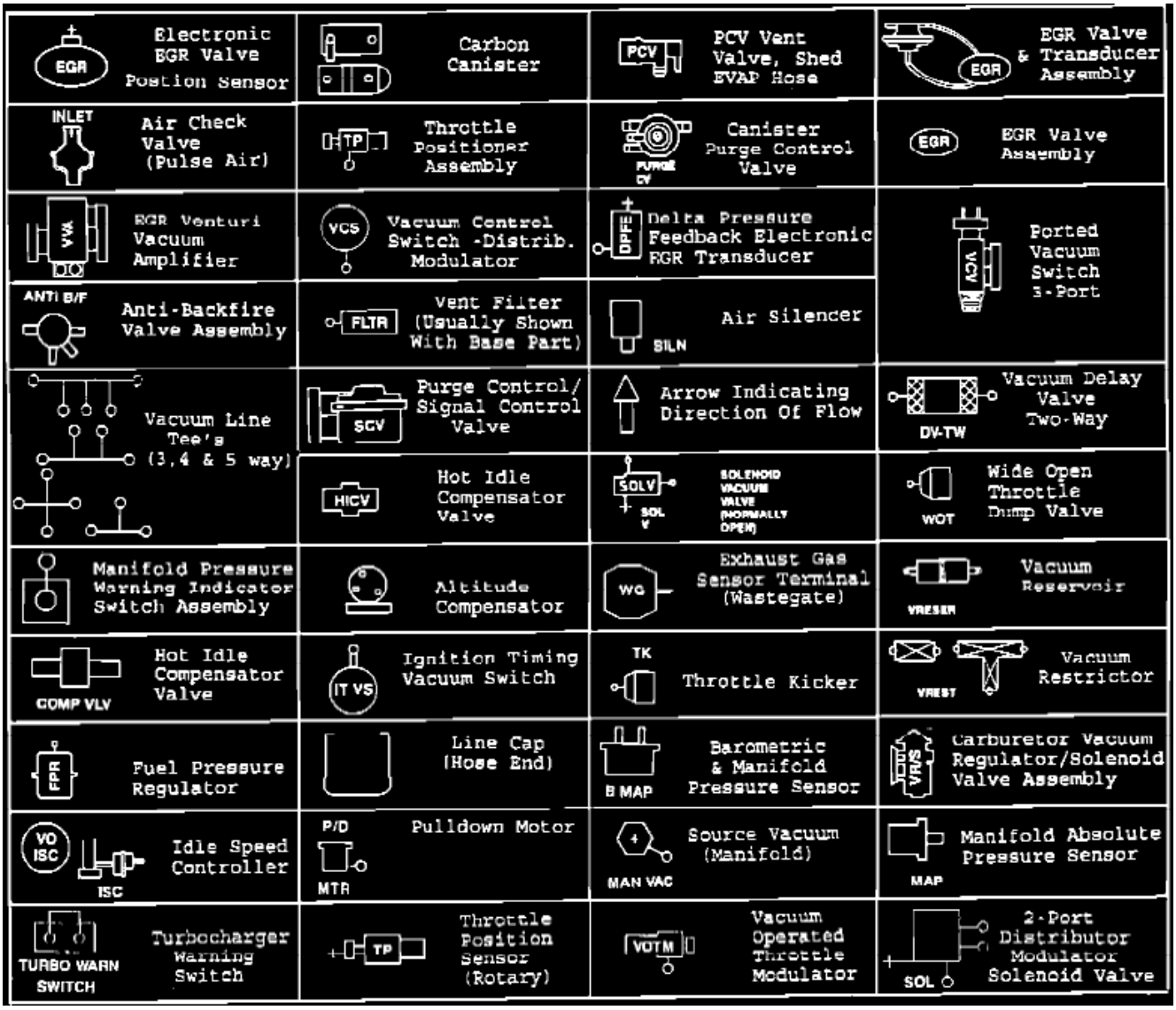


Wiper Switch: Diagram Information and Instructions

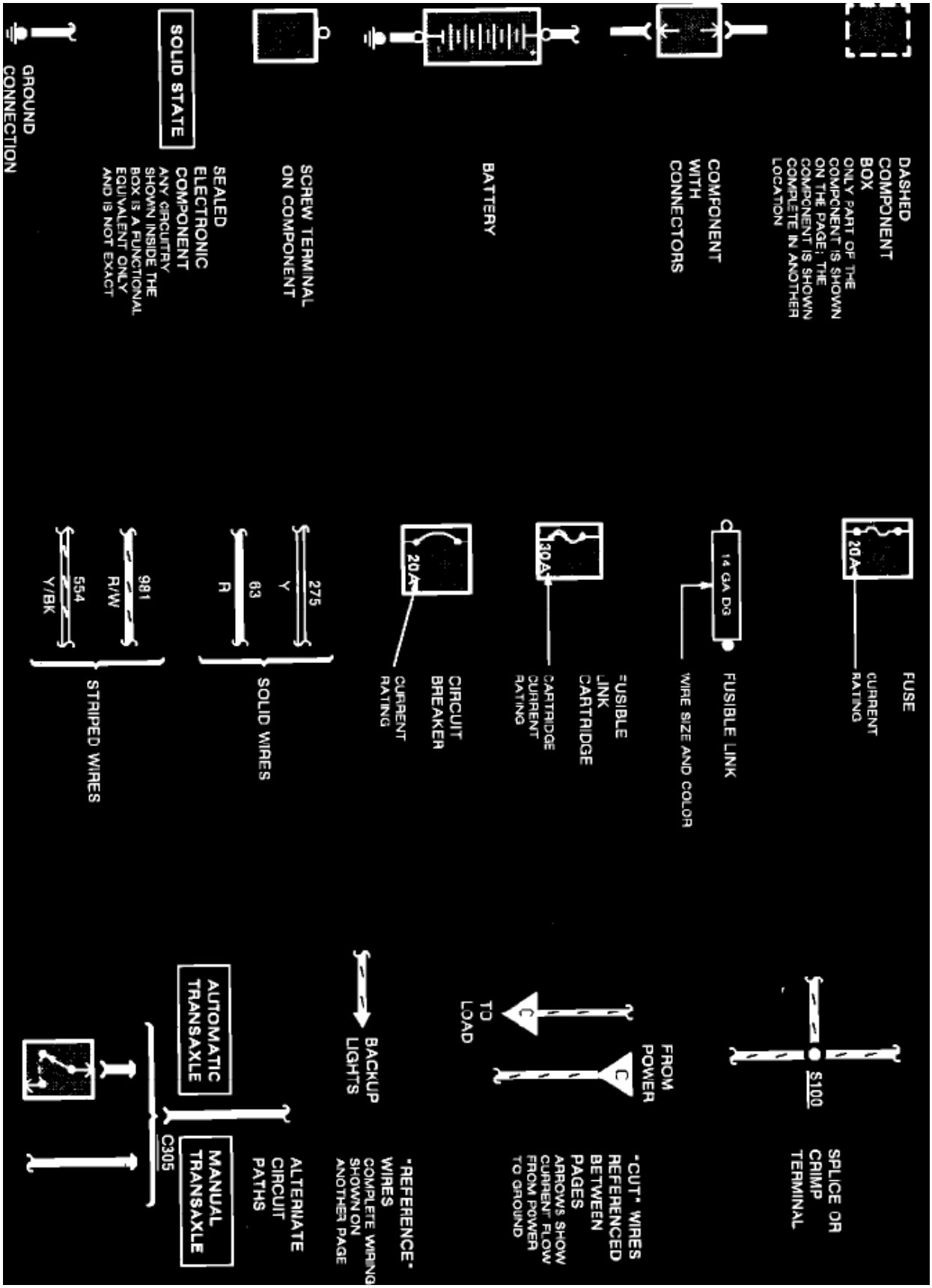
Symbol Identification



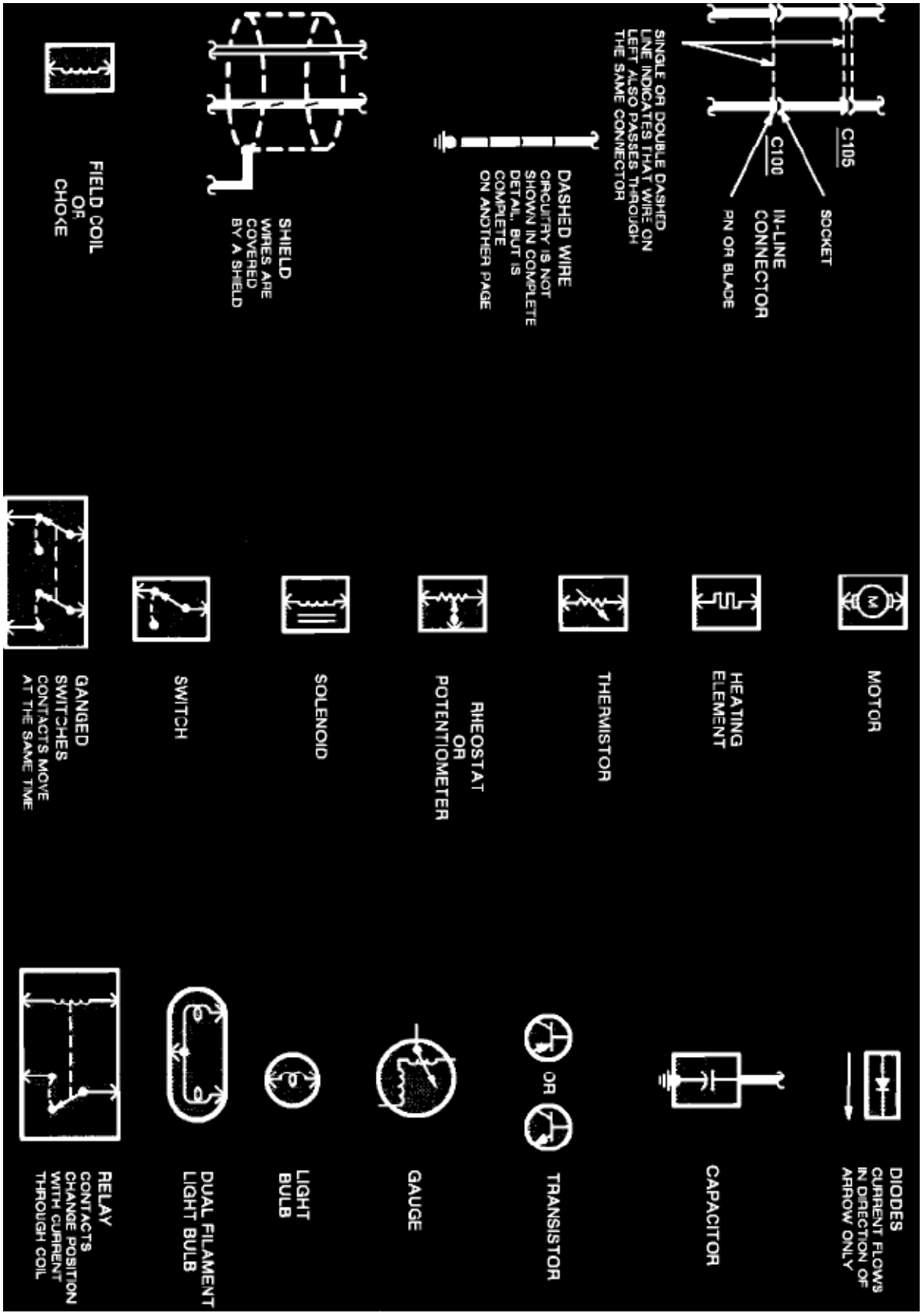
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

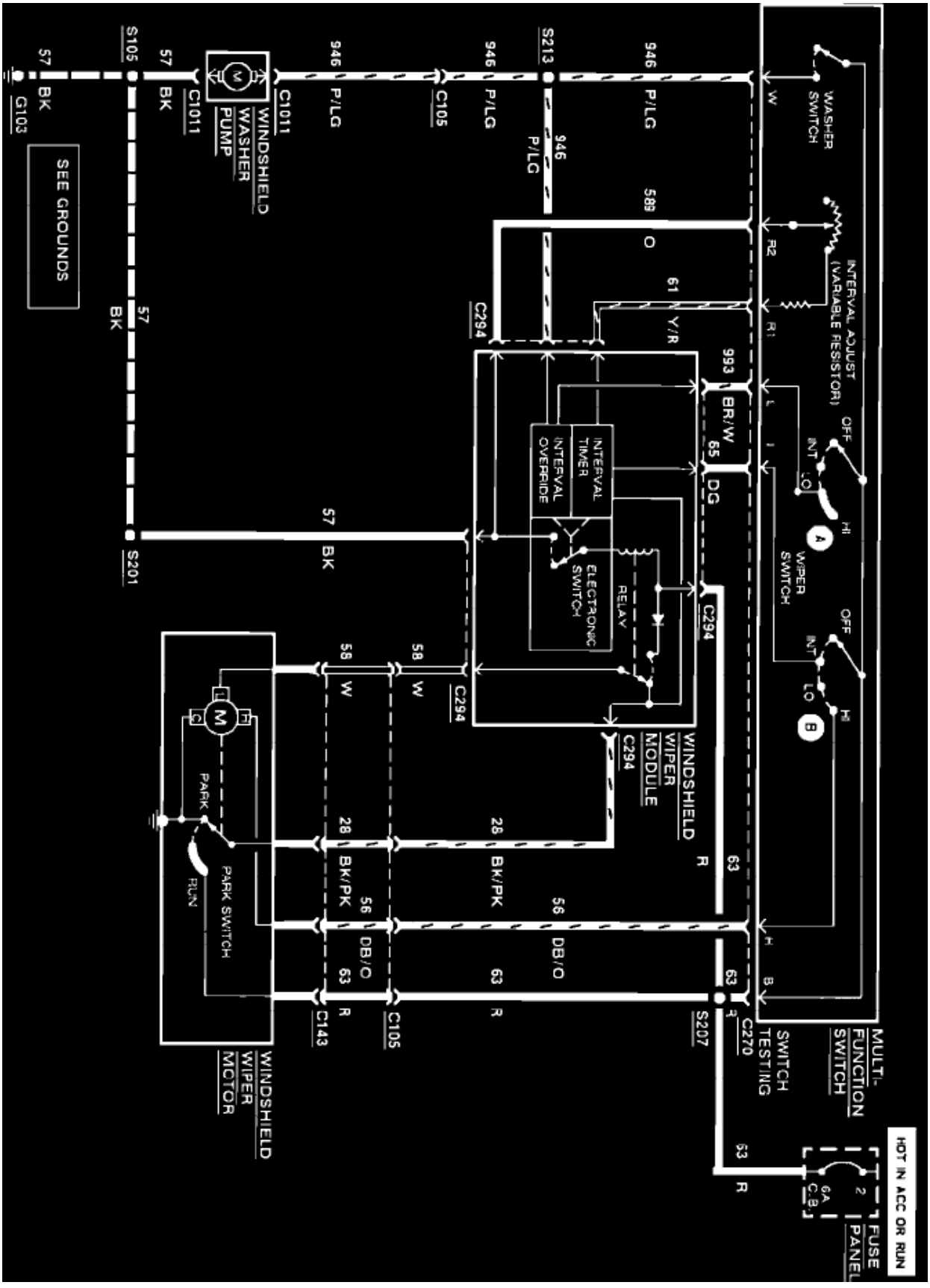
P: Purple

T: Tan

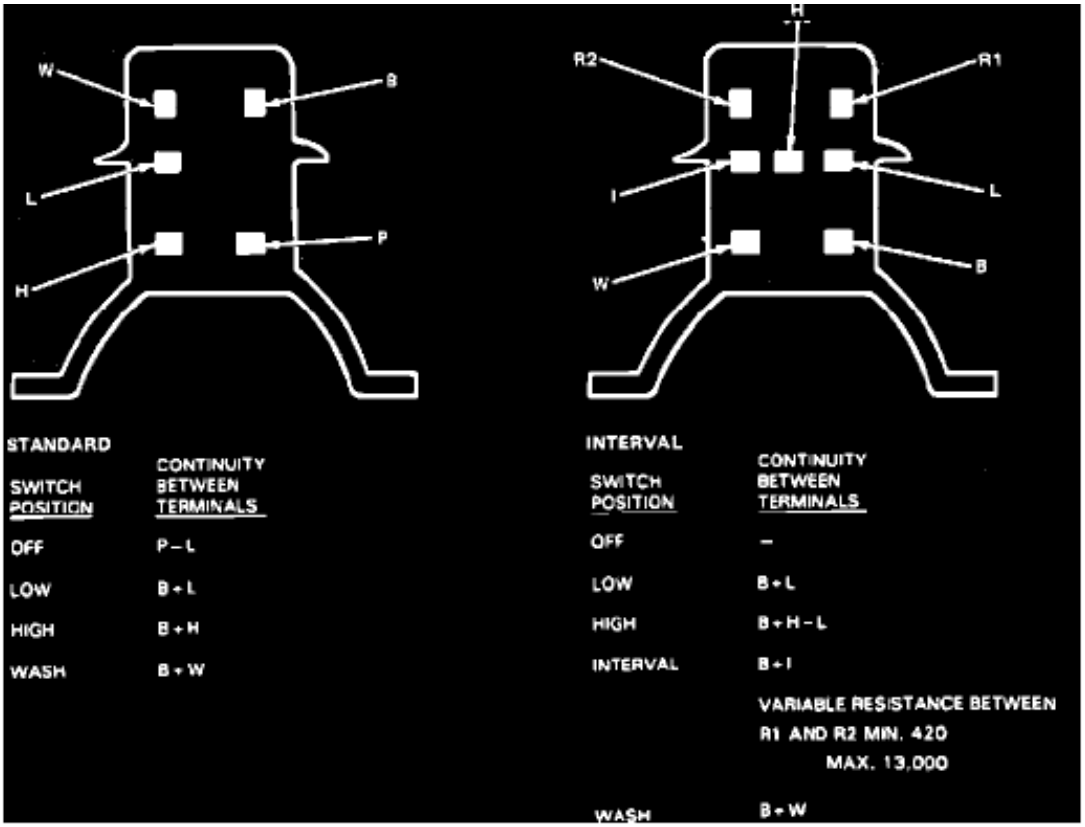
V: Violet

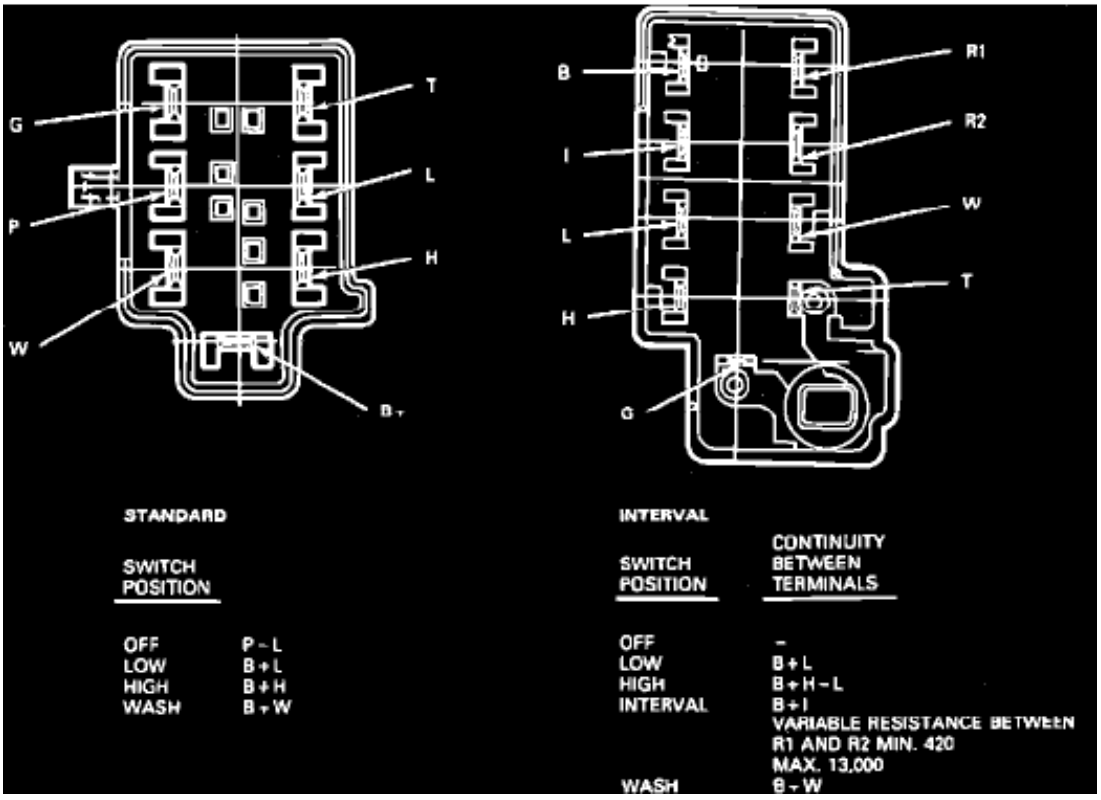
W: White

Y: Yellow


HOT IN ACC OR RUN
FUSE PANEL
2
6A C.B.
MULTI-FUNCTION SWITCH
C270
SWITCH TESTING
WASHER SWITCH
INTERVAL ADJUST (VARIABLE RESISTOR)
OFF
INT
LO
HI
WIPER SWITCH
W
R2
R1
L
I
B
53
R
S207
63
946
P/LG
589
O
61
Y/R
993
BR/W
65
DG
C294
INTERVAL TIMER
INTERVAL OVERRIDE
ELECTRONIC SWITCH
RELAY
WINDSHIELD WIPER MODULE
S213
C105
C1011
WINDSHIELD WASHER PUMP
57
BK
G103
SEE GROUNDS
S105
S201
58
W
28
BK/PK
56
DB/O
C143
PARK
RUN
PARK SWITCH
WINDSHIELD WIPER MOTOR

Wiper/Washer


W
B
L
P
H
STANDARD
SWITCH POSITION
CONTINUITY BETWEEN TERMINALS
OFF
P – L
LOW
B + L
HIGH
B + H
WASH
B + W
H
R2
R1
I
L
W
B
INTERVAL
SWITCH POSITION
CONTINUITY BETWEEN TERMINALS
OFF
–
LOW
B + L
HIGH
B + H – L
INTERVAL
B + I
VARIABLE RESISTANCE BETWEEN
R1 AND R2 MIN. 420
MAX. 13,000
WASH
B + W


G
T
L
P
H
W
B+
STANDARD
SWITCH POSITION
OFF
P – L
LOW
B + L
HIGH
B + H
WASH
B + W
B
R1
R2
I
W
L
T
H
G
INTERVAL
SWITCH POSITION
CONTINUITY BETWEEN TERMINALS
OFF
–
LOW
B + L
HIGH
B + H – L
INTERVAL
B + I
VARIABLE RESISTANCE BETWEEN
R1 AND R2 MIN. 420
MAX. 13,000
WASH
B + W

Wiper Switch: Testing and Inspection

Fig. 5 Wiper Switch Continuity Test. 1988 Bronco II & Ranger

Fig. 6 Wiper Switch Continuity Test. Except 88 Bronco II & Ranger

1. Check continuity between switch terminals, Figs 5 and 6.

2. To detect marginal operation of switch, move switch lever while each reading is being taken.

3. If switch does not show continuity or if poor continuity exists at any switch position, replace switch.

Wiper Switch: Service and Repair Rear Wiper Switch

1. Disconnect battery ground cable, then remove ashtray and instrument cluster trim panel.

2. Remove switch mounting bezel containing switches, then disconnect switch electrical connector and remove switch.

3. Reverse procedure to install, checking wiper operation.

Wiper Switch: Service and Repair Windshield Wiper Switch

REMOVAL

1. Disconnect battery ground cable (two ground cables on diesel engines).

2. On models with tilt steering, remove upper extension shroud by squeezing at six and twelve o'clock positions and popping free of retaining plate at three o'clock position.

3. On all models, remove steering column shroud halves.

4. Remove turn signal switch lever by grasping and using a twisting and pulling motion while pulling lever straight out from switch.

5. Peel back foam shield from switch, then disconnect electrical connectors.

6. Remove two switch attaching screws, then the switch.

INSTALLATION

1. Align switch mounting holes with holes in lock cylinder housing, then install screws and torque to 18-26 inch lbs.

2. Adhere foam shield to switch, then install switch lever by aligning key on lever with keyway in switch and pushing lever in until fully engaged.

3. Connect electrical connectors, then install steering column shroud halves.

4. On models with tilt steering, install upper extension shroud.

5.

On all models, connect battery ground cable.

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER 1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

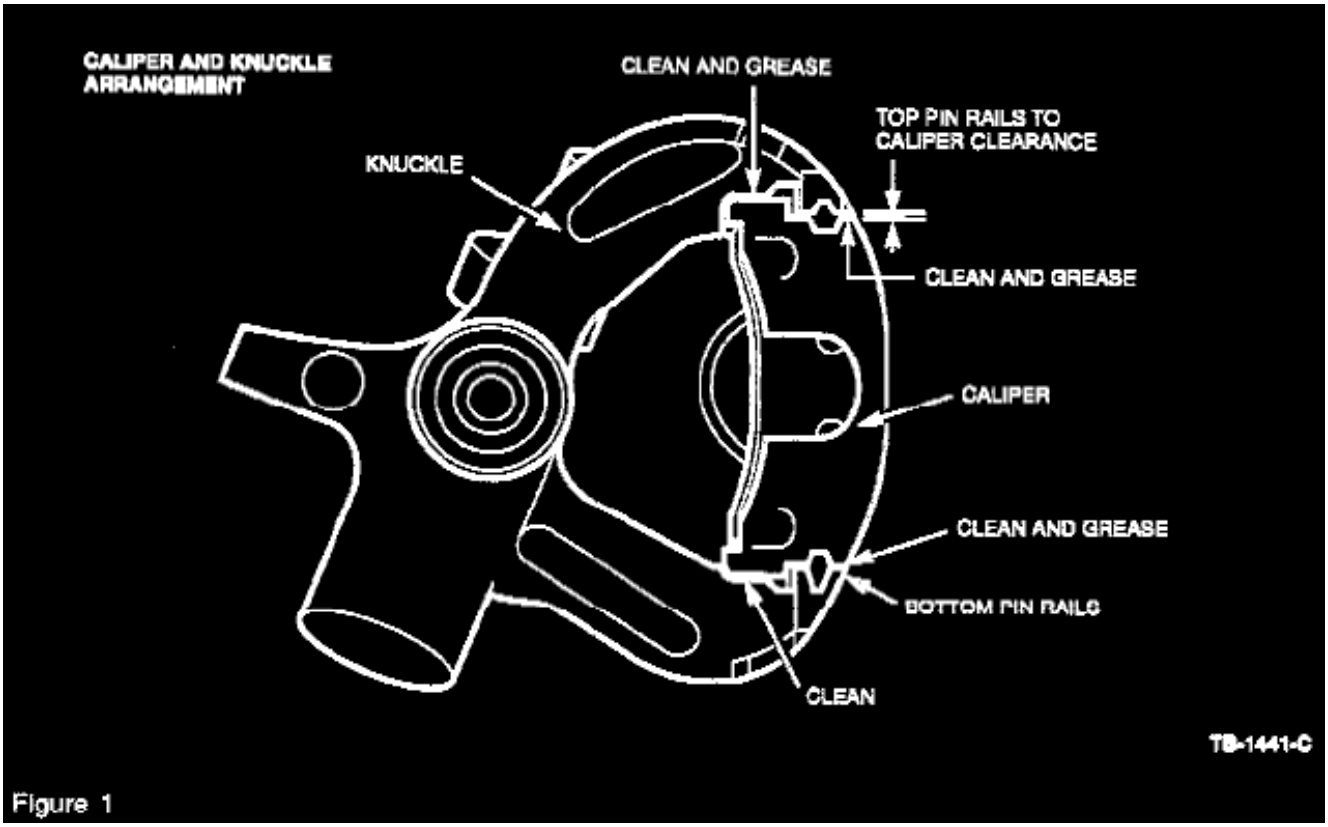


Figure 1

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

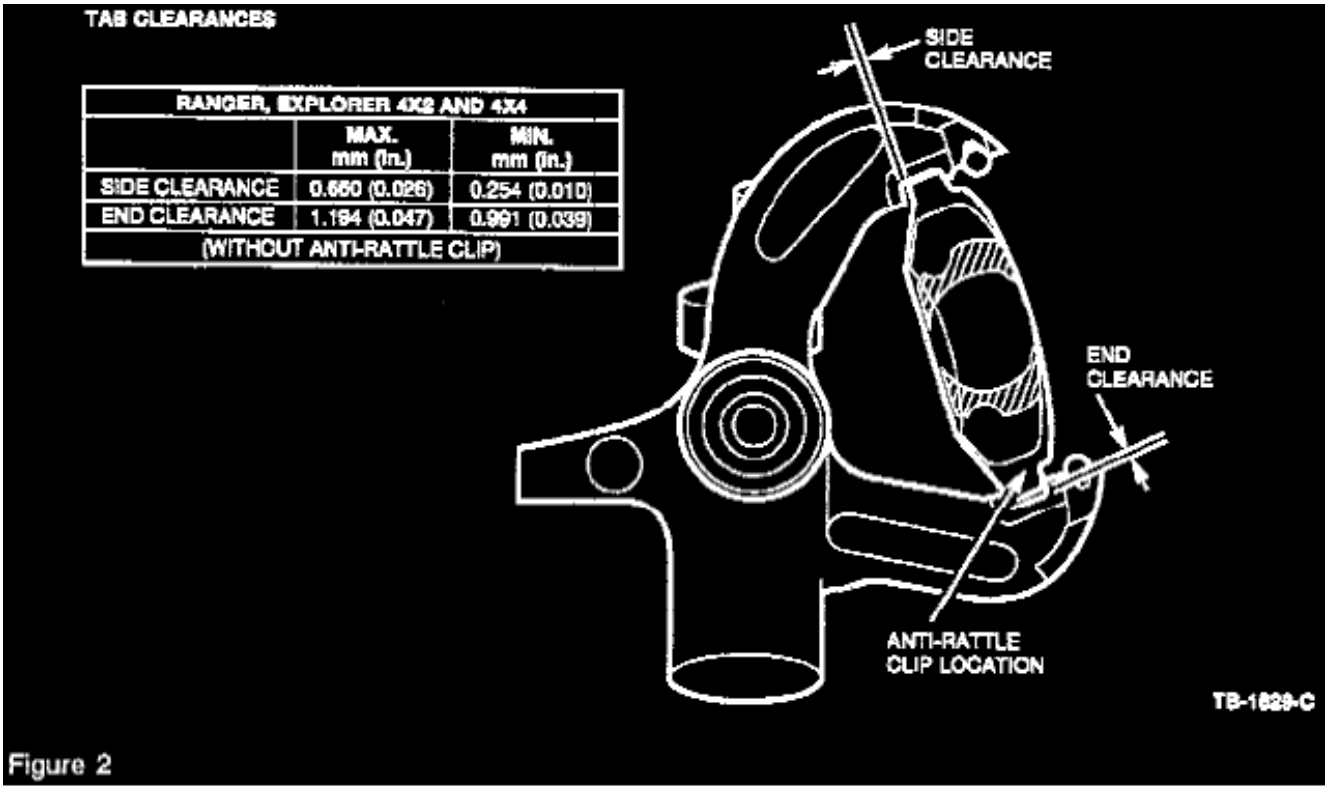


Figure 2

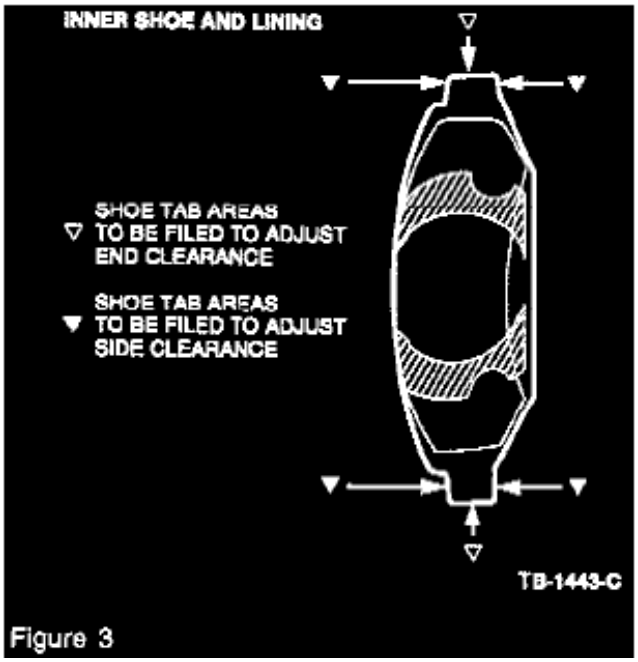


Figure 3

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application.
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

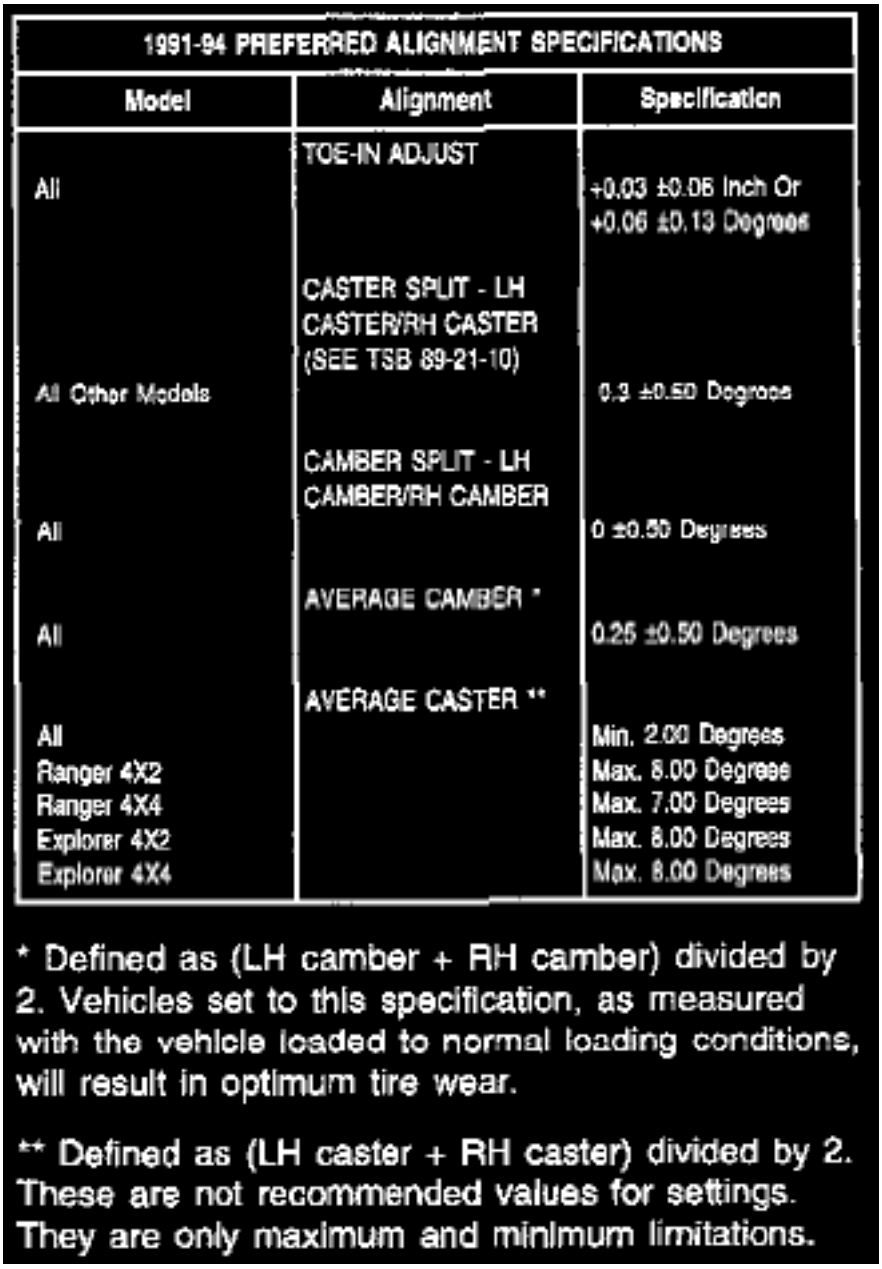
3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS

Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All	AVERAGE CASTER **	Min. 2.00 Degrees
Ranger 4X2		Max. 8.00 Degrees
Ranger 4X4		Max. 7.00 Degrees
Explorer 4X2		Max. 8.00 Degrees
Explorer 4X4		Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

7. Miscellaneous

___ Check for loose, damaged or worn parts.

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER 1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

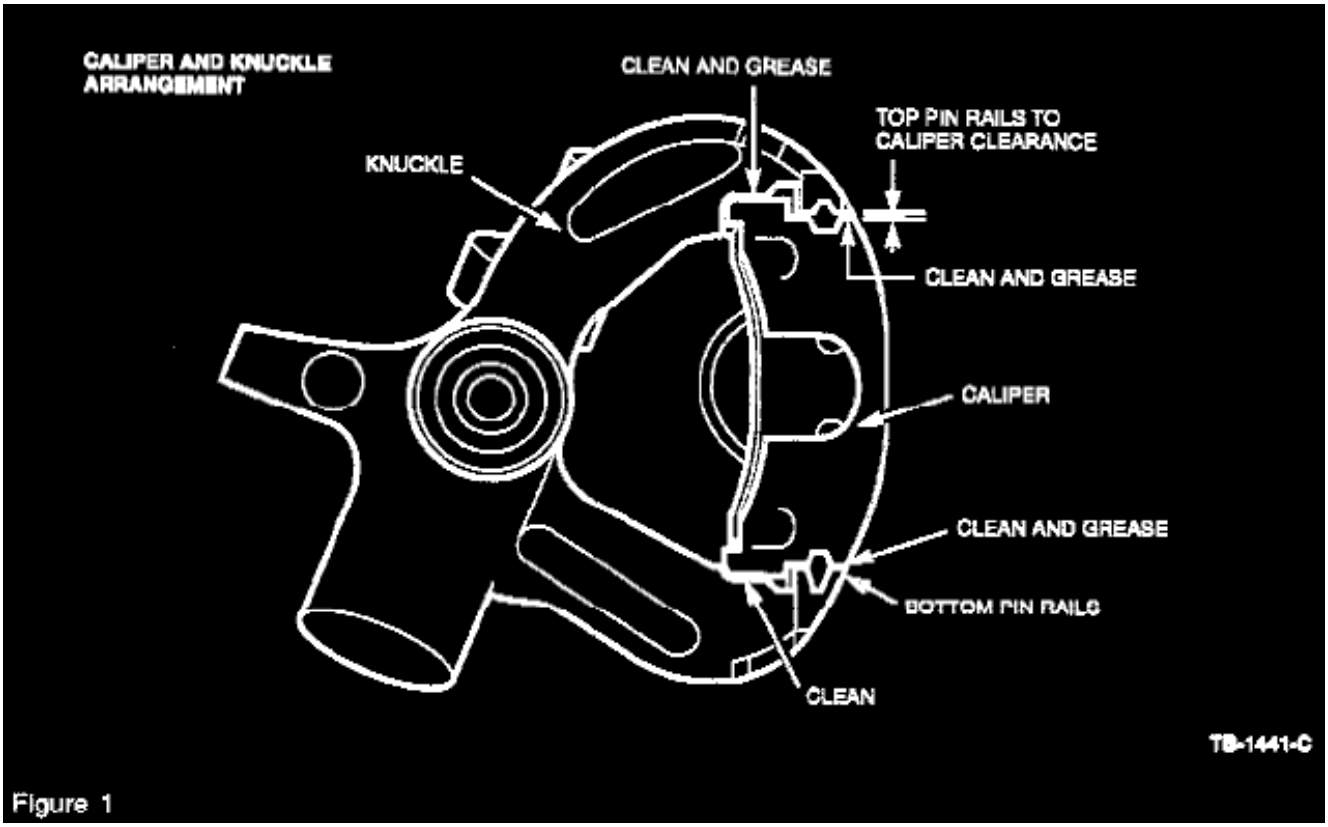


Figure 1

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

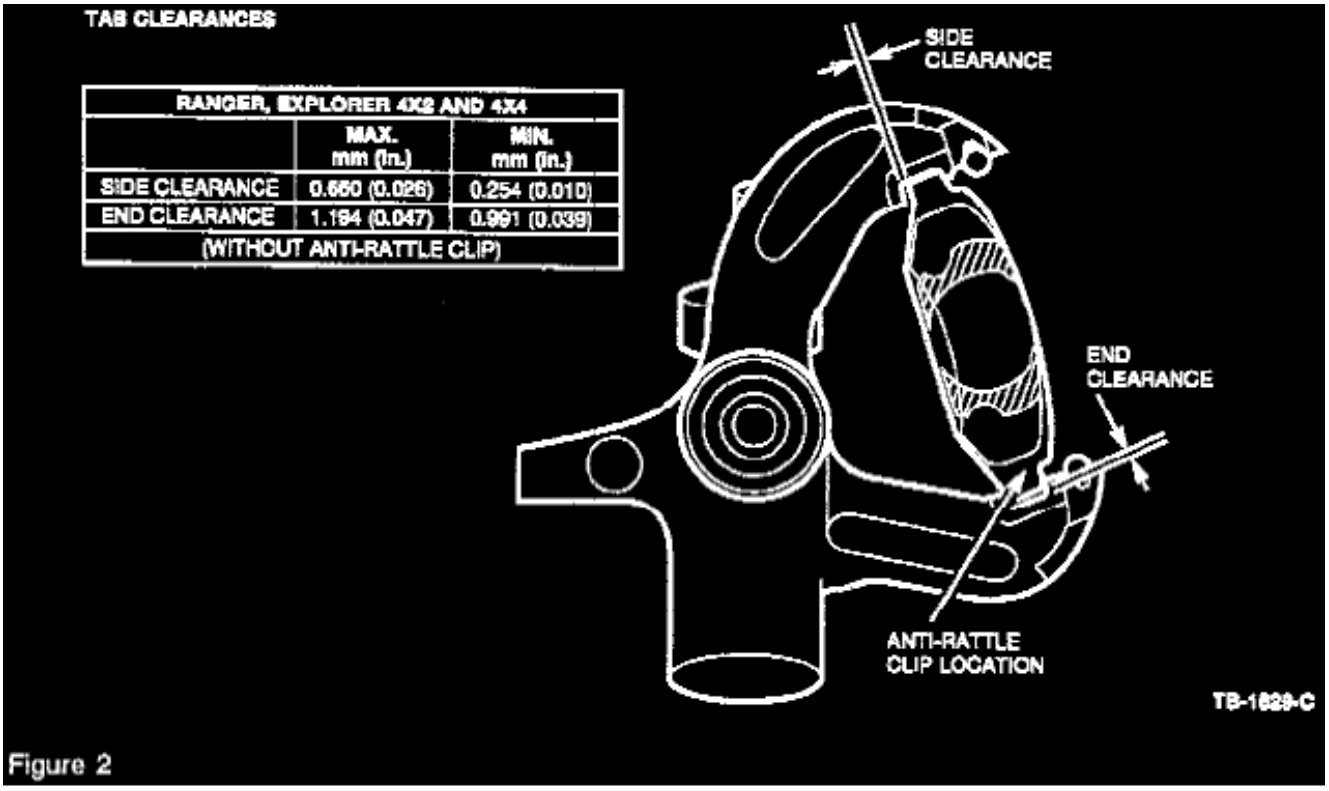


Figure 2

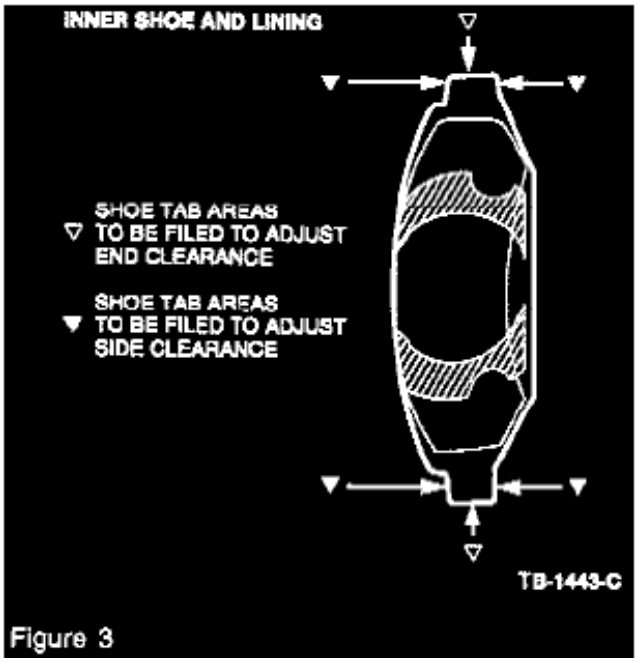


Figure 3

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application.
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

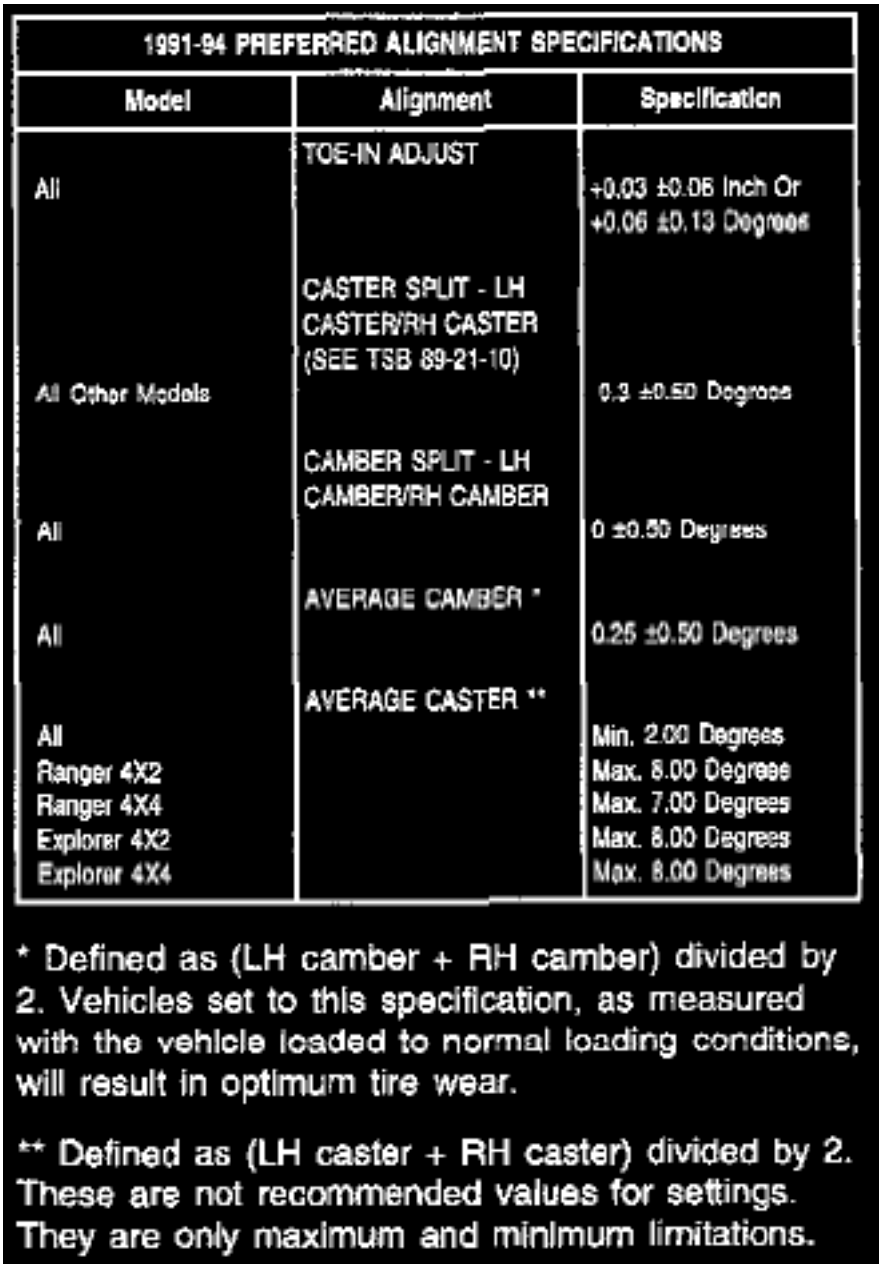
3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS		
Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All Ranger 4X2 Ranger 4X4 Explorer 4X2 Explorer 4X4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

7. Miscellaneous

___ Check for loose, damaged or worn parts.

Alignment: By Symptom

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER 1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

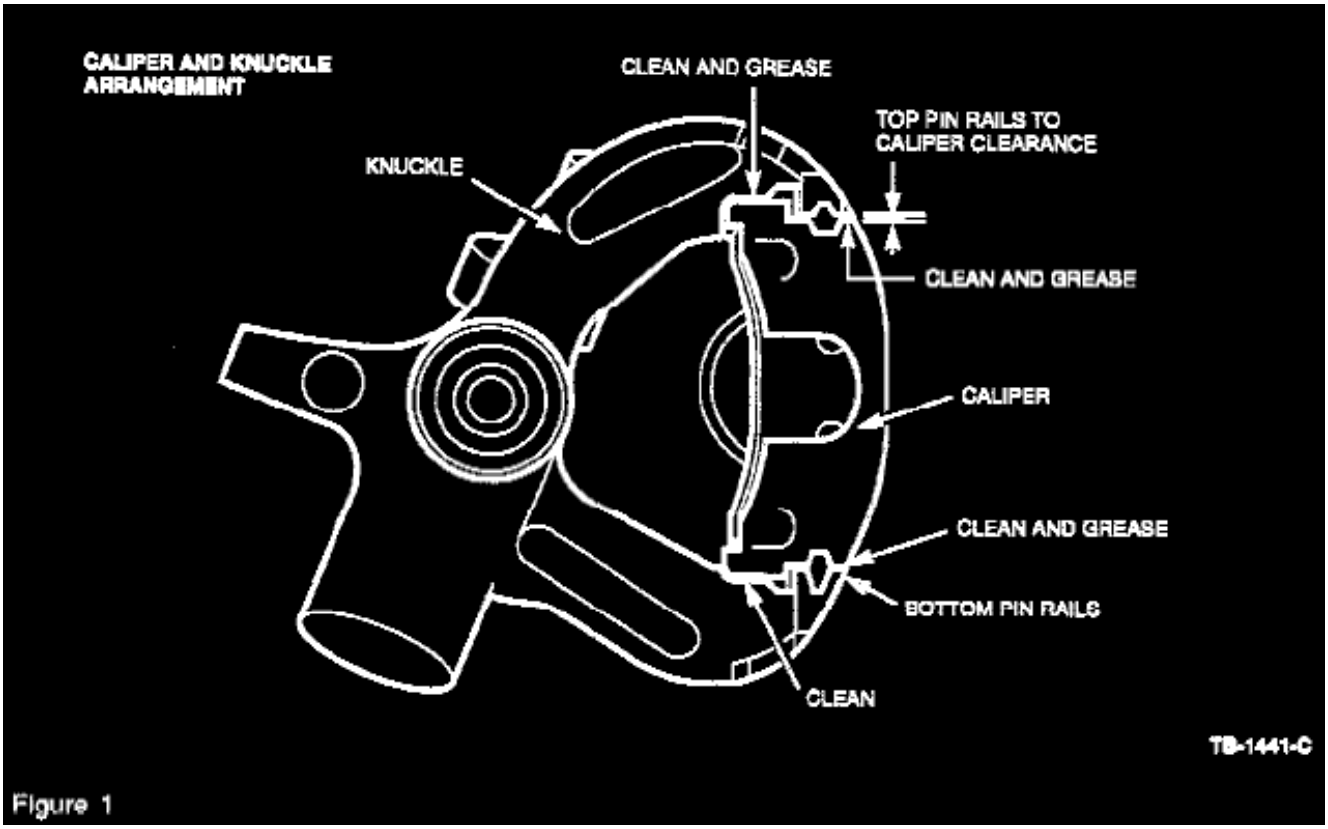


Figure 1

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

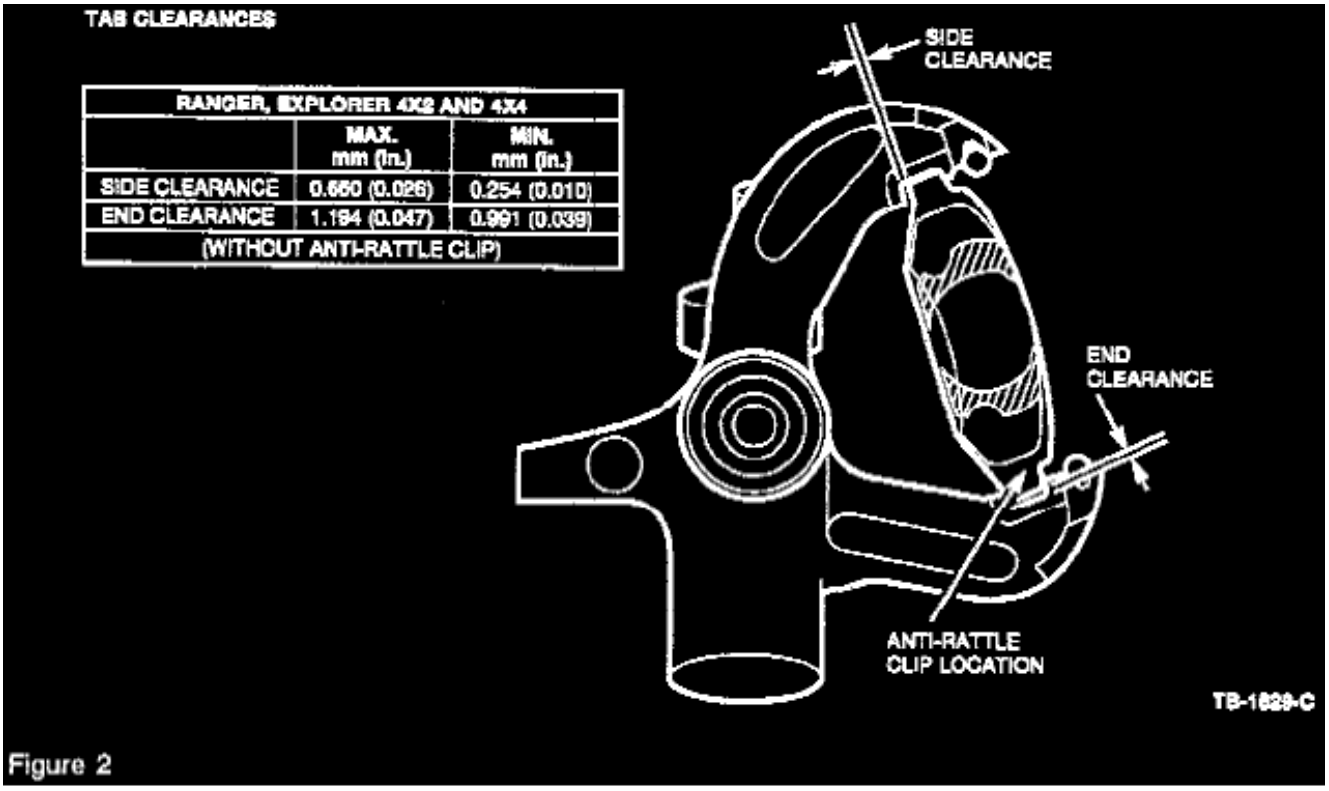


Figure 2

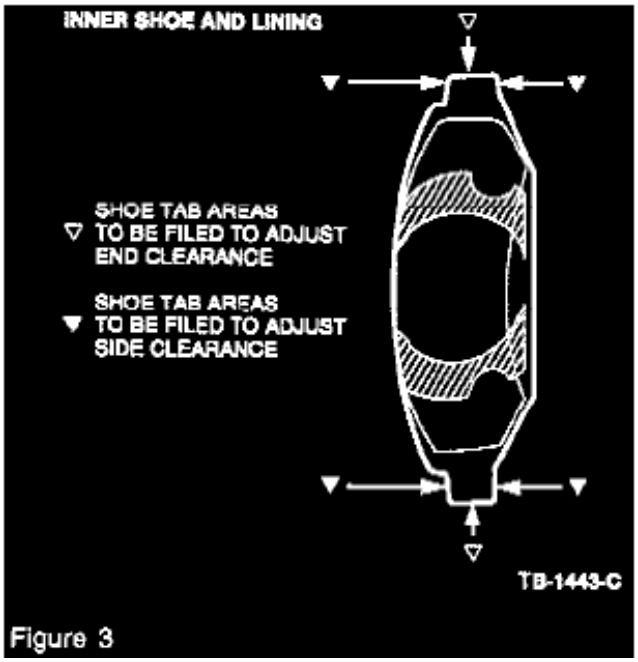


Figure 3

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application.
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

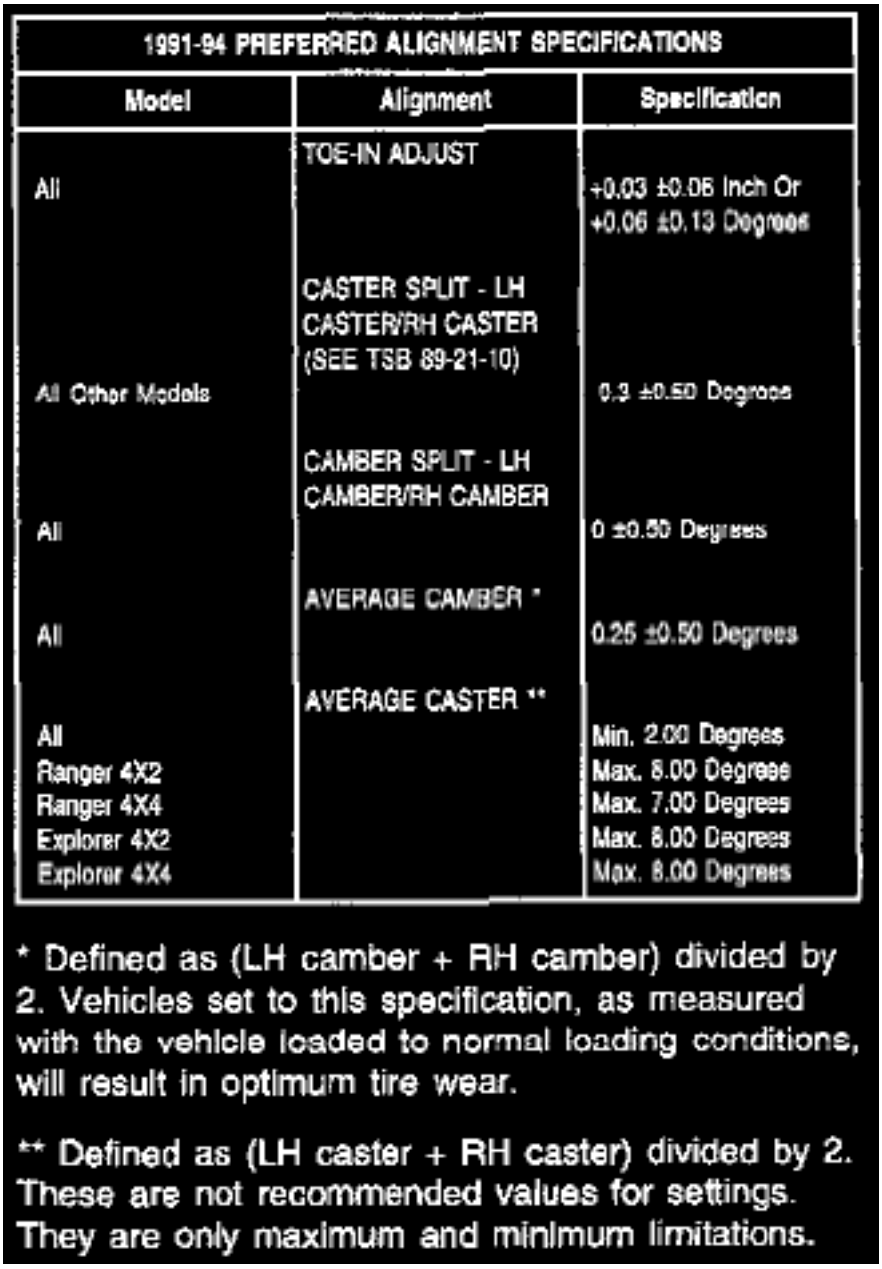
3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS		
Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degree
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degree
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All Ranger 4X2 Ranger 4X4 Explorer 4X2 Explorer 4X4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degree Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

7. Miscellaneous

___ Check for loose, damaged or worn parts.

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER

1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

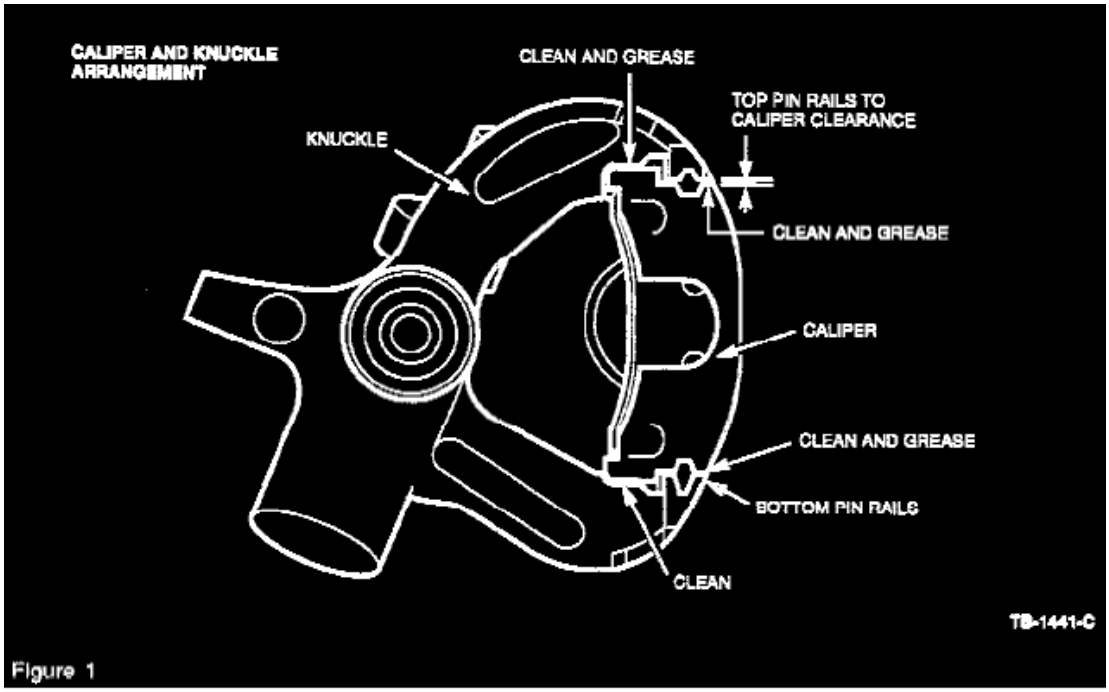


Figure 1

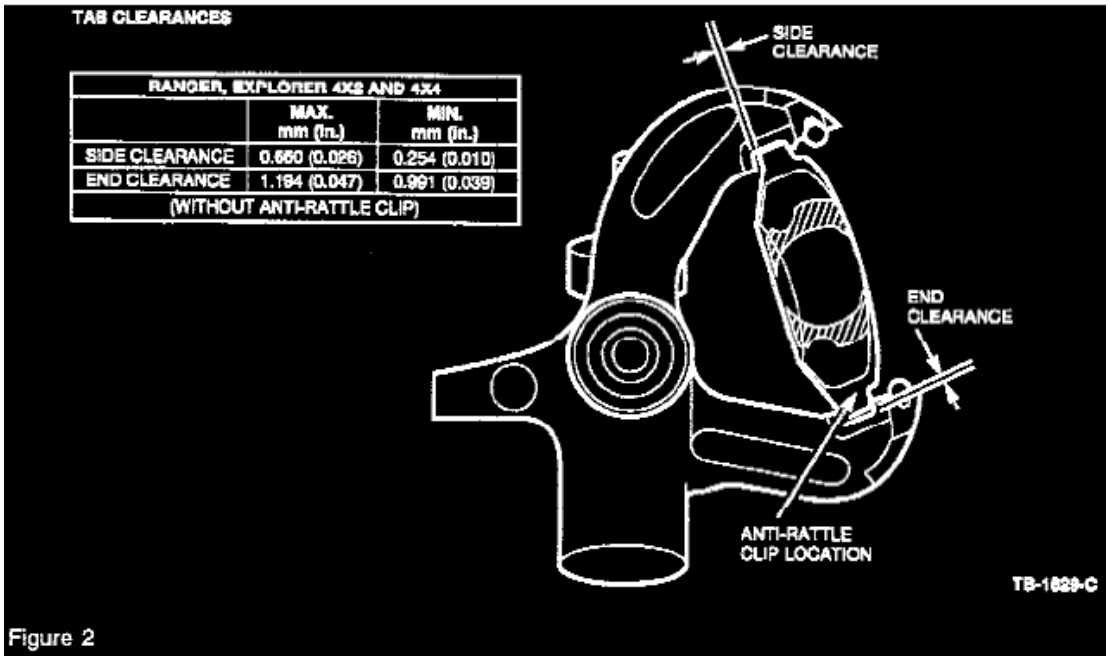


Figure 2

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

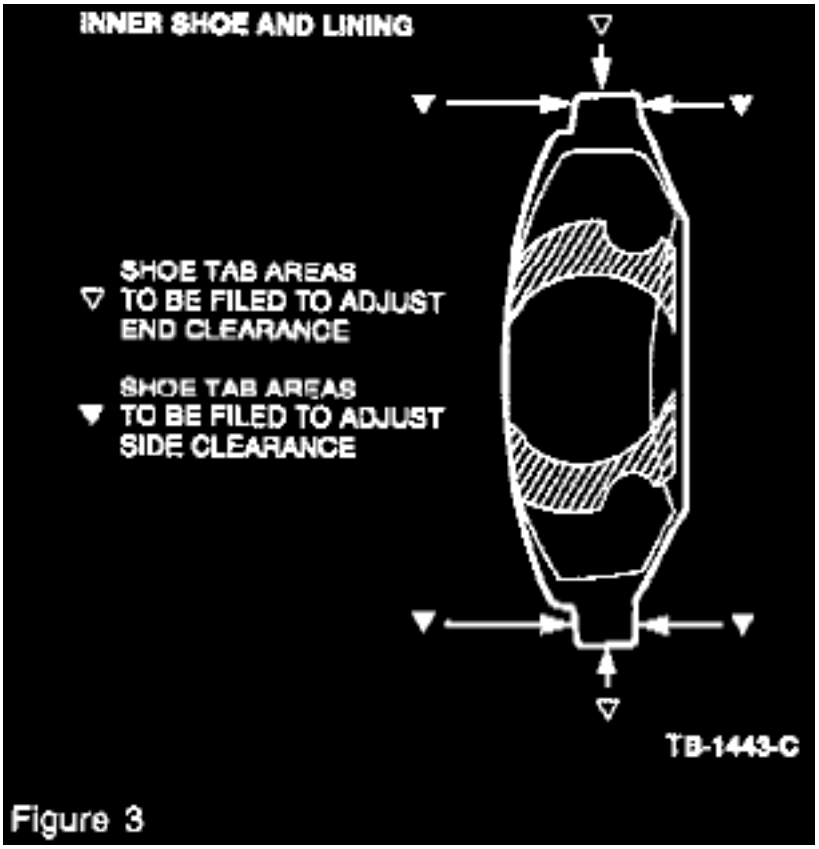


Figure 3

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

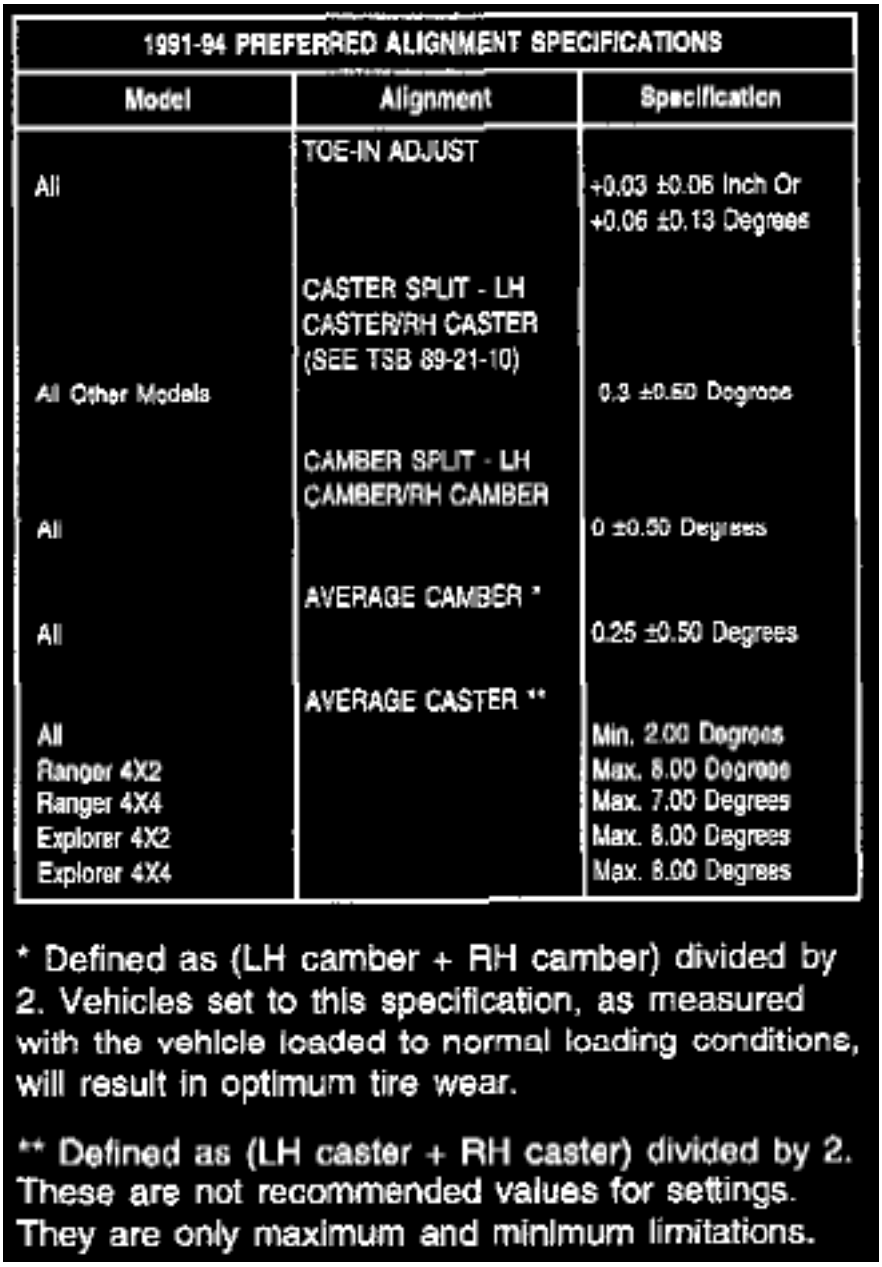
^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS

Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All Ranger 4X2 Ranger 4X4 Explorer 4X2 Explorer 4X4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

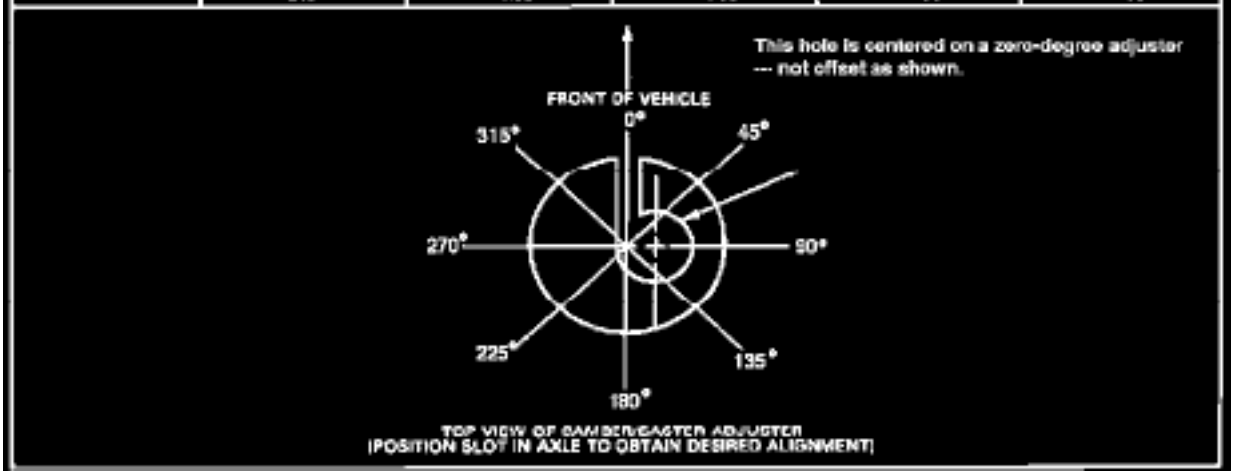
7. Miscellaneous

___ Check for loose, damaged or worn parts.

Make & Model	Caster	Camber	Toe-In Inch
Explorer 4X2	+4 to +6	-¾ to +1¼	0
Explorer 4X4	+2½ to +6	-¾ to +1¼	0
Ranger 4X2	+3½ to +6	-¾ to +1¼	0
Ranger 4X4	+2½ to +6	-¾ to +1¼	0

Wheel Alignment Specifications

Service Adjuster Type (Degrees)	Position Slot in Axle (Degrees)	LH Axle		RH Axle	
		Camber Change (Degrees)	Caster Change (Degrees)	Camber Change (Degrees)	Caster Change (Degrees)
1/2	0	−0.5	0	+0.5	0
1	0	−1.0	0	+1.0	0
1-1/2	0	−1.5	0	+1.5	0
1/2	45	−0.25	+0.25	+0.25	+0.25
1	45	−0.75	+0.75	+0.75	+0.75
1-1/2	45	−1.00	+1.00	+1.00	+1.00
1/2	90	0	+0.5	0	+0.5
1	90	0	+1.0	0	+1.0
1-1/2	90	0	+1.5	0	+1.5
1/2	135	+0.25	+0.25	−0.25	+0.25
1	135	+0.75	+0.75	−0.75	+0.75
1-1/2	135	+1.00	+1.00	−1.00	+1.00
1/2	180	+0.5	0	−0.5	0
1	180	+1.0	0	−1.0	0
1-1/2	180	+1.5	0	−1.5	0
1/2	225	+0.25	−0.25	−0.25	−0.25
1	225	+0.75	−0.75	−0.75	−0.75
1-1/2	225	+1.00	−1.00	−1.00	−1.00
1/2	270	0	−0.5	0	−0.5
1	270	0	−1.0	0	−1.0
1-1/2	270	0	−1.5	0	−1.5
1/2	315	−0.25	−0.25	+0.25	−0.25
1	315	−0.75	−0.75	+0.75	−0.75
1-1/2	315	−1.00	−1.00	+1.00	−1.00



TOP VIEW OF CAMBER/CASTER ADJUSTER
(POSITION SLOT IN AXLE TO OBTAIN DESIRED ALIGNMENT)

Alignment: Service and Repair Camber

Fig. 2 Caster/Camber Variation Chart.

Caster and camber adjustment is possible with adjusters available in 1/2°, 1° and 1-1/2° increments. One adjuster is used to adjust both caster and camber.

1. Measure caster and camber, noting difference between specification and actual measurement.

2. Select correct service adjuster, Fig. 2. Select adjuster that will bring alignment to specifications with the smallest side to side variation.

3. Remove front wheel and tire assembly.

4. On 4 x 4 models equipped with Dana 35 axle, remove caster/camber adjuster snap ring.

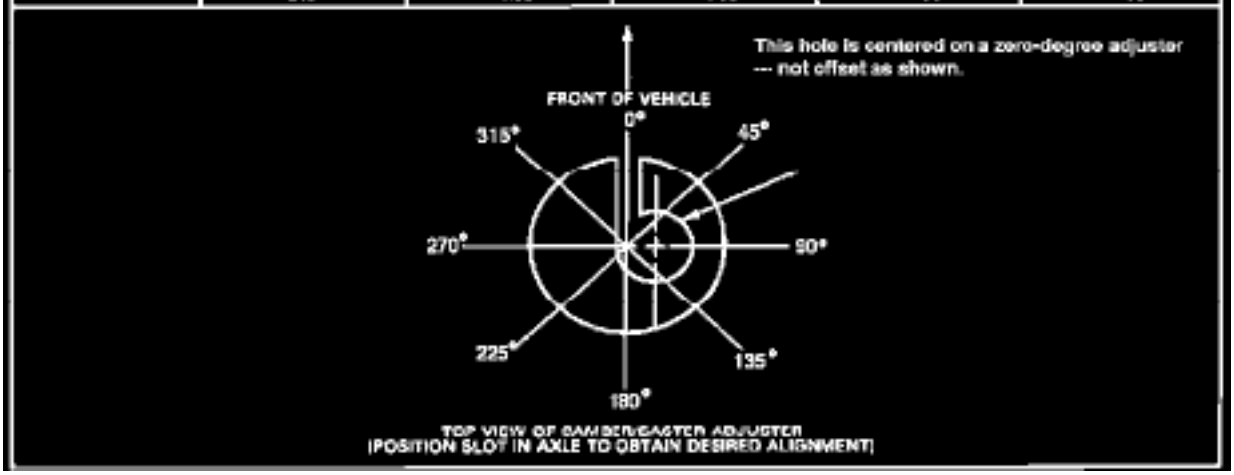
5. On all models, Remove upper ball joint pinch bolt, then using removal tool No. T64P-3590-F or D81T-3010-B or equivalent, remove adjuster.

6. Install new adjuster, then using suitable 1-1/2 inch socket rotate adjuster to specified position.

7. Install ball joint pinch bolt torquing to 48-65 ft. lbs., install snap ring.

8. Install front wheel and tire assembly, then recheck alignment.

Service Adjuster Type (Degrees)	Position Slot in Axle (Degrees)	LH Axle		RH Axle	
		Camber Change (Degrees)	Caster Change (Degrees)	Camber Change (Degrees)	Caster Change (Degrees)
1/2	0	−0.5	0	+0.5	0
1	0	−1.0	0	+1.0	0
1-1/2	0	−1.5	0	+1.5	0
1/2	45	−0.25	+0.25	+0.25	+0.25
1	45	−0.75	+0.75	+0.75	+0.75
1-1/2	45	−1.00	+1.00	+1.00	+1.00
1/2	90	0	+0.5	0	+0.5
1	90	0	+1.0	0	+1.0
1-1/2	90	0	+1.5	0	+1.5
1/2	135	+0.25	+0.25	−0.25	+0.25
1	135	+0.75	+0.75	−0.75	+0.75
1-1/2	135	+1.00	+1.00	−1.00	+1.00
1/2	180	+0.5	0	−0.5	0
1	180	+1.0	0	−1.0	0
1-1/2	180	+1.5	0	−1.5	0
1/2	225	+0.25	−0.25	−0.25	−0.25
1	225	+0.75	−0.75	−0.75	−0.75
1-1/2	225	+1.00	−1.00	−1.00	−1.00
1/2	270	0	−0.5	0	−0.5
1	270	0	−1.0	0	−1.0
1-1/2	270	0	−1.5	0	−1.5
1/2	315	−0.25	−0.25	+0.25	−0.25
1	315	−0.75	−0.75	+0.75	−0.75
1-1/2	315	−1.00	−1.00	+1.00	−1.00



Alignment: Service and Repair Caster

Fig. 2 Caster/Camber Variation Chart.

Caster and camber adjustment is possible with adjusters available in 1/2°, 1° and 1-1/2° increments. One adjuster is used to adjust both caster and camber.

1. Measure caster and camber, noting difference between specification and actual measurement.

2. Select correct service adjuster, Fig. 2. Select adjuster that will bring alignment to specifications with the smallest side to side variation.

3. Remove front wheel and tire assembly.

4. On 4 x 4 models equipped with Dana 35 axle, remove caster/camber adjuster snap ring.

5. On all models, Remove upper ball joint pinch bolt, then using removal tool No. T64P-3590-F or D81T-3010-B or equivalent, remove adjuster.

6. Install new adjuster, then using suitable 1 1/2 inch socket rotate adjuster to specified position.

7. Install ball joint pinch bolt torquing to 48-65 ft. lbs., install snap ring.

8. Install front wheel and tire assembly, then recheck alignment.

Alignment: Service and Repair Preliminary Inspection

Inspect the following components, adjust, repair or replace as required prior to performing front wheel alignment.

1. Inflate tires to cold specifications.

2. Ensure front tires are of same size, ply rating and load rating.

3. Inspect for excessive wheel bearing endplay.

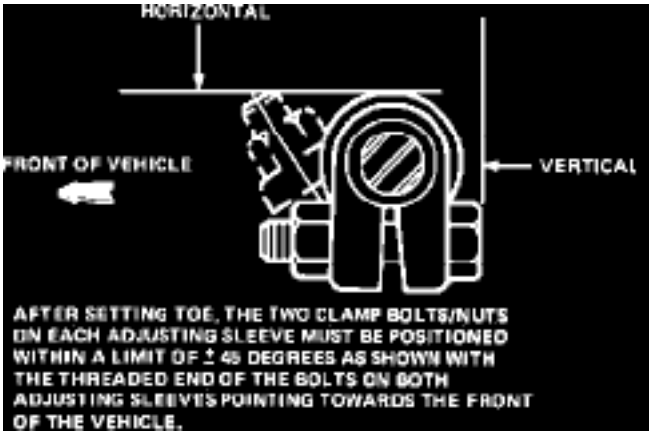
4. Inspect for worn or damaged spindle ball joints.

5. Inspect steering gear mounting bolts for proper torque.

6. Inspect radius arm or bent or damaged condition.

7. Inspect radius arm to frame bushings for looseness or wear.

8. Inspect suspension components for wear or damage.



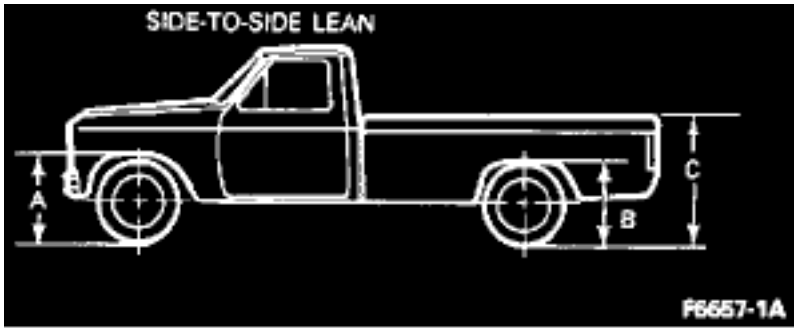
Alignment: Service and Repair Toe

Fig. 4 Toe-In Adjustment

1. Loosen clamp bolts at each end of spindle connecting rod tube, then rotate the sleeve until correct toe alignment of {1/32} inch is obtained.

2. Center clamps between adjustment sleeve nibs, then position bolts horizontally with clamps nuts positioned as shown in Fig. 4.

3. Recheck toe-in adjustment, then check that steering wheel spokes are properly positioned and adjust as necessary.



EXAMPLES

Ranger 4x2 Vehicle	Ranger 4x4 and Explorer Vehicle
Measured LH Ride Height 4-1/2"	Measured LH Ride Height 4-1/2"
Measured RH Ride Height 4"	Measured RH Ride Height 4-5/8"
Revised RH Ride Height 4-1/4"	—
Side to Side Difference 1/4"	Side to Side Difference 1/8"
Since the difference is larger than 1/8", one suspension shim would be added to the low right shim.	Since the difference does not exceed 1/8", no shim is to be used on the front suspension. The front lean may be caused by a rear lean condition.

CF3559-C

Alignment: Service and Repair Vehicle Lean Correction

Front Lean

Measure the left and right front ride heights as shown in the illustration.

Compute the difference between left and right ride heights as shown with the examples. If the difference exceeds 3-9 mm (1/8-3/8 inch) and is LESS than 19 mm (3/4 inch), measured at the wheel house opening to ground, add one shim to the side of the vehicle that is low. The shim is to be placed under the lower spring seat; service shim (part number 389117-S2) can be used without a front stabilizer bar. If there is a computed side-to-side difference of 19 mm (3/4 inch) or MORE in the left/right wheel house openings, remove the high side spring from the vehicle and compare it with a service replacement part having the same part number.

If the free height of the original equipment spring exceeds the free height of the service part by 13 mm (1/2 inch), install the service part in this location. If the free height is less than 13 mm (1/2 inch), remove the low side spring. Compare the service spring to both of the original springs and select the two springs most evenly matched. Install the higher spring at the low side.

NOTE: Changing front ride height by adding the service shim also affects caster angles. Adding the 4.5 mm thick shim (Part 389117-S2 or equivalent) may reduce caster by up to 0.40 degrees on the side the shim is added.

Rear Lean

A side-to-side lean at the rear of the vehicle can be adjusted by approximately 6 mm (1/4 inch) by installing a shim between the rear spring and axle on the low side of the vehicle. A "low at the rear" vehicle can be raised approximately 6 mm (1/4 inch) by installation of one shim on each side. Use the following procedure to install the shim (E37A-5742-AA). 1. Raise the vehicle until the weight is off the rear springs but with the tires still touching the floor. 2. Loosen the spring U-bolts to allow the axle to separate from the spring approximately 13 mm (1/2 inch). 3. Position the shim (E37A-5742-AA) between the spring and the spring seat with the tie bolt head through the hole in the shim.

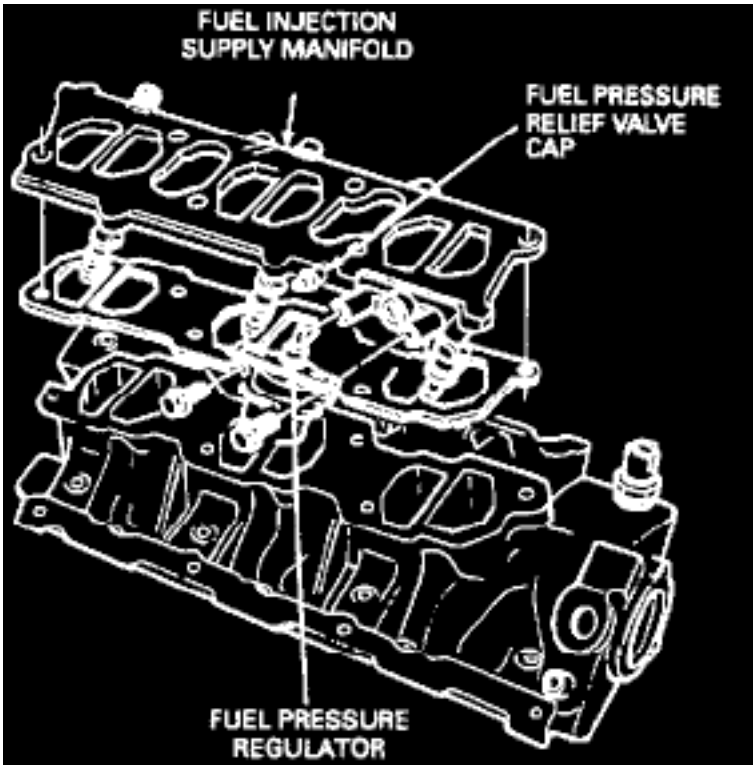
Position the shim between the rear spring and axle spacer. Tape may be used to hold the shim in position.

4. Make sure the spring leaves are properly aligned and the spring U-bolts contact the edges of the spring assembly or axle seat. 5. Tighten the spring U-bolt sufficiently and make sure the spring bolt head extends through shim into axle seat hole. 6. Tighten the U-bolt nuts to 88-102 N.m (65-75 ft-lb).

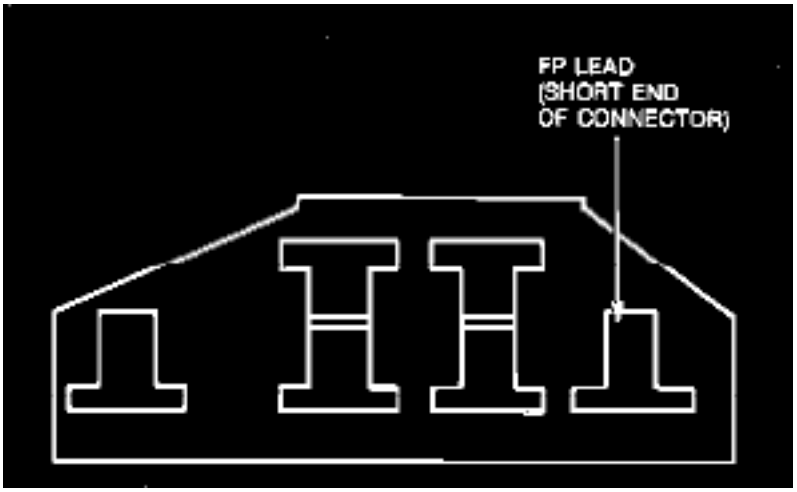
Fuel Pressure: Specifications

Key On Engine Off 35 - 45 psi

Key On Engine Running 30 - 40 psi



Fuel Injection Supply Manifold



Fuel Pressure: Testing and Inspection

STO Connector

STATIC PRESSURE TEST

1. Check for adequate fuel supply. 2. Turn key OFF 3. Install fuel pressure gauge to test port on fuel rail. 4. Install test lead to fuel pump lead of STO test connector. 5. Turn Key On Engine Off (KOEO). 6. Ground test lead to run fuel pump. 7. Check to determine if fuel pressure is within acceptable limits. Refer to SPECIFICATIONS.

a. If pressure is low but greater than 3 psi (indicates fuel pump is running but not enough pressure) check for:

^ Plugged fuel filter

^ Kinked fuel line

^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

^ Disconnect the fuel return line and note if fuel is being returned during this low pressure condition. If fuel is being returned, replace the fuel pressure regulator. Reconnect the fuel return line.

b. If pressure is less than 3 psi (pump not running) check for:

^ Defective fuse link

^ Inertia switch open

^ Wiring at fuel pump/tank connector loose or open

^ Fuel pump ground connection at chassis loose or defective

^ Improper fuel pump relay operation

If fuel supply and return lines are OK, and electrical supply and ground are OK, and fuel pressure is still low, replace fuel pump.

DYNAMIC PRESSURE TEST

1. Disconnect and plug the vacuum line to the pressure regulator.

2. Start engine and run at idle. Check to determine if fuel pressure is within acceptable limits.

a. If pressure is low check for:

^ Plugged fuel filter ^ Restricted fuel line ^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

3. Reconnect the vacuum line to the regulator.

If fuel supply and return lines are OK, and electrical supply and ground is OK, and fuel pressure is still low, replace fuel pump.

LEAKAGE TEST

1. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate operating pressure. 2. Remove ground from test lead and note pressure on gauge. Pressure should remain within 2 psi for 3 minutes after lead is ungrounded.

a. If pressure is not maintained check for leaking fuel

^ Lines ^ Connectors ^ Injectors

b. Disconnect fuel return line and plug engine side. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate

operating pressure. If pressure holds replace regulator and retest. Reconnect the fuel return line.

If pressure is not maintained replace fuel pump.

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

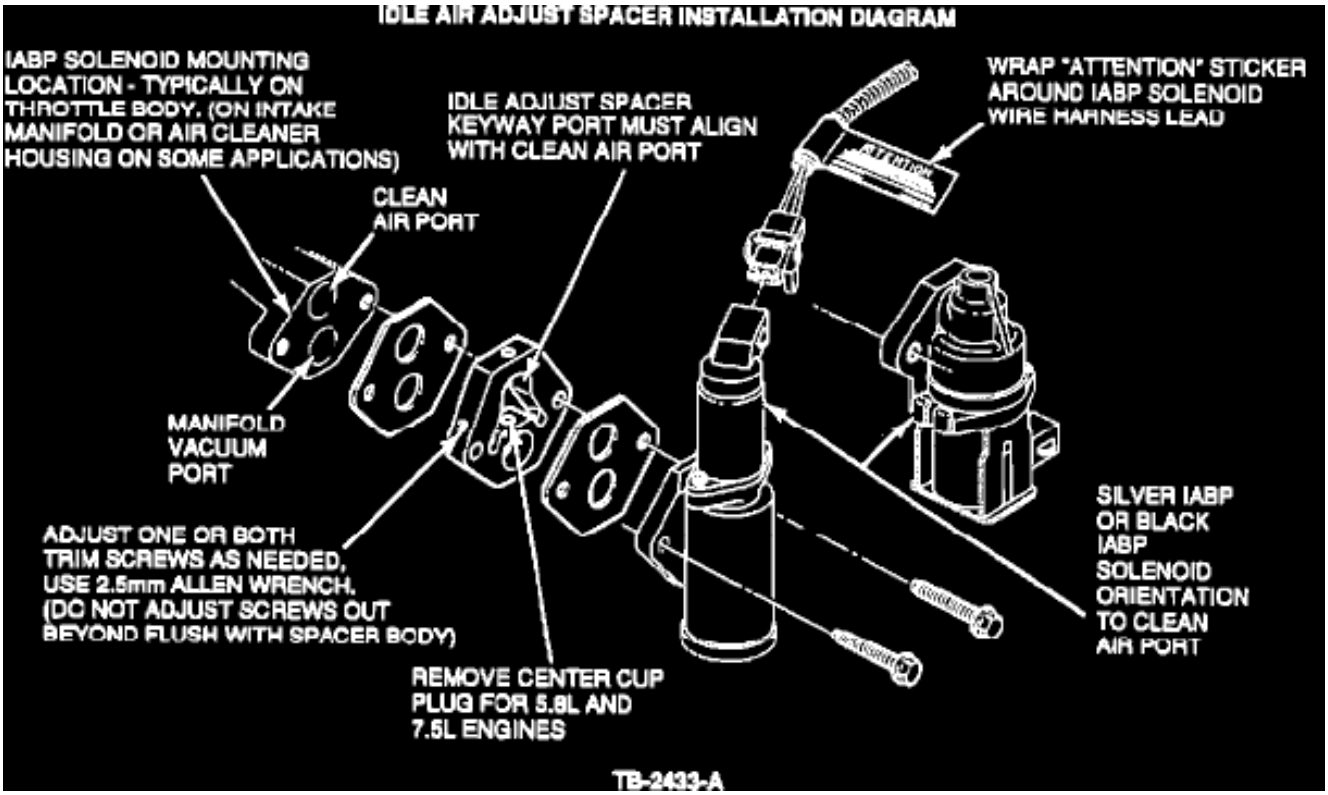
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

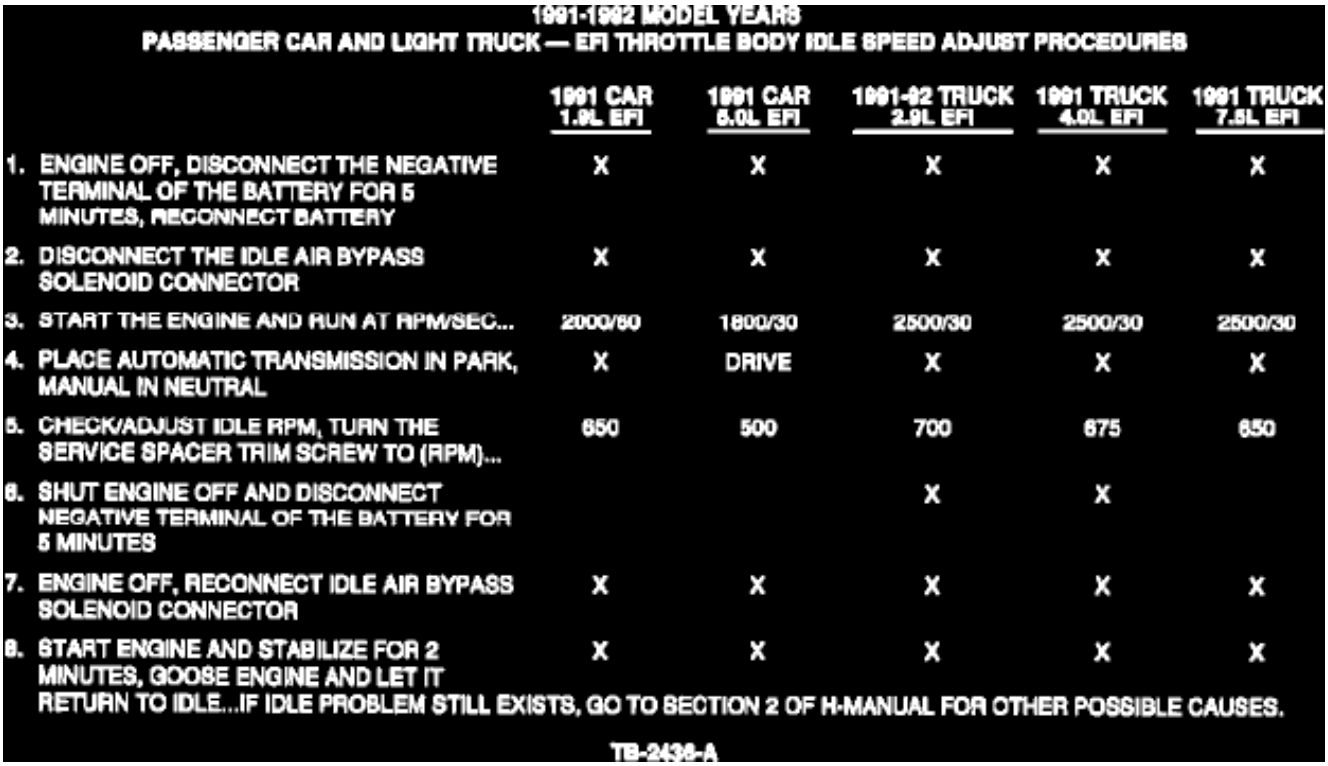
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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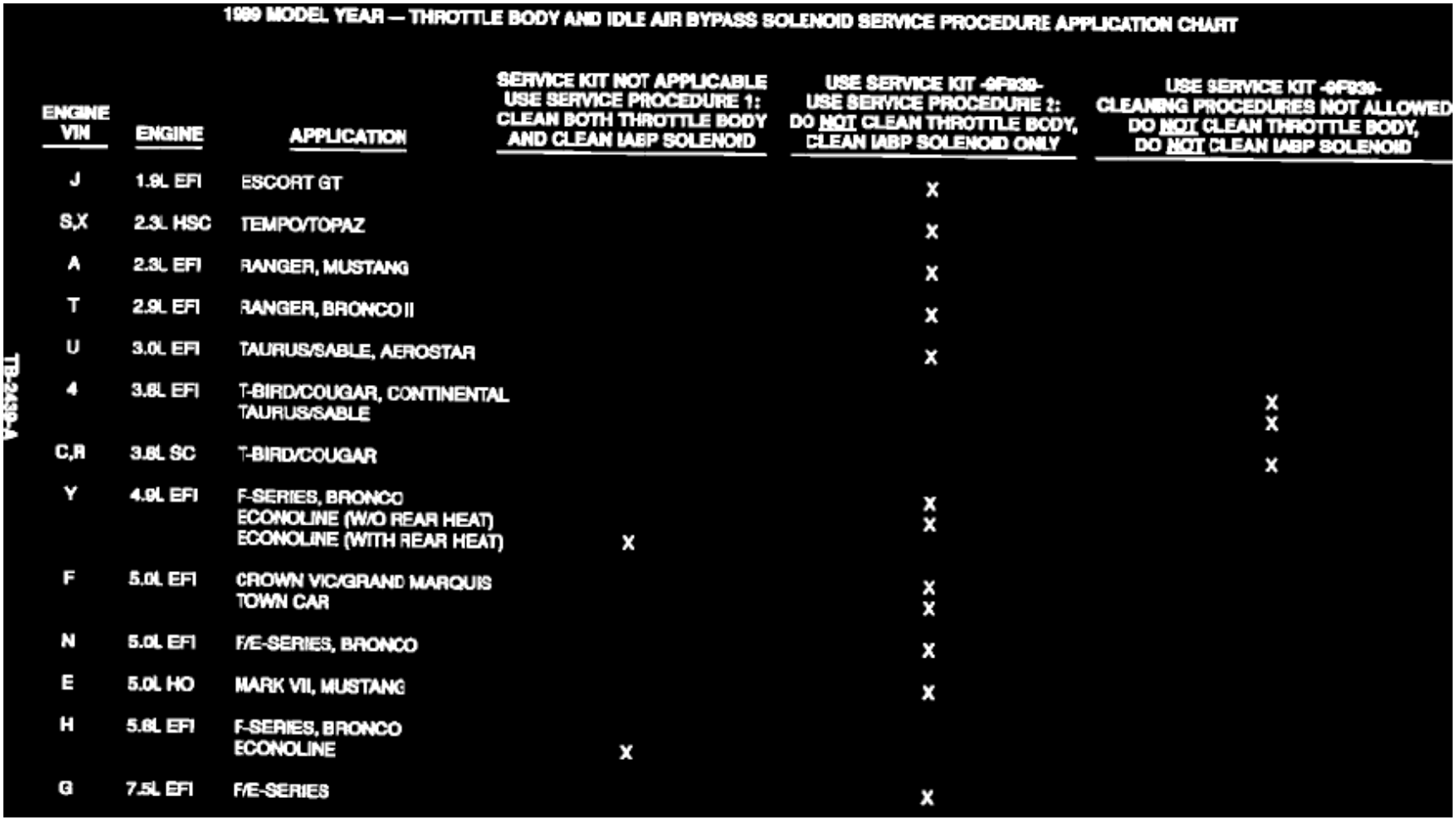
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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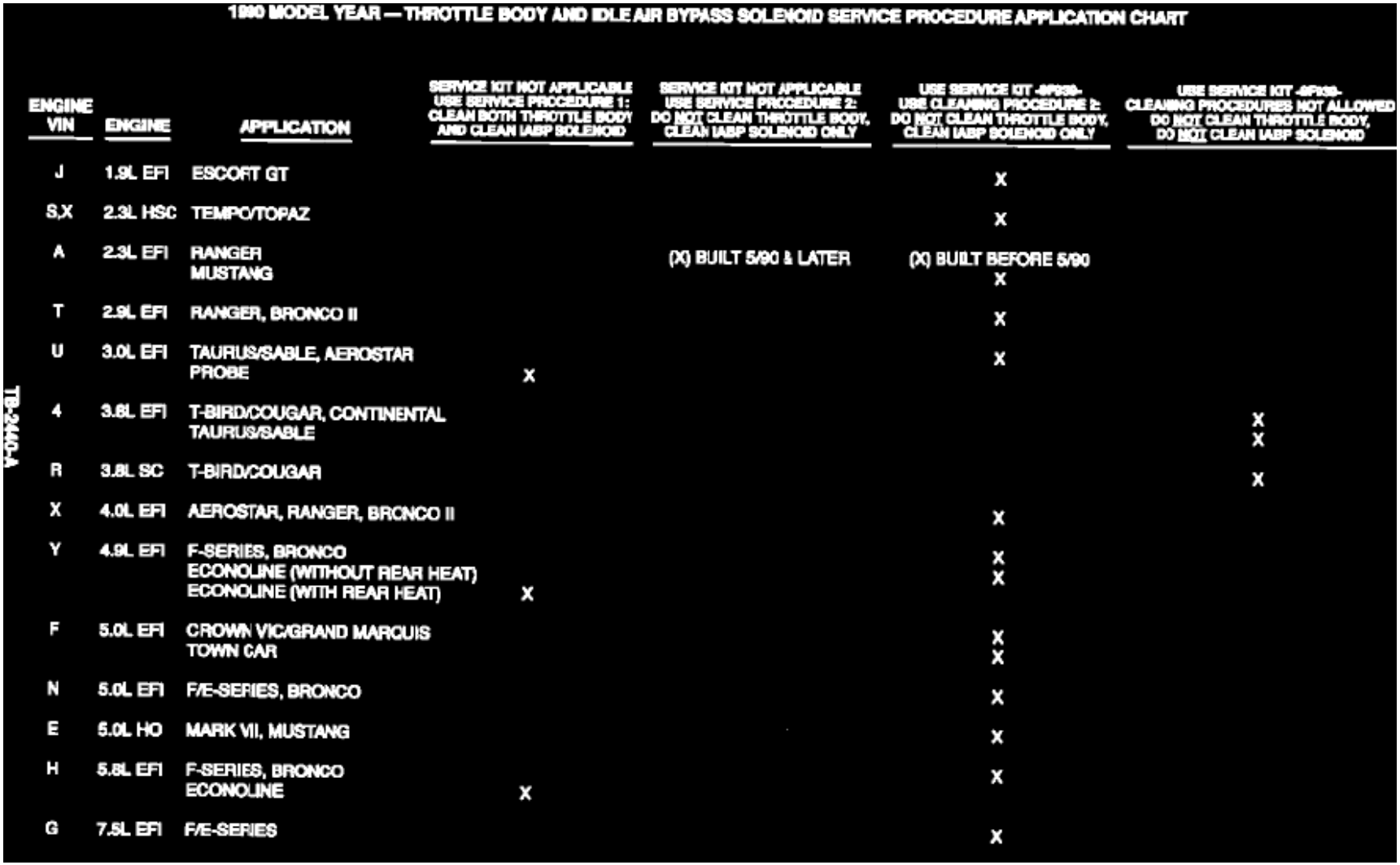
Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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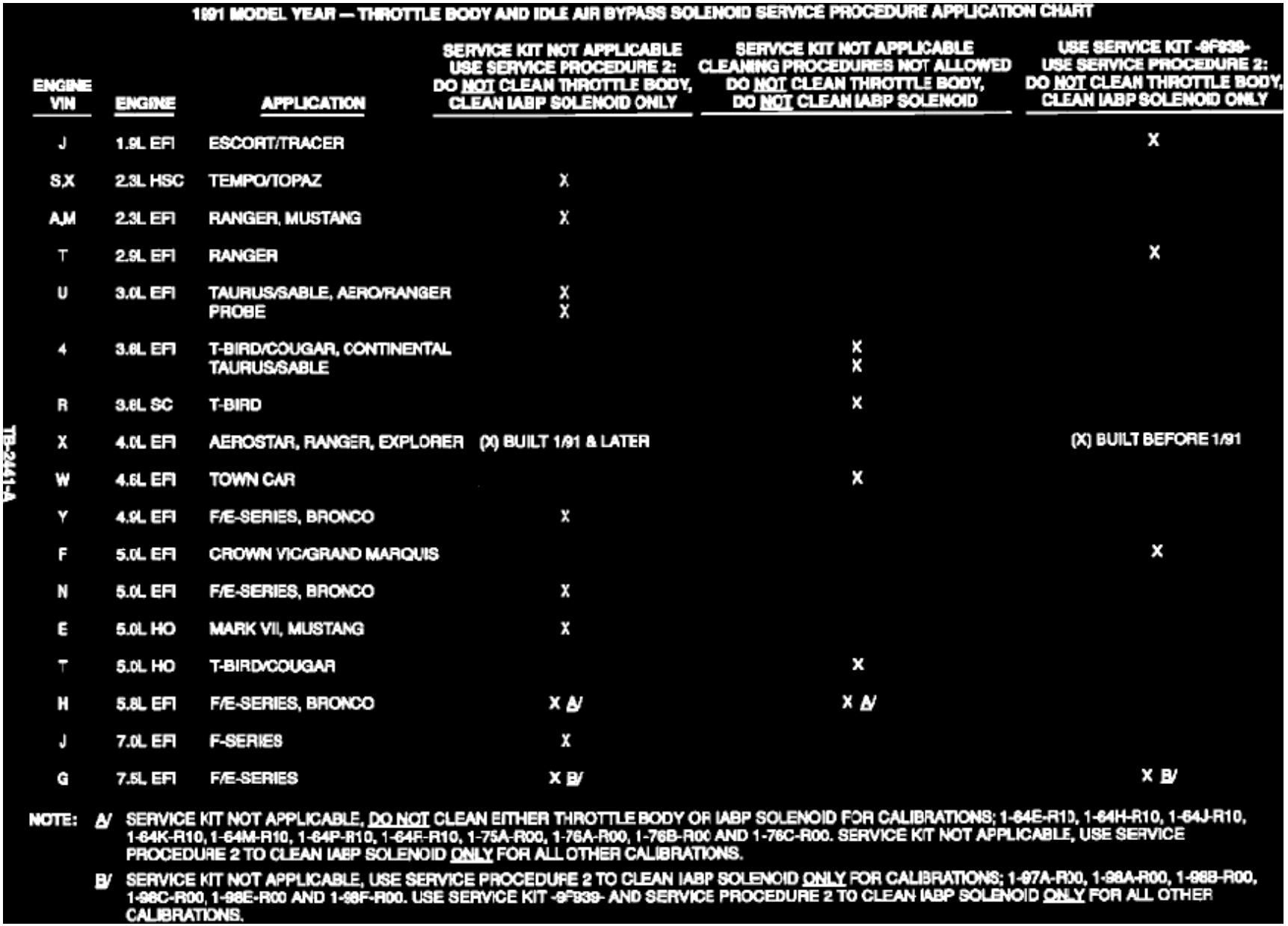
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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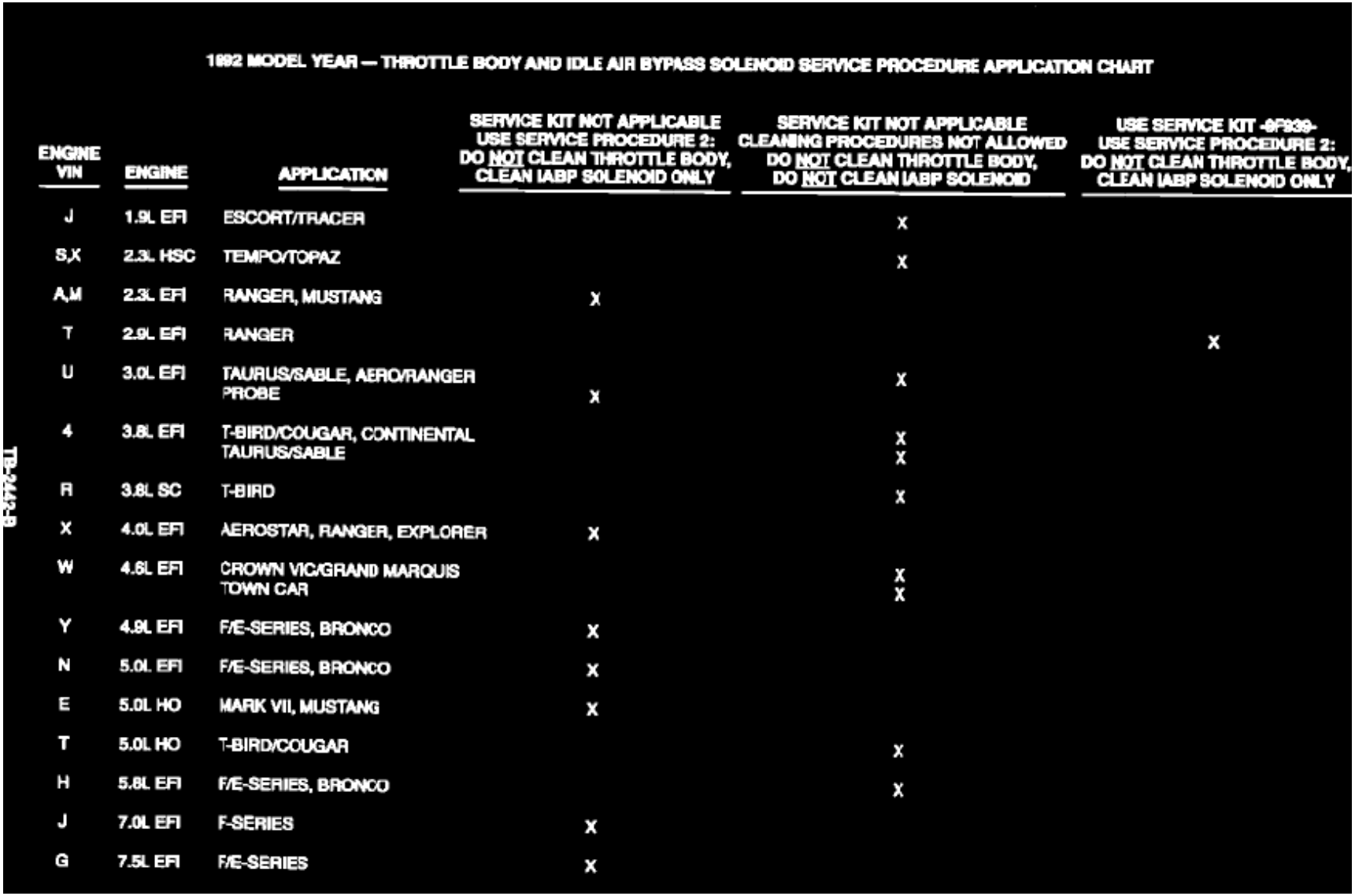
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TA-24428

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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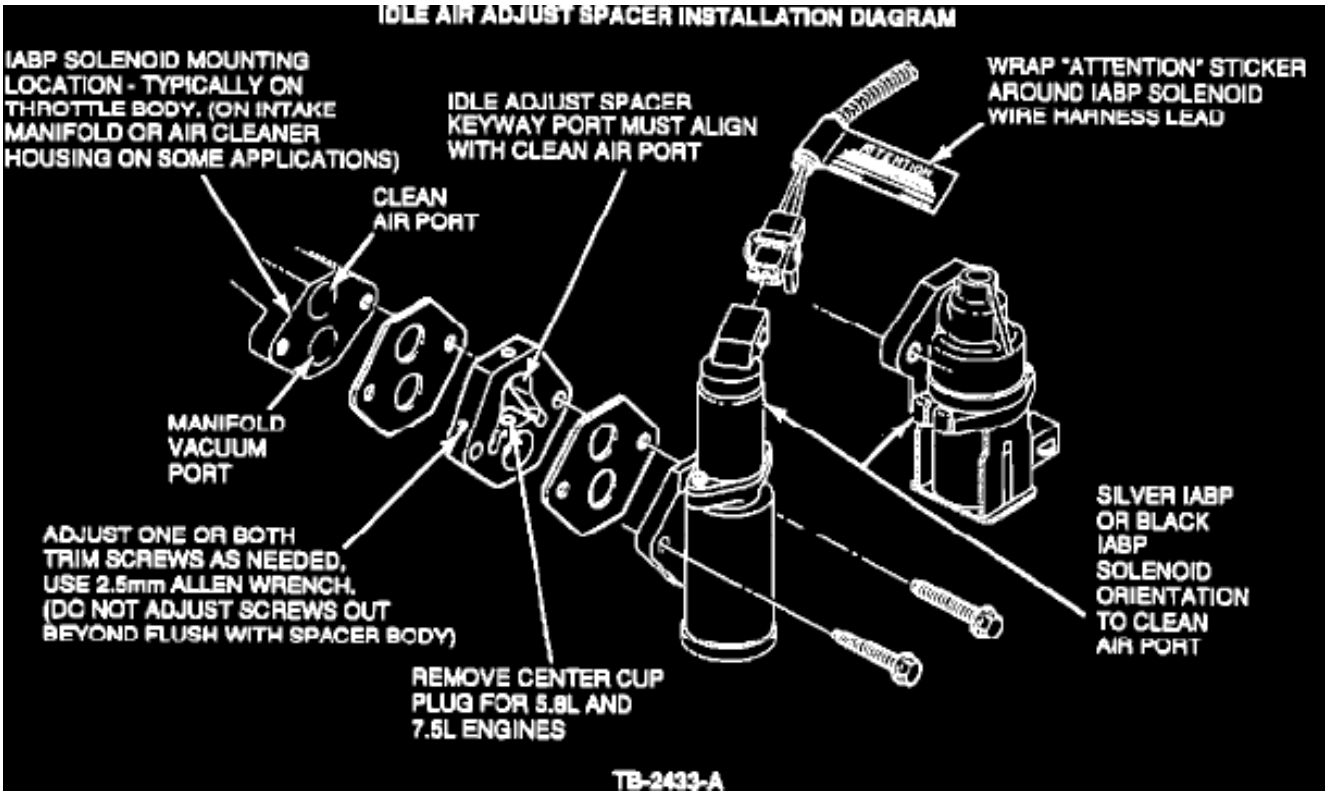
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

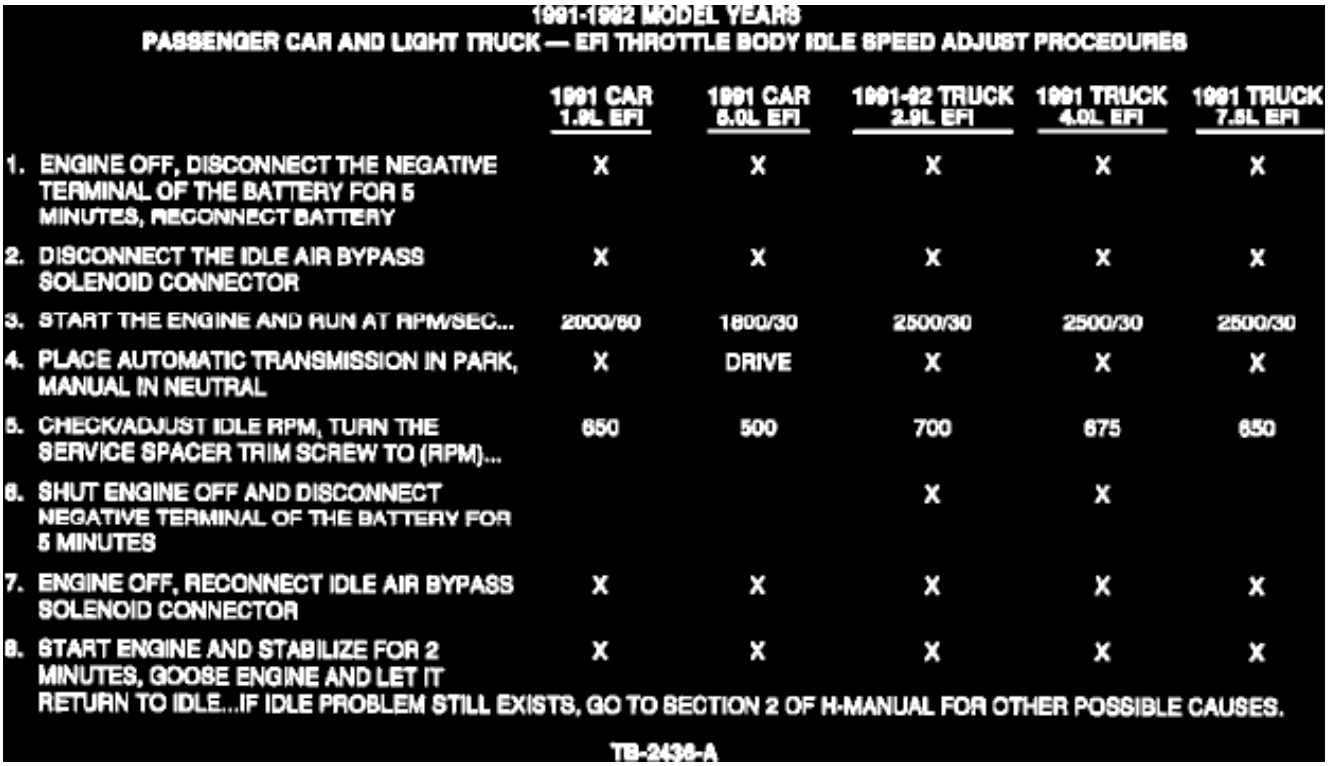
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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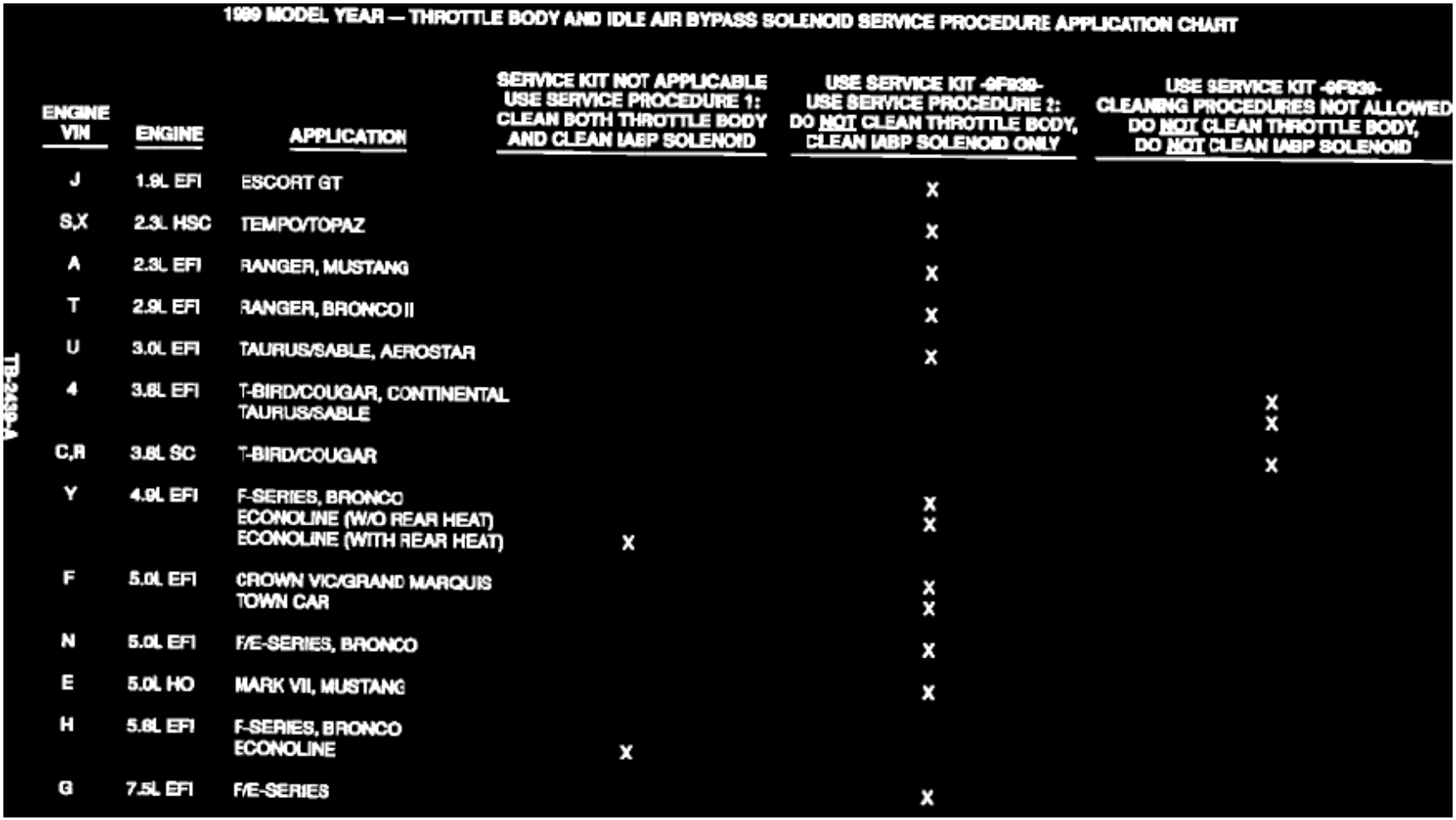
Figure 7

Figure 8

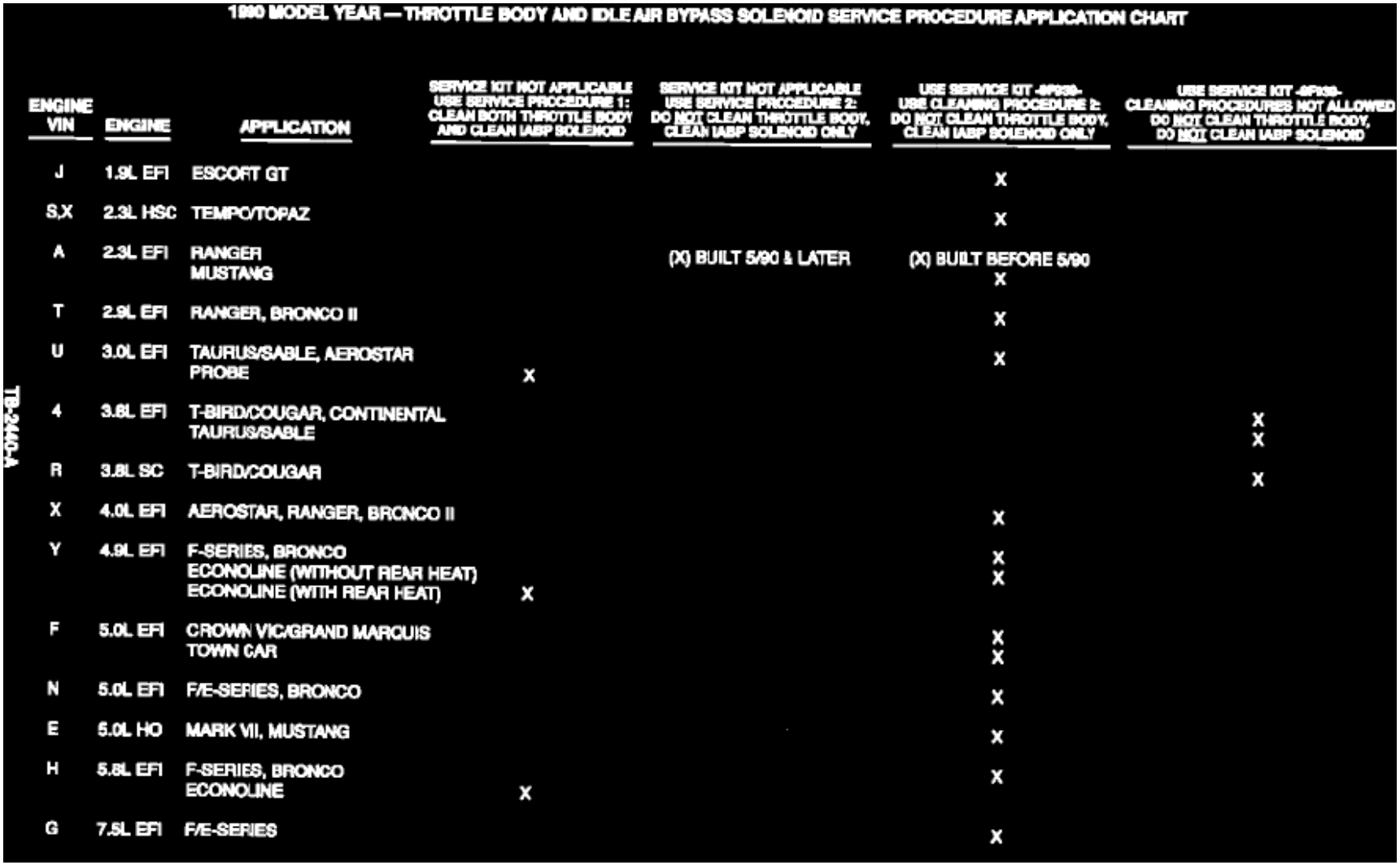


1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

TB-2439-A

Figure 9

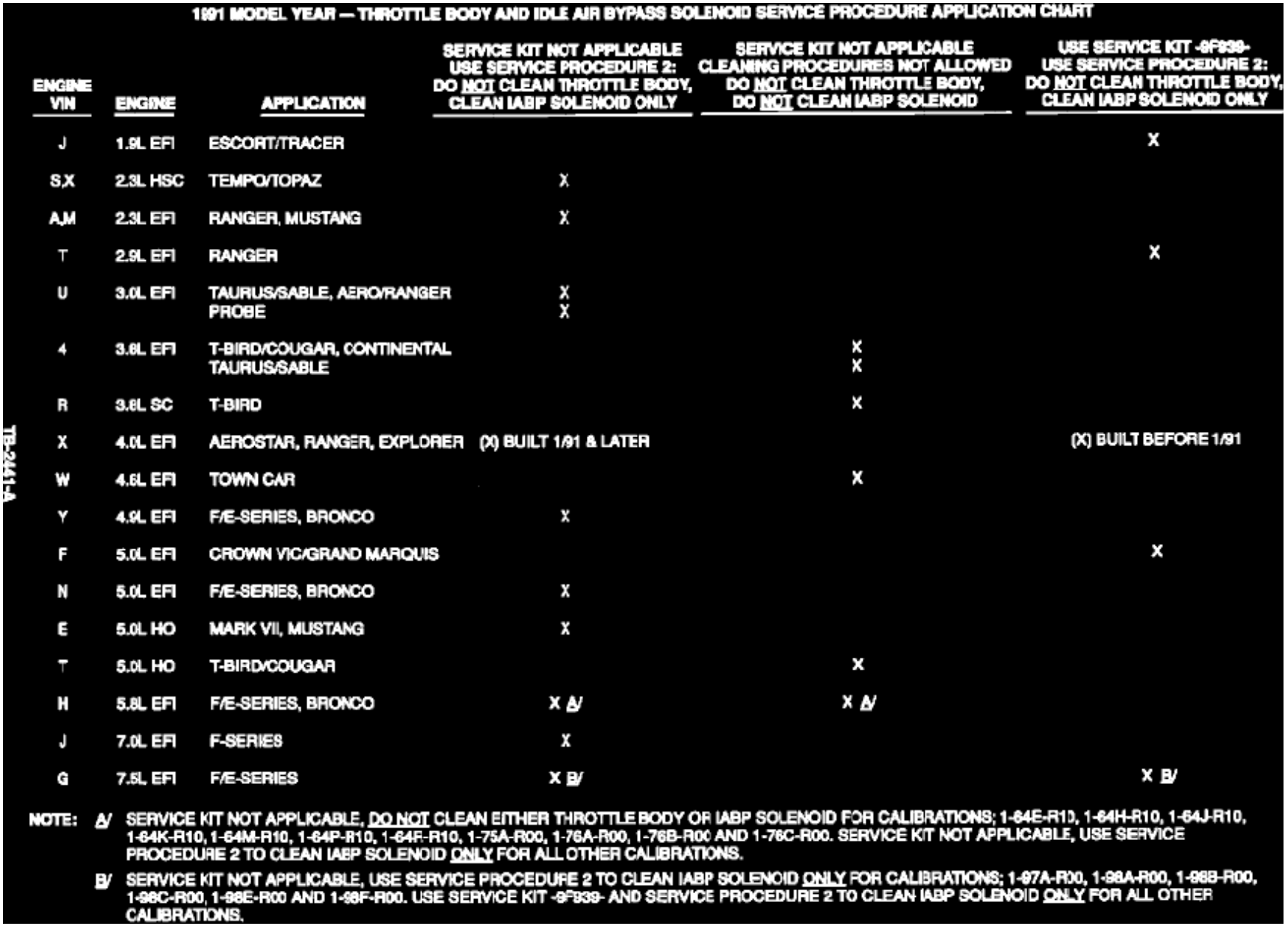


1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

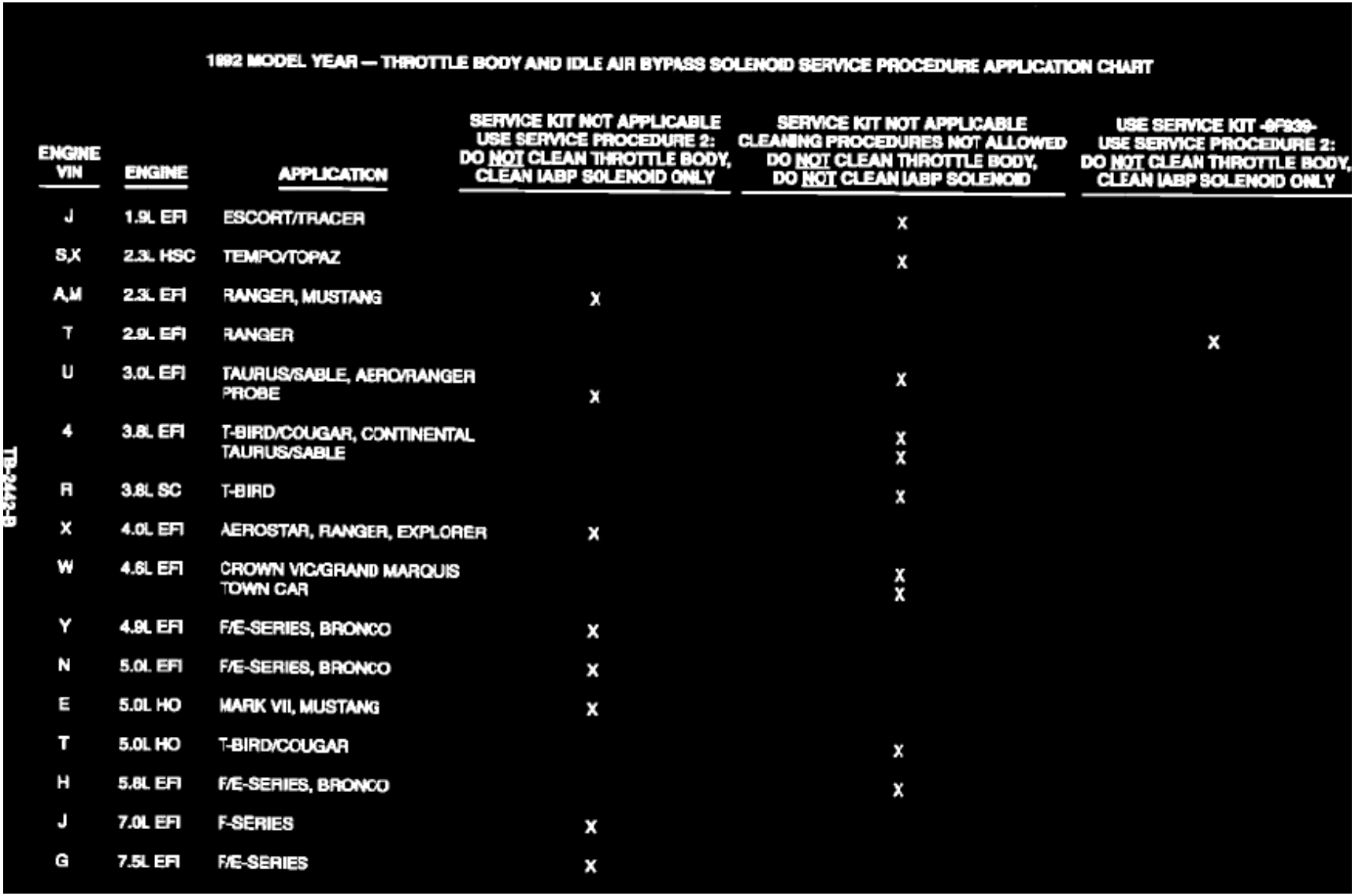
ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Component Descriptions

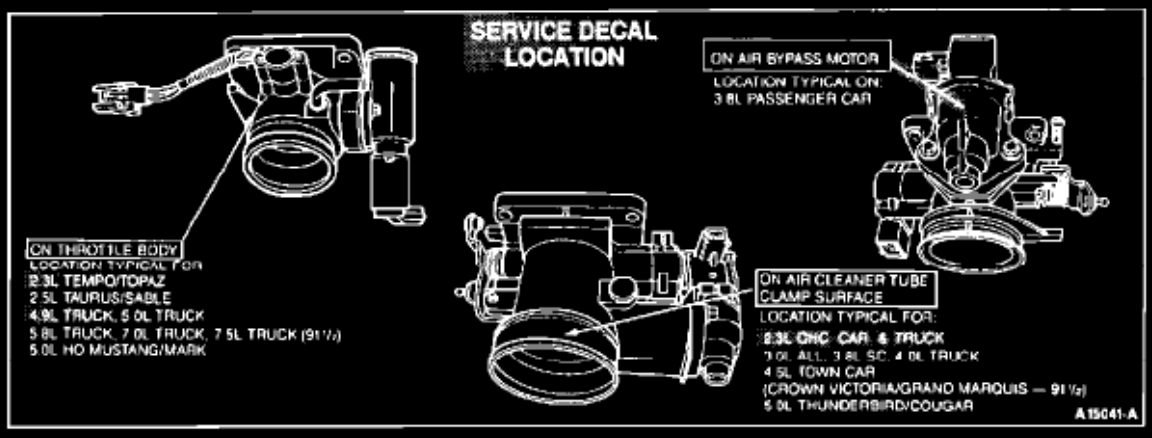


Figure 3

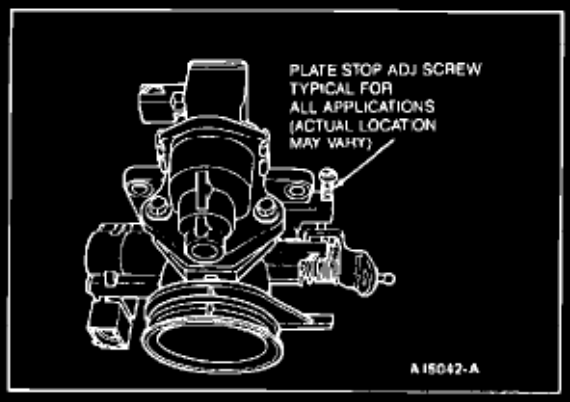


Figure 4

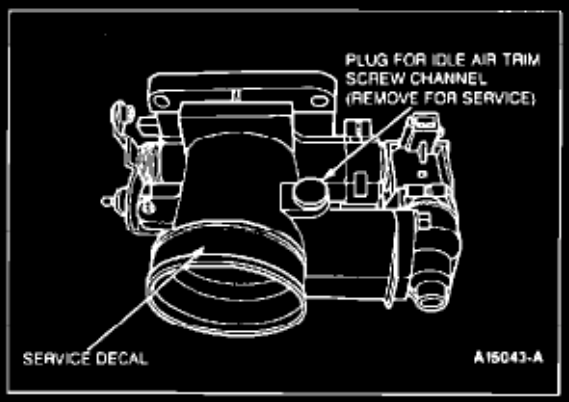


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

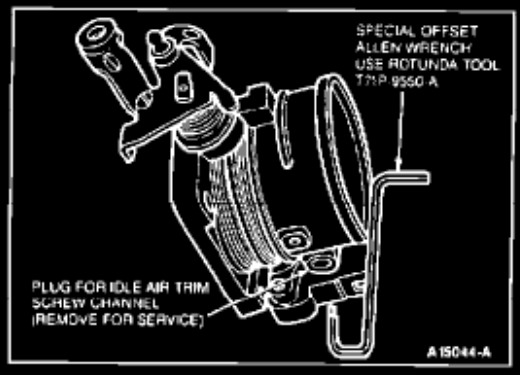
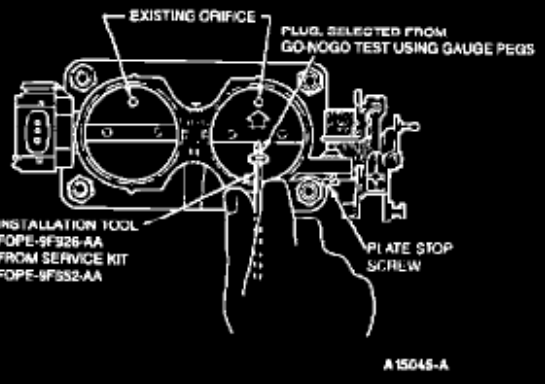


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K 3/ CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off (reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Component Descriptions

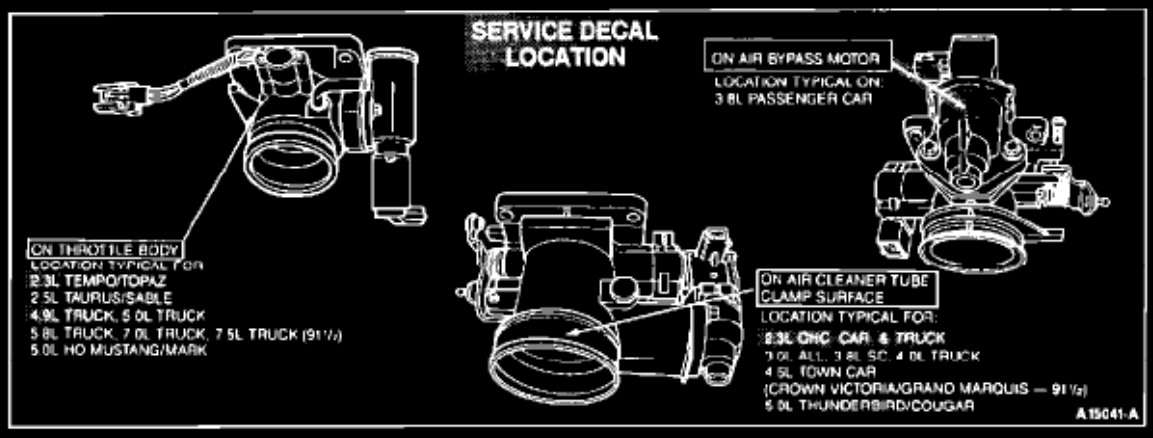


Figure 3

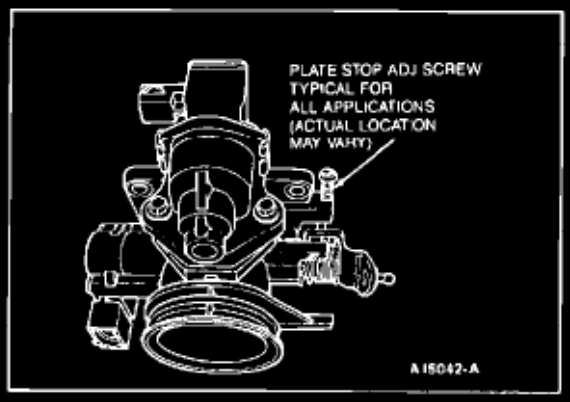


Figure 4

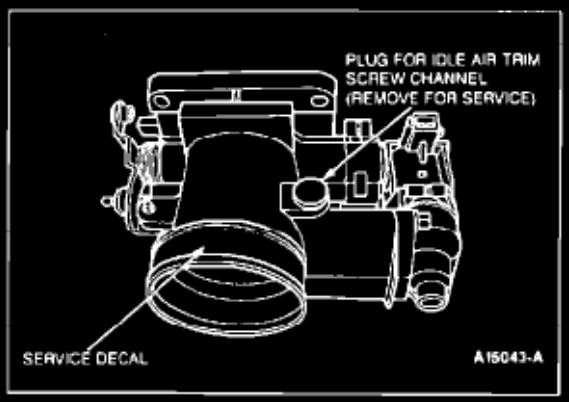


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

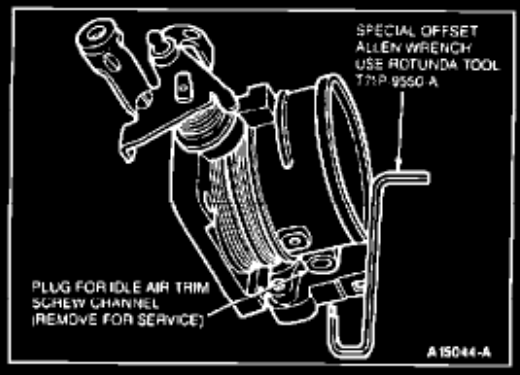
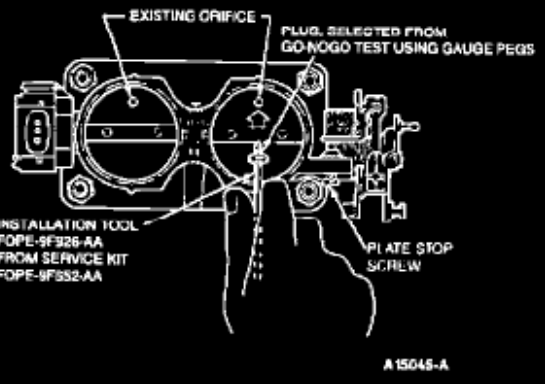


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Idle Speed: By Symptom

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-
APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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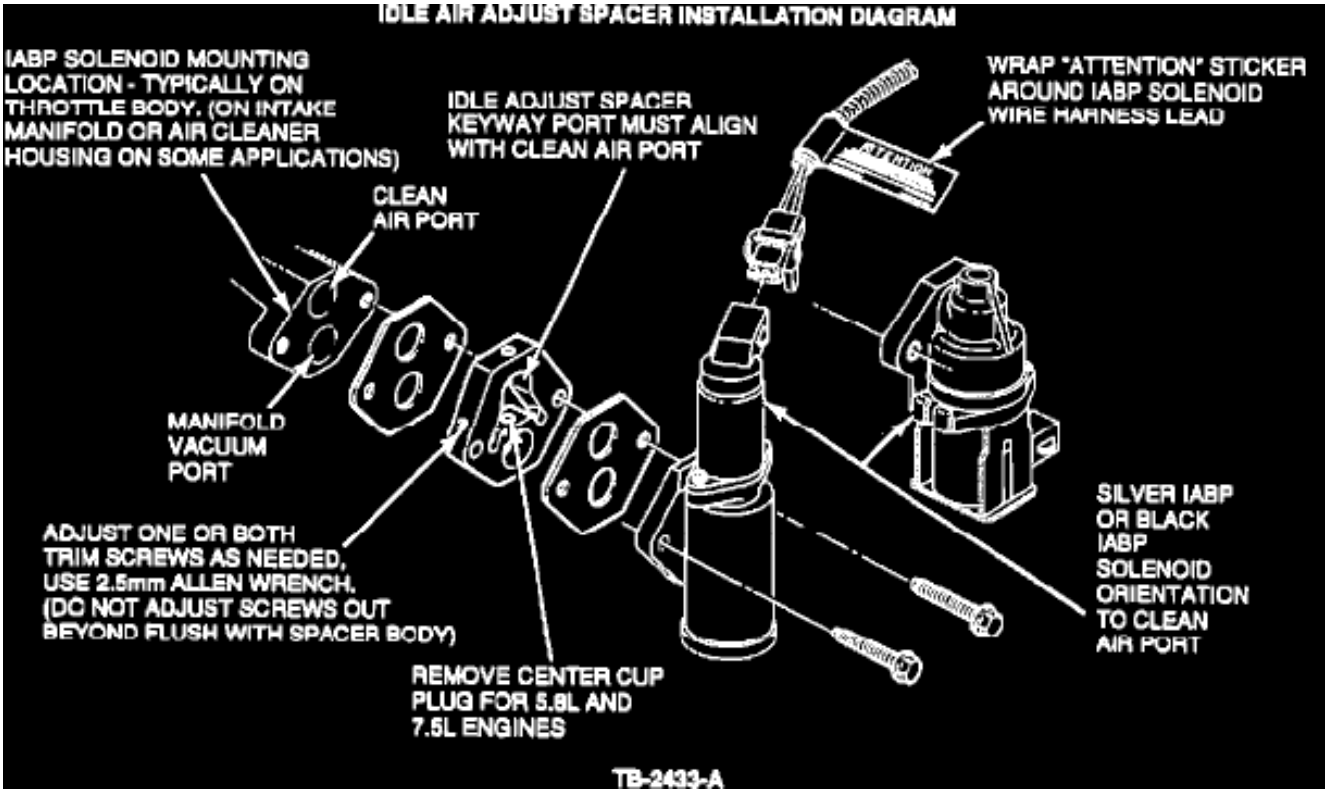
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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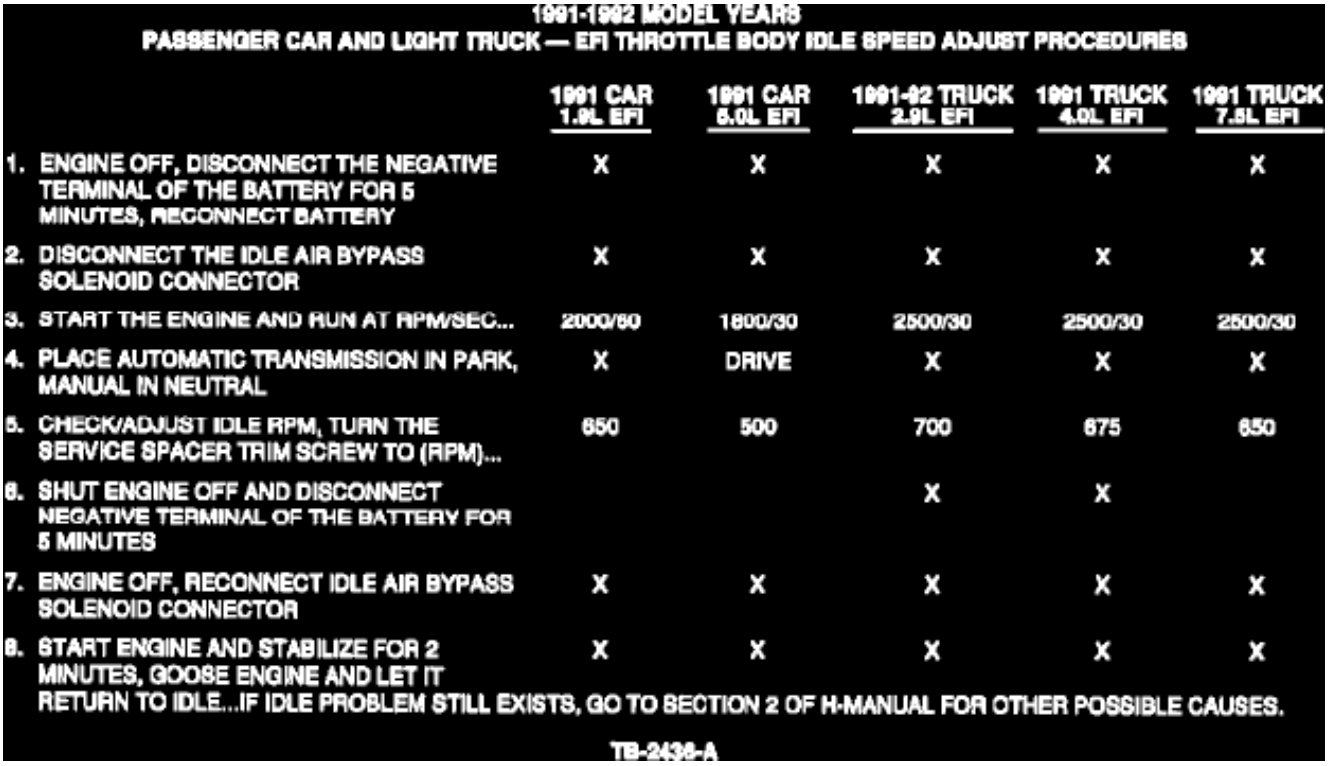
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO		X	
		ECONOLINE (W/O REAR HEAT)		X	
		ECONOLINE (WITH REAR HEAT)	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X	
				X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

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Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F836- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

SERVICE KIT -9F939-
APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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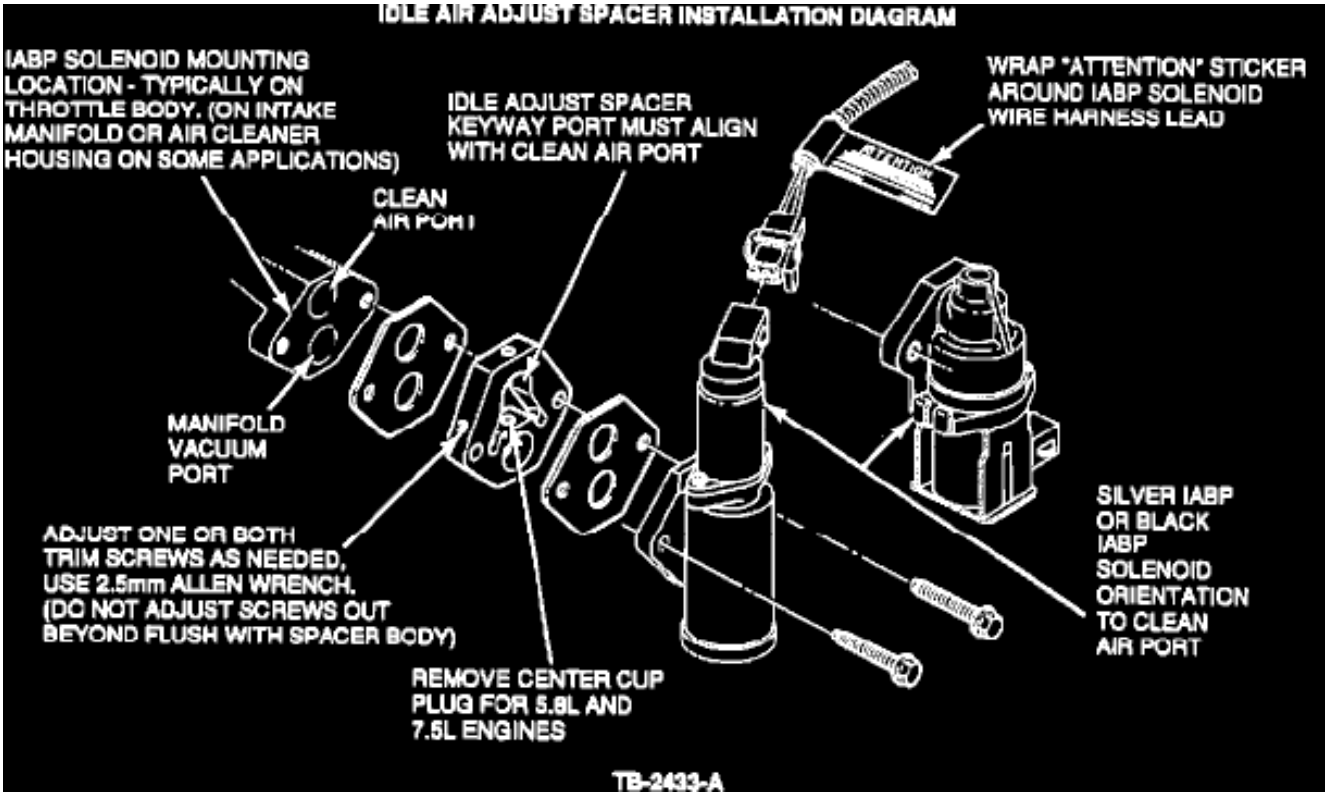
^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.



The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets

^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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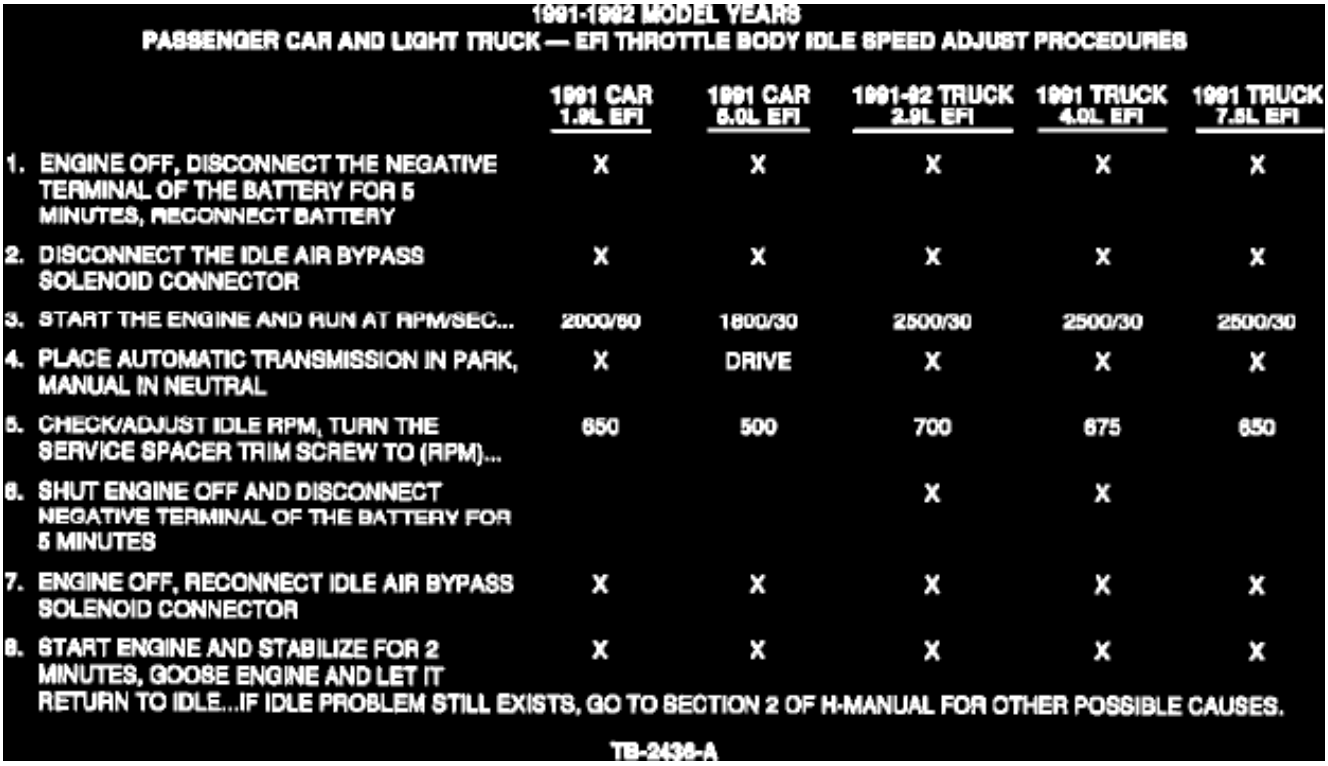
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

TB-2437-A

Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

TB-2438-A

Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT)		X	
		ECONOLINE (WITH REAR HEAT)	X	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

TB-2439-A

Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSS- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSS- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F836- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Idle Speed: Adjustments With 90TF-AA Throttle Body

*** UPDATED BY TSB 9111B4, 6/14/91; TSB 9025B2, 12/90

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5

Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-125 rpm.

RPM TOO LOW a.

Turn the plate stop screw to reach an idle speed of 675 +/- 25 rpm.

NOTE: During engine break-in reduce the idle rpm by 100 rpm. RPM TOO HIGH a.

Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6, if necessary.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

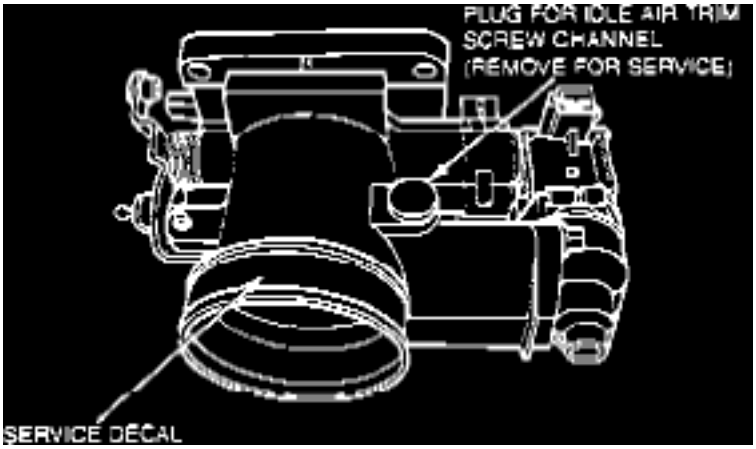
Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND

DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.



Idle Speed: Adjustments With 91TF-AA Throttle Body

*** UPDATED BY TSB 91-11B-4 6/14/91

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed. The idle speed setting procedure has been revised considerably to reflect the expanded application of the Self-Test idle speed options and because the throttle body incorporates an orifice in the throttle plate to control idle airflow as part of the sludge tolerant design.

Air Trim Screw Channel Cover

Throttle bodies with sludge tolerant design (introduced 1991 1/2 model vehicles) are clearly identified with a Yellow/Black decal. This decal warns that the throttle plate stop screw must not be adjusted counterclockwise (backed off), as this will not reduce the engine speed but may cause the throttle plate to stick in the bore. Backing out the screw may be required if the throttle body has been previously serviced (a plug in the throttle plate orifice may be present) or the plate stop screw tampered with (TPS Self-Test output out of range). The decal also warns that the throttle body must NOT be cleaned inside the bore, as this cleaning will impair the sensitive coating. The sludge accumulation will not affect the idle air flow. The cleaning procedure for the ISC-BPA still applies.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

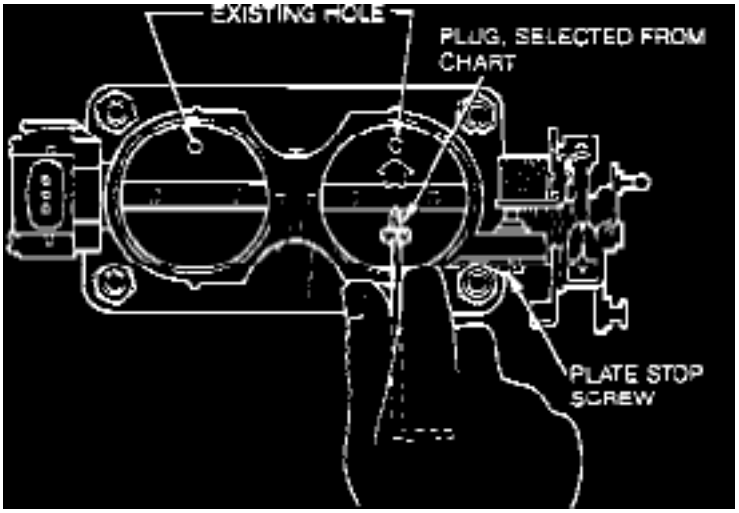
STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5



Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-120 rpm.

Throttle Plate Orifice Plug

NOTE: A plug in the throttle body orifice will decrease idle rpm. Where as an orifice without a plug will increase idle rpm. Orifice plugs and installation tools are available in service kit # FOPZ-9F652-A.

RPM TOO LOW a.

Do not clean the throttle body, check for the plate orifice plug. ^

If there is no plug, turn the screw clockwise to the desired rpm.

^ If there is a plug from previous service, remove the plug, and adjust the screw in either direction as required. NOTE: Screw must be in contact with the lever pad after adjustment.

RPM TOO HIGH a.

Turn the engine OFF.

b. Disconnect air cleaner hose.

c. Temporarily block the orifice in the throttle plate with tape. If the orifice already has a plug from previous service proceed to Step (e).

d. RESTART the engine, and check the idle speed, using a tachometer. NOTE: On vehicles with Mass Air Flow Sensors, reconnect the air intake duct hose before checking rpm. If the engine stalls, crack open the plate stop screw, but DO NOT over adjust.

e. If rpm continues to be fast, perform KOEO Self-Test. ^

If TPS output code is within range, remove tape from throttle plate, and check for other possible causes.

^ If TPS output is out of range, adjust screw for proper TPS code. Lever must be in contact with the screw.

^ If rpm is still fast, terminate this procedure, then check for other possible causes.

f. If rpm drops to 675 or lower, or engine stalls, turn the engine OFF, disconnect the air cleaner hose, and remove tape from throttle plate.

g. Install the plug with proper color code depending on throttle plate orifice size.

h. Reconnect the air cleaner hose. START the engine, and check the idle rpm using a tachometer. Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved. NOTE: Do not turn the plate stop screw counterclockwise. This may cause the throttle plate to stick at idle.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

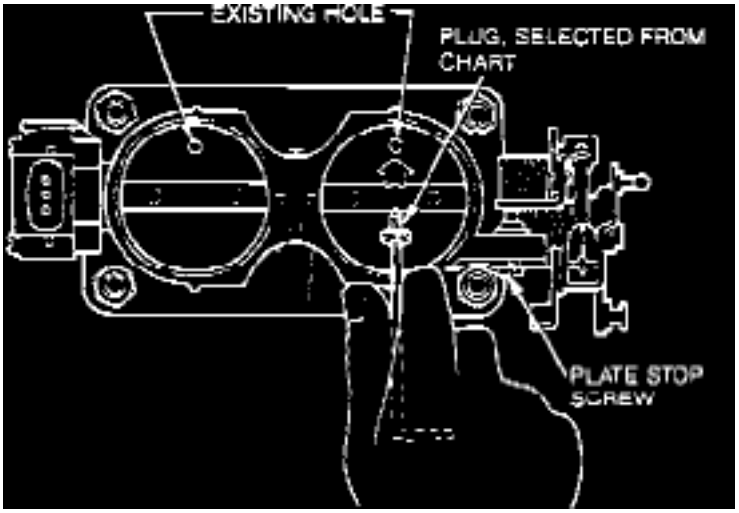
START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.

PROCEDURES FOR PLUG INSTALLATION

STEP 1

Remove air inlet tube(s) from throttle body.



Throttle Plate Orifice Plug

STEP 2

Select the proper color plug by using the Go/No-Go gauge pegs, included in the service kit (FOPZ-9F652-A).

STEP 3

Starting with the largest diameter gauge peg, attempt to insert through the throttle plate orifice.

STEP 4

If the gauge peg goes through the orifice, use the corresponding color plug. If the gauge peg does not go through, proceed with the next smaller gauge peg for Go/No-Go Test. NOTE: It is important that the largest Go/No-Go combination is used to determine the proper plug size.

STEP 5

If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe plate clean and then return to Step 3 to determine the proper plug size.

STEP 6

Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.

STEP 7

Open and snap closed the throttle several times to verify proper plug retention.

STEP 8

Reconnect the air inlet tube(s).

STEP 9

Reset idle rpm per engine requirement using the throttle plate stop screw.

Air Cleaner Fresh Air Duct/Hose: Technical Service Bulletins Engine - Water Entry Through Air Intake System

Article No. 94-3-8

02/09/94

^ AIR INTAKE - 2.9L, 3.0L, 4.0L EFI ENGINES - WATER ENTRY THROUGH AIR INTAKE SYSTEM

^ ENGINE - 2.9L, 3.0L, 4.0L EFI - POSSIBLE INTERNAL DAMAGE FROM WATER ENTRY THROUGH AIR INTAKE SYSTEM

LIGHT TRUCK: 1986-90 BRONCO II 1986-94 RANGER 1991-94 EXPLORER

This article is being republished in its entirety to add 1993-94 4.0L Ranger, 1993-94 3.0L Ranger and 1993-94 4.0L Explorer vehicles.

ISSUE: Reports have been received of internal engine damage caused by water entering the engine through the air intake system. This condition may occur when the vehicle is driven in normal wet conditions, such as water splash/spray from other vehicles, or when driven through shallow water. Improvements were made to the EFI engine air intake systems that have greatly reduced the number of reported incidences.

ACTION: Dealers should be assured that warranty repairs will be covered unless there Is evidence of owner misuse. This warranty repair policy will remain effective unless you are notified that a waterproof air intake system has been released.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-21-10 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

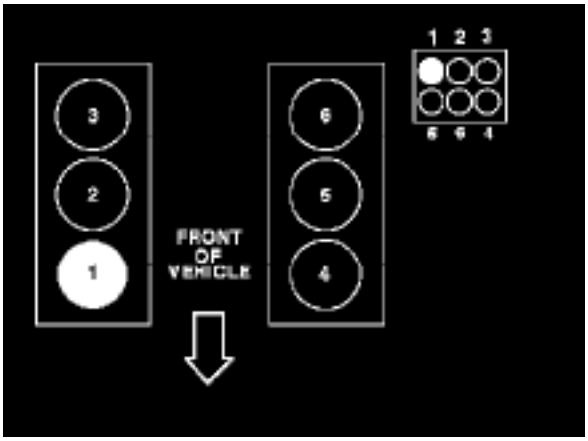
3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.



Firing Order: Specifications

V6 Firing Order: 1 4 2 5 3 6

Technical Service Bulletin # 9111B6 Date: 910614

Octane Adjust Shorting Bar - Revised Procedures

Article No. 91-11B-6

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1989 - PAGE 17-289 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGE 17-329 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGE 5-22 - EEC-IV QUICK TEST STEP 12.0 - CAR DIAGNOSIS BY SYMPTOM CHART REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 6-305 THROUGH 6-307 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

FORD: 1989-91 TAURUS, THUNDERBIRD 1991 ESCORT, MUSTANG

LINCOLN-MERCURY: 1989-90 COUGAR 1991 TRACER

LIGHT TRUCK: 1989-91 RANGER 1991 AEROSTAR, EXPLORER

ISSUE: Additional information regarding removal of the Octane Adjust Shorting Bar is required to assure compliance with Federal (EPA) Emission Standards. The following Manuals are affected on the pages indicated:

^ 1989 Engine/Emissions Diagnosis Page 17-289

^ 1990 Engine/Emissions Diagnosis Page 17-329

^ 1991 Engine/Emissions Diagnosis Page 5-22 and Pages 6-305 through 307

ACTION: Refer to the pages in this TSB article for the additional information.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 690000

Octane Adjust	Pinpoint Test	KP

Note

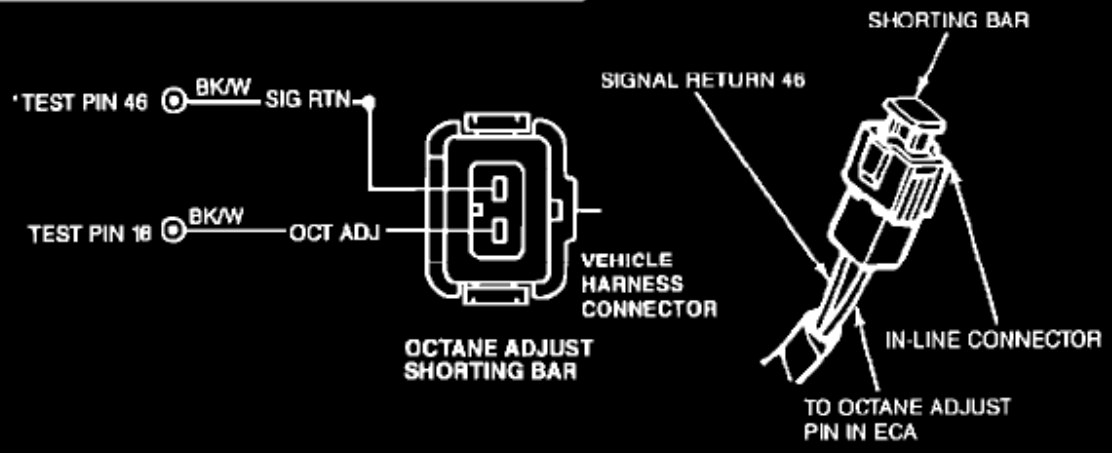
You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: Signal Return, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



OCTANE ADJUST SHORTING BAR LOCATIONS

APPLICATION	LOCATION
2.3L EFI Truck	Passenger side of fender apron, taped to the self-test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to self-test connector.

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9686-D

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

Octane Adjust

Pinpoint Test **KP**

Octane Adjust Shorting Bar Locations

Application	Location
1.9L MA SEFI	Near EEC-IV power relay, fuel pump relay and processor in passenger compartment.
2.3L EFI Truck	Passenger side of fender apron, taped to the Self-Test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to Self-Test connector.
4.0L MA EFI Aerostar	Driver side, engine cowl near windshield wiper motor take-out (alongside MAP take-out).
4.0L MA EFI Ranger/ Bronco II	Passenger side of fender apron, taped to the Self-Test connector.

Test Pin 18 (44 and 43) OCT ADJ

Application	Wire Color
2.3L EFI Truck 3.0L SEFI SHO 3.8L SEFI SC	DK/W
4.0L Aerostar	O
4.0L Ranger	W/R
1.9L MA SEFI	GR/W

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

EEC-IV QUICK TEST STEP: Diagnosis By Symptom

12.0

12.0 CAR DIAGNOSIS BY SYMPTOM CHART

Symptom	Pinpoint Test Step Direction												
	1.9L MA SEFI	2.3L OHC EFI	2.3L HSC EFI	2.5L AXODE SEFI	3.0L EFI PROBE	3.0L AXODE SEFI	3.0L SHO SEFI	3.8L AXODE SEFI	3.8L RWD SEFI	3.8L SC SEFI	4.6L 2V SEFI	5.0L SEFI	5.0L MA SEFI
Stumble after hot restart	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21
Fuel pump runs with engine off	—	—	—	X14	X14	X14	X14	X14	—	—	J22	J22	
Gasoline fumes under hood	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Black Exhaust Smoke	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Spark knock	KP5	KP5	—	—	DG1 or SEC. 11	—	KP5	—	—	KP5	KP5	—	—
Cooling fan does not operate Low speed cooling fan does not operate High speed cooling fan does not operate	KF10	X18	—	X18	X18	X18	X18	X18	—	X18	—	—	—
Low speed cooling fan always on	KF25	X35	—	X35	X35	X35	X35	X35	—	X35	—	—	—
High speed cooling fan always on	KF25	—	—	X40	X40	X40	x40	—	X40	X40	—	—	—

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

NOTE: The Octane Adjust shorting bar is similar in shape to the SPOUT in-line connector and on some applications the PSPS circuit will also have a shorting bar connector. **DO NOT** remove the shorting bar unless you have been directed by an application specific Technical Service Bulletin (TSB).

Test Pin 18, 29 or 44 OCT ADJ

Application	Wire Color
1.9L Escort/Tracer	GR/W
Car: 2.3L Mustang Truck: 2.3L Ranger 4.0L Explorer	DG
3.0L SHO	PK
3.8L SC	BK/W
4.0L Ranger	O
4.6L MA SEFI	W/R

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
3.8L SC SEFI	BK/W
All Others	GY/R

DELETION

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

TEST STEP	RESULT ▶	ACTION TO TAKE
KP1 VISUALLY INSPECT OCTANE ADJUST IN-LINE CONNECTOR SERVICE CODE 57/341		
Service Code 57/341 indicates Octane Adjust shorting bar is not in or the OCT ADJ circuit is open. • Key off. • Visually inspect Octane Adjust in-line connector. • **Is the shorting bar removed?**	Yes ▶ No ▶	GO to KP2. GO to KP4.
KP2 CHECK FOR MODIFICATION DECAL		
• Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	Testing complete. If vehicle has spark knock concern, GO to Section 2. GO to KP3.
KP3 CHECK FOR SERVICE CODE 57/341		
• Replace Octane Adjust shorting bar. • Key off. • Activate self-test. • **Is service code 57/341 present?**	Yes ▶ No ▶	GO to KP4. Testing complete. EEC system OK.
KP4 CHECK CONTINUITY OF OCTANE ADJUST CIRCUIT		
NOTE: There should be continuity from OCT ADJ circuit thru the in-line connector and shorting bar to SIG RTN circuit. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 46 and OCT ADJ Test Pin at the breakout box (see schematic for appropriate OCT ADJ circuit test pin). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE open OCT ADJ circuit or shorting bar or SIG RTN circuit. REMOVE breakout box. RERUN Quick Test.

Octane Adjust

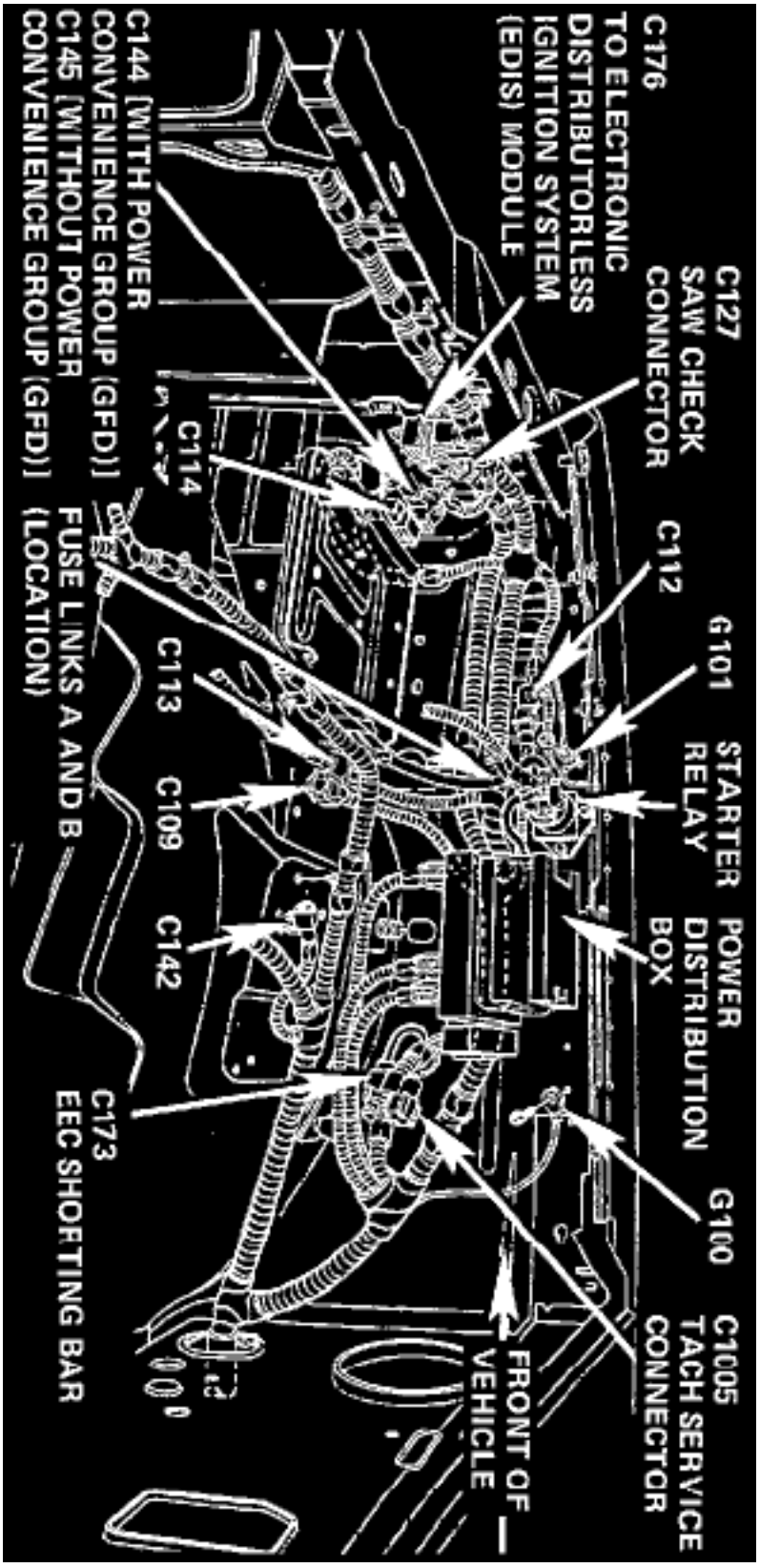
Pinpoint Test **KP**

TEST STEP	RESULT	ACTION TO TAKE
KP5 CHECK FOR SERVICE CODE 11 • Start engine and idle vehicle at operating temperature. • Key off. • Activate self-test. • Key on, engine off. • **Is service code 11 or 111 present?**	Yes ▶ No ▶	GO to KP6. **For service code 57/341:** GO to KP1. **For all other codes:** RETURN to Quick Test.
KP6 VERIFY IN-LINE CONNECTOR SHORTING BAR IS INSTALLED • Key off. • Visually inspect Octane Adjust in-line connector. • **Is shorting bar installed?**	Yes ▶ No ▶	GO to KP8. GO to KP7.
KP7 CHECK FOR MODIFICATION DECAL • Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	GO to KP10. REPLACE shorting bar. GO to Section 2 to address spark knock concern.
KP8 CHECK FOR TSB • Is there a Technical Service Bulletin (TSB) authorizing the removal of the Octane Adjust shorting bar?	Yes ▶ No ▶	GO to KP9. GO to Section 2 to address spark knock concern.
KP9 REMOVE SHORTING BAR • Remove shorting bar only if there is a TSB authorization. • Drive vehicle to verify spark knock. • **Is spark knock present?**	Yes ▶ No ▶	GO to KP10. Testing complete. EEC system OK.

Octane Adjust	Pinpoint Test	KP

TEST STEP	RESULT ▶	ACTION TO TAKE
KP10 CHECK OCTANE ADJUST CIRCUIT FOR A SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • Measure resistance between OCT ADJ circuit at the in-line connector and Test Pin 40/60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	GO to KP11.
	No ▶	SERVICE short circuit. REMOVE breakout box. If spark knock is still present, GO to Section 2.
KP11 CHECK PROCESSOR INTEGRITY • Key off. • Shorting bar removed because of TSB authorization. • Breakout box installed, processor connected. • Key on. • Measure voltage between Octane Adjust circuit and Test Pin 40/60 at the breakout box. • **Is voltage greater than 4.0 volts?**	Yes ▶	REMOVE breakout box. If spark knoock is still present, GO to Section 2.
	No ▶	REPLACE processor. REMOVE breakout box. If spark knock is still present, GO to Section 2.

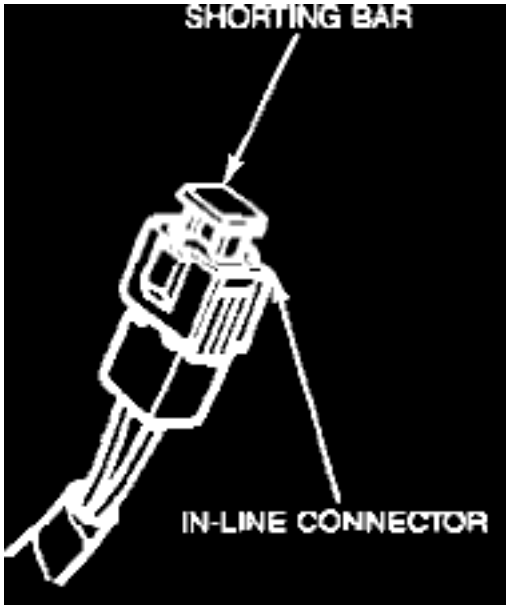
New 5/91


C176
TO ELECTRONIC DISTRIBUTORLESS IGNITION SYSTEM (EDIS) MODULE
C127
SAW CHECK CONNECTOR
C112
G101
STARTER RELAY
POWER DISTRIBUTION BOX
G100
C1005
TACH SERVICE CONNECTOR
C114
C144 [WITH POWER CONVENIENCE GROUP (GFD)]
C145 [WITHOUT POWER CONVENIENCE GROUP (GFD)]
C113
C109
C142
FUSE LINKS A AND B (LOCATION)
C173
EEC SHIFTING BAR
FRONT OF VEHICLE

Ignition Timing Connector: Locations

Component Location

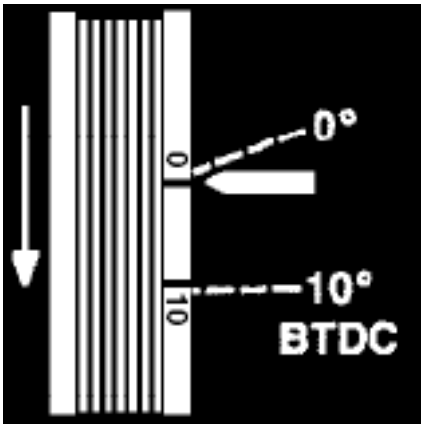
The SPOUT connector (SAW check connector C127) is located at the RH front of the engine compartment in front of the battery.



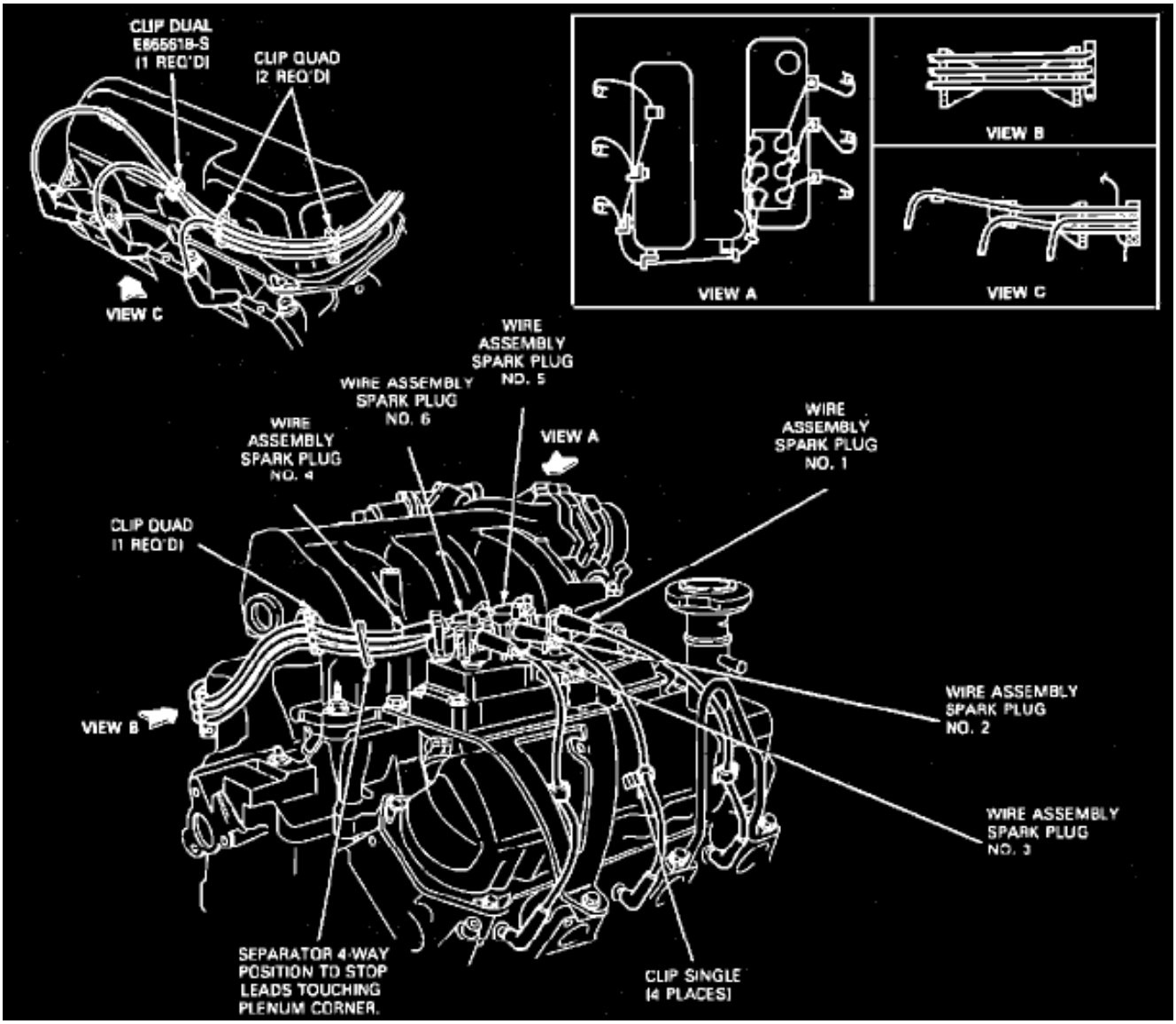
Ignition Timing Connector: Description and Operation

In-line Connector With Shorting Bar

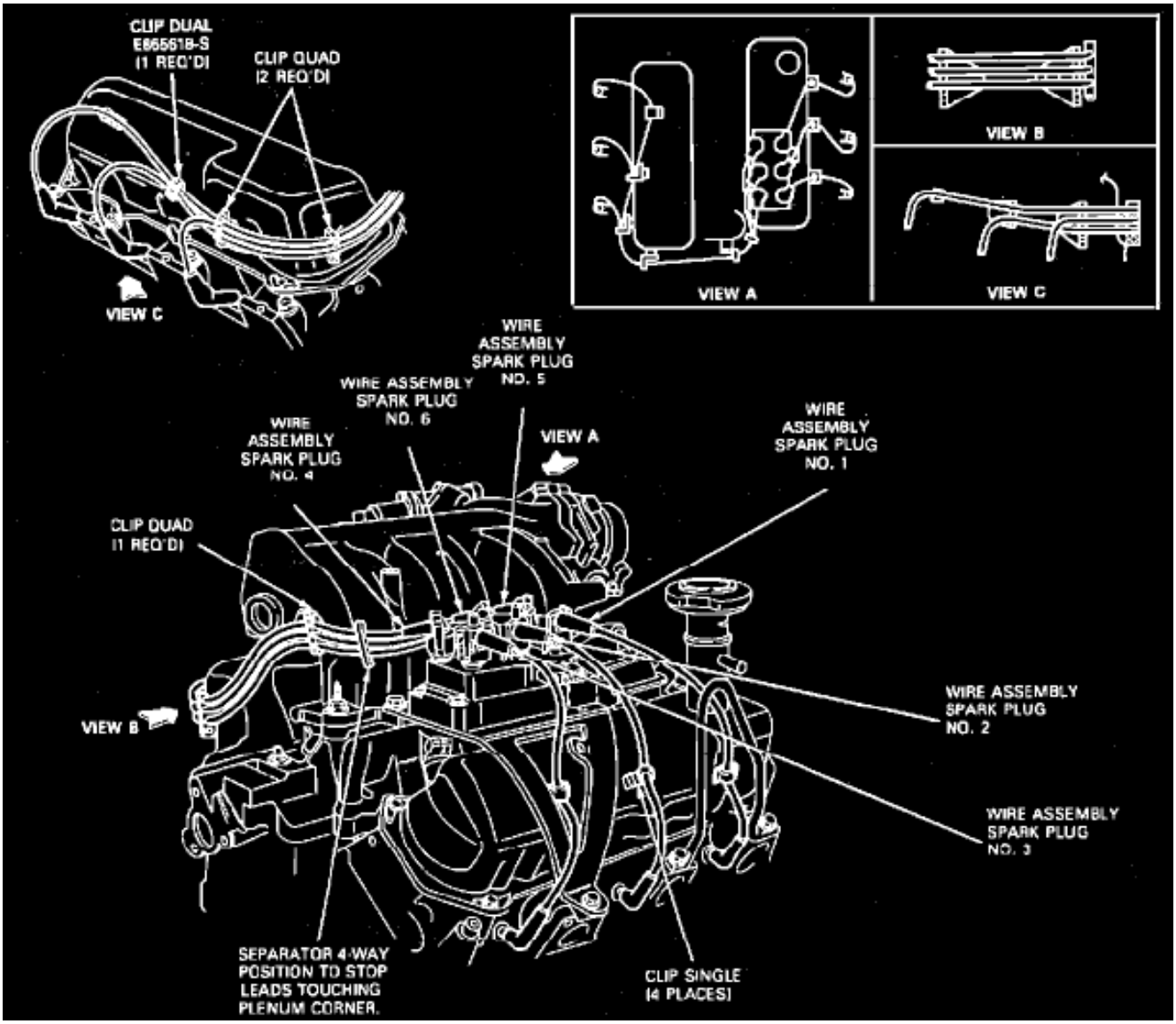
The octane adjustment switch is used to retard the ignition timing three to four degrees. When the switch jumper is INSTALLED, the timing is normal. With the jumper REMOVED, the timing is retarded. This is done to allow for optimum spark advance for effective combustion of the air/fuel mixture.



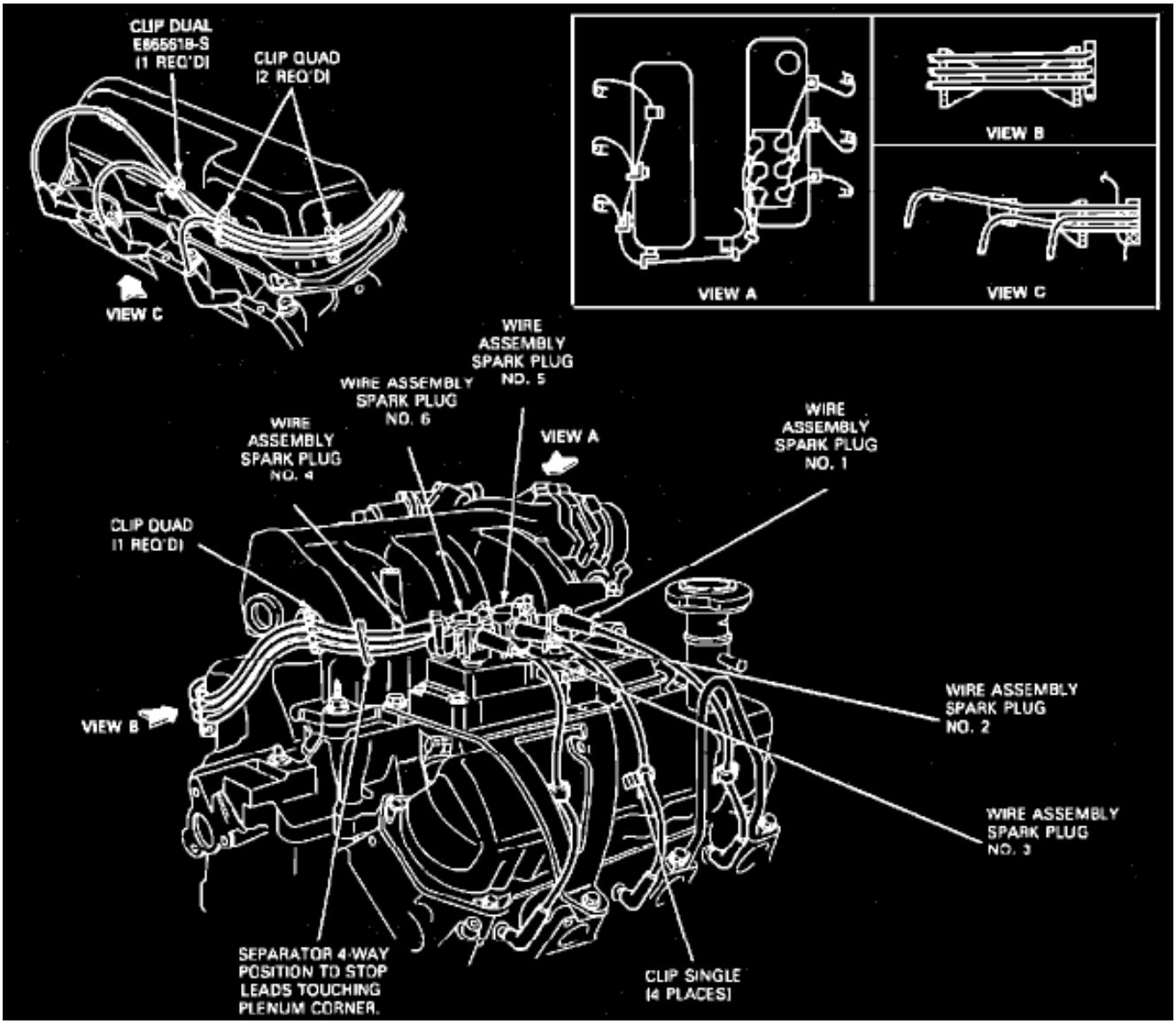
Timing Marks



Spark Plug Wire Assembly



Spark Plug Wire Assembly



Ignition Cable: Service and Repair

Spark Plug Wire Assembly

Removal:

1. When removing spark plug wires from the spark plugs, use the spark plug wire remover T74P-6666-A or equivalent. Grasp and twist the boot back and forth on the plug insulator to free the boot.

2. Use the special tool or equivalent to pull the boot from the plug. Do not pull on the wire directly, as it may become separated from the connector inside the boot.

3. To remove the wires from the coil pack, squeeze the locking tabs of the coil wire retainer and remove using a twisting and pulling motion. Do not pull on the wire.

INSTALLATION:

CAUTION: Proper installation of spark plug wires is critical to vehicle operation. If one spark plug wire is not properly installed on the spark plug or ignition coil, both spark plugs connected to that coil may not fire under load.

1. Whenever a high tension wire is removed for any reason from a spark plug or ignition coil, or a new high tension wire is installed, Silicone Dielectric Compound D7AZ-19A331-A or equivalent must be applied to the boot prior to installation. Using a small tool, coat the entire interior surface of the boot.

2. Install each wire on the proper ignition coil terminal. The terminal cylinder numbers are identified on the ignition coil pack. Ensure that both coil boot retainer locking tabs have engaged.

3. Remove the wire retaining brackets from the old wiring set and install the brackets on the new wires in the same position. Install the wires and retaining brackets on the engine.

4. Connect the wires to the proper Spark plugs.

Spark Plug: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Spark Plug: Specifications Spark Plug Gap

SPARK PLUG

Electrode Gap ..... 0.052-0.056 in (1.3-1.4 mm)

Spark Plug: Specifications Tightening Torque

SPARK PLUG

Tightening Torque ..... 10-16 ft lb (14-22 Nm)

Compression Check: Specifications

Compression Pressure .....
PSI of lowest cylinder must be within 75% of highest

Valve Clearance: Locations

Valve Arrangement (Front To Rear)

.....

L.H. I-E-I-E-I-E Valve Arrangement (Front To Rear)

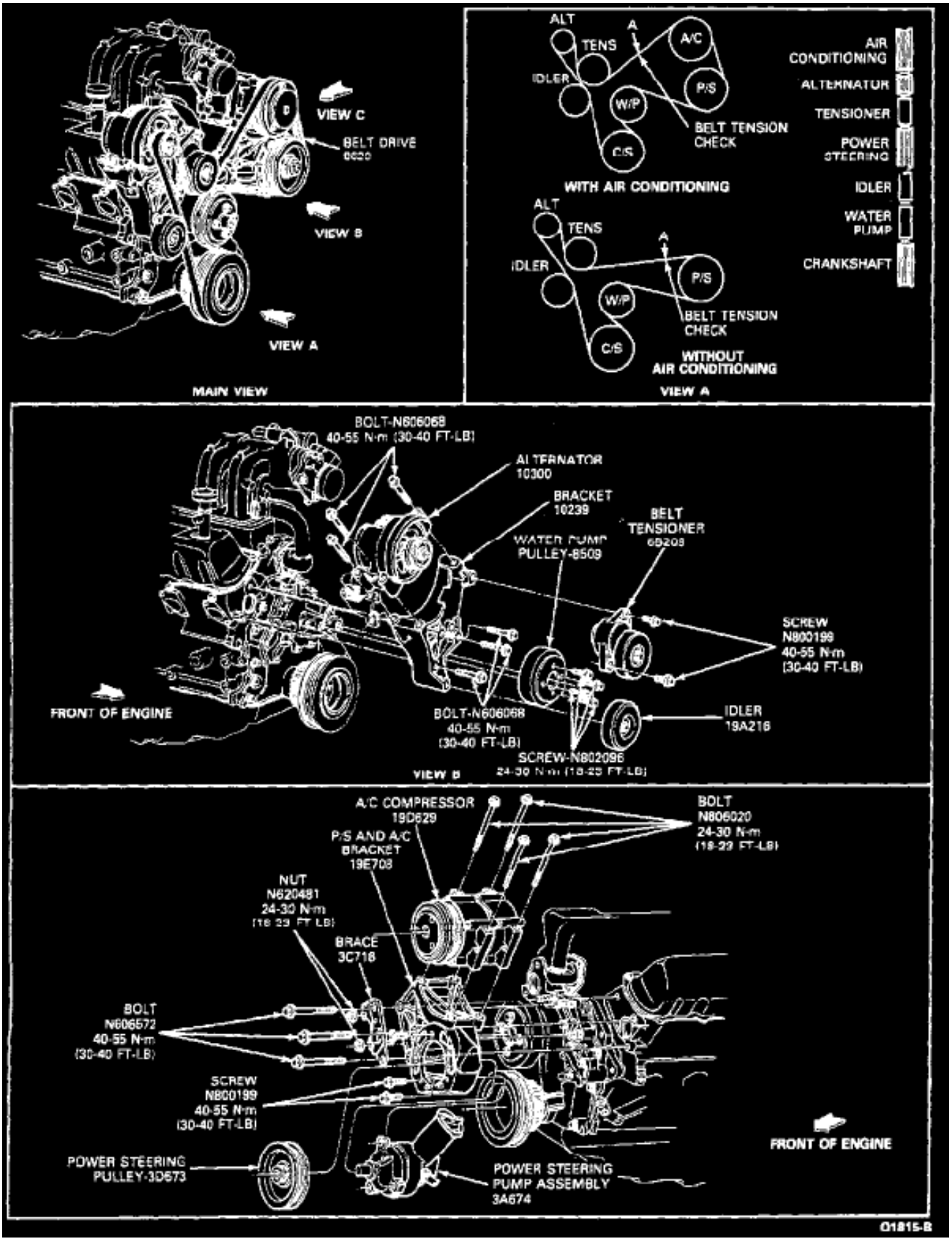
.....

R.H. E-I-E-I-E-I

Valve Clearance: Adjustments

The hydraulic roller tappets have non-adjustable rocker arms. The tappets are not adjustable, and if found to be excessively worn or noisy, should be tested and replaced.

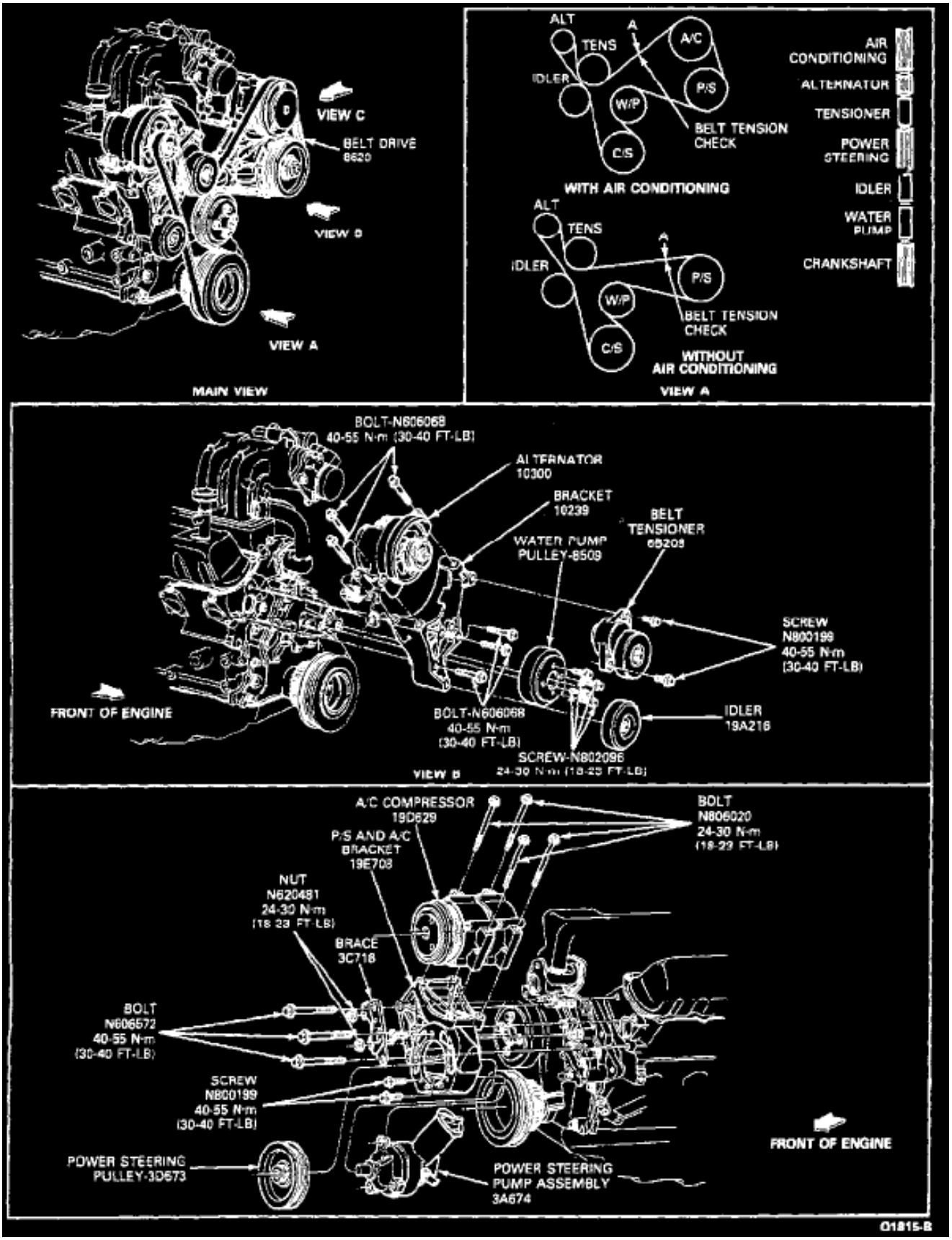
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Maintenance > Drive Belt > Component Information > Specifications



Drive Belt: Specifications

Drive Belt Routing

New Or Used Belt (Measured At "A") ..... 480-586 Newtons (108-132 lbs) Allowable Minimum .... 480 Newtons (108 lbs)


VIEW C
BELT DRIVE
8620
VIEW B
VIEW A
MAIN VIEW
ALT
TENS
IDLER
A
A/C
P/S
W/P
C/S
BELT TENSION CHECK
WITH AIR CONDITIONING
WITHOUT AIR CONDITIONING
AIR CONDITIONING
ALTERNATOR
TENSIONER
POWER STEERING
IDLER
WATER PUMP
CRANKSHAFT
VIEW A
BOLT-N606068
40-55 N·m (30-40 FT-LB)
ALTERNATOR
10300
BRACKET
10239
BELT TENSIONER
6B209
WATER PUMP PULLEY-8509
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
FRONT OF ENGINE
BOLT-N606068
40-55 N·m
(30-40 FT-LB)
IDLER
19A216
SCREW-N802096
24-30 N·m (18-23 FT-LB)
VIEW B
A/C COMPRESSOR
19D629
P/S AND A/C BRACKET
19E708
BOLT
N606020
24-30 N·m
(18-22 FT-LB)
NUT
N620481
24-30 N·m
(18-23 FT-LB)
BRACE
3C718
BOLT
N606572
40-55 N·m
(30-40 FT-LB)
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
POWER STEERING PULLEY-3D673
POWER STEERING PUMP ASSEMBLY
3A674
FRONT OF ENGINE
O1815-B

Drive Belt Routing

Drive Belt: Adjustments

Drive belt adjustment is accomplished by repositioning one of the belt driven components (alternator, air pump, or power steering pump). For belt routing information, refer to Engine/Drive Belts, Mounts, Brackets and Accessories/Drive Belt/Specifications/Mechanical.

1. Verify all drive pulleys and mounting bolts are tight.

2. Using a Belt Tension Gauge (Tool T63L-8620-A or equivalent), check the tension of the drive belts.

3. If adjustment is necessary, loosen accessory adjustment bolts.

4. Tighten the pivot enough to remove all freeplay from pivot area but not enough to prevent the accessory from rotating to allow belt tensioning.

5. ALL BELTS EXCEPT ALTERNATOR BELT - Insert a square drive ratchet wrench or breaker bar into the square hole in accessory bracket. Tighten belt to correct tension. ALTERNATOR BELT - Place a "C" clamp over the end of the adjusting arm and the adjusting bolt boss, and tighten the belt to the correct tension. Refer to SPECIFICATIONS/MECHANICAL. NOTE: Be sure to use the "New Belt Tension" specifications for new drive belts, and the "Used Belt Tension" specifications for used belts. A used belt is a belt with more than 5 minutes of engine operation.

6. While maintaining belt tension, tighten adjustment bolt to specification. Refer to SPECIFICATIONS/MECHANICAL.

7. Remove square driver tool or "C" clamp.

8. Tighten pivot bolt to specification. Refer to SPECIFICATIONS/MECHANICAL.

9. Check belt tension(s) and readjust if necessary.

10. START the engine, idle for 5 minutes, then recheck belt tension(s). NOTE: If tension is less than the "Minimum Tension" after 5 minutes of operation, then reset the belt tension(s) to within "Used Belt Tension specifications. START engine, idle for 5 minutes, then recheck belt tension(s). Make adjustments if necessary.

CAUTION: If using a pry bar, DO NOT use any of the driven components (alternator, air pump, power steering pump, or a/c compressor) as a leverage point. Damage to the component housing may result.

Air Cleaner Fresh Air Duct/Hose: Technical Service Bulletins Engine - Water Entry Through Air Intake System

Article No. 94-3-8

02/09/94

^ AIR INTAKE - 2.9L, 3.0L, 4.0L EFI ENGINES - WATER ENTRY THROUGH AIR INTAKE SYSTEM

^ ENGINE - 2.9L, 3.0L, 4.0L EFI - POSSIBLE INTERNAL DAMAGE FROM WATER ENTRY THROUGH AIR INTAKE SYSTEM

LIGHT TRUCK: 1986-90 BRONCO II 1986-94 RANGER 1991-94 EXPLORER

This article is being republished in its entirety to add 1993-94 4.0L Ranger, 1993-94 3.0L Ranger and 1993-94 4.0L Explorer vehicles.

ISSUE: Reports have been received of internal engine damage caused by water entering the engine through the air intake system. This condition may occur when the vehicle is driven in normal wet conditions, such as water splash/spray from other vehicles, or when driven through shallow water. Improvements were made to the EFI engine air intake systems that have greatly reduced the number of reported incidences.

ACTION: Dealers should be assured that warranty repairs will be covered unless there Is evidence of owner misuse. This warranty repair policy will remain effective unless you are notified that a waterproof air intake system has been released.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-21-10 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.

Technical Service Bulletin # 98-12-5 Date: 980622

A/C - Filtering Refrigerant After Compressor Replacement

Article No. 98-12-5

06/22/98

AIR CONDITIONING - FILTERING REFRIGERANT

AFTER A/C COMPRESSOR REPLACEMENT - SERVICE TIPS

FORD: 1980-98 CROWN VICTORIA 1981-98 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-97 THUNDERBIRD 1982-98 MUSTANG 1983-86 LTD 1984-94 TEMPO 1986-98 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-98 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1980-98 GRAND MARQUIS, TOWN CAR 1982-83 ZEPHYR 1982-86 CAPRI 1982-87 LN7 1982-97 COUGAR 1982-98 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-98 SABLE 1991-94 CAPRI 1991-98 TRACER 1993-98 MARK VIII 1995-98-MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1980-96 BRONCO 1980-97 F SUPER DUTY 1980-98 ECONOLINE, F-150, F-150, F-350 1983-98 RANGER 1984-90 BRONCO II 1986-97 AEROSTAR 1988-97 F-47 1991-98 EXPLORER 1993-98 VILLAGER 1995-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to revise the Service Procedure and to update the model years.

ISSUE Vehicles that have and inoperative A/C compressor, due to internal causes, MUST have the refrigerant system cleaned to remove any debris or contaminants that may be present to prevent damage to the replacement compressor.

ACTION

Install a Service Filter Kit in the refrigerant system prior to installing the replacement compressor. Refer to the following Service Procedure for details.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 96-15-5

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-99 Models And 1991 Lincolns, Basic Warranty Coverage For All Other Models And Major Component Warranty Coverage For All Other Lincoins

OPERATION DESCRIPTION TIME

981205A Kit Installation 1.2 Hrs.

981205B Extra Time For Refrigerant 0.4 Hr.

(R-12) Recovery

DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208999

Service Procedure

THIS PROCEDURE IS OPTIONAL IF THE SYSTEM IS FLUSHED USING THE ROTUNDA A/C FLUSHER.

CAUTION

THIS FILTERING PROCEDURE MAY BE USED FOR EITHER R-12 OR R-134a REFRIGERANT SYSTEMS. BECAUSE THE TWO (2) SYSTEMS USE DIFFERENT REFRIGERANT OILS AND BECAUSE THE COMPRESSOR COULD BE DAMAGED IF THE WRONG OIL IS USED, SYSTEM IDENTIFICATION IS VERY IMPORTANT. BE SURE SYSTEM IS CORRECTLY IDENTIFIED BEFORE STARTING THE FILTERING PROCEDURE.

Each Service Filter Kit includes the following items:

^ One (1) Pancake Filter (to be installed in the liquid line between the condenser and the orifice tube)

^ One (1) Instruction Sheet

NOTE

ON 1993-94 RANGER/EXPLORER VEHICLES, TECHNICIANS MAY EXPERIENCE DIFFICULTY WHEN CONNECTING THE PANCAKE FILTER HOSE FITTINGS TO THE EVAPORATOR INLET WITH THE ORIFICE TUBE INSTALLED. REMOVE THE OFFICE TUBE AND RUN THE SYSTEM FOR 1 HOUR AS DESCRIBED IN THE FILTERING PROCEDURE. REINSTALL THE ORIFICE TUBE AFTER FILTERING IS COMPLETE.

CAUTION

FOLLOW ALL REFRIGERANT SYSTEM SAFETY AND SERVICE PRECAUTIONS OUTLINED IN THE APPROPRIATE SERVICE OR WORKSHOP MANUAL.

1. Before removing any refrigerant system components, recover the refrigerant from the system following the recycling methods outlined In the appropriate Service/Workshop Manual.

2. Remove the suction accumulator/drier assembly and drain the oil into a calibrated container.

3. Install a new suction accumulator/drier and add new refrigerant oil to replace the old oil. The quantity of the new oil to be added is the amount to match that drained from the old accumulator plus 60 mL (2 oz). Refer to the Dealer Master Parts Catalog for the correct suction accumulator/drier part number.

CAUTION

REMEMBER TO USE MOTORCRAFT YN-9-A REFRIGERANT COMPRESSOR OIL WITH R-12 SYSTEMS AND MOTORCRAFT YN-12-C REFRIGERANT COMPRESSOR OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

4. Install a new orifice tube. Refer to the Dealer Master Parts Catalog for the correct orifice tube part number. If the orifice tube in the vehicle is located in the liquid line between the condenser and the evaporator, replace the liquid line assembly.

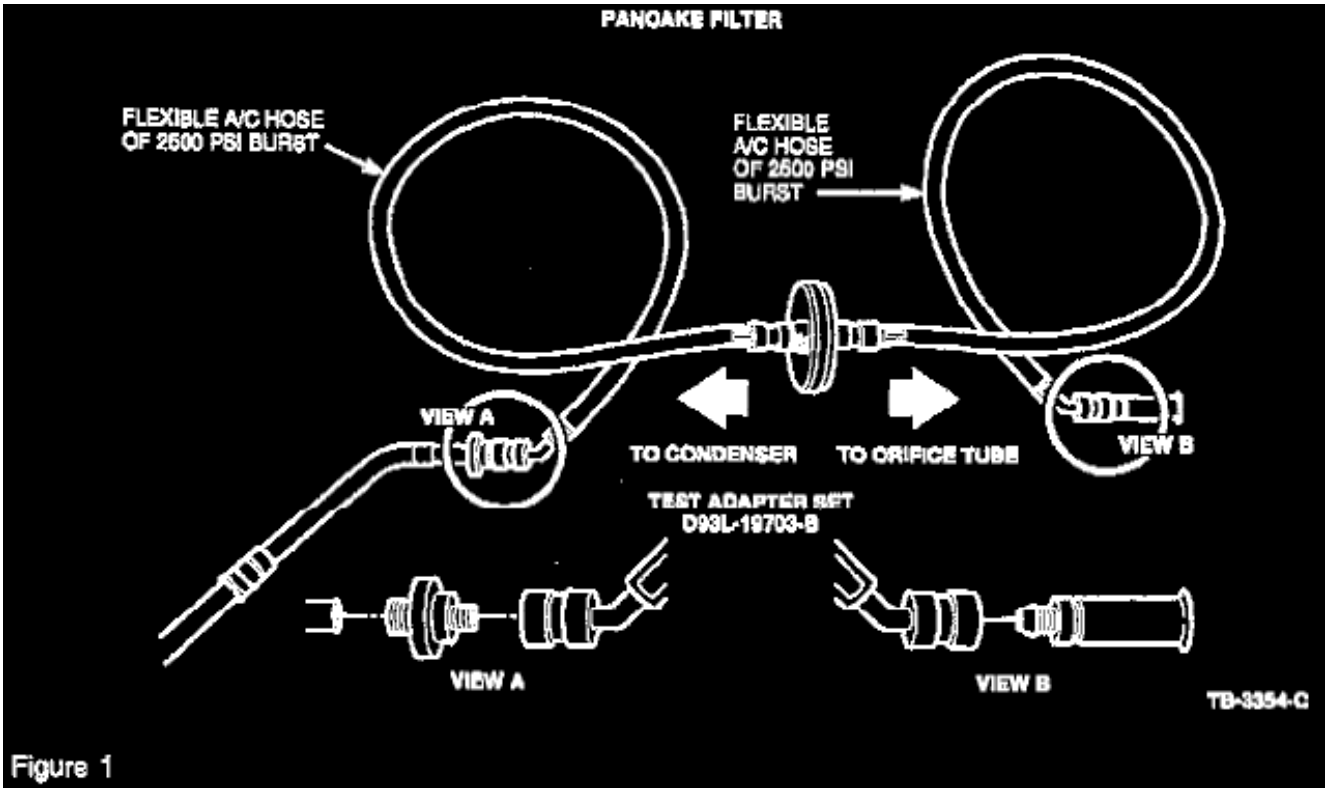


Figure 1

5. Install pancake filter in the liquid line between the condenser and the orifice tube, Figure 1.

a. Be sure orifice inlet is toward the condenser.

b. Connections can be made using Test Adapter Set D93L-19703-B, or equivalent, and flexible refrigerant hose of 2500 psi burst rating. Individual fittings are also available.

6. Remove the old compressor following Service/Workshop Manual procedures. Drain the oil into a calibrated container.

7. Drain the oil from the replacement compressor into a clean calibrated container.

NOTE:

IT WILL BE NECESSARY TO TRANSFER THE MAGNET CLUTCH FROM THE OLD COMPRESSOR TO THE REPLACEMENT COMPRESSOR. FOLLOW SERVICE/WORKSHOP MANUAL PROCEDURES.

8. A new FX-15 service compressor contains 207 mL (7 oz.) of R-12 refrigerant oil. A new FS-10 service compressor does not contain any oil and can be used with an R-12 or an R-134a system.

CAUTION

REMEMBER TO USE YN-9-A (MINERAL) OIL WITH R-12 SYSTEMS AND YN-12-C (PAG) OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

^ If the amount of oil drained from the removed compressor is between 90 and 148 mL (3-5 oz), pour the same amount of clean refrigerant oil into the new compressor.

^ If the amount of oil drained from the old compressor is greater than 90 mL (3 oz), pour 90 mL (3 oz) of clean refrigerant oil into the new compressor.

9. Install the new compressor following Service/Workshop Manual procedures. Make sure all mounting bolts are tightened properly. Check the tension of the compressor drive belt. Adjust if necessary.

10. Evacuate, charge and leak test the system, following Service/Workshop Manual procedures.

11. Check all refrigerant system hoses, lines and the position of the newly-installed filters to make sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

12. Set the A/C control on Max A/C, high blower and temperature control at full cold.

a. Start engine and let idle briefly.

b. Be sure A/C system is operating properly.

13. Gradually bring the engine up to 1200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1000 rpm). Set the engine at 1200 rpm and run it for an hour with the A/C system operating.

14. Stop the engine.

NOTE:

IT WILL BE NECESSARY TO RECOVER THE SYSTEM REFRIGERANT CHARGE BEFORE PROCEEDING.

15. Allow the engine to cool sufficiently to remove the fittings, flexible hoses and pancake filter from the liquid line.

16. Discard the filter. It can be used one (1) tie only.

17. Reconnect the liquid line back into the system.

18. Evacuate, charge and leak test the system. Make any necessary adjustments.

19. Check the operation of the system in all models.

PART NUMBER PART NAME

F8VZ-19E773-AA Filter Kit

F73Z-19577-AA Refrigerant Oil - Motorcraft YN-9-A (For R-12 Refrigerant Systems Only)

F7AZ-19589-DA Refrigerant Oil - Motorcraft YN-12-C (PAG-Type Oil For R-134a Refrigerant Systems Only)

NOTE

THE TOTAL REPAIR TIME IS FOR INSTALLING SERVICE FILTER KIT PER INSTRUCTIONS THIS INCLUDES INSTALLATION OF AND DISCARD OF FILTER. REFER TO SERVICE LABOR TIME STANDARDS MANUALS IF ADDITIONAL LABOR OPERATIONS ARE REQUIRED.

Hoses: Service Precautions

SERVICE PRECAUTIONS

To prevent vehicle damage, always observe the following precautions: -

After servicing a hose, check for leaks before and after test driving the vehicle.

- Always use the correct size hose. Do not use standard sized hose in place of metric hose or vice versa.

-

Always use the correct type of hose. Never use vacuum hose in place of fuel hose. Never use heater hose in place of PCV hose.

- When replacing hoses which are attached to the engine on one end and the frame or body on the other end, always leave sufficient length to compensate for engine movement (from torque).

Coolant: Technical Service Bulletins Engine Coolant - Propylene Glycol Recommendations

Article No. 01-23-6

11/26/01

^ ENGINE COOLANT - PROPYLENE GLYCOL - FORD MOTOR COMPANY POSITION ON ENGINE COOLANTS MADE FROM PROPYLENE GLYCOL

^ ENGINE COOLANT - PROPYLENE GLYCOL-BASED - FORD MOTOR COMPANY POSITION ON PROPYLENE GLYCOL-BASED ENGINE COOLANTS

FORD: 1989-1993 FESTIVA 1989-1994 TEMPO 1989-1997 PROBE, THUNDERBIRD 1989-2002 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS 1994-1997 ASPIRE 1995-2000 CONTOUR 2000-2002 FOCUS 2002 THUNDERBIRD 1989-1990 BRONCO II 1989-1996 BRONCO 1989-1997 AEROSTAR, F SUPER DUTY 1989-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2002 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION 2001-2002 ESCAPE, EXPLORER SPORT TRAC, EXPLORER SPORT 2000-2002 F-650, F-750

LINCOLN: 1989-1992 MARK VII 1989-2002 CONTINENTAL, TOWN CAR 1993-1998 MARK VIII 2000-2002 LS 1998-2002 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1989-1994 TOPAZ 1989-1997 COUGAR 1989-2002 GRAND MARQUIS, SABLE 1991-1994 CAPRI 1991-1999 TRACER 1995-2000 MYSTIQUE 1999-2002 COUGAR 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

MERKUR: 1989 SCORPIO, XR4TI

This article is being republished in its entirety to update the model year coverage.

ISSUE This TSB article describes Ford Motor Company's position on the use of propylene glycol-based engine coolants.

ACTION

Ford Motor Company does not recommend nor endorse the use of engine coolants made with propylene glycol in Ford vehicles. Ford Motor Company currently recommends the use of ethylene glycol-based engine coolants.

Published information suggests that engine coolants made with propylene glycol may provide engine cooling performance equivalent to engine coolants made with ethylene glycol. However, different brands of engine coolant provide varying corrosion protection for the cooling system. Ford does not have performance data for the multitude of engine coolants available in the aftermarket and therefore cannot recommend the use of any coolant except those sold by Ford Customer Service Division. Consult the vehicle's Owner's Guide to determine the appropriate Ford Customer Service Division coolant for the vehicle.

Furthermore, claims of toxicological and environmental advantages of propylene glycol over ethylene glycol may be misleading. When significant new information is developed, Ford will review this policy.

Ford Motor Company specifications recommend that vehicles be maintained using certain ethylene glycol-based engine coolants. Those specifications do not refer to engine coolants made with propylene glycol. Although the Ford New Vehicle Limited Warranty is not automatically voided upon the use of a coolant made with propylene glycol, if such use results in damage to the vehicle or its components, the cost of repairing the damage would not be covered by the Ford New Vehicle Limited Warranty.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 96-16-4 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 402000

Coolant: Technical Service Bulletins Recycled Engine Coolant - Service Tips

Article No. 95-18-2

09/11/95

^ COOLANT - USE OF RECYCLED ENGINE, COOLANT - SERVICE TIP

^ COOLING SYSTEM - USE OF RECYCLED ENGINE, COOLANT - SERVICE TIP

FORD: 1980 and after CROWN VICTORIA, MUSTANG, THUNDERBIRD 1981 and after ESCORT 1982-88 EXP 1984-94 TEMPO 1986 and after TAURUS 1988-93 FESTIVA 1989 and after PROBE 1994 and after ASPIRE 1995 and after CONTOUR

LINCOLN-MERCURY: 1980 and after CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1981-86 CAPRI 1981-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1986 and after SABLE 1987-89 TRACER 1991-94 CAPRI 1991 and after TRACER 1993 and after MARK VIII 1995 and after MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1980 and after F-150-350 SERIES 1981 and after ECONOLINE 1982 and after BRONCO 1983 and after RANGER 1984-90 BRONCO II 1986 and after AEROSTAR 1988 and after F SUPER DUTY 1991 and after EXPLORER 1993 and after VILLAGER 1995 and after WINDSTAR

This TSB is being republished in its entirety to include warranty information when using recycled coolant

ISSUE: Ford Motor Company authorizes the use of recycled engine coolant that, when properly processed and reinhibited, meets Ford specification ESE-M97B44-A. At this time, the Rotunda Coolant Recycler (181-00003) process is the only approved coolant recycling method available through Ford that is capable of producing recycled engine coolant that meets Ford specification ESE-M97B44-A.

ACTION: Refer to the following Service Procedure for coolant processing and reinhibiting using Rotunda Coolant Recycler (181-00003).

NOTE:

WHILE TESTING SHOWS THAT RECYCLED ENGINE COOLANT CAN PROVIDE ACCEPTABLE PERFORMANCE, THE COOLANT PRODUCED FROM ROTUNDA EQUIPMENT IS INTENDED FOR USE WITHIN DEALERSHIPS ON WARRANTY AND CUSTOMER PAY REPAIRS ONLY AND NOT INTENDED FOR RETAIL SALE. THERE ARE REGULATORY, PACKAGING AND LABELING CONCERNS

ASSOCIATED WITH THE RETAIL SALE OF CHEMICAL PRODUCTS.

CAUTION:

THE REINHIBITOR CHEMICALS PROVIDED WITH THIS EQUIPMENT ARE NOT APPROPRIATE FOR USE ON MEDIUM/HEAVY TRUCK APPLICATIONS.

WARNING:

ROTUNDA PREMIUM COOLANT REINHIBITORS # 1 AND # 2 HAVE BEEN SPECIFICALLY FORMULATED TO WORK WITH ROTUNDA COOLANT RECYCLER (181-00003).

USE OF ANY OTHER CHEMICAL ADDITIVES WITH THIS SYSTEM WILL VOID ALL WARRANTIES FOR THE EQUIPMENT AND FOR THE FINAL COOLANT PRODUCT.

SERVICE PROCEDURE

DIRECTIONS FOR PROCESSING USED ENGINE COOLANT WITH ROTUNDA COOLANT RECYCLER

1. Close the drain valve on the unit.

2. Open the fill valve.

3. Pour used engine coolant into the funnel on the side of the unit.

NOTE:

MAXIMUM CAPACITY 15 25 GALLONS (95 L).

4. Insert the outlet hoses of the recycler into clean, properly labeled containers. One (1) container is for the outlet process water and the other container is for distilled ethylene glycol.

5. Push the "ON" switch on the front to start the operation. The unit will process 1 gallon (3.8 L) per hour of operation and will automatically shut off when cycle is complete.

6. Add reinhibitor following the directions in this article.

7. Open the drain valve to drain the residue from the distillation vessel. Dispose of residue in accordance with all local. state and federal regulations.

ADDING REINHIBITOR CHEMICALS

1. Process the coolant according to the directions listed in this article

2. Thoroughly mix 4 fl oz (118 ml) of Reinhibitor # 1 to each gallon of distilled ethylene glycol.

3. Thoroughly mix 4 fl oz (118 ml) of Reinhibitor # 2 to each gallon of distilled ethylene glycol.

4. Mix well.

5. Check the pH level of the coolant. The pH level must be between 9 and 11.

6. Add enough water to the concentrated coolant to produce a 50/50 mixture of coolant and water.

NOTE:

THE CONCENTRATED COOLANT MUST BE MIXED WITH WATER TO MEET THE NECESSARY ENGINE FREEZE PROTECTION.

7. Check the coolant freeze point of the 50% coolant solution. Freeze point should be -34°F (-37°C).

Consult the Rotunda Coolant Recycler Manual for more detailed operating instructions. Call 1-800-ROTUNDA, 8 AM to 8 PM EST, for inquiries regarding the Rotunda Coolant Recycler and to order the Reinhibitor (187-R0001).

PART NUMBER PART NAME

Rotunda # 187-R0001 Rotunda Premium Coolant Reinhibitor

WARRANTY CLAIMS: Dealer can claim recycled engine coolant by Ford approved process via a warranty repair on an 1863 claim as follows:

Part Number: RECCOOL (not a valid part number, but it is recognized on an 1863 claim).

Quantity: Indicate the number of QUARTS of recycled coolant used.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 95-16-6 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 402000

Coolant: Technical Service Bulletins Cooling System - Proper Fluid Concentrations

Article No. 93-1-10

01/05/93

COOLING SYSTEM - PROPER FLUID CONCENTRATIONS

FORD: 1988 EXP 1988-93 CROWN VICTORIA, ESCORT, FESTIVA, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1989-93 PROBE

LINCOLN-MERCURY: 1988-89 TRACER 1988-92 MARK VII 1988-93 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1991-93 CAPRI, TRACER 1993 MARK VIII

MERKUR: 1988-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1988-90 BRONCO II 1988-93 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-93 EXPLORER 1993 VILLAGER

ISSUE: It is important to confirm the coolant fluid concentration during any repair of a vehicle's cooling system. A 50/50 concentration of Ford cooling system fluid, or an equivalent solution meeting Ford specifications, and water is best for all normal operating conditions.

ACTION: Check the coolant fluid concentration and use a 50/50 solution concentration for optimum results.

CAUTION: IF THE CONCENTRATION IS ALLOWED TO VARY TO ANY LARGE EXTENT EITHER WAY, COOLING SYSTEM CONCERNS CAN RESULT. IF THE COOLING SYSTEM FLUID LEVEL IS BELOW THE 50/50 CONCENTRATION, OVERHEATING CAN OCCUR. CONCENTRATIONS ABOVE 50/50 CAN CONTRIBUTE TO EXCESSIVE AND EVEN PREMATURE FAILURE OF THE WATER PUMP (MORE IS NOT BETTER).

1. Obtain a balanced mixture ratio of 50/50 cooling system fluid to water. Premix the two fluids in a separate container by adding equal volumes of coolant and water.

2. Be aware that overfilling of the coolant system is just as bad as not maintaining the proper coolant concentration level. If the coolant system is overfilled, and the system is allowed to expand dropping the excess coolant past the expansion tank, many of the vital coolant additives will be lost out the overflow pipe. This reduces the protection to the engine.

3. Pour in only enough coolant as specified for the system, and top off as necessary.

NOTE: TOP OFF ONLY WITH A PREMIXED 50/50 SOLUTION.

4. Check the coolant concentration, once the coolant system has been properly filled, to be sure that it is truly within the allowed tolerance range.

a. Use only a hand held refractometer such as a Rotunda Optical Antifreeze/Battery Tester # 021-00046 or equivalent to verify results. The acceptable coolant/water concentration range is: Minimum (45/55); Maximum (60/40).

b. If the coolant system is found to be low on coolant, top off only from a premixed solution.

c. If a weak concentration is found, add straight coolant sparingly until concentration readings are within acceptable levels.

d. If too strong a concentration is found, remove a small volume of coolant, and add water sparingly until coolant readings again fall within the specified levels.

NOTE: MAKE SURE THE COOLANT IS THOROUGHLY MIXED BEFORE TAKING READINGS.

A cooling system is only as effective as the condition of the system coolant.

^ USE ONLY FORD COOLING SYSTEM FLUID OR AN EQUIVALENT SOLUTION MEETING FORD SPECIFICATIONS.

^ FOR ADDITIONAL INFORMATION, SEE THE APPROPRIATE VEHICLE SERVICE MANUAL OR OWNER GUIDE.

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 402000, 499000

Coolant: Capacity Specifications

COOLANT CAPACITY

With A/C ..... 8.6 qts Without A/C ..... 7.8 qts

Coolant: Fluid Type Specifications

COOLING SYSTEM FLUID, PREMIUM

Ford Part No.

U.S.A (Except Oregon)
.....
E2FZ-19549-AA or -B Canada .....
..... CXC-8-B Oregon .....
.....
F5FZ-19549-CC

Ford Specification .....
..... ESE-M97B44-A

COOLING SYSTEM FLUSH

Ford Part No. .....
..... F1AZ-19A503-A Ford Specification .....
..... ESR-M14P7-A

Coolant Mixture with Water .....
..... 50%

Warning: Do not mix coolant types. Check the owners manual or refer to your local dealer for the correct coolant type.

Fluid - A/T: Technical Service Bulletins A/T - Mercon V ATF Usage

TSB 06-14-4

07/24/06

MERCON ATF IS BEING REPLACED BY MERCON V ATF AS A SERVICE FLUID.

FORD: 1980-1997 Crown Victoria 1981-1997 Mustang, Thunderbird 1981-2003 Escort 1986-1993 Festiva 1986-1997 Taurus 1989-1997 Probe 1994-1997 Aspire 1995-2000 Contour 1980-1996 Bronco 1981-2003 F-150 1981-2004 E-Series, F-Super Duty 1983-1996 Ranger 1986-1996 Aerostar 1991-1997 Explorer 1993-2004 F-53 Motorhome Chassis 1995-1998 Windstar 1997-2004 Expedition 2000-2005 Excursion 2001-2007 Escape 1987-2000 F-B-Series 2000-2007 F-650, F-750

LINCOLN: 1980-1997 Town Car 1981-1997 Continental 1993-1997 Mark VIII 1998-2004 Navigator 2002-2003 Blackwood

MERCURY: 1980-1997 Grand Marquis 1981-1997 Cougar 1986-1997 Sable 1987-1999 Tracer 1995-2000 Mystique 1999-2002 Cougar 1993-2002 Villager 1997 Mountaineer 2005-2007 Mariner

MERKUR: 1985-1989 XR4TI

This article supersedes TSB 01-15-7 to update the vehicle application chart.

ISSUE MERCON(R) Automatic Transmission Fluid is being replaced by MERCON(R) V as a service fluid.

ACTION Beginning immediately all automatic transmission / transaxle applications requiring MERCON(R) can now be serviced using MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON(R) / MERCON(R) V. After July 1, 2007, MERCON(R) Automatic Transmission Fluid will no longer be manufactured, therefore, availability of this fluid will only continue for however long it takes to deplete what remains in inventory.

SERVICE PROCEDURE

AUTOMATIC TRANSMISSION FLUID CHART

TRANSMISSIONS

TRANSAXLES

Specific service fluids (listed to the right) are called for depending on the type of transmisson and the year the transmission was built. It is important to use the correct fluid, each fluid exhibits different properties and should be used only in the transmisson for which they were designed. The vehicle owner or rebuilder should use the type of fluid printed in the owners guide or on the automatic transmission fluid level indicator. Refer to your scheduled maintenance guide to determine the correct service interval. Failure to use the recommended fluid may affect transmisson performance and durability.

CAUTION:
DO NOT USE SUPPLEMENTAL TRANSMISSION FLUID ADDITIVES, TREATMENTS OR CLEANING AGENTS. The use of these materials may affect transmission operation and result in damage to internal transmission components.

CAUTION:
MERCON® SP, Motorcraft® Premium Automatic Transmission Fluid and Motorcraft® M5 ATF's are unique fluids and MUST be used in applications recommending that particular fluid. Use of any other fluid may cause reduced functionality or transmission damage.

CAUTION:
The functional characteristics of fluids for the CVT transmissions are very different than those of other ATF's. Use of a fluid other than Motorcraft® Continuously Variable Chain Type Transmission Fluid or one labeled as meeting MERCON® C may cause severe transmission damage.

FAILURE TO USE RECOMMENDED FLUID WILL AFFECT TRANSMISSION PERFORMANCE. REFER TO OWNERS MANUAL AND/OR FLUID LEVEL INDICATOR FOR PROPER FLUID TYPE.

V **MERCON® V**
- Part number XT-5-QM (Quarts) and XT-5-DM (55 Gallon Drum) Ford Specification is MERCON® V.

NOTE: AUTOMATIC TRANSMISSIONS REQUIRING MERCON® V SHOULD ONLY BE SERVICED WITH MERCON® V, OR FLUID FROM A CONTAINER THAT IS SPECIFIED AS A DUAL USAGE FLUID: MERCON®/MERCON®V.

SP **MERCON® SP**
- Part number XT-6-QSP (Quarts) and XT-6-DSP (55 Gallon Drum) Ford Specification is MERCON® SP.

CVT **CONTINUOUSLY VARIABLE CHAIN TYPE**
- Part number XT-7-QCFT (Quarts)

P **PREMIUM AUTOMATIC TRANSMISSION FLUID**
- Part number XT-8-QAW.

M5 **MAZDA SPECIFIC FLUID**
- Part number XT-9-QMM5.

V M **MERCON® - Part number XT-2-QDX (Quarts) and XT-2-DDX (55 Gallon Drum) or,**
MERCON® V - Part number XT-5-QM (Quarts) and XT-5-DM (55 Gallon Drum)
NOTE: AUTOMATIC TRANSMISSIONS REQUIRING MERCON® CAN NOW BE SERVICED WITH MERCON®, MERCON® V, OR, DUAL USAGE FLUIDS LABELED MERCON®/MERCON®V.

TB-8592-D

Figure 1

Service automatic transmissions requiring MERCON(R) with MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON(R) / MERCON(R) V

For proper fluid application on current and past model vehicles equipped with automatic transmissions I transaxles refer to the fluid usage chart. (Figure 1)

CAUTION

AUTOMATIC TRANSMISSIONS / TRANSAXLES THAT REQUIRE MERCON® V SHOULD STILL ONLY USE MERCON(R) V OR DUAL USAGE FLUID LABELED MERCON(R) / MERCON(R) V.

PART NUMBER	PART NAME
XT-2-QDX	MERCON® (Quart)
XT-2-DDX	MERCON® (55 Gal. Drum)
XT-5-QM	MERCON® V (Quart)
XT-5-DM	MERCON® V (55 Gal. Drum)

NOTE: The information in Technical Service Bulletins is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. It informs these technicians of conditions that may occur on some vehicles, or provides information that could assist in proper vehicle service. The procedures should not be performed by "do-it-yourselfers". Do not assume that a condition described affects your car or truck. Contact a Ford, Lincoln, or Mercury dealership to determine whether the Bulletin applies to your vehicle.

CAUTION

MERCON(R) SP, MOTORCRAFT PREMIUM AUTOMATIC TRANSMISSION FLUID AND MOTORCRAFT M5 ATFS ARE UNIQUE FLUIDS AND MUST BE USED IN APPLICATIONS RECOMMENDING THAT PARTICULAR FLUID.

USE OF ANY OTHER FLUID MAY CAUSE REDUCED FUNCTIONALITY OR TRANSMISSION DAMAGE.

CAUTION

THE FUNCTIONAL CHARACTERISTICS OF FLUIDS FOR CVT TRANSMISSIONS ARE VERY DIFFERENT THAN THOSE OF OTHER AUTOMATIC TRANSMISSION FLUIDS (ATFS).

USE OF A FLUID OTHER THAN MOTORCRAFT CONTINUOUSLY VARIABLE CHAIN TYPE TRANSMISSION FLUID OR ONE LABELED AS MEETING MERCON(R) C WILL CAUSE FUNCTIONALITY CONCERNS AND INTERNAL TRANSMISSION DAMAGE.

CAUTION

DO NOT USE AUTOMATIC TRANSMISSION FLUID SUPPLEMENTS, ADDITIVES, TREATMENTS OR CLEANING AGENTS.

Parts Block

WARRANTY STATUS: Information Only

Disclaimer

Fluid - A/T: Specifications

TYPE MA

CAPACITY, Initial Refill*: C-6 (shallow pan) 5.0 qt (US)

With the engine at operating temperature, shift

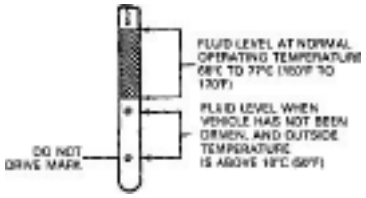
transmission through all gears. Check fluid level in PARK

and add fluid as needed

C-6 (deep pan) 6.0 qt (US)

E40D 8.5 qt (US)

Others 3.0 qt (US)



Fluid - A/T: Testing and Inspection Fluid Level Check

CHECKING OIL LEVEL

1. With transmission in Park, engine at curb idle RPM, foot brakes applied, and vehicle on a level surface, move transmission selector lever through

each range. Allow time in each range for transmission to engage, then return to Park and apply parking brake fully.

NOTE: If vehicle has been operated for an extended period at high speed, in city traffic during hot weather, or pulling a trailer, the vehicle should be turned off for about 30 minutes to allow the fluid to cool before checking.

NOTE: Vehicles equipped with 4X4 applications must have the 4X4 shift selector in any position other than neutral.

CAUTION: Your vehicle should not be driven if the fluid level is below the bottom hole on the dipstick and outside temperatures are above 10°C (50°F).

2. Clean all dirt from transmission dipstick cap. 3. Pull dipstick out of filler tube, wipe clean, and push dipstick back all the way into the filler tube, ensuring it is full seated. 4. Pull dipstick out of tube again and check fluid level as follows:

a. With transmission at operating temperature, 150° F-170° F, fluid level should be within the cross hatched area. b. With transmission at room temperature, 70° F-95° F, fluid should be between middle and top holes.

5. If it is necessary to add fluid, use only Dexron II or equivalent.

CAUTION: The use of fluid other than that specified could result in transmission malfunction and/or failure.

6. Install dipstick, ensuring it is fully seated in tube.

Adding Fluid

1. The fluid type is stamped on the dipstick. Before adding any fluid, be sure that the correct type will be used. 2. Add fluid in .25L (1/2 pint) increments through the filler tube to bring the level to the correct area on the dipstick. If an overfill occurs, excess

fluid should be removed.

Overfill can cause the fluid to foam and spill out through the transmission vent resulting in a transmission malfunction.

Undertill can result in transmission loss of engagement or slipping. This condition is most evident in cold weather or when the vehicle is parked or being driven on a hill.

If the transmission fluid level is checked when the fluid is at room temperature the dipstick could indicate that fluid should be added if the dipstick is misread. If fluid is added at this time, an overfill condition could result when the fluid reaches operating temperatures of 66° C-77°C (150°F-170°F) (dipstick hot to touch).

Fluid - A/T: Testing and Inspection Transaxle Fluid Cooler Flow Test

TRANSMISSION FLUID COOLER CHECK

1. Ensure linkage is properly adjusted and fluid level and control pressure are within specifications. 2. Remove transmission dipstick from filler tube and insert funnel in tube. 3. Raise and support vehicle. 4. Remove cooler return line from its fitting in the case, attach a hose to cooler return line and fasten free end of hose in funnel installed in filler tube. 5. Start engine and set idle at 1,000 RPM with transmission in Neutral. 6. Observe fluid flow at funnel. When flow is constant, it should be liberal. If there is not a liberal flow at 1,000 RPM in Neutral, low pump capacity,

main circuit system leakage, stuck converter charge relief valve, or cooler system restriction is indicated.

7. To separate transmission trouble from cooler system trouble, observe flow at transmission case converter-out fitting.

Fluid - A/T: Testing and Inspection Transmission Fluid Cooler Check

TRANSMISSION FLUID COOLER CHECK

1. Ensure linkage is properly adjusted and fluid level and control pressure are within specifications. 2. Remove transmission dipstick from filler tube and insert funnel in tube. 3. Raise and support vehicle. 4. Remove cooler return line from its fitting in the case, attach a hose to cooler return line and fasten free end of hose in funnel installed in filler tube. 5. Start engine and set idle at 1,000 RPM with transmission in Neutral. 6. Observe fluid flow at funnel. When flow is constant, it should be liberal. If there is not a liberal flow at 1,000 RPM in Neutral, low pump capacity,

main circuit system leakage, stuck converter charge relief valve, or cooler system restriction is indicated.

Fluid - A/T: Service and Repair

DRAIN AND REFILL

CAUTION: Normal maintenance and lubrication requirements do not necessitate periodic fluid changes. If a major failure has occurred in the transmission, it will have to be removed for service. At that time the converter, transmission cooler, and cooler lines must be flushed to remove any dirt. If vehicle accumulates 5,000 or more miles per month or is used in continuous stop and go service, change fluid every 30,000 miles as described.

NOTE: When filling a dry transmission and converter, approximate refill capacity is 9 quarts. Make final check using room temperature checking procedures. Procedures for partial drain and refill, due to in-vehicle service operation, are as follows:

1. Loosen pan attaching bolts and drain fluid. 2. Remove and thoroughly clean pan screen, discarding pan gasket. 3. Place new gasket on pan and install pan on transmission. 4. Add 3 quarts of fluid to transmission through filler tube. 5. Check fluid level following room temperature checking procedures.

Fluid - M/T: Technical Service Bulletins M/T - Mercon(R) V ATF Usage Information

TSB 06-26-1

01/08/07

MERCON ATF IS BEING REPLACED BY MERCON V AS A SERVICE FLUID FOR SOME MANUAL TRANSMISSIONS

FORD: 1981-2003 Escort 1984-1995 Thunderbird 1985-2007 Mustang 1985-1996 Bronco 1985-2007 Ranger 1986-1997 Aerostar 1991-2004 Explorer 1995-2007 F-150 1996-2007 F-Super Duty 2001-2003 Explorer Sport Trac, Explorer Sport

LINCOLN: 2001-2002 Lincoln LS

MERCURY: 1984-1995 Cougar 1987-1999 Tracer

ISSUE MERCON(R) Automatic Transmission Fluid is being replaced by MERCON(R) V as the service fluid for manual transmissions originally requiring MERCON(R).

ACTION Beginning immediately all manual transmission applications requiring MERCON(R) can now be serviced using MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON(R) / MERCON(R) V. After July 1, 2007, MERCON(R) Automatic Transmission Fluid will no longer be manufactured, therefore, availability of this fluid will continue until remaining inventory has been depleted.

SERVICE PROCEDURE

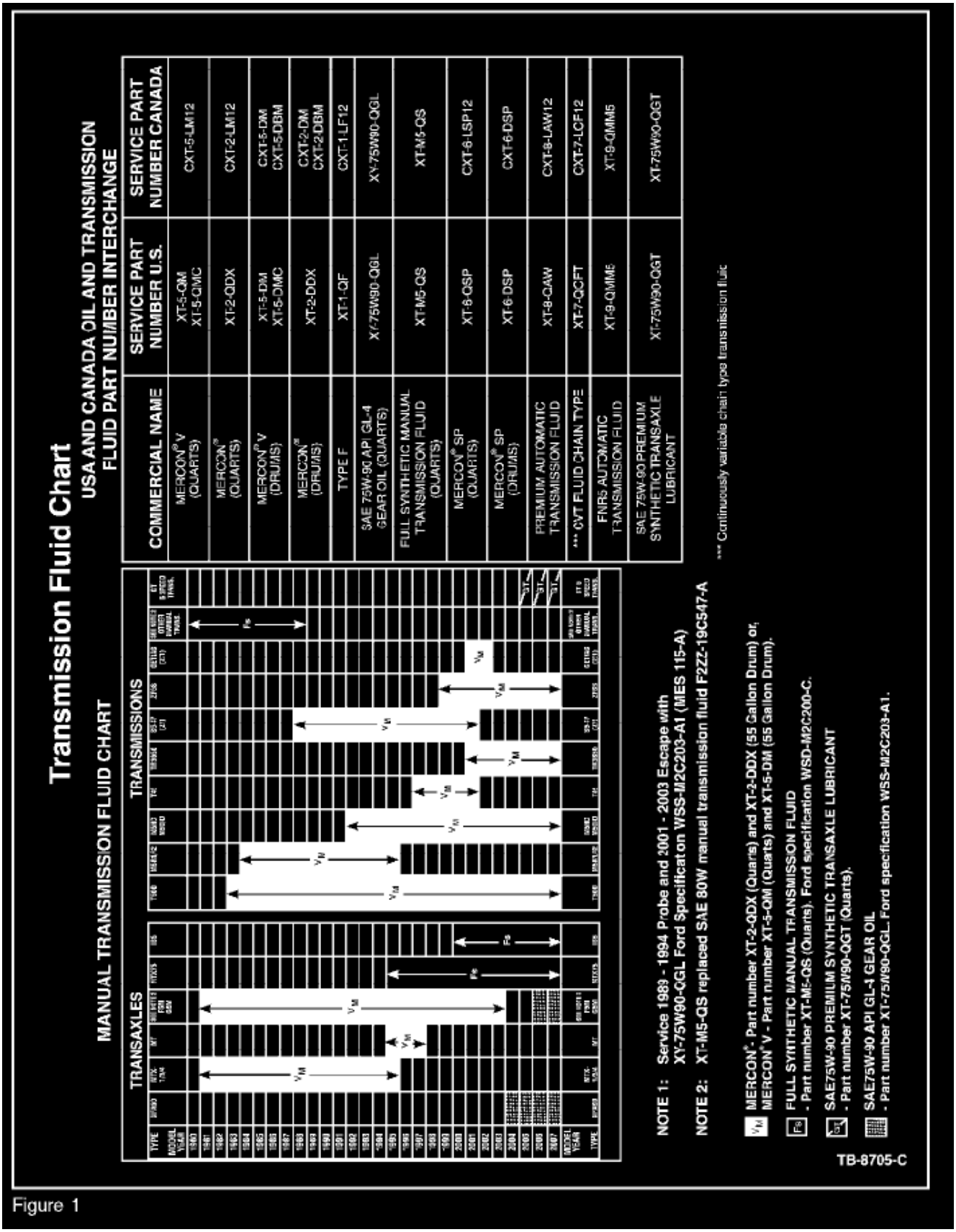

Transmission Fluid Chart
USA AND CANADA OIL AND TRANSMISSION FLUID PART NUMBER INTERCHANGE
MANUAL TRANSMISSION FLUID CHART
TRANSAXLES
TRANSMISSIONS
COMMERCIAL NAME
SERVICE PART NUMBER U.S.
SERVICE PART NUMBER CANADA
MERCON® V (QUARTS)
XT-5-QM XT-5-QMC
CXT-5-LM12
MERCON® (QUARTS)
XT-2-QDX
CXT-2-LM12
MERCON® V (DRUMS)
XT-5-DM XT-5-DMC
CXT-5-DM CXT-5-DBM
MERCON® (DRUMS)
XT-2-DDX
CXT-2-DM CXT-2-DBM
TYPE F
XT-1-QF
CXT-1-LF12
SAE 75W-90 API GL-4 GEAR OIL (QUARTS)
XY-75W90-QGL
XY-75W90-QGL
FULL SYNTHETIC MANUAL TRANSMISSION FLUID (QUARTS)
XT-M5-QS
XT-M5-QS
MERCON® SP (QUARTS)
XT-6-QSP
CXT-6-LSP12
MERCON® SP (DRUMS)
XT-6-DSP
CXT-6-DSP
PREMIUM AUTOMATIC TRANSMISSION FLUID
XT-8-QAW
CXT-8-LAW12
*** CVT FLUID CHAIN TYPE
XT-7-QCFT
CXT-7-LCF12
FNR5 AUTOMATIC TRANSMISSION FLUID
XT-9-QMM5
XT-9-QMM5
SAE 75W-90 PREMIUM SYNTHETIC TRANSAXLE LUBRICANT
XT-75W90-QGT
XT-75W90-QGT
*** Continuously variable chain type transmission fluid.
NOTE 1: Service 1983 - 1994 Probe and 2001 - 2003 Escape with XY-75W90-QGL Ford Specification WSS-M2C203-A1 (MES 115-A)
NOTE 2: XT-M5-QS replaced SAE 80W manual transmission fluid F2ZZ-19C547-A
MERCON®. Part number XT-2-QDX (Quarts) and XT-2-DDX (55 Gallon Drum) or, MERCON® V - Part number XT-5-QM (Quarts) and XT-5-DM (55 Gallon Drum).
FULL SYNTHETIC MANUAL TRANSMISSION FLUID
- Part number XT-M5-QS (Quarts). Ford specification WSD-M2C200-C.
SAE75W-90 PREMIUM SYNTHETIC TRANSAXLE LUBRICANT
- Part number XT-75W90-QGT (Quarts).
SAE75W-90 API GL-4 GEAR OIL
- Part number XT-75W90-QGL. Ford specification WSS-M2C203-A1.
TB-8705-C

Figure 1

Service manual transmissions requiring MERCON(R) with MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON/MERCON(R) V. For proper fluid application on current and past model manual transmissions refer to the fluid usage chart. (Figure 1)

WARNING

FULL SYNTHETIC MANUAL TRANSMISSION FLUID (XT-M5-QS), SAE 75W-90 API GL-4 GEAR OIL (XY-75W90-QGL) AND SAE 75W-90 PREMIUM SYNTHETIC TRANSAXLE LUBRICANT (XT-75W90-QGT) ARE UNIQUE FLUIDS AND MUST BE USED IN APPLICATIONS RECOMMENDING THAT PARTICULAR FLUID.

USE OF ANY OTHER FLUID MAY CAUSE REDUCED FUNCTIONALITY OR DAMAGE.

PART NUMBER	PART NAME
XT-2-QDX	MERCON® (Quart)
XT-5-QM	MERCON® V (Quart)
XT-2-DDX	MERCON® (55 Gallon Drum)
XT-5-DM	MERCON® V (55 Gallon Drum)

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Parts Block

WARRANTY STATUS: Information Only

Disclaimer

Fluid - M/T: Capacity Specifications

Type 4-speed 80W EP

5-speed Mitsubishi* 80W EP

Used in some Ranger & Bronco II and identified by

drain plug located in middle of pan

5-speed, All others Mercon(R) Automatic Transmission Fluid

CAPACITY, Refill: 5-speed (Mazda) R1, R2 Aerostar, Ranger, Bronco II 5.6 pt (US) Explorer

Bronco, Econoline, F-series 7.6 pt (US)

5-speed S5-42 ZF Bronco, Econoline, F-series 6.8 pt (US)

5-speed (Mitsubishi) Ranger, Bronco II 4.8 pt (US)

4-speed ex. OD 7.0 pt (US)

W/OD 4.5 pt (US)

Transmission	U.S. Pints	Imperial Pints	Litres
Five-Speed Manual Overdrive Transmission (Ford Manual Transmission Motorcraft MERCON® Multipurpose Automatic Transmission Fluid XT-2-QDX or DDX E4XZ-19582-B (ESP-M2C166-H) or Equivalent)	5.6	4.5	2.65

CC3401-1C

Fluid - M/T: Fluid Type Specifications

Key to Lubrication Abbreviations

BL Self-adjusting Brake Lubricant

EC Ethylene Glycol Coolant

Mix 50/50 with water or at least to -20°F (-29°C) protection

EP Extreme Pressure Gear Lubricant

Ford Part No. D8DZ-19C547-A

FA Automatic Transmission Fluid, Type F

HBH Hydraulic Brake Fluid, Extra

Heavy-Duty

HP Hypoid Gear Oil

Ford Part No. E0AZ-19580-A

HP* Hypoid Gear Oil for Limited-Slip

or Traction-Lok Differential

LM Lithium Grease, with Polyethylene

LS Steering Gear Lubricant

MA MERCON(R) Automatic Transmission

Fluid

MH Manifold Heat Valve Solvent

SG Motor Oil, API Service SG

Mazda M5OD 5-SPD O/D M/T

The Mazda M5OD 5-SPD O/D M/T uses ATF as shown. The Mitsubishi 5-SPD M/T uses gear oil, for more information on the Mitsubishi 5-SPD M/T, refer to 1991 Ranger 4x4 with 2.9L engine.

Fluid - Differential: Capacity Specifications

TYPE: Aerostar, front Mercon(R) Automatic Transmission Fluid

1992-93 F150, F250, front GLS - Gear Lubricant, Special

1990-93 Bronco II, Explorer, GLS - Gear Lubricant, Special

Ranger,front*

8.8" & 10 1/4" has removable cover, 9.0"

does not

All others: Standard 90 HP

Limited-Slip 90 HP*

CAPACITY, Refill: Front: Dana 28 Ranger, Bronco II 1.0 pt (US)

LIMITED-SLIP OR TRACTION-LOK

IDENTIFICATION: Label on door lock pillar

has letter and number

Dana 28-2 Aerostar 2.2 pt (US)

Dana 35 Ranger, Bronco II 3.5 pt (US)

Dana 44 3.6 pt (US)

Dana 50 3.8 pt (US)

Dana 60 5.8 pt (US)

Rear: Aerostar w/Ford 7.5" ring gear 3.5 pt (US)

Fill no higher than 3/8" below fill plug

Aerostar w/Ford 8.8" ring gear 5.3 pt (US)

Aerostar w/Dana 2.5 pt (US)

Bronco II 5.5 pt (US)

Ranger w/7.5" ring gear 5.0 pt (US)

Ranger w/8.8" ring gear 5.5 pt (US)

Other Ford w/8.8' ring gear* 5.5 pt (US)

8.8" & 10 1/4" has removable cover, 9.0"

does not

w/10 1/4" ring gear* 6.5 pt (US)

8.8" & 10 1/4" has removable cover, 9.0"

does not

Dana 60 & 61 ex. 60-IU 6.3 pt (US)

Dana 60-IU 1990 6.3 pt (US)

Dana 70 ex. HD 6.5 pt (US)

70 HD 7.4 pt (US)

Dana 80 8.3 pt (US)

Fluid - Differential: Fluid Type Specifications

BL Self-adjusting Brake Lubricant

EC Ethylene Glycol Coolant

Mix 50/50 with water or at least to -20°F (-29°C) protection

EP Extreme Pressure Gear Lubricant

Ford Part No. D8DZ-19C547-A

FA Automatic Transmission Fluid, Type F

HBH Hydraulic Brake Fluid, Extra

Heavy-Duty

HP Hypoid Gear Oil

Ford Part No. E0AZ-19580-A

HP* Hypoid Gear Oil for Limited-Slip

or Traction-Lok Differential

LM Lithium Grease, with Polyethylene

LS Steering Gear Lubricant

MA MERCON Automatic Transmission

Fluid

MH Manifold Heat Valve Solvent

SG Motor Oil, API Service SG

Fluid - Transfer Case: Capacity Specifications

TYPE MERCON(R) Automatic Transmission Fluid

CAPACITY, Refill: Warner 1345 6.5 pt (US)

Warner 1350 Ranger, Bronco II 3.0 pt (US)

Warner 1354 Ranger, Bronco II, Explorer 2.5 pt (US)

Warner 1356 4.0 pt (US)

Spicer TC28 Aerostar 4.5 pt (US)

Fluid - Transfer Case: Fluid Type Specifications

BL Self-adjusting Brake Lubricant

EC Ethylene Glycol Coolant

Mix 50/50 with water to at least -20°F (-29°C) protection

EP Extreme Pressure Gear Lubricant

Ford Part No. D8DZ-19C547-A

FA Automatic Transmission Fluid, Type F

HBH Hydraulic Brake Fluid, Extra

Heavy-Duty

HP* Hypoid Gear Oil

Ford Part No. E0AZ-19580-A

HP* Hypoid Gear Oil for Limited-Slip

or Traction-Lok Differential

LM Lithium Grease, with Polyethylene

LS Steering Gear Lubricant

MA MERCON Automatic Transmission

Fluid

MH Manifold Heat Valve Solvent

SG Motor Oil, API Service SG

Engine Oil: Technical Service Bulletins Motor Oil - Viscosity Grade Recommendation

Article No. 99-8-16

05/03/99

MOTOR OIL - SAE VISCOSITY GRADE RECOMMENDATION - SERVICE TIP

FORD: 1989-1993 FESTIVA 1989-1994 TEMPO 1989-1997 PROBE, THUNDERBIRD 1989-1999 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS 1994-1997 ASPIRE 1995-1999 CONTOUR

LINCOLN-MERCURY: 1989-1992 MARK VII 1989-1994 TOPAZ 1989-1997 COUGAR 1989-1999 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1991-1994 CAPRI 1994-1998 MARK VIII 1995-1999 MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1989-1990 BRONCO II 1989-1996 BRONCO 1989-1997 AEROSTAR, F SUPER DUTY 1989-1999 ECONOLINE, F-150, F-250 LD, RANGER 1991-1999 EXPLORER 1993-1999 VILLAGER 1995-1999 WINDSTAR 1997-1999 EXPEDITION, MOUNTAINEER 1998-1999 NAVIGATOR 1999 SUPER DUTY F SERIES

ISSUE Ford Motor Company now recommends SAE 5W-30 viscosity grade for servicing any Ford gasoline-powered vehicle regardless of model year.

ACTION When servicing any Ford gasoline-powered vehicle, use SAE 5W-30 viscosity grade motor oil. Refer to the following text for further details.

Both SAE 10W-30 and SAE 5W-30 viscosity grade motor oils have been recommended in the past depending on vehicle model and model year.

Tests have proven SAE 5W-30 viscosity grade motor oil provides the optimum protection and benefits for Ford gasoline engines. At both high and low ambient temperature conditions, SAE 5W-30 provides the best overall protection. It allows faster starts under cold ambient temperatures.

SAE 5W-30 also provides approximately 1/2% increase in fuel economy over SAE 10W-30.

SAE 5W-30 viscosity grade motor oils certified for gasoline engines by the American Petroleum Institute (API) should be used for all service procedures requiring replacement of the motor oil.

PART NUMBER PART NAME

XO-5W30-QSP 5W-30 Motorcraft Super Premium Motor Oil

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 401000, 490000, 499000

1991 ENGINE OIL FILL CAPACITY CHART			
VEHICLE	ENGINE	QUARTS	LITERS
Escort	1.9L	4.0	3.8
Mustang	2.3L	5.0	4.7
Tempo/Topaz	2.3L	5.0	4.7
Taurus/Sable	2.5L	5.0	4.7
Taurus/Sable	3.0L	4.5	4.25
Taurus/Sable	3.0L (SHO)	5.0	4.7
Taurus/Sable	3.8L	4.5	4.25
T'Bird/Cougar	3.8L	5.0	4.7
Thunderbird	3.8L (SC)	5.0	4.7
Continental	3.8L	4.5	4.25
Town Car	4.6L	5.0	4.7
Mustang	5.0L	5.0	4.7
Mark VII	5.0L	5.0	4.7
T'Bird/Cougar	5.0L	5.0	4.7
Ranger	2.3L	5.0	4.7
Ranger	2.9L	5.0	4.7
Ranger	3.0L	4.5	4.25
Ranger	4.0L	5.0	4.7
Explorer	4.0L	5.0	4.7
Aerostar	3.0L	4.5	4.25
Aerostar	4.0L	5.0	4.7
E, F, B Series	4.9L	6.0	5.6
E, F, B Series	5.0L	6.0	5.6
E, F, B Series	5.8L	6.0	5.6
F, B Series	7.0L	8.0	7.6
E, F Series	7.3L	10.0	9.5
E, F, B Series	7.5L	6.0	5.6

Engine Oil: Technical Service Bulletins Engine - Oil Fill Capacities

Article No. 90-22-12 ENGINE OIL FILL CAPACITIES - 1.9L, 2.3L, 2.9L, 3.0L, 3.8L, 4.0L, 4.6L, 4.9L, 5.0L, 5.8L, 7.0L, 7.3L DIESEL, 7.5L - WITH OIL FILTER CHANGE FORD:

1991 ESCORT, MUSTANG, PROBE, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991 CONTINENTAL, COUGAR, MARK VII, SABLE, TOPAZ, TOWN CAR,

TRACER

LIGHT TRUCK: 1991 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F SUPER DUTY, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 F & B SERIES

ISSUE: Engine oil fill capacities (with oil filter change) are available for 1991 Model Year Cars and Trucks.

ACTION: If service is required, refer to the following 1991 Engine Oil Fill Capacity Chart for oil fill capacity with oil filter change.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

401000, 499000

Engine Oil: Capacity Specifications

Engine oil with filter (approximate) ..... 5.0 Qts.(4.7L)

with oil cooler, add ..... 0.5 Qts.(0.47L)

Engine Oil: Fluid Type Specifications

Motorcraft Motor Oil 5W30 Super Premium
..... ESE-M2C153-E and API SG Motorcraft Motor Oil 10W30 Super Premium
..... ESE-M2C153-E and API SG

Technical Service Bulletin # 99-19-6 Date: 990920

A/C - Identification of Non Approved Refrigerants

Article No. 99-19-6

09/20/99

^ AIR CONDITIONING - IDENTIFICATION OF NON-FORD APPROVED REFRIGERANTS

^ AIR CONDITIONING - PURGING AIR FROM SYSTEM

FORD: 1985-1986 LTD 1985-1988 EXP 1985-1994 TEMPO 1985-1997 THUNDERBIRD 1985-2000 CROWN VICTORIA, ESCORT, MUSTANG 1986-2000 TAURUS 1988-1993 FESTIVA 1989-1997 PROBE 1994-1997 ASPIRE 1995-2000 CONTOUR 2000 FOCUS 1985-1990 BRONCO II 1985-1996 BRONCO 1985-1997 F-250 HD, F-350 1985-2000 ECONOLINE, F-150, F-250 LD, RANGER 1986-1997 AEROSTAR 1988-1997 F SUPER DUTY 1991-2000 EXPLORER 1995-2000 WINDSTAR 1997-2000 EXPEDITION 1999-2000 SUPER DUTY F SERIES 1985-1991 CL-CLT-9000 SERIES 1985-1999 L SERIES 1985-2000 F & B SERIES 1986-1998 CARGO SERIES 1997-1998 AEROMAX, LOUISVILLE

LINCOLN: 1985-1992 MARK VII 1985-2000 CONTINENTAL, TOWN CAR 1993-1998 MARK VIII 2000 LS 1998-2000 NAVIGATOR

MERCURY: 1985-1986 MARQUIS 1985-1987 LYNX 1985-1994 TOPAZ 1985-1997 COUGAR 1985-2000 GRAND MARQUIS 1986-2000 SABLE 1987-1989 TRACER 1991-1994 CAPRI 1991-2000 TRACER 1995-2000 MYSTIQUE 1999-2000 COUGAR 1993-2000 VILLAGER 1997-2000 MOUNTAINEER

MERKUR: 1985-1989 XR4TI 1988-1989 SCORPIO

This TSB article is being republished in its entirety to add model year vehicles

ISSUE A number of non-approved/alternate refrigerants have entered the marketplace and are being advertised as "drop-in replacements" for R-12 and R-134a. The use of non-approved refrigerants such as R-22, hydrocarbons, and other refrigerant blends could cause safety, durability, and performance concerns if they are installed in Ford A/C systems. Identification of the type of refrigerant contained in vehicle A/C systems, before servicing, is necessary to prevent dealer service equipment and refrigerant supplies from being contaminated with non-approved refrigerants.

ACTION Refrigerant identification must be performed prior to recovering the refrigerant into a recovery machine to prevent cross-contamination of the recovery machine and other A/C systems being serviced with that recovery machine. Refer to the following text.

OTHER APPLICABLE ARTICLES: 94-14-3, 95-18-4

SUPERSEDES: 98-12-8

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1993-2000 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

991906A Test A/C System For 0.3 Hr.

Contaminated Refrigerant

DEALER CODING

CONDITION

BASIC PART NO. CODE

R-12 49

OASIS CODES: 208000, 208999

A/C Refrigerant Analyzer Function

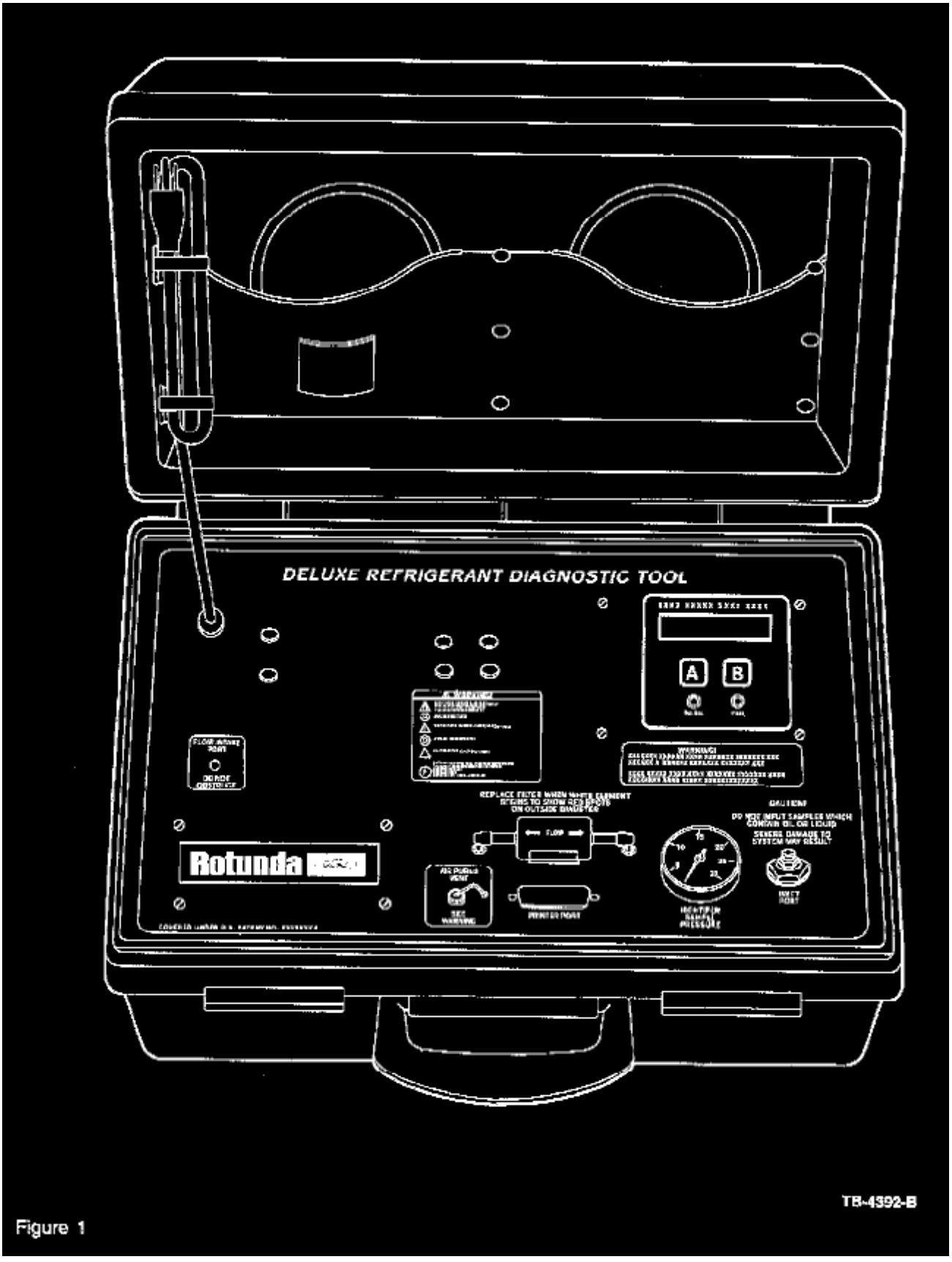

Figure 1

Ford Motor Company has approved the Rotunda Deluxe A/C Refrigerant Analyzer (198-00003) for use on Ford and Lincoln-Mercury vehicles (Figure 1). The analyzer provides the technician with a quick and easy way to identify the type and percentage of refrigerant (R-134a, R-12, R-22, or flammable hydrocarbon). The analyzer can also provide the percentage of air in the A/C system and automatically purge air from the system.

The A/C Refrigerant Analyzer is designed to identify vapor gas samples taken directly from automotive air conditioning systems or refrigerant storage cylinders. Refrigerant vapor passes through the multiple sensor Non-Dispersive Infra-Red (NDIR) sensing unit. The microprocessor calculates each refrigerant type and purity percentage which is displayed on the analyzer's Liquid Crystal Display (LCD).

The analyzer identifies the purity percentage of R-134a, R-12, R-22, hydrocarbon; and air in the sample. If the purity percentage of the R-134a or R-12 is 98% or greater by weight, a green "PASS" Light Emitting Diode (LED) will light. If refrigerants R-134a or R-12 do not meet 98% purity levels, the red "FAIL" LED will light. Levels of R-22 and flammable hydrocarbons above 2% will light the red "FAIL" light. If a hydrocarbon is detected above 5%, both the "FAIL" light and "HYDROCARBON" light will illuminate and a horn will sound alerting the user of potential hazards.

The percent of air contained in the sample will be displayed if the R-134a or R-12 content is 98% or above. The analyzer eliminates the effect of air

when determining the refrigerant sample content because air is not considered a contaminant although air can affect A/C system performance. Air will automatically be purged until a pure refrigerant with a less than 2% by weight air measurement is reached.

Recovery of Contaminated Refrigerant

If contaminated refrigerant is detected, DO NOT recover the refrigerant into your R-134a or R-12 recovery/recycling equipment. Take the following actions:

1. Repeat the test to verify contaminated refrigerant is present.

2. Advise the customer of the contaminated A/C system and any additional cost to repair the system. The customer may wish to return to the service facility which performed the last A/C service.

3. Recover the contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant. This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles. As an alternative, contact an A/C service facility in your area which has the proper equipment for refrigerant recovery.

Repairing A Contaminated A/C System

Once the contaminated refrigerant is removed from the system it will be necessary to repair the system. Ford recommends that you do the following to be sure a quality repair is made:

1. Determine the cause of the failure.

2. Determine which parts will need to be replaced.

3. Flush the heat exchangers to remove any oil that may be degraded due to the contaminated refrigerant.

4. Install a new suction/accumulator.

5. Properly oil match the system to verify that the correct amount of clean refrigerant oil is present in the system.

6. Evacuate the system for 45 minutes.

7. Recharge the system, verify proper operation, and leak test.

Disposal of Contaminated Refrigerant

Disposal of contaminated refrigerant is a new process to the automotive industry Listed below are companies that will assist with disposal of contaminated refrigerant. Ford Motor Company has not evaluated the processes of the listed refrigerant disposal companies and is not endorsing or promoting their companies Business transactions are between the dealership and disposal companies. Disposal costs will vary between $3.00 and $5.00 per pound, plus the cost of round trip cylinder shipping.

^ Omega Refrigerant Reclamation

^ 5263 North Fourth St.

^ Irwindale, CA 91706

^ (310) 698-0991 FAX: (310) 696-7908

^ Full Cycle Global

^ 2966 Wireton

^ Blue Island, IL 60406

^ (708) 388-8551 FAX: (708) 399-6550

^ U.S. Refrigerant Reclaim, Inc.

^ 12420 North Green River Road

^ Evansville, IN 47711

^ (800) 207-5931 FAX: (812) 867-1463

^ Full Cycle Global

^ 343 South Airline Highway

^ Gonzales, LA 70737

^ (504) 644-5333 FAX: (504) 644-1609

^ CFC Reclamation

^ 1321 Swift North

^ Kansas City, MO 64116

^ (816) 471-2511

^ Full Cycle Global

^ 550 James St.

^ Lakewood, NJ 08701

^ (908) 370-3400 FAX: (908) 370-3088

^ National Refrigerants, Inc.

^ 11401 Roosevelt Blvd.

^ Philadelphia, PA 19154

^ (215) 698-6620 FAX: (215) 602-8205

^ Gartech Refrigerant Reclamation

^ 2002 Platinum

^ Garland, TX 75042

^ (214) 272-4070 FAX: (214) 272-6548

^ Refrigerant Reclaim Services

^ 121 S. Norwood Dr.

^ Hurst, TX 76053-7807

^ (817) 282-0022 FAX: (800) 831-6182

^ Full Cycle Global

^ 2055 Silber, Suite 109

^ Houston, TX 77055

^ (713) 681-7370 FAX: (713) 681-9947

^ Refrigerant Reclaim, Inc.

^ 122 Old Stage Coach Road

^ Dumfries, VA 22026

^ (800) 238-5902 FAX: (703) 441-0393

Technical Service Bulletin # 99-19-6 Date: 990920

A/C - Identification of Non Approved Refrigerants

Article No. 99-19-6

09/20/99

^ AIR CONDITIONING - IDENTIFICATION OF NON-FORD APPROVED REFRIGERANTS

^ AIR CONDITIONING - PURGING AIR FROM SYSTEM

FORD: 1985-1986 LTD 1985-1988 EXP 1985-1994 TEMPO 1985-1997 THUNDERBIRD 1985-2000 CROWN VICTORIA, ESCORT, MUSTANG 1986-2000 TAURUS 1988-1993 FESTIVA 1989-1997 PROBE 1994-1997 ASPIRE 1995-2000 CONTOUR 2000 FOCUS 1985-1990 BRONCO II 1985-1996 BRONCO 1985-1997 F-250 HD, F-350 1985-2000 ECONOLINE, F-150, F-250 LD, RANGER 1986-1997 AEROSTAR 1988-1997 F SUPER DUTY 1991-2000 EXPLORER 1995-2000 WINDSTAR 1997-2000 EXPEDITION 1999-2000 SUPER DUTY F SERIES 1985-1991 CL-CLT-9000 SERIES 1985-1999 L SERIES 1985-2000 F & B SERIES 1986-1998 CARGO SERIES 1997-1998 AEROMAX, LOUISVILLE

LINCOLN: 1985-1992 MARK VII 1985-2000 CONTINENTAL, TOWN CAR 1993-1998 MARK VIII 2000 LS 1998-2000 NAVIGATOR

MERCURY: 1985-1986 MARQUIS 1985-1987 LYNX 1985-1994 TOPAZ 1985-1997 COUGAR 1985-2000 GRAND MARQUIS 1986-2000 SABLE 1987-1989 TRACER 1991-1994 CAPRI 1991-2000 TRACER 1995-2000 MYSTIQUE 1999-2000 COUGAR 1993-2000 VILLAGER 1997-2000 MOUNTAINEER

MERKUR: 1985-1989 XR4TI 1988-1989 SCORPIO

This TSB article is being republished in its entirety to add model year vehicles

ISSUE A number of non-approved/alternate refrigerants have entered the marketplace and are being advertised as "drop-in replacements" for R-12 and R-134a. The use of non-approved refrigerants such as R-22, hydrocarbons, and other refrigerant blends could cause safety, durability, and performance concerns if they are installed in Ford A/C systems. Identification of the type of refrigerant contained in vehicle A/C systems, before servicing, is necessary to prevent dealer service equipment and refrigerant supplies from being contaminated with non-approved refrigerants.

ACTION Refrigerant identification must be performed prior to recovering the refrigerant into a recovery machine to prevent cross-contamination of the recovery machine and other A/C systems being serviced with that recovery machine. Refer to the following text.

OTHER APPLICABLE ARTICLES: 94-14-3, 95-18-4

SUPERSEDES: 98-12-8

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1993-2000 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

991906A Test A/C System For 0.3 Hr.

Contaminated Refrigerant

DEALER CODING

CONDITION

BASIC PART NO. CODE

R-12 49

OASIS CODES: 208000, 208999

A/C Refrigerant Analyzer Function

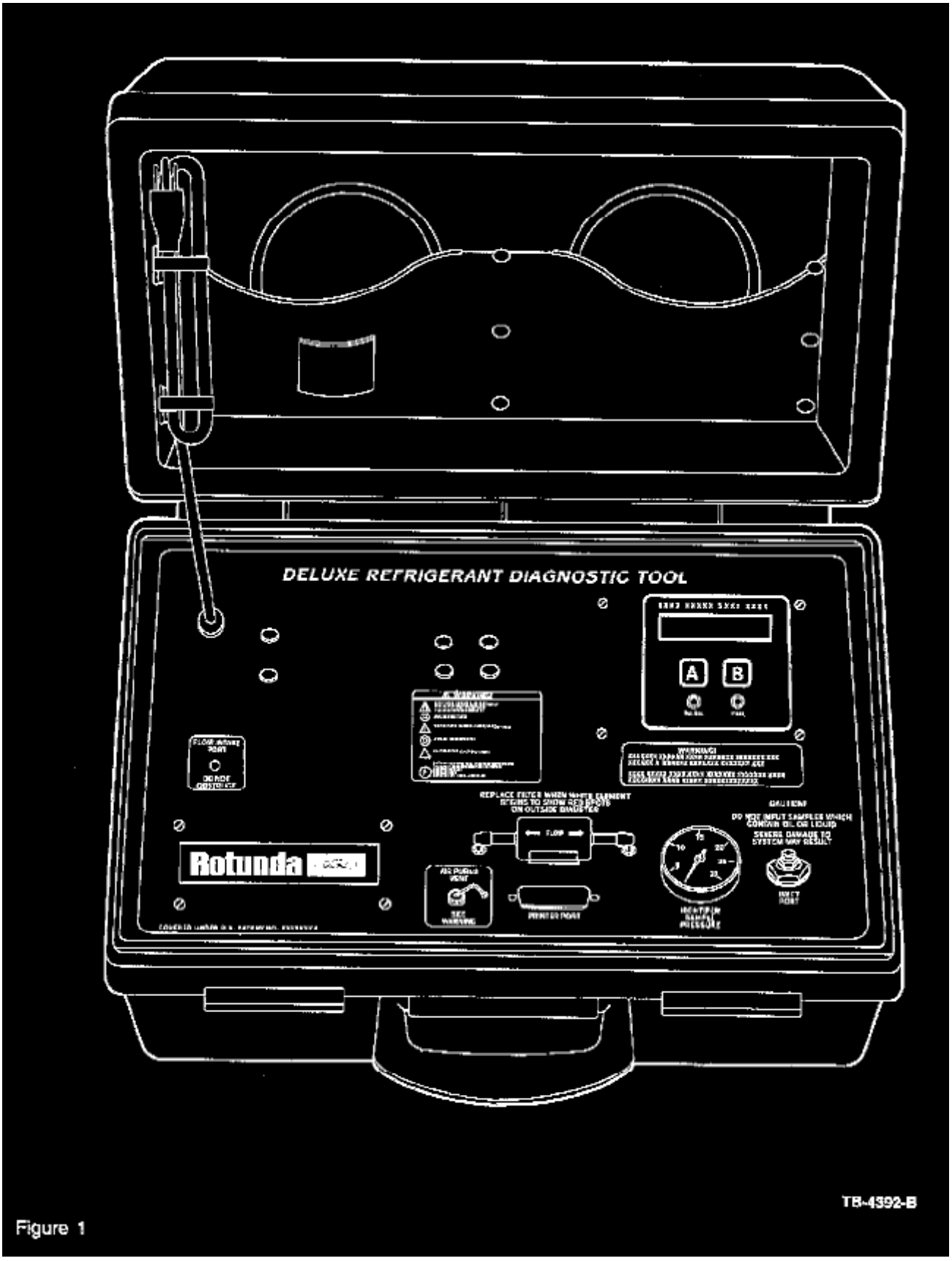

Figure 1

Ford Motor Company has approved the Rotunda Deluxe A/C Refrigerant Analyzer (198-00003) for use on Ford and Lincoln-Mercury vehicles (Figure 1). The analyzer provides the technician with a

quick and easy way to identify the type and percentage of refrigerant (R-134a, R-12, R-22, or flammable hydrocarbon). The analyzer can also provide the percentage of air in the A/C system and automatically purge air from the system.

The A/C Refrigerant Analyzer is designed to identify vapor gas samples taken directly from automotive air conditioning systems or refrigerant storage cylinders. Refrigerant vapor passes through the multiple sensor Non-Dispersive Infra-Red (NDIR) sensing unit. The microprocessor calculates each refrigerant type and purity percentage which is displayed on the analyzer's Liquid Crystal Display (LCD).

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The percent of air contained in the sample will be displayed if the R-134a or R-12 content is 98% or above. The analyzer eliminates the effect of air

when determining the refrigerant sample content because air is not considered a contaminant although air can affect A/C system performance. Air will automatically be purged until a pure

refrigerant with a less than 2% by weight air measurement is reached.

Recovery of Contaminated Refrigerant

If contaminated refrigerant is detected, DO NOT recover the refrigerant into your R-134a or R-12 recovery/recycling equipment. Take the following actions:

1. Repeat the test to verify contaminated refrigerant is present.

2. Advise the customer of the contaminated A/C system and any additional cost to repair the system. The customer may wish to return to the service facility which performed the last A/C service.

3. Recover the contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant. This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles. As an alternative, contact an A/C service facility in your area which has the proper equipment for refrigerant recovery.

Repairing A Contaminated A/C System

Once the contaminated refrigerant is removed from the system it will be necessary to repair the system. Ford recommends that you do the following to be sure a quality repair is made:

1. Determine the cause of the failure.

2. Determine which parts will need to be replaced.

3. Flush the heat exchangers to remove any oil that may be degraded due to the contaminated refrigerant.

4. Install a new suction/accumulator.

5. Properly oil match the system to verify that the correct amount of clean refrigerant oil is present in the system.

6. Evacuate the system for 45 minutes.

7. Recharge the system, verify proper operation, and leak test.

Disposal of Contaminated Refrigerant

Disposal of contaminated refrigerant is a new process to the automotive industry Listed below are companies that will assist with disposal of contaminated refrigerant. Ford Motor Company has not evaluated the processes of the listed refrigerant disposal companies and is not endorsing or promoting their companies Business transactions are between the dealership and disposal companies. Disposal costs will vary between $3.00 and $5.00 per pound, plus the cost of round trip cylinder shipping.

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^ Full Cycle Global

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^ 343 South Airline Highway

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^ Kansas City, MO 64116

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^ (713) 681-7370 FAX: (713) 681-9947

^ Refrigerant Reclaim, Inc.

^ 122 Old Stage Coach Road

^ Dumfries, VA 22026

^ (800) 238-5902 FAX: (703) 441-0393

A/C - Filtering Refrigerant After Compressor Replacement

Article No. 98-12-5

06/22/98

AIR CONDITIONING - FILTERING REFRIGERANT

AFTER A/C COMPRESSOR REPLACEMENT - SERVICE TIPS

FORD: 1980-98 CROWN VICTORIA 1981-98 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-97 THUNDERBIRD 1982-98 MUSTANG 1983-86 LTD 1984-94 TEMPO 1986-98 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-98 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1980-98 GRAND MARQUIS, TOWN CAR 1982-83 ZEPHYR 1982-86 CAPRI 1982-87 LN7 1982-97 COUGAR 1982-98 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-98 SABLE 1991-94 CAPRI 1991-98 TRACER 1993-98 MARK VIII 1995-98-MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1980-96 BRONCO 1980-97 F SUPER DUTY 1980-98 ECONOLINE, F-150, F-150, F-350 1983-98 RANGER 1984-90 BRONCO II 1986-97 AEROSTAR 1988-97 F-47 1991-98 EXPLORER 1993-98 VILLAGER 1995-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to revise the Service Procedure and to update the model years.

ISSUE Vehicles that have and inoperative A/C compressor, due to internal causes, MUST have the refrigerant system cleaned to remove any debris or contaminants that may be present to prevent damage to the replacement compressor.

ACTION

Install a Service Filter Kit in the refrigerant system prior to installing the replacement compressor. Refer to the following Service Procedure for details.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 96-15-5

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-99 Models And 1991 Lincolns, Basic Warranty Coverage For All Other Models And Major Component Warranty Coverage For All Other Lincoins

OPERATION DESCRIPTION TIME

981205A Kit Installation 1.2 Hrs.

981205B Extra Time For Refrigerant 0.4 Hr.

(R-12) Recovery

DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208999

Service Procedure

THIS PROCEDURE IS OPTIONAL IF THE SYSTEM IS FLUSHED USING THE ROTUNDA A/C FLUSHER.

CAUTION

THIS FILTERING PROCEDURE MAY BE USED FOR EITHER R-12 OR R-134a REFRIGERANT SYSTEMS. BECAUSE THE TWO (2) SYSTEMS USE DIFFERENT REFRIGERANT OILS AND BECAUSE THE COMPRESSOR COULD BE DAMAGED IF THE WRONG OIL IS USED, SYSTEM IDENTIFICATION IS VERY IMPORTANT. BE SURE SYSTEM IS CORRECTLY IDENTIFIED BEFORE STARTING THE FILTERING PROCEDURE.

Each Service Filter Kit includes the following items:

^ One (1) Pancake Filter (to be installed in the liquid line between the condenser and the orifice tube)

^ One (1) Instruction Sheet

NOTE

ON 1993-94 RANGER/EXPLORER VEHICLES, TECHNICIANS MAY EXPERIENCE DIFFICULTY WHEN CONNECTING THE PANCAKE FILTER HOSE FITTINGS TO THE EVAPORATOR INLET WITH THE ORIFICE TUBE INSTALLED. REMOVE THE OFFICE TUBE AND RUN THE SYSTEM FOR 1 HOUR AS DESCRIBED IN THE FILTERING PROCEDURE. REINSTALL THE ORIFICE TUBE AFTER FILTERING IS COMPLETE.

CAUTION

FOLLOW ALL REFRIGERANT SYSTEM SAFETY AND SERVICE PRECAUTIONS OUTLINED IN THE APPROPRIATE SERVICE OR WORKSHOP MANUAL.

1. Before removing any refrigerant system components, recover the refrigerant from the system following the recycling methods outlined In the appropriate Service/Workshop Manual.

2. Remove the suction accumulator/drier assembly and drain the oil into a calibrated container.

3. Install a new suction accumulator/drier and add new refrigerant oil to replace the old oil. The quantity of the new oil to be added is the amount to match that drained from the old accumulator plus 60 mL (2 oz). Refer to the Dealer Master Parts Catalog for the correct suction accumulator/drier part number.

CAUTION

REMEMBER TO USE MOTORCRAFT YN-9-A REFRIGERANT COMPRESSOR OIL WITH R-12 SYSTEMS AND MOTORCRAFT YN-12-C REFRIGERANT COMPRESSOR OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

4. Install a new orifice tube. Refer to the Dealer Master Parts Catalog for the correct orifice tube part number. If the orifice tube in the vehicle is located in the liquid line between the condenser and the evaporator, replace the liquid line assembly.

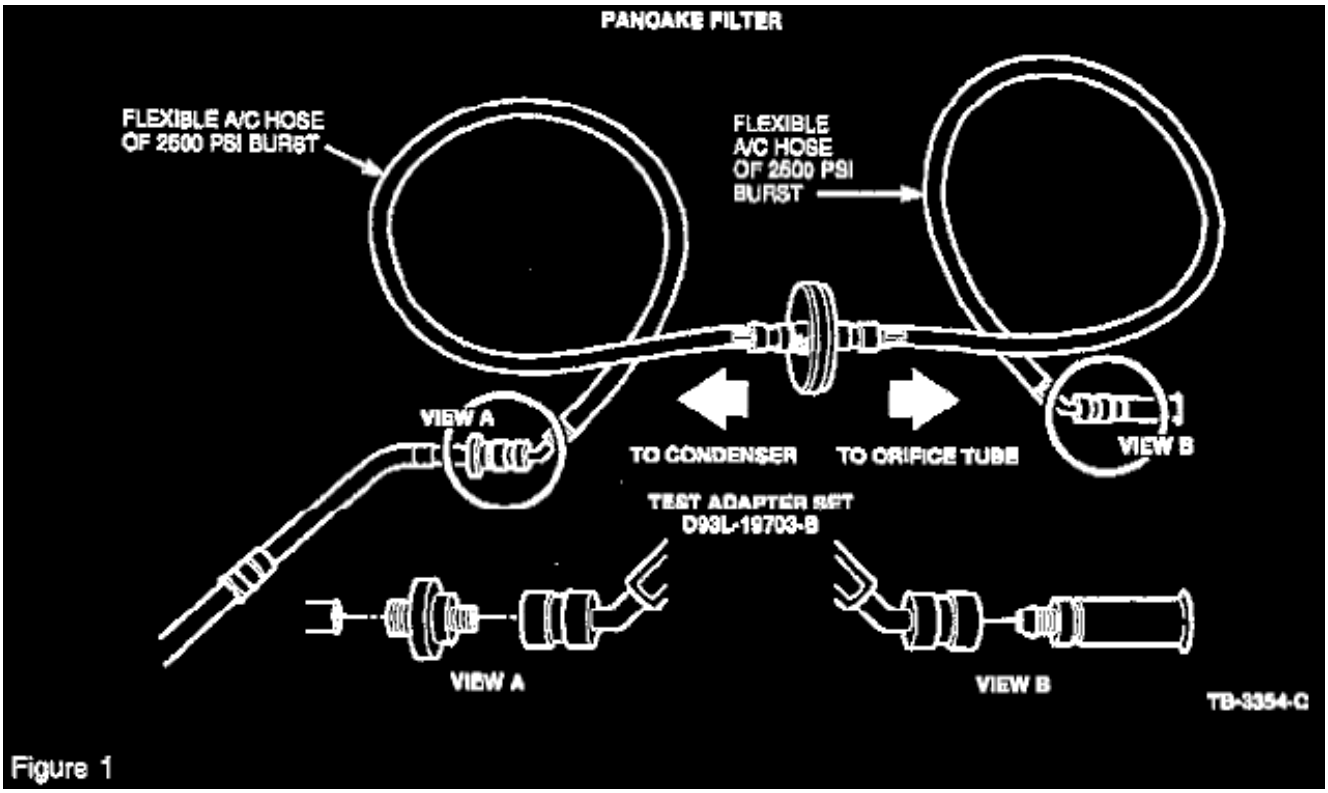


Figure 1

5. Install pancake filter in the liquid line between the condenser and the orifice tube, Figure 1.

a. Be sure orifice inlet is toward the condenser.

b. Connections can be made using Test Adapter Set D93L-19703-B, or equivalent, and flexible refrigerant hose of 2500 psi burst rating. Individual fittings are also available.

6. Remove the old compressor following Service/Workshop Manual procedures. Drain the oil into a calibrated container.

7. Drain the oil from the replacement compressor into a clean calibrated container.

NOTE:

IT WILL BE NECESSARY TO TRANSFER THE MAGNET CLUTCH FROM THE OLD COMPRESSOR TO THE REPLACEMENT COMPRESSOR. FOLLOW SERVICE/WORKSHOP MANUAL PROCEDURES.

8. A new FX-15 service compressor contains 207 mL (7 oz.) of R-12 refrigerant oil. A new FS-10 service compressor does not contain any oil and can be used with an R-12 or an R-134a system.

CAUTION

REMEMBER TO USE YN-9-A (MINERAL) OIL WITH R-12 SYSTEMS AND YN-12-C (PAG) OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

^ If the amount of oil drained from the removed compressor is between 90 and 148 mL (3-5 oz), pour the same amount of clean refrigerant oil into the new compressor.

^ If the amount of oil drained from the old compressor is greater than 90 mL (3 oz), pour 90 mL (3 oz) of clean refrigerant oil into the new compressor.

9. Install the new compressor following Service/Workshop Manual procedures. Make sure all mounting bolts are tightened properly. Check the tension of the compressor drive belt. Adjust if necessary.

10. Evacuate, charge and leak test the system, following Service/Workshop Manual procedures.

11. Check all refrigerant system hoses, lines and the position of the newly-installed filters to make sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

12. Set the A/C control on Max A/C, high blower and temperature control at full cold.

a. Start engine and let idle briefly.

b. Be sure A/C system is operating properly.

13. Gradually bring the engine up to 1200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1000 rpm). Set the engine at 1200 rpm and run it for an hour with the A/C system

operating.

14. Stop the engine.

NOTE:

IT WILL BE NECESSARY TO RECOVER THE SYSTEM REFRIGERANT CHARGE BEFORE PROCEEDING.

15. Allow the engine to cool sufficiently to remove the fittings, flexible hoses and pancake filter from the liquid line.

16. Discard the filter. It can be used one (1) tie only.

17. Reconnect the liquid line back into the system.

18. Evacuate, charge and leak test the system. Make any necessary adjustments.

19. Check the operation of the system in all models.

PART NUMBER PART NAME

F8VZ-19E773-AA Filter Kit

F73Z-19577-AA Refrigerant Oil - Motorcraft YN-9-A (For R-12 Refrigerant Systems Only)

F7AZ-19589-DA Refrigerant Oil - Motorcraft YN-12-C (PAG-Type Oil For R-134a Refrigerant Systems Only)

NOTE

THE TOTAL REPAIR TIME IS FOR INSTALLING SERVICE FILTER KIT PER INSTRUCTIONS THIS INCLUDES INSTALLATION OF AND DISCARD OF FILTER. REFER TO SERVICE LABOR TIME STANDARDS MANUALS IF ADDITIONAL LABOR OPERATIONS ARE REQUIRED.

Refrigerant: Technical Service Bulletins A/C - R12 Refrigerant Substitutes Service Tip

Article No. 96-17-10

08/12/96

AIR CONDITIONING - USE OF R-12 REFRIGERANT SUBSTITUTES - SERVICE TIP

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-94 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 COUGAR 1982-94 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1993 VILLAGER

MEDIUM/HEAVY TRUCK: 1985-94 CARGO SERIES, F & B SERIES, L SERIES

This TSB article is being republished in its entirety to list Environmental Protection Agency (EPA) reviewed NC substitutes for R-12 refrigerant.

ISSUE: A number of manufacturers are producing refrigerant products which are described as being direct replacements for refrigerant R-12.

ACTION: If service is required, use only new or of known quality recycled refrigerant R-12. Ford Motor Company has approved R-134a as the only refrigerant substitute for R-12.

CAUTION:

USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C SYSTEM COMPONENTS.

INFORMATION FROM THE EPA

				Components Percentage							
Brand Name (1)	Ford Approved	Status (2)	Date	HCFC 22	HCFC 124	HCFC 142b	HFC 134a	HFC 152a	Propane (R-290)	Butane (R-600)	Iso-butane (R-600a)
HFC-134a	Yes	ASU	3/18/94				100%				
R-401C	No	ASU	3/18/94	33%	52%			15%			
FRIGC FR-12	No	ASU	6/13/95		39%		59%			2%	
Freezone (3)	No	ASU	5/22/96			19%	70%				
R-406A / GHG / McCool (4)	No	P	5/22/96	55%		41%					4%
GHG-X4 / Autofrost / Chill-It (4)	No	P	5/22/96	51%	28.5%	16.5%					4%
Hot Shot / Kar Kool (4)	No	P	5/22/96	50%	39%	9.5%					1.5%
GHG-HP (4)	No	P	5/22/96	65%		31%					4%
FREEZ-12	No	Under Review				20%	80%				

(1) R-401A (made by DuPont), R-401B (DuPont), R-409A (Elf Atochem), Care 30 (Calor Gas), Adak-29/Adak-12 (TACIP International) and ES-12R (Interveet) have not been submitted for review in motor vehicle air conditioning, and it is therefore illegal to use them in such systems.

(2) See article for details on legality of use according to Status:
- ASU = acceptable subject to fittings, labeling, and no drop-in use conditions
- P = proposed acceptable subject to use conditions; open to public comment so decision is not final
- UNA = unacceptable; illegal for use as CFC-12 substitutes in motor vehicle air conditioners

(3) Freezone contains 2% of a lubricant

(4) Additional use condition: MUST BE USED WITH BARRIER HOSES

This information has been taken from EPA documents to address Ford specific applications and recommendations. Further EPA information on ozone-depleting substances and regulations regarding its handling can be found on the Internet at World Wide Web site: http://www.epa.gov/ozone/

In 1994, EPA established the Significant New Alternatives Policy (SNAP) program to review alternatives to ozone-depleting substances like R-12. EPA examines new substitutes for their ozone depleting, global warming, flammability, and toxicity characteristics. The SNAP process does not test these substitutes for A/C system compatibility, reliability, durability, or performance.

Under the SNAP rule, each new refrigerant must be used in accordance with the following conditions:

1. Unique Fittings - Each new refrigerant must be used with a unique set of fittings to prevent the accidental mixing of different refrigerants.

2. Unique Equipment - Each refrigerant must have dedicated recovery/recycling equipment for that refrigerant.

3. Labels - Whether a vehicle is originally designed to use a new refrigerant or is retrofitted, the technician must apply a detailed label giving specific information about the alternative. This label covers up information about the old refrigerant and provides valuable details on the alternative and how it was used. The technician is required to fill in their name, company performing the retrofit, address and the date retrofitted.

4. Remove Original Refrigerant - The original R-12 must be removed from the system prior to charging with the new refrigerant. This will guarantee that the largest amount of clean R-12 is available for use in vehicles that still need it.

				Reason Unacceptable
Brand Name (1)	Ford Approved	Status (2)	Date	HCFC 22, HCFC 124, HCFC 142b, HFC 134a, HFC 152a, Propane (R-290), Butane (R-600), Iso-butane (R-600a)
Ikon-12	No	ASU	5/22/96	Composition claimed as confidential business information
OZ-12	No	UNA	3/18/94	Flammable blend of hydrocarbons; insufficient data to demonstrate safety
R-176	No	UNA	3/18/94	Contains CFC-12, which is inappropriate in a CFC-12 substitute
HC-12a	No	UNA	6/13/95	Flammable blend of hydrocarbons; insufficient data to demonstrate safety
R-405A	No	UNA	6/13/95	Contains a perfluorocarbon, which has extremely high global warming potential and lifetime

(1) R-401A (made by DuPont), R-401B (DuPont), R-409A (Elf Atochem), Care 30 (Calor Gas), Adak-29/Adak-12 (TACIP International) and ES-12H (Intervest) have not been submitted for review in motor vehicle air conditioning, and it is therefore illegal to use them in such systems.

(2) See article for details on legality of use according to Status:

- ASU = acceptable subject to fittings, labeling, and no drop-in use conditions
- P = proposed acceptable subject to use conditions; open to public comment so decision is not final
- UNA = unacceptable; illegal for use as CFC-12 substitutes in motor vehicle air conditioners

(3) Freezone contains 2% of a lubricant

(4) Additional use condition; MUST BE USED WITH BARRIER HOSES

A summary of the refrigerants reviewed under EPA's SNAP program for use in motor vehicle air conditioning systems is in the table.

OTHER APPLICABLE ARTICLES: 91-9-7, 96-15-7

SUPERSEDES: 93-23-11

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999, 290000

Refrigerant: Technical Service Bulletins R-12 Refrigerant - Substitutes

Article No. 94-14-3

07/13/94

Air Conditioning - Use Of R-12 Refrigerant Substitutes - Service Tip

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

MERKUR: 1986-89 SCORPIO, XR4TI

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1992-94 F-53 1993 VILLAGER

MEDIUM/HEAVY TRUCK: 1954-90 C SERIES 1970-94 L SERIES 1979-90 CL-9000, CL-CLT-9000 SERIES 1980-94 F SERIES 1986-94 CARGO SERIES

This TSB is being republished in its entirety to include Heavy Truck models.

ISSUE:

A number of manufacturers are producing refrigerant products which are described as being direct replacements for refrigerant R-12. The use of any unauthorized substitute refrigerant may severely damage the A/C system components.

ACTION:

If service is required, use only NEW or RECYCLED refrigerant R-12.

Ford Motor Company has not tested or approved any R-12 refrigerant substitute at this time. R-134a is approved only for systems which specify R-134a,

and is not compatible with R-12 systems.

R-22 likewise, is not compatible with R-12 systems.

CAUTION:

USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C SYSTEM COMPONENTS.

OTHER APPLICABLE ARTICLES: 91-9-7

SUPERSEDES: 93-23-11

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999, 290000

Refrigerant: Technical Service Bulletins Air Conditioning - Use of Correct Fluorescent Tracer Dye

Article No. 93-20-6

09/29/93

AIR CONDITIONING - USE OF CORRECT FLUORESCENT TRACER DYE - SERVICE TIP

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1993 VILLAGER

ISSUE: Use of untested, unapproved fluorescent tracer dyes for A/C system leak checking may damage the air conditioning system. Some of these materials may not be compatible with Ford A/C systems.

ACTION: When leak-checking an R-12 A/C system with a "black light", use only Rotunda-supplied Part No. 112-R0027, Fluoro-Lite brand dye. No other dyes have been approved by Ford Motor Company.

NOTE: 112-R0027 DYE IS NOT COMPATIBLE WITH R-134a REFRIGERANT.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208999

Refrigerant: Technical Service Bulletins A/C - R12 Refrigerant Service Tips

Article No. 91-9-7

05/01/91

AIR CONDITIONING - REFRIGERANT R-12 - SERVICE TIPS

FORD: 1985-86 LTD 1985-88 EXP 1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-91 TAURUS 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1985-87 LYNX 1985-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER 1991 CAPRI

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-91 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1988-91 F SUPER DUTY 1991 EXPLORER

MEDIUM/HEAVY TRUCK: 1985-90 C SERIES 1985-91 CL-CLT-9000 SERIES, F & B SERIES, L SERIES 1986-91 CARGO SERIES

ISSUE: A number of manufacturers are producing refrigerant products which are described as being direct replacements for Refrigerant R-12. The use of any unauthorized substitute refrigerant may severely damage the A/C components.

ACTION: If service is required, use only NEW or RECYCLED Refrigerant R-12.

CAUTION: USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C

SYSTEM COMPONENTS.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

208000, 208200

Technical Service Bulletin # 98-12-5 Date: 980622

A/C - Filtering Refrigerant After Compressor Replacement

Article No. 98-12-5

06/22/98

AIR CONDITIONING - FILTERING REFRIGERANT

AFTER A/C COMPRESSOR REPLACEMENT - SERVICE TIPS

FORD: 1980-98 CROWN VICTORIA 1981-98 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-97 THUNDERBIRD 1982-98 MUSTANG 1983-86 LTD 1984-94 TEMPO 1986-98 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-98 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1980-98 GRAND MARQUIS, TOWN CAR 1982-83 ZEPHYR 1982-86 CAPRI 1982-87 LN7 1982-97 COUGAR 1982-98 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-98 SABLE 1991-94 CAPRI 1991-98 TRACER 1993-98 MARK VIII 1995-98-MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1980-96 BRONCO 1980-97 F SUPER DUTY 1980-98 ECONOLINE, F-150, F-150, F-350 1983-98 RANGER 1984-90 BRONCO II 1986-97 AEROSTAR 1988-97 F-47 1991-98 EXPLORER 1993-98 VILLAGER 1995-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to revise the Service Procedure and to update the model years.

ISSUE Vehicles that have and inoperative A/C compressor, due to internal causes, MUST have the refrigerant system cleaned to remove any debris or contaminants that may be present to prevent damage to the replacement compressor.

ACTION

Install a Service Filter Kit in the refrigerant system prior to installing the replacement compressor. Refer to the following Service Procedure for details.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 96-15-5

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-99 Models And 1991 Lincolns, Basic Warranty Coverage For All Other Models And Major Component Warranty Coverage For All Other Lincoins

OPERATION DESCRIPTION TIME

981205A Kit Installation 1.2 Hrs.

981205B Extra Time For Refrigerant 0.4 Hr.

(R-12) Recovery

DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208999

Service Procedure

THIS PROCEDURE IS OPTIONAL IF THE SYSTEM IS FLUSHED USING THE ROTUNDA A/C FLUSHER.

CAUTION

THIS FILTERING PROCEDURE MAY BE USED FOR EITHER R-12 OR R-134a REFRIGERANT SYSTEMS. BECAUSE THE TWO (2) SYSTEMS USE DIFFERENT REFRIGERANT OILS AND BECAUSE THE COMPRESSOR COULD BE DAMAGED IF THE WRONG OIL IS USED, SYSTEM IDENTIFICATION IS VERY IMPORTANT. BE SURE SYSTEM IS CORRECTLY IDENTIFIED BEFORE STARTING THE FILTERING PROCEDURE.

Each Service Filter Kit includes the following items:

^ One (1) Pancake Filter (to be installed in the liquid line between the condenser and the orifice tube)

^ One (1) Instruction Sheet

NOTE

ON 1993-94 RANGER/EXPLORER VEHICLES, TECHNICIANS MAY EXPERIENCE DIFFICULTY WHEN CONNECTING THE PANCAKE FILTER HOSE FITTINGS TO THE EVAPORATOR INLET WITH THE ORIFICE TUBE INSTALLED. REMOVE THE OFFICE TUBE AND RUN THE SYSTEM FOR 1 HOUR AS DESCRIBED IN THE FILTERING PROCEDURE. REINSTALL THE ORIFICE TUBE AFTER FILTERING IS COMPLETE.

CAUTION

FOLLOW ALL REFRIGERANT SYSTEM SAFETY AND SERVICE PRECAUTIONS OUTLINED IN THE APPROPRIATE SERVICE OR WORKSHOP MANUAL.

1. Before removing any refrigerant system components, recover the refrigerant from the system following the recycling methods outlined In the appropriate Service/Workshop Manual.

2. Remove the suction accumulator/drier assembly and drain the oil into a calibrated container.

3. Install a new suction accumulator/drier and add new refrigerant oil to replace the old oil. The quantity of the new oil to be added is the amount to match that drained from the old accumulator plus 60 mL (2 oz). Refer to the Dealer Master Parts Catalog for the correct suction accumulator/drier part number.

CAUTION

REMEMBER TO USE MOTORCRAFT YN-9-A REFRIGERANT COMPRESSOR OIL WITH R-12 SYSTEMS AND MOTORCRAFT YN-12-C REFRIGERANT COMPRESSOR OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

4. Install a new orifice tube. Refer to the Dealer Master Parts Catalog for the correct orifice tube part number. If the orifice tube in the vehicle is located in the liquid line between the condenser and the evaporator, replace the liquid line assembly.

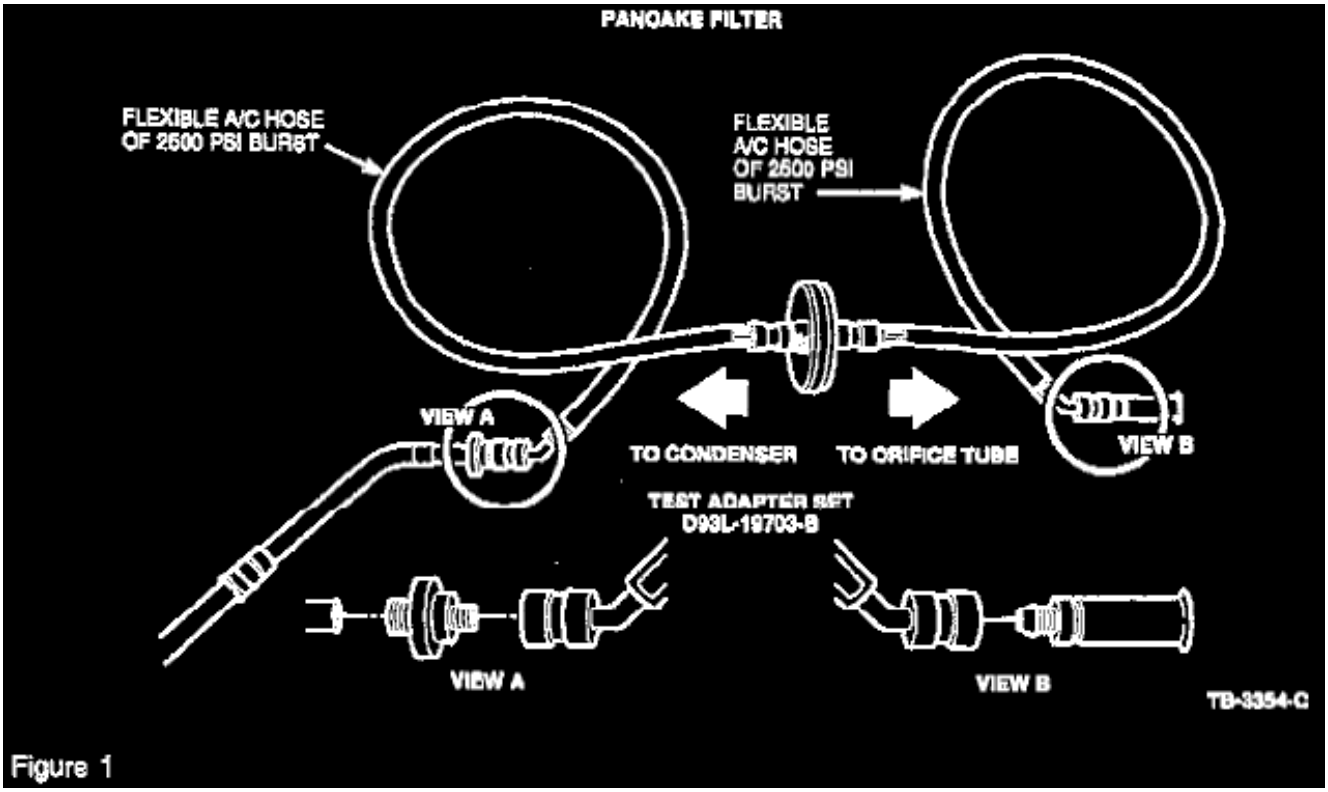


Figure 1

5. Install pancake filter in the liquid line between the condenser and the orifice tube, Figure 1.

a. Be sure orifice inlet is toward the condenser.

b. Connections can be made using Test Adapter Set D93L-19703-B, or equivalent, and flexible refrigerant hose of 2500 psi burst rating. Individual fittings are also available.

6. Remove the old compressor following Service/Workshop Manual procedures. Drain the oil into a calibrated container.

7. Drain the oil from the replacement compressor into a clean calibrated container.

NOTE:

IT WILL BE NECESSARY TO TRANSFER THE MAGNET CLUTCH FROM THE OLD COMPRESSOR TO THE REPLACEMENT COMPRESSOR. FOLLOW SERVICE/WORKSHOP MANUAL PROCEDURES.

8. A new FX-15 service compressor contains 207 mL (7 oz.) of R-12 refrigerant oil. A new FS-10 service compressor does not contain any oil and can be used with an R-12 or an R-134a system.

CAUTION

REMEMBER TO USE YN-9-A (MINERAL) OIL WITH R-12 SYSTEMS AND YN-12-C (PAG) OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

^ If the amount of oil drained from the removed compressor is between 90 and 148 mL (3-5 oz), pour the same amount of clean refrigerant oil into the new compressor.

^ If the amount of oil drained from the old compressor is greater than 90 mL (3 oz), pour 90 mL (3 oz) of clean refrigerant oil into the new compressor.

9. Install the new compressor following Service/Workshop Manual procedures. Make sure all mounting bolts are tightened properly. Check the tension of the compressor drive belt. Adjust if necessary.

10. Evacuate, charge and leak test the system, following Service/Workshop Manual procedures.

11. Check all refrigerant system hoses, lines and the position of the newly-installed filters to make sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

12. Set the A/C control on Max A/C, high blower and temperature control at full cold.

a. Start engine and let idle briefly.

b. Be sure A/C system is operating properly.

13. Gradually bring the engine up to 1200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1000 rpm). Set the engine at 1200 rpm and run it for an hour with the A/C system operating.

14. Stop the engine.

NOTE:

IT WILL BE NECESSARY TO RECOVER THE SYSTEM REFRIGERANT CHARGE BEFORE PROCEEDING.

15. Allow the engine to cool sufficiently to remove the fittings, flexible hoses and pancake filter from the liquid line.

16. Discard the filter. It can be used one (1) tie only.

17. Reconnect the liquid line back into the system.

18. Evacuate, charge and leak test the system. Make any necessary adjustments.

19. Check the operation of the system in all models.

PART NUMBER PART NAME

F8VZ-19E773-AA Filter Kit

F73Z-19577-AA Refrigerant Oil - Motorcraft YN-9-A (For R-12 Refrigerant Systems Only)

F7AZ-19589-DA Refrigerant Oil - Motorcraft YN-12-C (PAG-Type Oil For R-134a Refrigerant Systems Only)

NOTE

THE TOTAL REPAIR TIME IS FOR INSTALLING SERVICE FILTER KIT PER INSTRUCTIONS THIS INCLUDES INSTALLATION OF AND DISCARD OF FILTER. REFER TO SERVICE LABOR TIME STANDARDS MANUALS IF ADDITIONAL LABOR OPERATIONS ARE REQUIRED.

Refrigerant: Technical Service Bulletins Air Conditioning - Use of Correct Fluorescent Tracer Dye

Article No. 93-20-6

09/29/93

AIR CONDITIONING - USE OF CORRECT FLUORESCENT TRACER DYE - SERVICE TIP

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1993 VILLAGER

ISSUE: Use of untested, unapproved fluorescent tracer dyes for A/C system leak checking may damage the air conditioning system. Some of these materials may not be compatible with Ford A/C systems.

ACTION: When leak-checking an R-12 A/C system with a "black light", use only Rotunda-supplied Part No. 112-R0027, Fluoro-Lite brand dye. No other dyes have been approved by Ford Motor Company.

NOTE: 112-R0027 DYE IS NOT COMPATIBLE WITH R-134a REFRIGERANT.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208999

Refrigerant: Technical Service Bulletins R-12 Refrigerant - Substitutes

Article No. 94-14-3

07/13/94

Air Conditioning - Use Of R-12 Refrigerant Substitutes - Service Tip

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

MERKUR: 1986-89 SCORPIO, XR4TI

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1992-94 F-53 1993 VILLAGER

MEDIUM/HEAVY TRUCK: 1954-90 C SERIES 1970-94 L SERIES 1979-90 CL-9000, CL-CLT-9000 SERIES 1980-94 F SERIES 1986-94 CARGO SERIES

This TSB is being republished in its entirety to include Heavy Truck models.

ISSUE:

A number of manufacturers are producing refrigerant products which are described as being direct replacements for refrigerant R-12. The use of any unauthorized substitute refrigerant may severely damage the A/C system components.

ACTION:

If service is required, use only NEW or RECYCLED refrigerant R-12.

Ford Motor Company has not tested or approved any R-12 refrigerant substitute at this time. R-134a is approved only for systems which specify R-134a,

and is not compatible with R-12 systems.

R-22 likewise, is not compatible with R-12 systems.

CAUTION:

USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C SYSTEM COMPONENTS.

OTHER APPLICABLE ARTICLES: 91-9-7

SUPERSEDES: 93-23-11

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999, 290000

Refrigerant: Capacity Specifications

A/C Refrigerant Capacity ..... 32 oz

Refrigerant: Fluid Type Specifications

A/C Refrigerant Type R-12

FS-10 Compressors	
Tag Part Number	Oil Type/System
F1DH-19497-BA	Mineral/R-12
F3CH-19497-BB	Mineral/R-12
F3DH-19497-BB	PAG/R-134a
F3LH-19497-BB	PAG/R-134a
F3SH-19497-BB	Mineral/R-12
F3VH-19497-BB	Mineral/R-12
F3ZH-19497-BB	Mineral/R-12
93EW-19497-BB	PAG/R-134a
94EW-19497-BB	PAG/R-134a

Refrigerant Oil: Technical Service Bulletins A/C Compressor - Service Tips

Article No. 94-15-6

07/27/94

AIR CONDITIONING - FS-10 AND FX-15 COMPRESSORS - SERVICE TIPS

FORD: 1988-94 CROWN VICTORIA, ESCORT, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1988-92 MARK VII 1988-94 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1991-94 TRACER 1993-94 MARK VIII

LIGHT TRUCK: 1988-90 BRONCO II 1988-94 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1991-94 EXPLORER 1993-94 VILLAGER

ISSUE: FS-10 service compressors built between 1/1/93 and 9/30/93 were built with 7 oz. of oil. These compressors have a white label and are labeled to be compatible with either R-12 or R-134a. These compressors contain either PAG oil or Mineral oil and should be used only in the proper systems.

ACTION: Refer to the chart to determine the type of oil that is in each service compressor.

NOTE:

BE SURE TO CHOOSE THE COMPRESSOR THAT HAS THE CORRECT OIL FOR THE SYSTEM BEING SERVICED.

NOTE:

FS-10 COMPRESSORS BUILT AFTER 9/30/93 ARE NOT FILLED WITH OIL AND HAVE A YELLOW LABEL. THESE COMPRESSORS REQUIRE THE CORRECT AMOUNT OF EITHER MINERAL OIL OR PAG OIL DEPENDING ON THE SYSTEM BEING SERVICED.

NOTE:

FX-15 SERVICE COMPRESSORS BUILT BEFORE 1/1/93 ARE FILLED WITH MINERAL OIL AND ARE ONLY COMPATIBLE WITH R-12 SYSTEMS.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208000, 208999

Refrigerant Oil: Technical Service Bulletins A/C Compressor - Oil Recovery & Measuring Procedure

Article No. 92-24-6

11/18/92

AIR CONDITIONING - FX-15 AIR COMPRESSOR - OIL RECOVERY AND MEASURING PROCEDURE

FORD: 1988-93 TAURUS 1989-93 CROWN VICTORIA, THUNDERBIRD 1992-93 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-93 SABLE 1989-93 COUGAR 1991-93 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992-93 TOPAZ, TRACER

LIGHT TRUCK: 1989-90 BRONCO II 1989-93 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-93 EXPLORER

This article is being republished in its entirety to clarify the information about removing oil from both the "old" and "new" compressors.

ISSUE: When replacing the FX-15 Compressor it is very important to accurately match the amount of oil being replaced. Some dealerships have indicated that they are unable to properly match the amounts of oil being replaced.

ACTION: Replace the amount of oil being drained from the FX-15 compressor with an equal amount of new oil to assure proper compressor operation. Refer to the following service procedure for service details.

SERVICE - PROCEDURE

1. With both "OLD" and "NEW" compressors, remove as much oil as possible. On both compressors, the shaft should be rotated about six to eight revolutions while pouring the oil from the ports. This effectively empties the compressor of oil.

a. Obtain a clean container that can also be used as a measuring device.

b. Place the disc and hub assembly on the compressor shaft so the shaft can be rotated.

c. Rotate the shaft by hand (6) six to (8) eight revolutions, collecting the oil in a clean measuring device.

NOTE: SERVICE COMPRESSORS COME PRE-CHARGED WITH 7 OUNCES OF OIL

2. If the amount of oil drained from the old compressor is between (3) three and (5) five fluid ounces (85 and 142 cc), pour the same amount of clean Motorcraft YN-9 refrigerant oil into the new compressor.

3. If the amount of oil that was removed from the old compressor is greater than (5) fluid ounces (142 cc), pour five ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

4. If the amount of refrigerant oil that was removed from the old compressor is less than (3) three fluid ounces (85 cc), pour three fluid ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

NOTE: THE SUCTION/ACCUMULATOR-DRYER AND ORIFICE TUBE MUST BE REPLACED WHENEVER THE COMPRESSOR IS REPLACED.

PART NUMBER	PART NAME	CLASS
E73Z-19577-A	Refrigerant Oil (Motorcraft YN-9)	B

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 92-18-4

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208200, 208999, 290000

PART NUMBER	PART NAME	CLASS
E73Z-19577-A	Refrigerant Oil (Motorcraft YN-9)	B

Refrigerant Oil: Technical Service Bulletins A/C Compressor - Oil Recovery/Measuring Procedures

Article No. 92-18-4

08/26/92

AIR CONDITIONING - FX-15 AIR COMPRESSOR - OIL RECOVERY AND MEASURING PROCEDURE

FORD: 1988-93 TAURUS 1989-93 CROWN VICTORIA, THUNDERBIRD 1992-93 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-93 SABLE 1989-93 COUGAR 1991-93 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992-93 TOPAZ, TRACER

LIGHT TRUCK: 1989-90 BRONCO II 1989-93 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1990-93 EXPLORER

ISSUE: When replacing the FX-15 compressor it is very important to accurately match the amount of oil being replaced. Some dealerships have indicated that they are unable to properly match the amounts of oil being replaced.

ACTION: Replace the amount of oil being drained from the FX-15 compressor with an equal amount of new oil, to assure proper compressor operation. Refer to the following service procedure for service details.

SERVICE - PROCEDURE

1. Remove as much oil as possible from the compressor. The compressor shaft should be rotated about six to eight revolutions allowing the oil to drain from the compressor ports.

a. Obtain a clean container that can be also used as a measuring device.

b. Place the disc and hub assembly on the compressor shaft so the shaft can be rotated.

c. Rotate the shaft by hand (6) six to (8) eight revolutions allowing the oil to drain from the ports, while collecting the oil in the clean measuring device.

NOTE: SERVICE COMPRESSORS COME PRE-CHARGED WITH 7 OUNCES OF OIL

2. If the amount of oil drained from the old compressor is between (3) three and (5) five fluid ounces, pour the same amount of clean Motorcraft YN-9 refrigerant oil into the new compressor.

3. If the amount of oil that was removed from the old compressor is greater than (5) fluid ounces, pour five ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

4. If the amount of refrigerant oil that was removed from the old compressor is less than (3) three fluid ounces, pour three fluid ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

NOTE: THE SUCTION/ACCUMULATOR-DRYER AND ORIFICE TUBE MUST BE REPLACED WHENEVER THE COMPRESSOR IS REPLACED.

Part Number

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208200

Refrigerant Oil: Technical Service Bulletins A/C - Adding Refrigerant Oil Service Tip

Article No. 95-5-12

03/13/95

AIR CONDITIONING - ADDING REFRIGERANT OIL - SERVICE TIP

FORD: 1990-93 FESTIVA 1990-94 TEMPO 1990-95 CROWN VICTORIA, ESCORT, MUSTANG, PROBE, TAURUS, THUNDERBIRD 1994-95 ASPIRE

LINCOLN-MERCURY: 1990-92 MARK VII 1990-94 TOPAZ 1990-95 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1991-94 CAPRI 1993-95 MARK VIII MERKUR: 1990 SCORPIO

LIGHT TRUCK: 1990 BRONCO II 1990-95 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-95 EXPLORER 1993-95 VILLAGER 1995 WINDSTAR

MEDIUM/HEAVY TRUCK: 1990-91 C SERIES, CL-CLT-9000 SERIES 1990-95 CARGO SERIES, F & B SERIES, L SERIES

ISSUE: Current repair procedures do not advise on the addition of refrigerant oil to the A/C system when a minor repair is made.

ACTION: Add 0.06 L (2 oz) of the proper type new refrigerant oil to the system,. before recharging, when servicing concerns that do not require major component replacement. Repairs considered minor are: O-ring leaks, charge port leaks, Pressure Relief Valve (PRV) leaks, compressor shaft seal leaks, hose leaks, etc. Remember to use polyalkylene glycol (PAG) oil with R-134a systems and mineral oil with R-12 systems.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999

Refrigerant Oil: Capacity Specifications

Refrigerant Oil System Capacity ..... 7.0 oz

Refrigerant Oil: Fluid Type Specifications

Paraffin base viscosity refrigerant oil, part no. Motorcraft YN-9

Brake Bleeding: Service and Repair Manual Bleeding

Bleed the primary and secondary hydraulic brake systems separately.

NOTICE: Do not allow the reservoir to run dry during the bleeding operation. Keep the master cylinder reservoirs filled with the specified brake fluid. Never reuse the fluid that has been drained from the hydraulic system.

1. Loosen the master cylinder to hydraulic line nut. 2. Wrap a shop cloth around the tubing below the fitting to absorb escaping brake fluid. 3. Push the brake pedal down slowly by hand to the floor of the cab. This will force air trapped in the master cylinder to escape at the fitting. 4. Hold the pedal down and tighten the fitting. Release the brake pedal.

NOTICE: Do not release the brake pedal until the fitting is tightened or air will re-enter the master cylinder.

5. Repeat this procedure until air ceases to excape at the fitting and the brake pedal is firm. 6. Place a box wrench on the bleeder fitting on the Rear Antilock Brake System (RABS) valve. Attach a rubber drain tube to the bleeder fitting

making sure the end of the tube fits snugly around the bleeder fitting.

7. Submerge the free end of the tube in a container partially filled with clean brake fluid. Loosen the bleeder fitting approximately three-quarters of a

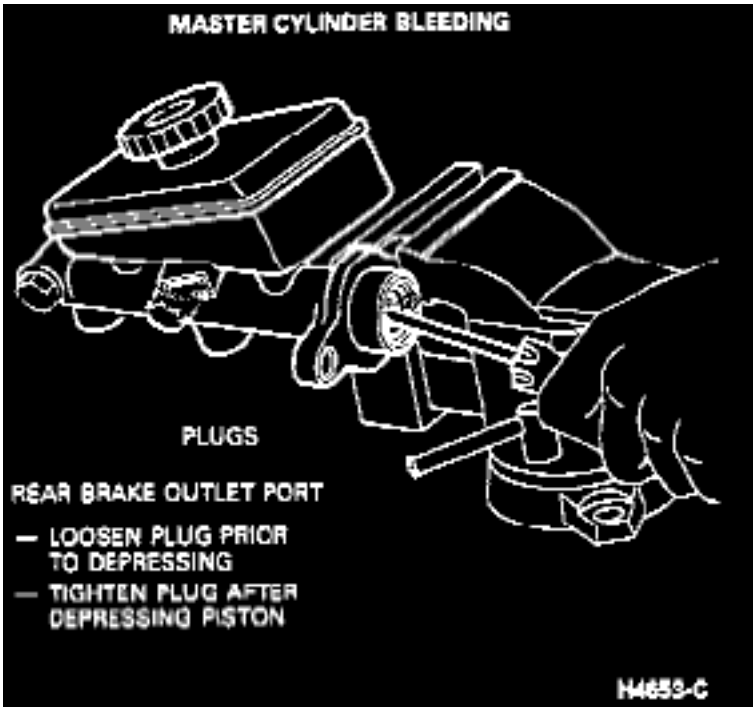
turn.

8. Slowly press the brake pedal all the way down. Close the bleeder fitting, and return the pedal to the fully released position. Repeat this operation

until air bubbles no longer appear at the submerged end of the bleeder tube.

9. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the bleeder tube.

10. Repeat this procedure at the RR, LR, RF and LF wheels. 11. When the bleeding procedure is complete, fill the master cylinder to the maximum level line of the master cylinder reservoir.



Brake Bleeding: Service and Repair Master Cylinder Bleeding

Bench Bleeding Master Cylinder

1. Support the master cylinder body in a vise, and fill both fluid reservoirs with heavy duty DOT 3 brake fluid. 2. Install plugs in the front and rear brake outlet ports. Bleed the rear brake outlet system first. 3. Loosen the plug in the rear brake outlet port. Depress the primary piston slowly to force the air out of the master cylinder. Tighten plug while

piston is depressed or air will enter the master cylinder.

4. Repeat this procedure until air ceases to exit at the outlet port. 5. Repeat steps 3 and 4 for the front brake outlet port with the rear brake outlet plugged. 6. Tighten the plugs and try to depress the piston. Depressing the piston should be harder after all air is expelled. 7. Install the cover and diaphragm assembly making sure the cover retainer is tightened securely. Remove the plugs.

For additional information see Bench Bleeding Notes.

Brake Bleeding: Service and Repair Pressure Bleeding

Be sure the bleeder tank contains enough of the specified brake fluid to complete the bleeding operation. Charge the tank with approximately 69-206 kPa (10-30 psi). Never exceed 345 kPa (50 psi). Never use brake fluid that has been drained from the hydraulic system. Bleed the longest lines first.

1. Clean all dirt from the master cylinder reservoir cap. 2. Remove the master cylinder reservoir cap and fill the master cylinder reservoir with the specified brake fluid. Install the pressure bleeder adapter

tool on the master cylinder, and attach the bleeder tank hose to the fitting on the adapter.

NOTE: Master cylinder pressure bleeder adapter tools are available from the manufacturers of pressure bleeding equipment. Follow the manufacturer's instructions when installing the adapter.

3. Place a 3/8 inch box wrench on the bleeder fitting on the right rear brake wheel cylinder. Attach a bleeder tube snugly to the bleeder fitting. 4. Open the valve on the bleeder tank and admit pressurized brake fluid to the master cylinder reservoir. 5. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting. 6. When air bubbles no longer appear in the fluid at the submerged end of the bleeder tube, close the bleeder fitting and remove the tube. 7. Repeat Steps 3 through 6 at the opposite wheel cylinder. On front brakes, bleed the right front caliper first. 8. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting. 9. Remove the pressure bleeder adapter tool. Fill the master cylinder reservoirs with the specified brake fluid to within 3 mm (1/8 in) from the top of

the filler neck. Install the master cylinder cover.

Circuit Breaker: Testing and Inspection

The 6 amp circuit breaker is located in the fuse panel. Two separate tests are necessary to check for correct circuit breaker operation. Remove circuit breaker from fuse panel and connect tester leads to circuit breaker.

TEST 1

1. Short tester leads together and adjust current draw until it equals circuit breaker rating.

2. Connect circuit breaker to tester.

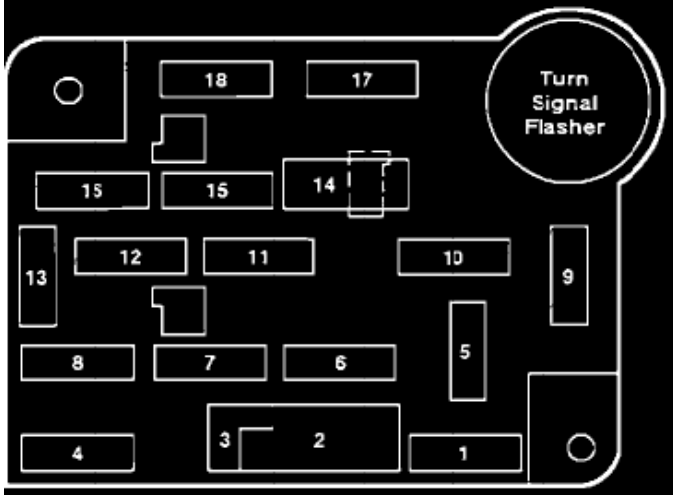
3. Leave circuit breaker connected to tester for ten minutes, holding current reading on tester at rated current. If circuit breaker opens before ten minutes has elapsed, replace circuit breaker.

TEST 2

1. Short tester leads together and adjust current draw until it is twice the rated current.

2. Connect circuit breaker to tester, holding current reading on tester at twice the rated current.

3. If tester reading does not drop to zero within 30 seconds, replace circuit breaker.



Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Fuse Position	Amps	Circuits Protected
1	15	Radio, Dome/Cargo Lamps
2	6 c.b.	Windshield Wipers
4	15	Stop/Hazard Lamps
5	15	Turn Lamps, Backup Lamps, Brake Fluid Level Sensor
6	—	Not Used
7	10	A/C Compressor Control
8	20	Horn
9	30	Air Conditioner/Heater
10	15	Lamps on Warning, Park/License Lamps
11	15	Radio, Electric Shift Control, Speed Contro
12	20 c.b.	Multi-Function Switch, Cigar Lighter, Power Lumbar Seats
13	10	Instrument Illumination
14	30 c.b.	Power Windows
15	20	Rear Anti-Lock Brakes
16	—	Not Used
17	15	Electric Shift Control, Warning Chime Module, Low Oil Level Relay, Instrument Cluster
18	10	HEGO

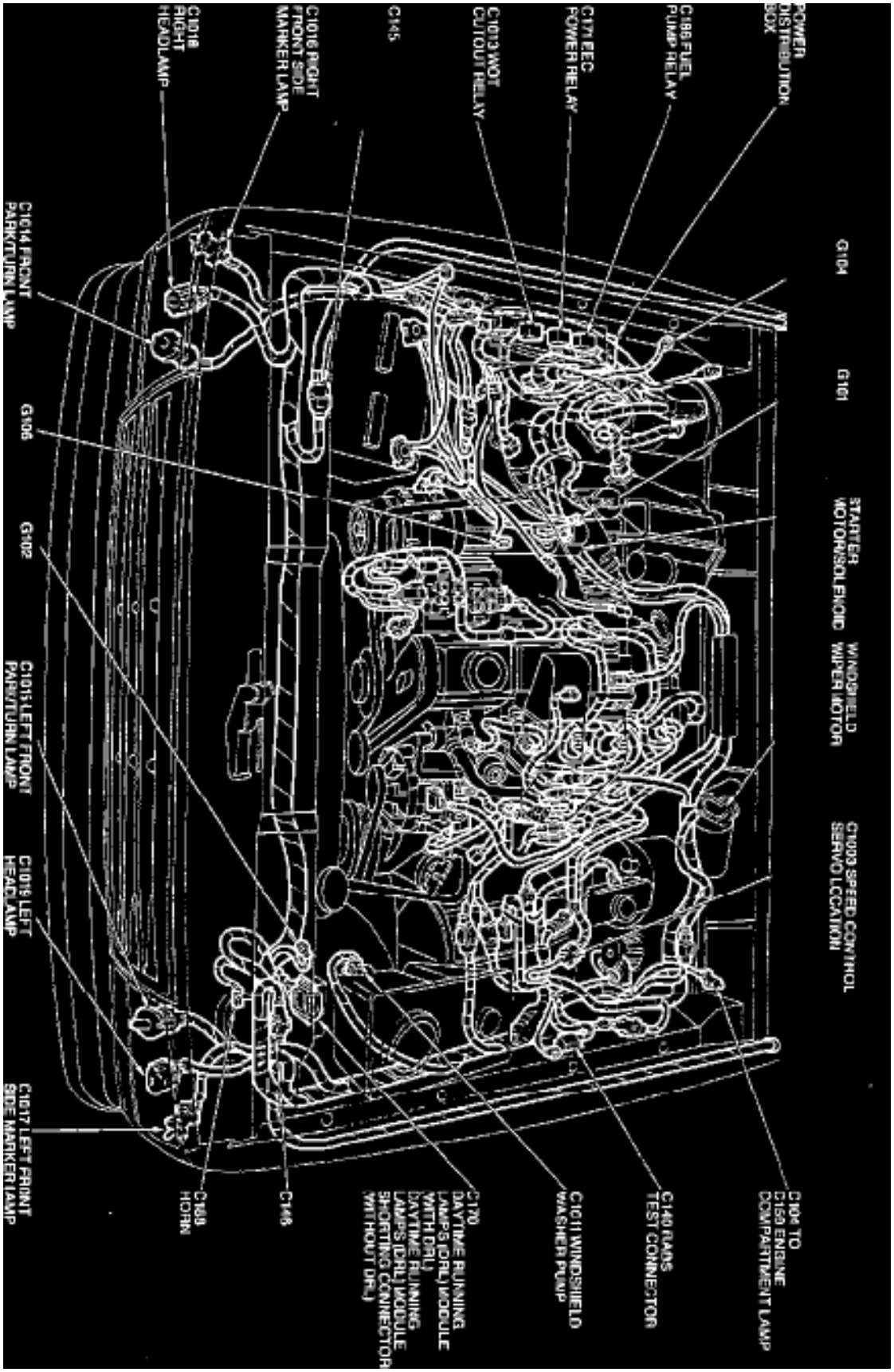
Power Distribution

The alternator is connected to maxi-fuses within the power distribution box which is then connected together with the Battery at the starter relay hot terminal. Circuits and components are protected by maxi-fuses. Low power circuits are also protected by fuses.

The Ignition Switch and Main Light Switch are powered at all times, as are Fuses 1, 4, 8, 10 and Circuit Breaker 12 in the Fuse Panel. The other fuses are powered through the Ignition Switch or the Main Light Switch.

Position 3 is not used and is covered by Circuit Breaker 2.

Fuse Panel Details

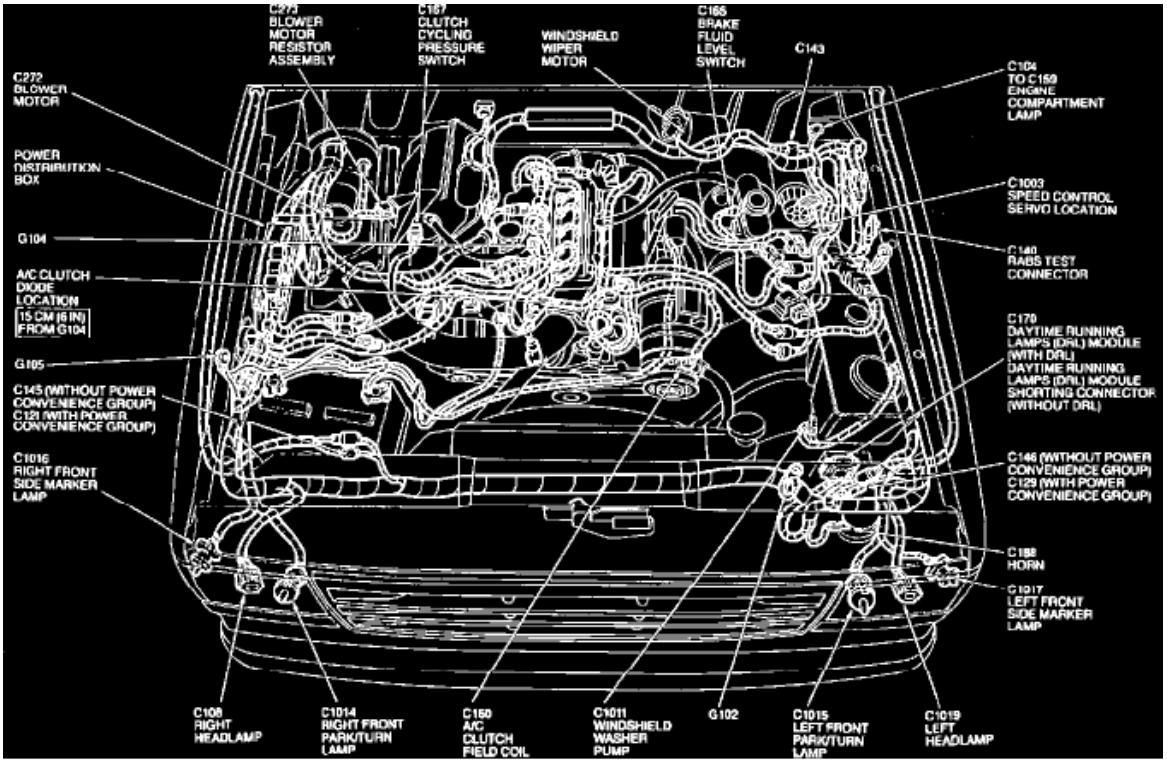

G104
G101
STARTER MOTOR/SOLENOID
WINDSHIELD WIPER MOTOR
C1003 SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C188 FUEL PUMP RELAY
C171 EEC POWER RELAY
C1013 WOT CUTOUT RELAY
C145
C1016 RIGHT FRONT SIDE MARKER LAMP
C1018 RIGHT HEADLAMP
C1014 FRONT PARK/TURN LAMP
G106
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP
C1017 LEFT FRONT SIDE MARKER LAMP
C169 HORN
C148
C170 DAYTIME RUNNING LAMPS (DRL) MODULE WITH DRL DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C1011 WINDSHIELD WASHER PUMP
C140 RAIRS TEST CONNECTOR
C104 TO C150 ENGINE COMPARTMENT LAMP

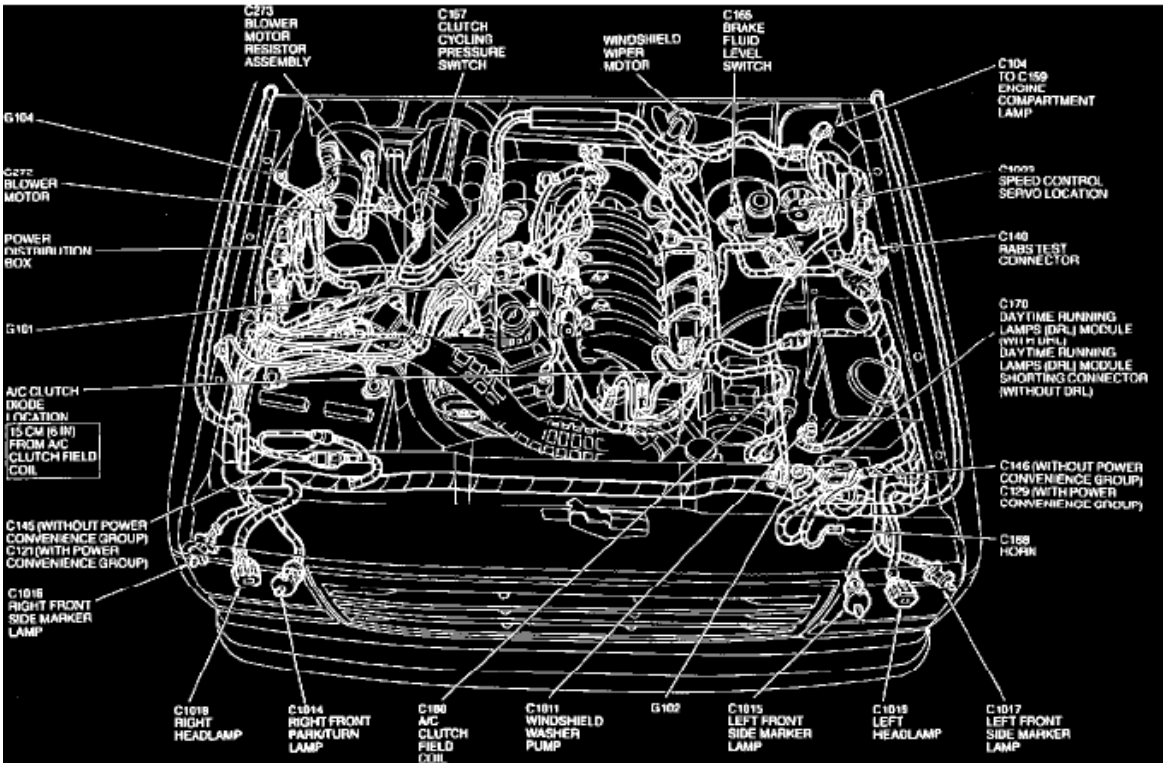
Fuse Block: Locations Power Distribution Box

Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

Applicable to: 2.3L/4-140


C272
BLOWER
MOTOR
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C143
C272
BLOWER
MOTOR
C104
TO C159
ENGINE
COMPARTMENT
LAMP
POWER
DISTRIBUTION
BOX
C1003
SPEED CONTROL
SERVO LOCATION
G104
C140
RABS TEST
CONNECTOR
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM G104
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
G105
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C158
HORN
C1017
LEFT FRONT
SIDE MARKER
LAMP
C108
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
PARK/TURN
LAMP
C1019
LEFT
HEADLAMP


C273
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C104
TO C159
ENGINE
COMPARTMENT
LAMP
G104
C272
BLOWER
MOTOR
C1003
SPEED CONTROL
SERVO LOCATION
POWER
DISTRIBUTION
BOX
C140
RABS TEST
CONNECTOR
G101
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM A/C
CLUTCH FIELD
COIL
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C158
HORN
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C1018
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD
COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
SIDE MARKER
LAMP
C1019
LEFT
HEADLAMP
C1017
LEFT FRONT
SIDE MARKER
LAMP

Engine Compartment Components.

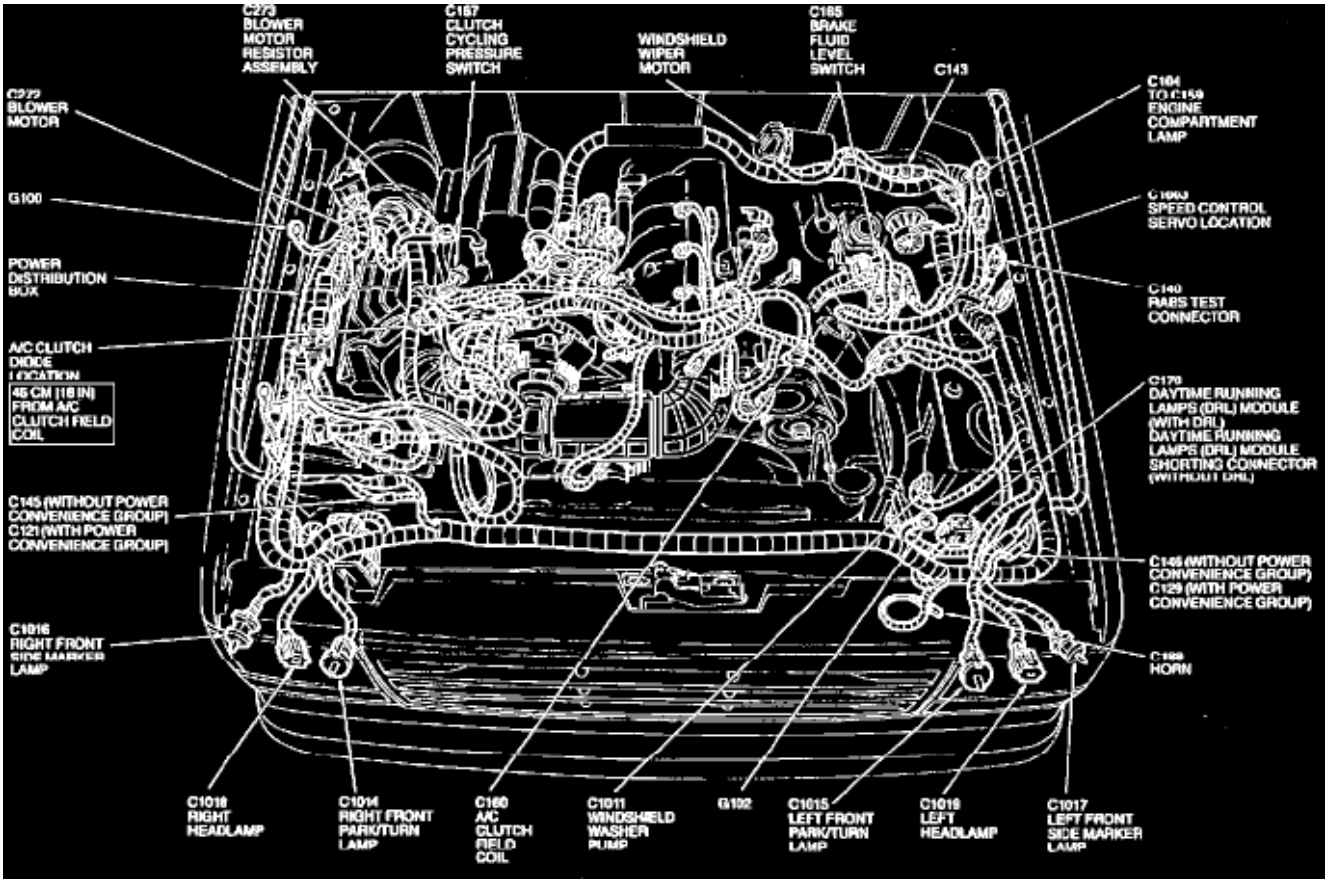
Center Of RH Fender Apron, Above Wheelwell

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

Applicable to: 3.0L/V6-181

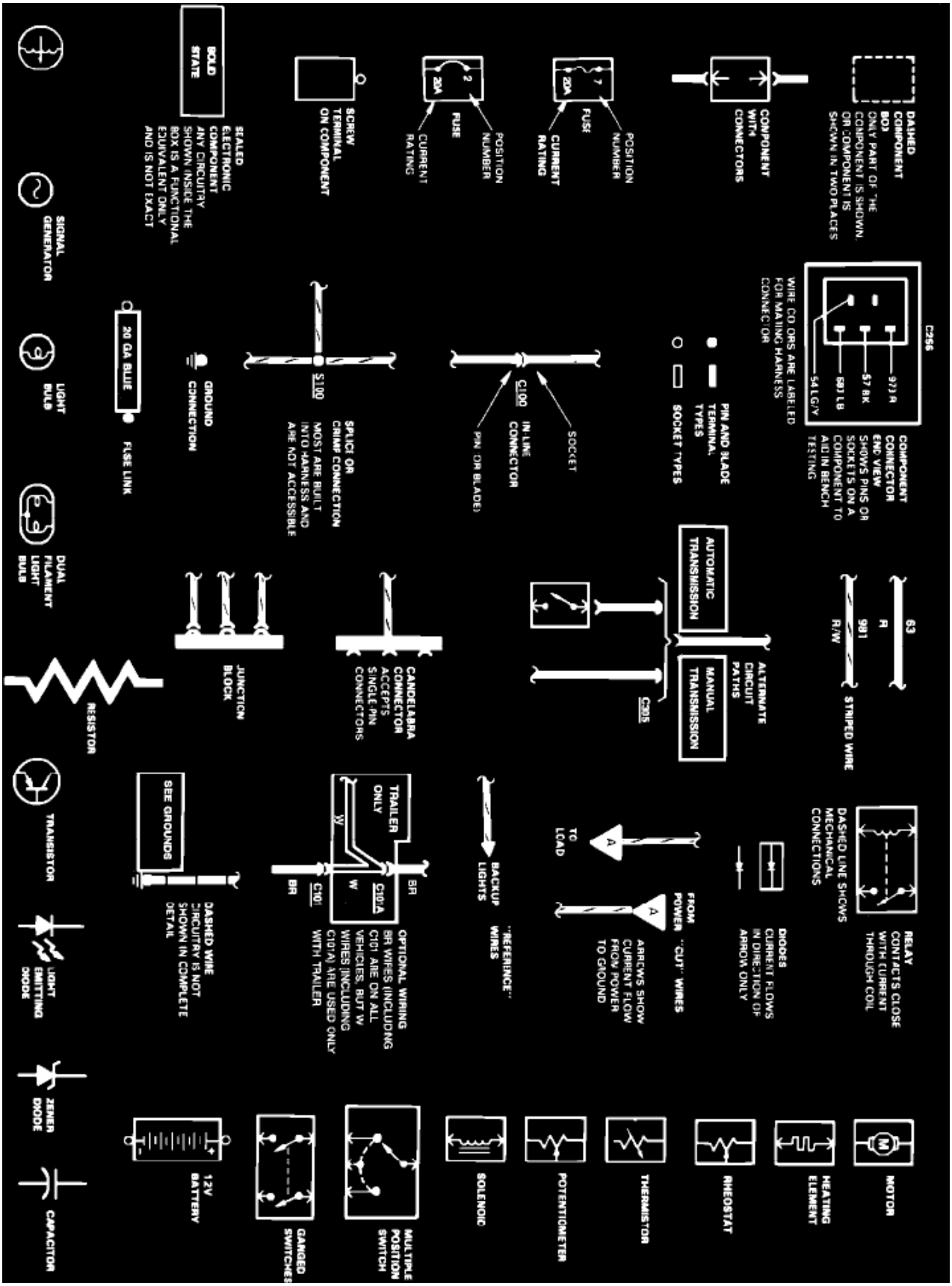


Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

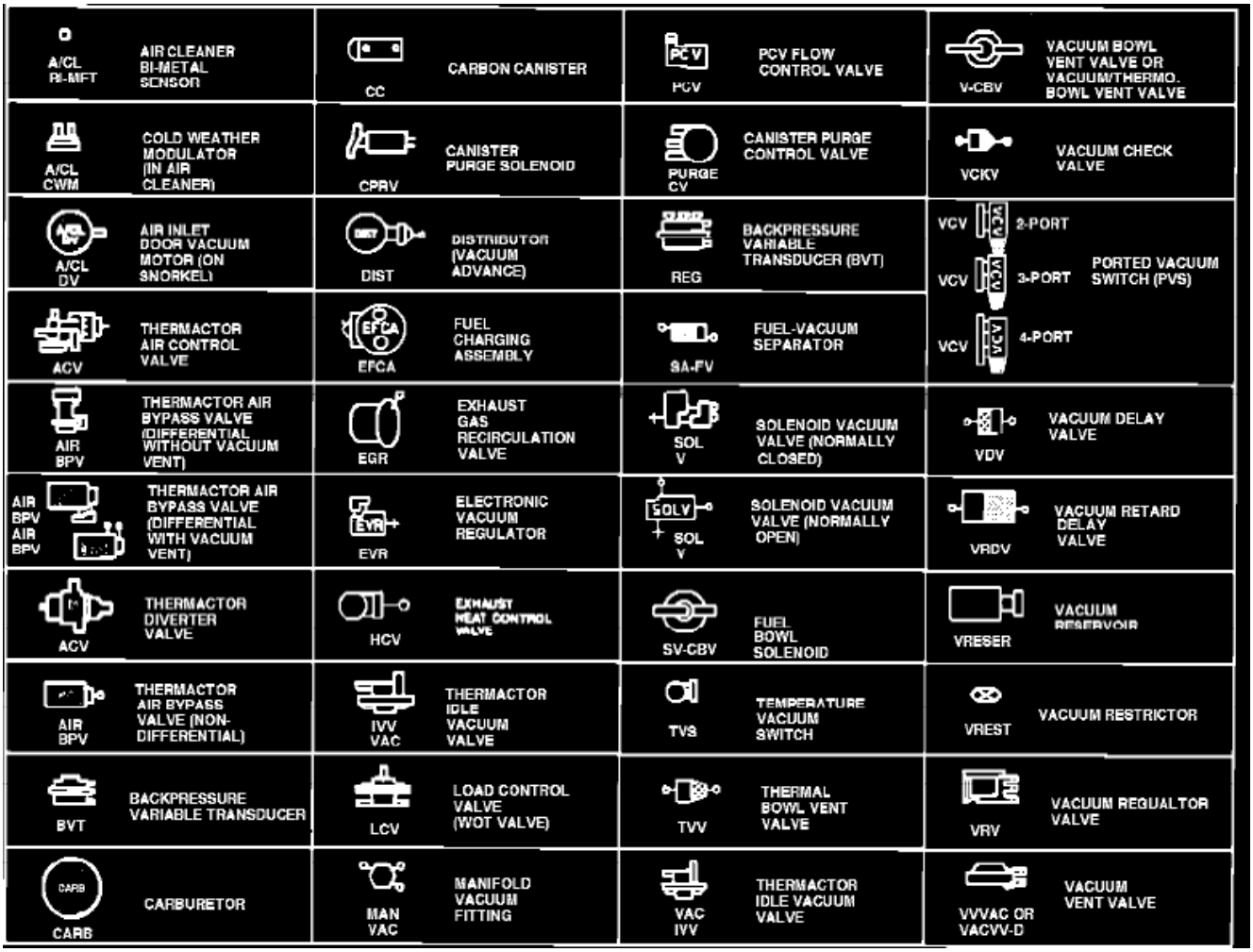
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Maintenance > Fuses and Circuit Breakers > Fuse Block > Component Information > Diagrams > Diagram Information and Instructions

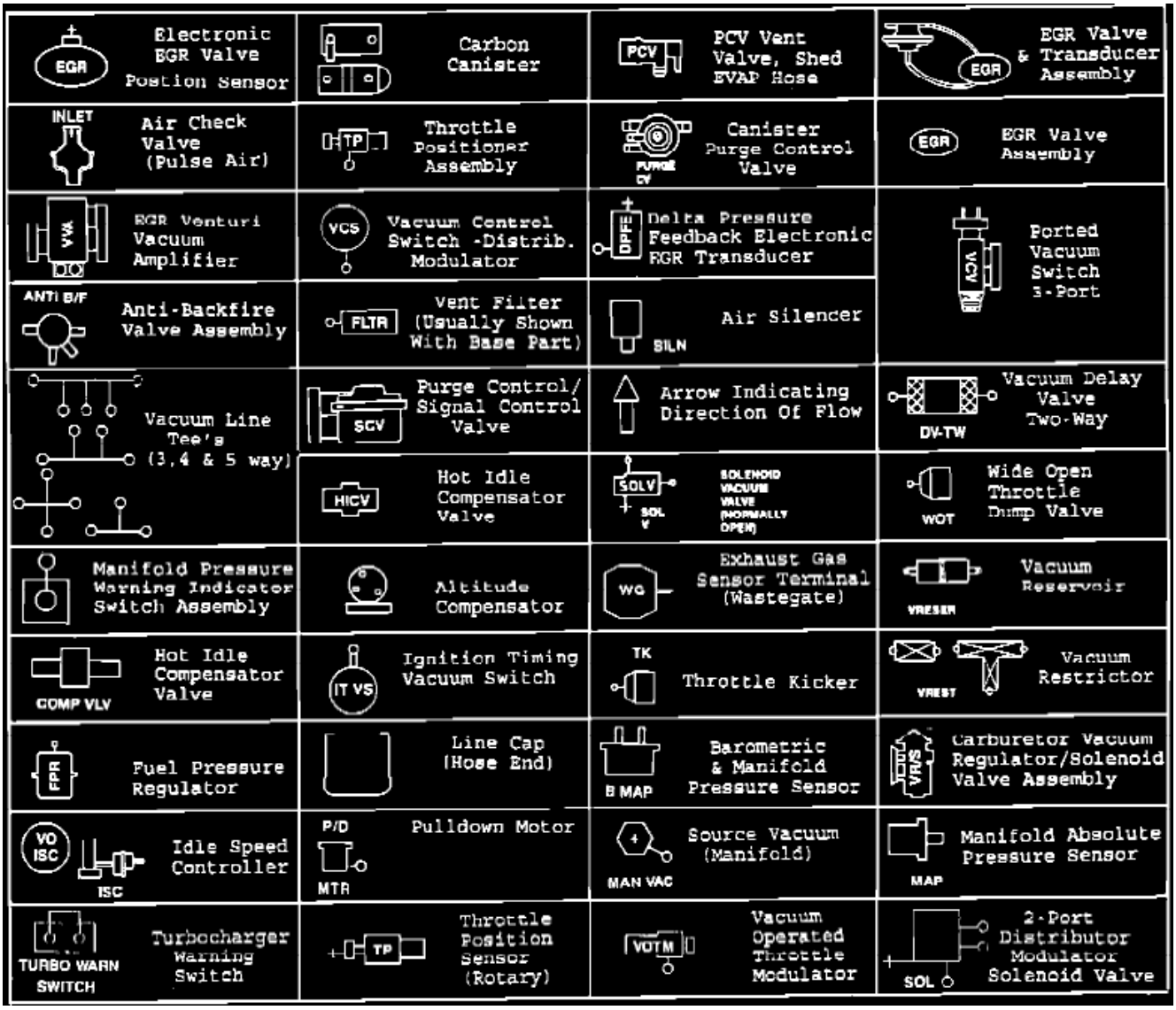


Fuse Block: Diagram Information and Instructions

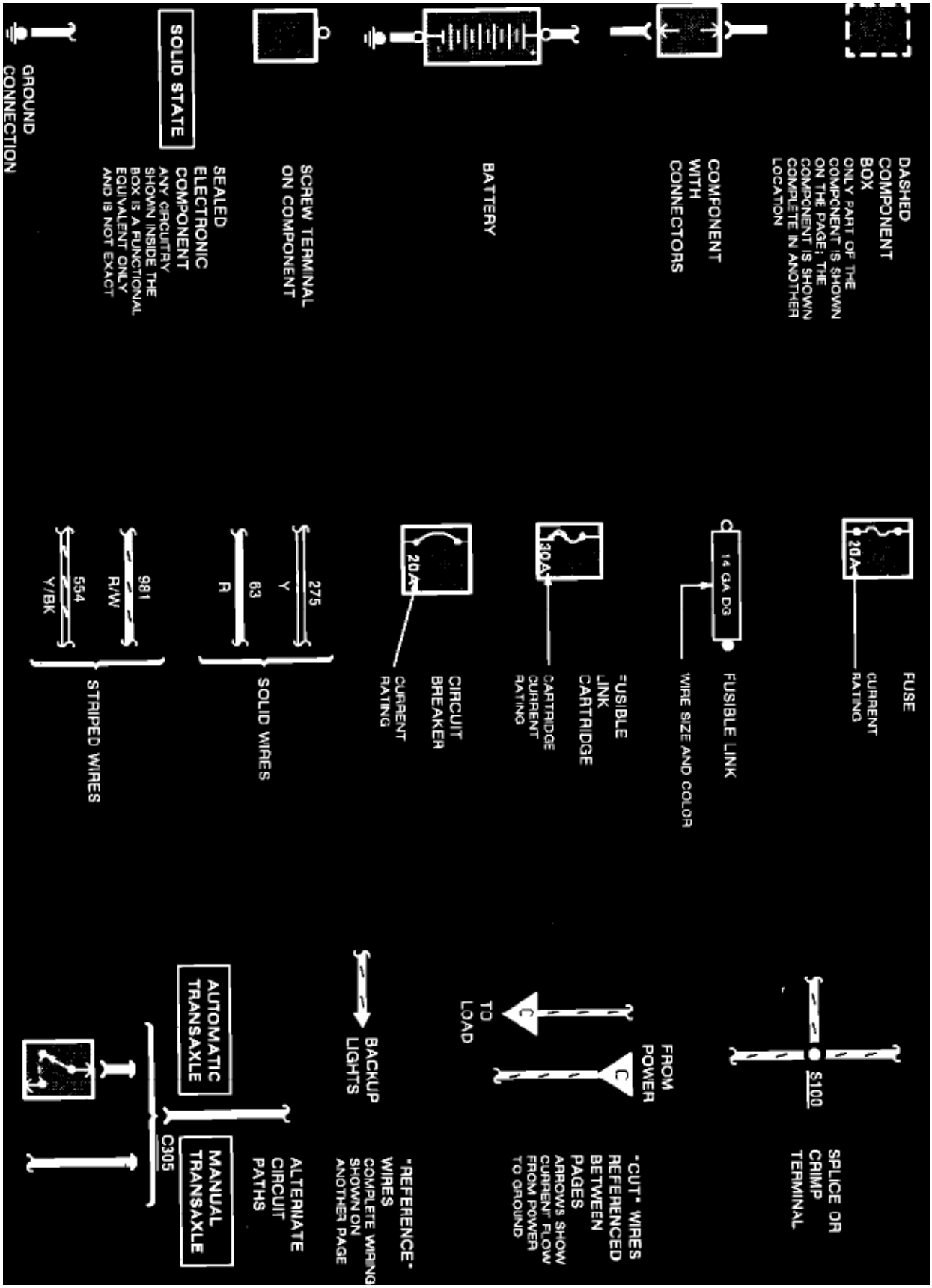
Symbol Identification



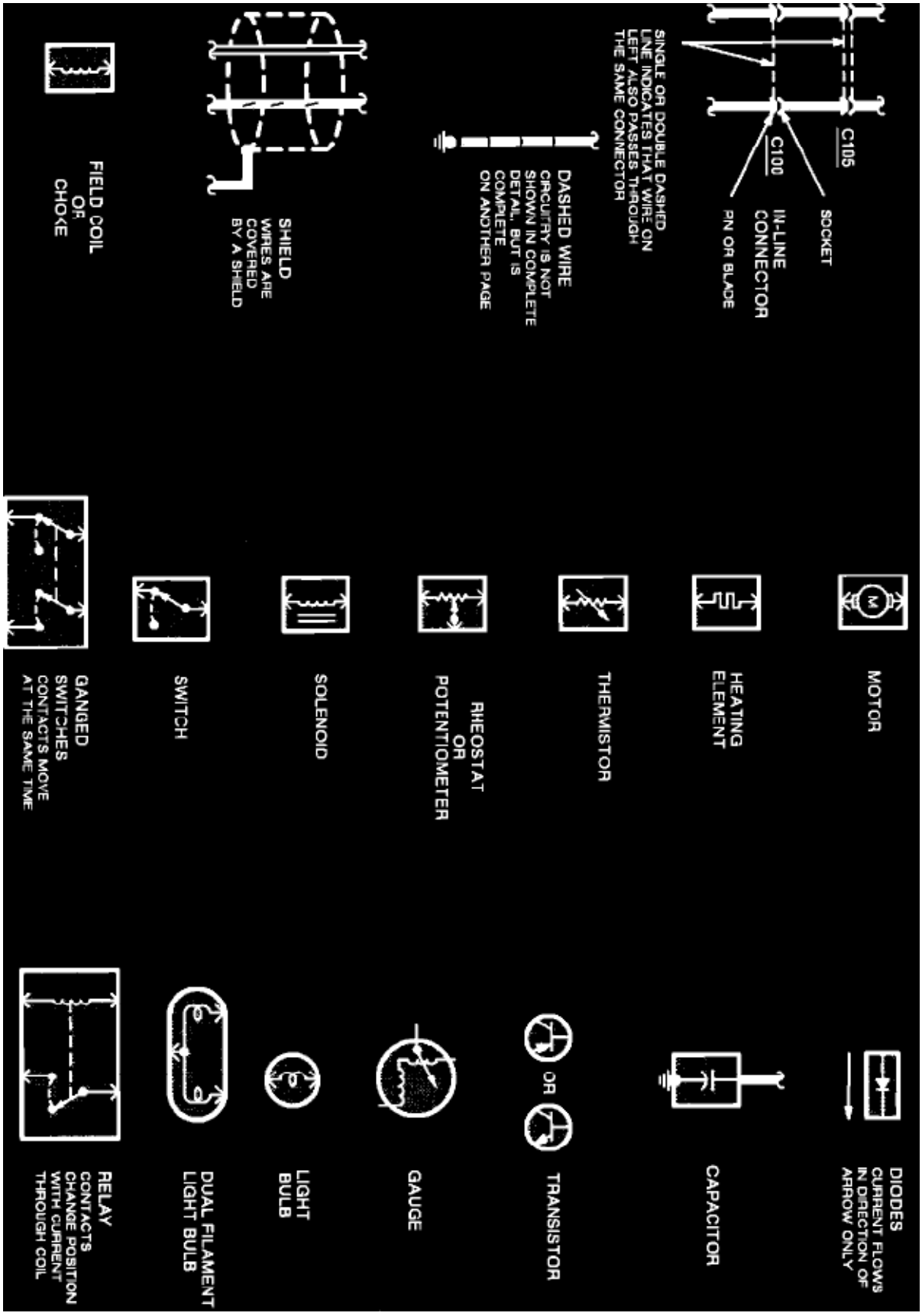
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
TO LOAD
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

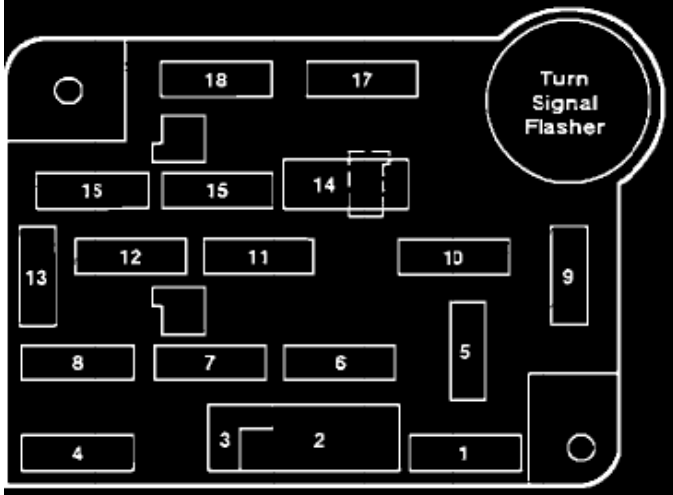
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Fuse Position	Amps	Circuits Protected
1	15	Radio, Dome/Cargo Lamps
2	6 c.b.	Windshield Wipers
4	15	Stop/Hazard Lamps
5	15	Turn Lamps, Backup Lamps, Brake Fluid Level Sensor
6	—	Not Used
7	10	A/C Compressor Control
8	20	Horn
9	30	Air Conditioner/Heater
10	15	Lamps on Warning, Park/License Lamps
11	15	Radio, Electric Shift Control, Speed Contro
12	20 c.b.	Multi-Function Switch, Cigar Lighter, Power Lumbar Seats
13	10	Instrument Illumination
14	30 c.b.	Power Windows
15	20	Rear Anti-Lock Brakes
16	—	Not Used
17	15	Electric Shift Control, Warning Chime Module, Low Oil Level Relay, Instrument Cluster
18	10	HEGO

Power Distribution

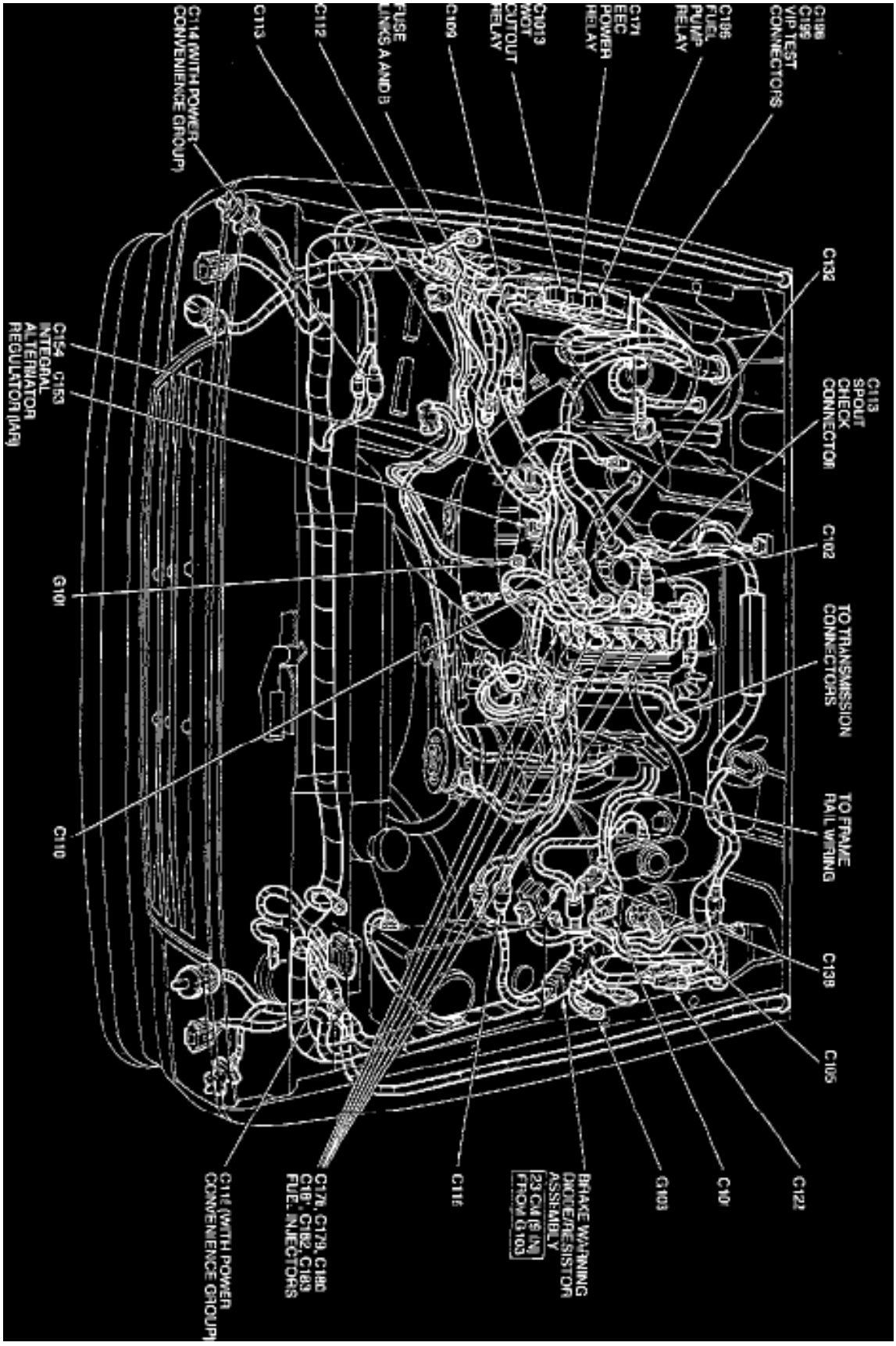
The alternator is connected to maxi-fuses within the power distribution box which is then connected together with the Battery at the starter relay hot terminal. Circuits and components are protected by maxi-fuses. Low power circuits are also protected by fuses.

The Ignition Switch and Main Light Switch are powered at all times, as are Fuses 1, 4, 8, 10 and Circuit Breaker 12 in the Fuse Panel. The other fuses are powered through the Ignition Switch or the Main Light Switch.

Position 3 is not used and is covered by Circuit Breaker 2.

Fuse Panel Details

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Maintenance > Fuses and Circuit Breakers > Fusible Link > Component Information > Locations > Fuse Link A

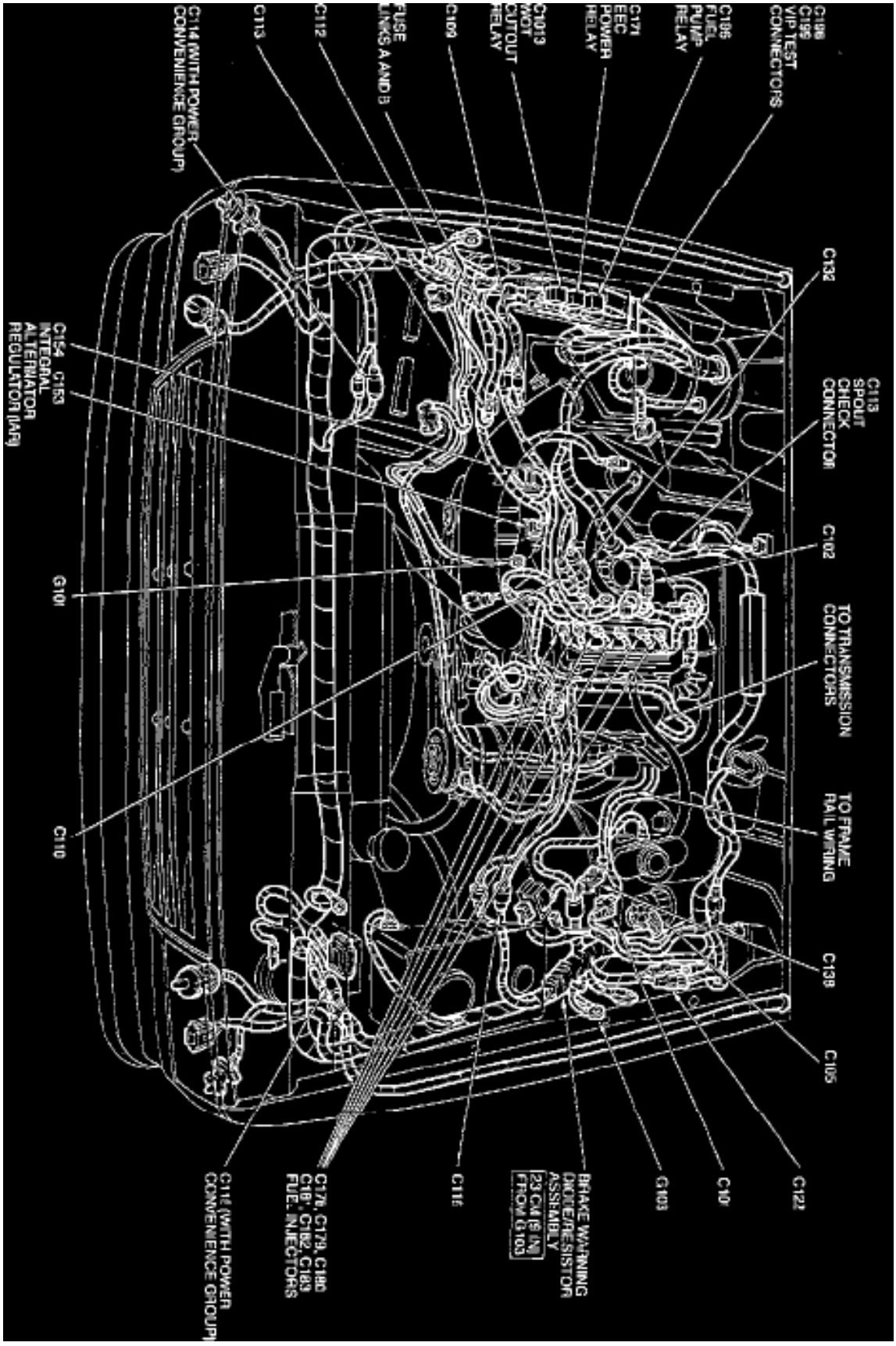


Fusible Link: Locations Fuse Link A

Engine Compartment Components.

RH Fender Apron, At Starter Relay

Applicable to: 2.9L/V6-179


C198
C196
VIP TEST
CONNECTORS
C196
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
KNOT
CUTOUT
RELAY
C109
FUSE
LINKS A AND B
C112
C113
C114 (WITH POWER
CONVENIENCE GROUP)
C154 C153
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
G101
C110
C134
C113
SPOUT
CHECK
CONNECTOR
C102
TO TRANSMISSION
CONNECTORS
TO FRAME
RAIL WIRING
C139
C105
C122
C107
G103
BRAKE WARNING
(MUTE) RESISTOR
ASSEMBLY
23 CM (9 IN)
FROM G103
C11E
C178, C179, C180
C181, C182, C183
FUEL INJECTORS
C114 (WITH POWER
CONVENIENCE GROUP)

Fusible Link: Locations Fuse Link B

Engine Compartment Components.

RH Fender Apron, At Starter Relay

Applicable to: 2.9L/V6-179

Malfunction Indicator Lamp: Technical Service Bulletins Connector, DIS Ignition Revised

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Malfunction Indicator Lamp: Locations

The Malfunction Indicator Light (MIL) is located on the instrument cluster. The MIL will show CHECK ENGINE when illuminated.

Malfunction Indicator Lamp: Description and Operation

The Malfunction Indicator Light (MIL) is mounted in the dash and reads CHECK ENGINE or SERVICE SOON. The MIL will ILLUMINATE when the engine is operating in Failure Mode Effects Management (FMEM). The light will stay ON as long as there is a fault in the system. The MIL can also be used to retrieve fault codes from the Electronic Engine Control (EEC) system when the self test mode is entered.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

Oil Level Warning Indicator: Description and Operation

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

Oil Level Warning Indicator: Testing and Inspection

With oil level at FULL mark on oil dipstick and engine oil warm to assure that oil drains properly from oil sensor, turn ignition on and start engine. Warning lamp should come on briefly in Start for bulb test, then go out. Turn engine off. Drain 2 quarts of oil from engine. Wait approximately 5 minutes, then restart engine. Warning lamp should come on and stay on. If warning lamp does not come on check fuse, low oil level relay, low oil level sensor and lamp.

Ford Motor Company

October 2001

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77 Supplement 7:** 10/12/01 Updated Information

REFERENCE: **Owner Notification Program 01B77 – Ford Wilderness AT Program:** Replacement of Wilderness AT tires

PROGRESS TO DATE

- To date we have replaced close to 7 million tires or 55% of the total tires needed
- Ford and Mercury dealers are currently handling over 70% of all Wilderness AT replacements
- All tire sizes are now readily available, though certain brands may not be available

The following information has been updated for ONP 01B77:

CHANGES MADE TO THE ALL DEALER LETTER

- ONP 01B77 – Ford Wilderness AT program will expire on March 31, 2002
- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- All customers who have not had their tires replaced will receive a follow-up letter by the end of October, 2001 announcing these program changes and encouraging them to visit a Ford Motor Company dealership for tire replacement
- 1995 and 1996 F-150 customers, which were added to the program on August 17, 2001, will receive their first notification letter by the end of October, 2001, which includes the following:
  - The customer must have their tires replaced at a Ford Motor Company dealer
  - They will only be eligible for refunds if they purchased their tires between August 1, 2000 through October 31, 2001

    NOTE: Refunded at actual cost and no DOT sections required, since these customers were never notified of the DOT requirements and maximum dollar limit.
- Effective immediately all tire refund requests are to be processed through the dealer (Online Refund Form should no longer be used)

CHANGES TO ATTACHMENT I

- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- The Online Refund Form used for refunds before May 22, 2001 is no longer posted on the web

CHANGES TO ATTACHMENT II

- Wait List Survey link added
- A procedure has been added to handle customers who purchase tires after November 15, 2001 and are seeking a refund

All revisions since Supplement 6 are in *red italics* and revised pages have been marked "*Revised10/12/01.*"

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Technical Service Bulletin # 01B77 Date: 011001

Ford Motor Company

May 2001
Revised 10/12/01

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77-S7 – Ford Firestone Wilderness AT Program:** Replacement of Firestone Wilderness AT tires.

OASIS: Yes
OWNER LIST: Yes
PARTS RETURN: No
PROGRAM TERMS: This program will expire *March 31, 2002* and has no mileage limit.

WHAT WE ARE DOING AND WHY

On August 9, 2000 Firestone initiated a voluntary recall of 6.5 million tires, including 3.8 million P235 75R15 Radial ATX tires manufactured since 1990 at all North American Firestone plants. Also, Firestone recalled about 2.7 million P235 75R15 Wilderness AT tires made at its Decatur, Illinois plant. The recall included both original equipment and replacement tires. As of January 22, 2001 more than 6.1 million tires have been replaced – the recall is more than 94% complete.

Under this new owner notification, Ford will replace 13 million Firestone Wilderness AT tires on Ford and Mercury SUVs and pickup trucks listed below under "affected tires and vehicles." This is a voluntary precautionary measure. Ford made the decision to take this action after extensive examination of field data as well as laboratory and track testing in close collaboration with NHTSA. The field data, along with our testing and statistical analysis, shows a directional trend toward elevated failure rates, that differs based upon where the tires were manufactured. Ford does not have sufficient confidence in the future performance of these tires, so we are acting in the interest of our customers to ensure their continued trust and confidence.

To date we have replaced close to 7 million tires or 55% of the total tires needed for this program. Ford and Mercury dealers are currently handling over 70% of the Wilderness AT tire replacements. Also, with the increased availability of all 15-, 16-, and 17-inch tires at the dealers, Ford is changing the expiration date of the program to March 31, 2002 to encourage customers to have their tires replaced as soon as possible.

NOTE: Certain brands of tires may have limited availability.

AFFECTED TIRES AND VEHICLES

This program affects 15-, 16-, and 17-inch Firestone Wilderness AT tires and Ford and Mercury vehicles with these tires on them. The vehicles listed below may have been originally equipped with Firestone Wilderness AT tires or may have had Wilderness AT tires installed during the Firestone recall launched in August, 2000.

- Certain 1991 through 2002 Ford Explorer
- Certain 2001 through 2002 Explorer Sport, and Sport Trac
- Certain 1997 through 2002 Mercury Mountaineer
- Certain 1991 through 2001 Ranger
- Certain 1999 through 2001 Expedition
- Certain 1991 through 1997 F-Series
- Certain 1991 through 1994 Bronco

NOTE: Both original equipment (OE) and replacement tires are affected.

IMPORTANT FACTS

- *Ford Wilderness AT tire program will expire on March 31, 2002.*
- *Tires purchased by customers after November 15, 2001 will no longer be eligible for a refund.*
- *A follow-up owner letter announcing program changes will be mailed beginning the week of October 17, 2001.*
- *1995 and 1996 F-150 owners, which were added to the program on August 17, 2001, will be notified by the end of October 2001.*
- All 15-, 16-, and 17-inch Firestone Wilderness AT tires (regardless of series number) that are mounted on Ford or Mercury vehicles are eligible for replacement.
- All other Firestone Wilderness AT tire sizes are not included in this program.
- AtW/Ford Tire Program dealers are to stop the sale of Firestone Wilderness AT tires in their parts inventory effective immediately.
- Ford Motor Company has notified customers of this owner notification program via first class mail.
- Customer refunds will be handled differently based on whether the tires were purchased before or after May 22, 2001.
- *Effective immediately all refunds will be processed through the dealer for customers who purchased their tires from August 1, 2000 through November 15, 2001, (Online Refund Form should no longer be used).*
- *1995 and 1996 F-150 owners will only be eligible for refunds for tires purchased between August 1, 2000 and October 31, 2001, (no DOT sections required).*
- A list of Ford-approved replacement tires is posted on QCDealer. Only these tires may be used as replacement tires for vehicles that were originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires under this program.
- There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.
- **Vehicles with branded titles** - although normally excluded from Owner Notification Programs are included as part of this program.
- Affected vehicles sold in Canada can be serviced by U.S. dealers, and affected vehicles sold in the U.S. can be serviced by Canadian dealers.

STOP SALE OF FIRESTONE WILDERNESS AT TIRES IN DEALER STOCK

Firestone Wilderness AT tires in stock at Ford and Lincoln Mercury dealers enrolled in the Around the Wheel or Ford Tire Program (Certified Tire Dealers) should not be sold. Dealers that purchased these tires through the Ford program and have them in stock should complete the *Unsold Wilderness AT Credit Form* located on QCDealer.com. If you have questions, call the Ford Tire Hotline at 1-888-353-3251 for disposal and credit information.

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

Non-Certified Tire (AtW or Ford Tire Program) Dealers who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program) or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "**SCHP**" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

SERVICE PROCEDURE

All 15-, 16-, and 17-inch Firestone Wilderness AT (regardless of series number) tires installed on Ford and Mercury vehicles must be replaced under this owner notification program. Original equipment (OE) and replacement tires are included.

Spare Tires

Firestone Wilderness AT (regardless of series number) spare tires are affected and should be replaced. The Firestone P235 75R15 ATX temporary spare tire used on Ranger vehicles is not included in this program.

Note: Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

Note: When processing refunds for customers, inspect the spare tire; if the spare tire is a Firestone Wilderness AT (with the Ranger exception noted previously) replace the spare tire using the information provided on Attachment II.

Does Current Tire Condition Affect Replacement Procedure?

All affected tires should be replaced regardless of the mileage or the remaining tread on the tire. If the customer caused damage to the tires, i.e. hit a curb, accident, under inflation, alignment issues, the tire should still be replaced. If the tire is worn out, it should still be replaced.

What if the Vehicle has a Mix of Affected and Non-Affected Tires?

- If the spare tire is the only Wilderness AT, then only the spare should be replaced (see exception on temporary spares above).
- In most cases an owner's vehicle will have all 15-, 16-, or 17–inch Firestone Wilderness AT tires installed and require replacement of all tires. In cases where a vehicle has a mix of tire brands/sizes installed, replace all Firestone Wilderness AT tires and the remaining tires to match the tire brand and size by axle.

For example, if a vehicle has a Wilderness AT on the left front, a Wilderness AT on the right rear, a Wilderness AT for a spare, and the other two tires are not Wilderness AT; the spare and the left front and right rear should be replaced and the new tires should be installed on the same axle. The customer should also be advised that all tires should be the same size especially on 4 X 4 models.

What replacement tires may be used for vehicles originally equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires?

Replacement tire(s) must be on the list of tires approved by Ford <link to approved tire list>. Any deviation from this approved list may change the vehicles handling, ride, vibration, and noise characteristics and cannot be claimed through Ford.

If customers are seeking reimbursement for tires purchased outside of a Ford Certified Tire Dealer, refer to Attachment I for reimbursement guidelines and claiming procedures. *Customers who purchase tires after November 15, 2001 are not eligible for a refund.*

Note: There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

Note: "Blemished" tires may not be used as replacement tires under this program.

FORD AND LINCOLN MERCURY DEALER TIRE DISPOSAL PROCESS

- Tires that are removed from vehicles must immediately be made unusable by either cutting the bead through the DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request. Marking the last 6 characters of the VIN on the removed tire(s) is no longer required.
- The tires will be disposed of by using the "National Tire Recovery and Recycle Program".

Regional FCSD and independent personnel will be randomly auditing dealers for proper tire scrapping and claiming procedures. Any infractions will result in prior approval for tire owner notification claims.

Note: Make removed tires unusable during tire replacement. Do not stack tires and disable them at a later time.

DEALERSHIPS ELIGIBLE TO REPLACE TIRES UNDER THIS PROGRAM

All Ford and Lincoln Mercury dealers enrolled on the Around the Wheel or Ford Tire Program (Certified Tire Dealers) are eligible to complete tire replacements under this program.

Ford dealers interested in joining the Ford Tire Program may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

APPROVED RETAILERS PARTICIPATION IN PROGRAM

We have developed a program to authorize Goodyear, Michelin, Continental, and General tire retailers to perform tire replacements at no cost to customers. These eligible retailers will use only tires from the Ford Approved Tire List when performing no cost replacements. This was done to reduce customer inconvenience by:

- Eliminating customer out of pocket expense
- Maximize the number of customers whose replacement tires are those on the Ford Approved tire list
- Expedite the completion of this program
- Reduce administrative burden on our Ford and Lincoln Mercury dealers
- Reduce dealer tire disposal responsibility
- Allow dealers to continue with their normal day to day service business

ATTACHMENTS

Attachment I:	Administrative Information
Attachment II:	Labor Allowances and Parts Ordering Information
Attachment III:	Technical Information

CONTACTS

Claims Information:	1-800-423-8851
For Around the Wheel/Ford Tire Program Questions:	1-888-353-3251
Ford Tire Inquiry Hotline (Customer):	1-866-300-1226
Other (Dealer Only) Program Questions:	1-800-325-5621
Tire Registration for Federal Regulations Questions:	1-330-794-9190

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Attachment I - Administrative Information

OASIS

OASIS must be used to determine vehicle eligibility.

IMPORTANT:

When an eligible vehicle is at the dealership for service, OASIS must be contacted to determine if Owner Notification Program 01B77 is open. If 01B77 is listed in OASIS as open, it is important that the vehicle is inspected for eligible tires. If the eligible vehicle is not equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires a claim must be submitted using labor operation 01B77A to close the program. If an affected vehicle does not have 01B77 open, this may indicate that a refund

or tire replacement has already been processed on this vehicle.

Some Ford and Lincoln Mercury vehicles not listed in the AFFECTED TIRES AND VEHICLES list may have 15-, 16-, or 17-inch Firestone Wilderness AT tires installed. These vehicles are covered under this program, but will not be active in OASIS. Contact the Special Service Support Center at 1-800-325-5621 to obtain prior approval before performing the repair or issuing a refund. This will insure that a previous repair/refund has not been performed on the vehicle.

CLAIMS PREPARATION AND SUBMISSION

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ Enter the full part number of the replacement tire with the quantity of tires replaced. Tires will be reimbursed at AtW Dealer cost + 25% (wheel weights and valve stems incl.).

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier. Dealers are encouraged to arrange for shipment of 4 or more tires at a time.

^ Dealers can no longer claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program". You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires on the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry.

RELATED DAMAGE

Vehicle damage caused by a tire related failure is not covered by this program. Refer to the Warranty and Policy Manual for proper claiming procedure for vehicles covered by the Ford Bumper-to-Bumper Tire Warranty (model years 2001 and 2002). All other pre-2001 model year vehicles with alleged tire related vehicle damage should be handled through the Firestone claims process, or by referring the customers to their insurance company.

Damage related to replacement of tires should be handled as described in the Warranty and Policy Manual.

OWNER REFUND

With the increased availability of replacement tires, it will no longer be necessary for customers to pay out-of-pocket expenses for tires. Therefore, refund requests for tires purchased after November 15, 2001 will no longer be granted. Owners will be notified of the refund expiration date and will be directed to a Ford or Mercury dealer They are directed to an authorized retailer only if the Ford or Mercury dealer cannot meet their scheduling needs or tires are not in stock. All Ford and Mercury dealers (AtW and non-AtW dealers) are required to process refunds for customers who purchase tires prior to November 15, 2001.

The following rules apply to refunds for tires purchased from August 1, 2001 through November 15, 2001:

Refunds will be processed for vehicles listed under "AFFECTED TIRES AND VEHICLES", and for other Ford and Lincoln Mercury vehicles that have 15-. 16-, or 17-inch Wilderness AT tires installed.

^ The customer must provide the original paid receipt (a copy of their paid receipt is acceptable on an exception basis in instances where the owner requires the original for another purpose (e.g. extended tire warranty or purchase rebate). The dealer will attach the receipt to the dealer file copy of the refund claim (see claim instructions below).

^ Dealers will be reimbursed to immediately disable tires returned for a refund (see claiming instructions for refunds and Attachment II for labor operations).

^ The tires must be purchased August 1, 2000 through November 15, 2001 to be eligible for a refund (through October 31, 2001 for 1995 and 1996 F-150 owners).

^ Customers requesting refunds for tire replacement May 22, 2001 through November 15, 2001 must provide either:

NOTE:

This does not apply to 1995 and 1996 F-150 customers.

^ The Firestone Wilderness AT tires that were replaced. Returned tire(s) are to be disabled by the dealership. Ford will reimburse the dealer to disable (see claim instructions below and use labor operation 01B77G). If tires are brought in for refund with the DOT codes missing dealers should not process the refund.

^ A section of the old tire(s) containing the DOT codes from each of the Firestone Wilderness AT tires that were replaced (To be cut from the Wilderness AT tires that were replaced by the outside repair facility) (use labor operation 01B77L). Dealers should deface (cut in pieces or make code unreadable) the DOT sections of the tire so they cannot be used to obtain another refund. If sections are brought in for refund with the DOT code defaced dealers should not process the refund.

NOTE:

The DOT Code Identification Guide has been developed to help dealers determine if the DOT sections returned to the dealership are from 15-, 16-,

Purchase Date Range	Refund Guidelines
August 1, 2000 through May 22, 2001	• The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
1995 and 1996 F-150 vehicles only *August 1, 2000 through October 31, 2001*	• *The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes (no DOT required)* • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
May 23, 2001 through November 15, 2001	• 15 inch tires - $110 (includes mounting, balancing, stems, disposal, and taxes) • 16 and 17 inch tires - $130 (includes mounting, balancing, stems, disposal, and taxes) • Dealers process refunds
After November 15, 2001	• *No refunds accepted for tires purchased after November 15, 2001*

Refund Questions	What is the owner qualified to receive?
Example: On December 21, 2000 the customer paid to have (4) Firestone Wilderness AT tires replaced on an affected vehicle.	o August 1, 2000 through May 22, 2001 (October 31, 2001 for 1995 and 1996 F-150) full refund with paid receipt o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
Example: On January 15, 2001 the customer paid to have (2) Wilderness AT tires replaced on a 1988 F-Series truck. The other tires are non-Firestone Wilderness AT.	o August 1, 2000 through May 22, 2001 – full refund with paid receipt o Dealer contacts Special Service Support Center at 1-800-325-5621 for approval code o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

or 17-inch Firestone Wilderness AT tires. Use the DOT Code Identification Guide in conjunction with the bulletin section "What if the Vehicle has a Mix of Affected and Non-Affected Tires" to determine how many tires are eligible for refund.

NOTE:

Ford will allow customers to file for a refund (with or without tires) for tires purchased after May 22 through June 30, 2001 because customers may not have tires to turn in. Customers must provide a paid receipt indicating tire replacement before July 1, 2001 in order to process a refund without tires or DOT sections. Customers who purchase tires after June 30, 2001 must provide tires or DOT sections.

Ford will reimburse customers the following amounts:

^ Tires purchased from August 1, 2000 through May 22, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes.

^ (1995 and 1996 F-150 vehicle only) Tires purchased from August 1, 2000 through October 31, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes. No DOT section required.

^ Tires purchased May 23, 2001 through November 15, 2001, the actual cost as stated on the receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes up to a maximum of $110 per tire for 15 inch, and $130 per tire for 16 and 17 inch tires.

^ Refunds will not be granted for tires purchased after November 15, 2001.

Note:

If an owner pays for the replacement of their tires after November 15, 2001, the dealer may handle on a case by case basis following the procedure in Attachment II.

Refund Questions	What is the owner qualified to receive?
Example: On May 27, 2001 the customer took their 1998 Explorer to an outside tire retailer and had (5) Firestone Wilderness AT 16 inch tires replaced.	o After May 22, 2001 refund tire replacement with paid receipt up to: o 15 inch = $110 (maximum per tire) o 16 and 17 inch = $130 (maximum per tire) o With a paid receipt this customer would be entitled to (5) tires x $130 (16 inch maximum per tire) = $650 refund (includes mounting, balancing, stems, disposal, and taxes) o Dealer will be eligible to claim for refund allowance using labor operation 01B77L o If the customer returns the old tires to the dealer o The dealer will disable the old tires and dispose of them using the *"National Tire Recovery and Recycle Program"* using labor operation 01B77G (disable) in conjunction with 01B77L (refund allowance) o Customer does not need old tire(s) *since tires purchased prior to July 1, 2001* (After June 30, 2001 customer will need old tires or removed DOT codes from replaced tires to qualify)
Example: On December 2, 2000 the owner replaced their (5) Firestone Wilderness AT tires with another set of Wilderness AT tires.	o The owner is not eligible for refund o The owner is eligible for tire replacement only o Use only tires from the "Ford Approved Tire List"
Example: *On November 16, 2001 the owner purchases tires from a tire retailer.*	o *No refund will be granted after November 15, 2001* o *Dealers may handle on a case-by-case (See Attachment II)*
Example: *On October 10, 2001 a 1995 F-150 owner purchases tires from a tire retailer.*	o *August 1, 2000 through October 31, 2001 – full refund with paid receipt* o *Customer does not need old tire(s) or DOT section(s)* o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

CLAIMS PREPARATION FOR REFUNDS (USE THIS PROCEDURE FOR ALL REFUND REQUESTS)

NOTE:

Tires must be purchased prior to November 15, 2001

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ When a customer brings in their old tires and is seeking a refund, use labor operation 01B77G (disable) and 01B77L (refund administration allowance) from Attachment II.

^ If a customer brings in the old DOT codes removed from the old tires - use labor operation 01B77L only.

^ The Miscellaneous Expense Code "ADMIN" will not be accepted under this program. A labor operation 01B77L has been provided to cover administrative costs.

^ Enter REFUND in the miscellaneous area of the claim.

^ Dealers will no longer be able to claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program" You may still claim any applicable local waste tax - enter OTHER

in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires in the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry. If the tires were replaced prior to May 23, 2001 (or November 1, 2001 for 1995 and 1996 F150 customers) the DOT may not be available, in this case record the brand, make and size of the tires in the technician comments area of the claim.

RENTAL CARS

TAP allowances have been increased specifically for this owner notification program. Refer to Don Brunner letter.

DOT REGISTRATION OF NEW TIRES

Dealers are required to register the DOT number of every tire sold to meet federal tire registration requirements. Ford has established a partnership with CIMS to assist dealers in registering these DOT codes. Information is available on QCDealer.com under CIMS Tire Registration or by contacting CIMS

Description	Labor Operation	Labor Time
Inspect for non-Wilderness AT tires (used to close 01B77 not for use when processing a refund)	01B77A	0.2 Hours
Replace & balance 1 tire (to be used for spare tire only)	01B77B	0.4 Hours
Replace & balance 2 tires (one axle)	01B77C	0.6 Hours
Replace & balance 3 tires (one axle plus spare)	01B77D	0.8 Hours
Replace & balance 4 tires (both axles)	01B77E	1.0 Hours
Replace & balance 5 tires	01B77F	1.2 Hours
Disable up to five tires (used only for refund claims)	01B77G	0.2 Hours
*Refund administration allowance (to be used when processing a customer refund without tire disposal, if tires are returned to dealership for disposal use in conjunction with operation 01B77G)	01B77L	0.2 Hours
Administrative Allowance for Non-Certified Tire Dealers (AtW or Ford Tire Program) to be used when sending a dealer stock unit, or customer vehicle (for tire replacement) to a Certified Tire Dealer, or tire retailer authorized to perform tire replacement under this program	Misc. Expense use code "SCHP"	$15.00

NOTE: Front-end alignment is not included in this program.

***NOTE:** When processing a refund for four (4) road tires, the non-temporary spare tire should be replaced as part of this program – file a related damage claim to cover the spare tire replacement.

at 330-794-9190.

NON-FORD OR LINCOLN MERCURY VEHICLES WITH FIRESTONE WILDERNESS AT

Non-Ford or Lincoln Mercury vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires installed by a Certified Tire Dealer (AtW or Ford Tire Program) are eligible for replacement. The repair should be submitted using a Warranty/ESP claim type form. The dealer must enter Program Code "P19", this will allow the repair to be submitted without a VIN. The causal part must be TIRE, with the actual part numbers for reimbursement at dealer cost plus 25%, and use actual time for labor reimbursement. These types of claims cannot be submitted as an Owner Notification Repair type.

Attachment II - Parts and Labor Information

LABOR ALLOWANCES

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

NOTE:

Non-Certified Tire Dealers (AtW or Ford Tire Program) who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program), or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "SCHP" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

PARTS REQUIREMENTS

Tire Ordering Information

^ Dealers are required to install only tires from the Approved Tire List for vehicles originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires. Dealers should immediately order replacement tires for inventory.

^ Certified Tire Dealers will order replacement tires through normal channels.

^ Dealers not authorized for the Around the Wheel Program will not participate in this recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

TIRE AVAILABILITY:

All dealers should check QCDealer.com daily for updates to the approved tires list. Distributors and tire retailers will allocate tires as best they can on a daily basis. Your dealership should do the following to ensure that you are able to secure your fair allotment of these limited volumes:

^ Contact your Ford authorized facing distributor(s) for each tire manufacturer.

^ Contact your Ford authorized facing tire retailers for each tire manufacturer.

^ Review with these supply points the volume of tires you need to ensure you have tires ready to fill orders with every supply point.

Questions not addressed by above sources should be directed to your market area team.

CUSTOMER WAIT LISTS:

Dealers should create a customer wait list and record: Customer name

^ Address and phone number

^ Vehicle make

^ Model year

^ Mileage

^ Tire size

NOTE:

Customers should be prioritized to replace oldest tires first.

WAIT LIST SURVEY

Please fill out the Firestone Tire Survey in the Management Report Section of QCDealer weekly. It is critical that you answer the questions as accurately as possible as the survey results will be used to help determine the level of production from the tire manufacturers.

DEALER PRICE

For latest prices on replacement tires, refer to the most recent Ford Motor Company Tire Price List.

PROCEDURE FOR CLAIMING REFUNDS FOR TIRES PURCHASED AFTER NOVEMBER 15, 2001

The following procedure applies to tires purchased after November 15, 2001:

1. Determine if the customer should receive special consideration based on owner loyalty, special circumstance cc, etc.

2. If the customer is eligible for special consideration the dealer will call the Special Service Support Center at 1800-325-5621 to request an authorization code.

3. The Special Service Support Center representative will ask for the following:

^ Customer Name

^ VIN

^ Date of repair

^ Original copy of invoice (be prepared to fax)

4. If the customer qualifies for a refund, the Special Service Support Center will provide your dealer with an authorization code.

5. Your dealer will input a claim with the authorization code (authorization code must be included to receive payment).

6. After the dealer receives payment for the claim, the dealer will then send the refund to the customer.

NOTE:

If the Special Service Support Center determines that the customer does not qualify for a refund, no authorization code will be given. Any appeals must be made by the dealer to the appropriate field representative

Attachment III - Technical Information

AFFECTED VEHICLES: REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES

OVERVIEW

This program details the replacement of 15-, 16-, and 17-inch Firestone Wilderness AT tires regardless of production plant. You will need to perform a DOT code inspection prior to replacing the 15, 16, or 17-inch Wilderness AT tires.

NOTE:

When lowering or raising an under-vehicle spare, DO NOT use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

NOTE:

Radial ATX "TEMPORARY USE" spare tires are not included under this program, and should not be replaced as part of this program.

NOTE:

Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

INSPECTION

1. Inspect the vehicle tires (including the spare tire) for the presence of Firestone Wilderness AT tires.

2. If Firestone Wilderness AT tires are present replace them with a suitable replacement from the "Approved Tire List".

Note:

There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

3. If only one Firestone Wilderness AT road tire is present on the vehicle, you will need to replace the opposing tire on the same axle. However, if one (1) front and one (1) rear tire are Wilderness AT you would not automatically replace all four (4) tires instead, you would replace the two (2) Wilderness AT tires and place them on the same axle.

4. Record the DOT code from each removed tire(s) on the repair order.

5. Tires that are removed from vehicles must immediately be made unusable by either cutting through the bead and DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall.

6. Adjust all tires to the proper inflation pressure, and release the vehicle. For specifications, refer to the vehicle Owner's Manual or the vehicle certification label located on the driver's door opening.

NOTE:

Tires that are removed from vehicles under this program, and those in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT

code will prevent the tire from being used for an additional refund request.

NOTE:

If the vehicle is a 4X4, and is equipped with non-Firestone Wilderness AT tires on one axle, and the replacement tires for the Firestone equipped axle causes a mismatch with the existing non-Firestone axle, the customer is responsible for the tire mismatch. If the customer refuses to purchase matching tires to correct the mismatch - the dealer should annotate the repair order to reflect the customer's decision.

Ford Motor Company

FIRESTONE TIRE RECALL

September 2000

TO: All Ford and Lincoln Mercury Dealers
SUBJECT: Firestone Tire Recall Supplement #4 9/1/00 - Updated Information
REFERENCE: Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires

Changes for this Supplement:

- The following has been added to Attachment I to clarify the claiming of freight: Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.
- Additional information is now required in the comments of each claim filed for tire replacement under both Program Codes P17 and P18. The comments must include the entire DOT code from the tire being replaced and under P17 only the part number of the replacement tire. Firestone requires this information for government reporting.

Claims under the Firestone recall for tire replacement filed by Ford and Lincoln Mercury dealers not enrolled in the AtW/Ford Tire Program will not be accepted for payment. Non-AtW/Ford Tire Program dealers will continue to be able to file claims for tire inspection. This is not new information; we have just added the edits to the ACES II system.

The revised letter and attachments have been marked "Revised 9/1/00", and a ( ) symbol appears at the beginning of any text that changed since the last Supplement and the text appears in green when viewed on line. To avoid confusion please discard all previous versions.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Technical Service Bulletin # FIRESTONE Date: 000901

Dealer Letter

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: DEMONSTRATION / DELIVERY HOLD - Firestone Tire Recall: Certain 1991 through 2000 Explorer, 1997 through 2000 Mountaineer, 2001 MY Explorer Sport Trac and Sport, 1991 through 2000 Ranger, 1991 through 1994 Bronco and 1991 through 1994 F-Series - Replacement of Firestone P235/75 R15 Radial ATX and Certain Wilderness AT Tires.

REFERENCE:

Model Year	Body Style	Tire/Wheel Size
1991 - 1994	ALL	15"
1995 - 1998	ALL (Excluding Eddie Bauer and 2-door Sport if equipped with 16 inch wheels)	15"
1999 - 2001	ALL (Excluding Eddie Bauer and Limited Editions if equipped with 16 inch wheels)	15"

Model Year	Body Style	Tire/Wheel Size
1995 - 1998	Eddie Bauer	16"
1996 - 2001	Sport and any 2-door Sport 4X4 w/Premium Sport Package	16"
1999 - 2001	Eddie Bauer and Limited	16"

Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires.

AFFECTED TIRES AND VEHICLES

Bridgestone Firestone Tire Company recently announced a Safety Recall on the following:

- All Firestone P235/75 R15 Radial ATX tires produced excluding tires marked "TEMPORARY" on the sidewall - and -

- P235/75 R15 wilderness AT tires produced only at the Decatur plant.

NOTE:

Decatur built tires have a DOT code of VDHL - see Attachment III for details. All other Wilderness AT tires are not affected.

Both original equipment (OE) and replacement tires are affected.

The following vehicles produced with Firestone P235/75 R15 Radial ATX original equipment tires are affected by this recall:

^ Certain 1991 through 1996 Ford Explorer (see chart)

^ Certain 1997 Mercury Mountaineer vehicles

^ Certain 1991 through 2000 Ranger vehicles

^ Certain 1991 through 1994 Bronco vehicles

^ Certain 1991 through 1994 F-Series vehicles

The following vehicles produced with P235/75 R15 Wilderness AT tires as original equipment are affected by this recall:

Certain 1997 through August 7, 2000 Mountaineer vehicles

^ Certain 1997 through August 7, 2000 Explorer vehicles (see chart)

^ Certain 1997 through June 1, 2000 Ranger vehicles

^ Certain 2001 Explorer Sport Trac and Sport vehicles produced through August 7, 2000

These Explorer vehicles produced with either P235/75 R15 Radial ATX or P235/75 R15 Wilderness AT tires as original equipment are affected as shown.

These Explorer vehicles are NOT affected:

IMPORTANT FACTS

^ This is a FIRESTONE recall.

^ FIRESTONE will notify customers of the recall via first class mail.

^ FIRESTONE will communicate recall information to authorized repair sites including Ford and Lincoln-Mercury Around the wheel/Ford Tire Program dealers.

FORD AND LINCOLN MERCURY DEALER INVOLVEMENT

As this field action will severely impact the availability of Firestone replacement tires, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers will be afforded the opportunity to address this recall utilizing Firestone and non-Firestone tires. This is being done to address immediate needs of our customers.

FORD AND LINCOLN MERCURY DEALERS ENROLLED IN AROUND THE WHEEL (AtW)

Dealerships enrolled in the AtW/Ford Tire Program are authorized Firestone outlets. If a customer with affected tires contacts an ATW Ford Tire Program dealer, as an authorized Firestone dealer regarding this safety recall, you will be able to replace that customer's tires with Firestone or "approved" non-Firestone tires. Tires that are approved for use as replacement tires under this recall will be posted in a matrix in the Firestone Tire Center in QCDealer.com. This matrix will be amended to add new tire manufactures and models of tires as they are approved. Claiming for reimbursement of tires is outlined on Attachment I.

If the customer requests a replacement Firestone tire, secure the tire through your normal distribution chain and process reimbursement as outlined in Attachment I.

FORD AND LINCOLN MERCURY DEALERS NOT ENROLLED IN AROUND THE WHEEL (AtW)

Dealers not enrolled in the ATW/Ford Tire Program can inspect customer vehicles (see Attachments I & II for claiming instructions & labor operations). These dealers should make individual arrangements with local Firestone outlets for tire replacement, or refer customers to their local Firestone outlet.

SERVICE PROCEDURE

All Firestone P235/75 R15 tires with Radial ATX on the sidewall (excludes Temporary spare tires identified by "Temporary" on the sidewall) must be replaced under this recall.

Firestone P235/75 R15 tires with Wilderness AT on the sidewall will need to be inspected for a DOT code of VDHL to determine if replacement is required. Refer to Attachment III for details.

This service action applies to original equipment and replacement tires that are installed on Ford and Mercury vehicles.

DEMONSTRATION / DELIVERY HOLD FOR VEHICLES AND TIRES IN DEALER INVENTORY

Do not demonstrate or deliver any of the affected vehicles prior to completing the Firestone recall. In addition, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers may have affected tires in inventory; these tires should not be sold.

Tires Removed from Vehicles

Tires that are removed from vehicles must immediately be made unusable by either cutting the bead with bolt cutters, drilling a one-inch diameter hole in the sidewall, or cutting the tire completely in half The DOT code should not be defaced or removed. The tire should then be disposed of according to local laws refer to the Tire Administration Guide for further information.

NOTE:

AtW/Ford Tire Program dealers will be independently audited for compliance with the above procedure.

New Inventory Tires

All new Radial ATX or Wilderness AT tires with DOT code VDHL tires (never mounted) in AtW/Ford Tire Program dealer inventory must be returned to Firestone. Dealers must call 1-800-668-0345 to obtain a "Returned Goods Authorization (RGA) number. The RGA is a 6-digit number required to return the tires. Only tires affected by the Firestone recall will be accepted. Firestone will pay all freight for the return of these tires.

ATTACHMENTS

^ Attachment I ^

Administrative Information

^ Attachment II ^

Labor Allowances

^ Parts Ordering Information

^ Attachment III ^

Technical Information

^ Attachment IV ^

Tire Inspection Aid

^ Attachment V ^

Tire Inflation Guide

CONTACTS

Claims Information: 1-800-423-8851

Other (Dealer Only) Recall Questions: 1-800-325-5621

For Around the Wheel/Ford Tire Program 1-888-353-3251

Questions:

Attachment I

OASIS Since this is a Firestone recall, OASIS will not be activated.

PLEASE NOTE

Correct all vehicles in stock before delivery. Federal law requires dealers to complete any outstanding safety recall service before a vehicle is delivered to the buyer or lessee. Violation of this requirement by a dealer could result in a civil penalty of up to $1,100 per vehicle.

CLAIMS PREPARATION AND SUBMISSION

NOTE:

Claims for Firestone tires (P18) may be entered for payment beginning with repairs dated August 28, 2000 and later.

Claims for non-Firestone tires

Enter claims in ACES II for non-Firestone tires using DWE with the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Program Code - P17. Enter P17TIRE as the causal part with condition code 82.

^ On the same line as PI7TIRE enter the total value of the tires from the "Suggested List Price" column of the latest Ford Motor Company Tire Selling Guide.

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.

^ Tire disposal and applicable local waste tax will be reimbursed - enter OTHER in the miscellaneous expense area of the claim with the actual cost.

^ Enter the entire DOT code and the part number of the replacement tire being used in the comments area of the claim.

Claims for Firestone tires

Enter claims in ACES II for Firestone tires using the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim type.

^ Program Code - P18.

^ Enter "P18TIRE" as the causal part, no material cost should be entered on this line.

Description	Labor Operation	Labor Time
Inspect 5 tires applies only to P235/75 R15 Wilderness AT tires) - VEHICLE NOT AFFECTED (Non VDHL DOT Code)	00V01G	0.2 Hours
Inspect 5 tires (applies only to P235/75 R15 Wilderness AT tires) - VEHICLE AFFECTED - Customer must return at a later date due to unavailability of replacement tires. This may be claimed only one time per vehicle per dealer.	00V01A	0.2 Hours
Replace & balance 1 tire (No longer includes inspect) May be used with labor op 00V01A only	00V01B	0.4 Hours
Replace & balance 2 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01C	0.6 Hours
Replace & balance 3 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01D	0.8 Hours
Replace & balance 4 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01E	1.0 Hours
Replace & balance 5 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01F	1.2 Hour

^ Condition code "82".

^ Use Customer Concern Code "A99".

^ Enter the full published tire part number with the quantity of tires replaced, the payment system will price the tire at Dealer Net multiplied by the quantity for the total value of the replaced tires.

^ Use Miscellaneous Expense Code "TIREMU" to claim the $20.00 difference per tire7 a maximum of $100.00.

^ The Firestone warranty claim form must be filled out and attached to the hard copy of the claim and retained in the service file. The entire DOT code from the replacement tire(s) must be recorded on this form.

^ The DOT code must also be entered in the comments area of the claim.

^ No labor operations will be allowed when claiming P18.

OWNER REFUND

Ford and Lincoln Mercury dealers, including AtW/Ford tire dealers; will not be involved in processing refunds for customers included in the Firestone recall. Customers inquiring about a refund should be provided copies of the Firestone refund request form. Refer to the Firestone website for the refund forms and for further details.

RENTAL CARS

TAP allowances have been increased specifically for the Firestone recall refer to M.J. Lombardi's Letter.

Attachment II

LABOR ALLOWANCES

NOTE:

Front-end alignment is not included in this recall.

NOTE:

These labor operations and revised times will begin paying with claims submitted on August 18, 2000; Claims in process at dealerships will need to use these new operations.

PARTS REQUIREMENTS

Tire Ordering Information

FIRESTONE TIRE INSPECTION

AFFECTED VEHICLES: **REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES**

OVERVIEW

This procedure outlines how to check the DOT code on the tires and determine if they must be replaced.

NOTE: All Firestone P235/75R15 tires that say "RADIAL ATX" on the sidewall are being recalled and no further inspection is necessary.

NOTE: All tires including the spare must be inspected if they are "WILDERNESS AT" P235/75R15.

NOTE: When lowering or raising an under-vehicle spare, **DO NOT** use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

INSPECTION

1. Raise vehicle on a hoist.
2. Locate the DOT code on the inboard sidewall of all tires including the spare. On F-Series and Bronco models, the spare tire must be lowered to view the DOT code. Clean the area if necessary in order to accurately read the code.
3. If the DOT code is **VDHL**, the tire must be replaced. See the matrix (part of the dealer bulletin) to determine the correct replacement tires. See Figure 1.

NOTE: Recall tires that are removed from vehicles and in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole in the sidewall.

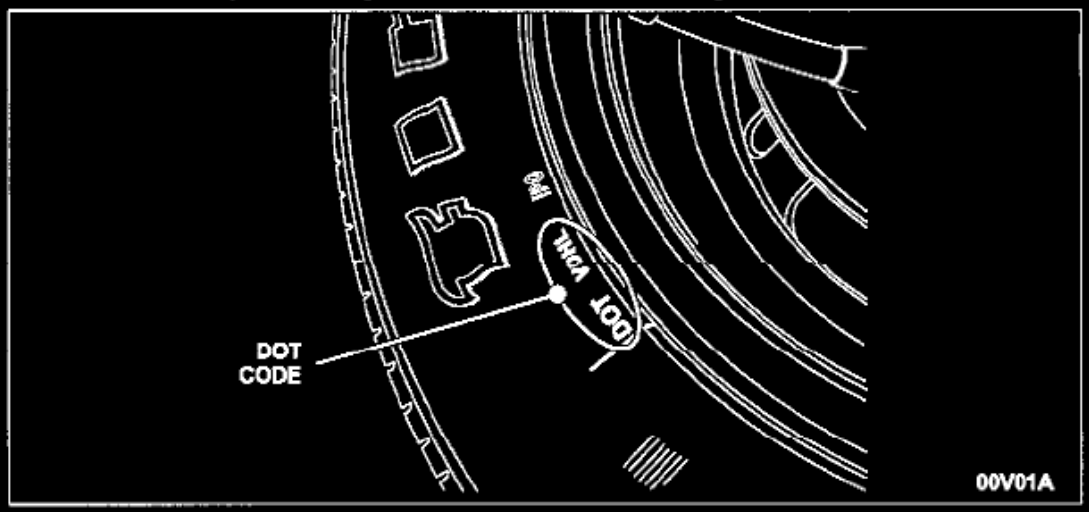

FIGURE 1

4. If the code is anything other than **VDHL**, release the vehicle to the owner.

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DEARBORN, MICHIGAN 48121
08/00

Authorized Around the Wheel (ATW)/Ford Tire Program dealers will order replacement tires through normal channels. Dealers not authorized for the Around the Wheel Program will not participate in the Firestone recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

DEALER PRICE

For latest prices on replacement tires refer to the most recent Ford Motor Company Tire Selling Guide.

ATTACHMENT IV
PAGE 1 OF 1
FIRESTONE TIRE RECALL SUPPLEMENT 1

TIRE INSPECTION

TIRES INVOLVED IN FIRESTONE RECALL

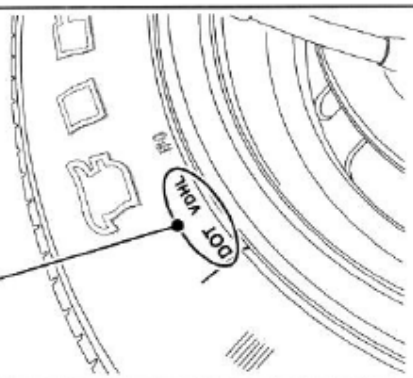
P235/75R15

ALL INCLUDED IN RECALL

P235/75R15

ONLY WITH DOT CODE VDHL

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL



THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL

TIRE DOT CODE CAN BE INSPECTED WITH VEHICLE ON GROUND

WARNING: IF RAISING THE VEHICLE TO INSPECT, DO NOT POSITION YOURSELF UNDER THE VEHICLE WITHOUT HAVING ADEQUATE SAFETY STANDS SUPPORTING THE WEIGHT OF THE VEHICLE. THE JACK PROVIDED FOR USE WHEN CHANGING A TIRE BY ITSELF IS NOT ADEQUATE FOR THE PURPOSE OF GETTING UNDER THE VEHICLE.

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08/00

Attachment V
Revised 8/16/00

Firestone Tire Recall

Replacement of Certain Firestone P235/75 R15 Tires

Tire Inflation Guide

AFFECTED BRAND	MODEL	FIRESTONE ATX	TIRE PRESSURE	FIRESTONE WILDERNESS	TIRE PRESSURE
		(MY)	(frt - rear) psi	(MY)	(frt - rear) psi
FORD	EXPLORER	91 - 96	26** - 26**	97 - 00*	26** - 26**
FORD	EXPLORER SPORT- 2DR.	91 - 96	26** - 26**	97 - 01*	26** - 26**
FORD	EXPLORER SPORTRAC	N/A	-	01*	28 - 35
FORD	RANGER	91 - 96	30 - 35	97 - 00*	30 - 35
FORD	F - 150	91 - 94	35 - 41	N/A	-
FORD	BRONCO	91 - 94	35 - 41	N/A	-
(I)MERCURY	MOUNTAINEER	N/A	26** - 26**	97 - 00*	26** - 26**
MAZDA	NAVAJO	91 - 94	26 - 26	N/A	-
MAZDA	B-SERIES PICKUP	94 - 96	30 - 35	97 - 00*	30 - 35

* Firestone Decatur, Illinois Plant only

** Ford approved range is 26 - 30 psi.

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Ford Customer Service Division

Tires: Customer Interest Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

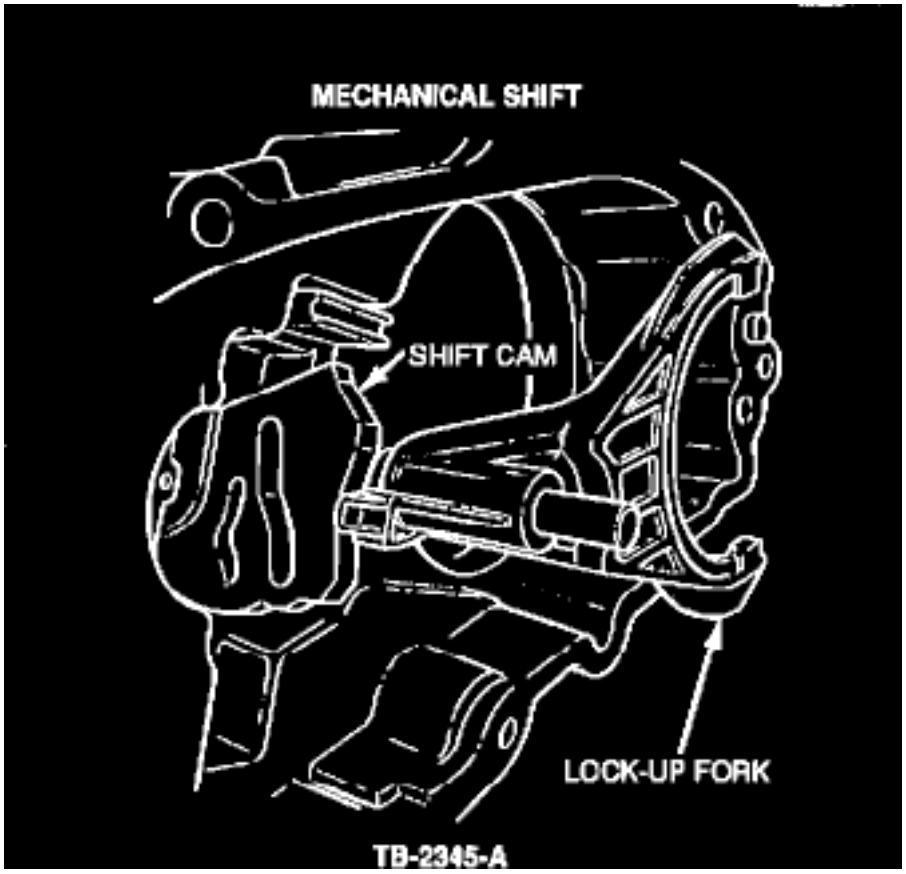
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

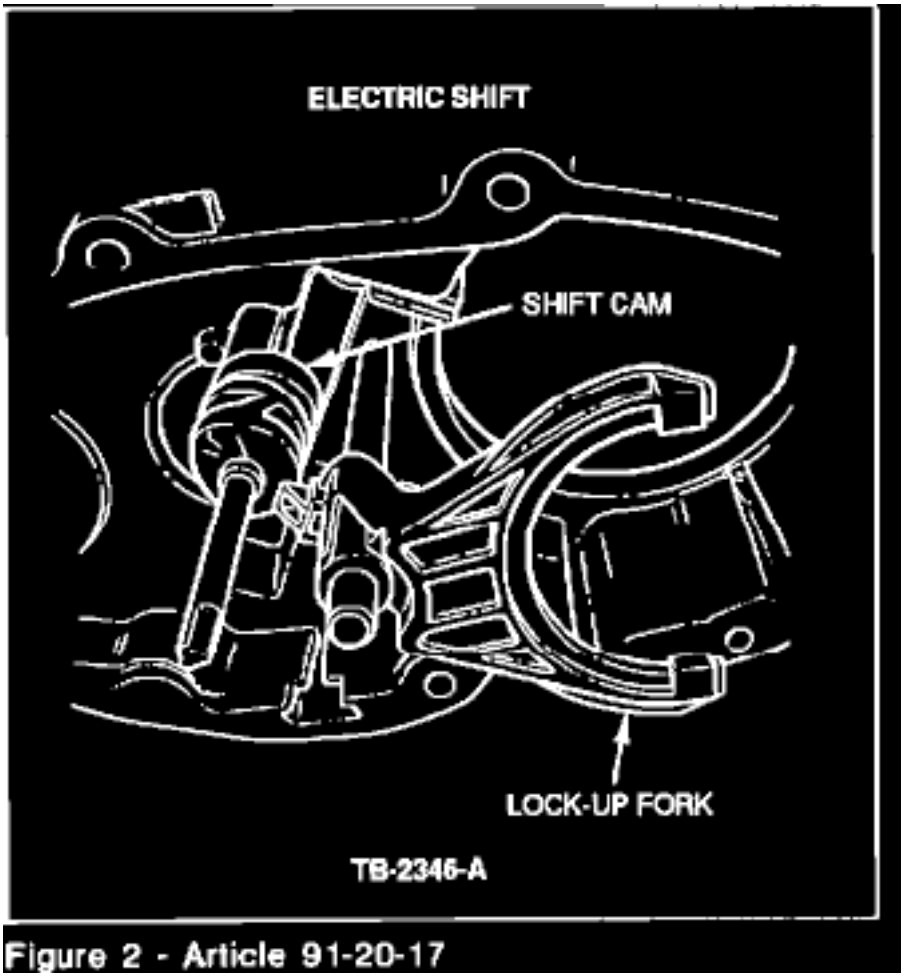


Figure 2 - Article 91-20-17

Figure 2

NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

EGTZ-7D126-A Sleeve Spring B

F1TZ-7289-D Lock-Up Fork B

OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

912017A Perform Initial Checks 0.5 Hr.

912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Ford Motor Company

October 2001

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77 Supplement 7:** 10/12/01 Updated Information

REFERENCE: **Owner Notification Program 01B77 – Ford Wilderness AT Program:** Replacement of Wilderness AT tires

PROGRESS TO DATE

- To date we have replaced close to 7 million tires or 55% of the total tires needed
- Ford and Mercury dealers are currently handling over 70% of all Wilderness AT replacements
- All tire sizes are now readily available, though certain brands may not be available

The following information has been updated for ONP 01B77:

CHANGES MADE TO THE ALL DEALER LETTER

- ONP 01B77 – Ford Wilderness AT program will expire on March 31, 2002
- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- All customers who have not had their tires replaced will receive a follow-up letter by the end of October, 2001 announcing these program changes and encouraging them to visit a Ford Motor Company dealership for tire replacement
- 1995 and 1996 F-150 customers, which were added to the program on August 17, 2001, will receive their first notification letter by the end of October, 2001, which includes the following:
  - The customer must have their tires replaced at a Ford Motor Company dealer
  - They will only be eligible for refunds if they purchased their tires between August 1, 2000 through October 31, 2001

    NOTE: Refunded at actual cost and no DOT sections required, since these customers were never notified of the DOT requirements and maximum dollar limit.
- Effective immediately all tire refund requests are to be processed through the dealer (Online Refund Form should no longer be used)

CHANGES TO ATTACHMENT I

- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- The Online Refund Form used for refunds before May 22, 2001 is no longer posted on the web

CHANGES TO ATTACHMENT II

- Wait List Survey link added
- A procedure has been added to handle customers who purchase tires after November 15, 2001 and are seeking a refund

All revisions since Supplement 6 are in *red italics* and revised pages have been marked "*Revised10/12/01.*"

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Technical Service Bulletin # 01B77 Date: 011001

Ford Motor Company

May 2001
Revised 10/12/01

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77-S7 – Ford Firestone Wilderness AT Program:** Replacement of Firestone Wilderness AT tires.

OASIS: Yes
OWNER LIST: Yes
PARTS RETURN: No
PROGRAM TERMS: This program will expire *March 31, 2002* and has no mileage limit.

WHAT WE ARE DOING AND WHY

On August 9, 2000 Firestone initiated a voluntary recall of 6.5 million tires, including 3.8 million P235 75R15 Radial ATX tires manufactured since 1990 at all North American Firestone plants. Also, Firestone recalled about 2.7 million P235 75R15 Wilderness AT tires made at its Decatur, Illinois plant. The recall included both original equipment and replacement tires. As of January 22, 2001 more than 6.1 million tires have been replaced – the recall is more than 94% complete.

Under this new owner notification, Ford will replace 13 million Firestone Wilderness AT tires on Ford and Mercury SUVs and pickup trucks listed below under "affected tires and vehicles." This is a voluntary precautionary measure. Ford made the decision to take this action after extensive examination of field data as well as laboratory and track testing in close collaboration with NHTSA. The field data, along with our testing and statistical analysis, shows a directional trend toward elevated failure rates, that differs based upon where the tires were manufactured. Ford does not have sufficient confidence in the future performance of these tires, so we are acting in the interest of our customers to ensure their continued trust and confidence.

To date we have replaced close to 7 million tires or 55% of the total tires needed for this program. Ford and Mercury dealers are currently handling over 70% of the Wilderness AT tire replacements. Also, with the increased availability of all 15-, 16-, and 17-inch tires at the dealers, Ford is changing the expiration date of the program to March 31, 2002 to encourage customers to have their tires replaced as soon as possible.

NOTE: Certain brands of tires may have limited availability.

AFFECTED TIRES AND VEHICLES

This program affects 15-, 16-, and 17-inch Firestone Wilderness AT tires and Ford and Mercury vehicles with these tires on them. The vehicles listed below may have been originally equipped with Firestone Wilderness AT tires or may have had Wilderness AT tires installed during the Firestone recall launched in August, 2000.

- Certain 1991 through 2002 Ford Explorer
- Certain 2001 through 2002 Explorer Sport, and Sport Trac
- Certain 1997 through 2002 Mercury Mountaineer
- Certain 1991 through 2001 Ranger
- Certain 1999 through 2001 Expedition
- Certain 1991 through 1997 F-Series
- Certain 1991 through 1994 Bronco

NOTE: Both original equipment (OE) and replacement tires are affected.

IMPORTANT FACTS

- *Ford Wilderness AT tire program will expire on March 31, 2002.*
- *Tires purchased by customers after November 15, 2001 will no longer be eligible for a refund.*
- *A follow-up owner letter announcing program changes will be mailed beginning the week of October 17, 2001.*
- *1995 and 1996 F-150 owners, which were added to the program on August 17, 2001, will be notified by the end of October 2001.*
- All 15-, 16-, and 17-inch Firestone Wilderness AT tires (regardless of series number) that are mounted on Ford or Mercury vehicles are eligible for replacement.
- All other Firestone Wilderness AT tire sizes are not included in this program.
- AtW/Ford Tire Program dealers are to stop the sale of Firestone Wilderness AT tires in their parts inventory effective immediately.
- Ford Motor Company has notified customers of this owner notification program via first class mail.
- Customer refunds will be handled differently based on whether the tires were purchased before or after May 22, 2001.
- *Effective immediately all refunds will be processed through the dealer for customers who purchased their tires from August 1, 2000 through November 15, 2001, (Online Refund Form should no longer be used).*
- *1995 and 1996 F-150 owners will only be eligible for refunds for tires purchased between August 1, 2000 and October 31, 2001, (no DOT sections required).*
- A list of Ford-approved replacement tires is posted on QCDealer. Only these tires may be used as replacement tires for vehicles that were originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires under this program.
- There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.
- **Vehicles with branded titles** - although normally excluded from Owner Notification Programs are included as part of this program.
- Affected vehicles sold in Canada can be serviced by U.S. dealers, and affected vehicles sold in the U.S. can be serviced by Canadian dealers.

STOP SALE OF FIRESTONE WILDERNESS AT TIRES IN DEALER STOCK

Firestone Wilderness AT tires in stock at Ford and Lincoln Mercury dealers enrolled in the Around the Wheel or Ford Tire Program (Certified Tire Dealers) should not be sold. Dealers that purchased these tires through the Ford program and have them in stock should complete the *Unsold Wilderness AT Credit Form* located on QCDealer.com. If you have questions, call the Ford Tire Hotline at 1-888-353-3251 for disposal and credit information.

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

Non-Certified Tire (AtW or Ford Tire Program) Dealers who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program) or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "**SCHP**" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

SERVICE PROCEDURE

All 15-, 16-, and 17-inch Firestone Wilderness AT (regardless of series number) tires installed on Ford and Mercury vehicles must be replaced under this owner notification program. Original equipment (OE) and replacement tires are included.

Spare Tires

Firestone Wilderness AT (regardless of series number) spare tires are affected and should be replaced. The Firestone P235 75R15 ATX temporary spare tire used on Ranger vehicles is not included in this program.

Note: Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

Note: When processing refunds for customers, inspect the spare tire; if the spare tire is a Firestone Wilderness AT (with the Ranger exception noted previously) replace the spare tire using the information provided on Attachment II.

Does Current Tire Condition Affect Replacement Procedure?

All affected tires should be replaced regardless of the mileage or the remaining tread on the tire. If the customer caused damage to the tires, i.e. hit a curb, accident, under inflation, alignment issues, the tire should still be replaced. If the tire is worn out, it should still be replaced.

What if the Vehicle has a Mix of Affected and Non-Affected Tires?

- If the spare tire is the only Wilderness AT, then only the spare should be replaced (see exception on temporary spares above).
- In most cases an owner's vehicle will have all 15-, 16-, or 17–inch Firestone Wilderness AT tires installed and require replacement of all tires. In cases where a vehicle has a mix of tire brands/sizes installed, replace all Firestone Wilderness AT tires and the remaining tires to match the tire brand and size by axle.

For example, if a vehicle has a Wilderness AT on the left front, a Wilderness AT on the right rear, a Wilderness AT for a spare, and the other two tires are not Wilderness AT; the spare and the left front and right rear should be replaced and the new tires should be installed on the same axle. The customer should also be advised that all tires should be the same size especially on 4 X 4 models.

What replacement tires may be used for vehicles originally equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires?

Replacement tire(s) must be on the list of tires approved by Ford <link to approved tire list>. Any deviation from this approved list may change the vehicles handling, ride, vibration, and noise characteristics and cannot be claimed through Ford.

If customers are seeking reimbursement for tires purchased outside of a Ford Certified Tire Dealer, refer to Attachment I for reimbursement guidelines and claiming procedures. *Customers who purchase tires after November 15, 2001 are not eligible for a refund.*

Note: There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

Note: "Blemished" tires may not be used as replacement tires under this program.

FORD AND LINCOLN MERCURY DEALER TIRE DISPOSAL PROCESS

- Tires that are removed from vehicles must immediately be made unusable by either cutting the bead through the DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request. Marking the last 6 characters of the VIN on the removed tire(s) is no longer required.
- The tires will be disposed of by using the "National Tire Recovery and Recycle Program".

Regional FCSD and independent personnel will be randomly auditing dealers for proper tire scrapping and claiming procedures. Any infractions will result in prior approval for tire owner notification claims.

Note: Make removed tires unusable during tire replacement. Do not stack tires and disable them at a later time.

DEALERSHIPS ELIGIBLE TO REPLACE TIRES UNDER THIS PROGRAM

All Ford and Lincoln Mercury dealers enrolled on the Around the Wheel or Ford Tire Program (Certified Tire Dealers) are eligible to complete tire replacements under this program.

Ford dealers interested in joining the Ford Tire Program may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

APPROVED RETAILERS PARTICIPATION IN PROGRAM

We have developed a program to authorize Goodyear, Michelin, Continental, and General tire retailers to perform tire replacements at no cost to customers. These eligible retailers will use only tires from the Ford Approved Tire List when performing no cost replacements. This was done to reduce customer inconvenience by:

- Eliminating customer out of pocket expense
- Maximize the number of customers whose replacement tires are those on the Ford Approved tire list
- Expedite the completion of this program
- Reduce administrative burden on our Ford and Lincoln Mercury dealers
- Reduce dealer tire disposal responsibility
- Allow dealers to continue with their normal day to day service business

ATTACHMENTS

Attachment I:	Administrative Information
Attachment II:	Labor Allowances and Parts Ordering Information
Attachment III:	Technical Information

CONTACTS

Claims Information:	1-800-423-8851
For Around the Wheel/Ford Tire Program Questions:	1-888-353-3251
Ford Tire Inquiry Hotline (Customer):	1-866-300-1226
Other (Dealer Only) Program Questions:	1-800-325-5621
Tire Registration for Federal Regulations Questions:	1-330-794-9190

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Attachment I - Administrative Information

OASIS

OASIS must be used to determine vehicle eligibility.

IMPORTANT:

When an eligible vehicle is at the dealership for service, OASIS must be contacted to determine if Owner Notification Program 01B77 is open. If 01B77 is listed in OASIS as open, it is important that the vehicle is inspected for eligible tires. If the eligible vehicle is not equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires a claim must be submitted using labor operation 01B77A to close the program. If an affected vehicle does not have 01B77 open, this may indicate that a refund

or tire replacement has already been processed on this vehicle.

Some Ford and Lincoln Mercury vehicles not listed in the AFFECTED TIRES AND VEHICLES list may have 15-, 16-, or 17-inch Firestone Wilderness AT tires installed. These vehicles are covered under this program, but will not be active in OASIS. Contact the Special Service Support Center at 1-800-325-5621 to obtain prior approval before performing the repair or issuing a refund. This will insure that a previous repair/refund has not been performed on the vehicle.

CLAIMS PREPARATION AND SUBMISSION

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ Enter the full part number of the replacement tire with the quantity of tires replaced. Tires will be reimbursed at AtW Dealer cost + 25% (wheel weights and valve stems incl.).

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier. Dealers are encouraged to arrange for shipment of 4 or more tires at a time.

^ Dealers can no longer claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program". You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires on the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry.

RELATED DAMAGE

Vehicle damage caused by a tire related failure is not covered by this program. Refer to the Warranty and Policy Manual for proper claiming procedure for vehicles covered by the Ford Bumper-to-Bumper Tire Warranty (model years 2001 and 2002). All other pre-2001 model year vehicles with alleged tire related vehicle damage should be handled through the Firestone claims process, or by referring the customers to their insurance company.

Damage related to replacement of tires should be handled as described in the Warranty and Policy Manual.

OWNER REFUND

With the increased availability of replacement tires, it will no longer be necessary for customers to pay out-of-pocket expenses for tires. Therefore, refund requests for tires purchased after November 15, 2001 will no longer be granted. Owners will be notified of the refund expiration date and will be directed to a Ford or Mercury dealer They are directed to an authorized retailer only if the Ford or Mercury dealer cannot meet their scheduling needs or tires are not in stock. All Ford and Mercury dealers (AtW and non-AtW dealers) are required to process refunds for customers who purchase tires prior to November 15, 2001.

The following rules apply to refunds for tires purchased from August 1, 2001 through November 15, 2001:

Refunds will be processed for vehicles listed under "AFFECTED TIRES AND VEHICLES", and for other Ford and Lincoln Mercury vehicles that have 15-. 16-, or 17-inch Wilderness AT tires installed.

^ The customer must provide the original paid receipt (a copy of their paid receipt is acceptable on an exception basis in instances where the owner requires the original for another purpose (e.g. extended tire warranty or purchase rebate). The dealer will attach the receipt to the dealer file copy of the refund claim (see claim instructions below).

^ Dealers will be reimbursed to immediately disable tires returned for a refund (see claiming instructions for refunds and Attachment II for labor operations).

^ The tires must be purchased August 1, 2000 through November 15, 2001 to be eligible for a refund (through October 31, 2001 for 1995 and 1996 F-150 owners).

^ Customers requesting refunds for tire replacement May 22, 2001 through November 15, 2001 must provide either:

NOTE:

This does not apply to 1995 and 1996 F-150 customers.

^ The Firestone Wilderness AT tires that were replaced. Returned tire(s) are to be disabled by the dealership. Ford will reimburse the dealer to disable (see claim instructions below and use labor operation 01B77G). If tires are brought in for refund with the DOT codes missing dealers should not process the refund.

^ A section of the old tire(s) containing the DOT codes from each of the Firestone Wilderness AT tires that were replaced (To be cut from the Wilderness AT tires that were replaced by the outside repair facility) (use labor operation 01B77L). Dealers should deface (cut in pieces or make code unreadable) the DOT sections of the tire so they cannot be used to obtain another refund. If sections are brought in for refund with the DOT code defaced dealers should not process the refund.

NOTE:

The DOT Code Identification Guide has been developed to help dealers determine if the DOT sections returned to the dealership are from 15-, 16-,

Purchase Date Range	Refund Guidelines
August 1, 2000 through May 22, 2001	• The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
1995 and 1996 F-150 vehicles only *August 1, 2000 through October 31, 2001*	• *The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes (no DOT required)* • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
May 23, 2001 through November 15, 2001	• 15 inch tires - $110 (includes mounting, balancing, stems, disposal, and taxes) • 16 and 17 inch tires - $130 (includes mounting, balancing, stems, disposal, and taxes) • Dealers process refunds
After November 15, 2001	• *No refunds accepted for tires purchased after November 15, 2001*

Refund Questions	What is the owner qualified to receive?
Example: On December 21, 2000 the customer paid to have (4) Firestone Wilderness AT tires replaced on an affected vehicle.	o August 1, 2000 through May 22, 2001 (October 31, 2001 for 1995 and 1996 F-150) full refund with paid receipt o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
Example: On January 15, 2001 the customer paid to have (2) Wilderness AT tires replaced on a 1988 F-Series truck. The other tires are non-Firestone Wilderness AT.	o August 1, 2000 through May 22, 2001 – full refund with paid receipt o Dealer contacts Special Service Support Center at 1-800-325-5621 for approval code o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

or 17-inch Firestone Wilderness AT tires. Use the DOT Code Identification Guide in conjunction with the bulletin section "What if the Vehicle has a Mix of Affected and Non-Affected Tires" to determine how many tires are eligible for refund.

NOTE:

Ford will allow customers to file for a refund (with or without tires) for tires purchased after May 22 through June 30, 2001 because customers may not have tires to turn in. Customers must provide a paid receipt indicating tire replacement before July 1, 2001 in order to process a refund without tires or DOT sections. Customers who purchase tires after June 30, 2001 must provide tires or DOT sections.

Ford will reimburse customers the following amounts:

^ Tires purchased from August 1, 2000 through May 22, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes.

^ (1995 and 1996 F-150 vehicle only) Tires purchased from August 1, 2000 through October 31, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes. No DOT section required.

^ Tires purchased May 23, 2001 through November 15, 2001, the actual cost as stated on the receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes up to a maximum of $110 per tire for 15 inch, and $130 per tire for 16 and 17 inch tires.

^ Refunds will not be granted for tires purchased after November 15, 2001.

Note:

If an owner pays for the replacement of their tires after November 15, 2001, the dealer may handle on a case by case basis following the procedure in Attachment II.

Refund Questions	What is the owner qualified to receive?
Example: On May 27, 2001 the customer took their 1998 Explorer to an outside tire retailer and had (5) Firestone Wilderness AT 16 inch tires replaced.	o After May 22, 2001 refund tire replacement with paid receipt up to: o 15 inch = $110 (maximum per tire) o 16 and 17 inch = $130 (maximum per tire) o With a paid receipt this customer would be entitled to (5) tires x $130 (16 inch maximum per tire) = $650 refund (includes mounting, balancing, stems, disposal, and taxes) o Dealer will be eligible to claim for refund allowance using labor operation 01B77L o If the customer returns the old tires to the dealer o The dealer will disable the old tires and dispose of them using the *"National Tire Recovery and Recycle Program"* using labor operation 01B77G (disable) in conjunction with 01B77L (refund allowance) o Customer does not need old tire(s) *since tires purchased prior to July 1, 2001* (After June 30, 2001 customer will need old tires or removed DOT codes from replaced tires to qualify)
Example: On December 2, 2000 the owner replaced their (5) Firestone Wilderness AT tires with another set of Wilderness AT tires.	o The owner is not eligible for refund o The owner is eligible for tire replacement only o Use only tires from the "Ford Approved Tire List"
Example: *On November 16, 2001 the owner purchases tires from a tire retailer.*	o *No refund will be granted after November 15, 2001* o *Dealers may handle on a case-by-case (See Attachment II)*
Example: *On October 10, 2001 a 1995 F-150 owner purchases tires from a tire retailer.*	o *August 1, 2000 through October 31, 2001 – full refund with paid receipt* o *Customer does not need old tire(s) or DOT section(s)* o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

CLAIMS PREPARATION FOR REFUNDS (USE THIS PROCEDURE FOR ALL REFUND REQUESTS)

NOTE:

Tires must be purchased prior to November 15, 2001

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ When a customer brings in their old tires and is seeking a refund, use labor operation 01B77G (disable) and 01B77L (refund administration allowance) from Attachment II.

^ If a customer brings in the old DOT codes removed from the old tires - use labor operation 01B77L only.

^ The Miscellaneous Expense Code "ADMIN" will not be accepted under this program. A labor operation 01B77L has been provided to cover administrative costs.

^ Enter REFUND in the miscellaneous area of the claim.

^ Dealers will no longer be able to claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program" You may still claim any applicable local waste tax - enter OTHER

in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires in the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry. If the tires were replaced prior to May 23, 2001 (or November 1, 2001 for 1995 and 1996 F150 customers) the DOT may not be available, in this case record the brand, make and size of the tires in the technician comments area of the claim.

RENTAL CARS

TAP allowances have been increased specifically for this owner notification program. Refer to Don Brunner letter.

DOT REGISTRATION OF NEW TIRES

Dealers are required to register the DOT number of every tire sold to meet federal tire registration requirements. Ford has established a partnership with CIMS to assist dealers in registering these DOT codes. Information is available on QCDealer.com under CIMS Tire Registration or by contacting CIMS

Description	Labor Operation	Labor Time
Inspect for non-Wilderness AT tires (used to close 01B77 not for use when processing a refund)	01B77A	0.2 Hours
Replace & balance 1 tire (to be used for spare tire only)	01B77B	0.4 Hours
Replace & balance 2 tires (one axle)	01B77C	0.6 Hours
Replace & balance 3 tires (one axle plus spare)	01B77D	0.8 Hours
Replace & balance 4 tires (both axles)	01B77E	1.0 Hours
Replace & balance 5 tires	01B77F	1.2 Hours
Disable up to five tires (used only for refund claims)	01B77G	0.2 Hours
*Refund administration allowance (to be used when processing a customer refund without tire disposal, if tires are returned to dealership for disposal use in conjunction with operation 01B77G)	01B77L	0.2 Hours
Administrative Allowance for Non-Certified Tire Dealers (AtW or Ford Tire Program) to be used when sending a dealer stock unit, or customer vehicle (for tire replacement) to a Certified Tire Dealer, or tire retailer authorized to perform tire replacement under this program	Misc. Expense use code "SCHP"	$15.00

NOTE: Front-end alignment is not included in this program.

***NOTE:** When processing a refund for four (4) road tires, the non-temporary spare tire should be replaced as part of this program – file a related damage claim to cover the spare tire replacement.

at 330-794-9190.

NON-FORD OR LINCOLN MERCURY VEHICLES WITH FIRESTONE WILDERNESS AT

Non-Ford or Lincoln Mercury vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires installed by a Certified Tire Dealer (AtW or Ford Tire Program) are eligible for replacement. The repair should be submitted using a Warranty/ESP claim type form. The dealer must enter Program Code "P19", this will allow the repair to be submitted without a VIN. The causal part must be TIRE, with the actual part numbers for reimbursement at dealer cost plus 25%, and use actual time for labor reimbursement. These types of claims cannot be submitted as an Owner Notification Repair type.

Attachment II - Parts and Labor Information

LABOR ALLOWANCES

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

NOTE:

Non-Certified Tire Dealers (AtW or Ford Tire Program) who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program), or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "SCHP" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

PARTS REQUIREMENTS

Tire Ordering Information

^ Dealers are required to install only tires from the Approved Tire List for vehicles originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires. Dealers should immediately order replacement tires for inventory.

^ Certified Tire Dealers will order replacement tires through normal channels.

^ Dealers not authorized for the Around the Wheel Program will not participate in this recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

TIRE AVAILABILITY:

All dealers should check QCDealer.com daily for updates to the approved tires list. Distributors and tire retailers will allocate tires as best they can on a daily basis. Your dealership should do the following to ensure that you are able to secure your fair allotment of these limited volumes:

^ Contact your Ford authorized facing distributor(s) for each tire manufacturer.

^ Contact your Ford authorized facing tire retailers for each tire manufacturer.

^ Review with these supply points the volume of tires you need to ensure you have tires ready to fill orders with every supply point.

Questions not addressed by above sources should be directed to your market area team.

CUSTOMER WAIT LISTS:

Dealers should create a customer wait list and record: Customer name

^ Address and phone number

^ Vehicle make

^ Model year

^ Mileage

^ Tire size

NOTE:

Customers should be prioritized to replace oldest tires first.

WAIT LIST SURVEY

Please fill out the Firestone Tire Survey in the Management Report Section of QCDealer weekly. It is critical that you answer the questions as accurately as possible as the survey results will be used to help determine the level of production from the tire manufacturers.

DEALER PRICE

For latest prices on replacement tires, refer to the most recent Ford Motor Company Tire Price List.

PROCEDURE FOR CLAIMING REFUNDS FOR TIRES PURCHASED AFTER NOVEMBER 15, 2001

The following procedure applies to tires purchased after November 15, 2001:

1. Determine if the customer should receive special consideration based on owner loyalty, special circumstance cc, etc.

2. If the customer is eligible for special consideration the dealer will call the Special Service Support Center at 1800-325-5621 to request an authorization code.

3. The Special Service Support Center representative will ask for the following:

^ Customer Name

^ VIN

^ Date of repair

^ Original copy of invoice (be prepared to fax)

4. If the customer qualifies for a refund, the Special Service Support Center will provide your dealer with an authorization code.

5. Your dealer will input a claim with the authorization code (authorization code must be included to receive payment).

6. After the dealer receives payment for the claim, the dealer will then send the refund to the customer.

NOTE:

If the Special Service Support Center determines that the customer does not qualify for a refund, no authorization code will be given. Any appeals must be made by the dealer to the appropriate field representative

Attachment III - Technical Information

AFFECTED VEHICLES: REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES

OVERVIEW

This program details the replacement of 15-, 16-, and 17-inch Firestone Wilderness AT tires regardless of production plant. You will need to perform a DOT code inspection prior to replacing the 15, 16, or 17-inch Wilderness AT tires.

NOTE:

When lowering or raising an under-vehicle spare, DO NOT use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

NOTE:

Radial ATX "TEMPORARY USE" spare tires are not included under this program, and should not be replaced as part of this program.

NOTE:

Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

INSPECTION

1. Inspect the vehicle tires (including the spare tire) for the presence of Firestone Wilderness AT tires.

2. If Firestone Wilderness AT tires are present replace them with a suitable replacement from the "Approved Tire List".

Note:

There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

3. If only one Firestone Wilderness AT road tire is present on the vehicle, you will need to replace the opposing tire on the same axle. However, if one (1) front and one (1) rear tire are Wilderness AT you would not automatically replace all four (4) tires instead, you would replace the two (2) Wilderness AT tires and place them on the same axle.

4. Record the DOT code from each removed tire(s) on the repair order.

5. Tires that are removed from vehicles must immediately be made unusable by either cutting through the bead and DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall.

6. Adjust all tires to the proper inflation pressure, and release the vehicle. For specifications, refer to the vehicle Owner's Manual or the vehicle certification label located on the driver's door opening.

NOTE:

Tires that are removed from vehicles under this program, and those in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT

code will prevent the tire from being used for an additional refund request.

NOTE:

If the vehicle is a 4X4, and is equipped with non-Firestone Wilderness AT tires on one axle, and the replacement tires for the Firestone equipped axle causes a mismatch with the existing non-Firestone axle, the customer is responsible for the tire mismatch. If the customer refuses to purchase matching tires to correct the mismatch - the dealer should annotate the repair order to reflect the customer's decision.

Ford Motor Company

FIRESTONE TIRE RECALL

September 2000

TO: All Ford and Lincoln Mercury Dealers
SUBJECT: Firestone Tire Recall Supplement #4 9/1/00 - Updated Information
REFERENCE: Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires

Changes for this Supplement:

- The following has been added to Attachment I to clarify the claiming of freight: Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.
- Additional information is now required in the comments of each claim filed for tire replacement under both Program Codes P17 and P18. The comments must include the entire DOT code from the tire being replaced and under P17 only the part number of the replacement tire. Firestone requires this information for government reporting.

Claims under the Firestone recall for tire replacement filed by Ford and Lincoln Mercury dealers not enrolled in the AtW/Ford Tire Program will not be accepted for payment. Non-AtW/Ford Tire Program dealers will continue to be able to file claims for tire inspection. This is not new information; we have just added the edits to the ACES II system.

The revised letter and attachments have been marked "Revised 9/1/00", and a ( ) symbol appears at the beginning of any text that changed since the last Supplement and the text appears in green when viewed on line. To avoid confusion please discard all previous versions.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Technical Service Bulletin # FIRESTONE Date: 000901

Dealer Letter

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: DEMONSTRATION / DELIVERY HOLD - Firestone Tire Recall: Certain 1991 through 2000 Explorer, 1997 through 2000 Mountaineer, 2001 MY Explorer Sport Trac and Sport, 1991 through 2000 Ranger, 1991 through 1994 Bronco and 1991 through 1994 F-Series - Replacement of Firestone P235/75 R15 Radial ATX and Certain Wilderness AT Tires.

REFERENCE:

Model Year	Body Style	Tire/Wheel Size
1991 - 1994	ALL	15"
1995 - 1998	ALL (Excluding Eddie Bauer and 2-door Sport if equipped with 16 inch wheels)	15"
1999 - 2001	ALL (Excluding Eddie Bauer and Limited Editions if equipped with 16 inch wheels)	15"

Model Year	Body Style	Tire/Wheel Size
1995 - 1998	Eddie Bauer	16"
1996 - 2001	Sport and any 2-door Sport 4X4 w/Premium Sport Package	16"
1999 - 2001	Eddie Bauer and Limited	16"

Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires.

AFFECTED TIRES AND VEHICLES

Bridgestone Firestone Tire Company recently announced a Safety Recall on the following:

- All Firestone P235/75 R15 Radial ATX tires produced excluding tires marked "TEMPORARY" on the sidewall - and -

- P235/75 R15 wilderness AT tires produced only at the Decatur plant.

NOTE:

Decatur built tires have a DOT code of VDHL - see Attachment III for details. All other Wilderness AT tires are not affected.

Both original equipment (OE) and replacement tires are affected.

The following vehicles produced with Firestone P235/75 R15 Radial ATX original equipment tires are affected by this recall:

^ Certain 1991 through 1996 Ford Explorer (see chart)

^ Certain 1997 Mercury Mountaineer vehicles

^ Certain 1991 through 2000 Ranger vehicles

^ Certain 1991 through 1994 Bronco vehicles

^ Certain 1991 through 1994 F-Series vehicles

The following vehicles produced with P235/75 R15 Wilderness AT tires as original equipment are affected by this recall:

Certain 1997 through August 7, 2000 Mountaineer vehicles

^ Certain 1997 through August 7, 2000 Explorer vehicles (see chart)

^ Certain 1997 through June 1, 2000 Ranger vehicles

^ Certain 2001 Explorer Sport Trac and Sport vehicles produced through August 7, 2000

These Explorer vehicles produced with either P235/75 R15 Radial ATX or P235/75 R15 Wilderness AT tires as original equipment are affected as shown.

These Explorer vehicles are NOT affected:

IMPORTANT FACTS

^ This is a FIRESTONE recall.

^ FIRESTONE will notify customers of the recall via first class mail.

^ FIRESTONE will communicate recall information to authorized repair sites including Ford and Lincoln-Mercury Around the wheel/Ford Tire Program dealers.

FORD AND LINCOLN MERCURY DEALER INVOLVEMENT

As this field action will severely impact the availability of Firestone replacement tires, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers will be afforded the opportunity to address this recall utilizing Firestone and non-Firestone tires. This is being done to address immediate needs of our customers.

FORD AND LINCOLN MERCURY DEALERS ENROLLED IN AROUND THE WHEEL (AtW)

Dealerships enrolled in the AtW/Ford Tire Program are authorized Firestone outlets. If a customer with affected tires contacts an ATW Ford Tire Program dealer, as an authorized Firestone dealer regarding this safety recall, you will be able to replace that customer's tires with Firestone or "approved" non-Firestone tires. Tires that are approved for use as replacement tires under this recall will be posted in a matrix in the Firestone Tire Center in QCDealer.com. This matrix will be amended to add new tire manufactures and models of tires as they are approved. Claiming for reimbursement of tires is outlined on Attachment I.

If the customer requests a replacement Firestone tire, secure the tire through your normal distribution chain and process reimbursement as outlined in Attachment I.

FORD AND LINCOLN MERCURY DEALERS NOT ENROLLED IN AROUND THE WHEEL (AtW)

Dealers not enrolled in the ATW/Ford Tire Program can inspect customer vehicles (see Attachments I & II for claiming instructions & labor operations). These dealers should make individual arrangements with local Firestone outlets for tire replacement, or refer customers to their local Firestone outlet.

SERVICE PROCEDURE

All Firestone P235/75 R15 tires with Radial ATX on the sidewall (excludes Temporary spare tires identified by "Temporary" on the sidewall) must be replaced under this recall.

Firestone P235/75 R15 tires with Wilderness AT on the sidewall will need to be inspected for a DOT code of VDHL to determine if replacement is required. Refer to Attachment III for details.

This service action applies to original equipment and replacement tires that are installed on Ford and Mercury vehicles.

DEMONSTRATION / DELIVERY HOLD FOR VEHICLES AND TIRES IN DEALER INVENTORY

Do not demonstrate or deliver any of the affected vehicles prior to completing the Firestone recall. In addition, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers may have affected tires in inventory; these tires should not be sold.

Tires Removed from Vehicles

Tires that are removed from vehicles must immediately be made unusable by either cutting the bead with bolt cutters, drilling a one-inch diameter hole in the sidewall, or cutting the tire completely in half The DOT code should not be defaced or removed. The tire should then be disposed of according to local laws refer to the Tire Administration Guide for further information.

NOTE:

AtW/Ford Tire Program dealers will be independently audited for compliance with the above procedure.

New Inventory Tires

All new Radial ATX or Wilderness AT tires with DOT code VDHL tires (never mounted) in AtW/Ford Tire Program dealer inventory must be returned to Firestone. Dealers must call 1-800-668-0345 to obtain a "Returned Goods Authorization (RGA) number. The RGA is a 6-digit number required to return the tires. Only tires affected by the Firestone recall will be accepted. Firestone will pay all freight for the return of these tires.

ATTACHMENTS

^ Attachment I ^

Administrative Information

^ Attachment II ^

Labor Allowances

^ Parts Ordering Information

^ Attachment III ^

Technical Information

^ Attachment IV ^

Tire Inspection Aid

^ Attachment V ^

Tire Inflation Guide

CONTACTS

Claims Information: 1-800-423-8851

Other (Dealer Only) Recall Questions: 1-800-325-5621

For Around the Wheel/Ford Tire Program 1-888-353-3251

Questions:

Attachment I

OASIS Since this is a Firestone recall, OASIS will not be activated.

PLEASE NOTE

Correct all vehicles in stock before delivery. Federal law requires dealers to complete any outstanding safety recall service before a vehicle is delivered to the buyer or lessee. Violation of this requirement by a dealer could result in a civil penalty of up to $1,100 per vehicle.

CLAIMS PREPARATION AND SUBMISSION

NOTE:

Claims for Firestone tires (P18) may be entered for payment beginning with repairs dated August 28, 2000 and later.

Claims for non-Firestone tires

Enter claims in ACES II for non-Firestone tires using DWE with the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Program Code - P17. Enter P17TIRE as the causal part with condition code 82.

^ On the same line as PI7TIRE enter the total value of the tires from the "Suggested List Price" column of the latest Ford Motor Company Tire Selling Guide.

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.

^ Tire disposal and applicable local waste tax will be reimbursed - enter OTHER in the miscellaneous expense area of the claim with the actual cost.

^ Enter the entire DOT code and the part number of the replacement tire being used in the comments area of the claim.

Claims for Firestone tires

Enter claims in ACES II for Firestone tires using the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim type.

^ Program Code - P18.

^ Enter "P18TIRE" as the causal part, no material cost should be entered on this line.

Description	Labor Operation	Labor Time
Inspect 5 tires applies only to P235/75 R15 Wilderness AT tires) - VEHICLE NOT AFFECTED (Non VDHL DOT Code)	00V01G	0.2 Hours
Inspect 5 tires (applies only to P235/75 R15 Wilderness AT tires) - VEHICLE AFFECTED - Customer must return at a later date due to unavailability of replacement tires. This may be claimed only one time per vehicle per dealer.	00V01A	0.2 Hours
Replace & balance 1 tire (No longer includes inspect) May be used with labor op 00V01A only	00V01B	0.4 Hours
Replace & balance 2 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01C	0.6 Hours
Replace & balance 3 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01D	0.8 Hours
Replace & balance 4 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01E	1.0 Hours
Replace & balance 5 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01F	1.2 Hour

^ Condition code "82".

^ Use Customer Concern Code "A99".

^ Enter the full published tire part number with the quantity of tires replaced, the payment system will price the tire at Dealer Net multiplied by the quantity for the total value of the replaced tires.

^ Use Miscellaneous Expense Code "TIREMU" to claim the $20.00 difference per tire7 a maximum of $100.00.

^ The Firestone warranty claim form must be filled out and attached to the hard copy of the claim and retained in the service file. The entire DOT code from the replacement tire(s) must be recorded on this form.

^ The DOT code must also be entered in the comments area of the claim.

^ No labor operations will be allowed when claiming P18.

OWNER REFUND

Ford and Lincoln Mercury dealers, including AtW/Ford tire dealers; will not be involved in processing refunds for customers included in the Firestone recall. Customers inquiring about a refund should be provided copies of the Firestone refund request form. Refer to the Firestone website for the refund forms and for further details.

RENTAL CARS

TAP allowances have been increased specifically for the Firestone recall refer to M.J. Lombardi's Letter.

Attachment II

LABOR ALLOWANCES

NOTE:

Front-end alignment is not included in this recall.

NOTE:

These labor operations and revised times will begin paying with claims submitted on August 18, 2000; Claims in process at dealerships will need to use these new operations.

PARTS REQUIREMENTS

Tire Ordering Information

FIRESTONE TIRE INSPECTION

AFFECTED VEHICLES: **REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES**

OVERVIEW

This procedure outlines how to check the DOT code on the tires and determine if they must be replaced.

NOTE: All Firestone P235/75R15 tires that say "RADIAL ATX" on the sidewall are being recalled and no further inspection is necessary.

NOTE: All tires including the spare must be inspected if they are "WILDERNESS AT" P235/75R15.

NOTE: When lowering or raising an under-vehicle spare, **DO NOT** use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

INSPECTION

1. Raise vehicle on a hoist.
2. Locate the DOT code on the inboard sidewall of all tires including the spare. On F-Series and Bronco models, the spare tire must be lowered to view the DOT code. Clean the area if necessary in order to accurately read the code.
3. If the DOT code is **VDHL**, the tire must be replaced. See the matrix (part of the dealer bulletin) to determine the correct replacement tires. See Figure 1.

NOTE: Recall tires that are removed from vehicles and in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole in the sidewall.

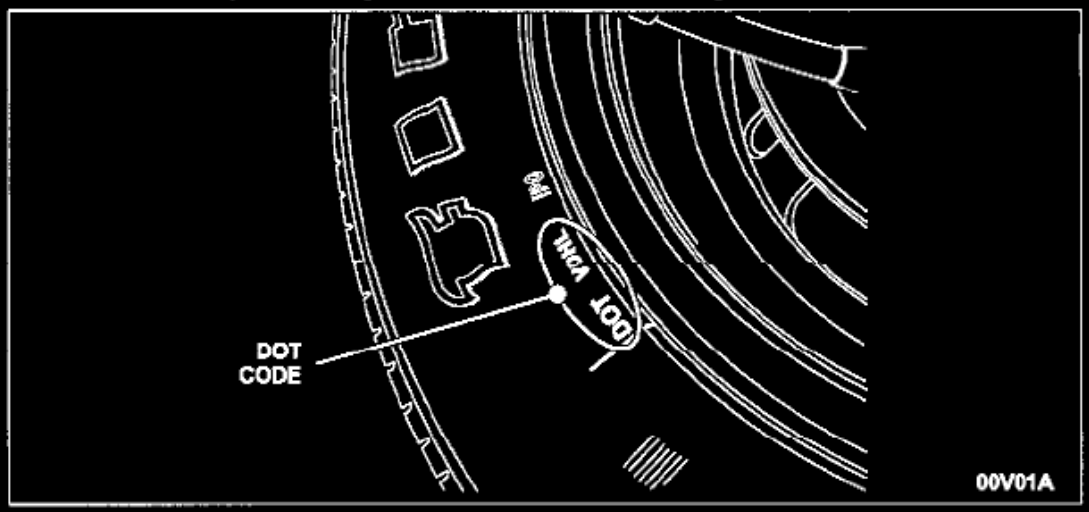

FIGURE 1

4. If the code is anything other than **VDHL**, release the vehicle to the owner.

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DEARBORN, MICHIGAN 48121
08/00

Authorized Around the Wheel (ATW)/Ford Tire Program dealers will order replacement tires through normal channels. Dealers not authorized for the Around the Wheel Program will not participate in the Firestone recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

DEALER PRICE

For latest prices on replacement tires refer to the most recent Ford Motor Company Tire Selling Guide.

ATTACHMENT IV
PAGE 1 OF 1
FIRESTONE TIRE RECALL SUPPLEMENT 1

TIRE INSPECTION

TIRES INVOLVED IN FIRESTONE RECALL

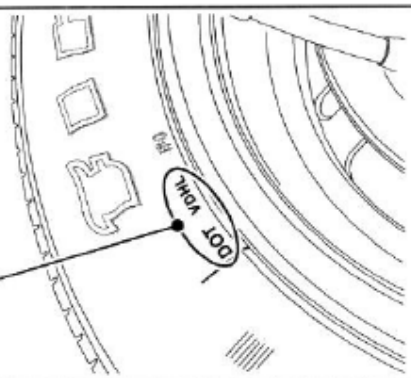
P235/75R15

ALL INCLUDED IN RECALL

P235/75R15

ONLY WITH DOT CODE VDHL

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL



DOT CODE

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL

TIRE DOT CODE CAN BE INSPECTED WITH VEHICLE ON GROUND

WARNING: IF RAISING THE VEHICLE TO INSPECT, DO NOT POSITION YOURSELF UNDER THE VEHICLE WITHOUT HAVING ADEQUATE SAFETY STANDS SUPPORTING THE WEIGHT OF THE VEHICLE. THE JACK PROVIDED FOR USE WHEN CHANGING A TIRE BY ITSELF IS NOT ADEQUATE FOR THE PURPOSE OF GETTING UNDER THE VEHICLE.

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Attachment V
Revised 8/16/00

Firestone Tire Recall

Replacement of Certain Firestone P235/75 R15 Tires

Tire Inflation Guide

AFFECTED BRAND	MODEL	FIRESTONE ATX	TIRE PRESSURE	FIRESTONE WILDERNESS	TIRE PRESSURE
		(MY)	(frt - rear) psi	(MY)	(frt - rear) psi
FORD	EXPLORER	91 - 96	26** - 26**	97 - 00*	26** - 26**
FORD	EXPLORER SPORT- 2DR.	91 - 96	26** - 26**	97 - 01*	26** - 26**
FORD	EXPLORER SPORTRAC	N/A	-	01*	28 - 35
FORD	RANGER	91 - 96	30 - 35	97 - 00*	30 - 35
FORD	F - 150	91 - 94	35 - 41	N/A	-
FORD	BRONCO	91 - 94	35 - 41	N/A	-
(I)MERCURY	MOUNTAINEER	N/A	26** - 26**	97 - 00*	26** - 26**
MAZDA	NAVAJO	91 - 94	26 - 26	N/A	-
MAZDA	B-SERIES PICKUP	94 - 96	30 - 35	97 - 00*	30 - 35

* Firestone Decatur, Illinois Plant only

** Ford approved range is 26 - 30 psi.

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Tires: All Technical Service Bulletins Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

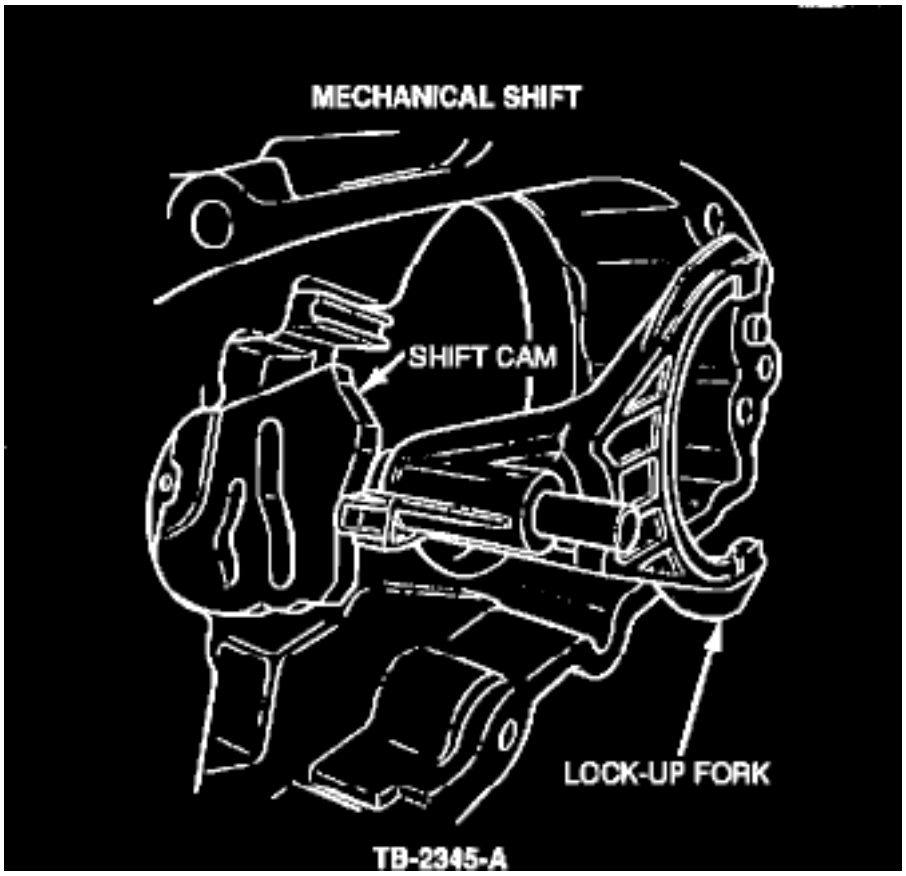
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

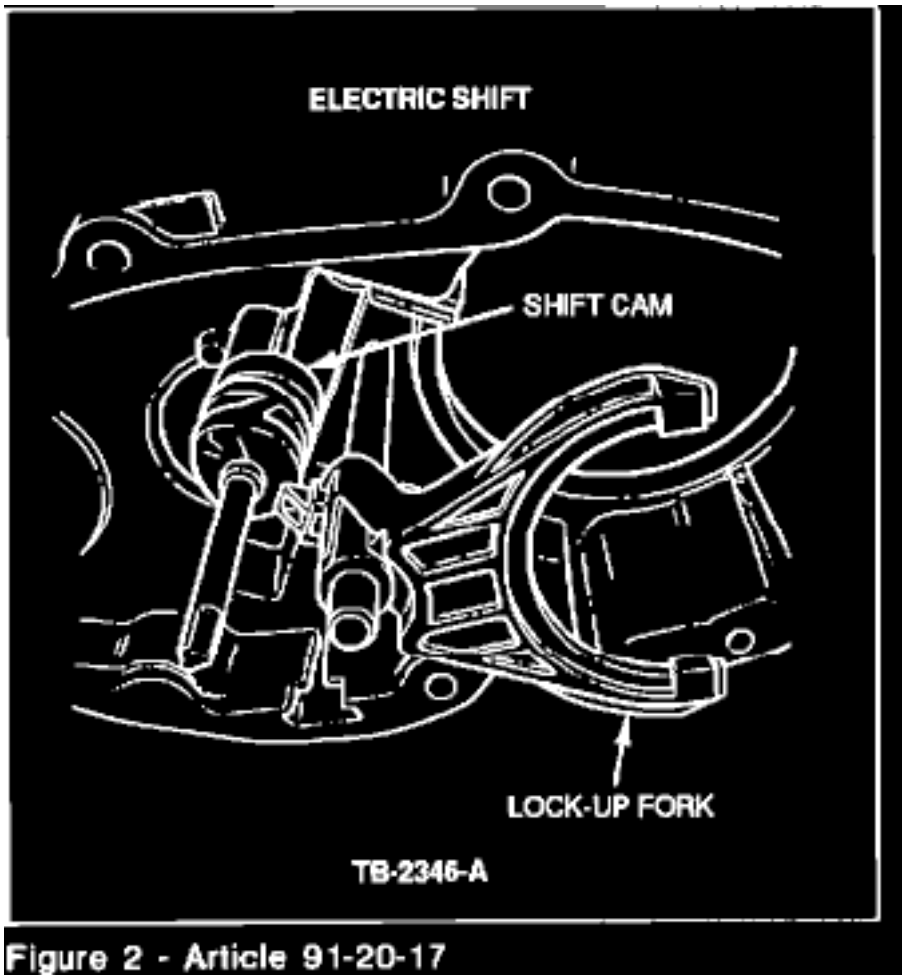


Figure 2 - Article 91-20-17

Figure 2

NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

EGTZ-7D126-A Sleeve Spring B

F1TZ-7289-D Lock-Up Fork B

OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

912017A Perform Initial Checks 0.5 Hr.

912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Tires: All Technical Service Bulletins Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

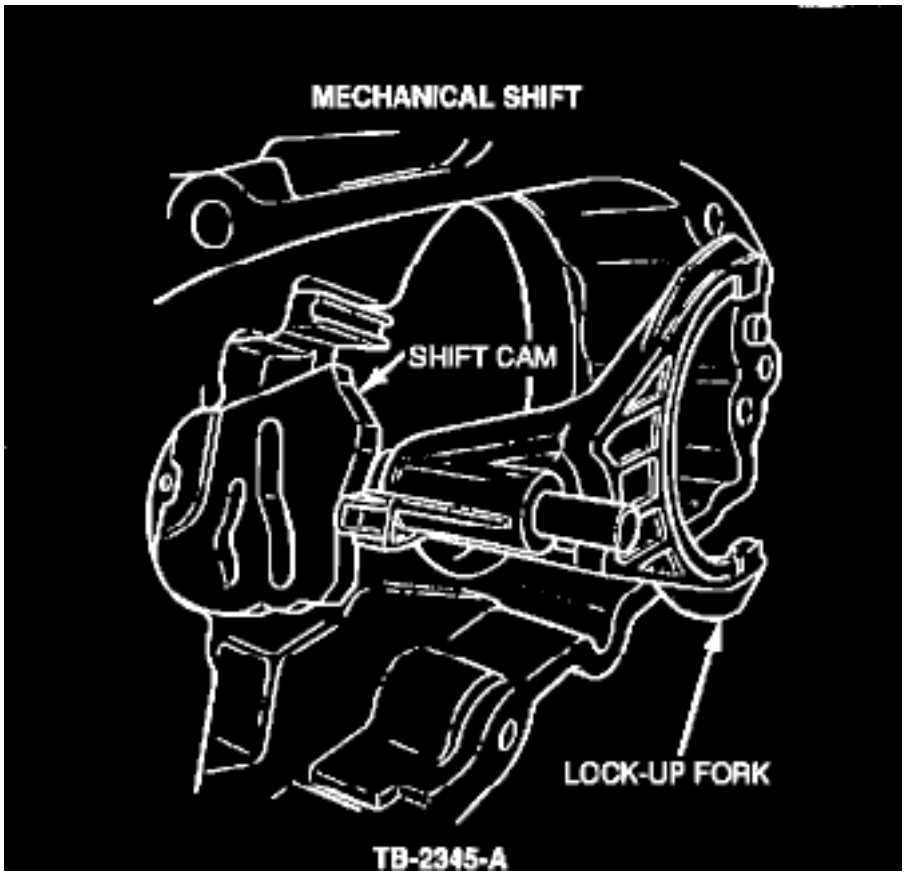
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

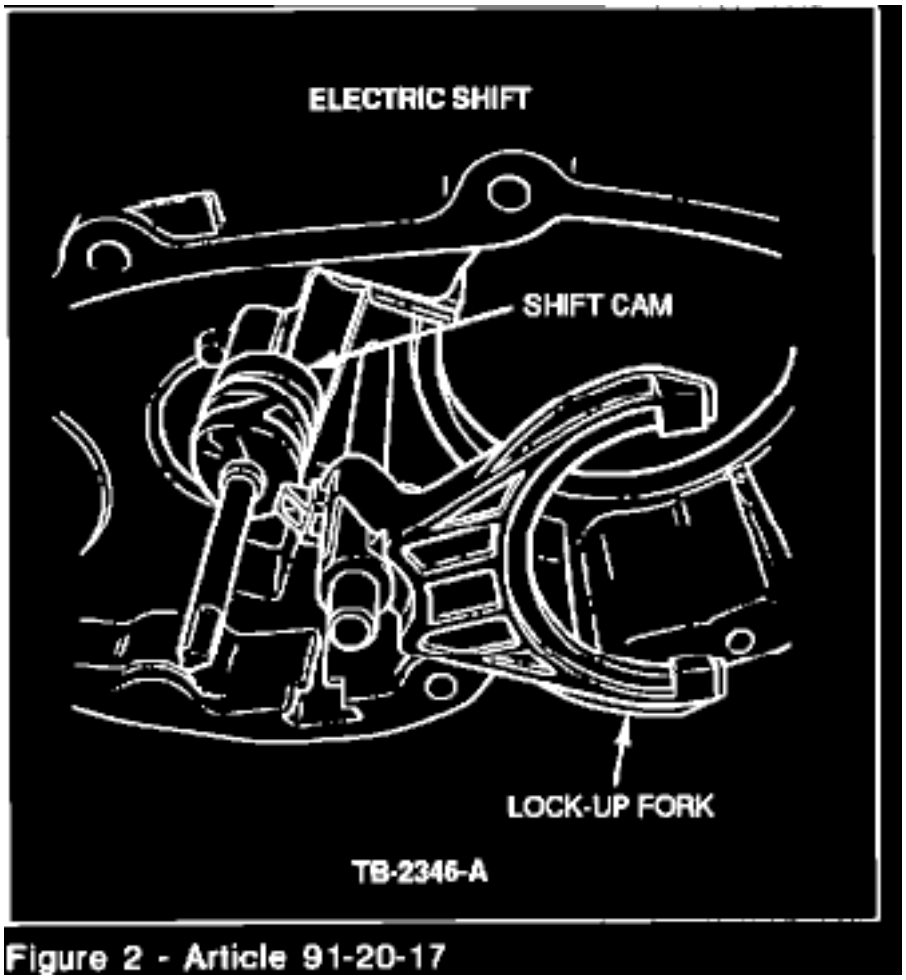


Figure 2 - Article 91-20-17

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NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

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OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

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912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Ford Motor Company

October 2001

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77 Supplement 7:** 10/12/01 Updated Information

REFERENCE: **Owner Notification Program 01B77 – Ford Wilderness AT Program:** Replacement of Wilderness AT tires

PROGRESS TO DATE

- To date we have replaced close to 7 million tires or 55% of the total tires needed
- Ford and Mercury dealers are currently handling over 70% of all Wilderness AT replacements
- All tire sizes are now readily available, though certain brands may not be available

The following information has been updated for ONP 01B77:

CHANGES MADE TO THE ALL DEALER LETTER

- ONP 01B77 – Ford Wilderness AT program will expire on March 31, 2002
- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- All customers who have not had their tires replaced will receive a follow-up letter by the end of October, 2001 announcing these program changes and encouraging them to visit a Ford Motor Company dealership for tire replacement
- 1995 and 1996 F-150 customers, which were added to the program on August 17, 2001, will receive their first notification letter by the end of October, 2001, which includes the following:
  - The customer must have their tires replaced at a Ford Motor Company dealer
  - They will only be eligible for refunds if they purchased their tires between August 1, 2000 through October 31, 2001

    NOTE: Refunded at actual cost and no DOT sections required, since these customers were never notified of the DOT requirements and maximum dollar limit.
- Effective immediately all tire refund requests are to be processed through the dealer (Online Refund Form should no longer be used)

CHANGES TO ATTACHMENT I

- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- The Online Refund Form used for refunds before May 22, 2001 is no longer posted on the web

CHANGES TO ATTACHMENT II

- Wait List Survey link added
- A procedure has been added to handle customers who purchase tires after November 15, 2001 and are seeking a refund

All revisions since Supplement 6 are in *red italics* and revised pages have been marked "*Revised10/12/01.*"

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Technical Service Bulletin # 01B77 Date: 011001

Ford Motor Company

May 2001
Revised 10/12/01

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77-S7 – Ford Firestone Wilderness AT Program:** Replacement of Firestone Wilderness AT tires.

OASIS: Yes
OWNER LIST: Yes
PARTS RETURN: No
PROGRAM TERMS: This program will expire *March 31, 2002* and has no mileage limit.

WHAT WE ARE DOING AND WHY

On August 9, 2000 Firestone initiated a voluntary recall of 6.5 million tires, including 3.8 million P235 75R15 Radial ATX tires manufactured since 1990 at all North American Firestone plants. Also, Firestone recalled about 2.7 million P235 75R15 Wilderness AT tires made at its Decatur, Illinois plant. The recall included both original equipment and replacement tires. As of January 22, 2001 more than 6.1 million tires have been replaced – the recall is more than 94% complete.

Under this new owner notification, Ford will replace 13 million Firestone Wilderness AT tires on Ford and Mercury SUVs and pickup trucks listed below under "affected tires and vehicles." This is a voluntary precautionary measure. Ford made the decision to take this action after extensive examination of field data as well as laboratory and track testing in close collaboration with NHTSA. The field data, along with our testing and statistical analysis, shows a directional trend toward elevated failure rates, that differs based upon where the tires were manufactured. Ford does not have sufficient confidence in the future performance of these tires, so we are acting in the interest of our customers to ensure their continued trust and confidence.

To date we have replaced close to 7 million tires or 55% of the total tires needed for this program. Ford and Mercury dealers are currently handling over 70% of the Wilderness AT tire replacements. Also, with the increased availability of all 15-, 16-, and 17-inch tires at the dealers, Ford is changing the expiration date of the program to March 31, 2002 to encourage customers to have their tires replaced as soon as possible.

NOTE: Certain brands of tires may have limited availability.

AFFECTED TIRES AND VEHICLES

This program affects 15-, 16-, and 17-inch Firestone Wilderness AT tires and Ford and Mercury vehicles with these tires on them. The vehicles listed below may have been originally equipped with Firestone Wilderness AT tires or may have had Wilderness AT tires installed during the Firestone recall launched in August, 2000.

- Certain 1991 through 2002 Ford Explorer
- Certain 2001 through 2002 Explorer Sport, and Sport Trac
- Certain 1997 through 2002 Mercury Mountaineer
- Certain 1991 through 2001 Ranger
- Certain 1999 through 2001 Expedition
- Certain 1991 through 1997 F-Series
- Certain 1991 through 1994 Bronco

NOTE: Both original equipment (OE) and replacement tires are affected.

IMPORTANT FACTS

- *Ford Wilderness AT tire program will expire on March 31, 2002.*
- *Tires purchased by customers after November 15, 2001 will no longer be eligible for a refund.*
- *A follow-up owner letter announcing program changes will be mailed beginning the week of October 17, 2001.*
- *1995 and 1996 F-150 owners, which were added to the program on August 17, 2001, will be notified by the end of October 2001.*
- All 15-, 16-, and 17-inch Firestone Wilderness AT tires (regardless of series number) that are mounted on Ford or Mercury vehicles are eligible for replacement.
- All other Firestone Wilderness AT tire sizes are not included in this program.
- AtW/Ford Tire Program dealers are to stop the sale of Firestone Wilderness AT tires in their parts inventory effective immediately.
- Ford Motor Company has notified customers of this owner notification program via first class mail.
- Customer refunds will be handled differently based on whether the tires were purchased before or after May 22, 2001.
- *Effective immediately all refunds will be processed through the dealer for customers who purchased their tires from August 1, 2000 through November 15, 2001, (Online Refund Form should no longer be used).*
- *1995 and 1996 F-150 owners will only be eligible for refunds for tires purchased between August 1, 2000 and October 31, 2001, (no DOT sections required).*
- A list of Ford-approved replacement tires is posted on QCDealer. Only these tires may be used as replacement tires for vehicles that were originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires under this program.
- There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.
- **Vehicles with branded titles** - although normally excluded from Owner Notification Programs are included as part of this program.
- Affected vehicles sold in Canada can be serviced by U.S. dealers, and affected vehicles sold in the U.S. can be serviced by Canadian dealers.

STOP SALE OF FIRESTONE WILDERNESS AT TIRES IN DEALER STOCK

Firestone Wilderness AT tires in stock at Ford and Lincoln Mercury dealers enrolled in the Around the Wheel or Ford Tire Program (Certified Tire Dealers) should not be sold. Dealers that purchased these tires through the Ford program and have them in stock should complete the *Unsold Wilderness AT Credit Form* located on QCDealer.com. If you have questions, call the Ford Tire Hotline at 1-888-353-3251 for disposal and credit information.

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

Non-Certified Tire (AtW or Ford Tire Program) Dealers who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program) or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "**SCHP**" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

SERVICE PROCEDURE

All 15-, 16-, and 17-inch Firestone Wilderness AT (regardless of series number) tires installed on Ford and Mercury vehicles must be replaced under this owner notification program. Original equipment (OE) and replacement tires are included.

Spare Tires

Firestone Wilderness AT (regardless of series number) spare tires are affected and should be replaced. The Firestone P235 75R15 ATX temporary spare tire used on Ranger vehicles is not included in this program.

Note: Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

Note: When processing refunds for customers, inspect the spare tire; if the spare tire is a Firestone Wilderness AT (with the Ranger exception noted previously) replace the spare tire using the information provided on Attachment II.

Does Current Tire Condition Affect Replacement Procedure?

All affected tires should be replaced regardless of the mileage or the remaining tread on the tire. If the customer caused damage to the tires, i.e. hit a curb, accident, under inflation, alignment issues, the tire should still be replaced. If the tire is worn out, it should still be replaced.

What if the Vehicle has a Mix of Affected and Non-Affected Tires?

- If the spare tire is the only Wilderness AT, then only the spare should be replaced (see exception on temporary spares above).
- In most cases an owner's vehicle will have all 15-, 16-, or 17–inch Firestone Wilderness AT tires installed and require replacement of all tires. In cases where a vehicle has a mix of tire brands/sizes installed, replace all Firestone Wilderness AT tires and the remaining tires to match the tire brand and size by axle.

For example, if a vehicle has a Wilderness AT on the left front, a Wilderness AT on the right rear, a Wilderness AT for a spare, and the other two tires are not Wilderness AT; the spare and the left front and right rear should be replaced and the new tires should be installed on the same axle. The customer should also be advised that all tires should be the same size especially on 4 X 4 models.

What replacement tires may be used for vehicles originally equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires?

Replacement tire(s) must be on the list of tires approved by Ford <link to approved tire list>. Any deviation from this approved list may change the vehicles handling, ride, vibration, and noise characteristics and cannot be claimed through Ford.

If customers are seeking reimbursement for tires purchased outside of a Ford Certified Tire Dealer, refer to Attachment I for reimbursement guidelines and claiming procedures. *Customers who purchase tires after November 15, 2001 are not eligible for a refund.*

Note: There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

Note: "Blemished" tires may not be used as replacement tires under this program.

FORD AND LINCOLN MERCURY DEALER TIRE DISPOSAL PROCESS

- Tires that are removed from vehicles must immediately be made unusable by either cutting the bead through the DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request. Marking the last 6 characters of the VIN on the removed tire(s) is no longer required.
- The tires will be disposed of by using the "National Tire Recovery and Recycle Program".

Regional FCSD and independent personnel will be randomly auditing dealers for proper tire scrapping and claiming procedures. Any infractions will result in prior approval for tire owner notification claims.

Note: Make removed tires unusable during tire replacement. Do not stack tires and disable them at a later time.

DEALERSHIPS ELIGIBLE TO REPLACE TIRES UNDER THIS PROGRAM

All Ford and Lincoln Mercury dealers enrolled on the Around the Wheel or Ford Tire Program (Certified Tire Dealers) are eligible to complete tire replacements under this program.

Ford dealers interested in joining the Ford Tire Program may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

APPROVED RETAILERS PARTICIPATION IN PROGRAM

We have developed a program to authorize Goodyear, Michelin, Continental, and General tire retailers to perform tire replacements at no cost to customers. These eligible retailers will use only tires from the Ford Approved Tire List when performing no cost replacements. This was done to reduce customer inconvenience by:

- Eliminating customer out of pocket expense
- Maximize the number of customers whose replacement tires are those on the Ford Approved tire list
- Expedite the completion of this program
- Reduce administrative burden on our Ford and Lincoln Mercury dealers
- Reduce dealer tire disposal responsibility
- Allow dealers to continue with their normal day to day service business

ATTACHMENTS

Attachment I:	Administrative Information
Attachment II:	Labor Allowances and Parts Ordering Information
Attachment III:	Technical Information

CONTACTS

Claims Information:	1-800-423-8851
For Around the Wheel/Ford Tire Program Questions:	1-888-353-3251
Ford Tire Inquiry Hotline (Customer):	1-866-300-1226
Other (Dealer Only) Program Questions:	1-800-325-5621
Tire Registration for Federal Regulations Questions:	1-330-794-9190

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Attachment I - Administrative Information

OASIS

OASIS must be used to determine vehicle eligibility.

IMPORTANT:

When an eligible vehicle is at the dealership for service, OASIS must be contacted to determine if Owner Notification Program 01B77 is open. If 01B77 is listed in OASIS as open, it is important that the vehicle is inspected for eligible tires. If the eligible vehicle is not equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires a claim must be submitted using labor operation 01B77A to close the program. If an affected vehicle does not have 01B77 open, this may indicate that a refund

or tire replacement has already been processed on this vehicle.

Some Ford and Lincoln Mercury vehicles not listed in the AFFECTED TIRES AND VEHICLES list may have 15-, 16-, or 17-inch Firestone Wilderness AT tires installed. These vehicles are covered under this program, but will not be active in OASIS. Contact the Special Service Support Center at 1-800-325-5621 to obtain prior approval before performing the repair or issuing a refund. This will insure that a previous repair/refund has not been performed on the vehicle.

CLAIMS PREPARATION AND SUBMISSION

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ Enter the full part number of the replacement tire with the quantity of tires replaced. Tires will be reimbursed at AtW Dealer cost + 25% (wheel weights and valve stems incl.).

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier. Dealers are encouraged to arrange for shipment of 4 or more tires at a time.

^ Dealers can no longer claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program". You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires on the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry.

RELATED DAMAGE

Vehicle damage caused by a tire related failure is not covered by this program. Refer to the Warranty and Policy Manual for proper claiming procedure for vehicles covered by the Ford Bumper-to-Bumper Tire Warranty (model years 2001 and 2002). All other pre-2001 model year vehicles with alleged tire related vehicle damage should be handled through the Firestone claims process, or by referring the customers to their insurance company.

Damage related to replacement of tires should be handled as described in the Warranty and Policy Manual.

OWNER REFUND

With the increased availability of replacement tires, it will no longer be necessary for customers to pay out-of-pocket expenses for tires. Therefore, refund requests for tires purchased after November 15, 2001 will no longer be granted. Owners will be notified of the refund expiration date and will be directed to a Ford or Mercury dealer They are directed to an authorized retailer only if the Ford or Mercury dealer cannot meet their scheduling needs or tires are not in stock. All Ford and Mercury dealers (AtW and non-AtW dealers) are required to process refunds for customers who purchase tires prior to November 15, 2001.

The following rules apply to refunds for tires purchased from August 1, 2001 through November 15, 2001:

Refunds will be processed for vehicles listed under "AFFECTED TIRES AND VEHICLES", and for other Ford and Lincoln Mercury vehicles that have 15-. 16-, or 17-inch Wilderness AT tires installed.

^ The customer must provide the original paid receipt (a copy of their paid receipt is acceptable on an exception basis in instances where the owner requires the original for another purpose (e.g. extended tire warranty or purchase rebate). The dealer will attach the receipt to the dealer file copy of the refund claim (see claim instructions below).

^ Dealers will be reimbursed to immediately disable tires returned for a refund (see claiming instructions for refunds and Attachment II for labor operations).

^ The tires must be purchased August 1, 2000 through November 15, 2001 to be eligible for a refund (through October 31, 2001 for 1995 and 1996 F-150 owners).

^ Customers requesting refunds for tire replacement May 22, 2001 through November 15, 2001 must provide either:

NOTE:

This does not apply to 1995 and 1996 F-150 customers.

^ The Firestone Wilderness AT tires that were replaced. Returned tire(s) are to be disabled by the dealership. Ford will reimburse the dealer to disable (see claim instructions below and use labor operation 01B77G). If tires are brought in for refund with the DOT codes missing dealers should not process the refund.

^ A section of the old tire(s) containing the DOT codes from each of the Firestone Wilderness AT tires that were replaced (To be cut from the Wilderness AT tires that were replaced by the outside repair facility) (use labor operation 01B77L). Dealers should deface (cut in pieces or make code unreadable) the DOT sections of the tire so they cannot be used to obtain another refund. If sections are brought in for refund with the DOT code defaced dealers should not process the refund.

NOTE:

The DOT Code Identification Guide has been developed to help dealers determine if the DOT sections returned to the dealership are from 15-, 16-,

Purchase Date Range	Refund Guidelines
August 1, 2000 through May 22, 2001	• The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
1995 and 1996 F-150 vehicles only *August 1, 2000 through October 31, 2001*	• *The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes (no DOT required)* • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
May 23, 2001 through November 15, 2001	• 15 inch tires - $110 (includes mounting, balancing, stems, disposal, and taxes) • 16 and 17 inch tires - $130 (includes mounting, balancing, stems, disposal, and taxes) • Dealers process refunds
After November 15, 2001	• *No refunds accepted for tires purchased after November 15, 2001*

Refund Questions	What is the owner qualified to receive?
Example: On December 21, 2000 the customer paid to have (4) Firestone Wilderness AT tires replaced on an affected vehicle.	o August 1, 2000 through May 22, 2001 (October 31, 2001 for 1995 and 1996 F-150) full refund with paid receipt o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
Example: On January 15, 2001 the customer paid to have (2) Wilderness AT tires replaced on a 1988 F-Series truck. The other tires are non-Firestone Wilderness AT.	o August 1, 2000 through May 22, 2001 – full refund with paid receipt o Dealer contacts Special Service Support Center at 1-800-325-5621 for approval code o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

or 17-inch Firestone Wilderness AT tires. Use the DOT Code Identification Guide in conjunction with the bulletin section "What if the Vehicle has a Mix of Affected and Non-Affected Tires" to determine how many tires are eligible for refund.

NOTE:

Ford will allow customers to file for a refund (with or without tires) for tires purchased after May 22 through June 30, 2001 because customers may not have tires to turn in. Customers must provide a paid receipt indicating tire replacement before July 1, 2001 in order to process a refund without tires or DOT sections. Customers who purchase tires after June 30, 2001 must provide tires or DOT sections.

Ford will reimburse customers the following amounts:

^ Tires purchased from August 1, 2000 through May 22, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes.

^ (1995 and 1996 F-150 vehicle only) Tires purchased from August 1, 2000 through October 31, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes. No DOT section required.

^ Tires purchased May 23, 2001 through November 15, 2001, the actual cost as stated on the receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes up to a maximum of $110 per tire for 15 inch, and $130 per tire for 16 and 17 inch tires.

^ Refunds will not be granted for tires purchased after November 15, 2001.

Note:

If an owner pays for the replacement of their tires after November 15, 2001, the dealer may handle on a case by case basis following the procedure in Attachment II.

Refund Questions	What is the owner qualified to receive?
Example: On May 27, 2001 the customer took their 1998 Explorer to an outside tire retailer and had (5) Firestone Wilderness AT 16 inch tires replaced.	o After May 22, 2001 refund tire replacement with paid receipt up to: o 15 inch = $110 (maximum per tire) o 16 and 17 inch = $130 (maximum per tire) o With a paid receipt this customer would be entitled to (5) tires x $130 (16 inch maximum per tire) = $650 refund (includes mounting, balancing, stems, disposal, and taxes) o Dealer will be eligible to claim for refund allowance using labor operation 01B77L o If the customer returns the old tires to the dealer o The dealer will disable the old tires and dispose of them using the *"National Tire Recovery and Recycle Program"* using labor operation 01B77G (disable) in conjunction with 01B77L (refund allowance) o Customer does not need old tire(s) *since tires purchased prior to July 1, 2001* (After June 30, 2001 customer will need old tires or removed DOT codes from replaced tires to qualify)
Example: On December 2, 2000 the owner replaced their (5) Firestone Wilderness AT tires with another set of Wilderness AT tires.	o The owner is not eligible for refund o The owner is eligible for tire replacement only o Use only tires from the "Ford Approved Tire List"
Example: *On November 16, 2001 the owner purchases tires from a tire retailer.*	o *No refund will be granted after November 15, 2001* o *Dealers may handle on a case-by-case (See Attachment II)*
Example: *On October 10, 2001 a 1995 F-150 owner purchases tires from a tire retailer.*	o *August 1, 2000 through October 31, 2001 – full refund with paid receipt* o *Customer does not need old tire(s) or DOT section(s)* o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

CLAIMS PREPARATION FOR REFUNDS (USE THIS PROCEDURE FOR ALL REFUND REQUESTS)

NOTE:

Tires must be purchased prior to November 15, 2001

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ When a customer brings in their old tires and is seeking a refund, use labor operation 01B77G (disable) and 01B77L (refund administration allowance) from Attachment II.

^ If a customer brings in the old DOT codes removed from the old tires - use labor operation 01B77L only.

^ The Miscellaneous Expense Code "ADMIN" will not be accepted under this program. A labor operation 01B77L has been provided to cover administrative costs.

^ Enter REFUND in the miscellaneous area of the claim.

^ Dealers will no longer be able to claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program" You may still claim any applicable local waste tax - enter OTHER

in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires in the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry. If the tires were replaced prior to May 23, 2001 (or November 1, 2001 for 1995 and 1996 F150 customers) the DOT may not be available, in this case record the brand, make and size of the tires in the technician comments area of the claim.

RENTAL CARS

TAP allowances have been increased specifically for this owner notification program. Refer to Don Brunner letter.

DOT REGISTRATION OF NEW TIRES

Dealers are required to register the DOT number of every tire sold to meet federal tire registration requirements. Ford has established a partnership with CIMS to assist dealers in registering these DOT codes. Information is available on QCDealer.com under CIMS Tire Registration or by contacting CIMS

Description	Labor Operation	Labor Time
Inspect for non-Wilderness AT tires (used to close 01B77 not for use when processing a refund)	01B77A	0.2 Hours
Replace & balance 1 tire (to be used for spare tire only)	01B77B	0.4 Hours
Replace & balance 2 tires (one axle)	01B77C	0.6 Hours
Replace & balance 3 tires (one axle plus spare)	01B77D	0.8 Hours
Replace & balance 4 tires (both axles)	01B77E	1.0 Hours
Replace & balance 5 tires	01B77F	1.2 Hours
Disable up to five tires (used only for refund claims)	01B77G	0.2 Hours
*Refund administration allowance (to be used when processing a customer refund without tire disposal, if tires are returned to dealership for disposal use in conjunction with operation 01B77G)	01B77L	0.2 Hours
Administrative Allowance for Non-Certified Tire Dealers (AtW or Ford Tire Program) to be used when sending a dealer stock unit, or customer vehicle (for tire replacement) to a Certified Tire Dealer, or tire retailer authorized to perform tire replacement under this program	Misc. Expense use code "SCHP"	$15.00

NOTE: Front-end alignment is not included in this program.

***NOTE:** When processing a refund for four (4) road tires, the non-temporary spare tire should be replaced as part of this program – file a related damage claim to cover the spare tire replacement.

at 330-794-9190.

NON-FORD OR LINCOLN MERCURY VEHICLES WITH FIRESTONE WILDERNESS AT

Non-Ford or Lincoln Mercury vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires installed by a Certified Tire Dealer (AtW or Ford Tire Program) are eligible for replacement. The repair should be submitted using a Warranty/ESP claim type form. The dealer must enter Program Code "P19", this will allow the repair to be submitted without a VIN. The causal part must be TIRE, with the actual part numbers for reimbursement at dealer cost plus 25%, and use actual time for labor reimbursement. These types of claims cannot be submitted as an Owner Notification Repair type.

Attachment II - Parts and Labor Information

LABOR ALLOWANCES

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

NOTE:

Non-Certified Tire Dealers (AtW or Ford Tire Program) who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program), or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "SCHP" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

PARTS REQUIREMENTS

Tire Ordering Information

^ Dealers are required to install only tires from the Approved Tire List for vehicles originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires. Dealers should immediately order replacement tires for inventory.

^ Certified Tire Dealers will order replacement tires through normal channels.

^ Dealers not authorized for the Around the Wheel Program will not participate in this recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

TIRE AVAILABILITY:

All dealers should check QCDealer.com daily for updates to the approved tires list. Distributors and tire retailers will allocate tires as best they can on a daily basis. Your dealership should do the following to ensure that you are able to secure your fair allotment of these limited volumes:

^ Contact your Ford authorized facing distributor(s) for each tire manufacturer.

^ Contact your Ford authorized facing tire retailers for each tire manufacturer.

^ Review with these supply points the volume of tires you need to ensure you have tires ready to fill orders with every supply point.

Questions not addressed by above sources should be directed to your market area team.

CUSTOMER WAIT LISTS:

Dealers should create a customer wait list and record: Customer name

^ Address and phone number

^ Vehicle make

^ Model year

^ Mileage

^ Tire size

NOTE:

Customers should be prioritized to replace oldest tires first.

WAIT LIST SURVEY

Please fill out the Firestone Tire Survey in the Management Report Section of QCDealer weekly. It is critical that you answer the questions as accurately as possible as the survey results will be used to help determine the level of production from the tire manufacturers.

DEALER PRICE

For latest prices on replacement tires, refer to the most recent Ford Motor Company Tire Price List.

PROCEDURE FOR CLAIMING REFUNDS FOR TIRES PURCHASED AFTER NOVEMBER 15, 2001

The following procedure applies to tires purchased after November 15, 2001:

1. Determine if the customer should receive special consideration based on owner loyalty, special circumstance cc, etc.

2. If the customer is eligible for special consideration the dealer will call the Special Service Support Center at 1800-325-5621 to request an authorization code.

3. The Special Service Support Center representative will ask for the following:

^ Customer Name

^ VIN

^ Date of repair

^ Original copy of invoice (be prepared to fax)

4. If the customer qualifies for a refund, the Special Service Support Center will provide your dealer with an authorization code.

5. Your dealer will input a claim with the authorization code (authorization code must be included to receive payment).

6. After the dealer receives payment for the claim, the dealer will then send the refund to the customer.

NOTE:

If the Special Service Support Center determines that the customer does not qualify for a refund, no authorization code will be given. Any appeals must be made by the dealer to the appropriate field representative

Attachment III - Technical Information

AFFECTED VEHICLES: REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES

OVERVIEW

This program details the replacement of 15-, 16-, and 17-inch Firestone Wilderness AT tires regardless of production plant. You will need to perform a DOT code inspection prior to replacing the 15, 16, or 17-inch Wilderness AT tires.

NOTE:

When lowering or raising an under-vehicle spare, DO NOT use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

NOTE:

Radial ATX "TEMPORARY USE" spare tires are not included under this program, and should not be replaced as part of this program.

NOTE:

Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

INSPECTION

1. Inspect the vehicle tires (including the spare tire) for the presence of Firestone Wilderness AT tires.

2. If Firestone Wilderness AT tires are present replace them with a suitable replacement from the "Approved Tire List".

Note:

There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

3. If only one Firestone Wilderness AT road tire is present on the vehicle, you will need to replace the opposing tire on the same axle. However, if one (1) front and one (1) rear tire are Wilderness AT you would not automatically replace all four (4) tires instead, you would replace the two (2) Wilderness AT tires and place them on the same axle.

4. Record the DOT code from each removed tire(s) on the repair order.

5. Tires that are removed from vehicles must immediately be made unusable by either cutting through the bead and DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall.

6. Adjust all tires to the proper inflation pressure, and release the vehicle. For specifications, refer to the vehicle Owner's Manual or the vehicle certification label located on the driver's door opening.

NOTE:

Tires that are removed from vehicles under this program, and those in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT

code will prevent the tire from being used for an additional refund request.

NOTE:

If the vehicle is a 4X4, and is equipped with non-Firestone Wilderness AT tires on one axle, and the replacement tires for the Firestone equipped axle causes a mismatch with the existing non-Firestone axle, the customer is responsible for the tire mismatch. If the customer refuses to purchase matching tires to correct the mismatch - the dealer should annotate the repair order to reflect the customer's decision.

Ford Motor Company

FIRESTONE TIRE RECALL

September 2000

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: Firestone Tire Recall Supplement #4 9/1/00 - Updated Information

REFERENCE: Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires

Changes for this Supplement:

- The following has been added to Attachment I to clarify the claiming of freight: Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.
- Additional information is now required in the comments of each claim filed for tire replacement under both Program Codes P17 and P18. The comments must include the entire DOT code from the tire being replaced and under P17 only the part number of the replacement tire. Firestone requires this information for government reporting.

Claims under the Firestone recall for tire replacement filed by Ford and Lincoln Mercury dealers not enrolled in the AtW/Ford Tire Program will not be accepted for payment. Non-AtW/Ford Tire Program dealers will continue to be able to file claims for tire inspection. This is not new information; we have just added the edits to the ACES II system.

The revised letter and attachments have been marked "Revised 9/1/00", and a ( ) symbol appears at the beginning of any text that changed since the last Supplement and the text appears in green when viewed on line. To avoid confusion please discard all previous versions.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Technical Service Bulletin # FIRESTONE Date: 000901

Dealer Letter

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: DEMONSTRATION / DELIVERY HOLD - Firestone Tire Recall: Certain 1991 through 2000 Explorer, 1997 through 2000 Mountaineer, 2001 MY Explorer Sport Trac and Sport, 1991 through 2000 Ranger, 1991 through 1994 Bronco and 1991 through 1994 F-Series - Replacement of Firestone P235/75 R15 Radial ATX and Certain Wilderness AT Tires.

REFERENCE:

Model Year	Body Style	Tire/Wheel Size
1991 - 1994	ALL	15"
1995 - 1998	ALL (Excluding Eddie Bauer and 2-door Sport if equipped with 16 inch wheels)	15"
1999 - 2001	ALL (Excluding Eddie Bauer and Limited Editions if equipped with 16 inch wheels)	15"

Model Year	Body Style	Tire/Wheel Size
1995 - 1998	Eddie Bauer	16"
1996 - 2001	Sport and any 2-door Sport 4X4 w/Premium Sport Package	16"
1999 - 2001	Eddie Bauer and Limited	16"

Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires.

AFFECTED TIRES AND VEHICLES

Bridgestone Firestone Tire Company recently announced a Safety Recall on the following:

- All Firestone P235/75 R15 Radial ATX tires produced excluding tires marked "TEMPORARY" on the sidewall - and -

- P235/75 R15 wilderness AT tires produced only at the Decatur plant.

NOTE:

Decatur built tires have a DOT code of VDHL - see Attachment III for details. All other Wilderness AT tires are not affected.

Both original equipment (OE) and replacement tires are affected.

The following vehicles produced with Firestone P235/75 R15 Radial ATX original equipment tires are affected by this recall:

^ Certain 1991 through 1996 Ford Explorer (see chart)

^ Certain 1997 Mercury Mountaineer vehicles

^ Certain 1991 through 2000 Ranger vehicles

^ Certain 1991 through 1994 Bronco vehicles

^ Certain 1991 through 1994 F-Series vehicles

The following vehicles produced with P235/75 R15 Wilderness AT tires as original equipment are affected by this recall:

Certain 1997 through August 7, 2000 Mountaineer vehicles

^ Certain 1997 through August 7, 2000 Explorer vehicles (see chart)

^ Certain 1997 through June 1, 2000 Ranger vehicles

^ Certain 2001 Explorer Sport Trac and Sport vehicles produced through August 7, 2000

These Explorer vehicles produced with either P235/75 R15 Radial ATX or P235/75 R15 Wilderness AT tires as original equipment are affected as shown.

These Explorer vehicles are NOT affected:

IMPORTANT FACTS

^ This is a FIRESTONE recall.

^ FIRESTONE will notify customers of the recall via first class mail.

^ FIRESTONE will communicate recall information to authorized repair sites including Ford and Lincoln-Mercury Around the wheel/Ford Tire Program dealers.

FORD AND LINCOLN MERCURY DEALER INVOLVEMENT

As this field action will severely impact the availability of Firestone replacement tires, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers will be afforded the opportunity to address this recall utilizing Firestone and non-Firestone tires. This is being done to address immediate needs of our customers.

FORD AND LINCOLN MERCURY DEALERS ENROLLED IN AROUND THE WHEEL (AtW)

Dealerships enrolled in the AtW/Ford Tire Program are authorized Firestone outlets. If a customer with affected tires contacts an ATW Ford Tire Program dealer, as an authorized Firestone dealer regarding this safety recall, you will be able to replace that customer's tires with Firestone or "approved" non-Firestone tires. Tires that are approved for use as replacement tires under this recall will be posted in a matrix in the Firestone Tire Center in QCDealer.com. This matrix will be amended to add new tire manufactures and models of tires as they are approved. Claiming for reimbursement of tires is outlined on Attachment I.

If the customer requests a replacement Firestone tire, secure the tire through your normal distribution chain and process reimbursement as outlined in Attachment I.

FORD AND LINCOLN MERCURY DEALERS NOT ENROLLED IN AROUND THE WHEEL (AtW)

Dealers not enrolled in the ATW/Ford Tire Program can inspect customer vehicles (see Attachments I & II for claiming instructions & labor operations). These dealers should make individual arrangements with local Firestone outlets for tire replacement, or refer customers to their local Firestone outlet.

SERVICE PROCEDURE

All Firestone P235/75 R15 tires with Radial ATX on the sidewall (excludes Temporary spare tires identified by "Temporary" on the sidewall) must be replaced under this recall.

Firestone P235/75 R15 tires with Wilderness AT on the sidewall will need to be inspected for a DOT code of VDHL to determine if replacement is required. Refer to Attachment III for details.

This service action applies to original equipment and replacement tires that are installed on Ford and Mercury vehicles.

DEMONSTRATION / DELIVERY HOLD FOR VEHICLES AND TIRES IN DEALER INVENTORY

Do not demonstrate or deliver any of the affected vehicles prior to completing the Firestone recall. In addition, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers may have affected tires in inventory; these tires should not be sold.

Tires Removed from Vehicles

Tires that are removed from vehicles must immediately be made unusable by either cutting the bead with bolt cutters, drilling a one-inch diameter hole in the sidewall, or cutting the tire completely in half The DOT code should not be defaced or removed. The tire should then be disposed of according to local laws refer to the Tire Administration Guide for further information.

NOTE:

AtW/Ford Tire Program dealers will be independently audited for compliance with the above procedure.

New Inventory Tires

All new Radial ATX or Wilderness AT tires with DOT code VDHL tires (never mounted) in AtW/Ford Tire Program dealer inventory must be returned to Firestone. Dealers must call 1-800-668-0345 to obtain a "Returned Goods Authorization (RGA) number. The RGA is a 6-digit number required to return the tires. Only tires affected by the Firestone recall will be accepted. Firestone will pay all freight for the return of these tires.

ATTACHMENTS

^ Attachment I ^

Administrative Information

^ Attachment II ^

Labor Allowances

^ Parts Ordering Information

^ Attachment III ^

Technical Information

^ Attachment IV ^

Tire Inspection Aid

^ Attachment V ^

Tire Inflation Guide

CONTACTS

Claims Information: 1-800-423-8851

Other (Dealer Only) Recall Questions: 1-800-325-5621

For Around the Wheel/Ford Tire Program 1-888-353-3251

Questions:

Attachment I

OASIS Since this is a Firestone recall, OASIS will not be activated.

PLEASE NOTE

Correct all vehicles in stock before delivery. Federal law requires dealers to complete any outstanding safety recall service before a vehicle is delivered to the buyer or lessee. Violation of this requirement by a dealer could result in a civil penalty of up to $1,100 per vehicle.

CLAIMS PREPARATION AND SUBMISSION

NOTE:

Claims for Firestone tires (P18) may be entered for payment beginning with repairs dated August 28, 2000 and later.

Claims for non-Firestone tires

Enter claims in ACES II for non-Firestone tires using DWE with the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Program Code - P17. Enter P17TIRE as the causal part with condition code 82.

^ On the same line as PI7TIRE enter the total value of the tires from the "Suggested List Price" column of the latest Ford Motor Company Tire Selling Guide.

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.

^ Tire disposal and applicable local waste tax will be reimbursed - enter OTHER in the miscellaneous expense area of the claim with the actual cost.

^ Enter the entire DOT code and the part number of the replacement tire being used in the comments area of the claim.

Claims for Firestone tires

Enter claims in ACES II for Firestone tires using the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim type.

^ Program Code - P18.

^ Enter "P18TIRE" as the causal part, no material cost should be entered on this line.

Description	Labor Operation	Labor Time
Inspect 5 tires applies only to P235/75 R15 Wilderness AT tires) - VEHICLE NOT AFFECTED (Non VDHL DOT Code)	00V01G	0.2 Hours
Inspect 5 tires (applies only to P235/75 R15 Wilderness AT tires) - VEHICLE AFFECTED - Customer must return at a later date due to unavailability of replacement tires. This may be claimed only one time per vehicle per dealer.	00V01A	0.2 Hours
Replace & balance 1 tire (No longer includes inspect) May be used with labor op 00V01A only	00V01B	0.4 Hours
Replace & balance 2 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01C	0.6 Hours
Replace & balance 3 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01D	0.8 Hours
Replace & balance 4 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01E	1.0 Hours
Replace & balance 5 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01F	1.2 Hour

^ Condition code "82".

^ Use Customer Concern Code "A99".

^ Enter the full published tire part number with the quantity of tires replaced, the payment system will price the tire at Dealer Net multiplied by the quantity for the total value of the replaced tires.

^ Use Miscellaneous Expense Code "TIREMU" to claim the $20.00 difference per tire7 a maximum of $100.00.

^ The Firestone warranty claim form must be filled out and attached to the hard copy of the claim and retained in the service file. The entire DOT code from the replacement tire(s) must be recorded on this form.

^ The DOT code must also be entered in the comments area of the claim.

^ No labor operations will be allowed when claiming P18.

OWNER REFUND

Ford and Lincoln Mercury dealers, including AtW/Ford tire dealers; will not be involved in processing refunds for customers included in the Firestone recall. Customers inquiring about a refund should be provided copies of the Firestone refund request form. Refer to the Firestone website for the refund forms and for further details.

RENTAL CARS

TAP allowances have been increased specifically for the Firestone recall refer to M.J. Lombardi's Letter.

Attachment II

LABOR ALLOWANCES

NOTE:

Front-end alignment is not included in this recall.

NOTE:

These labor operations and revised times will begin paying with claims submitted on August 18, 2000; Claims in process at dealerships will need to use these new operations.

PARTS REQUIREMENTS

Tire Ordering Information

FIRESTONE TIRE INSPECTION

AFFECTED VEHICLES: **REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES**

OVERVIEW

This procedure outlines how to check the DOT code on the tires and determine if they must be replaced.

NOTE: All Firestone P235/75R15 tires that say "RADIAL ATX" on the sidewall are being recalled and no further inspection is necessary.

NOTE: All tires including the spare must be inspected if they are "WILDERNESS AT" P235/75R15.

NOTE: When lowering or raising an under-vehicle spare, **DO NOT** use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

INSPECTION

1. Raise vehicle on a hoist.
2. Locate the DOT code on the inboard sidewall of all tires including the spare. On F-Series and Bronco models, the spare tire must be lowered to view the DOT code. Clean the area if necessary in order to accurately read the code.
3. If the DOT code is **VDHL**, the tire must be replaced. See the matrix (part of the dealer bulletin) to determine the correct replacement tires. See Figure 1.

NOTE: Recall tires that are removed from vehicles and in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole in the sidewall.

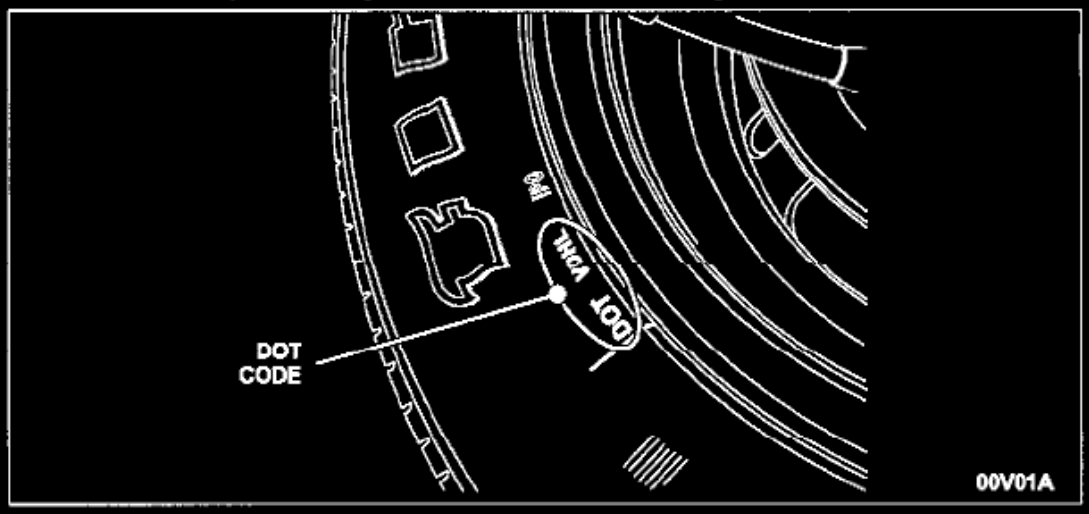

FIGURE 1

4. If the code is anything other than **VDHL**, release the vehicle to the owner.

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DEARBORN, MICHIGAN 48121
08/00

Authorized Around the Wheel (ATW)/Ford Tire Program dealers will order replacement tires through normal channels. Dealers not authorized for the Around the Wheel Program will not participate in the Firestone recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

DEALER PRICE

For latest prices on replacement tires refer to the most recent Ford Motor Company Tire Selling Guide.

TIRE INSPECTION

TIRES INVOLVED IN FIRESTONE RECALL

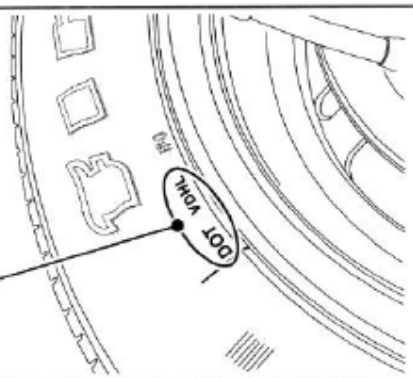
P235/75R15

ALL INCLUDED IN RECALL

P235/75R15

ONLY WITH DOT CODE VDHL

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL



DOT CODE

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL

TIRE DOT CODE CAN BE INSPECTED WITH VEHICLE ON GROUND

WARNING: IF RAISING THE VEHICLE TO INSPECT, DO NOT POSITION YOURSELF UNDER THE VEHICLE WITHOUT HAVING ADEQUATE SAFETY STANDS SUPPORTING THE WEIGHT OF THE VEHICLE. THE JACK PROVIDED FOR USE WHEN CHANGING A TIRE BY ITSELF IS NOT ADEQUATE FOR THE PURPOSE OF GETTING UNDER THE VEHICLE.

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08/00

Attachment V
Revised 8/16/00

Firestone Tire Recall

Replacement of Certain Firestone P235/75 R15 Tires

Tire Inflation Guide

AFFECTED BRAND	MODEL	FIRESTONE ATX	TIRE PRESSURE	FIRESTONE WILDERNESS	TIRE PRESSURE
		(MY)	(frt - rear) psi	(MY)	(frt - rear) psi
FORD	EXPLORER	91 - 96	26** - 26**	97 - 00*	26** - 26**
FORD	EXPLORER SPORT- 2DR.	91 - 96	26** - 26**	97 - 01*	26** - 26**
FORD	EXPLORER SPORTRAC	N/A	-	01*	28 - 35
FORD	RANGER	91 - 96	30 - 35	97 - 00*	30 - 35
FORD	F - 150	91 - 94	35 - 41	N/A	-
FORD	BRONCO	91 - 94	35 - 41	N/A	-
(I)MERCURY	MOUNTAINEER	N/A	26** - 26**	97 - 00*	26** - 26**
MAZDA	NAVAJO	91 - 94	26 - 26	N/A	-
MAZDA	B-SERIES PICKUP	94 - 96	30 - 35	97 - 00*	30 - 35

* Firestone Decatur, Illinois Plant only

** Ford approved range is 26 - 30 psi.

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Wheels: Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Wheels: Specifications

Lugnut torque ..... 135 Nm (100 ft lb)

NOTE: Torque specifications are for clean, dirt and paint free dry bolt and nut threads. Never use oil or grease on studs and nuts.

Wheel Bearing: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

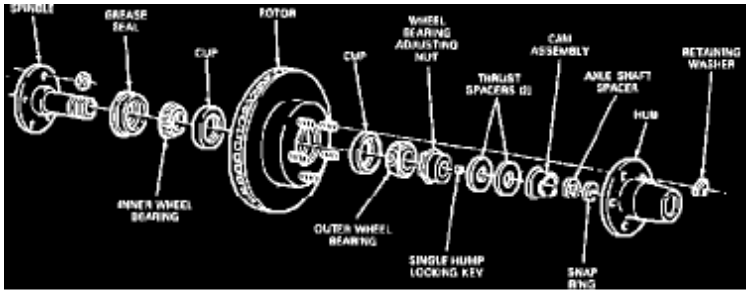
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

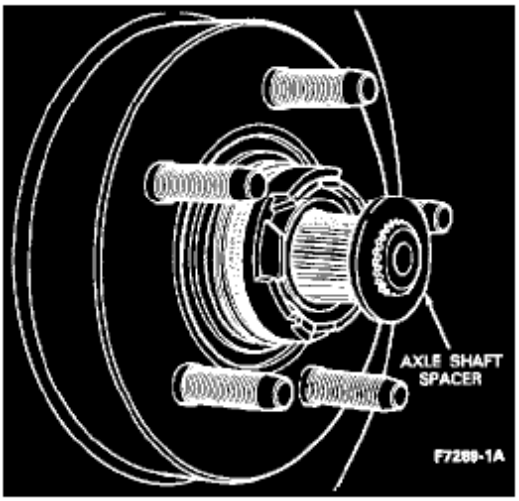
NOTES:

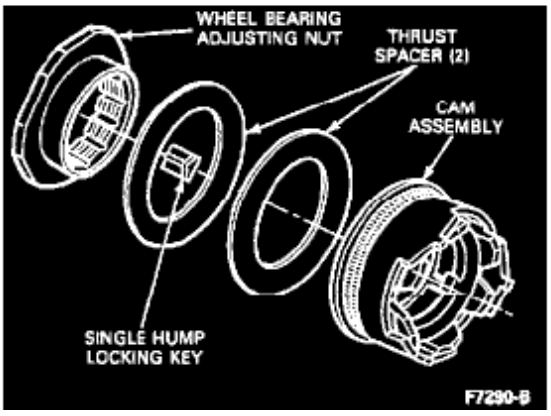
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Maintenance > Wheels and Tires > Wheel Bearing > Component Information > Adjustments > With Automatic Locking Hubs







Wheel Bearing: Adjustments With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer. 6. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

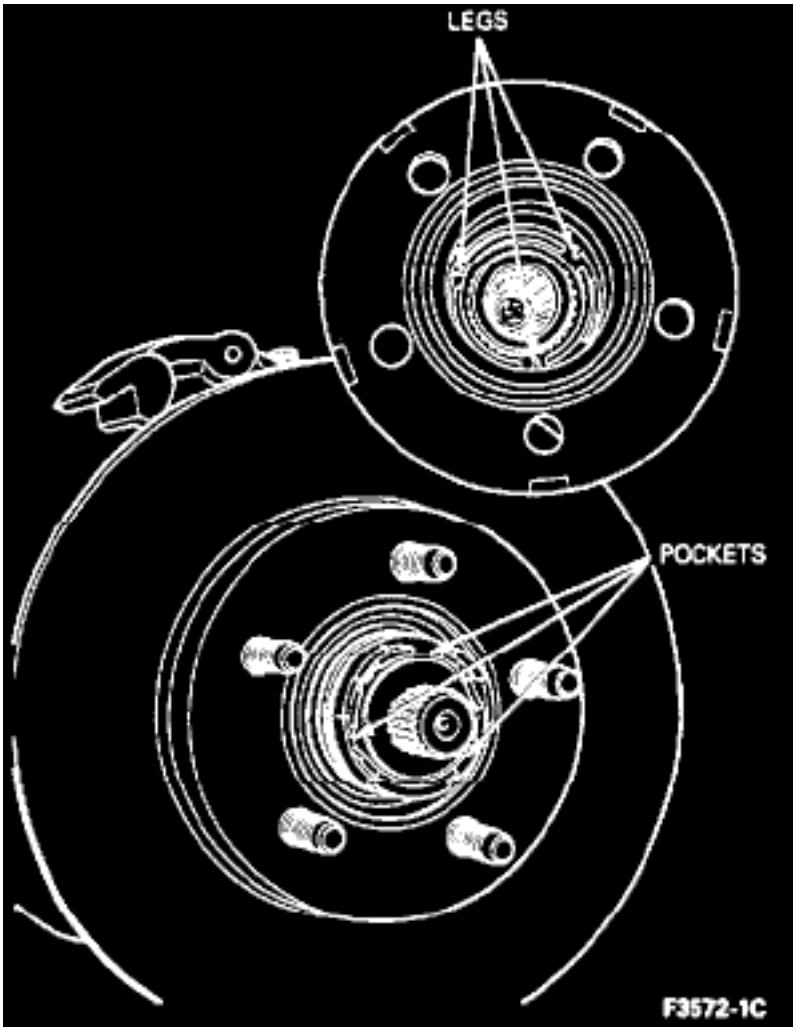
Cam Assembly And Locking Key

7. Using a magnet, remove the locking key.

NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

8. Loosen the wheel bearing adjusting nut from the spindle using a 2-3/8 inch hex locknut wrench.



9. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

10. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 11. Make sure the final end play of the wheel on the spindle is 0.00-0.08mm (0.000-0.003 inch). 12. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. the wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

13. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

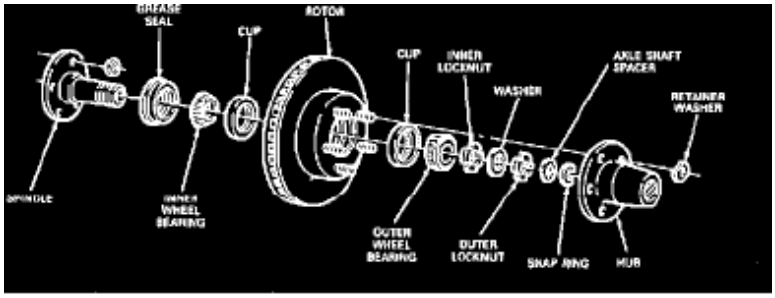
14. Install the axle shaft spacer. 15. Clip the snap ring onto the end of the spindle shaft.

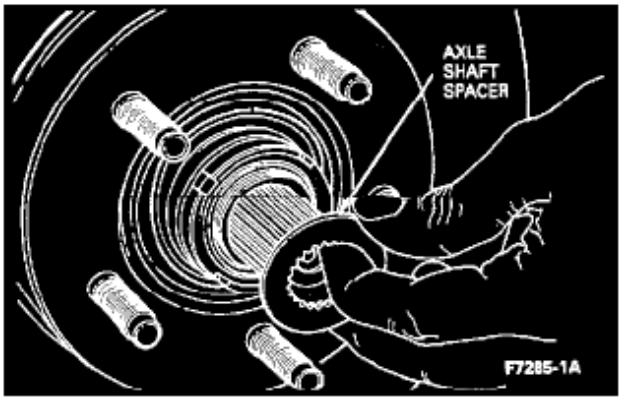
Automatic Locking Hub Installation

16. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

washers.

17. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB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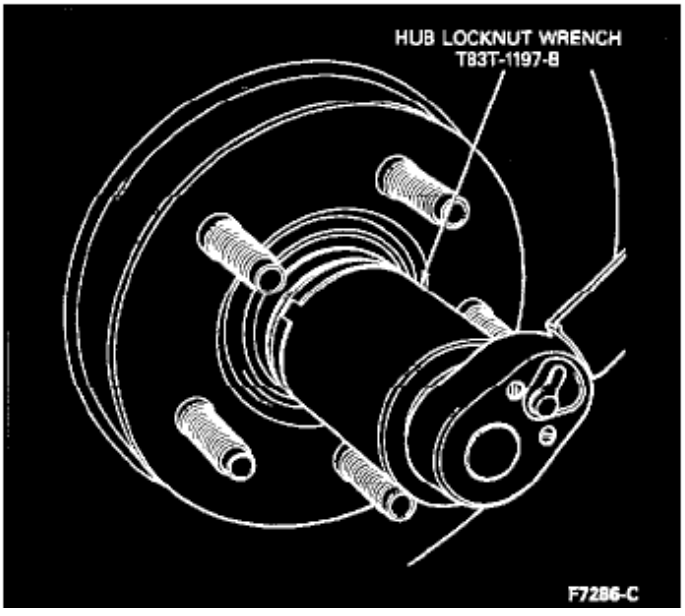
F7285-1A


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

Wheel Bearing: Adjustments With Manual Locking Hubs

Fig. 5 Manual Locking Hub

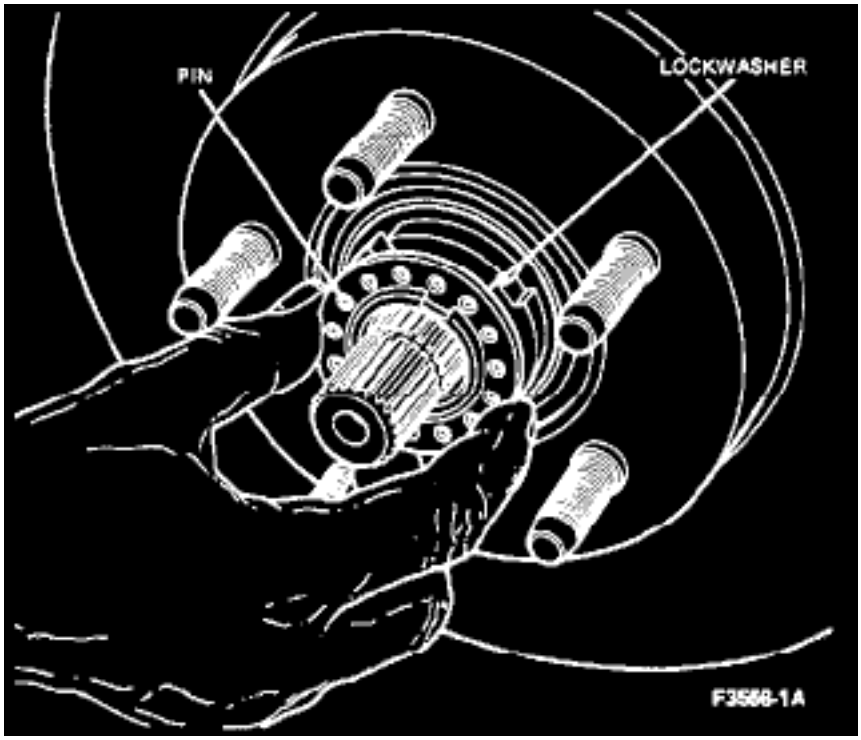
1. Raise the vehicle and install safety stands. 2. Remove the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.

Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.



Locknut Washer

7. Remove locknut washer from spindle. 8. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 9. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb).

10. Install the lockwasher on the spindle. 11. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 12. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.02-0.08 mm (0.001-0.003 inch). 13. Install the axle shaft spacer. 14. Clip the snap ring onto the end of the spindle shaft. 15. Install the manual hub assembly over the spindle. Install the retainer washers. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

Wheel Hub: Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Wheel Hub: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

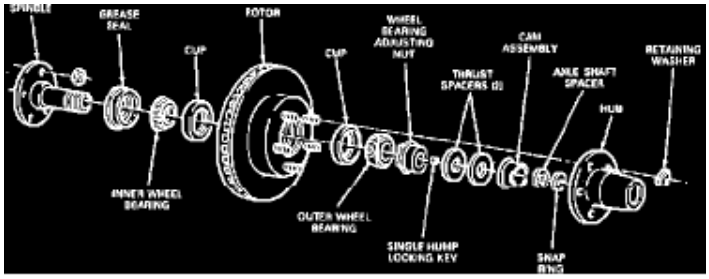
Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

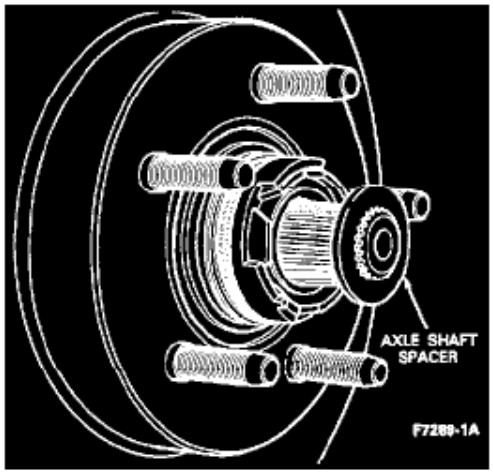
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

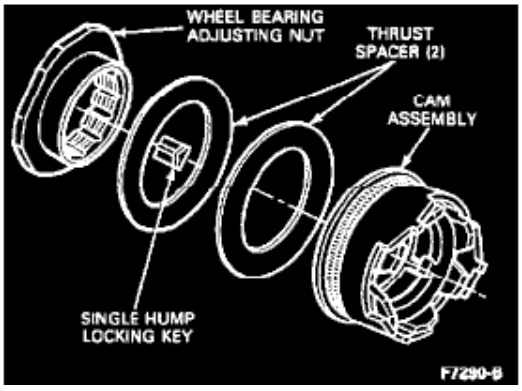
NOTES:

* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


AXLE SHAFT SPACER
F7289-1A


WHEEL BEARING ADJUSTING NUT
THRUST SPACER (2)
CAM ASSEMBLY
SINGLE HUMP LOCKING KEY
F7290-B

Wheel Hub: Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

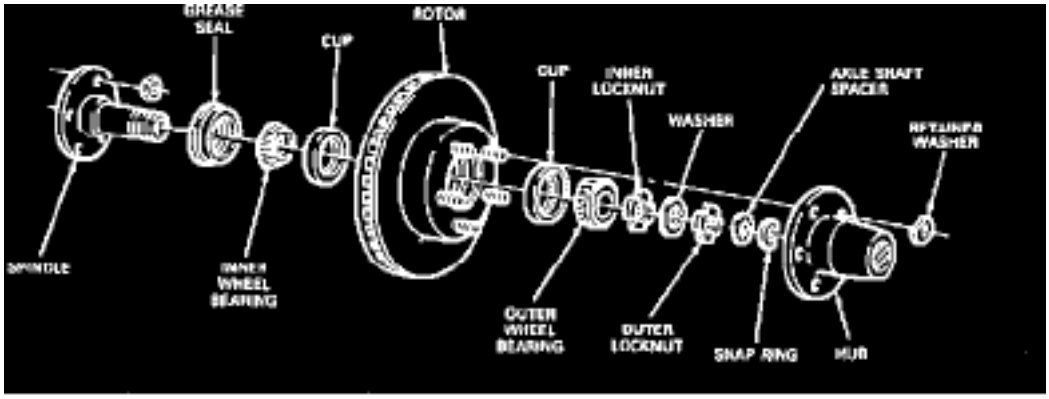
Axle Shaft Spacer

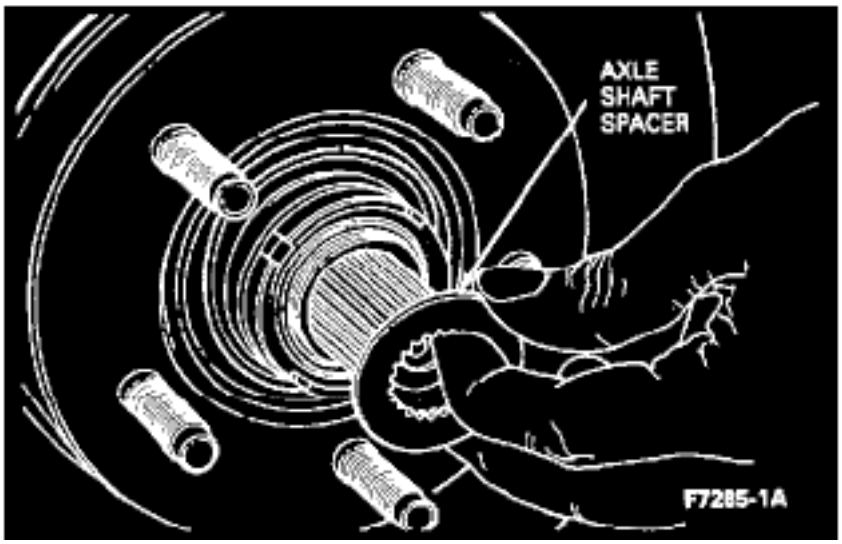
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

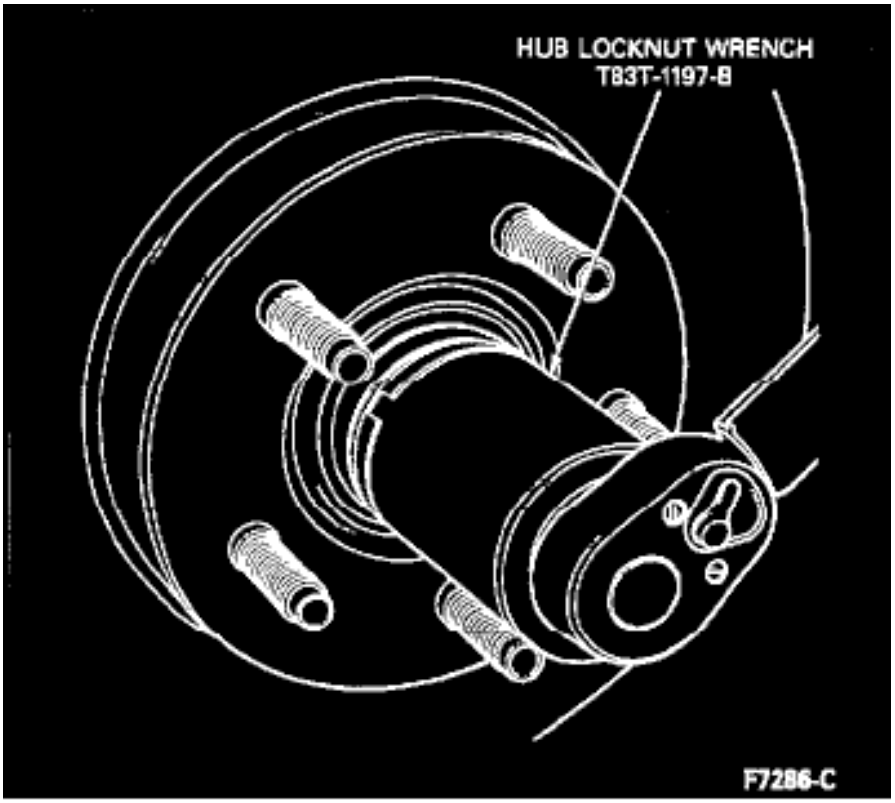
caliper.

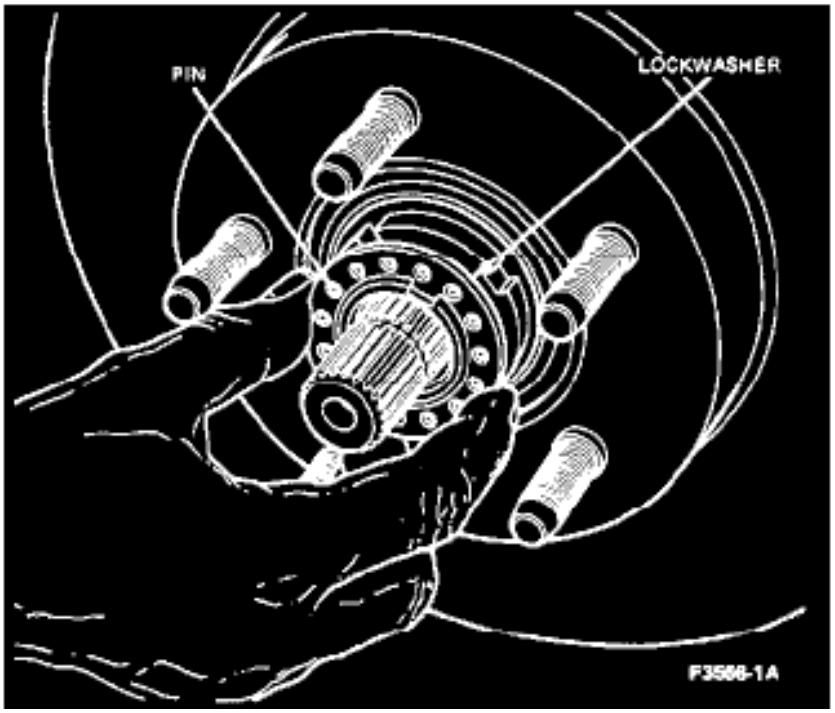
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

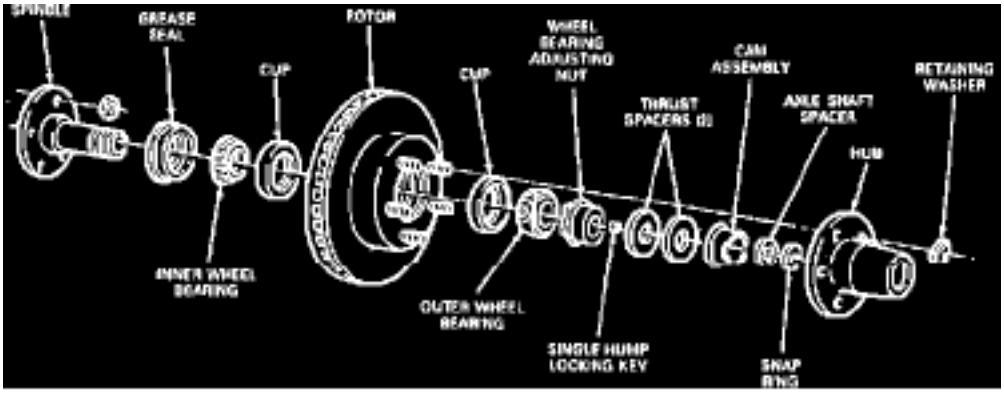

PIN
LOCKWASHER
F3566-1A

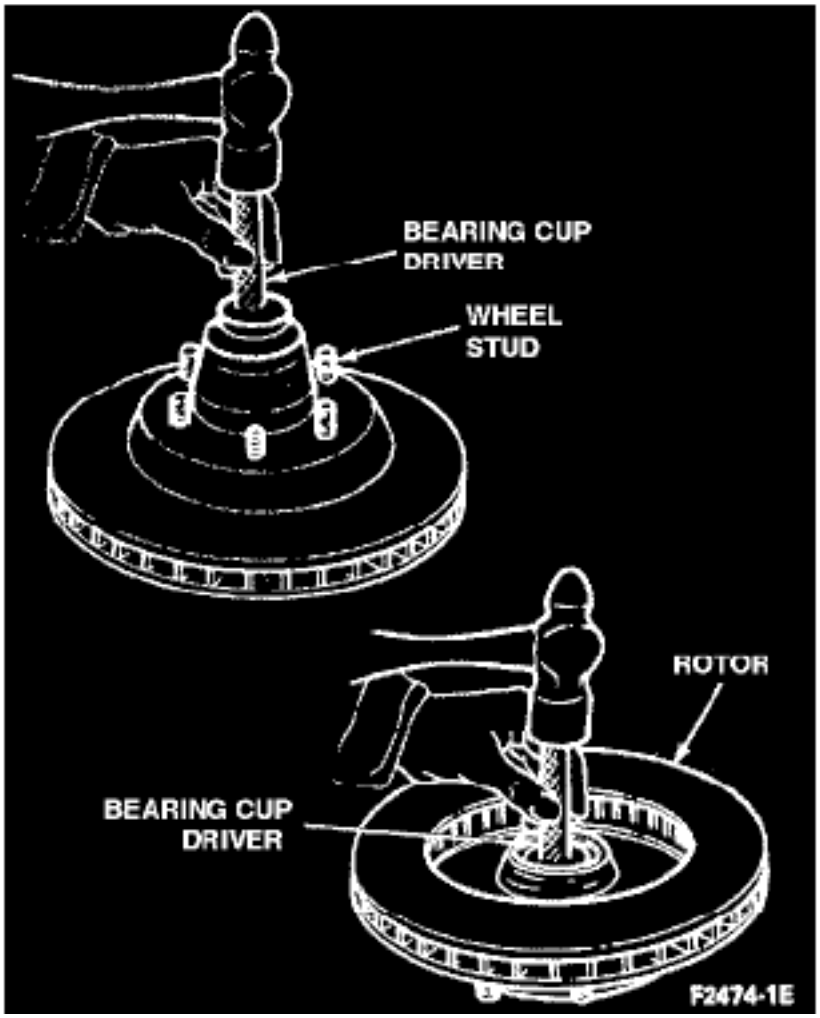
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub: Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

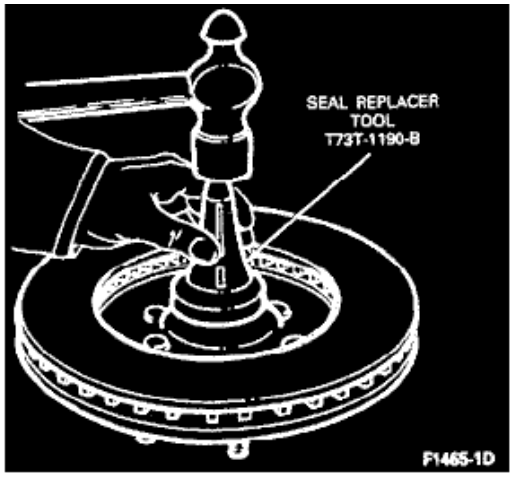
Installing Bearing Cups (Typical)

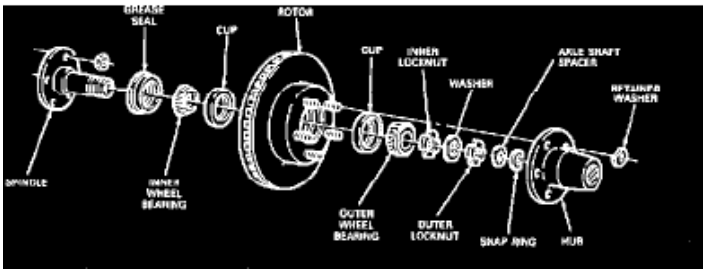
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

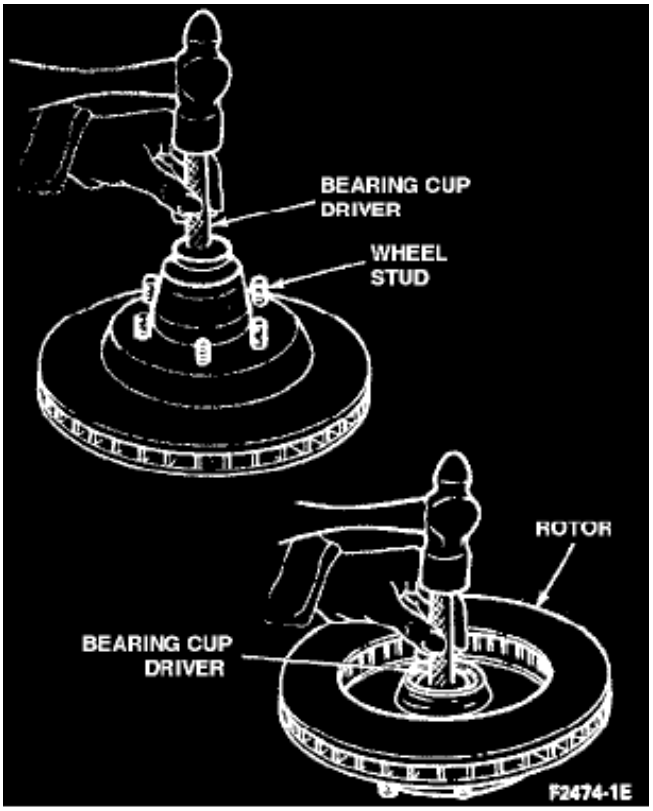
washers.

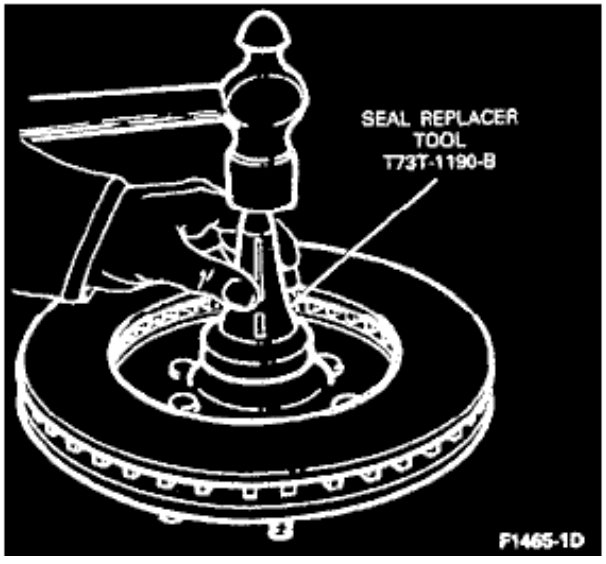
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP
DRIVER
WHEEL
STUD
ROTOR
BEARING CUP
DRIVER
F2474-1E


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Wheel Hub (Locking): Customer Interest Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

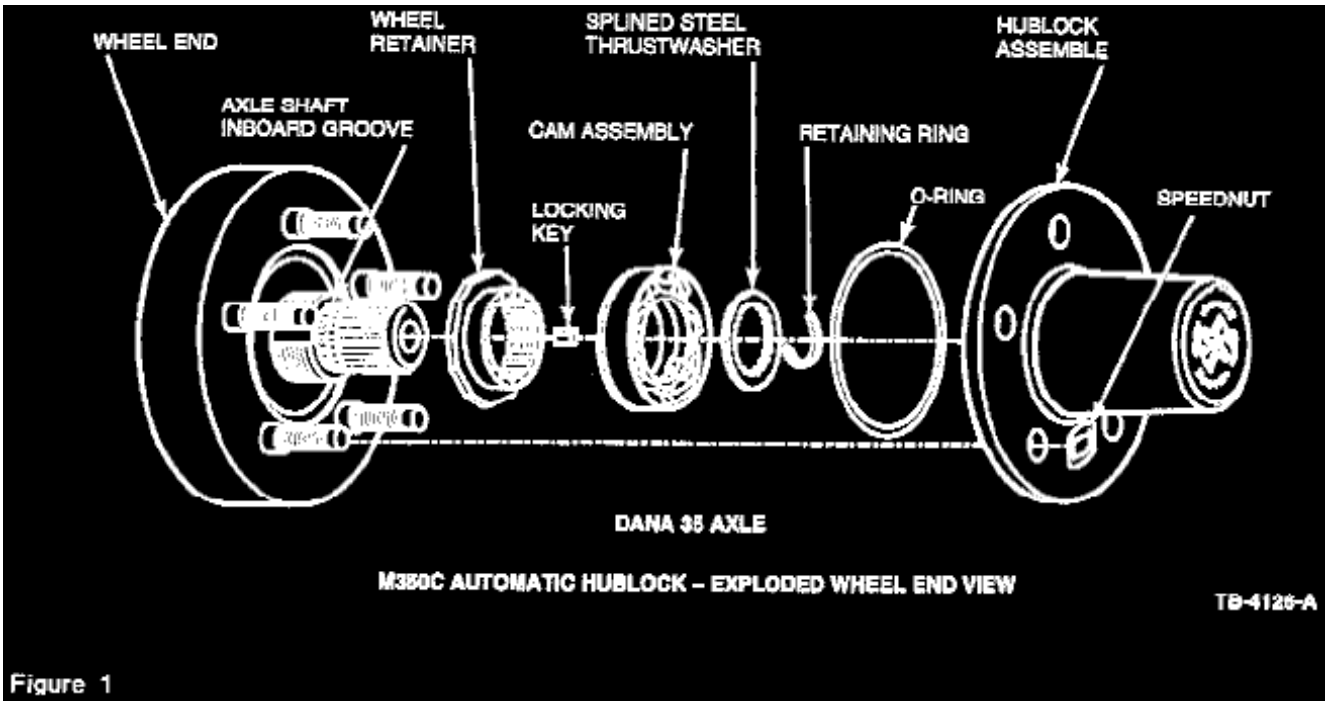


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

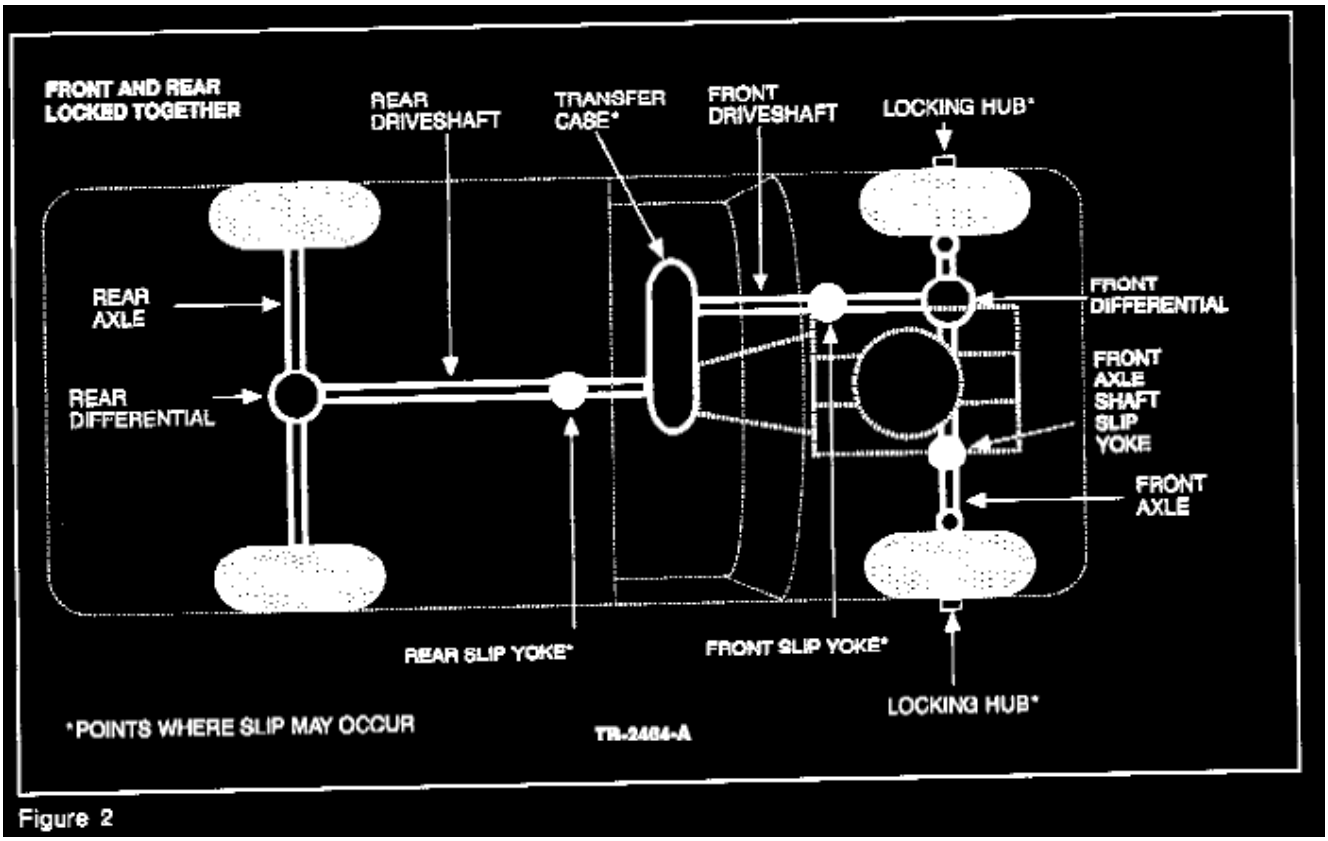


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART

AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): All Technical Service Bulletins Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

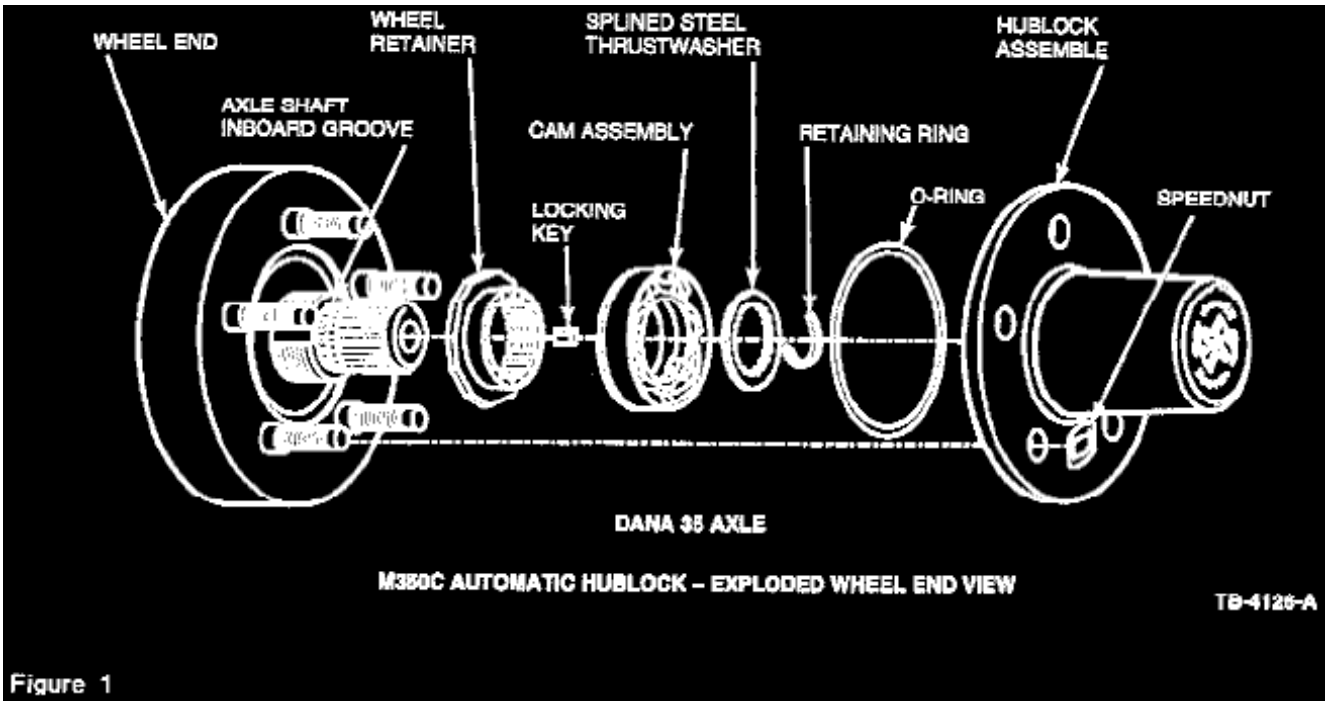


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

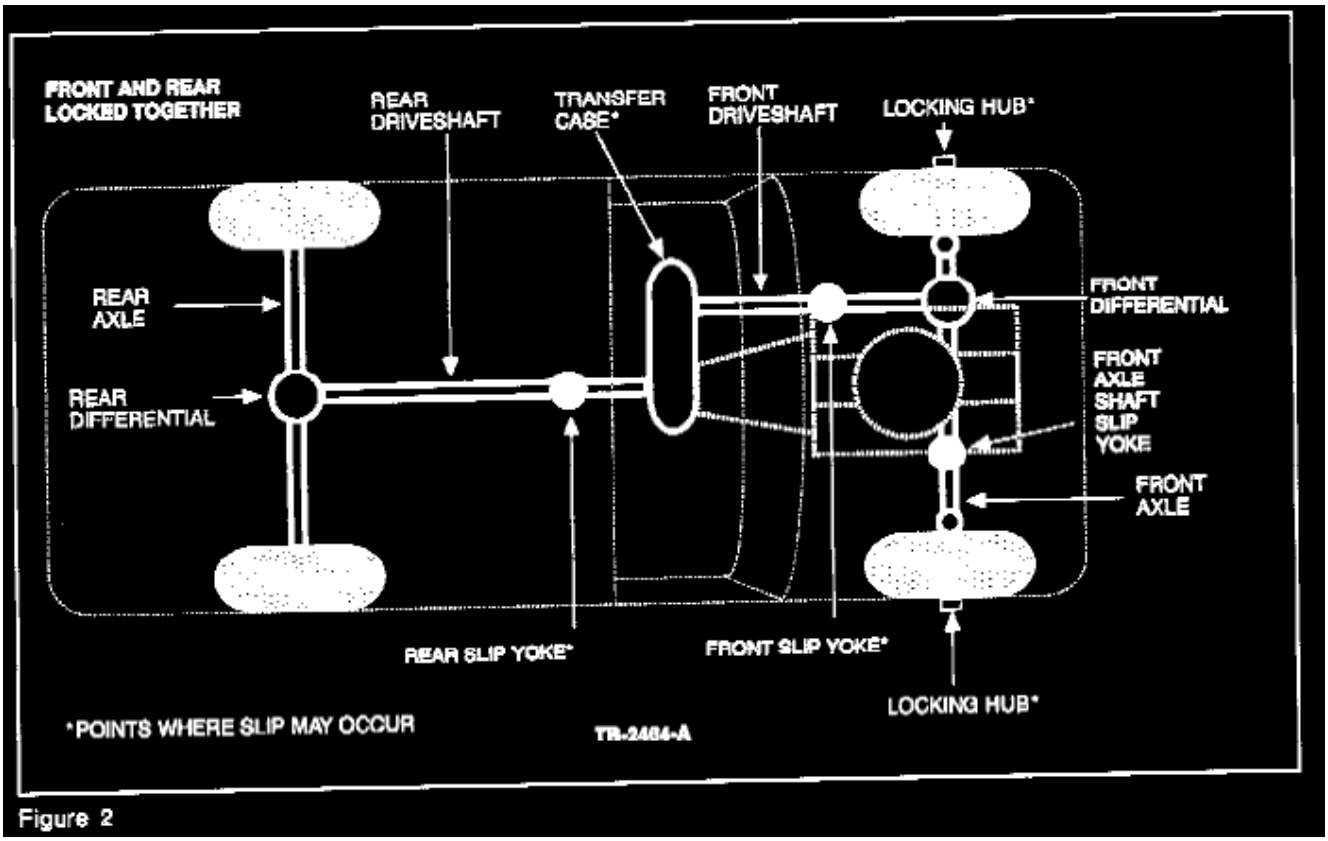


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART				
AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

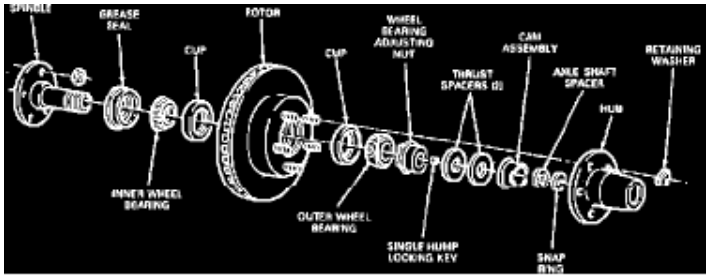
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

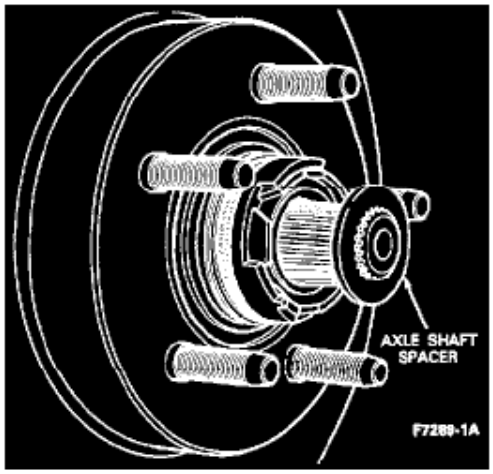
NOTES:

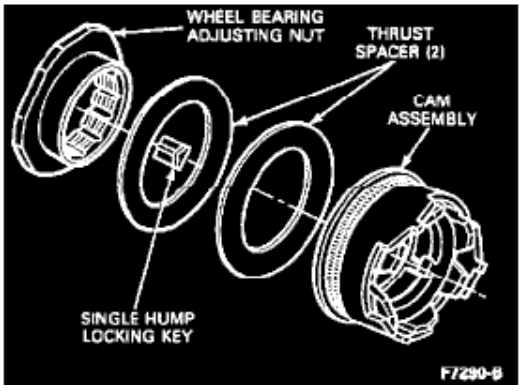
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Maintenance > Wheels and Tires > Wheel Hub (Locking) > Component Information > Service and Repair > Removal







Wheel Hub (Locking): Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

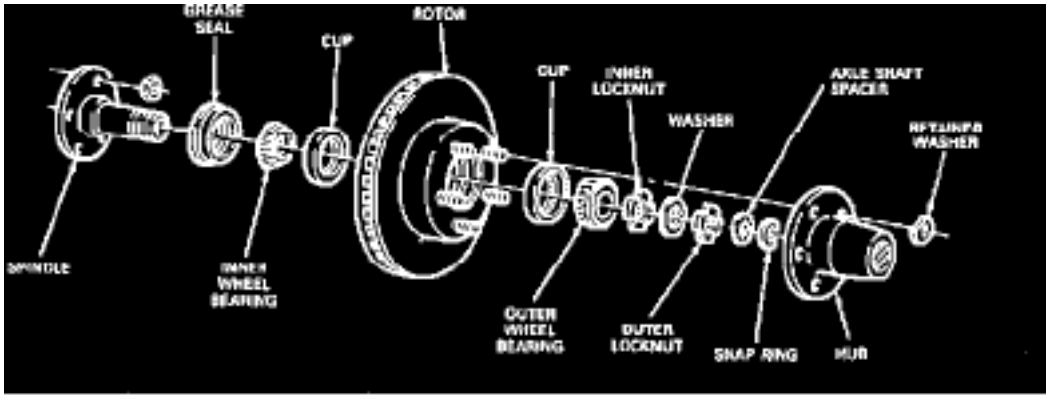
Axle Shaft Spacer

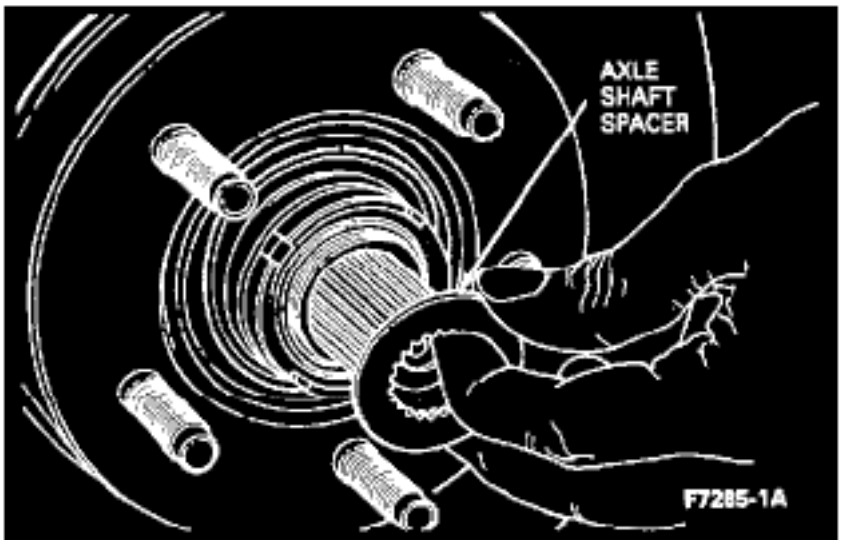
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

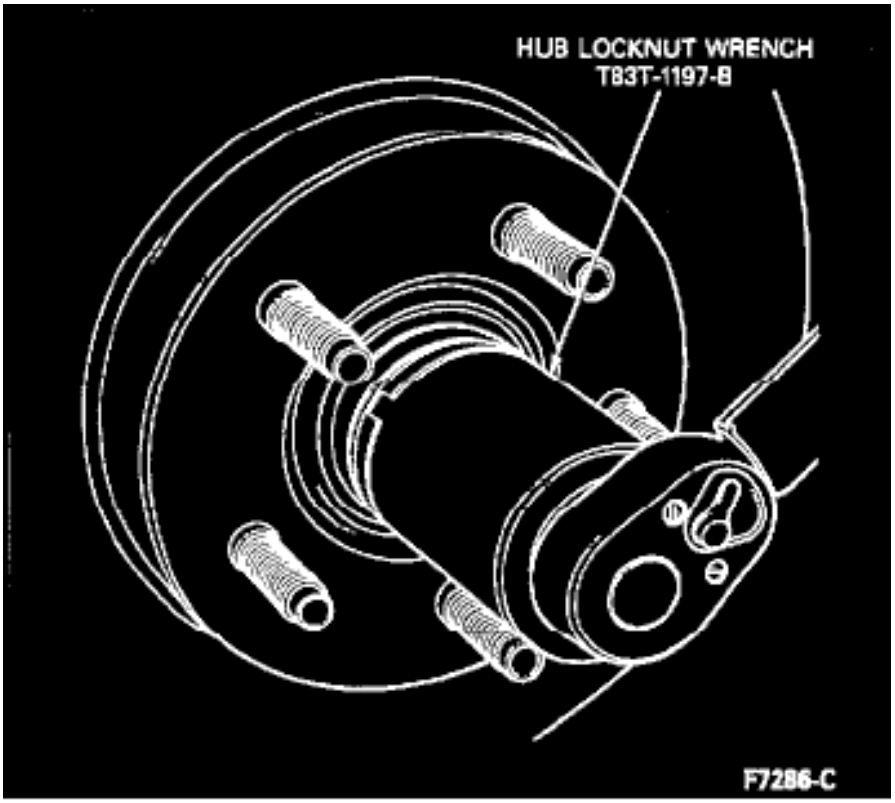
caliper.

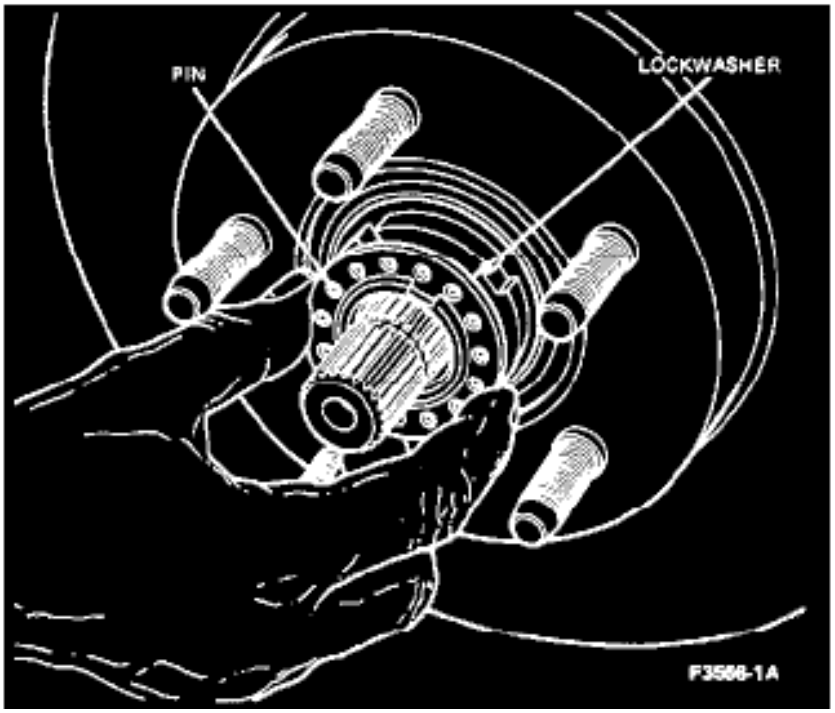
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

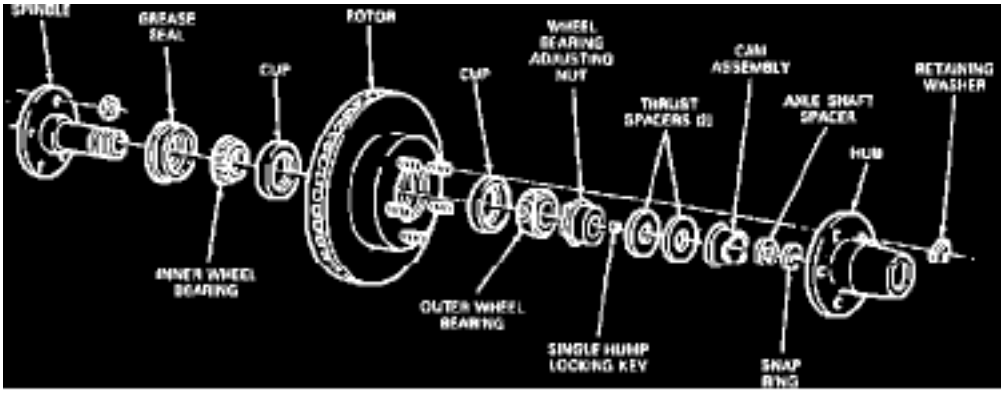

PIN
LOCKWASHER
F3566-1A

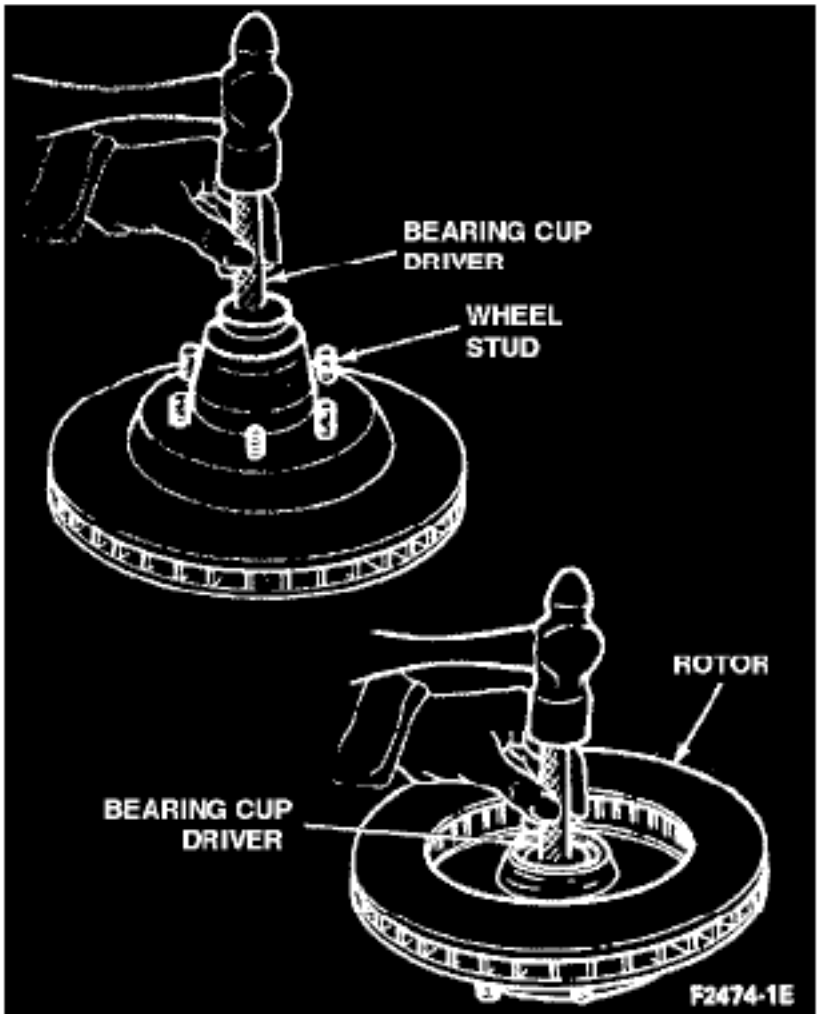
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub (Locking): Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

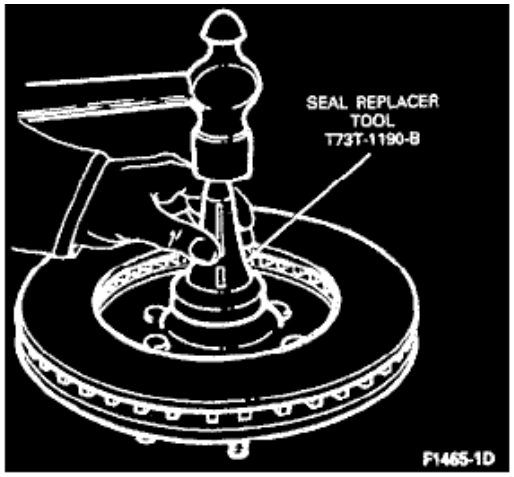
Installing Bearing Cups (Typical)

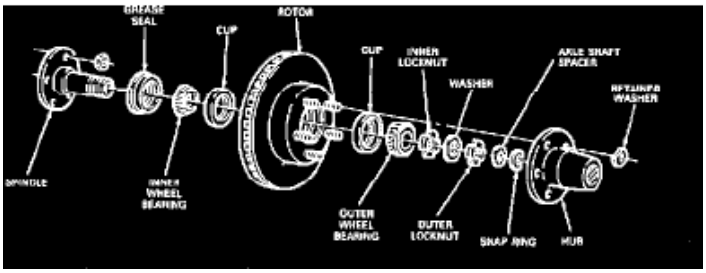
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

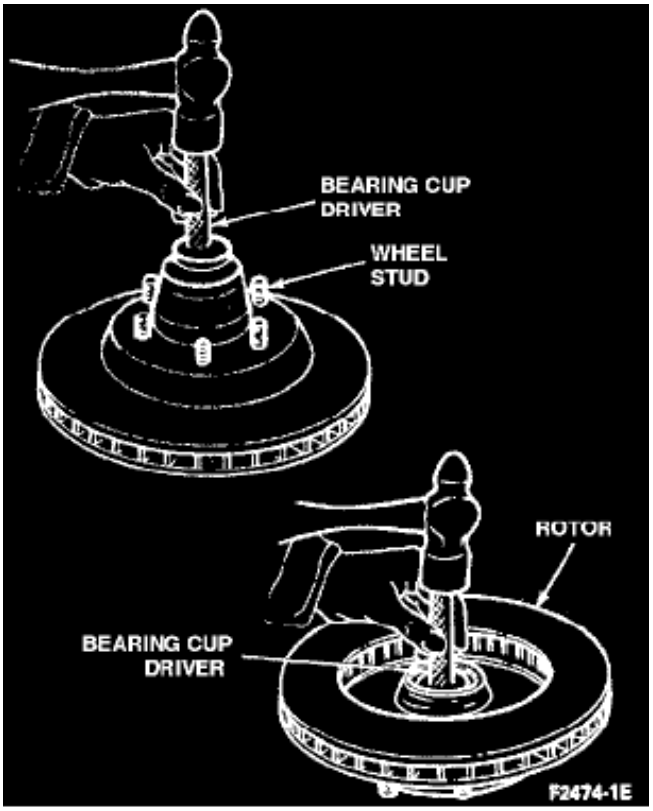
washers.

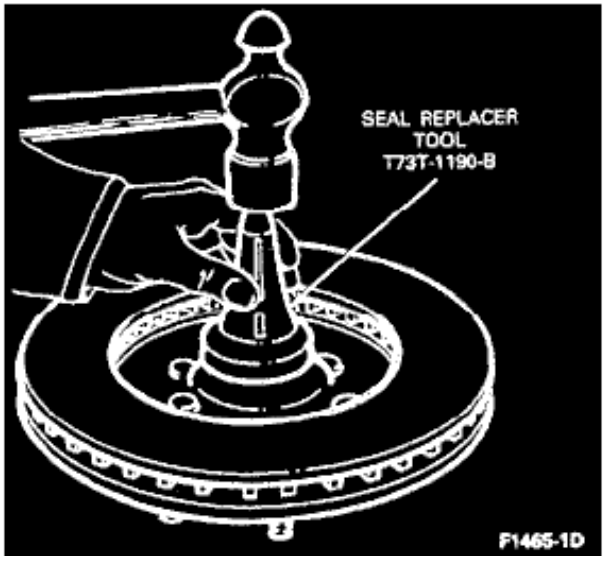
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E


SEAL REPLACER TOOL T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Wheel Fastener: Technical Service Bulletins Lug Nuts - Proper Installation/Torqueing Procedure

Article No. 98-5A-4

^ BRAKES - PREVENTING BRAKE VIBRATION - SERVICE TIP

^ WHEELS - PROPER LUG TORQUE PROCEDURES - SERVICE TIP

FORD: 1972-97 THUNDERBIRD 1976-86 LTD 1976-97 MUSTANG 1981-97 CROWN VICTORIA 1982-88 EXP 1982-98 ESCORT 1984-94 TEMPO 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1979-83 MONARCH, ZEPHYR 1979-97 COUGAR 1980-83 MARK VI 1980-98 CONTINENTAL, TOWN CAR 1981-86 LYNX 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-97 SABLE 1987-89 TRACER 1987-97 GRAND MARQUIS 1991-94 CAPRI 1991-97 TRACER 1993-98 MARK VIII 1995-98 MYSTIQUE

LIGHT TRUCK: 1979-96 BRONCO 1979-97 ECONOLINE, F-150-350 SERIES 1984-90 BRONCO II 1984-97 RANGER 1986-97 AEROSTAR 1988-97 F SUPER DUTY 1991-97 EXPLORER 1993-97 VILLAGER 1995-98 WINDSTAR 1997 EXPEDITION 1998 NAVIGATOR

ISSUE: The use of air impact tools to tighten wheel lug nuts can lead to overtightened and/or unevenly tightened wheel lug nuts. Air impact tools typically used for wheel lug nut removal and installation can generate up to 475 N.m (350 lb-ft) of torque. Overtightened and/or unevenly torqued wheel lug nuts may cause:

^ Brake vibration

^ Distortion of the wheel hub

^ Distortion of the brake rotor

ACCUTORQ SOCKETS

VEHICLE	YEAR	SIZE	LB-FT TORQUE	TOOL COLOR
FORD				
Aspire	1994-97	21mm	80	Light Brown
Contour	1995-96	19mm-3/4"	100	Grey
Crown Victoria	1981-97	13/16"	100	Dark Brown
Escort ZX2	1998	21mm	80	Light Brown
Escort	1991-98	21mm	80	Light Brown
Escort	1982-90	19mm-3/4"	100	Grey
EXP	1982-88	19mm-3/4"	100	Grey
Festiva	1988-93	21mm	80	Light Brown
Granada	1975-82	13/16"	100	Dark Brown
LTD	1975-86	13/16"	100	Dark Brown
Mustang	1979-97	13/16"	100	Dark Brown
Probe	1989-97	21mm	80	Light Brown
Taurus	1986-97	19mm-3/4"	100	Grey
Tempo	1984-94	19mm-3/4"	100	Grey
Thunderbird	1967-97	19mm-3/4"	100	Grey
Thunderbird	1972-86	13/16"	100	Dark Brown
LINCOLN				
All Models	1980-98	13/16"	100	Dark Brown
MERCURY				
Capri	1991-94	21mm	80	Light Brown
Capri	1979-86	13/16"	100	Dark Brown
Cougar	1967-97	19mm-3/4"	100	Grey
Cougar	1979-86	13/16"	100	Dark Brown
Lynx	1981-86	19mm-3/4"	100	Grey
Marquis	1983-86	13/16"	100	Dark Brown
Mystique	1996-98	19mm-3/4"	100	Grey
Monarch, Zephyr	1979-83	13/16"	100	Dark Brown
Sable	1986-97	19mm-3/4"	100	Grey
Topaz	1984-94	19mm-3/4"	100	Grey
Tracer	1991-97	21mm	80	Light Brown
Tracer	1987-89	21mm	80	Light Brown
Grand Marquis	1987-97	19mm-3/4"	100	Grey
LIGHT TRUCK				
E-150/F-150	1975-97	13/16"	100	Dark Brown
E/F-250/350	1989-97	7/8"	140	Turquoise
E/F-250/350 (Dual Rears)	1994-97	7/8"	140	Turquoise
F-Super Duty	1988-97		140	N/A
Aerostar	1986-97	19mm-3/4"	100	Grey
Bronco	1975-96	13/16"	100	Dark Brown
Bronco II	1984-90	19mm-3/4"	100	Grey
Courier	1979-83	21mm	65	Black
Explorer	1991-97	13/16"	100	Dark Brown
Ranger	1984-97	19mm-3/4"	100	Grey
Windstar	1995-98	13/16"	100	Dark Brown
Villager	1993-97	21mm	80	Light Brown
Expedition	1997	19mm-3/4"	100	Grey
Navigator	1998	19mm-3/4"	100	Grey

TD-4106-B

Figure 1

^ Brake rotor runout

^ Damage to the wheel

^ Damage to the wheel nuts and studs

ACTION: All wheel lug nuts should only be tightened to specification using a torque wrench or by using the Rotunda ACCUTORO 164-R0314 or equivalent on a 1/2" drive air impact tool. The "ACCUTORO" lug nut sockets limit the torque of the air impact tool, preventing overtightening or uneven tightening of the wheel lug nuts. The torque limiting devices (regulators) on air impact tools will not reduce the output torque enough to prevent overtightening of the wheel lug nuts.

NOTE:

REFER TO THE APPROPRIATE SERVICE MANUAL OR THE CHART IN FIGURE 1 FOR THE CORRECT WHEEL LUG NUT TORQUE SPECIFICATION. THE CHART IN FIGURE 1 ALSO PROVIDES THE CORRECT "ACCUTORO" LUG NUT SOCKET TO USE.

The "ACCUTORO" socket is intended for lug nut installation, not removal. When using the "ACCUTORO" socket, the output torque of the air impact tool must be set to 217-339 N.m (160-250 lb-ft), usually this will be the lowest setting on the air impact tool.

The "ACCUTORO" lug nut sockets are available through Rotunda Equipment. The four-piece set (164-R0314) fits most Ford Motor Company cars and light trucks. The tool set consists of four (4) lug nut sockets and a storage case. The set can be ordered by calling Rotunda Equipment at 1-800-ROT-UNDA (768-8632).

CAUTION:

AIR IMPACT TOOLS SHOULD NOT BE USED TO TIGHTEN WHEEL LUG NUTS UNLESS THE "ACCUTORO" LUG NUT SOCKET OF THE CORRECT SPECIFICATION IS USED.

NOTE:

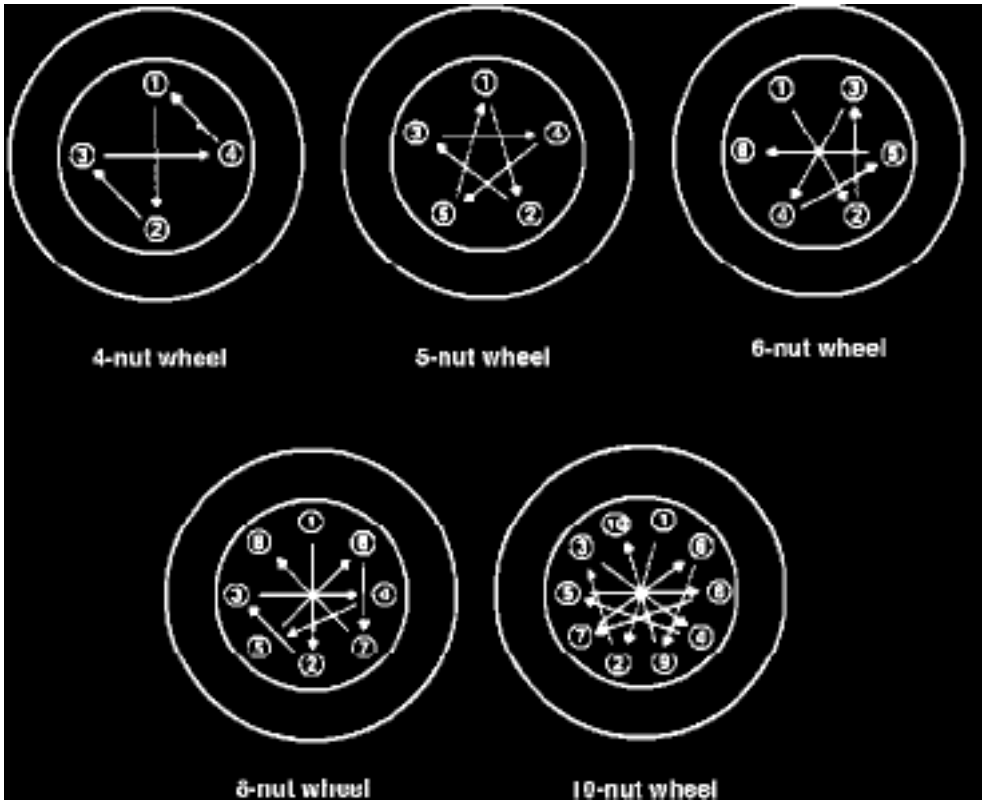
DO NOT USE AIR IMPACT TOOLS ON LOCKING WHEEL LUG NUTS. THEY ARE TO BE HAND-TORQUED ONLY.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 97-17-6

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 301000, 303000, 306000



Wheel Fastener: Service and Repair

NOTE: For additional information see Tightening Notes.

Lug Nut Torque Patterns

IMPORTANT

Check all parts, including rims, lug studs, lug nuts, and mating surfaces of hubs and tire rims for rust, damage, or dirt. Clean mating surfaces with a wire brush to remove any foreign material. Replace any damaged parts as needed. Careless installation of tire/rim assemblies in a vehicle is a major cause of tire installation problems. Proper installation, including fastener torque, is essential to economical, safe and trouble free service. Use only the proper sizes and types of fasteners for safe and proper service.

Tighten the fasteners a quarter turn at a time using the tightening sequence diagram as a guide. This is very important to prevent misalignment of the wheel. Continue tightening the fasteners in sequence until the fasteners are tightened to the proper torque. See Specifications See: Wheels/Specifications

CAUTION: Improper torque or tightening sequence can cause distortion, fatigue cracks, or alignment problems. After driving the vehicle for a short distance, recheck the wheel fastener torque. Parts will usually seat naturally, reducing the torque on the fasteners. Retorque all fasteners to the proper torque.

Towing Information: Technical Service Bulletins Vehicle - Towing Behind RVs Guidelines

Article No. 98-5A-12

03/18/98

^ BRAKES - WEIGHT LIMITATIONS FOR TOWING

^ RECREATIONAL VEHICLES - WEIGHT RATINGS FOR UNBRAKED TOWING LESS THAN GROSS COMBINATION WEIGHT RATING (GCWR)

^ TOWING BEHIND RECREATIONAL VEHICLES - RECOMMENDED GUIDELINES

^ TRANSAXLE/TRANSMISSION/TRANSFER CASE - VEHICLES TOWED BEHIND RECREATIONAL VEHICLES - RECOMMENDED TOWING GUIDELINES

FORD: 1988-93 FESTIVA 1988-94 TEMPO 1989-96 PROBE, TAURUS SHO 1991-97 ESCORT 1994-96 ASPIRE

LINCOLN-MERCURY: 1988-94 TOPAZ 1991-94 CAPRI 1991-97 TRACER

LIGHT TRUCK: 1988-96 AEROSTAR, BRONCO, E-350, F SUPER DUTY, F-250, F-350, F-53 MOTORHOME, RANGER 1988-97 F-150 1991-96 EXPLORER 1997 MOUNTAINEER

ISSUE: Many motorhome owners tow a vehicle when traveling. Improper techniques can "overload" the brake system of the tow vehicle or damage the drivetrain of the vehicle being towed.

ACTION: Use the information and charts shown in this TSB article to properly match tow vehicle, towed vehicle and towing method.

TOWING METHODS

1. TRAILER - The vehicle is loaded onto and secured to a trailer and simply acts as "secured" cargo.

2. DOLLY - The vehicle is "partially" loaded and partially towed. Either front or rear wheels are loaded and secured to a "towing dolly" and the other wheels roll on the road.

3. TOW BAR - All of the vehicle wheels roll on the pavement. The towed vehicle's steering column must be unlocked so that it can track correctly behind the tow vehicle.

WEIGHT RATINGS AND BRAKES

^ GVWR (Gross Vehicle Weight Rating) - is the MAXIMUM allowable weight of the towing vehicle, passengers and cargo

^ GCWR (Gross Combined Weight Rating) - is the MAXIMUM allowable weight of the towing vehicle and the weight of the trailer or vehicle being towed, including all passengers and cargo

^ BRAKES - The motorhome brakes are designed and rated for the GVWR of that vehicle and will provide adequate braking for trailers and towing vehicles up to 680 kg (1500 lb)

FORD-BUILT VEHICLES APPROVED FOR DINGHY TOWING

VEHICLE	MANUAL TRANSMISSION	AUTOMATIC TRANSMISSION
FORD CARS		
ASPIRE	YES	NO
FESTIVA	YES	NO
ESCORT	YES	NO
TEMPO	YES	NO
PROBE	YES	NO
TAURUS (SHO ONLY)	YES	NO
LINCOLN-MERCURY CARS		
TRACER	YES	NO
TOPAZ	YES	NO
CAPRI	YES	NO
FORD TRUCKS		
RANGER 4X2	YES	NO
RANGER 4X4	YES	YES**
EXPLORER 4X2	YES	NO
EXPLORER 4X4	YES	YES**
AEROSTAR 2WD	YES	NO
F-SERIES 4X4	YES**	YES**
BRONCO 4X4	YES**	YES**
E-350	YES	NO
MOUNTAINEER 4X2	YES	NO
MOUNTAINEER 4X4	YES	YES**

**Manual transfer case only (not Touch Drive Electric Shift).

CAUTION:

SEPARATE AUXILIARY BRAKES ARE REQUIRED ON TRAILERS OR TOWED VEHICLES OVER 680 KG (1500 LBS). DO NOT CONNECT A TRAILER'S, DOLLY'S OR OTHER TOWED VEHICLE'S BRAKE SYSTEM TO THE TOWING VEHICLE'S BRAKE SYSTEM.

TOWED VEHICLES

1. Trailer-towed - The vehicle should be loaded on the trailer in a manner to:

a. achieve a trailer tongue load of 10-15% of total trailer weight,

b. not exceed the trailer or hitch ratings and

c. be securely tied down.

2. Dolly-towed - For front wheel drive vehicles, towing an automatic transaxle (ATX)-equipped vehicle behind another vehicle, such as a Recreational Vehicle (RV), requires that a front wheel dolly or trailer be used.

NOTE:

TEMPO ALL-WHEEL DRIVE MODELS MUST BE TRAILER-TOWED. DO NOT TOW THESE VEHICLES USING A TWO-WHEEL TOWING DOLLY.

CAUTION:

DO NOT TOW A VEHICLE WITH AN AUTOMATIC (ATX) TRANSAXLE WITH THE DRIVE WHEELS ON THE GROUND. DAMAGE TO THE TRANSAXLE MAY RESULT.

3. Tow Bar-towed - Vehicles which can be successfully towed with a tow bar are listed in the following chart. Additional vehicle-specific information follows the chart.

ALL VEHICLES

NOTE:

DO NOT TOW ANY VEHICLE AT A SPEED FASTER THAN 88 KM/H (55 MPH). THE MAXIMUM TOWING DISTANCE (WHEN TOWED CORRECTLY) IS UNLIMITED.

WARNING:

NEVER USE A TOW BAR THAT ATTACHES ONLY TO THE BUMPER.

MTX-EQUIPPED VEHICLES

Towing a manual transaxle (MTX)-equipped vehicle with the drive wheels on the ground is acceptable only if the vehicle is towed in a forward direction. The parking brake must be released and the gear shift lever must be in Neutral.

^ For Aspire, Festiva, Escort and Tracer, the ignition key must be in the ACO position, the battery must be disconnected to eliminate battery drain, and the steering wheel must be unlocked

^ For Capri, the ignition key must be in the OFF position and the steering wheel unlocked

^ Refer to the specific vehicle Owner Guide for complete details

CAUTION:

TOWING MTX-EQUIPPED VEHICLES INCORRECTLY MAY RESULT IN TRANSAXLE DAMAGE.

TRUCKS

^ The steering wheel must be unlocked by placing the ignition key in the OFF position

^ Manual transmission shift lever must be in Neutral

^ On 4X4 manual shift transfer cases, the shift lever must be in Neutral

^ 4X4 locking hubs (both manual and automatic) must be unlocked

^ Refer to the specific vehicle Owner Guide for complete details

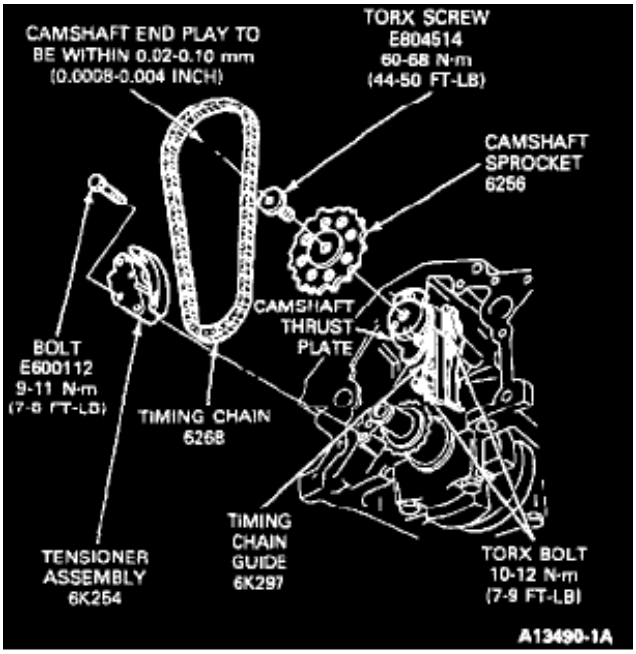
OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-24-6 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 504000

Compression Check: Specifications

Compression Pressure .....
PSI of lowest cylinder must be within 75% of highest

Camshaft Gear/Sprocket: Specifications

Camshaft Sprocket Retaining Bolt	60-68 Nm (44-50 ft lb)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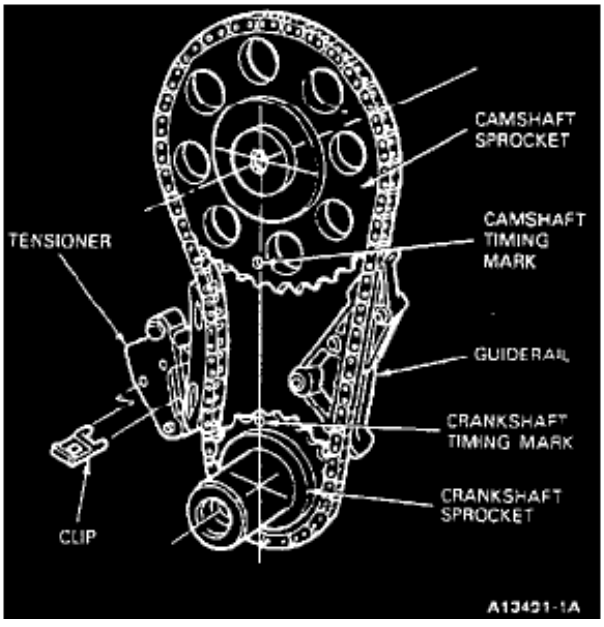
CAMSHAFT SPROCKET
TENSIONER
CAMSHAFT TIMING MARK
GUIDERAIL
CRANKSHAFT TIMING MARK
CRANKSHAFT SPROCKET
CLIP
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Camshaft Gear/Sprocket: Service and Repair

REMOVAL

1. Drain the cooling system and crankcase. Remove the oil pan and radiator. 2. Remove the cylinder front cover and water pump, drive belt and crankshaft damper. 3. Remove the camshaft sprocket retaining bolt and the crankshaft sprocket key. 4. Remove the crankshaft and camshaft sprockets with the timing chain.

Timing Chain, Sprockets And Tensioner

5. Remove the timing chain tensioner and guide.

INSTALLATION

1. Install the timing chain guide to the cylinder block with the pin of the guide inserted into the oil hole in the block. Install the two retaining bolts,

and tighten to 10-12 Nm (7-9 ft lb).

2. Position the camshaft so the timing mark will align with the crankshaft. Position the crankshaft so the timing mark will align with the camshaft. 3. Install the crankshaft sprocket, camshaft sprocket and timing chain together. 4. Install the timing chain tensioner with the clip in place to lock the tensioner in the retracted position. Tighten tensioner bolts to 9-11 Nm (7-8 ft lb)

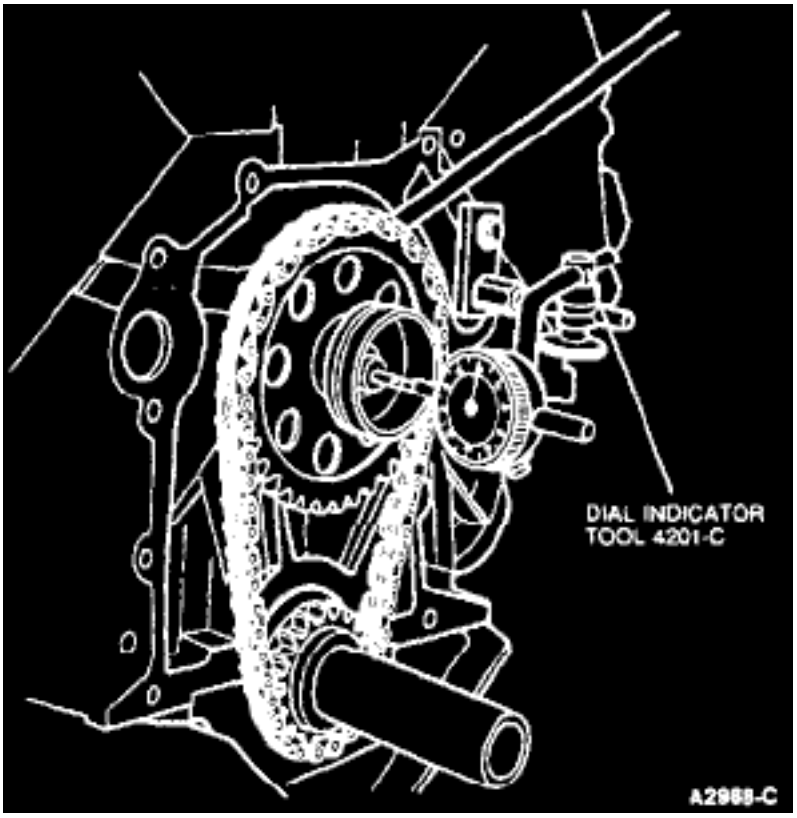
.

Timing Marks

5. Install the crankshaft key and check the timing marks on the crankshaft sprocket and camshaft sprocket for correct alignment.

NOTE: Make sure that the tensioner side of the timing chain is held inward, and that the guide side of the chain is straight and tight.

6. Install the camshaft sprocket retaining bolt, and tighten to 60-68 Nm (44-50 ft lb). 7. Remove the clip from the tensioner assembly.



8. Check the camshaft end play.

Camshaft End Play

CAUTION: Prying against the camshaft gear with the valve train load on the camshaft can break or damage the gear. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

a. Push camshaft toward rear of engine. Install Dial Indicator TOOL-4201-C or equivalent so indicator point is on camshaft sprocket attaching

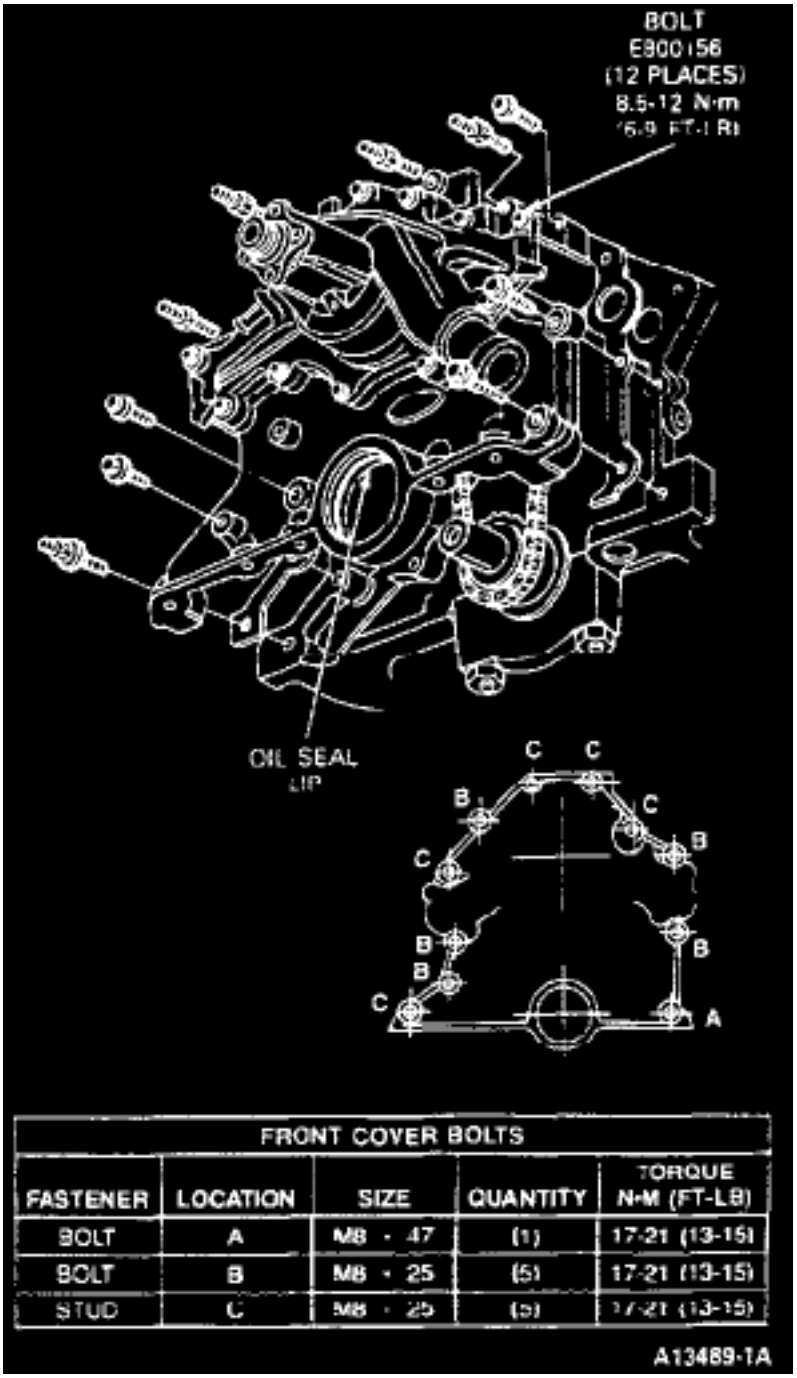
screw.

b. Zero dial indicator. Pull camshaft forward and release it. Compare dial indicator reading with specifications. Camshaft end play specification is

0.0203-0.1016 mm (0.0008-0.004 in) and camshaft end play service limit is 0.2286 mm (0.009 in). If end play is excessive, replace camshaft thrust plate.

c. Remove dial indicator. d. After replacing thrust plate, check end play again. If it is still out of specified range, inspect camshaft and cylinder head/cylinder block for

excessive wear.



FRONT COVER BOLTS				
FASTENER	LOCATION	SIZE	QUANTITY	TORQUE N·M (FT-LB)
BOLT	A	M8 - 47	(1)	17-21 (13-15)
BOLT	B	M8 - 25	(5)	17-21 (13-15)
STUD	C	M8 - 25	(5)	17-21 (13-15)

A13489-1A

Timing Cover And Bolts

9. Install the cylinder front cover. Tighten front cover attaching screws to 17-21 Nm (13-15 ft lb). Install the oil pan and radiator.

10. Fill and bleed the cooling system. 11

Fill the crankcase with clean engine oil of the recommended grade and viscosity.

12. Start the engine and operate at fast idle. Check for coolant and oil leaks.

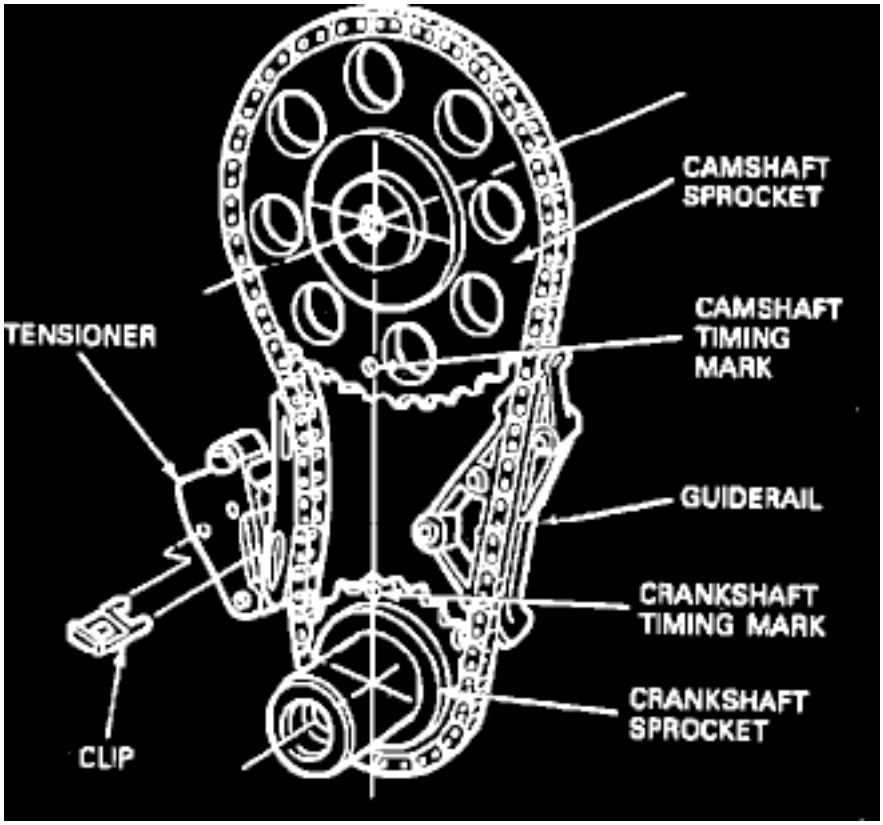
Camshaft: Specifications General Specifications

Allowable Lobe Lift Loss ..... 0.005 Theoretical Intake Valve Lift @ Zero Lash ..... 0.4024 Theoretical Exhaust Valve Lift @ Zero Lash ..... 0.4024 Camshaft End Play ..... 0.0008-0.004 Camshaft End Play Service Limit ..... 0.009 Thrust Plate Thickness ..... 0.158-0.159 Journal-To-Bearing Clearance ..... 0.001-0.0026 Journal-To-Bearing Clearance Service Limit ..... 0.006 Bearing Outside Diameter ..... 0.158-0.159 # 1 Journal Diameter ..... 49.57-49.59 (1.951.1.952) # 2 Journal Diameter ..... 49.21-49.23 (1.937-1.938) # 3 Journal Diameter ..... 48.83-48.85 (1.922-1.923) # 4 Journal Diameter ..... 48.44-48.48 (1.907-1.908) Runout ..... 0.127 (0.005) Max T.I.R. # 1 Bearing Inside Diameter ..... 49.635-49.655 (1.954.1.955) # 2 Bearing Inside Diameter ..... 49-255-49.275 (1.938-1.940) # 3 Bearing Inside Diameter ..... 48.750-48.768 (1.919-1.920) # 4 Bearing Inside Diameter ..... 48.875-48.895 (1.924-1.925) Front Bearing Location

Distance In Inches That Front Edge Of Bearing Is Installed Below Front Face Of Cylinder Block 0.040-0.060

Camshaft: Specifications Torque

Camshaft Thrust Plate Screws	9-13 Nm (7-10 ft lb)



Camshaft: Service and Repair

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable, then drain engine oil and cooling system. 2. Remove radiator, fan, spacer, drive belt and crankshaft damper. 3. Disconnect ignition wires from spark plugs. 4. Disconnect ignition coil and bracket assembly. 5. Remove clamp, bolt and oil pump drive from rear of engine block. 6. Remove alternator, then disconnect fuel lines. 7. Remove upper and lower intake manifolds as an assembly. 8. Remove rocker arm covers and rocker arm shafts. 9. Remove pushrods in order so they can be installed in their original positions.

NOTE: Cylinder heads must be removed to remove the roller tappets.

10. Remove roller tappets, then the oil pan. 11. Remove engine front cover and water pump as an assembly.

Fig. 6 Valve Timing Marks

12. Push timing chain tensioner into retracted position, then install retaining clip. 13. Remove camshaft sprocket attaching bolt, then the sprocket from camshaft.

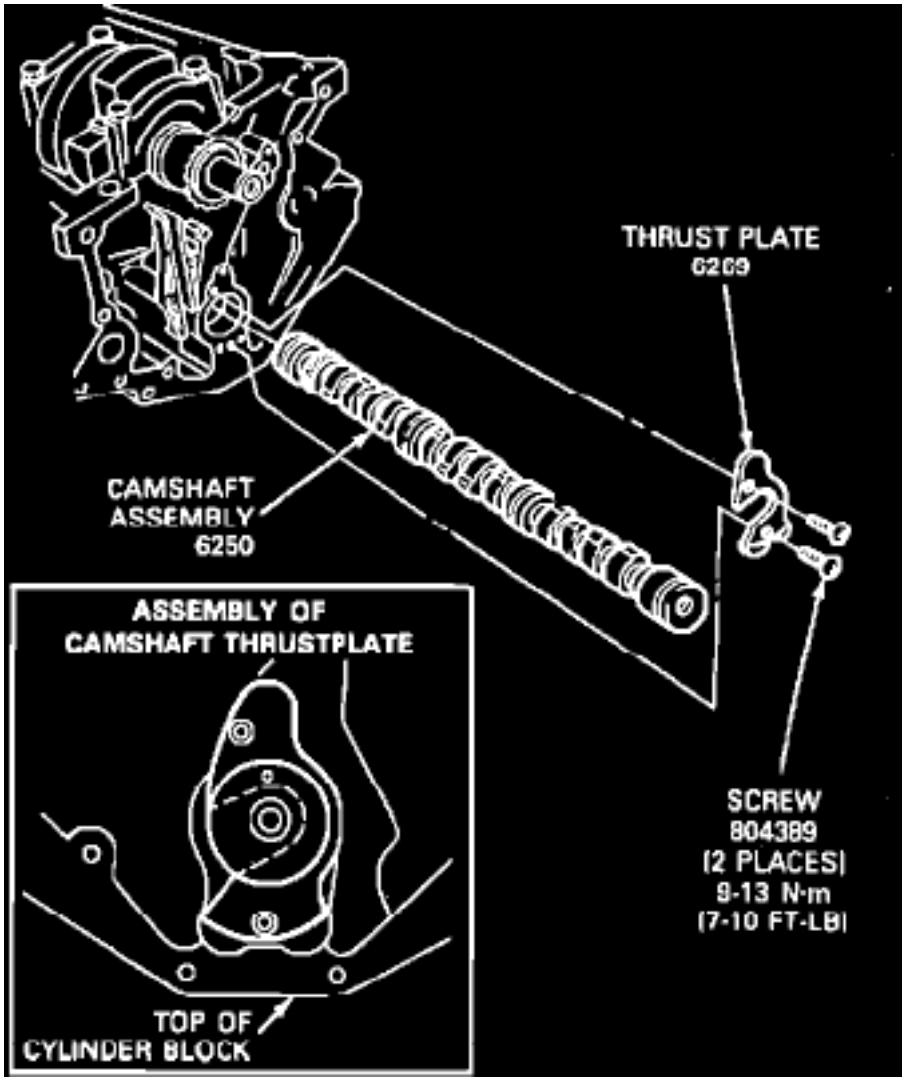


Fig. 7 Camshaft Thrust Plate Removal

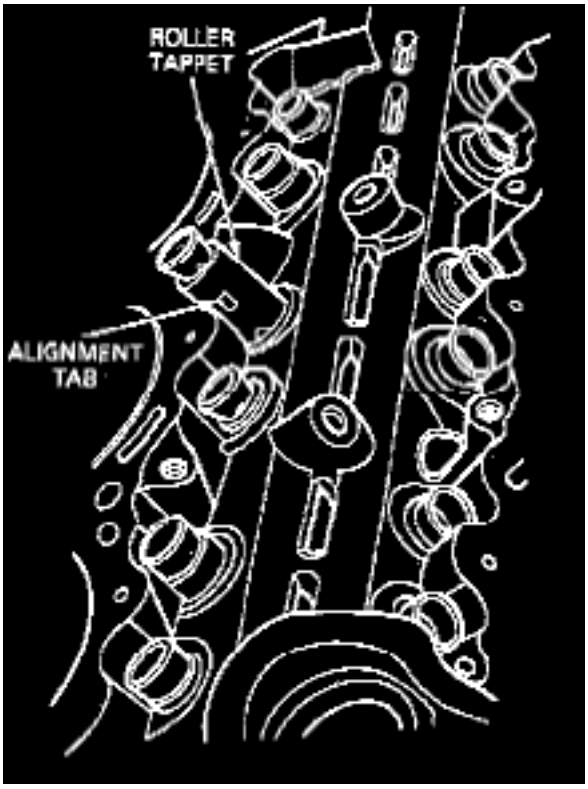
14. Remove camshaft thrust plate. 15. Carefully remove camshaft from block, avoiding any damage to camshaft bearings. 16. Reverse procedure to install.

Lifter / Lash Adjuster: Specifications Camshaft & Lifters

Valve Roller Tappet Diameter (Std.)
.....
0.8742-0.8755 Valve Roller Tappet Clearance To Bore
.....
0.0005-0.0022 Valve Roller Tappet Service Limit .....
..... 0.005

Lifter / Lash Adjuster: Specifications Valve Lift Specifications

Valve lift should measure .4024 at zero lash.



Lifter / Lash Adjuster: Service and Repair

Note: Before removing a tappet for noisy operating, ensure the noise is not caused by improper valve-to-rocker arm clearance or by worn rocker arms or push rods.

Removal

1. Disconnect the battery ground cable. 2. Drain the coolant. 3. Remove the upper and lower intake manifolds and rocker arm covers. 4. Remove the rocker arm shafts by loosening the rocker arm shaft support bolts two turns at a time until the shaft can be removed.

Caution: If the rocker arm shafts are not loosened gradually, the shaft may become bent or damaged during removal.

5. Remove the pushrods, and note the location of each for reassembly. 6. Remove the tappets. Note the location of each tappet so each tappet can be installed in the original position.

Installtion

Note: Lightly oil all bolt and stud threads before installation, except those specifying special sealant. Using solvent, clean the intake manifold, cylinder head and valve rocker arm cover sealing surfaces.

1. Lubricate each tappet and bore with oil conditioner D9AZ-19579-CA (ESR-M99C80-A) or equivalent heavy engine oil.

2. Install each tappet in the bore from which it was removed with the alignment tab in the locating groove of the bore. If new tappet(s) is being

installed, check the new tappet for free fit in the bore.

3. Dip each push rod end in oil conditioner D9AZ-19579-CA (ESR-M99C80-A) or equivalent heavy engine oil. Install push rods in their original

position.

4. Lubricate all rocker arm assemblies with oil conditioner D9AZ-19579-CA (ESR-M99C80-A) or equivalent. 5. Install the rocker arm shaft assemblies and draw the shaft support bolts down evenly, two turns at a time until the rocker shaft assemblies are fully

down. Tighten shaft support bolts to 62-70 Nm (46-52 ft-lb).

6. Install the lower intake manifold assembly. 7. Install the valve rocker arm covers. 8. Install the upper intake manifold and tighten the nuts to 20-25 Nm (15-18 ft-lb). 9. Fill and bleed the cooling system. Refer to cooling system

10. Connect the battery ground cable. 11. Start the engine and check for coolant and oil leaks.

Push Rod: Specifications

Push Rod Runout (T.I.R. Max.) 0.020

Rocker Arm Assembly: Specifications Torque

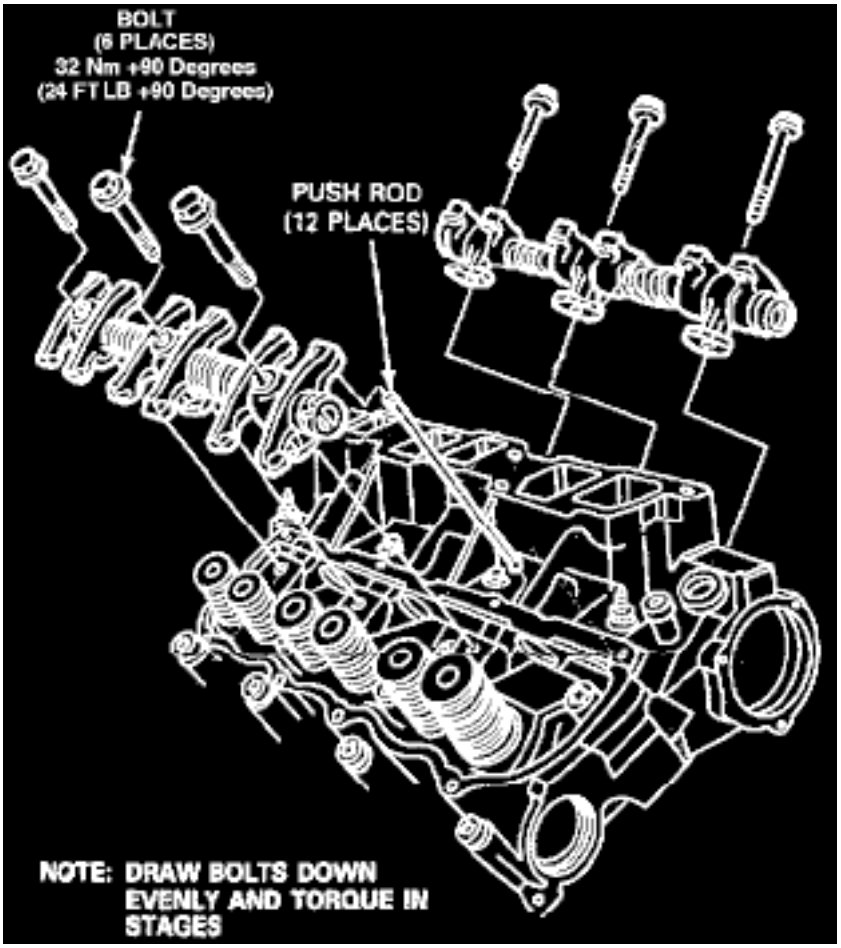
Shaft support bolts ..... 32 Nm +90° (24 ft lb +90°)

Rocker Arm Assembly: Specifications Rebuild

Rocker Arm Shaft Diameter 0.7799-O.7811

Rocker Arm Bore Diameter 0.7830-0.7842

Rocker Arm Ratio 1.46:1



Rocker Arm Assembly: Service and Repair

Valve Push Rod, Rocker Arm, and Shaft Assembly Installation

REMOVAL

1. Remove valve covers.

2. Remove the rocker arm shafts by loosening the rocker arm shaft support bolts 2 turns at a time until the shaft can be removed.

CAUTION: If the rocker arm shafts are not loosened gradually, the shaft may become bent or damaged during removal.

INSTALLATION

1. Lubricate all rocker arm assemblies with Engine Assembly Lubricant (D9AZ-19579 D, or equivalent).

2. Install rocker arm shaft assemblies and draw the shaft support bolts down evenly, two turns at a time, until the rocker shaft assemblies are fully down. Tighten shaft support bolts to 32 Nm +90° (24 ft lb +90°).

3. Install valve covers.

Connecting Rod: Specifications General Specifications

Connecting Rod Pin Bore Diameter .... 0.9432-0.9439 Connecting Rod Crankshaft Bearing Bore Diameter ..... 2.2370-2.2378 Connecting Rod Crankshaft Bearing Bore Out-Of-Round ..... 0.0004 Connecting Rod Crankshaft Bearing Bore Taper ..... 0.0004 Connecting Rod Length (Center-To-Center) ..... 5.1386-5.1413 Connecting Rod Alignment (Bore-To-Bore Max. Diff.), (Pin and crank bearing bore must be parallel and in same vertical plane within the specified total difference when measured at ends of an 8" bar, 4" on each side of rod centerline.)

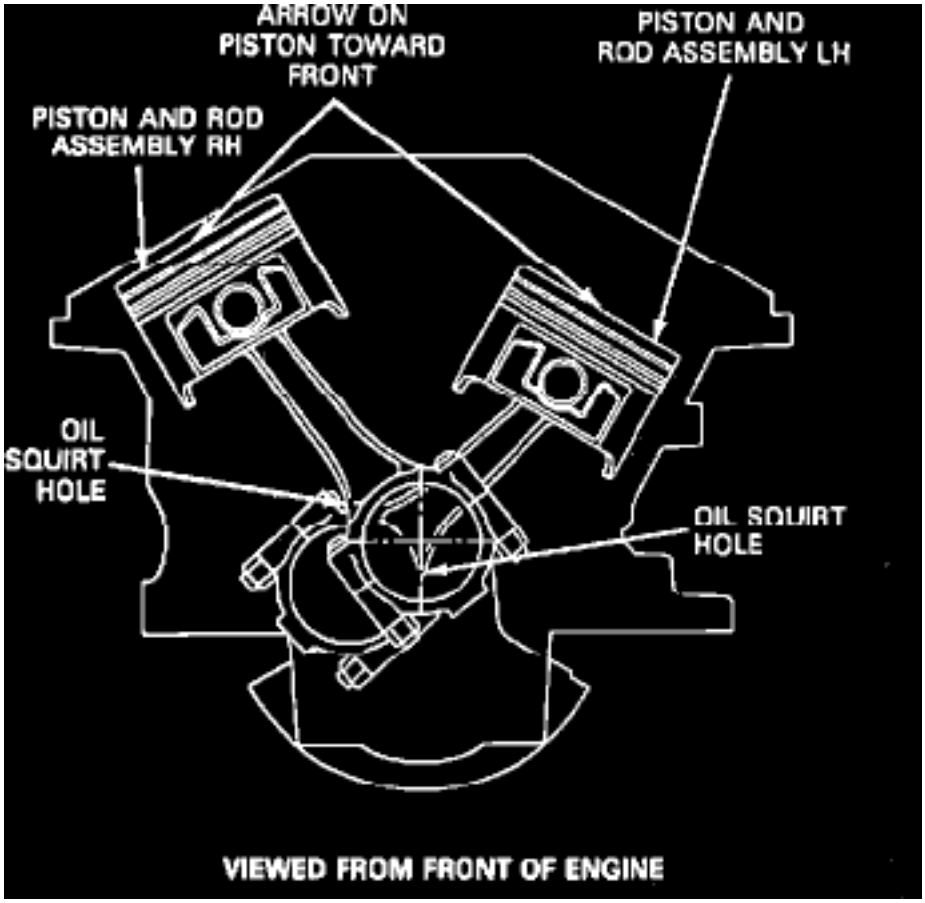
Twist .... 0.006 Bend 0.002

Connecting Rod Side Clearance (Assembled To Crank)

Standard .... 0.0002-0.0025 Service Limit 0.014

Connecting Rod: Specifications Tightening Specifications

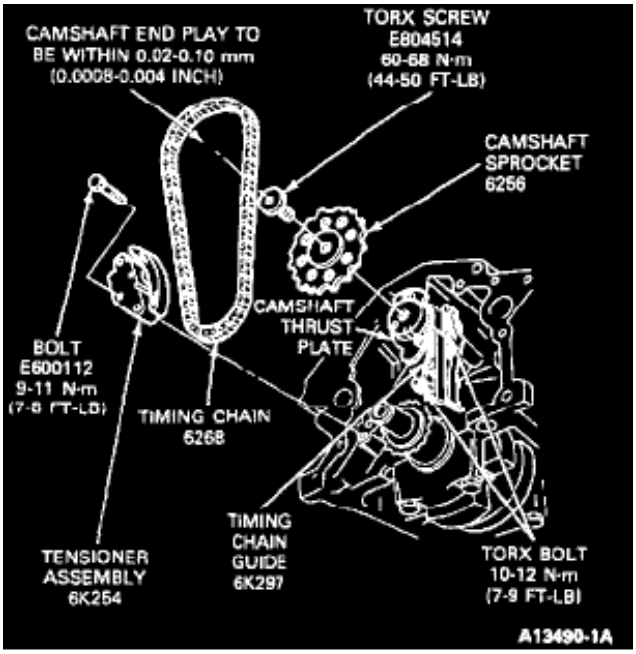
Connecting Rod Bearing Cap Nuts
..... 25-32 Nm (18-24 ft lb)



Connecting Rod: Service and Repair

Fig. 8 Piston & Rod Assembly

Ensure arrow is piston dome faces front of engine as shown, Fig. 8.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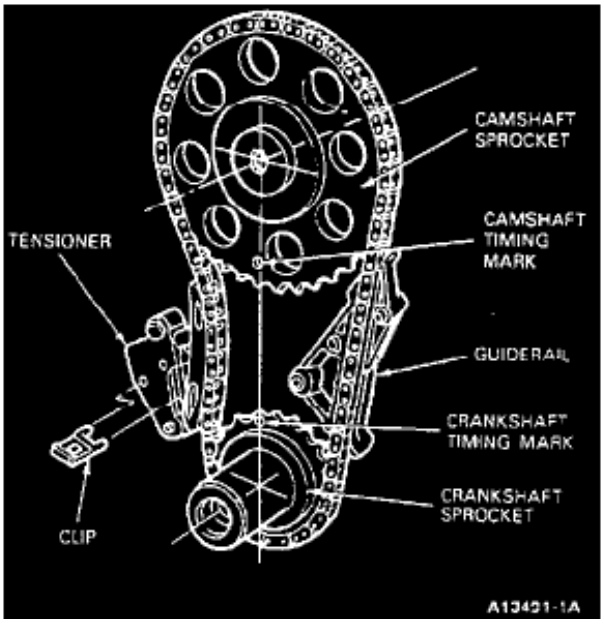

CAMSHAFT SPROCKET
TENSIONER
CAMSHAFT TIMING MARK
GUIDERAIL
CRANKSHAFT TIMING MARK
CRANKSHAFT SPROCKET
CLIP
A13491-1A

Crankshaft Gear/Sprocket: Service and Repair

REMOVAL

1. Drain the cooling system and crankcase. Remove the oil pan and radiator. 2. Remove the cylinder front cover and water pump, drive belt and crankshaft damper. 3. Remove the camshaft sprocket retaining bolt and the crankshaft sprocket key. 4. Remove the crankshaft and camshaft sprockets with the timing chain.

Timing Chain, Sprockets And Tensioner

5. Remove the timing chain tensioner and guide.

INSTALLATION

1. Install the timing chain guide to the cylinder block with the pin of the guide inserted into the oil hole in the block. Install the two retaining bolts,

and tighten to 10-12 Nm (7-9 ft lb).

2. Position the camshaft so the timing mark will align with the crankshaft. Position the crankshaft so the timing mark will align with the camshaft. 3. Install the crankshaft sprocket, camshaft sprocket and timing chain together. 4. Install the timing chain tensioner with the clip in place to lock the tensioner in the retracted position. Tighten tensioner bolts to 9-11 Nm (7-8 ft lb)

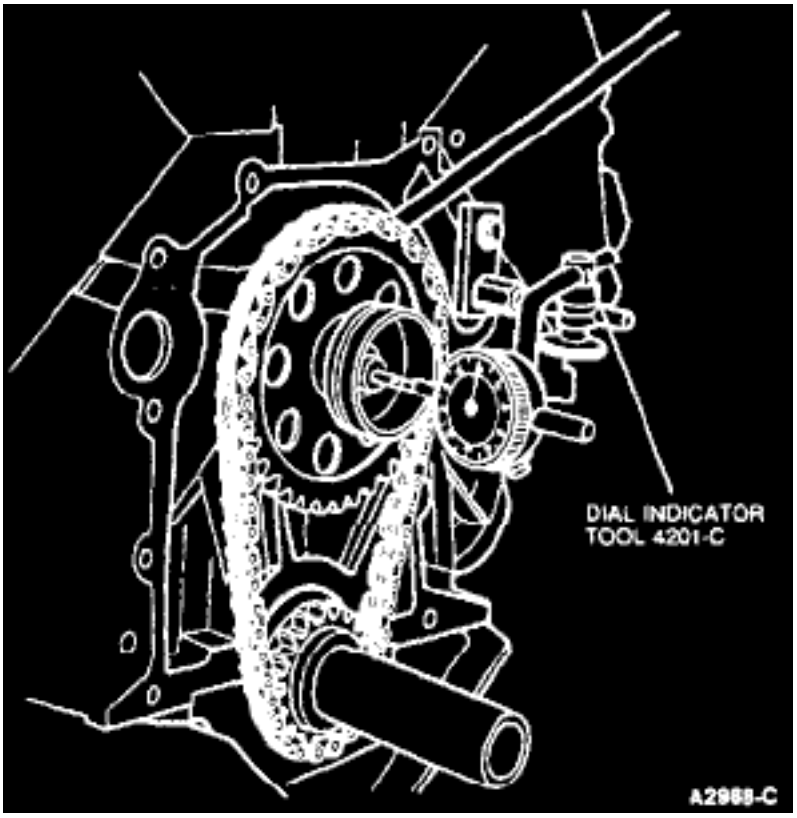
.

Timing Marks

5. Install the crankshaft key and check the timing marks on the crankshaft sprocket and camshaft sprocket for correct alignment.

NOTE: Make sure that the tensioner side of the timing chain is held inward, and that the guide side of the chain is straight and tight.

6. Install the camshaft sprocket retaining bolt, and tighten to 60-68 Nm (44-50 ft lb). 7. Remove the clip from the tensioner assembly.



8. Check the camshaft end play.

Camshaft End Play

CAUTION: Prying against the camshaft gear with the valve train load on the camshaft can break or damage the gear. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

a. Push camshaft toward rear of engine. Install Dial Indicator TOOL-4201-C or equivalent so indicator point is on camshaft sprocket attaching

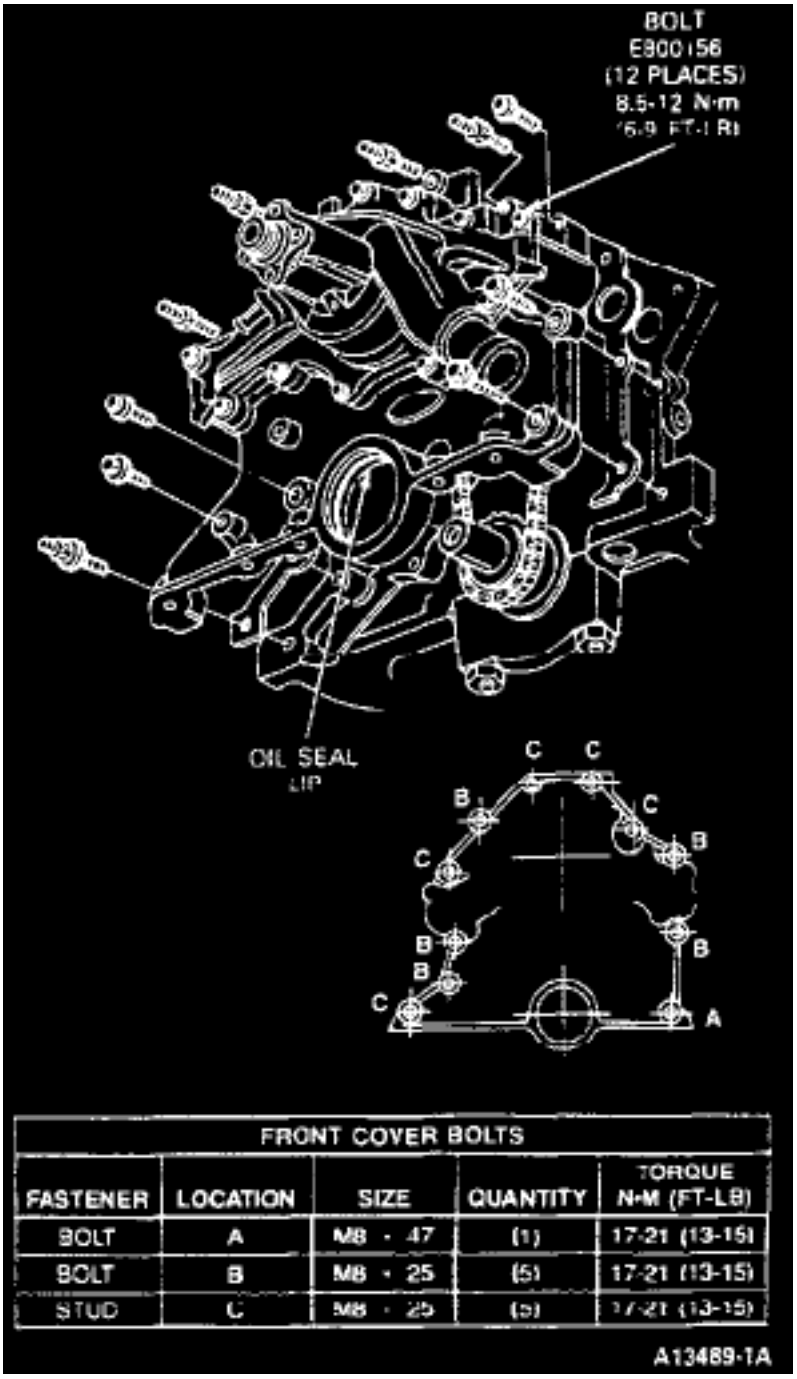
screw.

b. Zero dial indicator. Pull camshaft forward and release it. Compare dial indicator reading with specifications. Camshaft end play specification is

0.0203-0.1016 mm (0.0008-0.004 in) and camshaft end play service limit is 0.2286 mm (0.009 in). If end play is excessive, replace camshaft thrust plate.

c. Remove dial indicator. d. After replacing thrust plate, check end play again. If it is still out of specified range, inspect camshaft and cylinder head/cylinder block for

excessive wear.



FRONT COVER BOLTS				
FASTENER	LOCATION	SIZE	QUANTITY	TORQUE N·M (FT-LB)
BOLT	A	M8 - 47	(1)	17-21 (13-15)
BOLT	B	M8 - 25	(5)	17-21 (13-15)
STUD	C	M8 - 25	(5)	17-21 (13-15)

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Timing Cover And Bolts

9. Install the cylinder front cover. Tighten front cover attaching screws to 17-21 Nm (13-15 ft lb). Install the oil pan and radiator.

10. Fill and bleed the cooling system. 11

Fill the crankcase with clean engine oil of the recommended grade and viscosity.

12. Start the engine and operate at fast idle. Check for coolant and oil leaks.

Crankshaft: Specifications General Specifications

Main Bearing Journal Diameter ..... 2.2433-2.2441 Main Bearing Out-Of-Round ..... 0.0006 Main Bearing Taper Limit ..... 0.0006 per inch Main Bearing Journal Runout ..... 0.002 Max. Main Bearing Surface Finish (RMS) ..... 12 Main Bearing Runout Service Limit ..... 0.005 Thrust Bearing Journal Length ..... 1.039-1.041 Connecting Rod Journal Diameter ..... 2.1252-2.1260 Connecting Rod Journal Out-Of-Round ..... 0.0006 Connecting Rod Journal Taper Limit ..... 0.0006 per inch Connecting Rod Journal Surface Finish (RMS) ..... 12 Max. Main Bearing Thrust Face Surface Finish ..... 2O Max. Main Bearing Runout (T.I.R.) ..... 0.001 Max. Crankshaft Free End Play ..... 0.016-0.0126 Crankshaft Free End Play Service Limit ..... 0.012 Connecting Rod Bearings

Desired Clearance to Crankshaft ..... 0.0003-0.0024 Allowable Clearance to Crankshaft 0.0005-0.0022

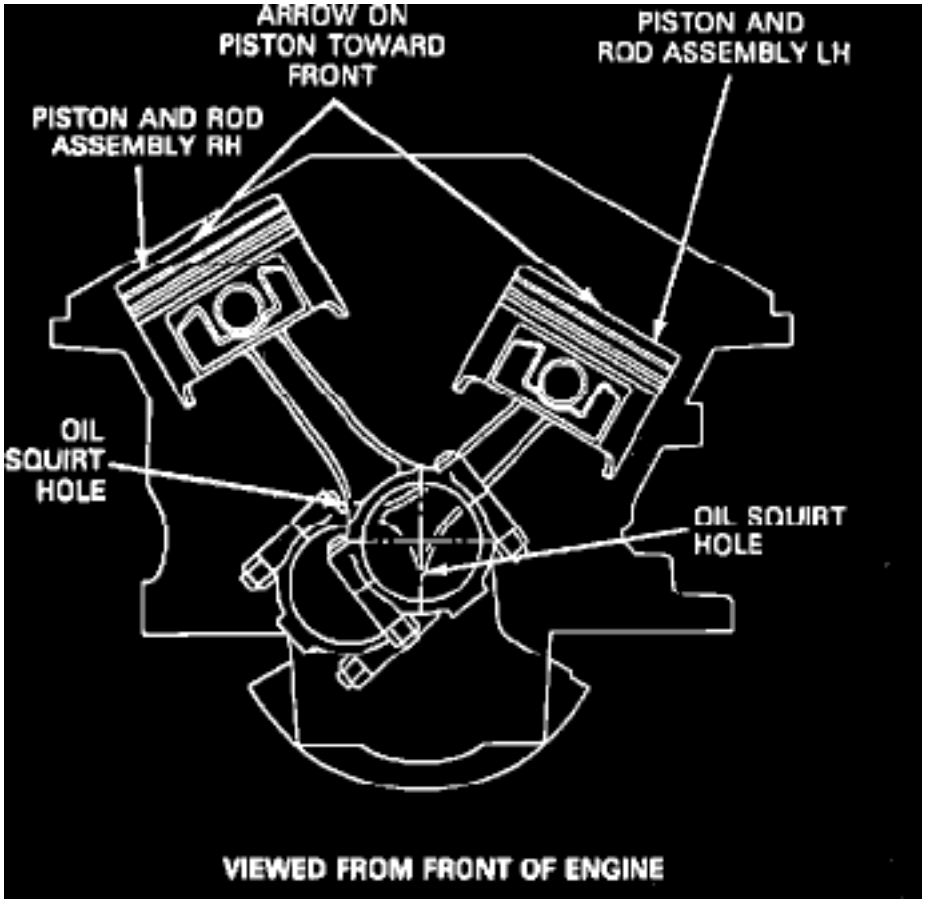
Connecting Rod Bearing Wall Thickness (Std.) Red ..... 0.0548-0.0552 Connecting Rod Bearing Wall Thickness (Std.) Blue ..... 0.0552-0.0556 Main Bearing Desired Clearance to Crankshaft ..... 0.0008-0.0015 Main Bearing Allowable Clearance to Crankshaft ..... 0.0005-0.0019 Main Bearing Wall Thickness (Std.) Red ..... 0.0707-0.0710 Main Bearing Wall Thickness (Std.) Blue 0.0711-0.0714

Crankshaft: Specifications Tightening Specifications

Crankshaft Main Bearing Cap Bolts ..... 90-104 Nm (66-77 ft lb) Crankshaft Oil Baffle Nuts .... 17-21 Nm (13-15 ft lb)

Piston: Specifications

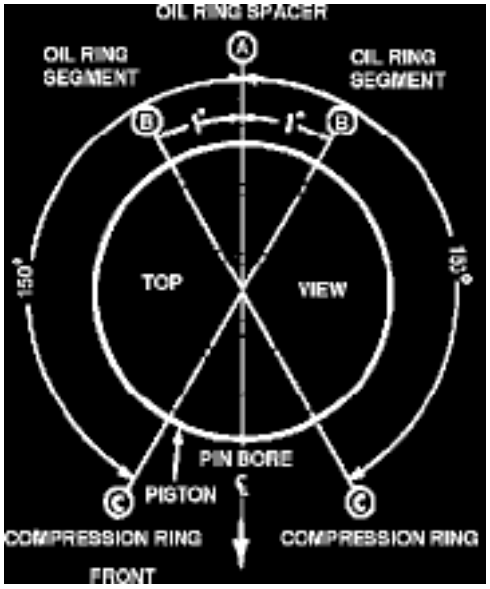
Piston Height (above cyl block surface @ TDC) ..... 0.0015-00205 Standard Piston Diameter (measured at the piston pin bore centerline at 90° to the pin) ..... 3.9524-3.9531 Piston-To-Bore Clearance .... 0.0008-0.0019 Piston Pin Bore Diameter .... 0.9450-0.9452 Compression Piston Ring Groove Width (Top) ..... 0.0803-0.0811 Compression Piston Ring Groove Width (Bottom) ..... 0.1197-0.1205 Oil Piston Ring Groove Width 0.1579-0.1587



Piston: Service and Repair Piston and Rod Assembly Service

Fig. 8 Piston & Rod Assembly

Ensure arrow is piston dome faces front of engine as shown, Fig. 8.



Piston: Service and Repair Pistons, Oversize

Fig. 9 Piston Ring Gaps

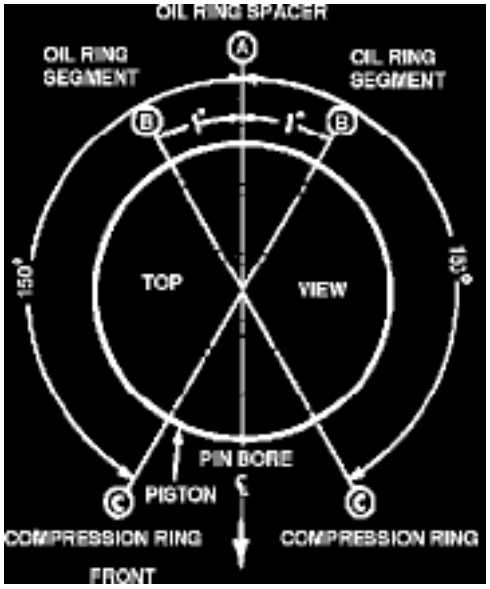
Piston are available in standard sizes and oversizes. Ensure ring gaps are aligned as shown, Fig. 9.

Piston Pin: Specifications

Piston Pin Length ..... 2.835-2.886 Red Piston Pin Diameter ..... 0.9446-0.9448 Blue Piston Pin Diameter ..... 0.9448-0.9449 Pin-To-Piston Clearance ..... 0.0003-0.OOO6 Pin-To-Rod Clearance ..... Interference Fit

Piston Ring: Specifications

Compression Piston Ring Width (Top) ..... 0.0778-0.0783 Compression Piston Ring Width (Bottom) ..... 0.1172-0.1177 Compression Piston Ring Side Clearance (Top) ..... 0.0020-0.0033 Compression Piston Ring Side Clearance (Bottom) ..... 0.0020-0.0033 Piston Oil Ring Side Clearance .... Snug Fit Side Clearance Service Limit .... 0.006 Compression Piston Ring Gap (Top) .... 0.015-0.023 Compression Piston Ring Gap (Bottom) ..... 0.015-0.023 Piston Oil Ring Gap (Steel Rail) 0.015-0.055



Piston Ring: Service and Repair

Fig. 9 Piston Ring Gaps

Piston are available in standard sizes and oversizes. Ensure ring gaps are aligned as shown, Fig. 9.

Valve Clearance: Locations

Valve Arrangement (Front To Rear)

.....

L.H. I-E-I-E-I-E Valve Arrangement (Front To Rear)

.....

R.H. E-I-E-I-E-I

Valve Clearance: Adjustments

The hydraulic roller tappets have non-adjustable rocker arms. The tappets are not adjustable, and if found to be excessively worn or noisy, should be tested and replaced.

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.

Rocker Arm Assembly: Specifications Torque

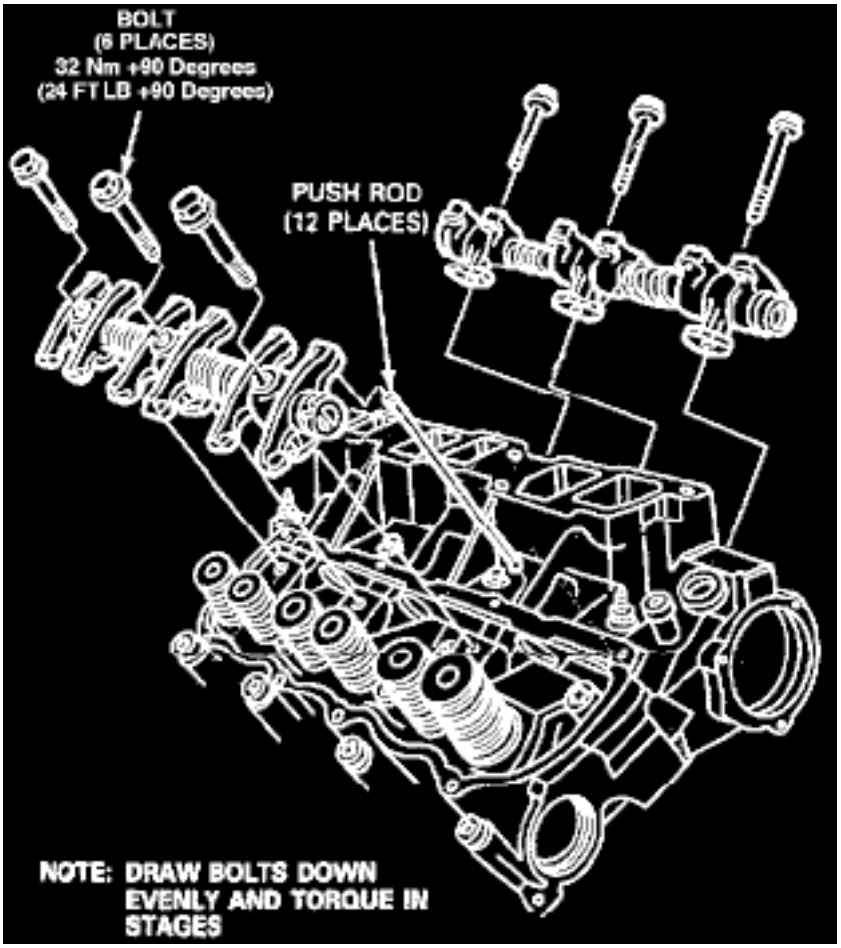
Shaft support bolts ..... 32 Nm +90° (24 ft lb +90°)

Rocker Arm Assembly: Specifications Rebuild

Rocker Arm Shaft Diameter 0.7799-O.7811

Rocker Arm Bore Diameter 0.7830-0.7842

Rocker Arm Ratio 1.46:1



Rocker Arm Assembly: Service and Repair

Valve Push Rod, Rocker Arm, and Shaft Assembly Installation

REMOVAL

1. Remove valve covers.

2. Remove the rocker arm shafts by loosening the rocker arm shaft support bolts 2 turns at a time until the shaft can be removed.

CAUTION: If the rocker arm shafts are not loosened gradually, the shaft may become bent or damaged during removal.

INSTALLATION

1. Lubricate all rocker arm assemblies with Engine Assembly Lubricant (D9AZ-19579 D, or equivalent).

2. Install rocker arm shaft assemblies and draw the shaft support bolts down evenly, two turns at a time, until the rocker shaft assemblies are fully down. Tighten shaft support bolts to 32 Nm +90° (24 ft lb +90°).

3. Install valve covers.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

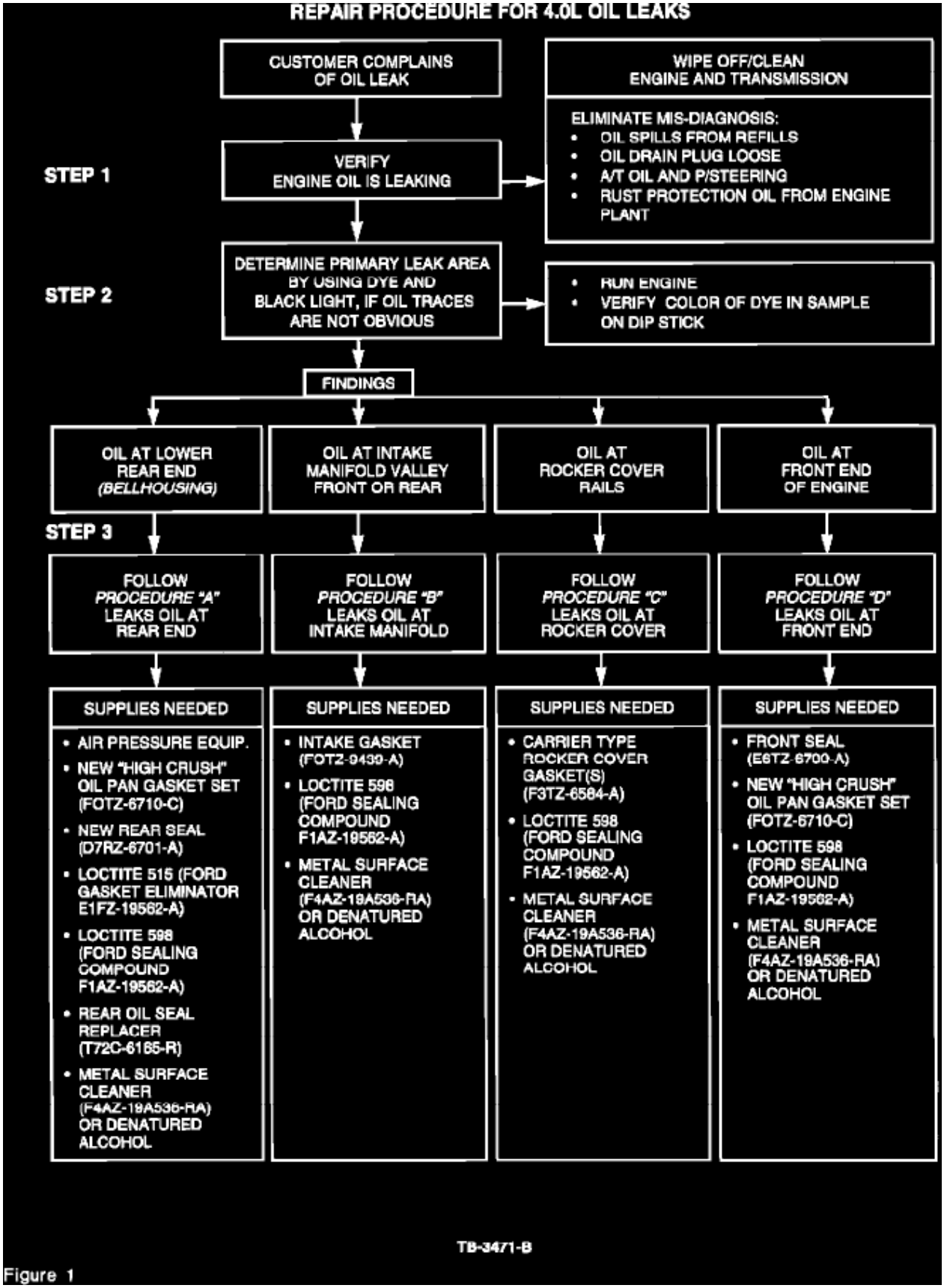


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

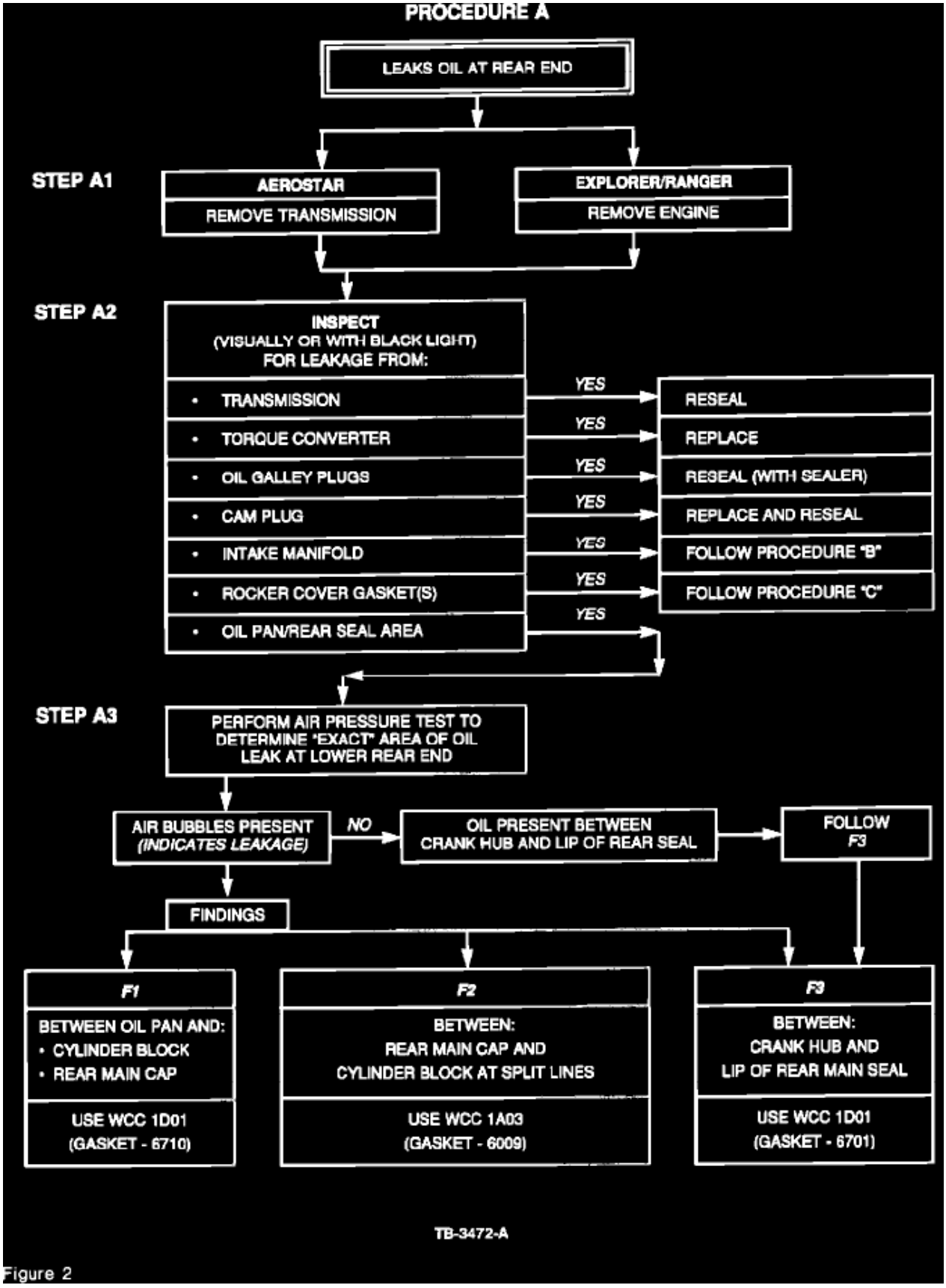

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

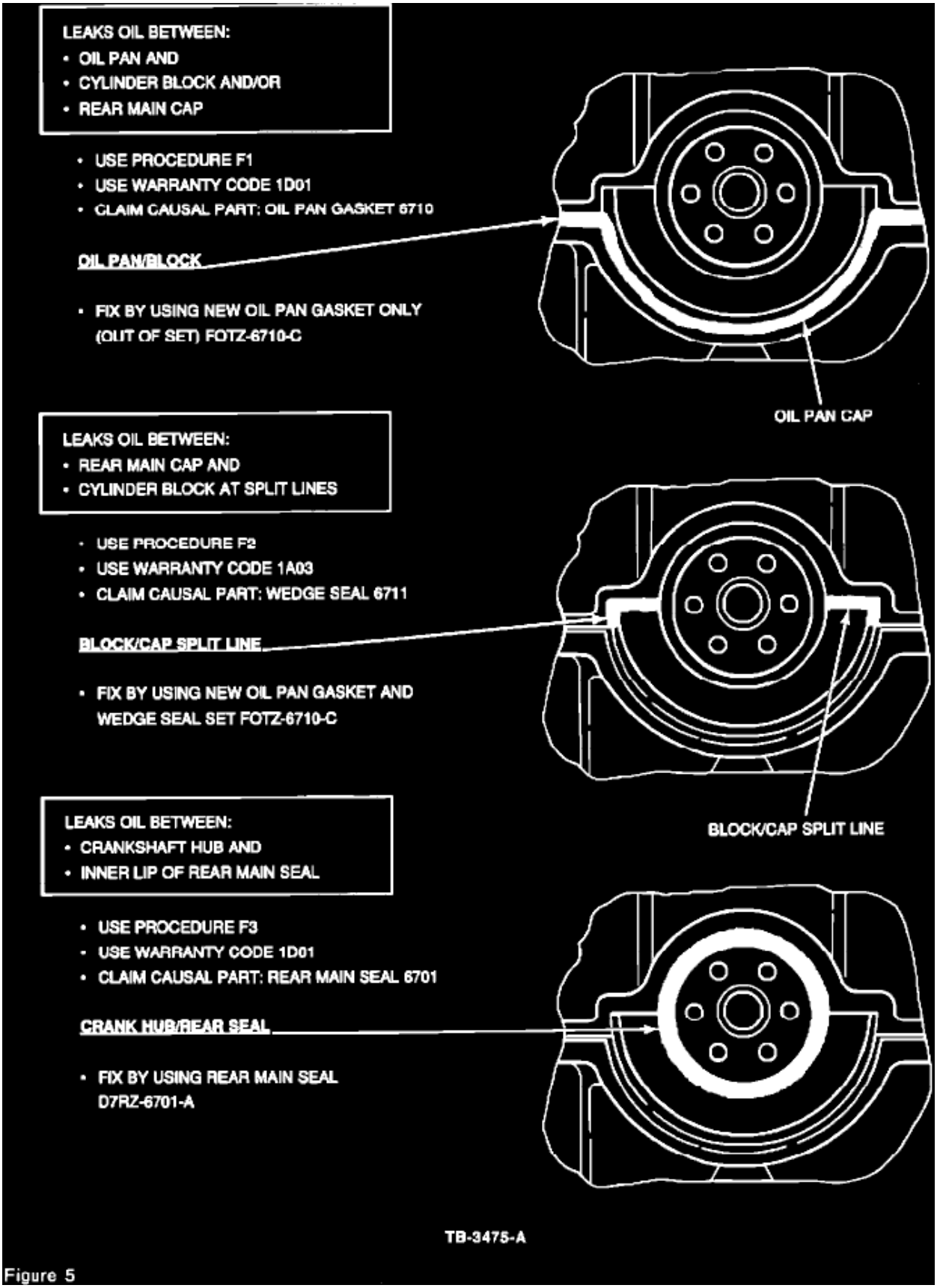


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

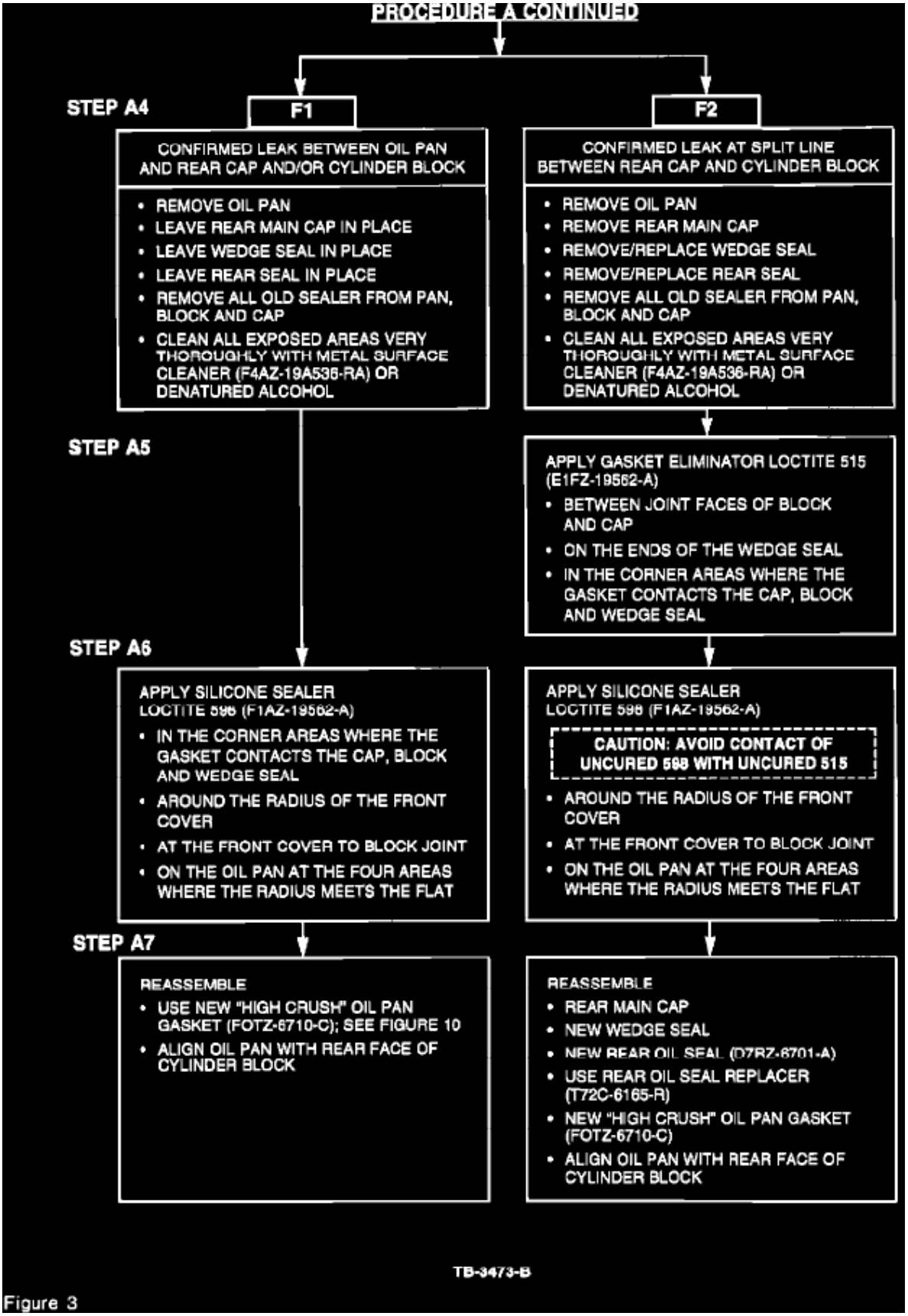
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

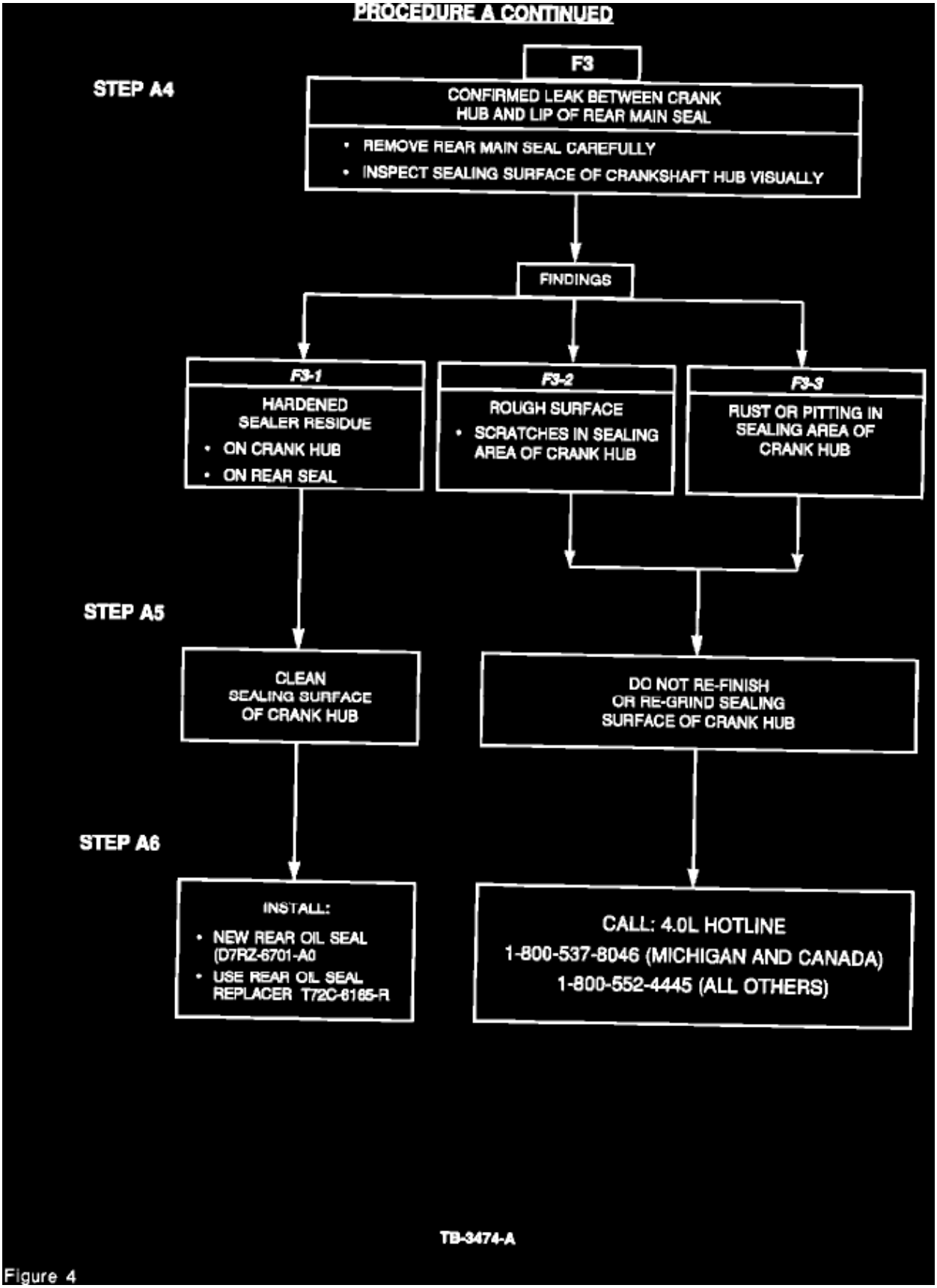


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

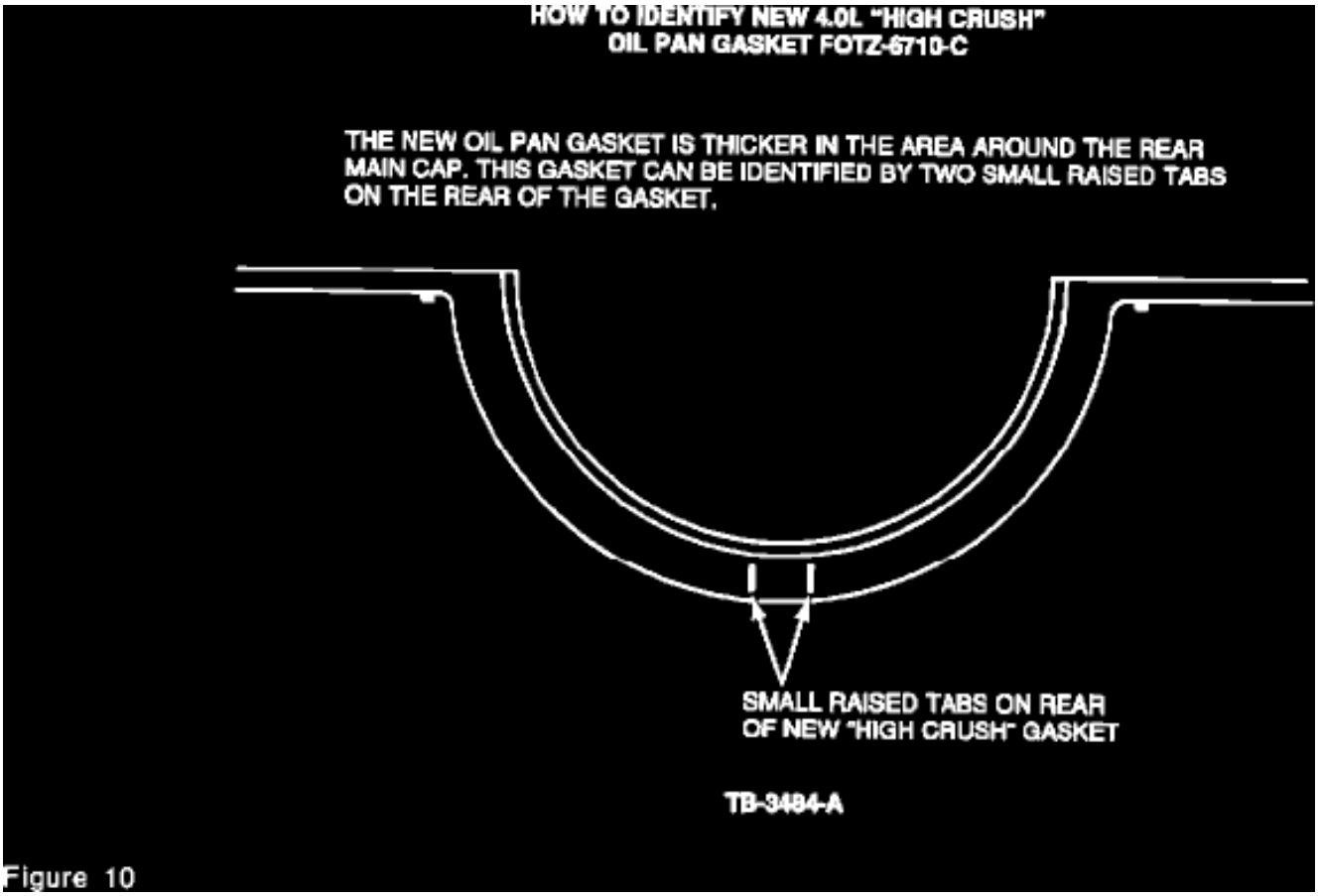


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

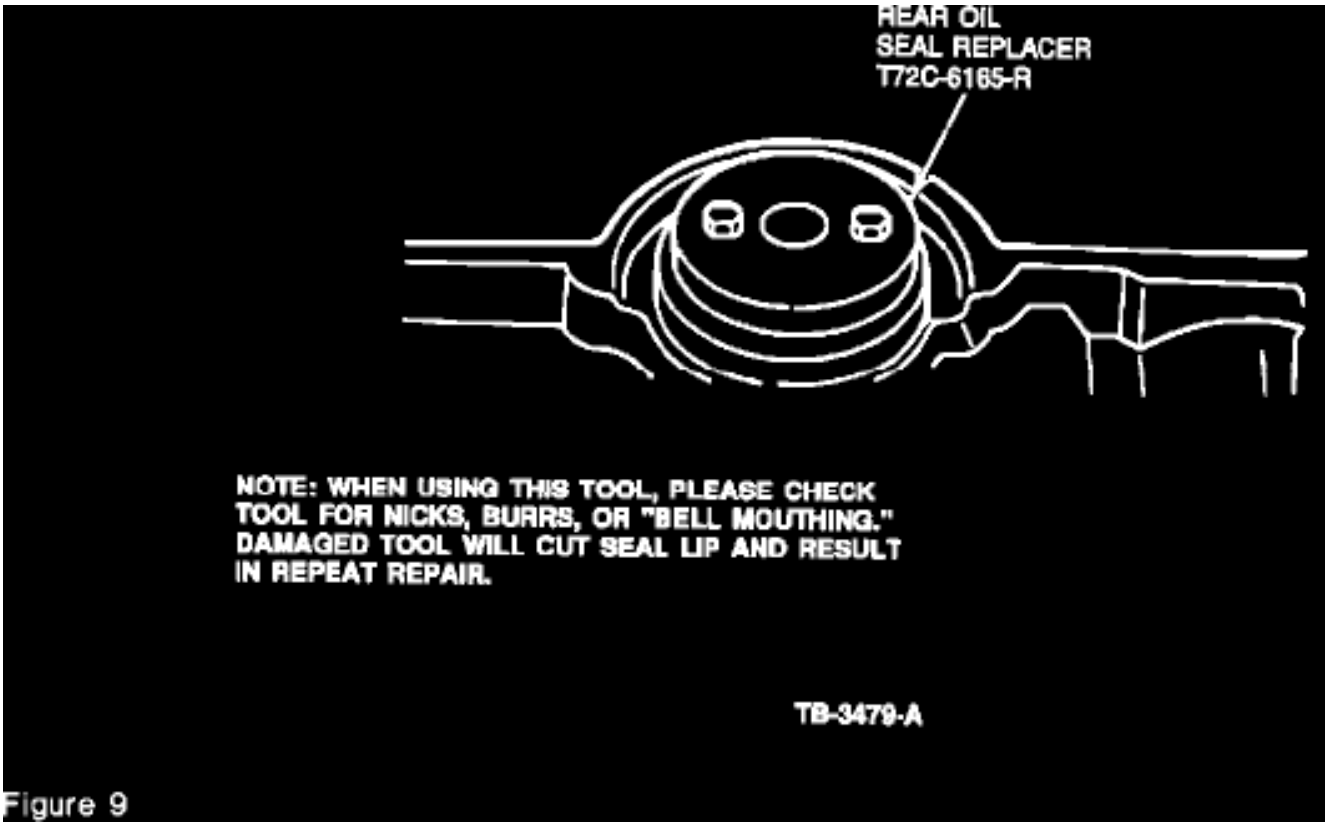


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

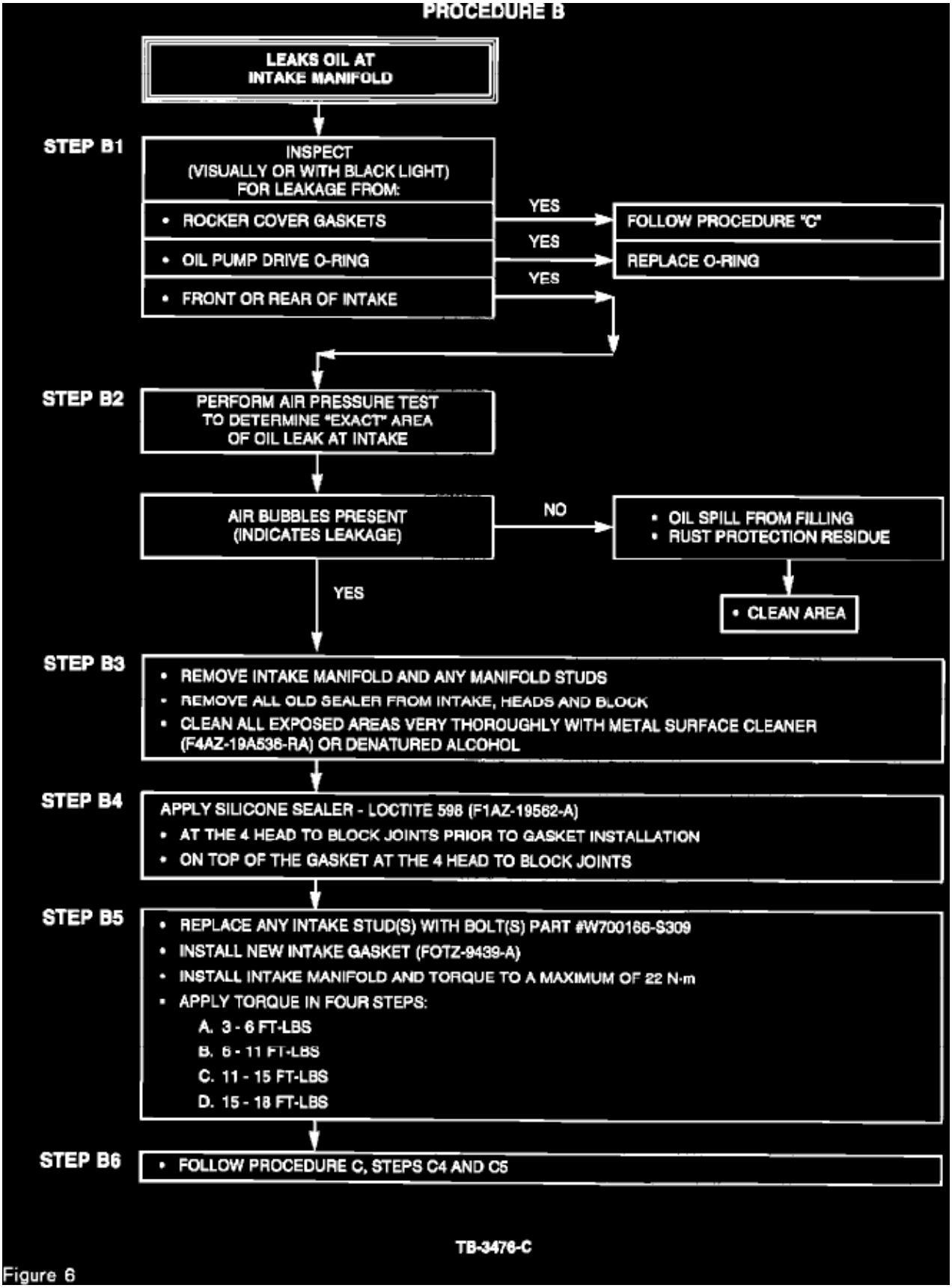


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

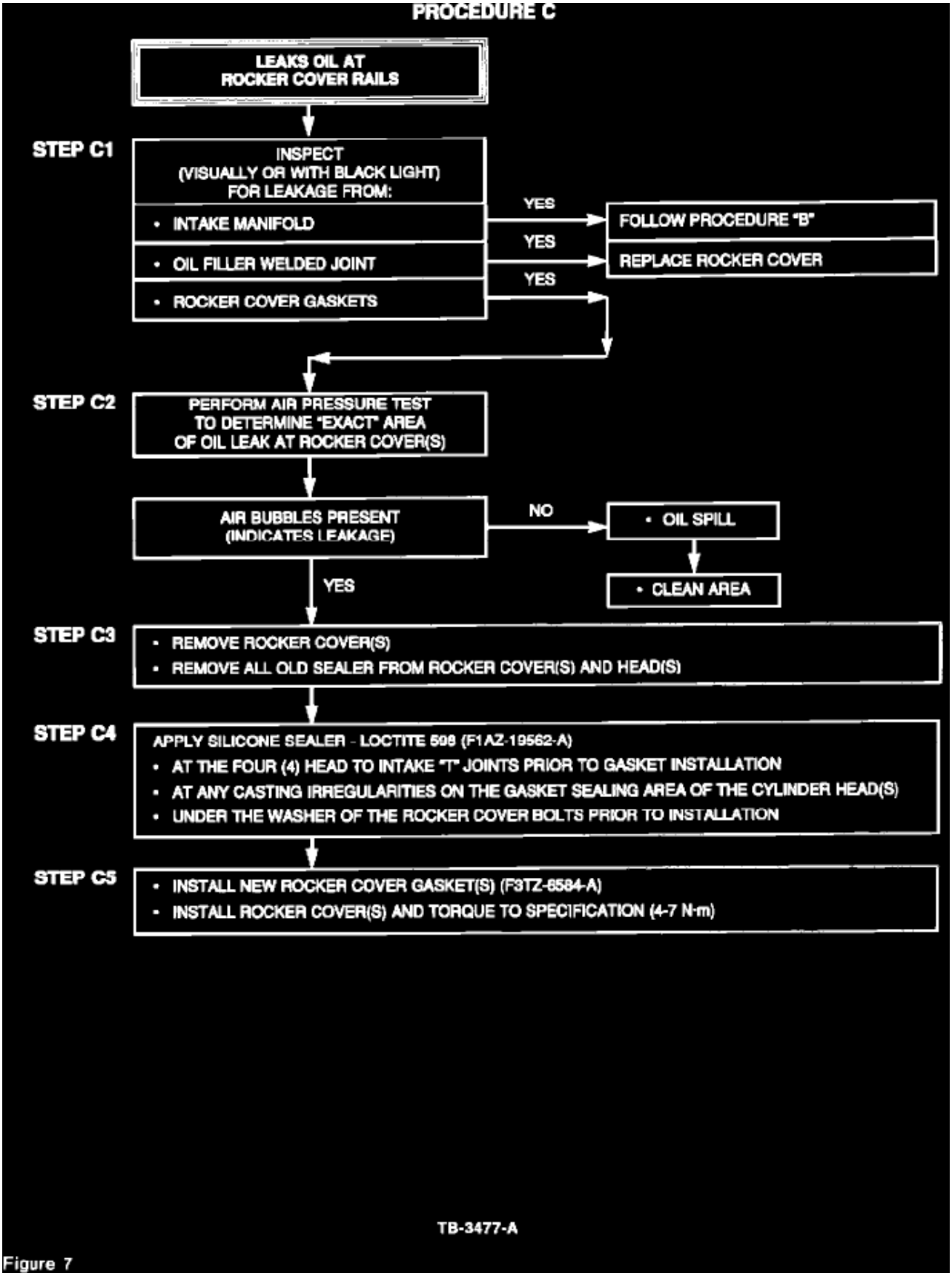


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

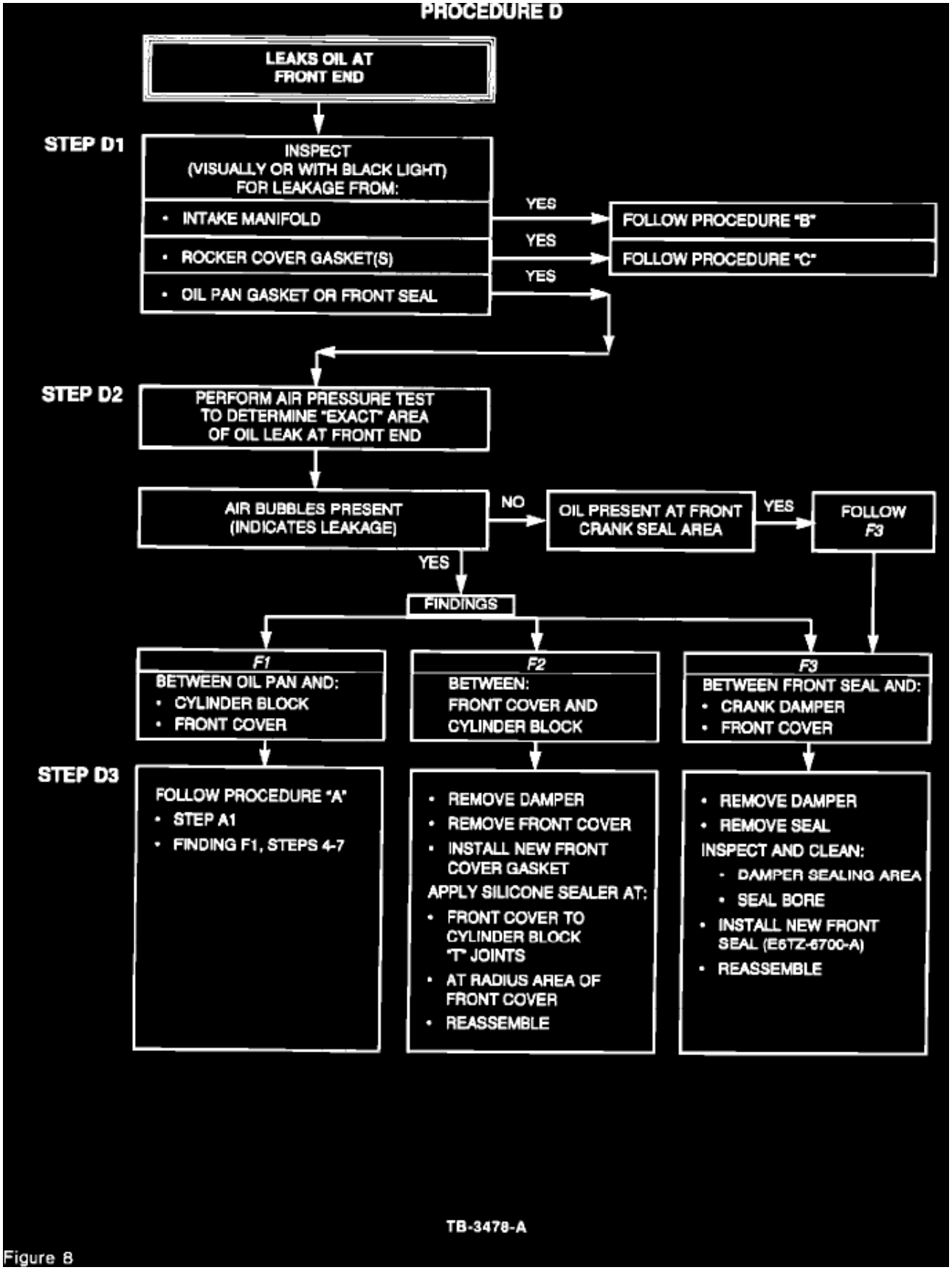


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

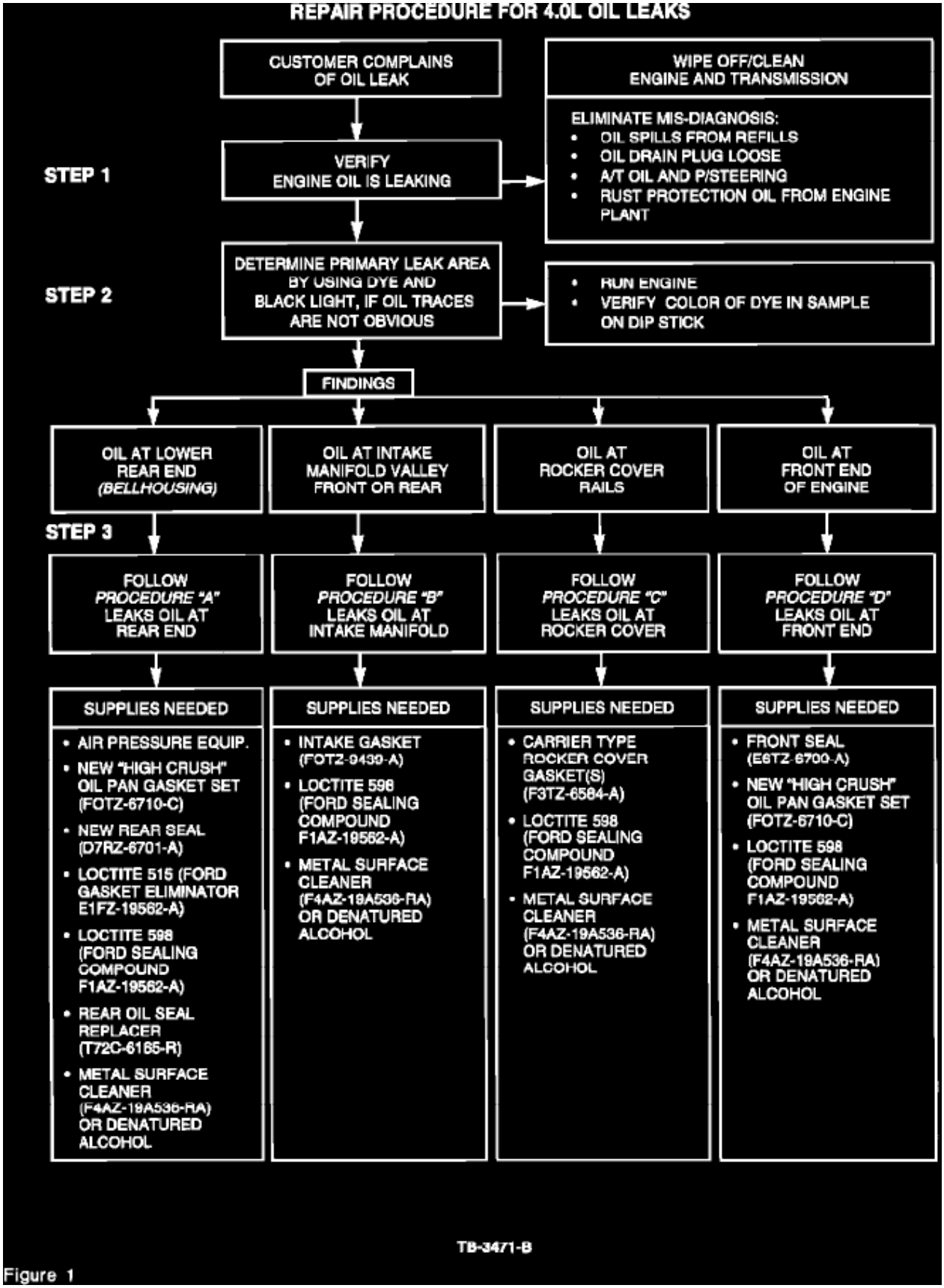


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

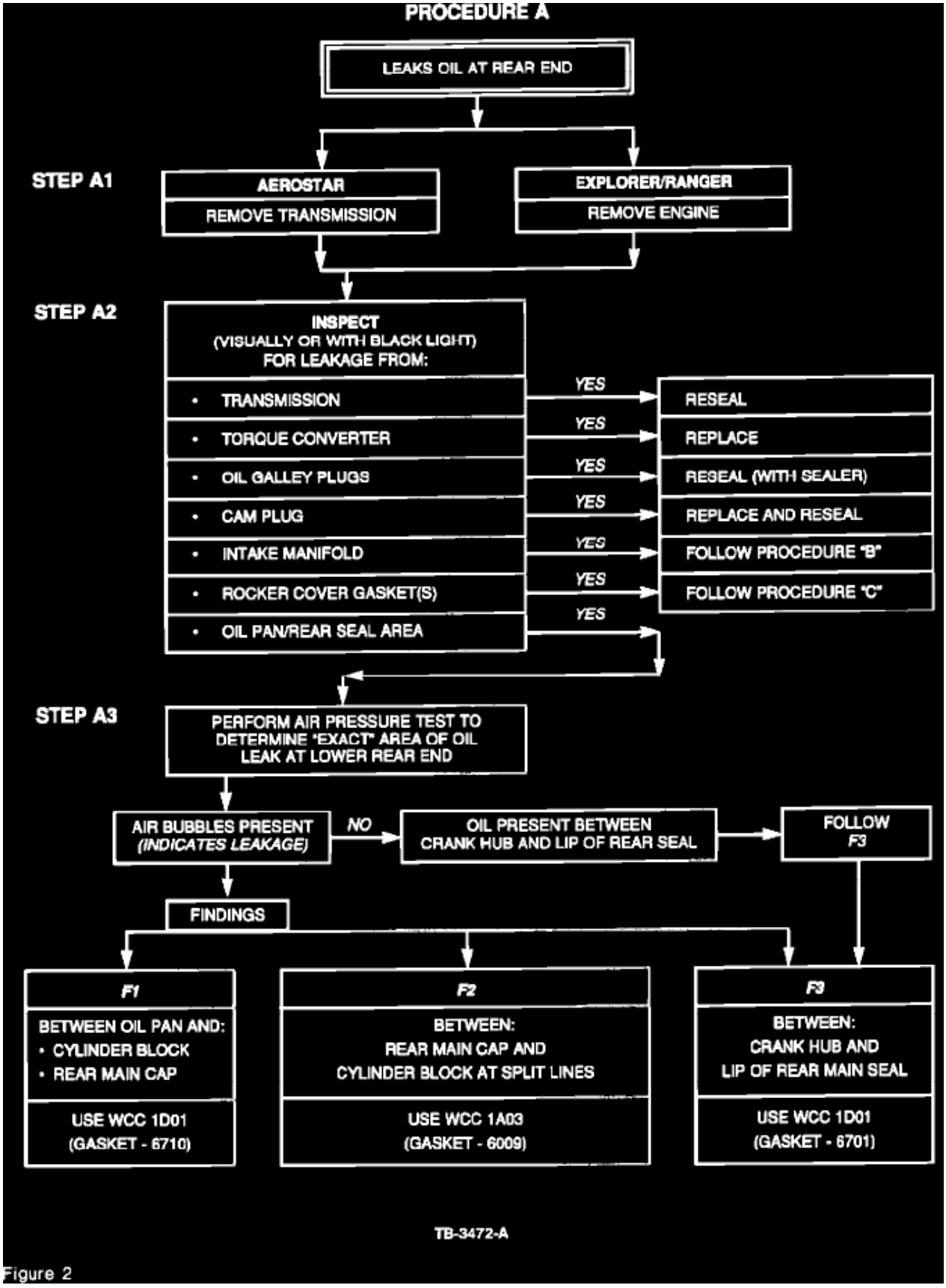

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

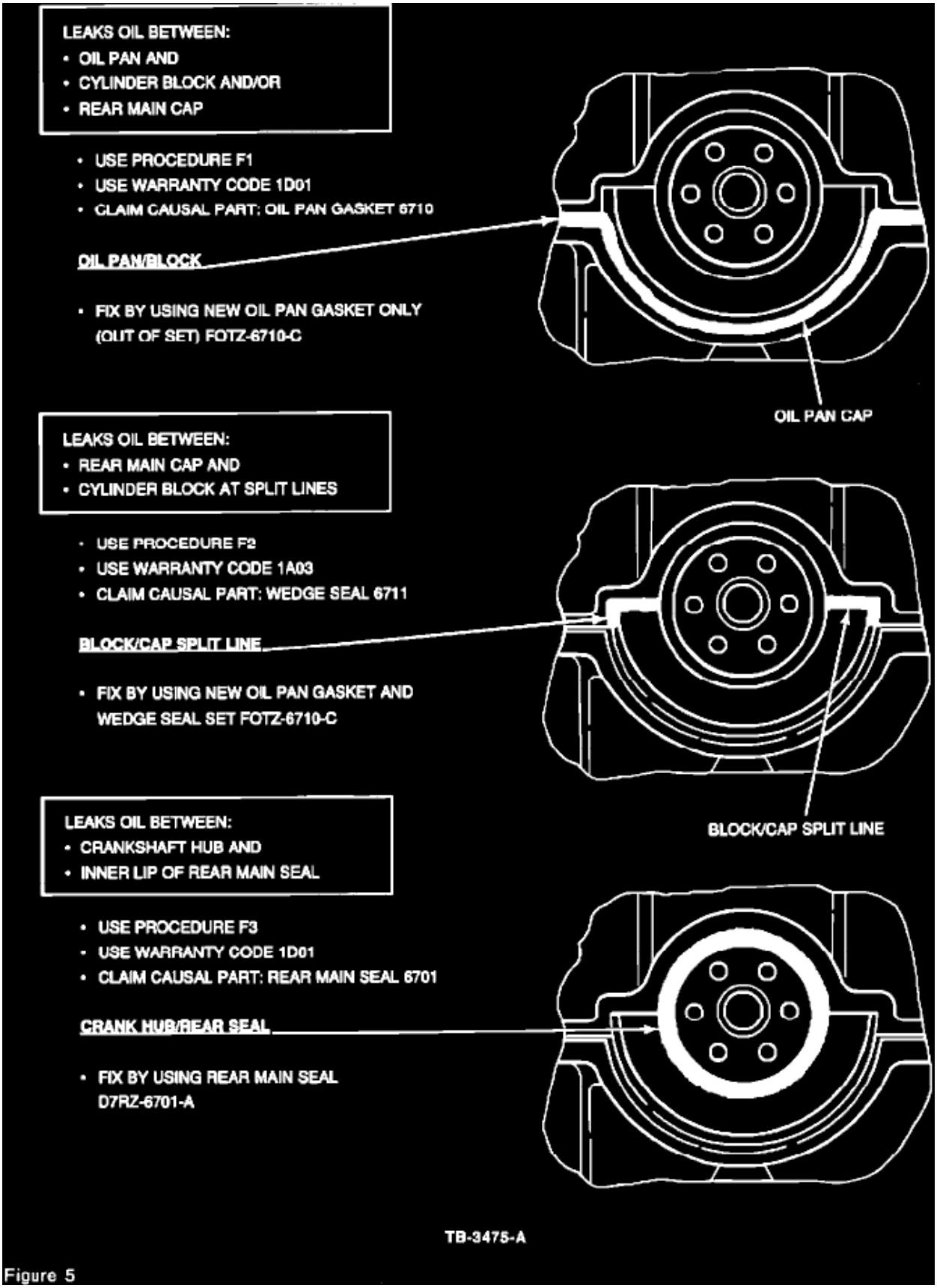


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

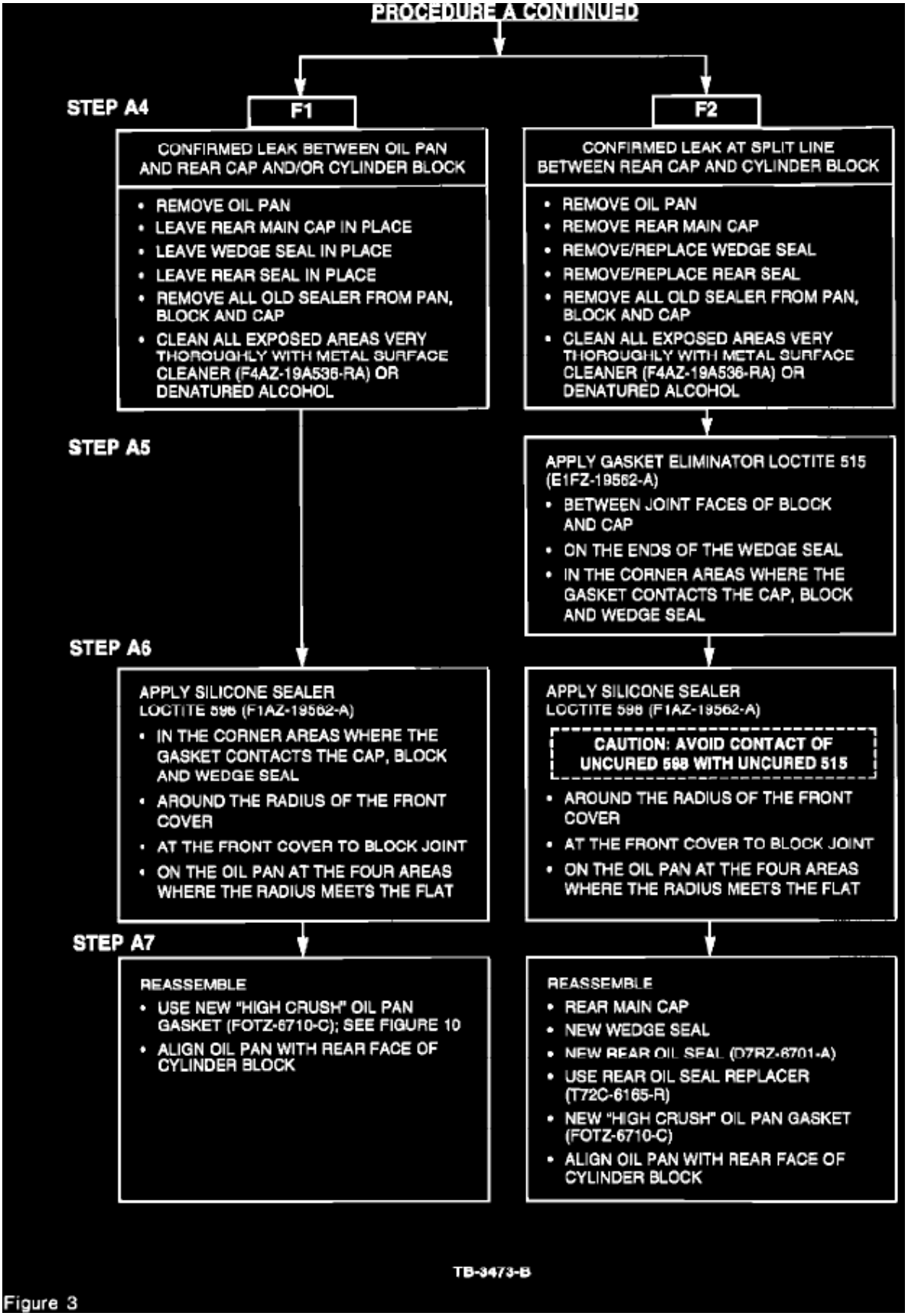
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

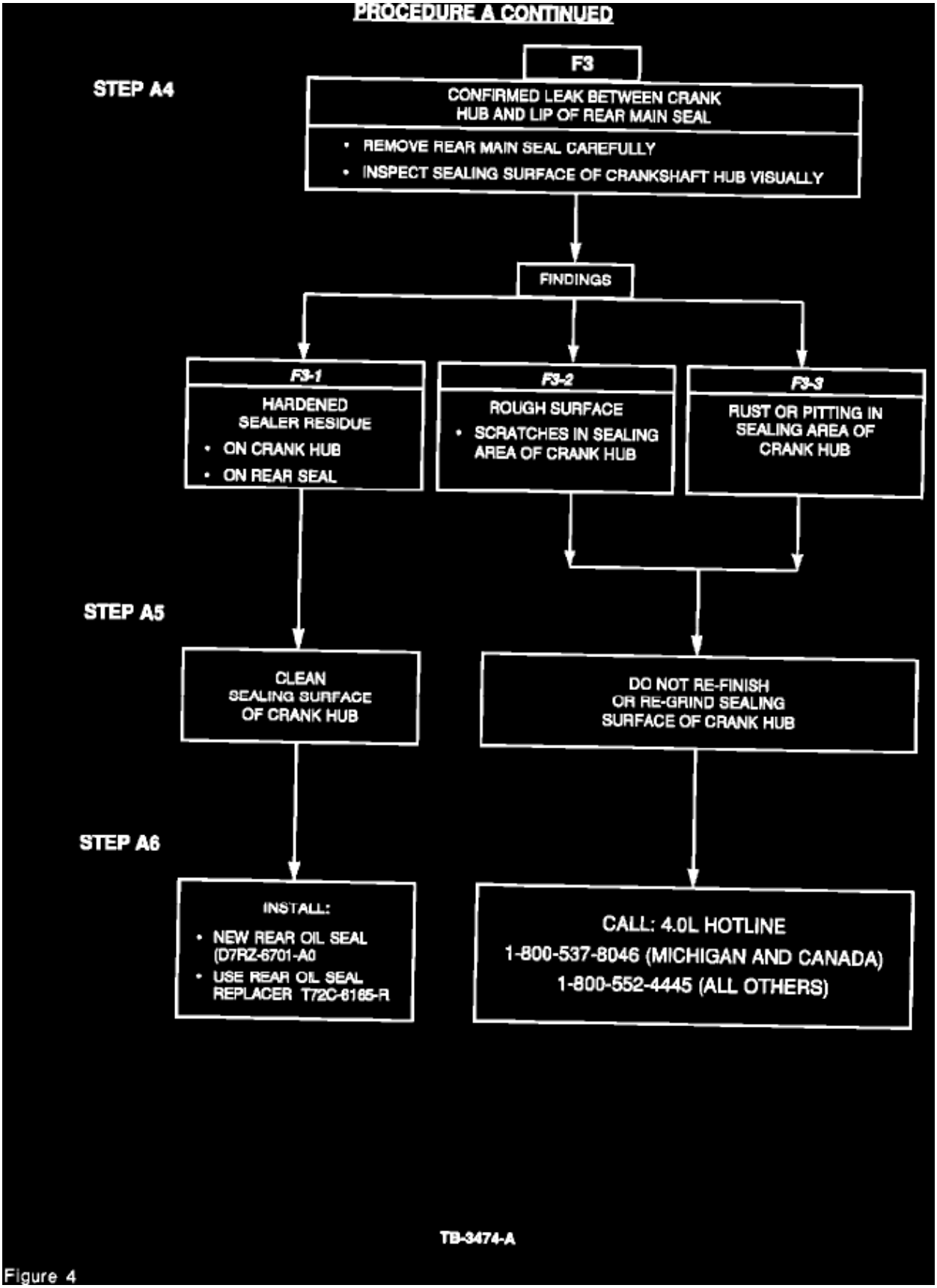


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

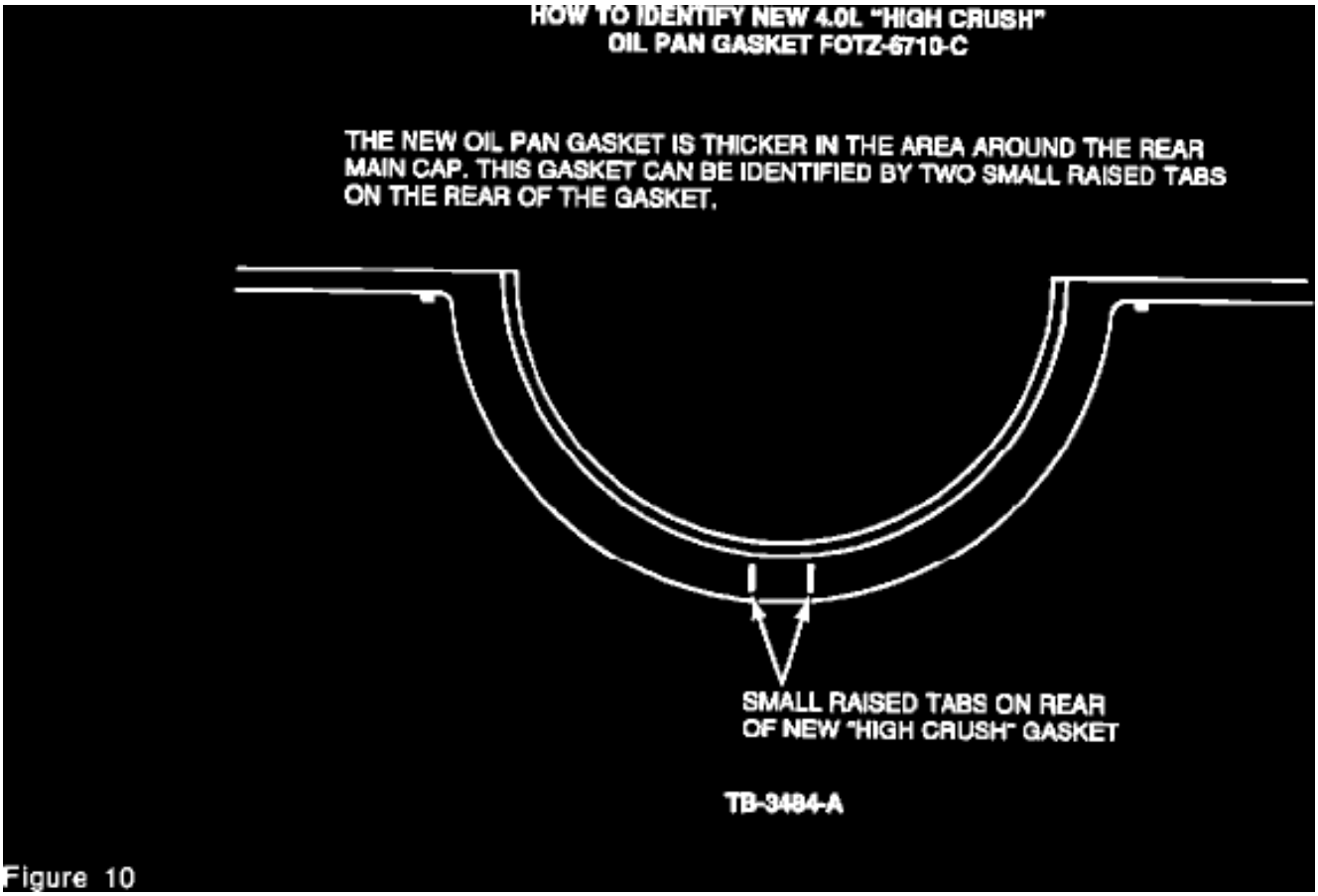


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

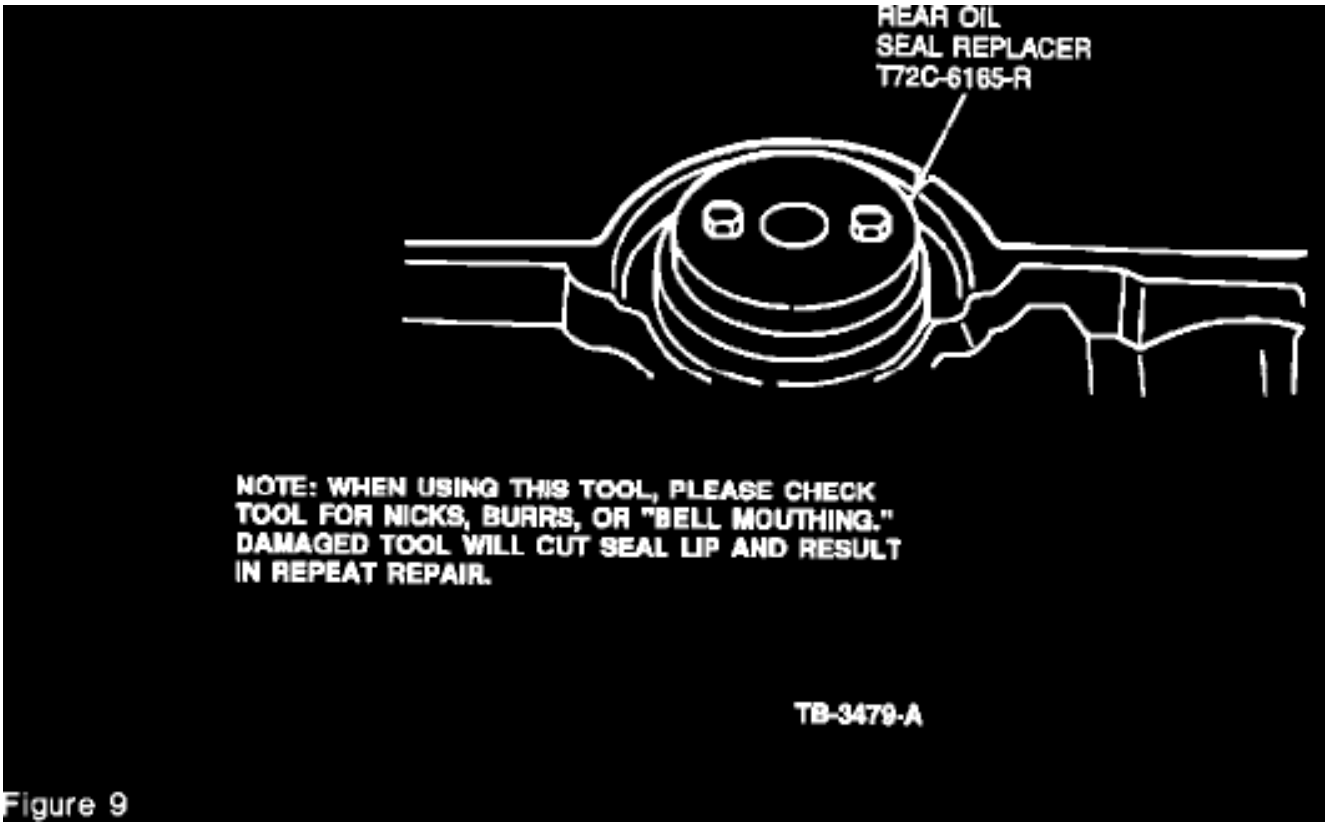


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

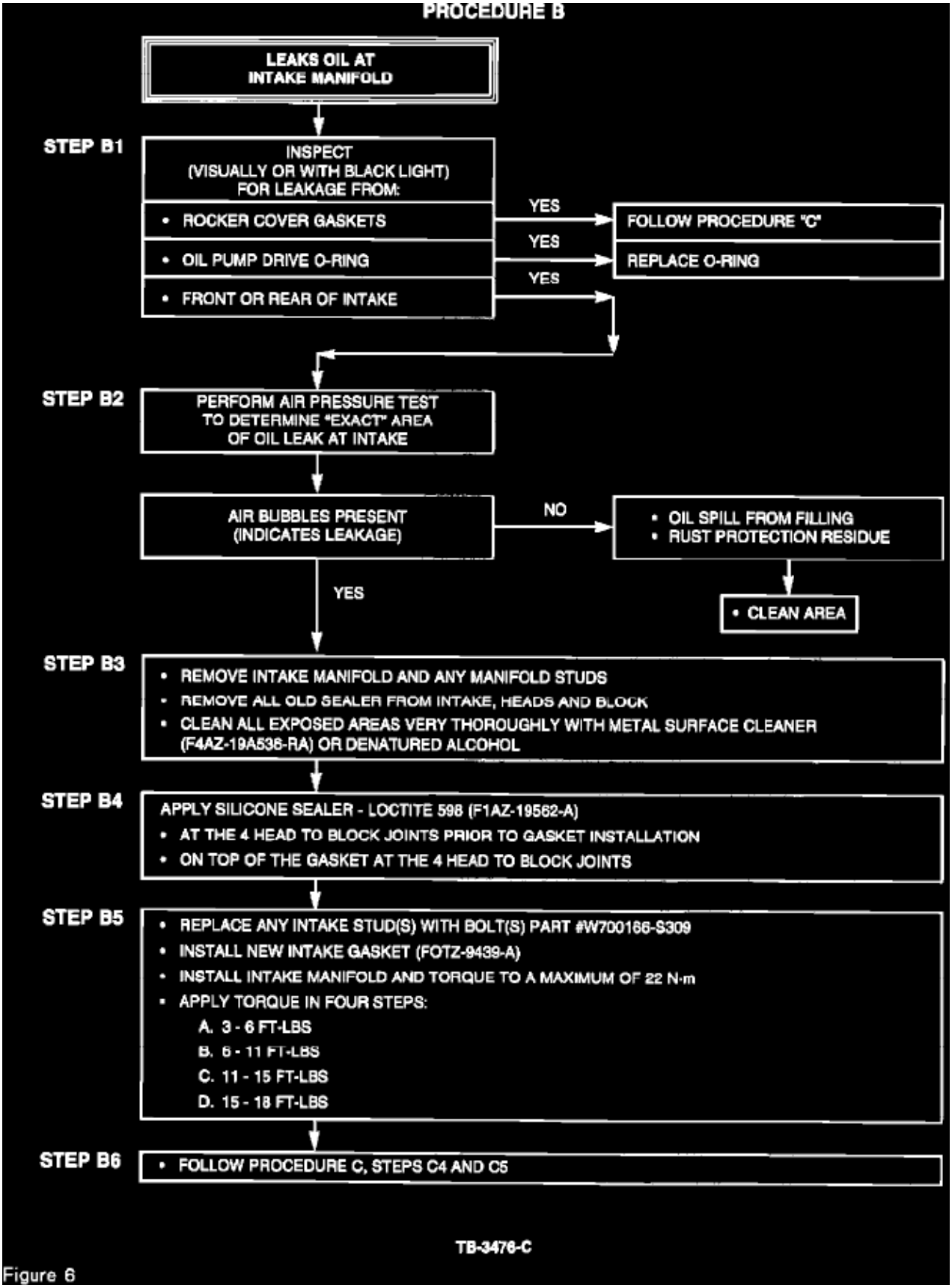


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

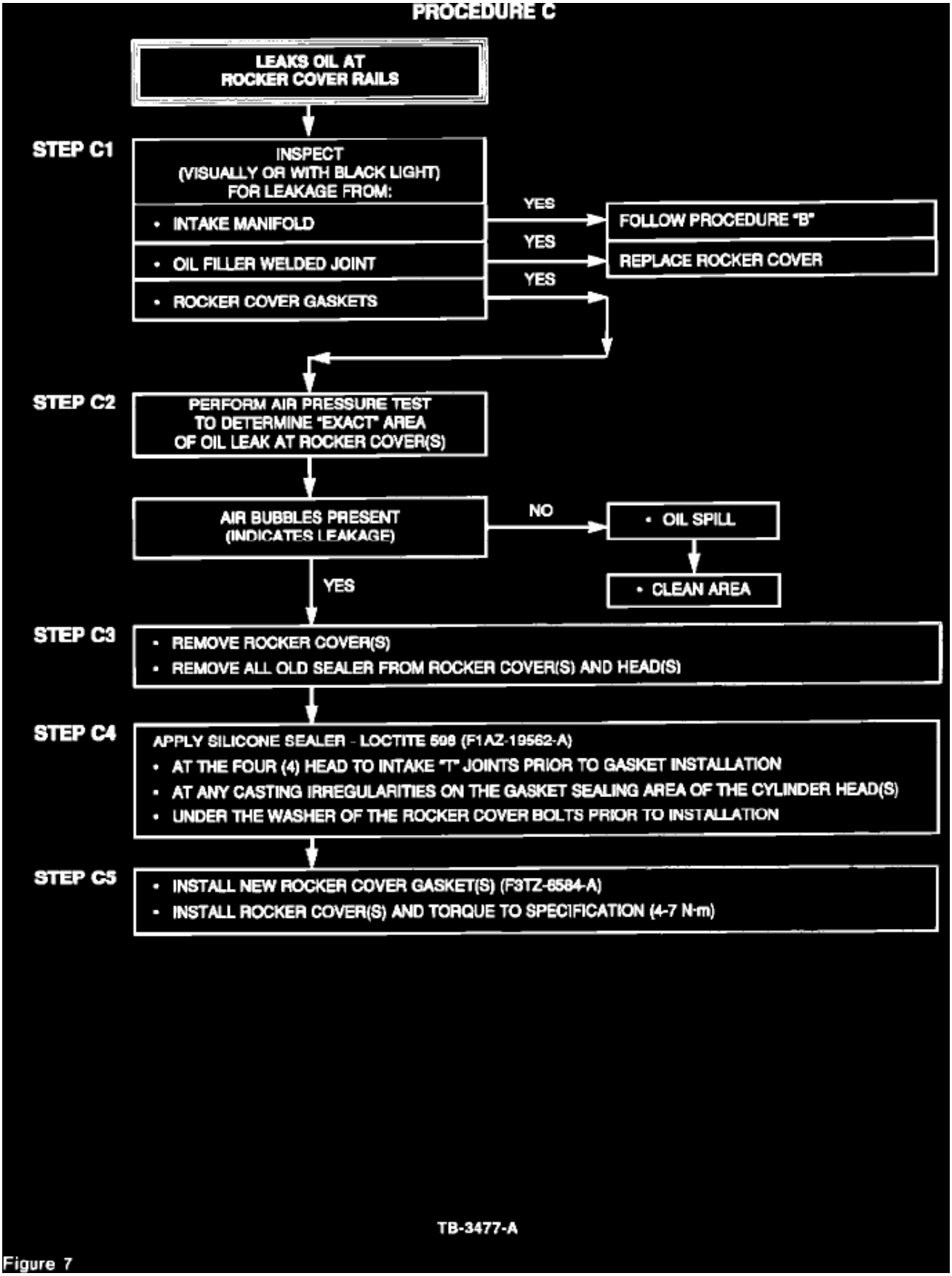


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

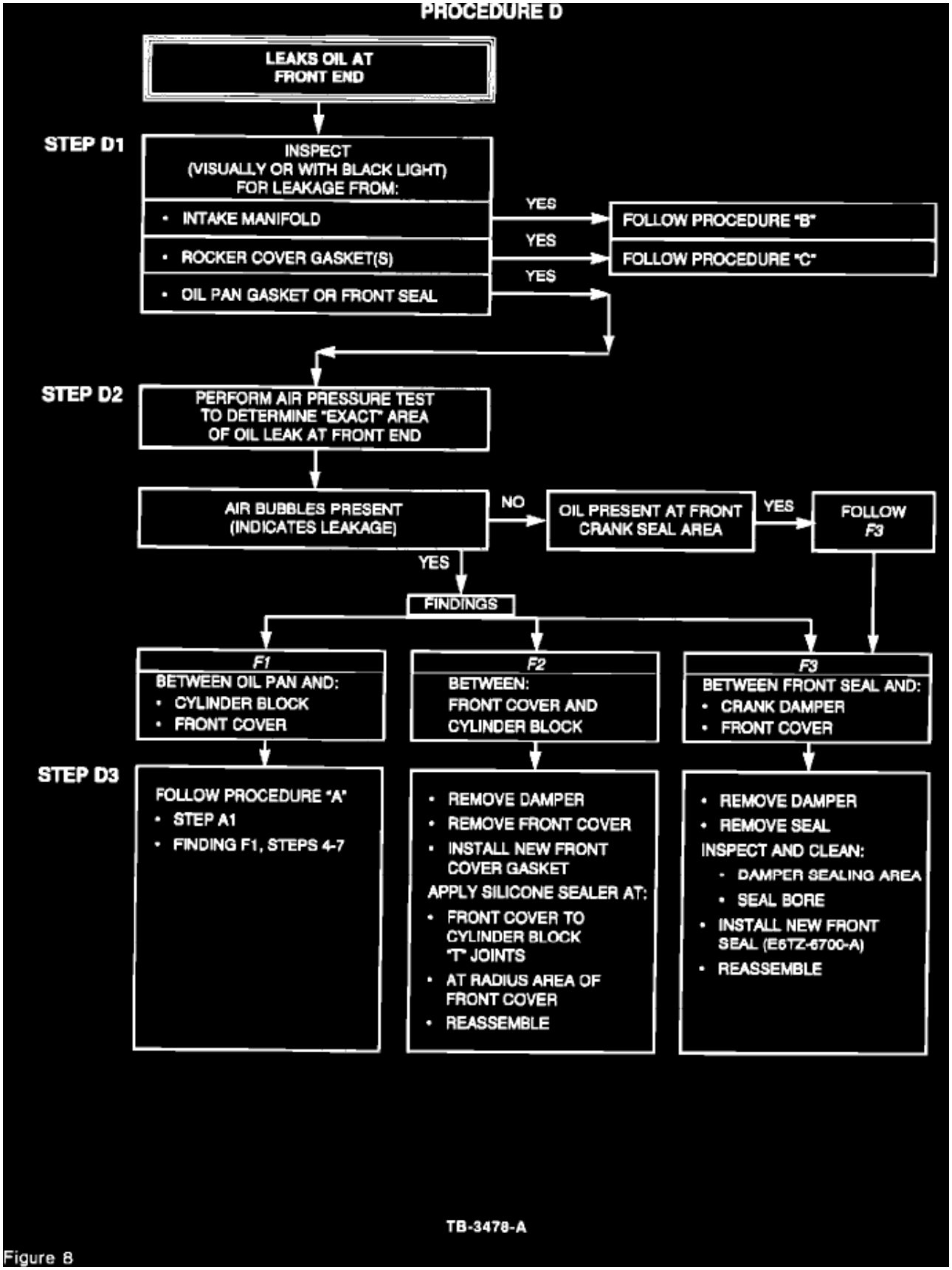


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Cylinder Head Assembly > Valve Cover > Valve Cover Gasket > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Valve Cover Gasket: > 915B28 > Mar > 91 > Rocker Cover Gasket - Installation Revision

Rocker Cover Gasket - Installation Revision

Article No. 91-5B-28

03/22/91

^ SHOP MANUAL - 1988 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1989 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1990 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1991 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

LIGHT TRUCK: 1988-91 AEROSTAR, RANGER 1990 BRONCO II 1991 EXPLORER

ISSUE: Service procedures for the installation of new rocker cover gasket and new conical spring washer screws have been revised in the following Shop Manuals on the pages indicated:

^ 1988 Ranger/Bronco II Pages 21-20-7 and 8

^ 1989 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01D-15

^ 1991 Explorer Supplement Page 03-01D-11

^ 1991 Aerostar/Explorer/Ranger Pages 03-01D-10 and 11

ACTION: Refer to the pages following this TSB article for the updated procedures.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

490000

REMOVAL AND INSTALLATION (Continued)

Valve Rocker Arm Cover and Rocker Arm

Removal

1. Remove spark plug wires using Spark Plug Wire Remover T74P-6666-A or equivalent.
2. Disconnect fuel supply and return lines using Spring Lock Coupling Disconnect Tool T81P-19623-G2, or equivalent and position out of way. Install white "Tell-Tale" rings in male connector to ensure positive indication of proper mating when re-assembling.

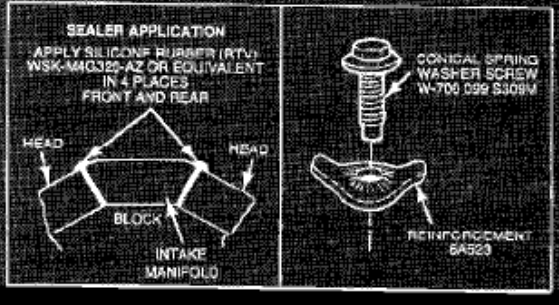
NOTE: Air conditioned vehicles only: Remove dipstick tube and bracket to access LH lifting eye. Remove LH lifting eye.

3. Remove PCV valve hose and breather.
4. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
5. With a light plastic hammer, tap rocker arm covers to break seal.
6. Remove rocker covers.
7. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly and oil baffle.

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



REMOVAL AND INSTALLATION (Continued)

8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W 700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

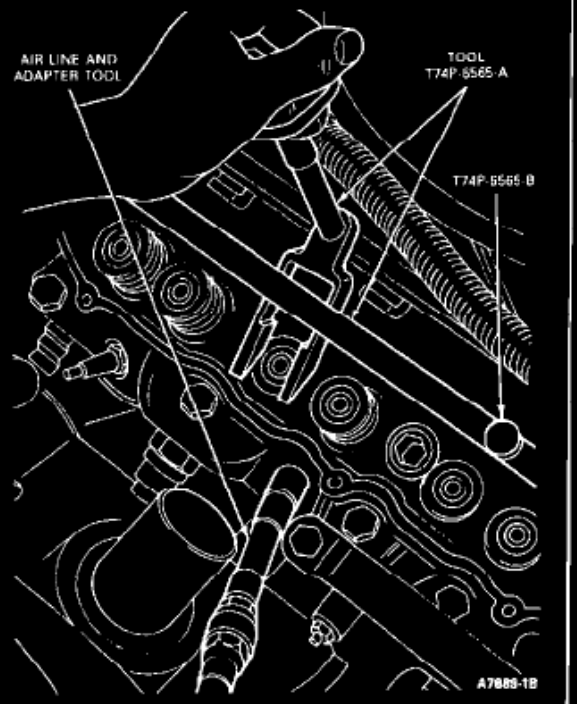
Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

Compressing Valve Spring-In Chassis—Typical

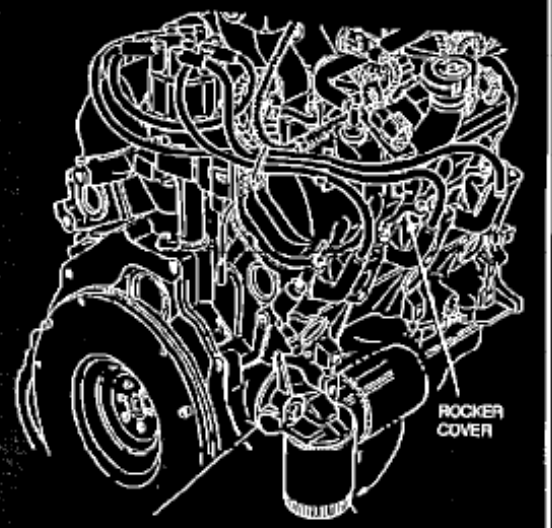


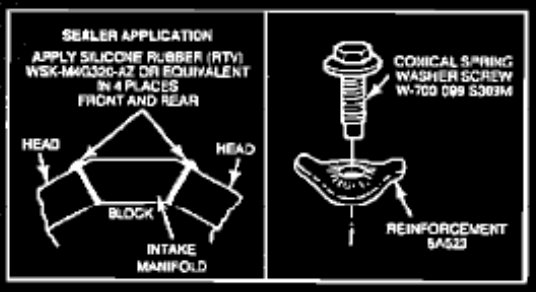
REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.





8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

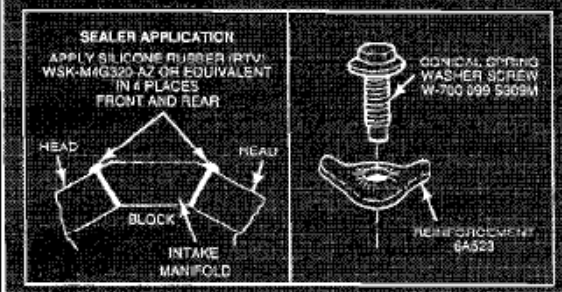
Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit), Part # W-700 099 S309M.
11. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Connect the fuel supply quick connect redundant clip over the fuel supply connection. Tighten the fuel return connection specification using care to avoid bending the fuel rail.
17. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

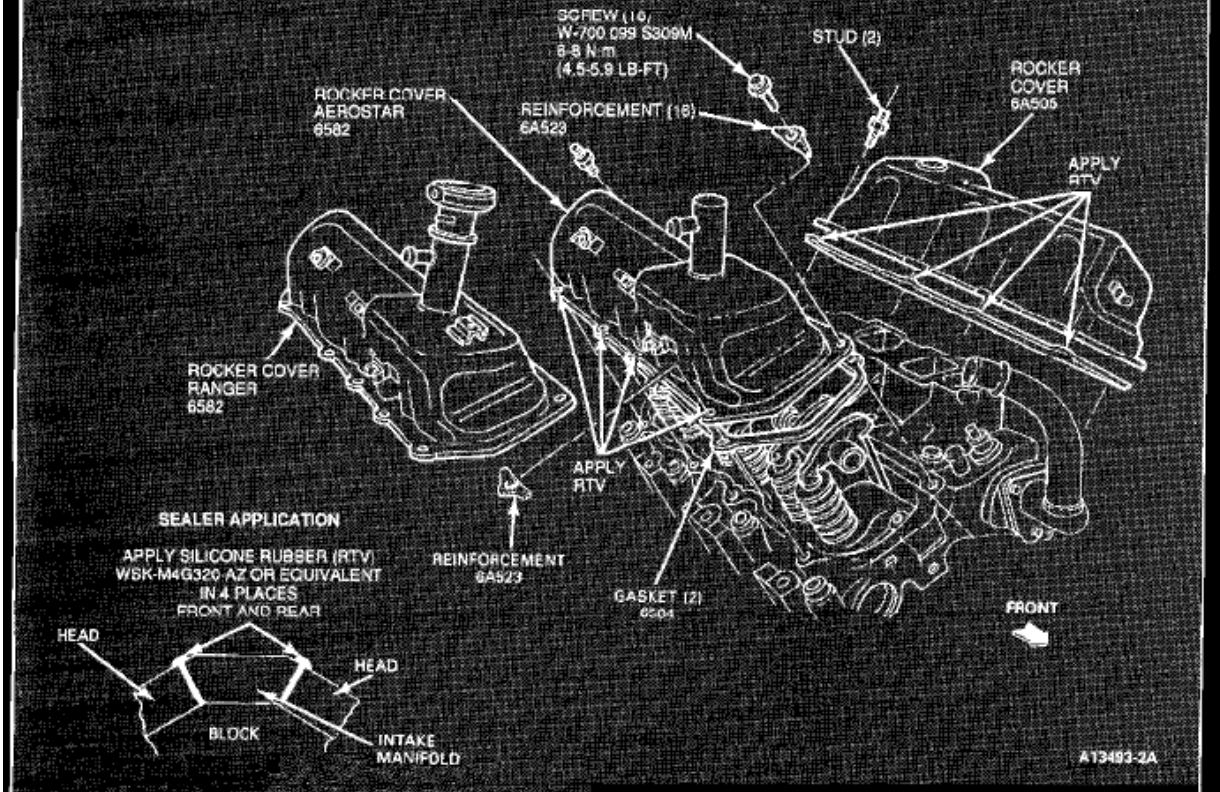
CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86L-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part #W-700 099 S309M.



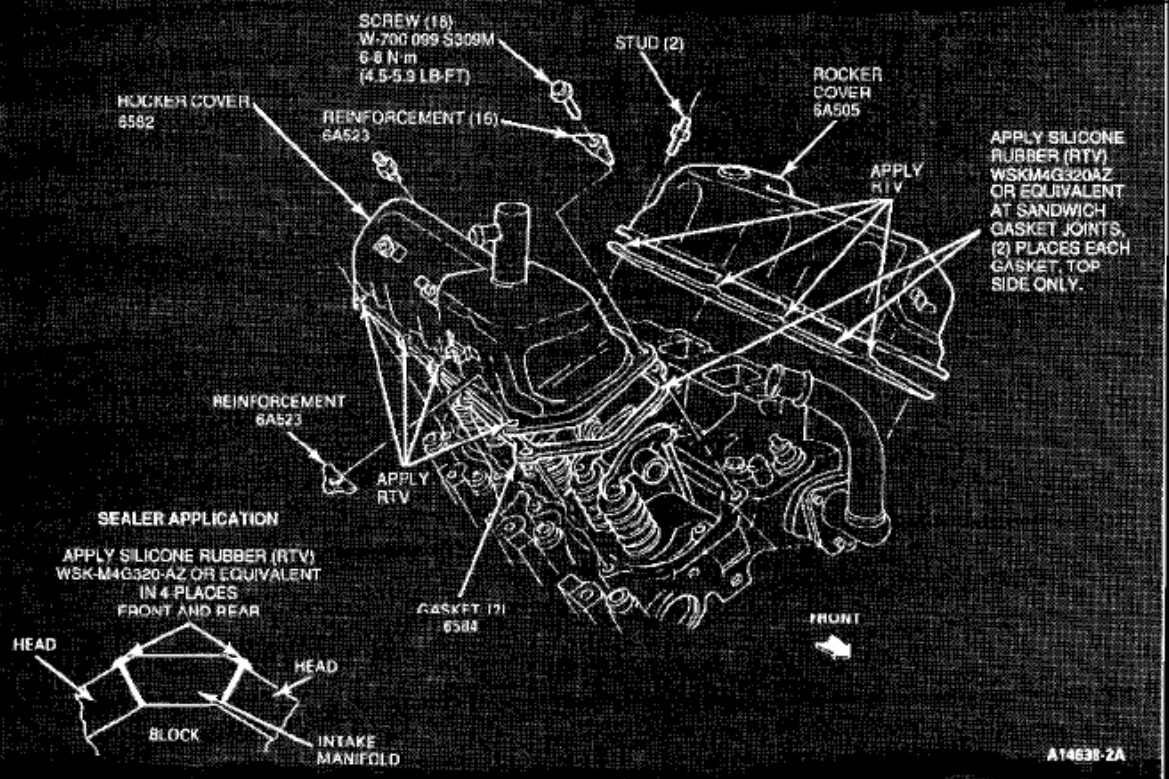
CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.

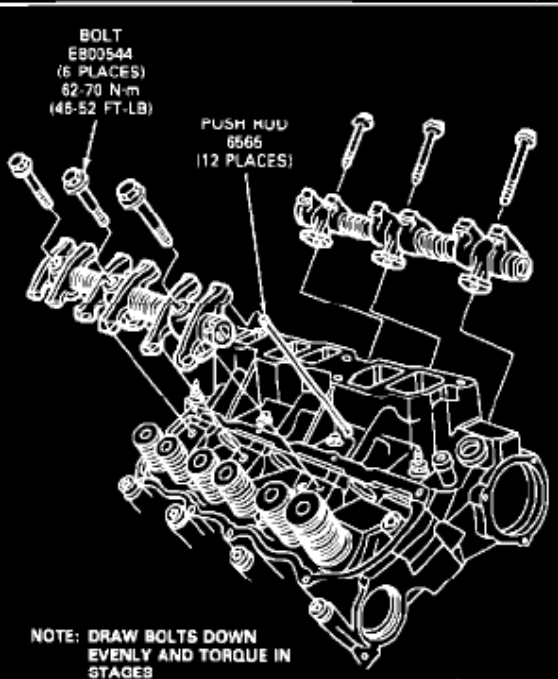


CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

IN VEHICLE SERVICE (Continued)

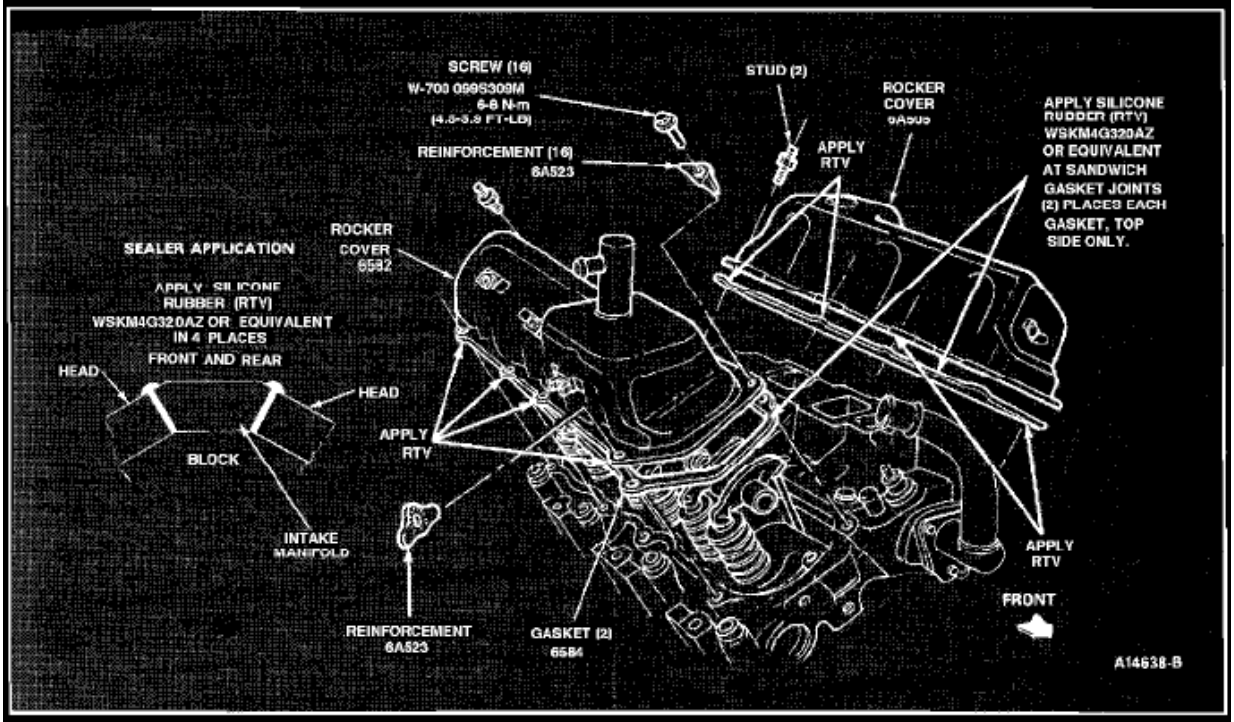
6. Remove the accessory drive belt from the alternator.
7. Remove the alternator from the engine.
8. Drain the cooling system.
9. Remove the upper radiator hose from the engine.
10. Remove the D.I.S. ignition coil and bracket assembly.
11. Remove the low pressure A/C hose bracket from the upper intake (if still installed).
12. Remove vacuum hose from the air cleaner.
13. Remove PCV valve hose and breather.
14. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
15. With a light plastic hammer, tap rocker arm covers to break seal.
16. Remove rocker covers.
17. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly.



Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
5. Peel the plastic film from the gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head / intake manifold.
6. Install rocker arm covers with new gaskets.

IN VEHICLE SERVICE (Continued)



CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700-099-S309M.
9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 ft. lb).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A / C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to Section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.

   CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

Rocker Cover Gasket - Installation Revision

Article No. 91-5B-28

03/22/91

^ SHOP MANUAL - 1988 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1989 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1990 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1991 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

LIGHT TRUCK: 1988-91 AEROSTAR, RANGER 1990 BRONCO II 1991 EXPLORER

ISSUE: Service procedures for the installation of new rocker cover gasket and new conical spring washer screws have been revised in the following Shop Manuals on the pages indicated:

^ 1988 Ranger/Bronco II Pages 21-20-7 and 8

^ 1989 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01D-15

^ 1991 Explorer Supplement Page 03-01D-11

^ 1991 Aerostar/Explorer/Ranger Pages 03-01D-10 and 11

ACTION: Refer to the pages following this TSB article for the updated procedures.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

490000

REMOVAL AND INSTALLATION (Continued)

Valve Rocker Arm Cover and Rocker Arm

Removal

1. Remove spark plug wires using Spark Plug Wire Remover T74P-6666-A or equivalent.
2. Disconnect fuel supply and return lines using Spring Lock Coupling Disconnect Tool T81P-19623-G2, or equivalent and position out of way. Install white "Tell-Tale" rings in male connector to ensure positive indication of proper mating when re-assembling.

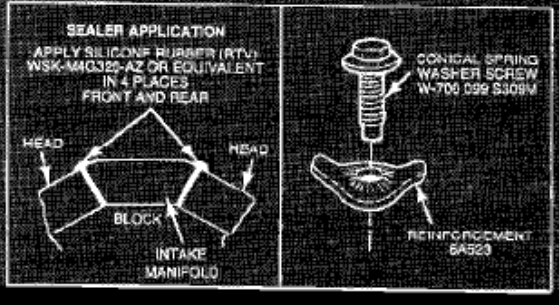
NOTE: Air conditioned vehicles only: Remove dipstick tube and bracket to access LH lifting eye. Remove LH lifting eye.

3. Remove PCV valve hose and breather.
4. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
5. With a light plastic hammer, tap rocker arm covers to break seal.
6. Remove rocker covers.
7. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly and oil baffle.

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



REMOVAL AND INSTALLATION (Continued)

8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W 700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

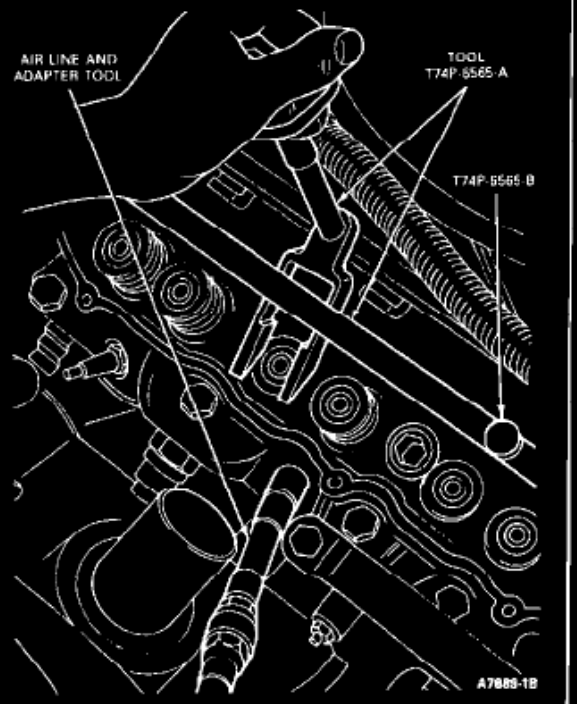
Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

Compressing Valve Spring-In Chassis—Typical

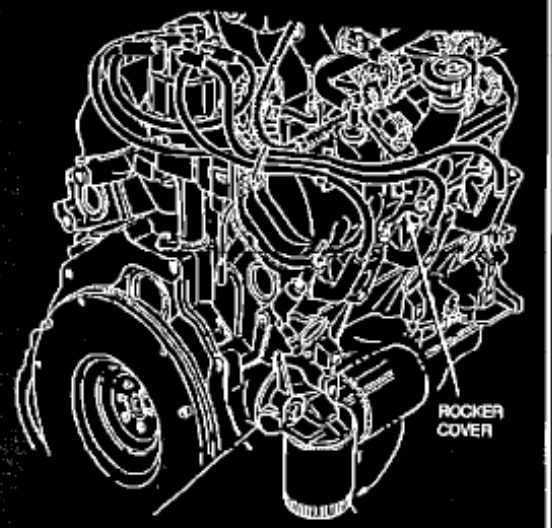


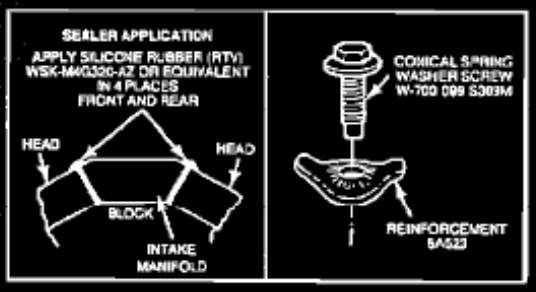
REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.





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REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
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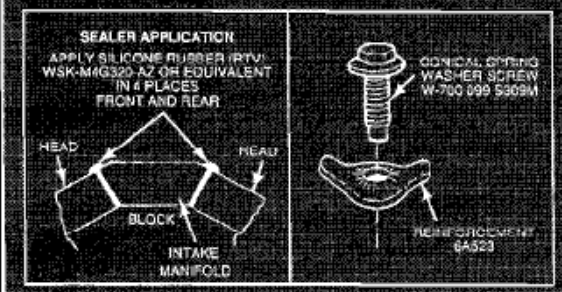
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



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12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Connect the fuel supply quick connect redundant clip over the fuel supply connection. Tighten the fuel return connection specification using care to avoid bending the fuel rail.
17. Start engine and check for oil and fuel leaks.

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Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

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3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

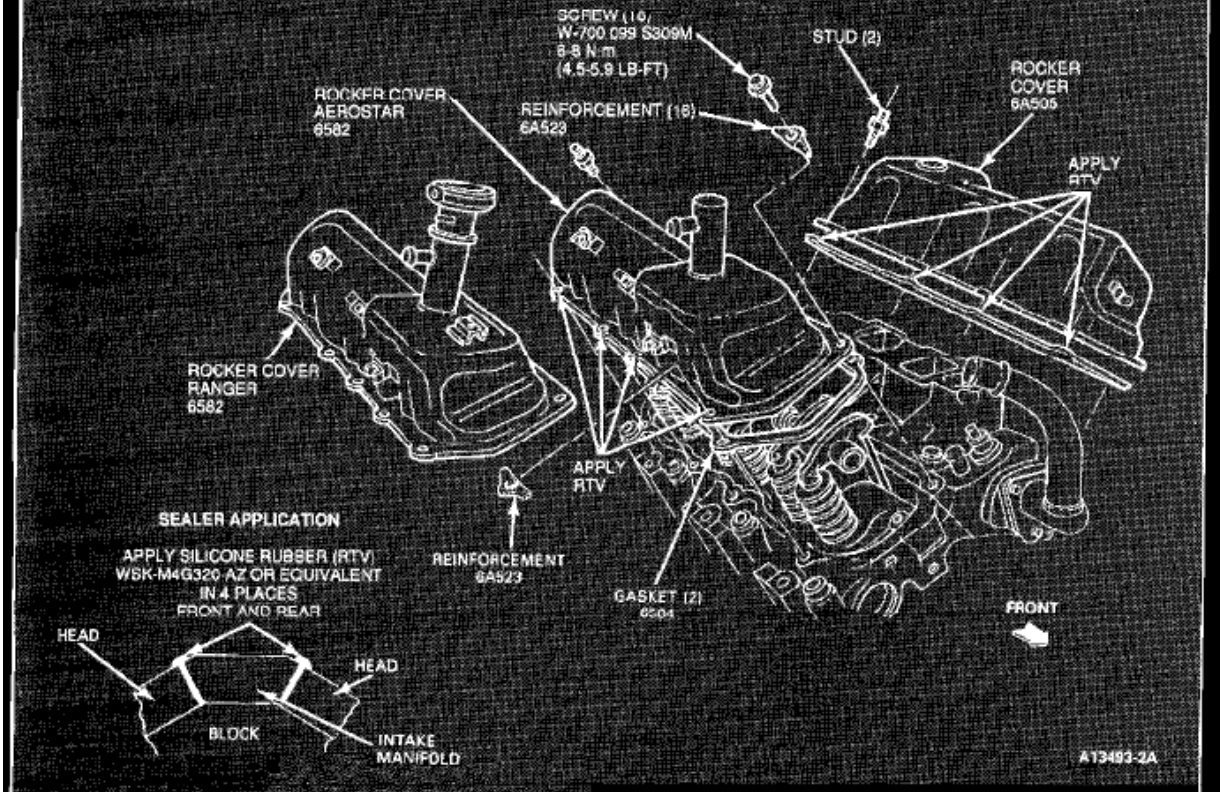
CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86L-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part #W-700 099 S309M.



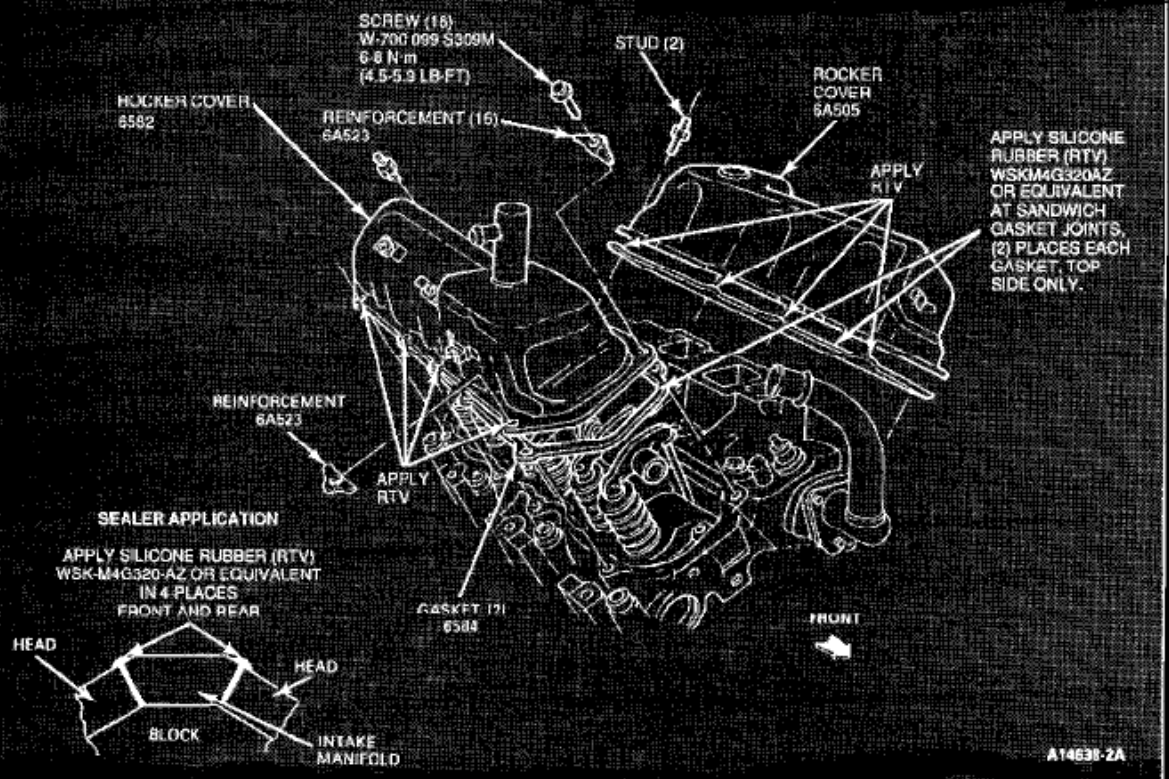
CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.



CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
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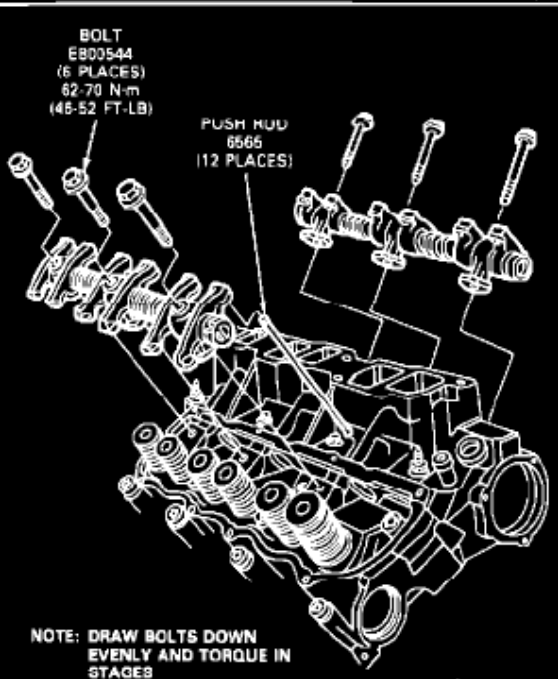
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

IN VEHICLE SERVICE (Continued)

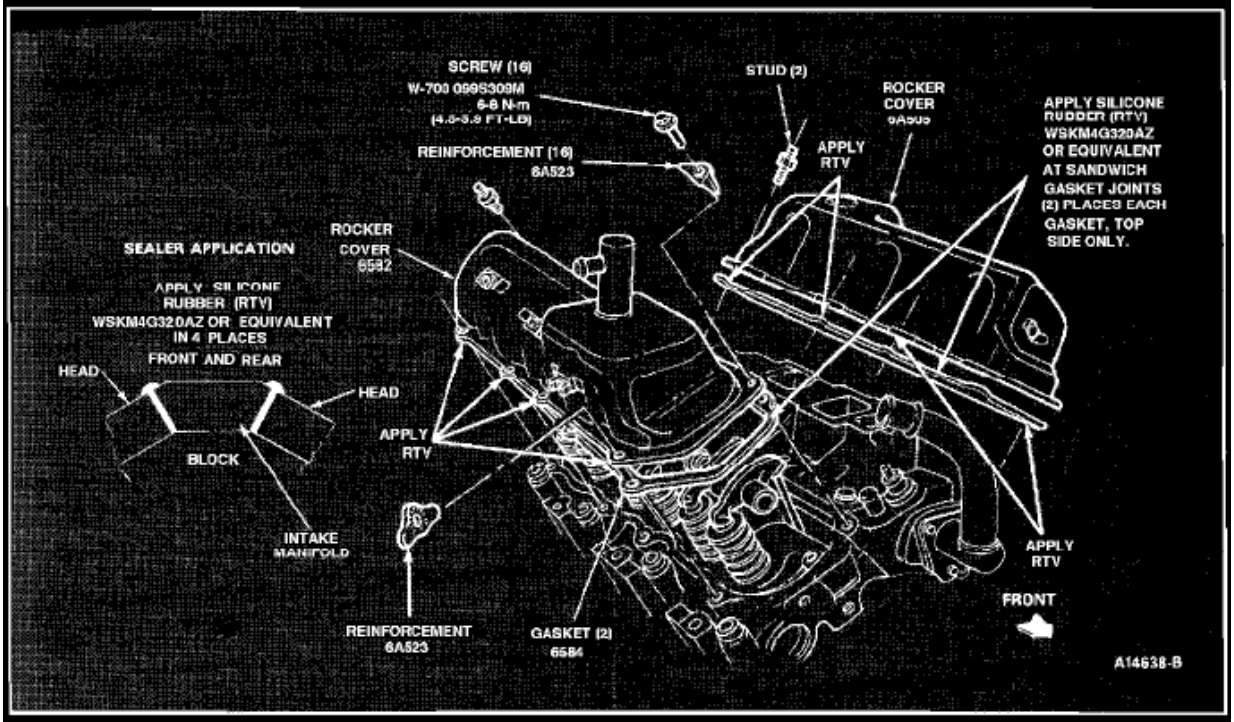
6. Remove the accessory drive belt from the alternator.
7. Remove the alternator from the engine.
8. Drain the cooling system.
9. Remove the upper radiator hose from the engine.
10. Remove the D.I.S. ignition coil and bracket assembly.
11. Remove the low pressure A/C hose bracket from the upper intake (if still installed).
12. Remove vacuum hose from the air cleaner.
13. Remove PCV valve hose and breather.
14. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
15. With a light plastic hammer, tap rocker arm covers to break seal.
16. Remove rocker covers.
17. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly.



Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
5. Peel the plastic film from the gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head / intake manifold.
6. Install rocker arm covers with new gaskets.

IN VEHICLE SERVICE (Continued)



CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700-099-S309M.
9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 ft. lb).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A / C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to Section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.

   CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

Valve Guide: Specifications

Valve Guide Bore Diameter 0.3174.0-0.3184

Valve Guide: Service and Repair

Valve guides consist of holes bored in the cylinder head. For service the guides can be reamed oversize to accommodate valves with oversize stems of .016, .030 and .032 inch.

Valve Seat: Specifications

Intake Valve Seat Width ..... 0.060-0.079 Exhaust Valve Seat Width ..... 0.060-0.079 Valve Seat Angle ..... 45° Valve Seat Runout Limit (T.I.R. Max) 0.0015

Valve Spring: Specifications

Valve Springs Compression Pressure

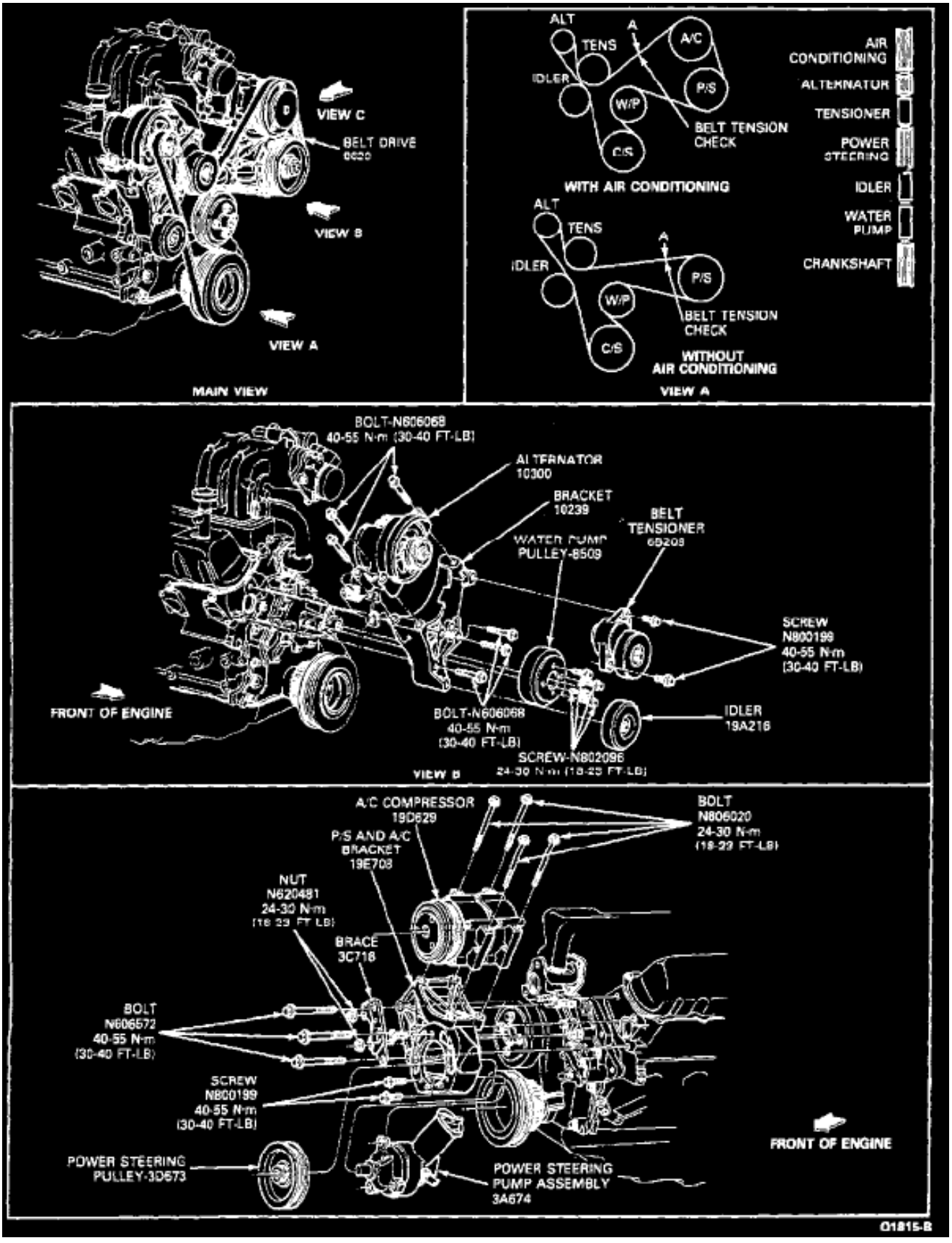
(lb. @ Spec. Length) .... 60.0-68.0 @ 1.585 (lb. @ Spec. Length) .... 138.0-149.O @ 1.222

Valve Spring Free Length (Approximate) .... 1.91 Valve Spring Assembled Height .... 1-37/64-1-39/64 Valve Spring Service Limit ..... 10% pressure loss @ specified length Valve Spring Out-Of-Square 5/64 (0.078)

Valve: Specifications

Intake Valve Stem-to-guide Clearance
.....
0.0008-0.0025 Exhaust Valve Stem-to-guide Clearance
.....
0.0018-0.0035 Service Clearance .....
..... 0.0055 Intake Valve Head Diameter ...
.....
43.5 mm (1.71 Inch) Exhaust Valve Head Diameter
.....
34.5 mm (1.36 Inch) Valve Face Runout Limit .....
..... 0.002 Max. Valve Face Angle .....
.....
..... 44° Intake Valve Stem Diameter (std.) .....
..... 0.3159-0.3167 Exhaust Valve Stem Diameter (std.)
.....
0.3149-0.3156 Intake Valve Stem Diameter (0.008 oversize)
.....
0.3239-0.3245 Exhaust Valve Stem Diameter (0.008 oversize)
.....
0.3228-0.3235 Intake Valve Stem Diameter (0.016 oversize.)
.....
0.3318-0.3324 Exhaust Valve Stem Diameter (0.016 oversize.)
.....
0.33O7-0.3314

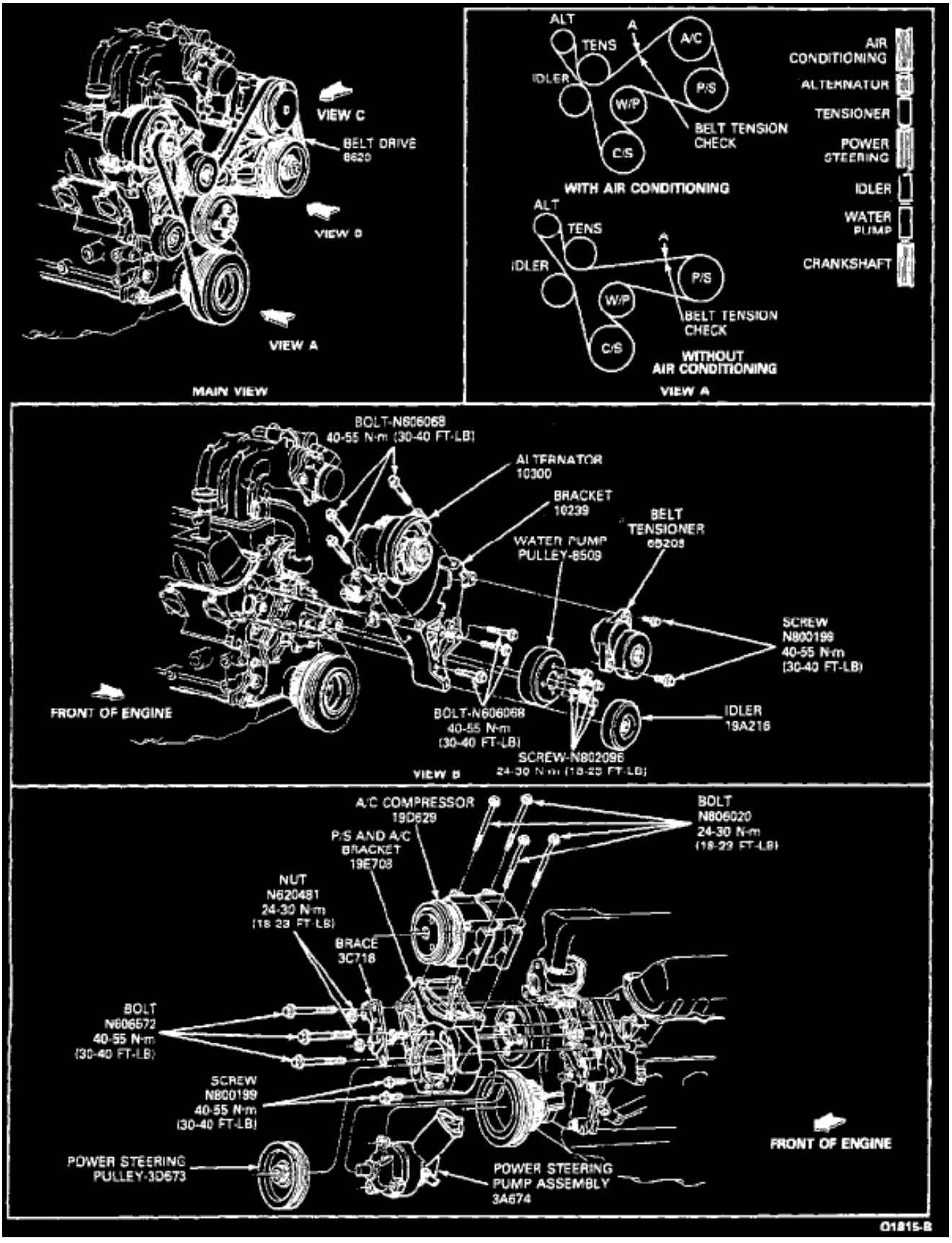
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Drive Belts, Mounts, Brackets and Accessories > Drive Belt > Component Information > Specifications



Drive Belt: Specifications

Drive Belt Routing

New Or Used Belt (Measured At "A") ..... 480-586 Newtons (108-132 lbs) Allowable Minimum .... 480 Newtons (108 lbs)


VIEW C
BELT DRIVE
8620
VIEW B
VIEW A
MAIN VIEW
ALT
TENS
IDLER
A
A/C
P/S
W/P
C/S
BELT TENSION CHECK
WITH AIR CONDITIONING
WITHOUT AIR CONDITIONING
AIR CONDITIONING
ALTERNATOR
TENSIONER
POWER STEERING
IDLER
WATER PUMP
CRANKSHAFT
VIEW A
BOLT-N606068
40-55 N·m (30-40 FT-LB)
ALTERNATOR
10300
BRACKET
10239
BELT TENSIONER
65203
WATER PUMP PULLEY-8509
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
FRONT OF ENGINE
BOLT-N606068
40-55 N·m
(30-40 FT-LB)
IDLER
19A216
SCREW-N802096
24-30 N·m (18-23 FT-LB)
VIEW B
A/C COMPRESSOR
19D629
P/S AND A/C BRACKET
19E708
BOLT
N806020
24-30 N·m
(18-23 FT-LB)
NUT
N620481
24-30 N·m
(18-23 FT-LB)
BRACE
3C718
BOLT
N606572
40-55 N·m
(30-40 FT-LB)
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
POWER STEERING PULLEY-3D673
POWER STEERING PUMP ASSEMBLY
3A674
FRONT OF ENGINE
O1815-B

Drive Belt Routing

Drive Belt: Adjustments

Drive belt adjustment is accomplished by repositioning one of the belt driven components (alternator, air pump, or power steering pump). For belt routing information, refer to Engine/Drive Belts, Mounts, Brackets and Accessories/Drive Belt/Specifications/Mechanical.

1. Verify all drive pulleys and mounting bolts are tight.

2. Using a Belt Tension Gauge (Tool T63L-8620-A or equivalent), check the tension of the drive belts.

3. If adjustment is necessary, loosen accessory adjustment bolts.

4. Tighten the pivot enough to remove all freeplay from pivot area but not enough to prevent the accessory from rotating to allow belt tensioning.

5. ALL BELTS EXCEPT ALTERNATOR BELT - Insert a square drive ratchet wrench or breaker bar into the square hole in accessory bracket. Tighten belt to correct tension. ALTERNATOR BELT - Place a "C" clamp over the end of the adjusting arm and the adjusting bolt boss, and tighten the belt to the correct tension. Refer to SPECIFICATIONS/MECHANICAL. NOTE: Be sure to use the "New Belt Tension" specifications for new drive belts, and the "Used Belt Tension" specifications for used belts. A used belt is a belt with more than 5 minutes of engine operation.

6. While maintaining belt tension, tighten adjustment bolt to specification. Refer to SPECIFICATIONS/MECHANICAL.

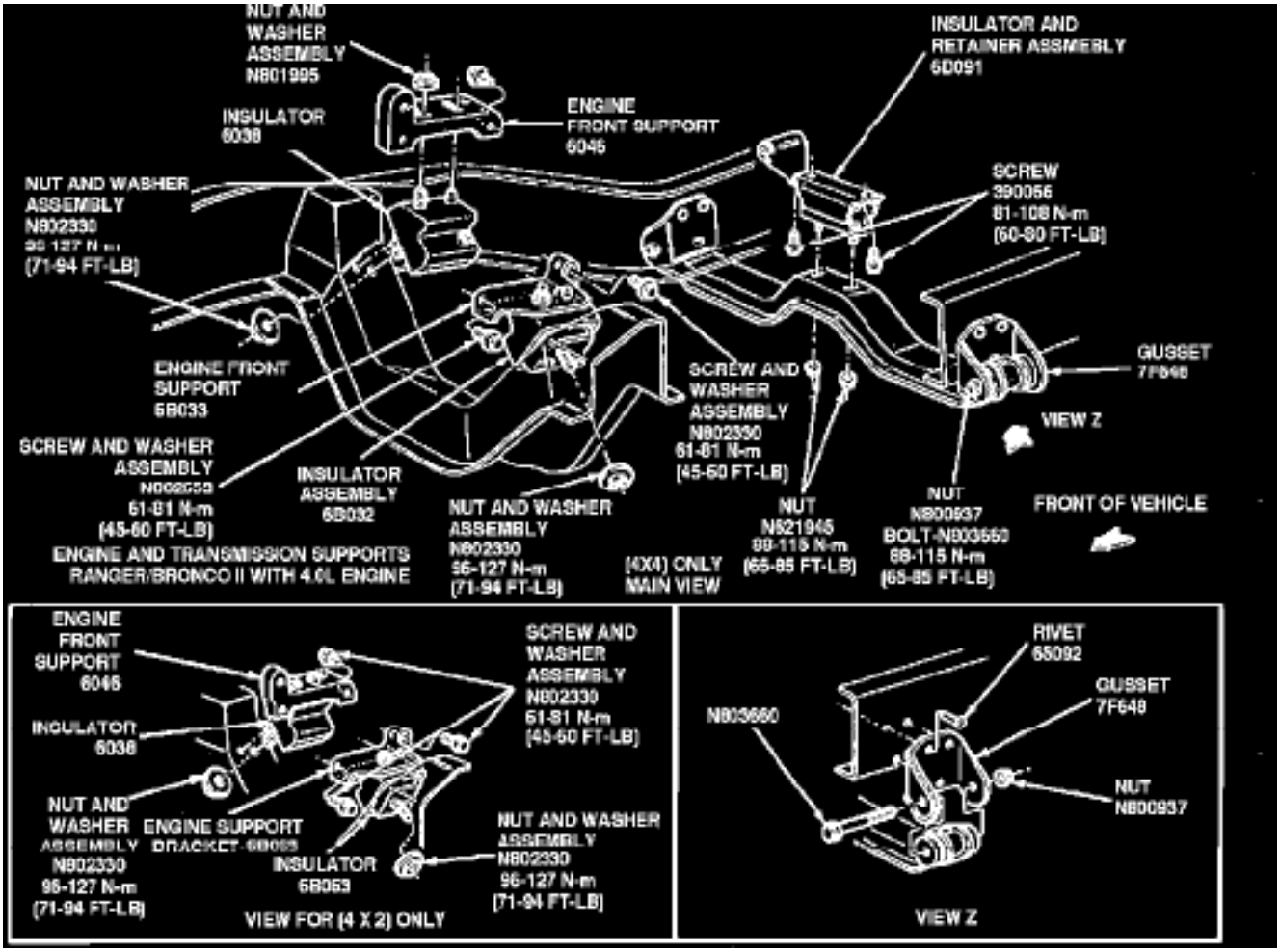
7. Remove square driver tool or "C" clamp.

8. Tighten pivot bolt to specification. Refer to SPECIFICATIONS/MECHANICAL.

9. Check belt tension(s) and readjust if necessary.

10. START the engine, idle for 5 minutes, then recheck belt tension(s). NOTE: If tension is less than the "Minimum Tension" after 5 minutes of operation, then reset the belt tension(s) to within "Used Belt Tension specifications. START engine, idle for 5 minutes, then recheck belt tension(s). Make adjustments if necessary.

CAUTION: If using a pry bar, DO NOT use any of the driven components (alternator, air pump, power steering pump, or a/c compressor) as a leverage point. Damage to the component housing may result.



Engine Mount: Service and Repair

Fig. 1 Engine Mounts

1. Remove fan shroud attaching screws, then support engine using a suitable jack and block of wood under oil pan.

2. Remove insulator to crossmember attaching nuts and washers, then raise engine until insulator stud clears crossmember.

3. Remove fuel pump shield to left side engine bracket attaching bolt, if necessary.

4. Remove mount to cylinder block attaching bolts and the mount, Fig. 1.

5. Reverse procedure to install.

Engine Oil Drain Plug: Specifications

Oil Drain Plug ..... 21-28 Nm (15-21 ft lb)

Engine Oil: Technical Service Bulletins Motor Oil - Viscosity Grade Recommendation

Article No. 99-8-16

05/03/99

MOTOR OIL - SAE VISCOSITY GRADE RECOMMENDATION - SERVICE TIP

FORD: 1989-1993 FESTIVA 1989-1994 TEMPO 1989-1997 PROBE, THUNDERBIRD 1989-1999 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS 1994-1997 ASPIRE 1995-1999 CONTOUR

LINCOLN-MERCURY: 1989-1992 MARK VII 1989-1994 TOPAZ 1989-1997 COUGAR 1989-1999 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1991-1994 CAPRI 1994-1998 MARK VIII 1995-1999 MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1989-1990 BRONCO II 1989-1996 BRONCO 1989-1997 AEROSTAR, F SUPER DUTY 1989-1999 ECONOLINE, F-150, F-250 LD, RANGER 1991-1999 EXPLORER 1993-1999 VILLAGER 1995-1999 WINDSTAR 1997-1999 EXPEDITION, MOUNTAINEER 1998-1999 NAVIGATOR 1999 SUPER DUTY F SERIES

ISSUE Ford Motor Company now recommends SAE 5W-30 viscosity grade for servicing any Ford gasoline-powered vehicle regardless of model year.

ACTION When servicing any Ford gasoline-powered vehicle, use SAE 5W-30 viscosity grade motor oil. Refer to the following text for further details.

Both SAE 10W-30 and SAE 5W-30 viscosity grade motor oils have been recommended in the past depending on vehicle model and model year.

Tests have proven SAE 5W-30 viscosity grade motor oil provides the optimum protection and benefits for Ford gasoline engines. At both high and low ambient temperature conditions, SAE 5W-30 provides the best overall protection. It allows faster starts under cold ambient temperatures.

SAE 5W-30 also provides approximately 1/2% increase in fuel economy over SAE 10W-30.

SAE 5W-30 viscosity grade motor oils certified for gasoline engines by the American Petroleum Institute (API) should be used for all service procedures requiring replacement of the motor oil.

PART NUMBER PART NAME

XO-5W30-QSP 5W-30 Motorcraft Super Premium Motor Oil

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 401000, 490000, 499000

1991 ENGINE OIL FILL CAPACITY CHART

VEHICLE	ENGINE	QUARTS	LITERS
Escort	1.9L	4.0	3.8
Mustang	2.3L	5.0	4.7
Tempo/Topaz	2.3L	5.0	4.7
Taurus/Sable	2.5L	5.0	4.7
Taurus/Sable	3.0L	4.5	4.25
Taurus/Sable	3.0L (SHO)	5.0	4.7
Taurus/Sable	3.8L	4.5	4.25
T'Bird/Cougar	3.8L	5.0	4.7
Thunderbird	3.8L (SC)	5.0	4.7
Continental	3.8L	4.5	4.25
Town Car	4.6L	5.0	4.7
Mustang	5.0L	5.0	4.7
Mark VII	5.0L	5.0	4.7
T'Bird/Cougar	5.0L	5.0	4.7
Ranger	2.3L	5.0	4.7
Ranger	2.9L	5.0	4.7
Ranger	3.0L	4.5	4.25
Ranger	4.0L	5.0	4.7
Explorer	4.0L	5.0	4.7
Aerostar	3.0L	4.5	4.25
Aerostar	4.0L	5.0	4.7
E, F, B Series	4.9L	6.0	5.6
E, F, B Series	5.0L	6.0	5.6
E, F, B Series	5.8L	6.0	5.6
F, B Series	7.0L	6.0	7.6
E, F Series	7.3L	10.0	9.5
E, F, B Series	7.5L	6.0	5.6

Engine Oil: Technical Service Bulletins Engine - Oil Fill Capacities

Article No. 90-22-12 ENGINE OIL FILL CAPACITIES - 1.9L, 2.3L, 2.9L, 3.0L, 3.8L, 4.0L, 4.6L, 4.9L, 5.0L, 5.8L, 7.0L, 7.3L DIESEL, 7.5L - WITH OIL FILTER CHANGE FORD:

1991 ESCORT, MUSTANG, PROBE, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991 CONTINENTAL, COUGAR, MARK VII, SABLE, TOPAZ, TOWN CAR,

TRACER

LIGHT TRUCK: 1991 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F SUPER DUTY, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 F & B SERIES

ISSUE: Engine oil fill capacities (with oil filter change) are available for 1991 Model Year Cars and Trucks.

ACTION: If service is required, refer to the following 1991 Engine Oil Fill Capacity Chart for oil fill capacity with oil filter change.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

401000, 499000

Engine Oil: Capacity Specifications

Engine oil with filter (approximate) ..... 5.0 Qts.(4.7L)

with oil cooler, add ..... 0.5 Qts.(0.47L)

Engine Oil: Fluid Type Specifications

Motorcraft Motor Oil 5W30 Super Premium
..... ESE-M2C153-E and API SG Motorcraft Motor Oil 10W30 Super Premium
..... ESE-M2C153-E and API SG

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

Oil Level Warning Indicator: Description and Operation

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

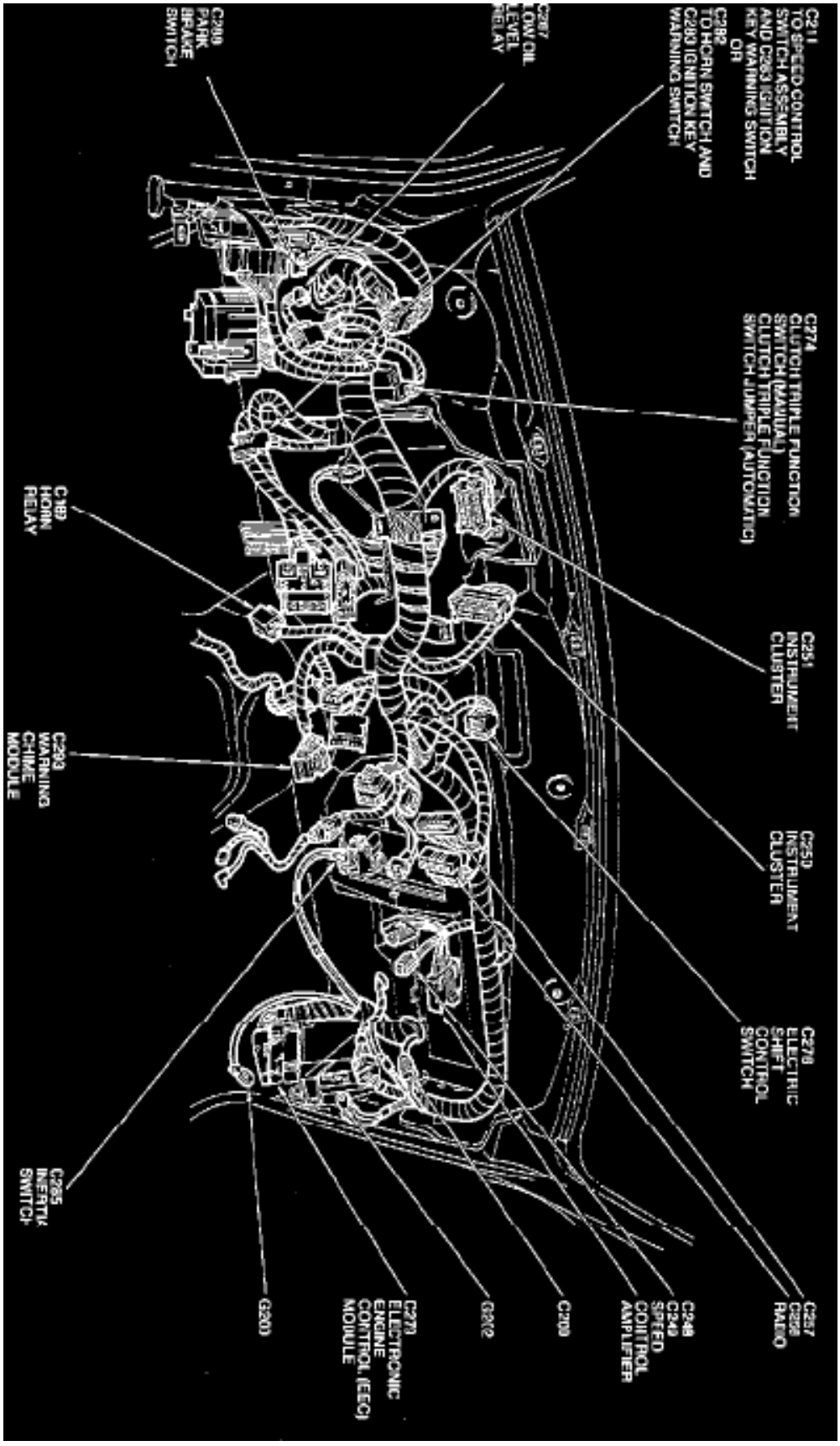
Oil Level Warning Indicator: Testing and Inspection

With oil level at FULL mark on oil dipstick and engine oil warm to assure that oil drains properly from oil sensor, turn ignition on and start engine. Warning lamp should come on briefly in Start for bulb test, then go out. Turn engine off. Drain 2 quarts of oil from engine. Wait approximately 5 minutes, then restart engine. Warning lamp should come on and stay on. If warning lamp does not come on check fuse, low oil level relay, low oil level sensor and lamp.

Oil Level Sensor: Specifications

Low Oil Level Sensor ..... 17-21 Nm (13-20 ft lb)

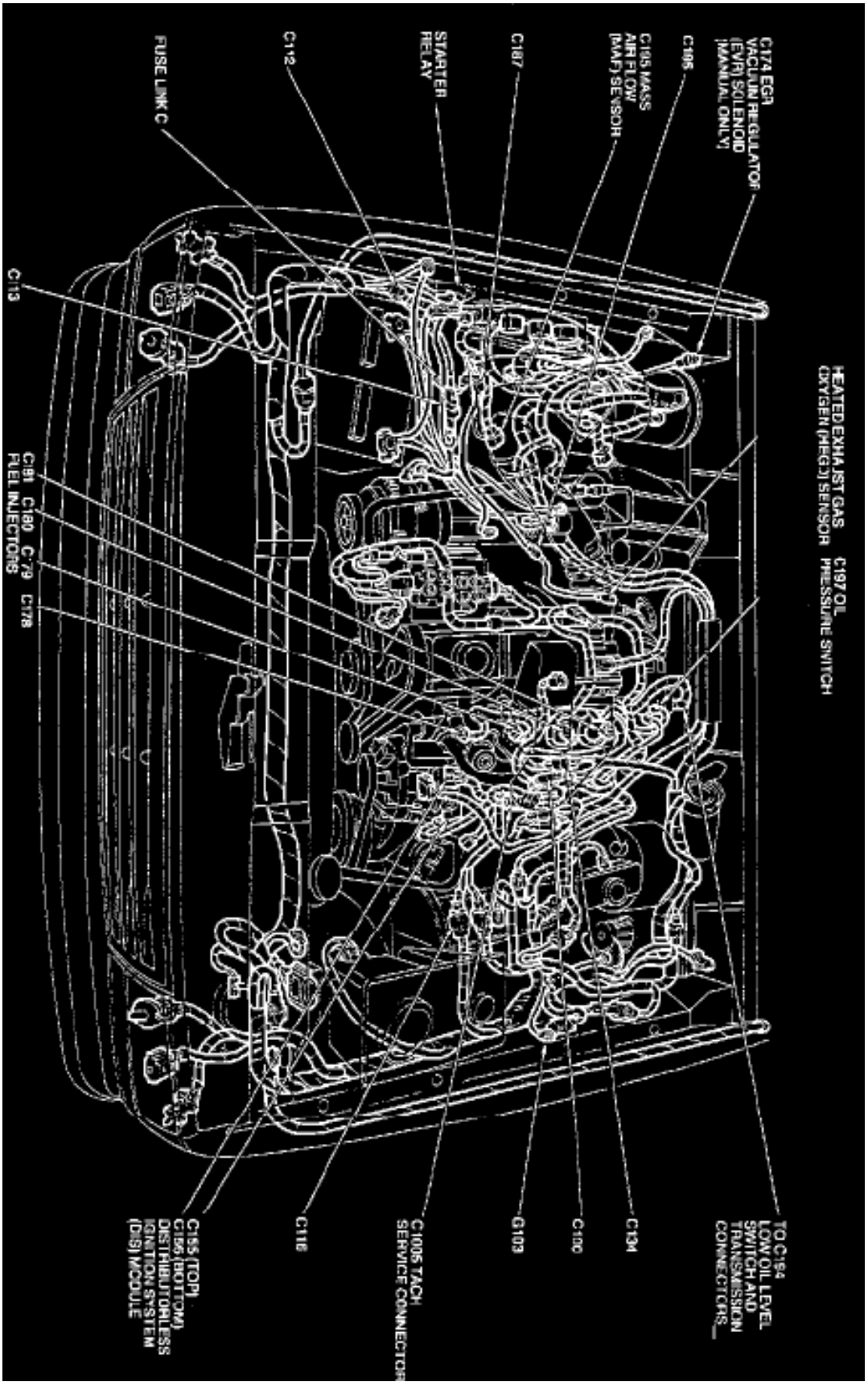
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Engine Lubrication > Oil Level Sensor > Component Information > Locations > Low Oil Level Relay



Oil Level Sensor: Locations Low Oil Level Relay

I/P Components

Behind Lower RH Side Of I/P, On Bracket


C174 EGR VACUUM REGULATOR (EVR) SOLENOID (MANUAL ONLY)
C105
C195 MASS AIR FLOW (MAF) SENSOR
C187
STARTER RELAY
C112
FUSE LINK C
C13
C181 C180 C179 C178 FUEL INJECTORS
HEATED EXHAUST GAS OXYGEN (HEGO) SENSOR
C197 OIL PRESSURE SWITCH
TO C194 LOW OIL LEVEL SWITCH AND TRANSMISSION CONNECTORS
C134
C100
G103
C1005 TACH SERVICE CONNECTOR
C116
C155 (TOP) C156 (BOTTOM) DISTRIBUTORLESS IGNITION SYSTEM (DIS) MODULE

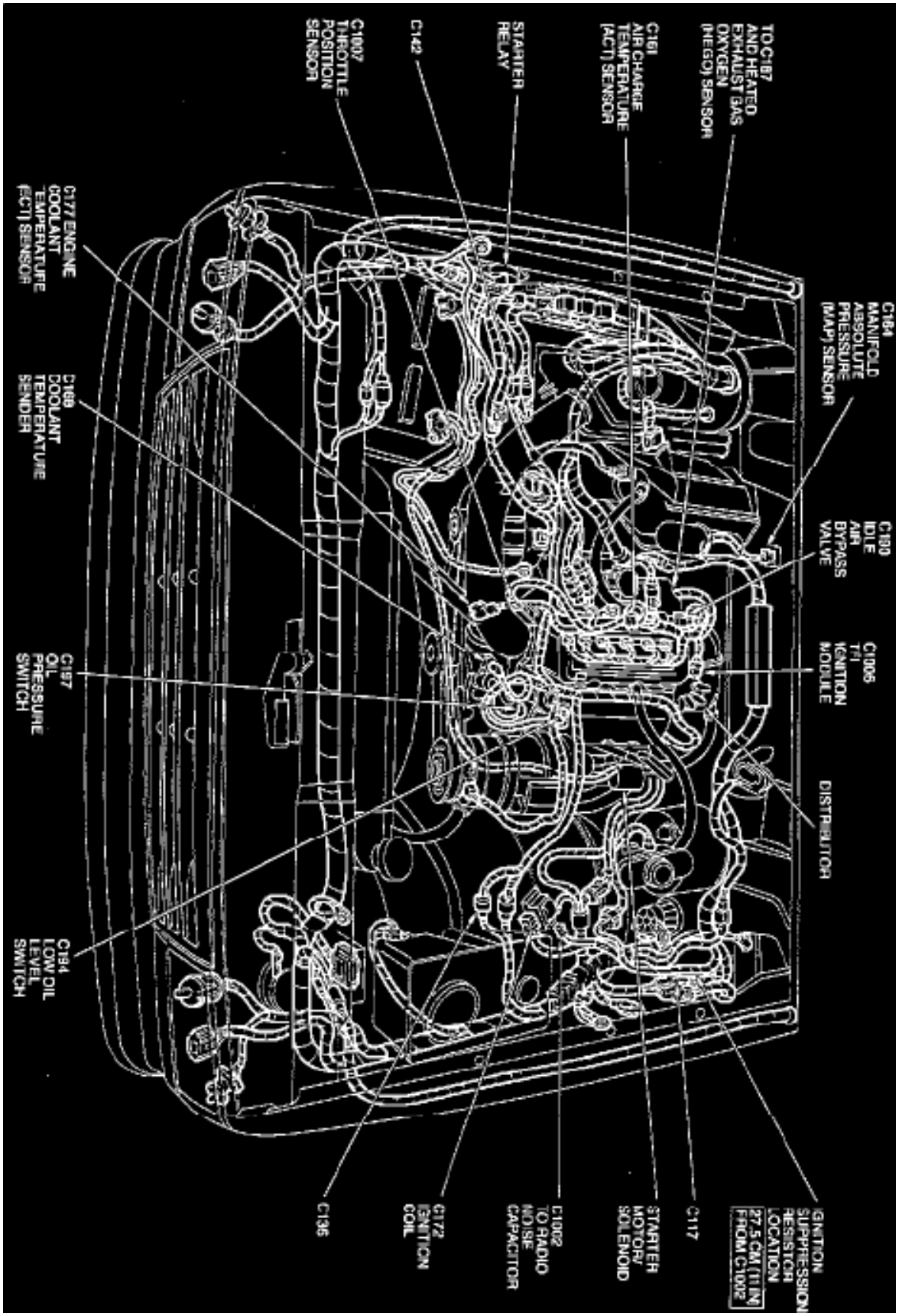
Oil Level Sensor: Locations Low Oil Level Switch (2.3L/4-140)

Engine Compartment Components.

Lower LH Rear Of Engine, Below Oil Filter

Applicable to: 2.3L/4-140

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Engine Lubrication > Oil Level Sensor > Component Information > Locations > Low Oil Level Relay > Page 1518

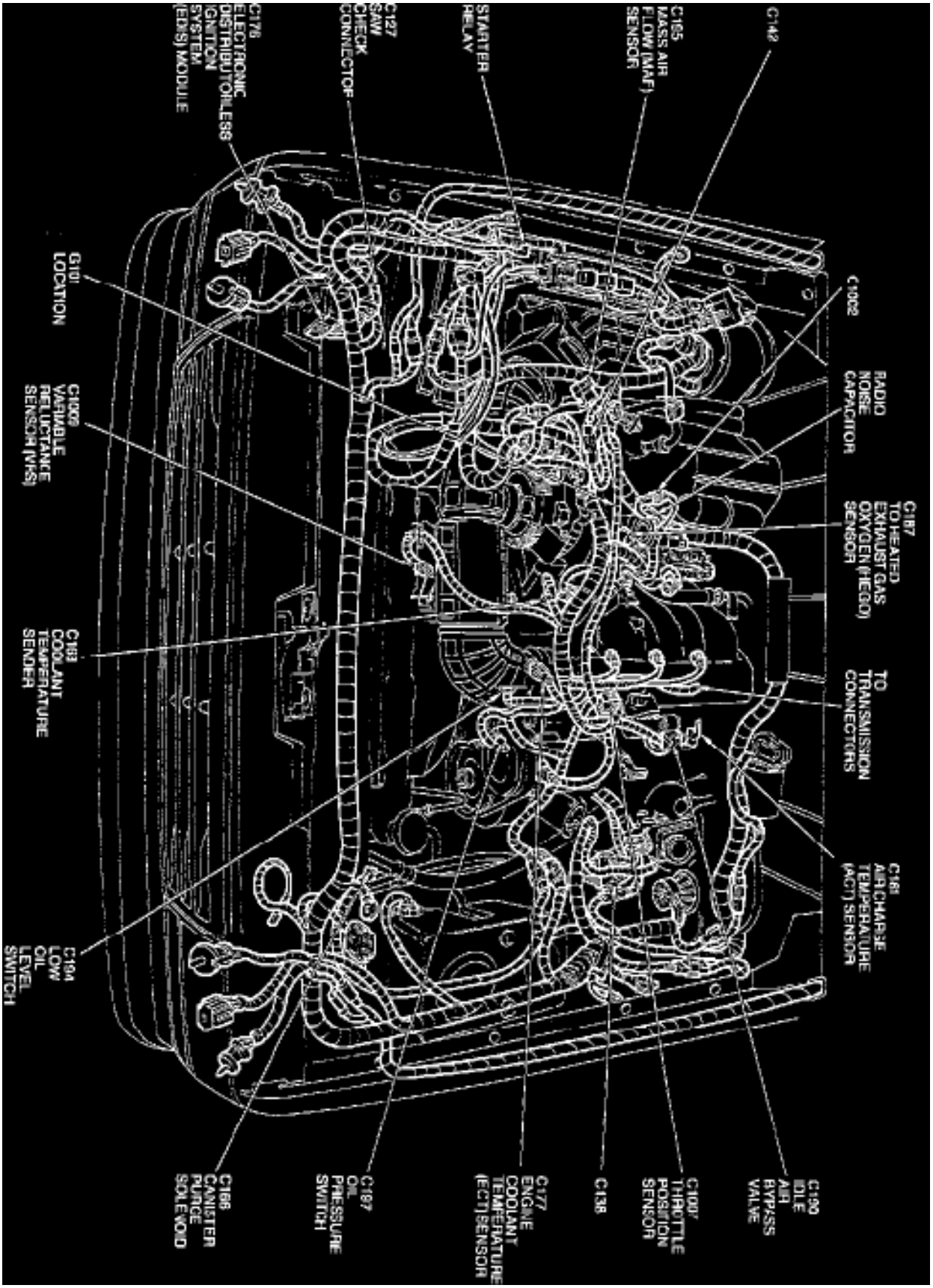


Oil Level Sensor: Locations Low Oil Level Switch (2.9L/V6-179 & 4.0L/V6-244)

Engine Compartment Components.

Lower LH Rear Of Engine

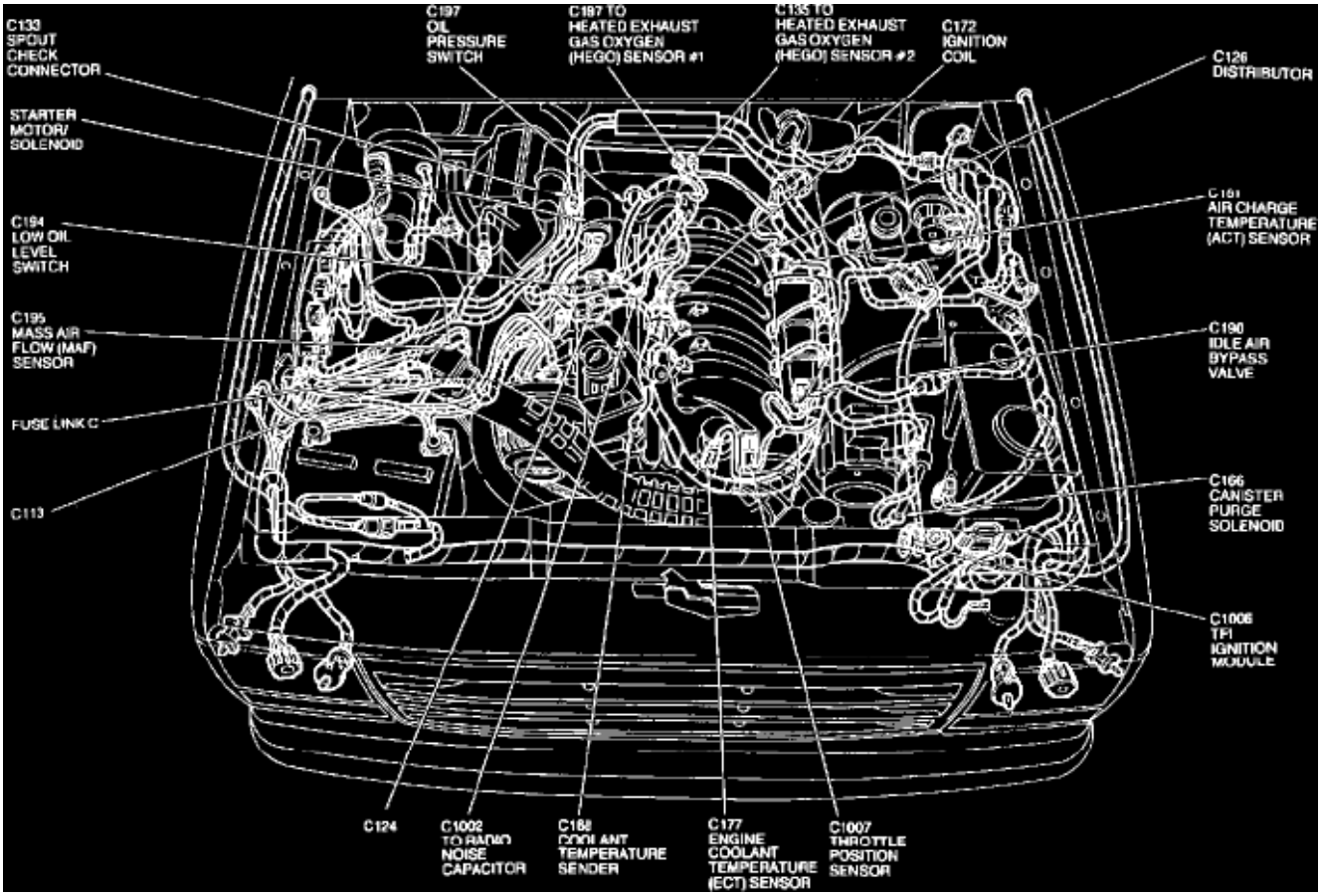
Applicable to: 2.9L/V6-179


C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C163
COOLANT
TEMPERATURE
SENDER
C190A
LOW
OIL
LEVEL
SWITCH
C166
CANISTER
PURGE
SOLENOID
C187
OIL
PRESSURE
SWITCH
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C138
C100
THROTTLE
POSITION
SENSOR
C190
IDLE
AIR
BYPASS
VALVE

Engine Compartment Components.

Lower LH Rear Of Engine

Applicable to: 4.0L/V6-244



Oil Level Sensor: Locations Low Oil Level Switch (3.0L/V6-181)

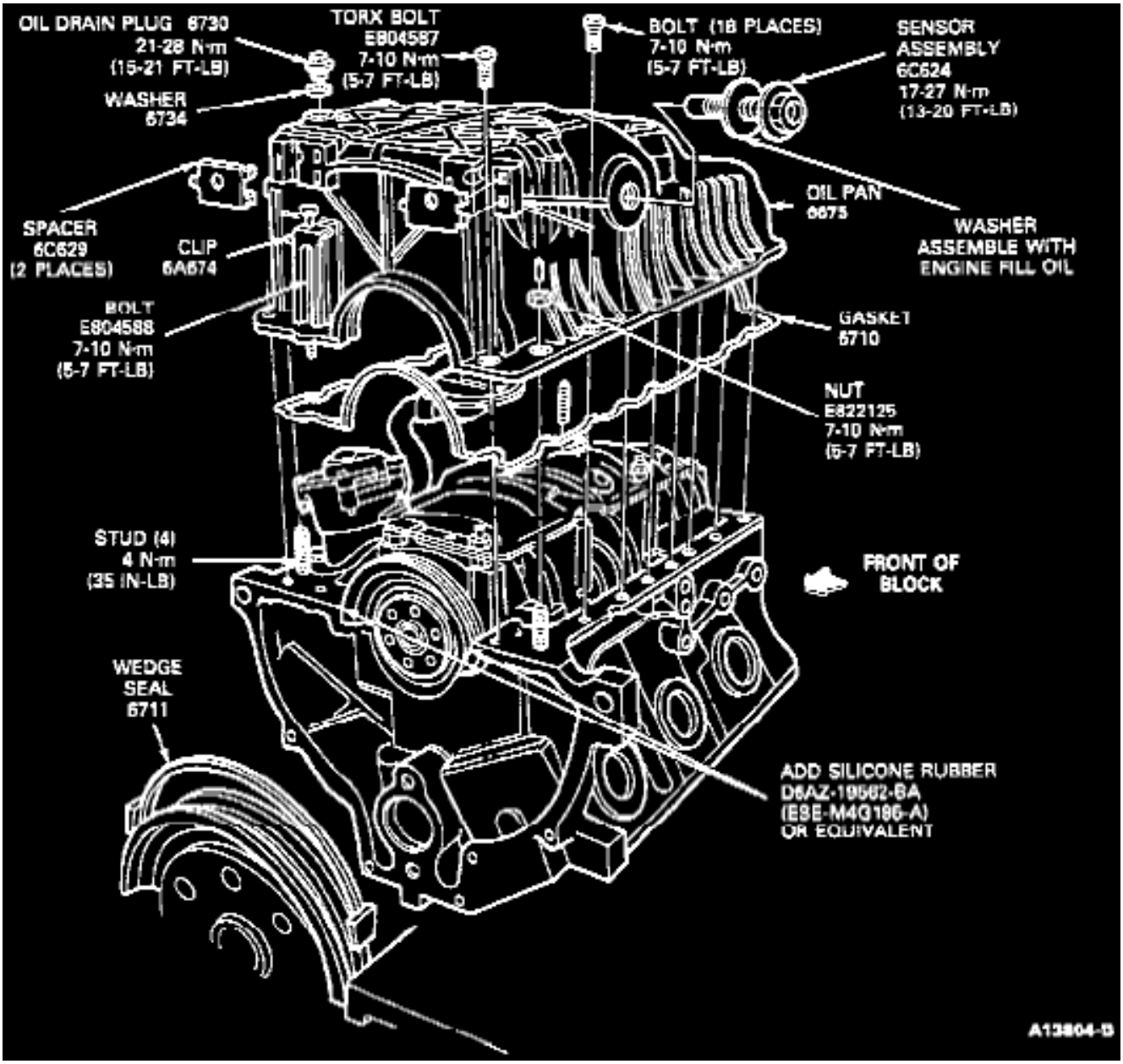
Engine Compartment Components.

Lower RH Side Of Engine

Applicable to: 3.0L/V6-181

Oil Pan: Specifications

Oil Pan Nuts and Bolts .... 7-10 Nm (7-10 ft lb) Oil Pan To Transmission Bolts ..... 38-51 Nm (28-38 ft lb)



Oil Pan: Service and Repair

*** THIS ARTICLE REFLECTS CHANGES MADE BY TSB 9518 DATED JANUARY 16, 1995

REMOVAL

1. Remove the engine assembly from the vehicle. 2. Mount the engine on a suitable engine stand with the oil pan facing up. 3. Remove the oil pan retaining bolts and remove the oil pan. 4. Remove the oil pan gasket, oil pump, oil baffle, rear main bearing cap and wedge seal. 5. Thoroughly clean the gasket mating surfaces of the engine block, oil pan and the rear main bearing cap.

INSTALLATION

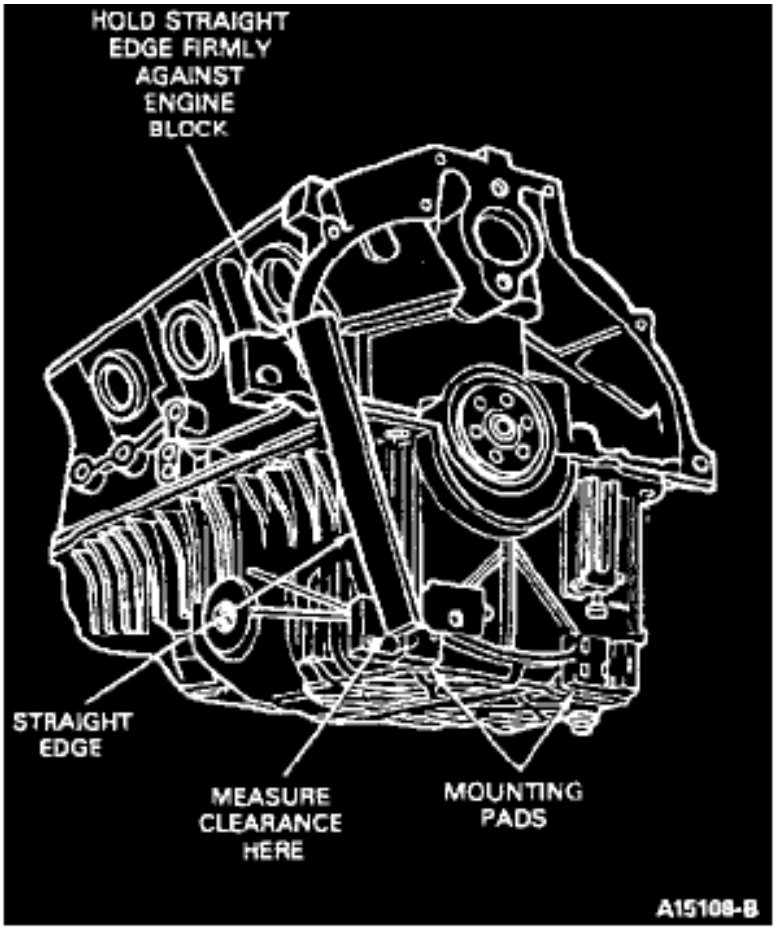
Oil Pan Installation

1. Install a new crankshaft rear main bearing cap wedge seal. The seal should fit snugly into the sides of the rear main bearing cap.

2. position the oil pan gasket to the engine block and place the oil pan in position on the four locating studs.

3. Tighten the retaining nuts and bolts evenly to 7-10 Nm (5-7 ft-lb)

NOTE: The transmission bolts to the engine and oil pan when installed, so it is important to measure the gap between the surface of the rear face of the oil pan (at the spacer locations) and the rear face of the engine block. Refer to the following procedure for checking this dimension.



SPACER SELECTION CHART

Measured Gap		Spacer Required		
mm	Inch	mm	Inch	Shim Color Code
0.0-0.254	0.0-0.010	None	None	—
0.27-0.61	0.011-0.020	0.254	0.010	Yellow
0.52-0.76	0.021-0.029	0.508	0.020	Blue
0.77-1.00	0.030-0.039	0.762	0.030	Pink

TA13805A

Rear View Of Engine

a. With the oil pan installed on the engine, position straightedge D83L-4201-A or equivalent flat on the rear of the engine block (as shown) so

that it extends over one of the oil pan/transmission bolt mounting pads.

Spacer Selection Chart

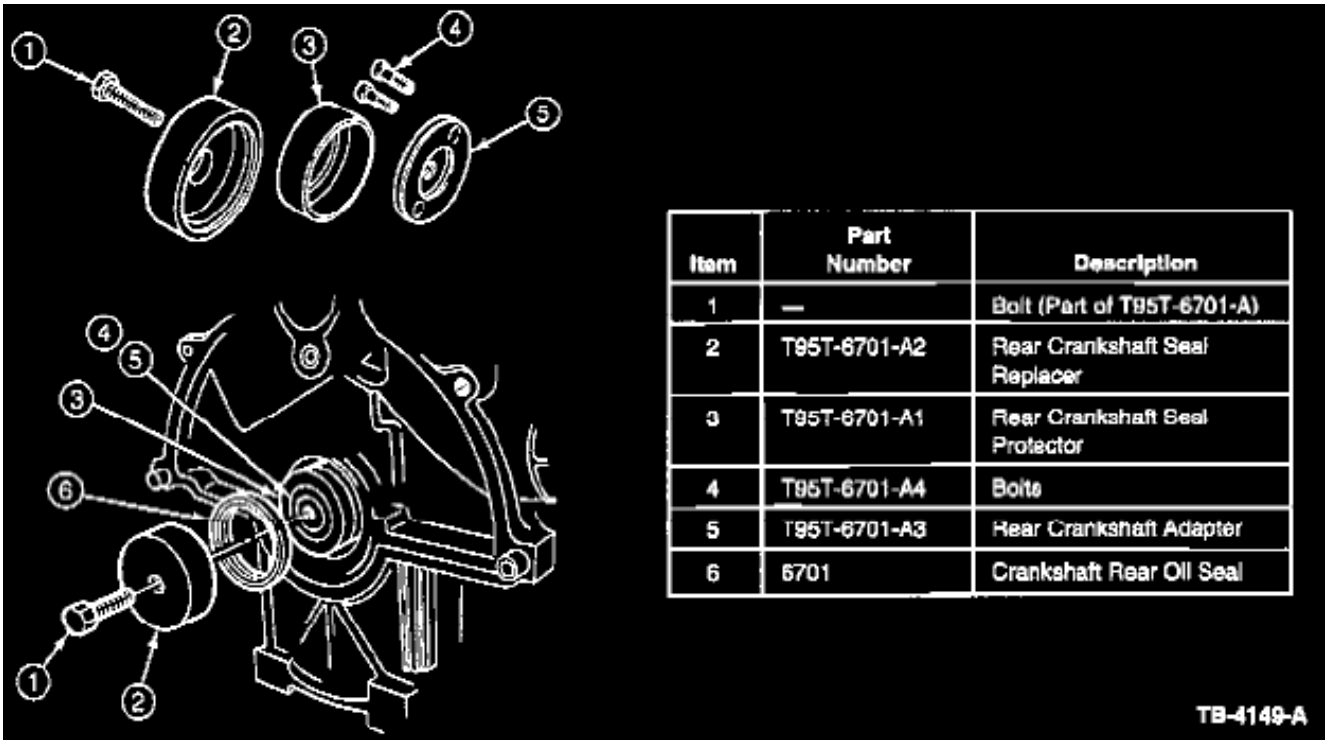
b. Using feeler gauge D81L-4201-A or equivalent, measure the gap between the mounting pad and the straight edge. Repeat the procedure for the

other mounting pad. Select spacers of the required thickness from the chart.

CAUTION: Failure to measure the required spacer thickness will result in insufficient or excessive clearance between the engine oil pan and the transmission when installed in the vehicle. This can result in oil pan damage and/or an oil leak.

c. Install the selected spacers to the mounting pads on the rear of the oil pan before bolting the engine and transmission together.

CAUTION: This installation procedure requires the use of hand tools only. The use of power tools or hammering on the installer can damage the sleeve and seal.



Item	Part Number	Description
1	—	Bolt (Part of T95T-6701-A)
2	T95T-6701-A2	Rear Crankshaft Seal Replacer
3	T95T-6701-A1	Rear Crankshaft Seal Protector
4	T95T-6701-A4	Bolts
5	T95T-6701-A3	Rear Crankshaft Adapter
6	6701	Crankshaft Rear Oil Seal

Rear Main Seal Installation Tool

1. Attach the rear crankshaft adapter to the rear of the crankshaft using the supplied mounting screws.

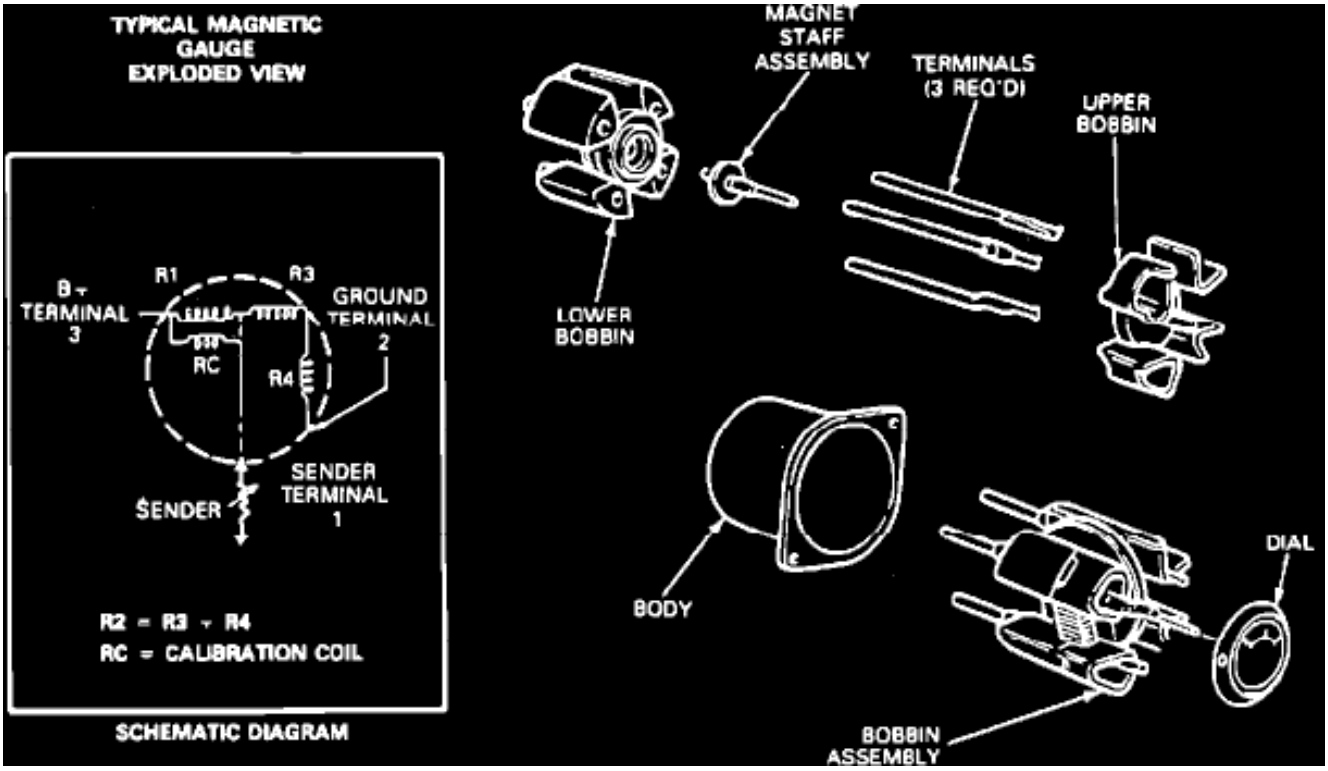
2. Apply a few drops of clean engine oil to the inboard side of the seal/sleeve at the area where the seal contacts the sleeve.

3. Apply a very light film of clean engine oil on the inner diameter of the sleeve and outer diameter of seal.

4. Slide the seal/sleeve over the rear crankshaft seal adapter with flange to the rear of the engine.

NOTE: It is normal for the seal to sit approximately 0.76 mm (0.030 inch) deeper than the sleeve flange. Do not adjust.

5. Use the rear crankshaft seal replacer and supplied bolt to push the rear seal into the cylinder block.



Oil Pressure Gauge: Description and Operation

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

This oil pressure indicating system incorporates an instrument voltage regulator, electrical oil pressure gauge and a sending unit which are connected in series. The sending unit consists of a diaphragm, contact and a variable resistor. As oil pressure increases or decreases, the diaphragm actuates the contact on the variable resistor, which in turn controls current flow to the gauge. When oil pressure is low, resistance of the variable resistor is high, which restricts current flow to the gauge, indicating low oil pressure. As oil pressure increases, resistance of the variable resistor is lowered, permitting increased current flow to the gauge, which increases the gauge reading.

MAGNETIC GAUGE SYSTEM

Fig. 8 Magnetic Guage

The magnetic gauge movement consists of three primary coils, one of which is wound at a 90° angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet which is attached to a shaft and pointer rotates to align to this primary field resulting in pointer position. The bobbin/coil assembly is pressed into a metal housing which is attached to the instrument cluster Fig. 8. These gauges require no adjustments, calibrations or maintenance. This gauge system does not use an IVR.

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	TEMPERATURE OR OIL GAUGE INOPERATIVE		
	• Check complaint.	Gauge pointer does not move ▶	GO to Step A2.
		Gauge pointer moves ▶	GO to Step B1.

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	VERIFY POWER TO CLUSTER		
	• With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test light to verify voltage at B+ terminal of cluster connector.	Other gauges and warning lamps operate correctly: voltage present at cluster ▶	GO to Step B1.
		Other gauges and warning lamps do not operate correctly: no voltage present at cluster ▶	SERVICE wiring to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TESTING SENDER CIRCUIT AT LOW		
	• Insert test box in sender circuit. Disconnect connector at sender and connect test box to cluster side of connector. Set box to LOW (73 ohms).	Temperature gauge reads around the C band ▶	GO to Step B2.
		Oil reads at or below L band ▶	GO to Step B3
		Pointer does not move ▶	GO to Step B4.
B2	TESTING TEMPERATURE SENDER CIRCUIT AT HIGH		
	• TEMPERATURE GAUGE • Set test box to HIGH (9.7 ohms).	Temperature gauge reads around the H grad ▶	REPLACE sender.
		Temperature gauge does not read around the H grad ▶	GO to Step B4.
B3	TESTING ON CABLE SENDER CIRCUIT AT HIGH		
	• OIL GAUGE • Set test box to 0 ohms (short circuit).	Oil gauge reads MID SCALE or slightly above ▶	REPLACE switch.
		Oil gauge does not read MID SCALE or slightly above ▶	GO to Step B4.
B4	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flexible circuit for shorts or open with ohmmeter.	Wiring and flex circuit OK ▶	REPLACE gauge. GO to A1.
		Wiring shorted or open. Flex circuit damaged ▶	REPAIR wiring / flex circuit. GO to A1.

Oil Pressure Gauge: Pinpoint Tests

Fig. 11 Troubleshooting Chart

Fig. 11 Troubleshooting Chart

Fig. 12 Troubleshooting Chart

Oil Pressure Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

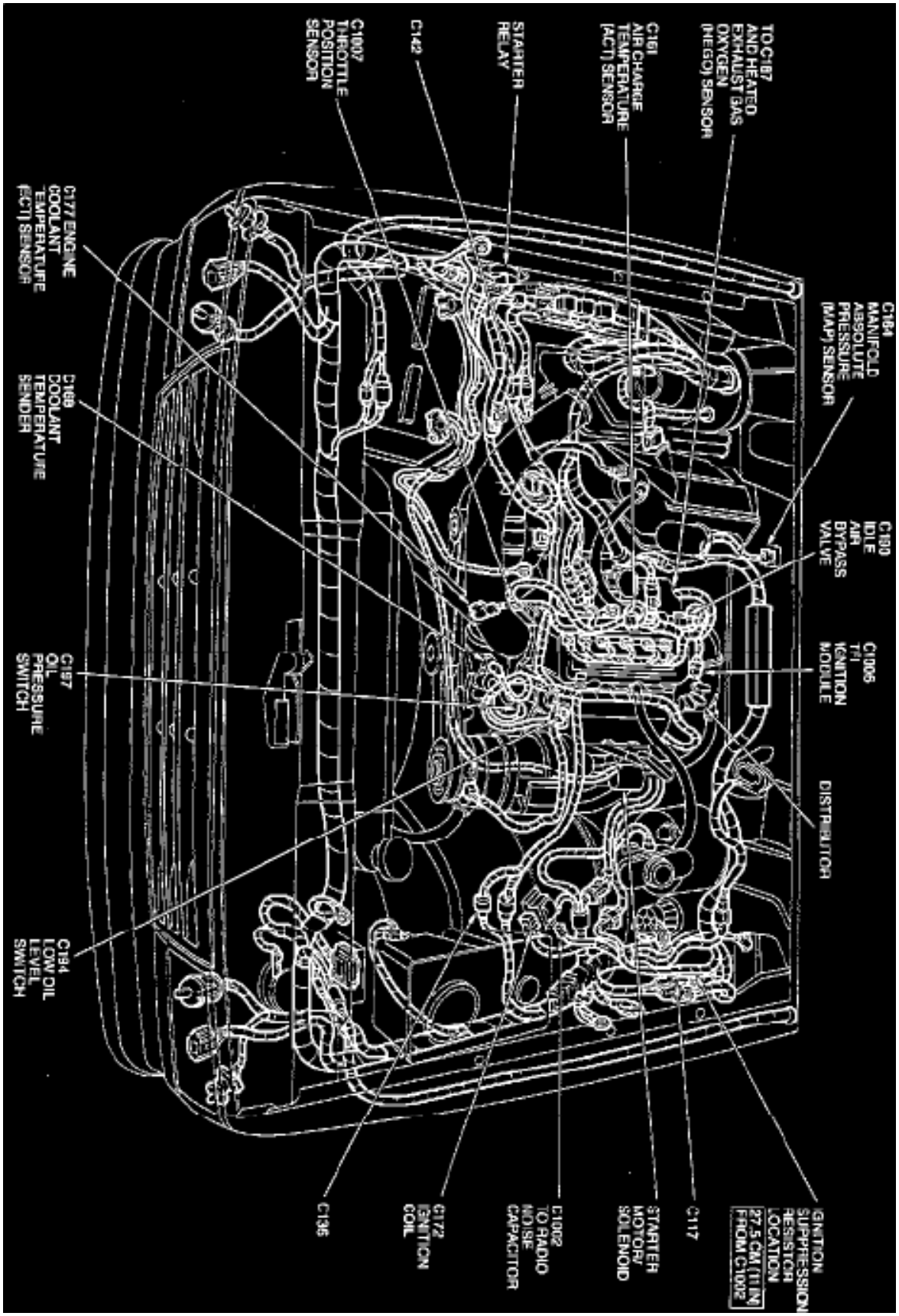
1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Oil Pressure Gauge: Tools and Equipment

Tester tool No. 021-00055 or equivalent should be used to diagnose these type gauges, following manufacturer's instructions.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Engine Lubrication > Oil Pressure Switch <--> [Oil Pressure Sender] > Component Information > Locations



Oil Pressure Switch: Locations

Engine Compartment Components.

Lower LH Rear Of Engine

Applicable to: 2.9L/V6-179

Oil Pressure Warning Lamp/Indicator: Description and Operation

Many trucks utilize a warning light on the instrument panel in place of the conventional dash indicating gauge to warn the driver when the oil pressure is dangerously low. The warning light is wired in series with the ignition switch and the engine unit--which is an oil pressure switch. The oil pressure switch contains a diaphragm and a set of contacts. When the ignition switch is turned on, the warning light circuit is energized and the circuit is completed through the closed contacts in the pressure switch. When the engine is started, build-up of oil pressure compresses the diaphragm, opening the contacts, thereby breaking the circuit and putting out the light.

Oil Pressure Warning Lamp/Indicator: Testing and Inspection

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

Oil Pump: Specifications General Specifications

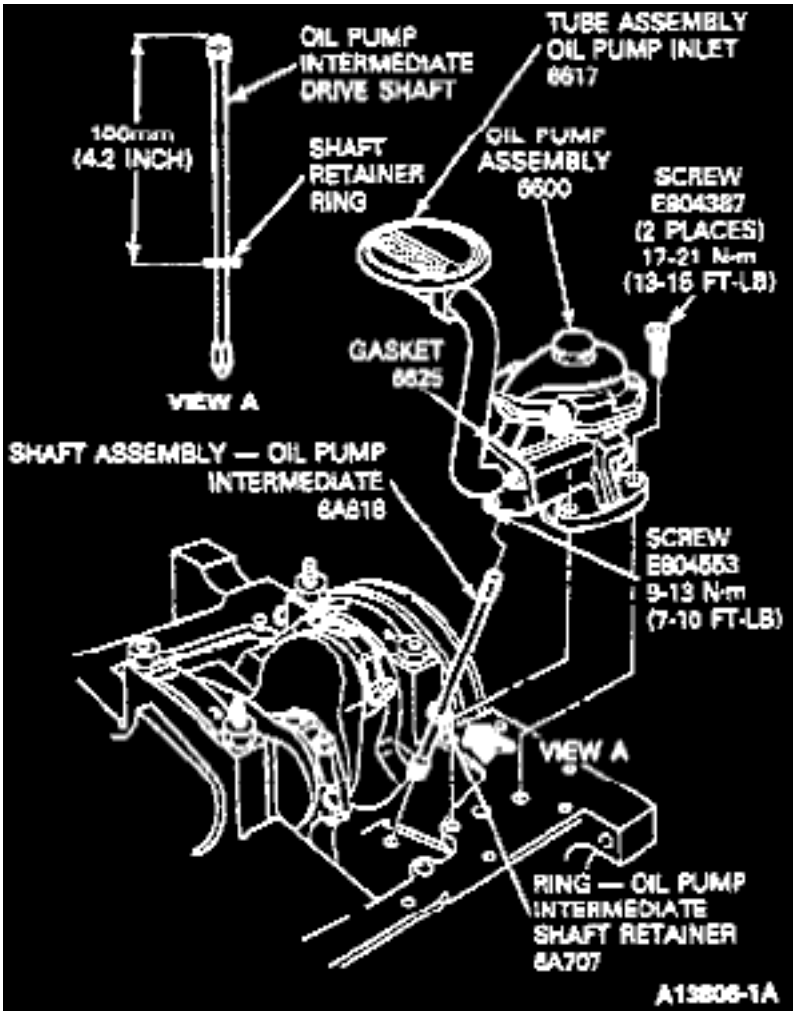
Oil Pump Relief Valve Spring Tension

(Lbs. @ Spec. Length) ..... 13.6-14.7 @ 1.39

Oil Pump Drive Shaft-To-Housing Bearing Clearance 0.0015-0.0030
Oil Pump Relief Valve-To-Bore Clearance ..... 0.0015-0.0030 Oil Pump Rotor Assembly End Clearance (Assembled) ..... 0.004 Max. Oil Pump Outer Race-To-Housing Clearance 0.001-0.013

Oil Pump: Specifications Torque

Oil Pump Drive Assembly Hold Down Bolts
..... 17-21 Nm
(13-15 ft lb) Oil Pump Pick-Up To Pump Screws
..... 9-13
Nm (7-10 ft lb) Oil Pump To engine Block Screws
..... 17-21
Nm (13-15 ft lb)



Oil Pump: Service and Repair

NOTE: The oil pump is only serviced as an assembly.

Removal

1. Remove oil pan. See Oil Pan/Service and Repair. See: Oil Pan/Service and Repair

2. Remove oil pump attaching bolts. Lift off oil pump and withdraw oil pump drive shaft.

Oil Pump Installation

Installation

1. Prime the oil pump by filling either the inlet or outlet port with engine oil XO-5W30-QSP (WSE-M2903-A1) or equivalent SAE 5W-30 Service SG. Rotate the pump shaft to distribute the oil within the pump body.

2. Insert oil pump drive shaft into block with the pointed end facing inward. The pointed end is closest to the pressed-on flange. Place oil pump in position with new gasket and install attaching screws. Tighten screws to 17-21 Nm (13-15 ft lb). Clean and install the oil pump inlet tube and

screen assembly with a new gasket. Tighten the screws to 9-13 Nm (7-10 ft lb).

3. Install oil pan as outlined under Oil Pan/Service and Repair.

4. Operate the engine at fast idle speed and check for oil leaks.

Intake Manifold: Specifications

Oil Filter Adapter - Through Bolt 35-40 Nm

Water Pump to Front Cover - Bolts 8.5-12 Nm

Cylinder Front Cover - Bolts 17-21 Nm

Timing Chain Guide - Bolts 10-12 Nm

Timing Chain Tensioner - Bolts 9-11 Nm

Camshaft Sprocker - Bolt 60-68 Nm

Rocker Arm Stand - Bolts 62-70 Nm

Rocker Arm Cover - Bolts 4-7 Nm

E-DIS Coil Bracket to Engine - Bolts 26-32 Nm

Upper Intake Manifold - Nuts 20-25 Nm

Camshaft Thrust Plate - Screws 9-13 Nm

Oil Pump Drive Assembly Hold Down - Bolt 17-21 Nm

Thermostat Housing - Bolts 9-13 Nm

Oil Pressure Switch 18-22 Nm

Coolant Temperature Sensor 12-18 Nm

Coolant Temperature Sender 4.5-7 Nm

Oil Pan - Bolts and Nuts 7-10 Nm

Oil Pump Pick-Up To Pump-Screws 9-13 Nm

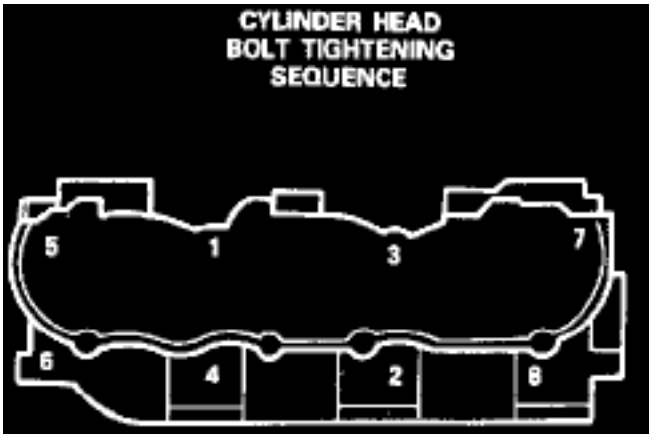
Oil Pump to Engine Block - Screws 17-21 Nm

Connecting Rod Bearing Cap - Nuts 25-32 Nm

Crankshaft Main Bearing Cap - Bolts 90-104 Nm

Crankshaft Oil Baffle - Nuts 17-21 Nm

Cylinder Head - Bolts Tighten the cylinder head bolts in sequence in three steps: Step 1: 30 Nm (22 ft-lb). Step 2: 70 Nm (52 ft lb). Step 3: Rotate the cylinder head bolts an additional 90 degrees tighter in sequence.



Cylinder Head Bolt Tightening Sequence

SERVICE SPECIFICATIONS

GENERAL SPECIFICATIONS	
DISPLACEMENT	4.0L (4000 cc)
NUMBER OF CYLINDERS	6
BORE AND STROKE	100 x 84mm (3.94 x 3.31 in.)
FIRING ORDER	1-4-2-5-3-6
OIL PRESSURE (hot @ 2000 rpm)	40-60
COMPRESSION PRESSURE	(1)

(1) PSI of lowest cylinder must be within 75% of highest.

Intake Manifold: Specifications General Specifications

CYLINDER HEAD AND VALVE TRAIN

COMBUSTION CHAMBER VOLUME (cc)	57.2-59.2
VALVE GUIDE BORE DIAMETER	0.3174.0-0.3184
VALVE SEATS	
Width — Intake	0.060-0.079
Width — Exhaust	0.060-0.079
Angle	45°
Runout Limit (T.I.R. Max.)	0.0015
VALVE ARRANGEMENT (Front to Rear)	L.H. = I-E-I-E-I-E
	R.H. = E-I-E-I-E-I
GASKET SURFACE FLATNESS	0.333 in 6 in., 0.0006 in. overall
GASKET SURFACE FINISH (RMS)	60-150
VALVE STEM-TO-GUIDE CLEARANCE	
Intake	0.0008-0.0025
Exhaust	0.0018-0.0035
Service Clearance	0.0055
VALVE HEAD DIAMETER	
Intake	43.5mm (1.71 in.)
Exhaust	34.5mm (1.36 in.)
VALVE FACE RUNOUT LIMIT	0.002 Max.
VALVE FACE ANGLE	44°
VALVE STEM DIAMETER (Std.)	
Intake	0.3159-0.3167
Exhaust	0.3149-0.3156
(0.008 Oversize)	
Intake	0.3239-0.3245
Exhaust	0.3228-0.3235
(0.016 Oversize)	
Intake	0.3318-0.3324
Exhaust	0.3307-0.3314
VALVE SPRINGS	
Compression Pressure (lb. @ Spec. Length)	60.0-68.0 @ 1.585
	138.0-149.0 @ 1.222
Free Length (Approximate)	1.91
Assembled Height	1-37/64 – 1-39/64
Service Limit	[2]
Out-Of-Square	5/64 (0.078)
ROCKER ARM	
Shaft Diameter	0.7799-0.7811
Bore Diameter	0.7830-0.7842
Ratio	1.46:1
PUSH ROD RUNOUT (T.I.R.) Max.	0.020
VALVE ROLLER TAPPET	
Diameter (Std.)	0.8742-0.8755
Clearance To Bore	0.0005-0.0022
Service Limit	0.005

[2] 10% pressure loss @ specified length.

CAMSHAFT	
LOBE LIFT	
Allowable Lobe Lift Loss	0.005
THEORETICAL VALVE LIFT @ ZERO LASH	
Intake	0.4024
Exhaust	0.4024
END PLAY	0.0008-0.004
Service Limit	0.009
THRUST PLATE THICKNESS	0.158-0.159
JOURNAL-TO-BEARING CLEARANCE	0.001-0.0026
Service Limit	0.006
BEARING OUTSIDE DIAMETER	0.158-0.159
#1	49.57-49.59 (1.951-1.952)
#2	49.21-49.23 (1.937-1.938)
#3	48.83-48.85 (1.922-1.923)
#4	48.44-48.46 (1.907-1.908)
Runout	0.127 (0.005) Max. T.I.R.
Out-Of-Round	0.0076 (0.0003) Max. T.I.R.
BEARING INSIDE DIAMETER	
#1	49.635-49.655 (1.954-1.955)
#2	49.255-49.275 (1.939-1.940)
#3	48.750-48.768 (1.919-1.920)
#4	48.875-48.895 (1.924-1.925)
FRONT BEARING LOCATION	[3] 0.040-0.060
CYLINDER BLOCK	
HEAD GASKET SURFACE FLATNESS	[4]
Finish (RMS)	60-150
CRANKSHAFT TO REAR FACE OF BLOCK RUNOUT (T.I.R. Max.)	0.005
CYLINDER BORE AND PISTON	
TAPER BORE DIAMETER	0.8750-0.8760
MAIN BEARING BORE DIAMETER	2.3866-2.3874
CYLINDER BORE DIAMETER	
Diameter	3.9527-3.9543
Surface Finish (RMS)	18.38
Out-Of-Round	0.0015
Out-Of-Round Service Limit	0.005
Taper Service Limit	0.010
PISTON	
Height [6]	0.0015-00205
Diameter [5]	
Standard	3.9524-3.9531
Piston-To-Bore Clearance	0.0008-0.0019
Pin Bore Diameter	0.9450-0.9452
Ring Groove Width	
Compression (Top)	0.0803-0.0811
Compression (Bottom)	0.1197-0.1205
Oil	0.1579-0.1587

[3] Distance in inches that front edge of bearing is installed below front face of cylinder block.
[4] 0.003 in any 6 inches — 0.006 overall.
[5] Measured at the piston pin bore centerline at 90 degrees to the pin.
[6] Height of piston above cylinder block surface at TDC position.

SERVICE SPECIFICATIONS — CONT'D

CYLINDER BORE AND PISTON (CONT'D)

PISTON PIN	
Length	2.835-2.866
Diameter	
Red	0.9446-0.9448
Blue	0.9448-0.9449
Pin-To-Piston Clearance	0.0003-0.0006
Pin-To-Rod Clearance	Interference Fit
PISTON RINGS	
Ring Width	
Compression (Top)	0.0778-0.0783
Compression (Bottom)	0.1172-0.1177
Side Clearance	
Compression (Top)	0.0020-0.0033
Compression (Bottom)	0.0020-0.0033
Oil Ring	Snug Fit
Service Limit	0.006
Ring Gap	
Compression (Top)	0.015-0.023
Compression (Bottom)	0.015-0.023
Oil Ring (Steel Rail)	0.015-0.055

CRANKSHAFT AND FLYWHEEL

MAIN BEARING JOURNAL DIAMETER	2.2433-2.2441
Out-Of-Round	0.0006
Taper Limit	0.0006 per inch
Journal Runout	0.002 Max.
Surface Finish (RMS)	12
Runout Service Limit	0.005
THRUST BEARING JOURNAL	
Length	1.039-1.041
CONNECTING ROD JOURNAL	
Diameter	2.1252-2.1260
Out-Of-Round	0.0006
Taper Limit	0.0006 per inch
Surface Finish (RMS)	12 Max.
MAIN BEARING THRUST FACE	
Surface Finish	20 Max.
Runout (T.I.R.)	0.001 Max.
FLYWHEEL CLUTCH FACE	
Runout	0.005
FLYWHEEL RING GEAR LATERAL RUNOUT (T.I.R.)	
Standard Transmission	0.025
Automatic Transmission	0.060
CRANKSHAFT FREE END PLAY	0.016-0.0126
Service Limit	0.012
CONNECTING ROD BEARINGS	
Clearance To Crankshaft — Desired	0.0003-0.0024
— Allowable	0.0005-0.0022
Bearing Wall Thickness (Std.) [7]	Red — 0.0548-0.0552
	Blue — 0.0552-0.0556
MAIN BEARING	
Clearance To Crankshaft — Desired	0.0008-0.0015
— Allowable	0.0005-0.0019
Bearing Wall Thickness (Std.) [7]	Red — 0.0707-0.0710
	Blue — 0.0711-0.0714

CONNECTING ROD

CONNECTING ROD	
Piston Pin Bore Diameter	0.9432-0.9439
Crankshaft Bearing Bore Diameter	2.2370-2.2378
Out-Of-Round	0.0004
Taper	0.0004
Length (Center-to-Center)	5.1386-5.1413
Alignment (Bore-To-Bore Max. Diff.) [8]	
Twist	0.006
Bend	0.002
Slide Clearance (Assembled to Crank)	
Standard	0.0002-0.0025
Service Limit	0.014

[8] 0.002 Undersize = add 0.001 to standard thickness.

[9] Pin and crank bearing bore must be parallel and in same vertical plane within the specified total difference when measured at ends of an 8 inch bar, 4 inch on each side of rod centerline.

SERVICE SPECIFICATIONS — CONT'D

LUBRICATING SYSTEM

OIL PUMP	
Relief Valve Spring Tension (Lbs. at Spec. Length)	13.6-14.7 @ 1.39
Drive Shaft-To-Housing Bearing Clearance	0.0015-0.0030
Relief Valve-To-Bore Clearance	0.0015-0.0030
Rotor Assembly End Clearance (Assembled)	0.004 Max.
Outer Race-To-Housing Clearance	0.001-0.013
OIL CAPACITY (Quarts U.S.)	4+1

AVAILABILITY/POWER RATINGS

All Engines

Engine	Sales Region	Models	Trans.	Horsepower (1)		Torque (1)		Nominal Compression Ratio
				HP	RPM	Lb-Ft	RPM	
2.3L EFI	50S	Ranger	M/T & A/T	90	4000	134	2000	9.5
2.9L EFI	50S	Ranger	M/T & A/T	140	4600	170	2600	9.0
3.0L EFI	50S	Aerostar	M/T & A/T	145	4800	165	3600	9.3
4.0L EFI V6	50S	Aerostar, Explorer, Ranger	M/T & A/T	245	—	—	—	—

(1) Representative horsepower and torque ratings adjusted to SAE J1349 net for gasoline engines as noted. Ratings for individual engine model combinations may vary slightly. This potential variation must be acknowledged whenever engine performance levels are utilized for marketing/advertising purposes. More specific information is available (for certification and compliance-related issues) from Light Truck Engineering.

COMPRESSION TEST PERCENTAGES — ALL ENGINES

Maximum kPa (PSI)	Minimum kPa (PSI)	Maximum kPa (PSI)	Minimum kPa (PSI)	Maximum kPa (PSI)	Minimum kPa (PSI)
923 (134)	697 (101)	1199 (174)	903 (131)	1475 (214)	1103 (160)
937 (136)	703 (102)	1213 (176)	910 (132)	1489 (216)	1116 (162)
951 (138)	717 (104)	1227 (178)	917 (133)	1503 (218)	1123 (163)
965 (140)	723 (105)	1241 (180)	930 (135)	1516 (220)	1137 (165)
979 (142)	737 (107)	1254 (182)	937 (136)	1530 (222)	1144 (166)
992 (144)	744 (108)	1268 (184)	951 (138)	1544 (224)	1158 (168)
1006 (146)	758 (110)	1282 (186)	965 (140)	1558 (226)	1165 (169)
1020 (148)	765 (111)	1296 (188)	972 (141)	1572 (228)	1179 (171)
1034 (150)	779 (113)	1310 (190)	979 (142)	1585 (230)	1185 (172)
1048 (152)	786 (114)	1323 (192)	992 (144)	1599 (232)	1199 (174)
1061 (154)	792 (115)	1337 (194)	999 (145)	1613 (234)	1206 (175)
1075 (156)	806 (117)	1351 (196)	1013 (147)	1627 (236)	1220 (177)
1089 (158)	813 (118)	1365 (198)	1020 (148)	1641 (238)	1227 (178)
1103 (160)	827 (120)	1379 (200)	1034 (150)	1654 (240)	1241 (180)
1116 (162)	834 (121)	1392 (202)	1041 (151)	1668 (242)	1247 (181)
1130 (164)	848 (123)	1406 (204)	1054 (153)	1682 (244)	1261 (183)
1144 (166)	854 (124)	1420 (206)	1061 (154)	1696 (246)	1268 (184)
1158 (168)	868 (126)	1434 (208)	1075 (156)	1709 (248)	1282 (186)
1172 (170)	875 (127)	1447 (210)	1082 (157)	1723 (250)	1289 (187)
1185 (172)	889 (129)	1461 (212)	1089 (158)		

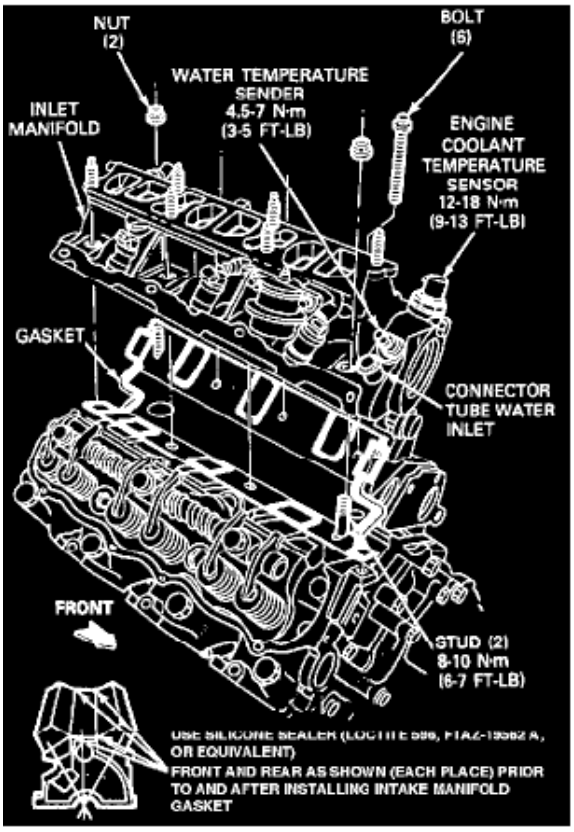
Compression Test Percentages - All Engines

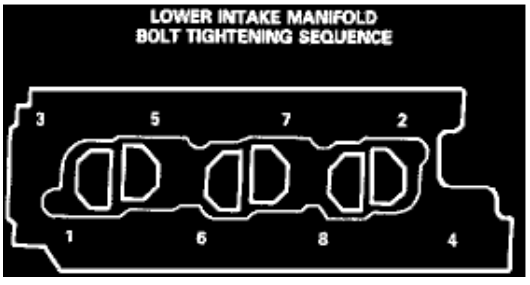
Belt Tension Allowable Limits

	Specifications		Allowable Minimum
	New Belt[1] Installation Tension	Used Belt[2] Reset Tension	Cold Belt[2] [3] Audit Check
"V" Belts			
1/4 in. Width	50-80	40-60	40-80
1/4 in. Width	120-160	90-120	70-160
1/4 in. Width (Air Pump Belt Only)	90-130	90-120	60-120
"V" Ribbed Belts			
6 rib (Non-Serpentine)	150-190	140-160	90
6 rib (V-6 Serpentine)	160-190	130-160	90-180
6 rib (V-8 Serpentine)	85-140	80-140	80-140
5 rib	130-170	120-150	80-150
4 rib	100-140	80-100	60
4 rib (Air Pump Belt Only)	90-130	40-60	40

[1] New belt installed and tensioned; engine not rotated.
[2] Used belt is any belt that has rotated on an engine.
[3] Cold belt (i.e., 3-hour soak; 0 warm-up).

Belt Tension Allowable Limits


NUT
(2)
BOLT
(6)
WATER TEMPERATURE
SENDER
4.5-7 N·m
(3-5 FT-LB)
INLET
MANIFOLD
ENGINE
COOLANT
TEMPERATURE
SENSOR
12-18 N·m
(9-13 FT-LB)
GASKET
CONNECTOR
TUBE WATER
INLET
FRONT
STUD (2)
8-10 N·m
(6-7 FT-LB)
USE SILICONE SEALER (LOCTITE 598, F1AZ-19562 A,
OR EQUIVALENT)
FRONT AND REAR AS SHOWN (EACH PLACE) PRIOR
TO AND AFTER INSTALLING INTAKE MANIFOLD
GASKET


LOWER INTAKE MANIFOLD
BOLT TIGHTENING SEQUENCE
3
5
7
2
1
6
8
4

Intake Manifold: Specifications

Lower Intake Manifold to Cylinder Head Step 1 4-8 Nm

Step 2 8-15 Nm

Step 3 15-21 Nm

Step 4 21-25 Nm

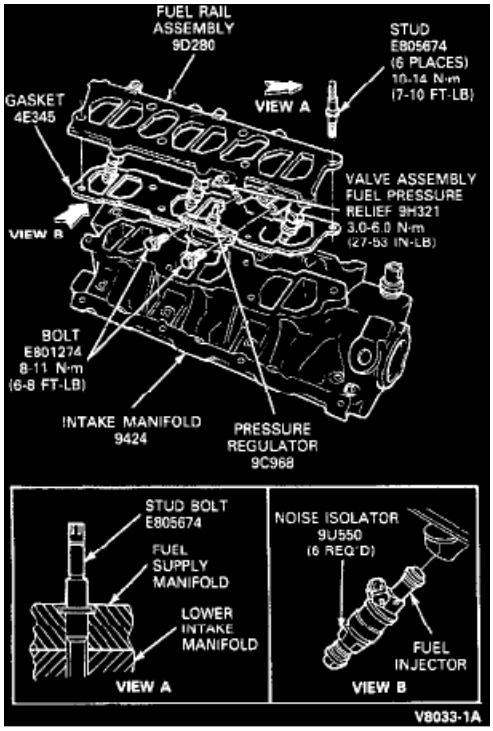
Fuel Supply Manifold to Lower Intake Manifold 10-14 Nm

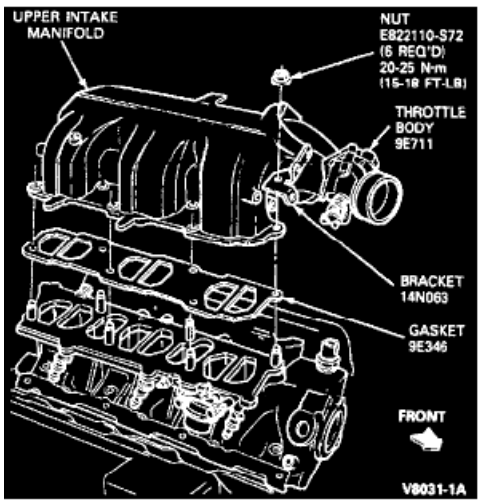
Upper Intake Manifold to Lower Intake Manifold 20-25 Nm

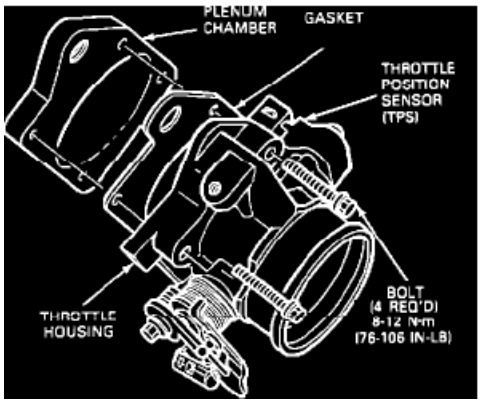
Throttle Body to Upper Intake Manifold 8-12 Nm

Cylinder Head And Block

Lower Intake Manifold Bolt Tightening Sequence

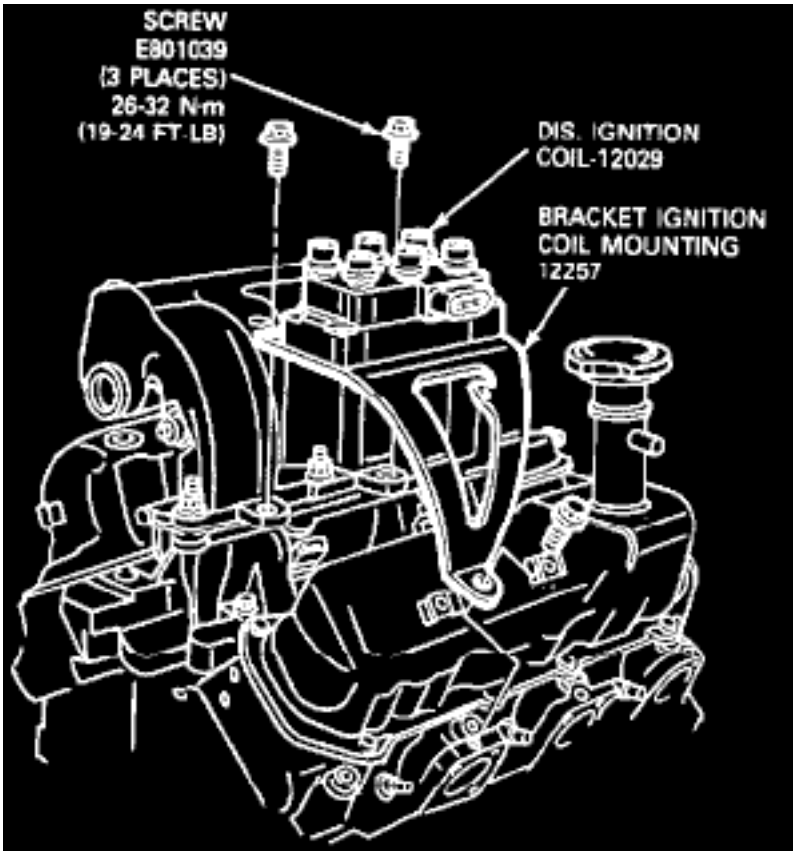

FUEL RAIL ASSEMBLY 9D280
STUD E805674 (6 PLACES) 10-14 N·m (7-10 FT-LB)
VIEW A
GASKET 4E345
VALVE ASSEMBLY FUEL PRESSURE RELIEF 9H321 3.0-6.0 N·m (27-53 IN-LB)
VIEW B
BOLT E801274 8-11 N·m (6-8 FT-LB)
INTAKE MANIFOLD 9424
PRESSURE REGULATOR 9C968
STUD BOLT E805674
FUEL SUPPLY MANIFOLD
LOWER INTAKE MANIFOLD
VIEW A
NOISE ISOLATOR 9U550 (6 REQ'D)
FUEL INJECTOR
VIEW B
V8033-1A


UPPER INTAKE MANIFOLD
NUT E822110-S72 (6 REQ'D) 20-25 N·m (15-18 FT-LB)
THROTTLE BODY 9E711
BRACKET 14N063
GASKET 9E346
FRONT
V8031-1A


PLENUM CHAMBER
GASKET
THROTTLE POSITION SENSOR (TPS)
BOLT (4 REQ'D) 8-12 N·m (76-106 IN-LB)
THROTTLE HOUSING

Upper Intake Manifold

Throttle Body Assembly



Intake Manifold: Service and Repair Lower

*** THIS ARTICLE REFLECTS CHANGES MADE BY TSB #94-18-10, DATED September 07, 1994

REMOVAL

NOTE: The intake manifold is a four piece assembly consisting of the upper intake manifold, the throttle body, the fuel supply manifold and the lower intake manifold.

1. Disconnect the battery ground cable at the battery.

2. Remove the air cleaner air intake duct from the throttle body.

3. Remove the snow/ice shield and disconnect the throttle cable and bracket assembly.

4. Disconnect all vacuum hoses from the fittings on the upper intake manifold.

5. Disconnect the electrical connections at the throttle body, upper intake manifold, lower intake manifold and injectors.

6. Relieve fuel system pressure.

7. Disconnect the fuel supply and return lines at the fuel supply manifold.

E-DIS Coil Pack Mounting

8. Remove the bolts securing the E-DIS coil pack and bracket assembly to the upper intake manifold.

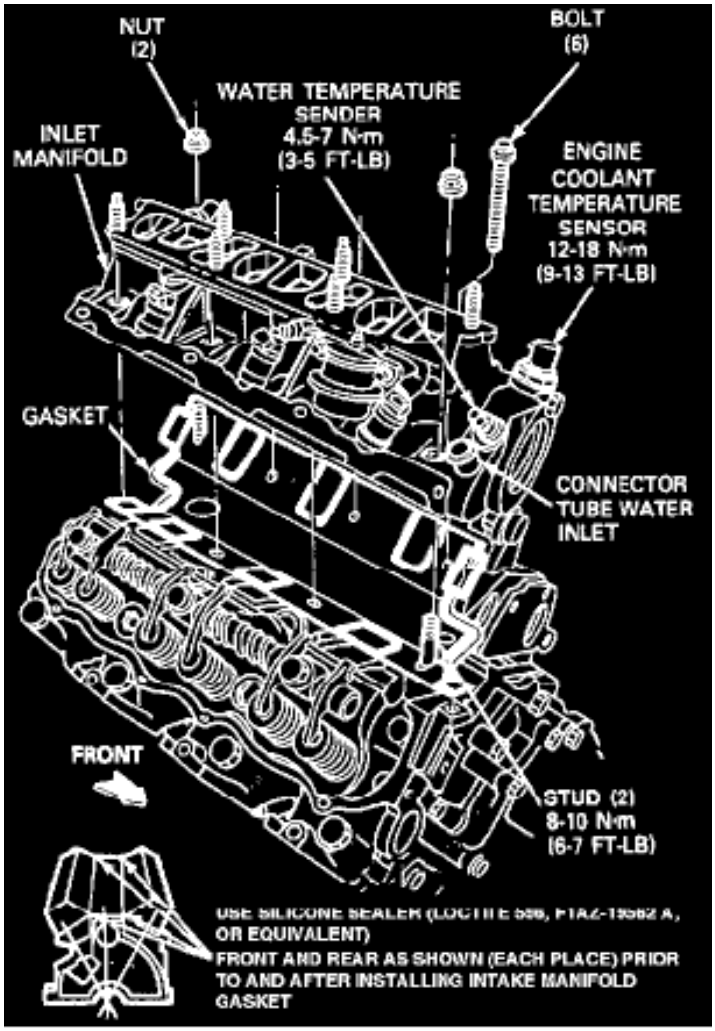
9. Remove the six nuts securing the upper intake manifold and remove the upper manifold.

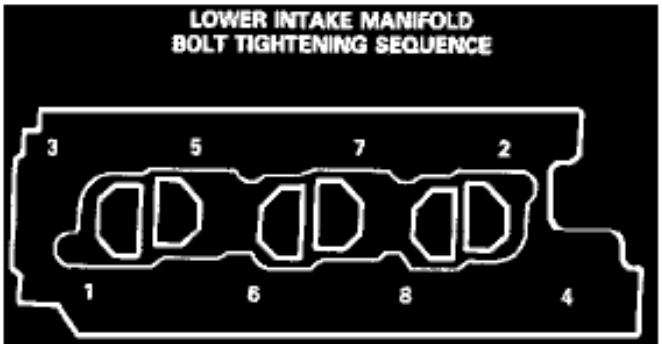
10. Remove the valve rocker arm covers. See: Cylinder Head Assembly/Valve Cover/Service and Repair

11. Remove the intake manifold attaching bolts and nuts. Tap the intake manifold lightly with a plastic mallet to break the gasket seal, and lift off the intake manifold assembly.

12. Remove all old gasket material, and sealing compound.

INSTALLATION


NUT
(2)
BOLT
(6)
WATER TEMPERATURE
SENDER
4.5-7 N·m
(3-5 FT-LB)
INLET
MANIFOLD
ENGINE
COOLANT
TEMPERATURE
SENSOR
12-18 N·m
(9-13 FT-LB)
GASKET
CONNECTOR
TUBE WATER
INLET
FRONT
STUD (2)
8-10 N·m
(6-7 FT-LB)
OR EQUIVALENT)
FRONT AND REAR AS SHOWN (EACH PLACE) PRIOR
TO AND AFTER INSTALLING INTAKE MANIFOLD
GASKET


LOWER INTAKE MANIFOLD
BOLT TIGHTENING SEQUENCE
3
5
7
2
1
6
8
4

Cylinder Head And Block

1. Apply Silicone Sealer (Loctite 598, F1AZ-19562 A, or equivalent) to the block and cylinder head mating surfaces at the four corners shown. Install the intake manifold gaskets and again apply sealer to the four corner locations.

NOTE: Once applied, the silicone sealer will set-up in approximately 15 minutes. The intake manifold must be installed immediately after the sealer is applied.

Lower Intake Manifold Bolt Tightening Sequence

2. Position the intake manifold on the two guide studs and install the nuts and bolts hand tight. Tighten the intake manifold bolts in four stages following the sequence shown.

^ 4-8 Nm (3-6 ft lb)

^ 8-15 Nm (6-11 ft lb)

^ 15-21 Nm (11-15 ft lb)

^ 21-25 Nm (15-18 ft lb)

3. Apply Silicone Sealer (Loctite 598, F1AZ-19562 A, or equivalent) to the four locations at the joint where the intake manifold and cylinder heads meet.

4. Position valve rocker arm cover gasket in each cover and install valve rocker arm covers. Tighten rocker arm cover bolts evenly to 4-7 Nm (3-5 ft lb).

NOTE: Valve rocker arm covers are tightened in 2 steps. Tighten bolts to specification. Two minutes later, tighten bolts to the same specification.

5. Install upper intake manifold and tighten nuts to 20-25 Nm (15-18 ft lb).

6. Install the E-DIS ignition coil and bracket assembly.

7. Connect the fuel supply and return lines at the fuel supply manifold.

8. Connect the electrical connections at the throttle body, upper intake manifold, lower intake manifold and injectors.

9. Connect all vacuum hoses to the fittings on the upper intake manifold.

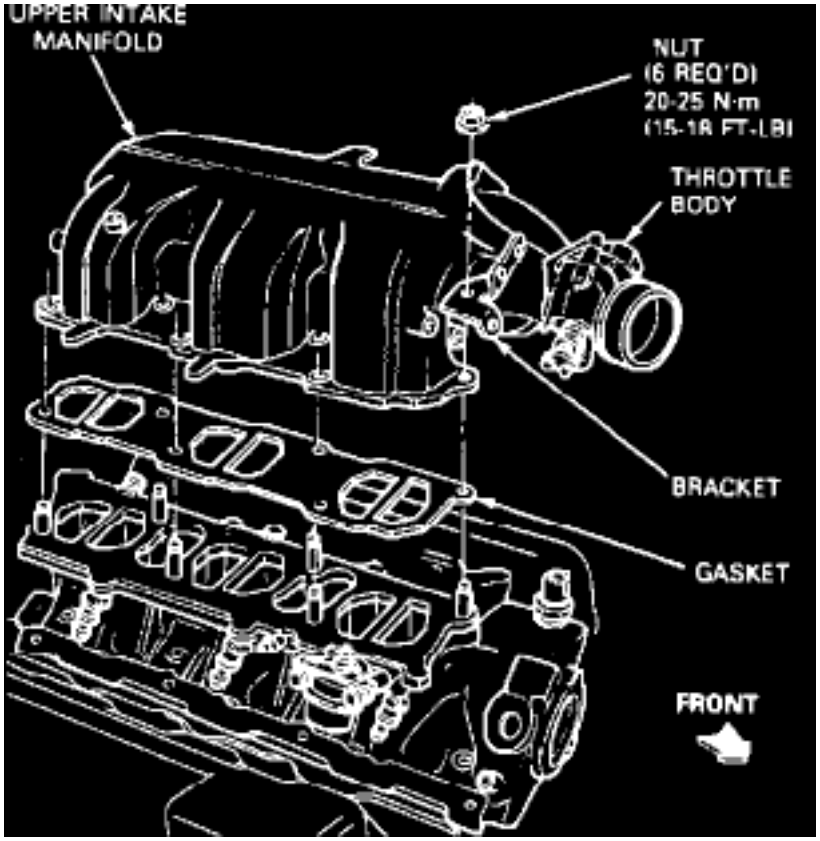
10. Install the throttle cable and bracket assembly and the snow/ice shield to the throttle body.

11. Connect the air cleaner air intake duct to the throttle body.

12. Fill and bleed the cooling system.

13. Connect the battery ground cable at the battery.

14. Check for fuel system and oil leaks.



Intake Manifold: Service and Repair Upper Intake Manifold

Upper Intake Manifold

REMOVAL

1. Disconnect the electrical connectors at the air bypass valve, Throttle Position (TP) sensor and Air Charge Temperature (ACT) sensor.

2. Remove the snow/ice shield to expose the throttle linkage. Remove the throttle cable bracket and disconnect the cable from the ball stud on the

throttle body.

3. Remove the air inlet tube from air cleaner to throttle body.

4. Disconnect the upper intake manifold vacuum connectors.

5. Disconnect the PCV valve from the rocker cover.

6. Disconnect the spark plug wires from the comb at the rear of the manifold.

7. Remove the canister purge line from the fitting in the throttle housing.

8. Remove the bolt retaining the engine oil dipstick tube.

9. Remove the bolt which retains the A/C line at the upper rear of the upper manifold.

10. Remove the six upper intake manifold retaining bolts.

11. Remove the upper intake and throttle body as an assembly from the lower intake and fuel supply manifolds.

INSTALLATION

1. Clean and inspect the mounting faces of the fuel manifold and upper intake manifold.

2. Position a new gasket on the mounting studs.

3. Install the upper intake manifold on the studs.

4. Install six upper intake manifold retaining nuts. Torque to 21-25 Nm (15-18 ft lb).

5. Connect the spark plug wires to the retainer comb at the rear of the intake manifold.

6. Attach the A/C line retainer and automatic transmission vacuum line retainer at the upper intake manifold.

7. Install the canister purge line on the throttle body fitting.

8. Connect vacuum lines to the vacuum tree. Connect the electrical connector at the air bypass valve, TP sensor and ACT sensor.

9. Install the PCV valve in the grommet at the rear of the RH rocker cover.

10. Attach the engine oil dipstick tube to the upper intake manifold.

11. Attach the throttle cable bracket to the upper intake manifold, then connect the throttle cable to the ball stud and install the snow/ice shield.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

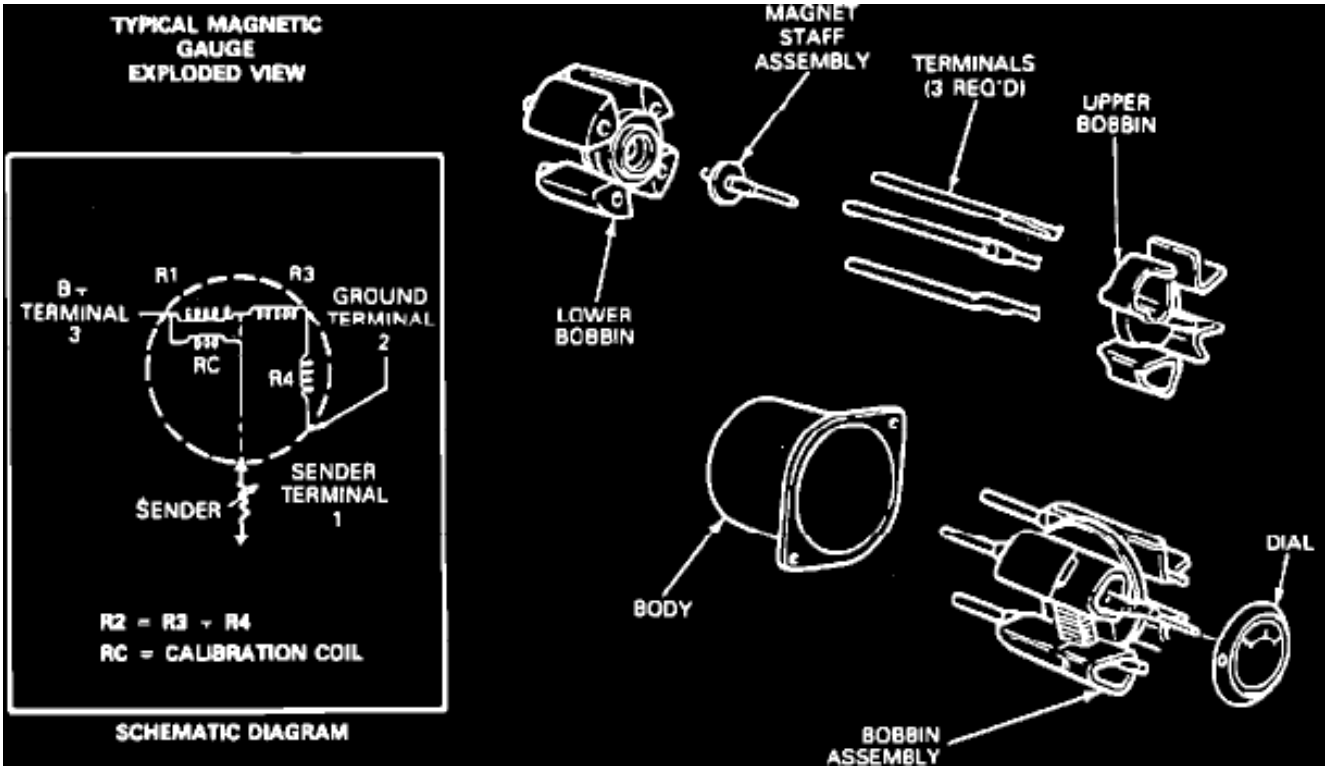
OASIS CODES: 201000, 201100, 206000

Oil Level Warning Indicator: Description and Operation

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

Oil Level Warning Indicator: Testing and Inspection

With oil level at FULL mark on oil dipstick and engine oil warm to assure that oil drains properly from oil sensor, turn ignition on and start engine. Warning lamp should come on briefly in Start for bulb test, then go out. Turn engine off. Drain 2 quarts of oil from engine. Wait approximately 5 minutes, then restart engine. Warning lamp should come on and stay on. If warning lamp does not come on check fuse, low oil level relay, low oil level sensor and lamp.



Oil Pressure Gauge: Description and Operation

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

This oil pressure indicating system incorporates an instrument voltage regulator, electrical oil pressure gauge and a sending unit which are connected in series. The sending unit consists of a diaphragm, contact and a variable resistor. As oil pressure increases or decreases, the diaphragm actuates the contact on the variable resistor, which in turn controls current flow to the gauge. When oil pressure is low, resistance of the variable resistor is high, which restricts current flow to the gauge, indicating low oil pressure. As oil pressure increases, resistance of the variable resistor is lowered, permitting increased current flow to the gauge, which increases the gauge reading.

MAGNETIC GAUGE SYSTEM

Fig. 8 Magnetic Guage

The magnetic gauge movement consists of three primary coils, one of which is wound at a 90° angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet which is attached to a shaft and pointer rotates to align to this primary field resulting in pointer position. The bobbin/coil assembly is pressed into a metal housing which is attached to the instrument cluster Fig. 8. These gauges require no adjustments, calibrations or maintenance. This gauge system does not use an IVR.

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	TEMPERATURE OR OIL GAUGE INOPERATIVE		
	• Check complaint.	Gauge pointer does not move ▶	GO to Step A2.
		Gauge pointer moves ▶	GO to Step B1.

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	VERIFY POWER TO CLUSTER		
	• With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test light to verify voltage at B+ terminal of cluster connector.	Other gauges and warning lamps operate correctly: voltage present at cluster ▶	GO to Step B1.
		Other gauges and warning lamps do not operate correctly: no voltage present at cluster ▶	SERVICE wiring to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TESTING SENDER CIRCUIT AT LOW		
	• Insert test box in sender circuit. Disconnect connector at sender and connect test box to cluster side of connector. Set box to LOW (73 ohms).	Temperature gauge reads around the C band ▶	GO to Step B2.
		Oil reads at or below L band ▶	GO to Step B3
		Pointer does not move ▶	GO to Step B4.
B2	TESTING TEMPERATURE SENDER CIRCUIT AT HIGH		
	• TEMPERATURE GAUGE • Set test box to HIGH (9.7 ohms).	Temperature gauge reads around the H grad ▶	REPLACE sender.
		Temperature gauge does not read around the H grad ▶	GO to Step B4.
B3	TESTING ON CABLE SENDER CIRCUIT AT HIGH		
	• OIL GAUGE • Set test box to 0 ohms (short circuit).	Oil gauge reads MID SCALE or slightly above ▶	REPLACE switch.
		Oil gauge does not read MID SCALE or slightly above ▶	GO to Step B4.
B4	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flexible circuit for shorts or open with ohmmeter.	Wiring and flex circuit OK ▶	REPLACE gauge. GO to A1.
		Wiring shorted or open. Flex circuit damaged ▶	REPAIR wiring / flex circuit. GO to A1.

Oil Pressure Gauge: Pinpoint Tests

Fig. 11 Troubleshooting Chart

Fig. 11 Troubleshooting Chart

Fig. 12 Troubleshooting Chart

Oil Pressure Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Oil Pressure Gauge: Tools and Equipment

Tester tool No. 021-00055 or equivalent should be used to diagnose these type gauges, following manufacturer's instructions.

Oil Pressure Warning Lamp/Indicator: Description and Operation

Many trucks utilize a warning light on the instrument panel in place of the conventional dash indicating gauge to warn the driver when the oil pressure is dangerously low. The warning light is wired in series with the ignition switch and the engine unit--which is an oil pressure switch. The oil pressure switch contains a diaphragm and a set of contacts. When the ignition switch is turned on, the warning light circuit is energized and the circuit is completed through the closed contacts in the pressure switch. When the engine is started, build-up of oil pressure compresses the diaphragm, opening the contacts, thereby breaking the circuit and putting out the light.

Oil Pressure Warning Lamp/Indicator: Testing and Inspection

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

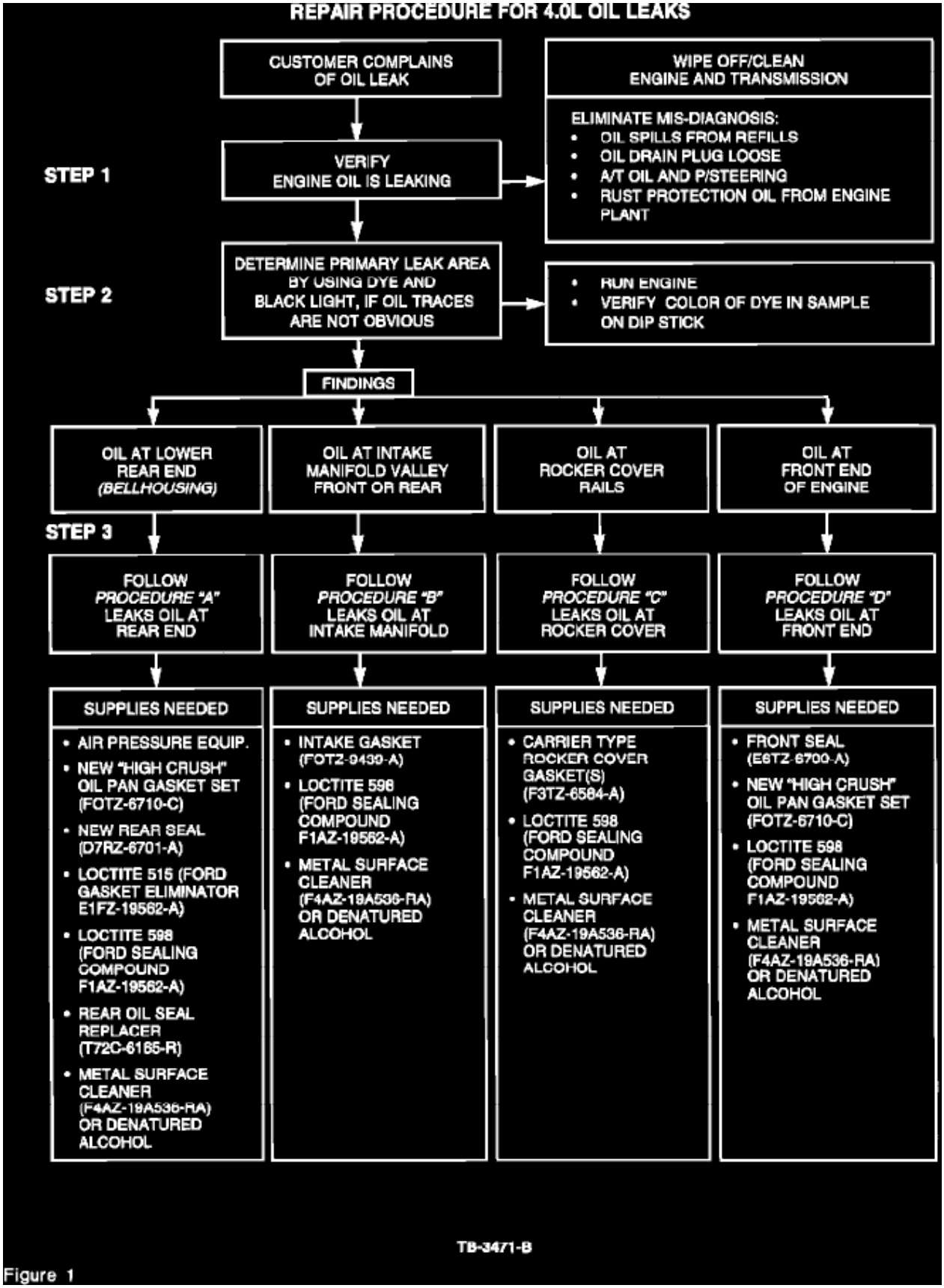


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

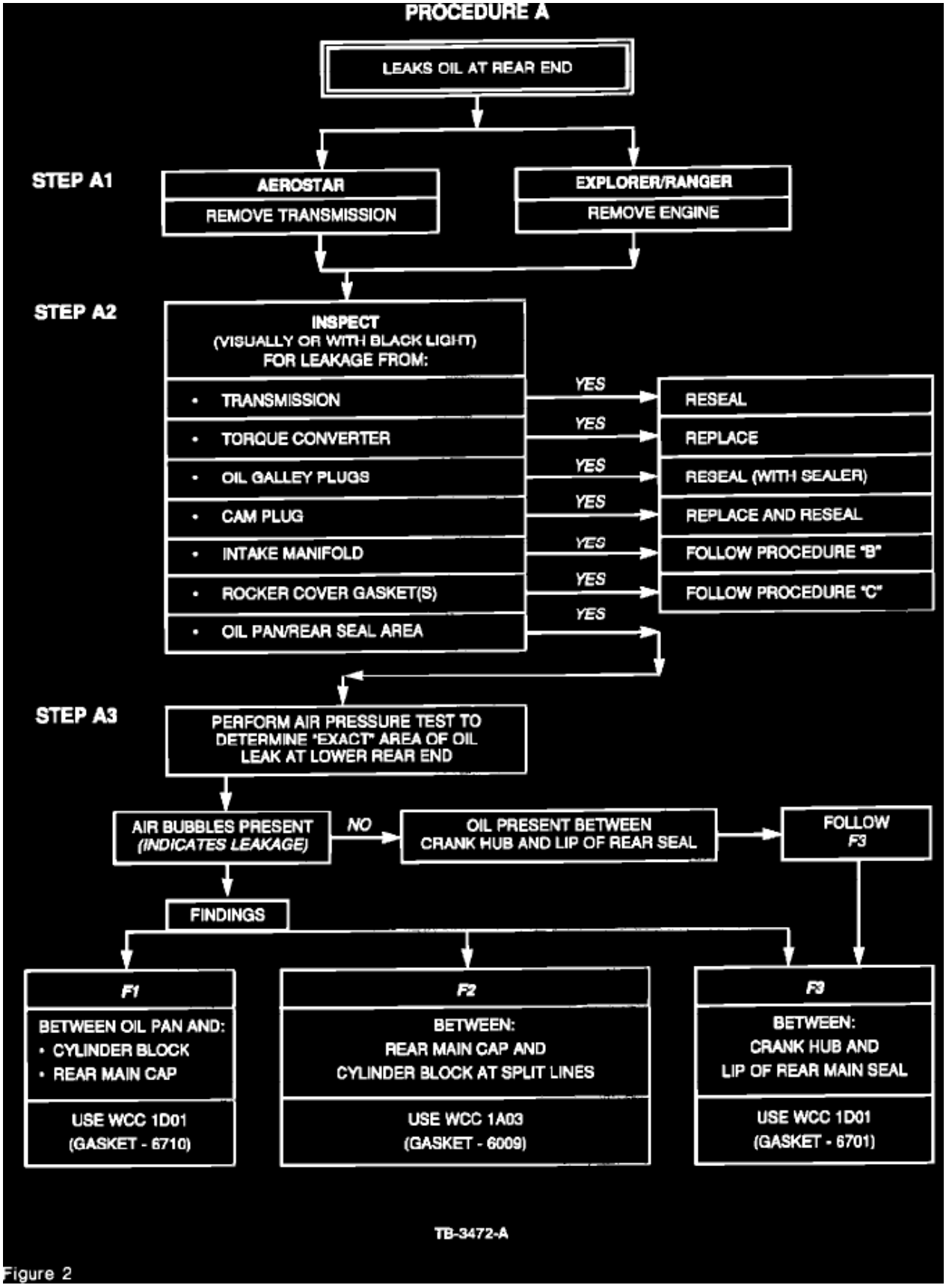

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

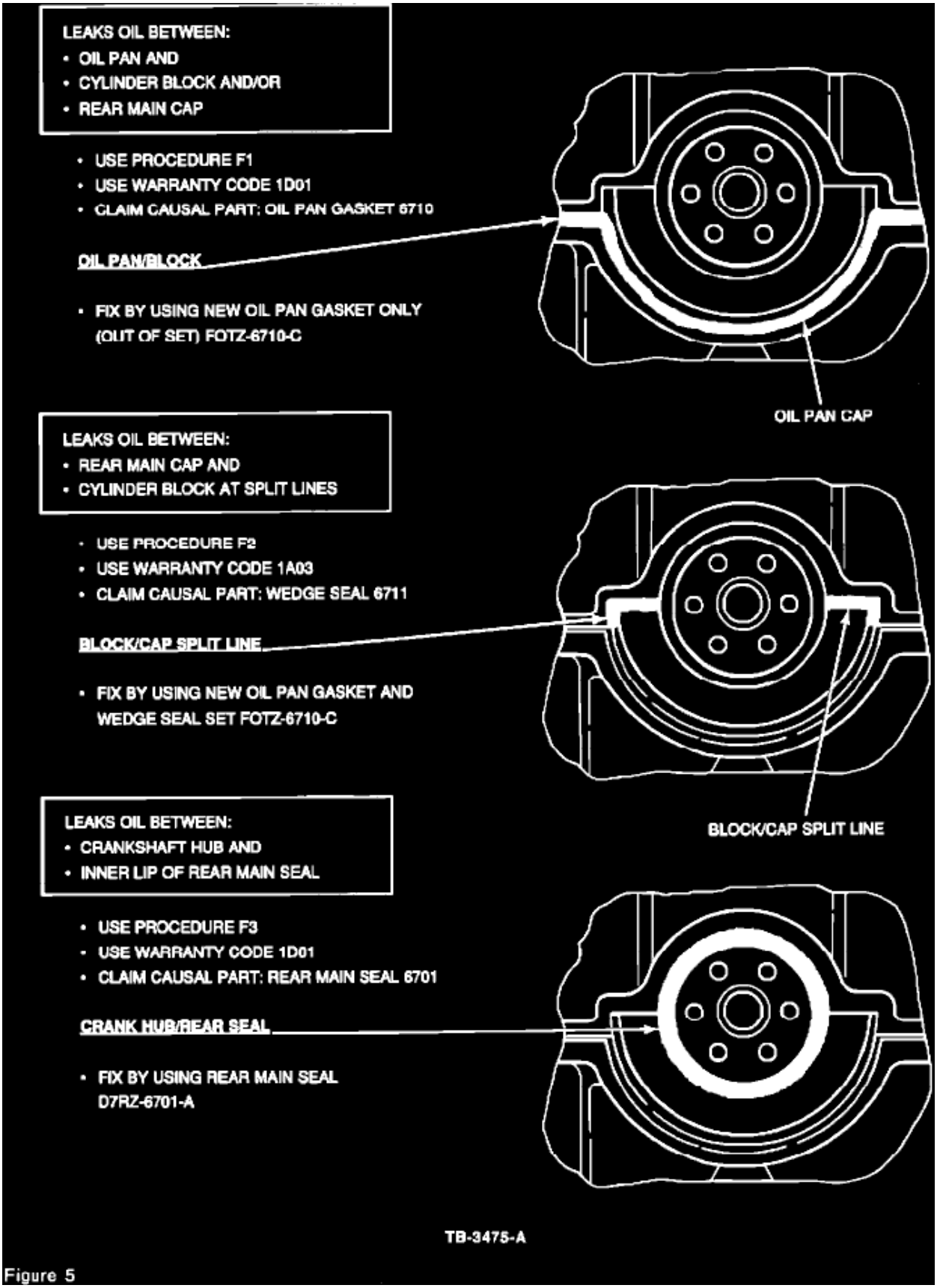


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

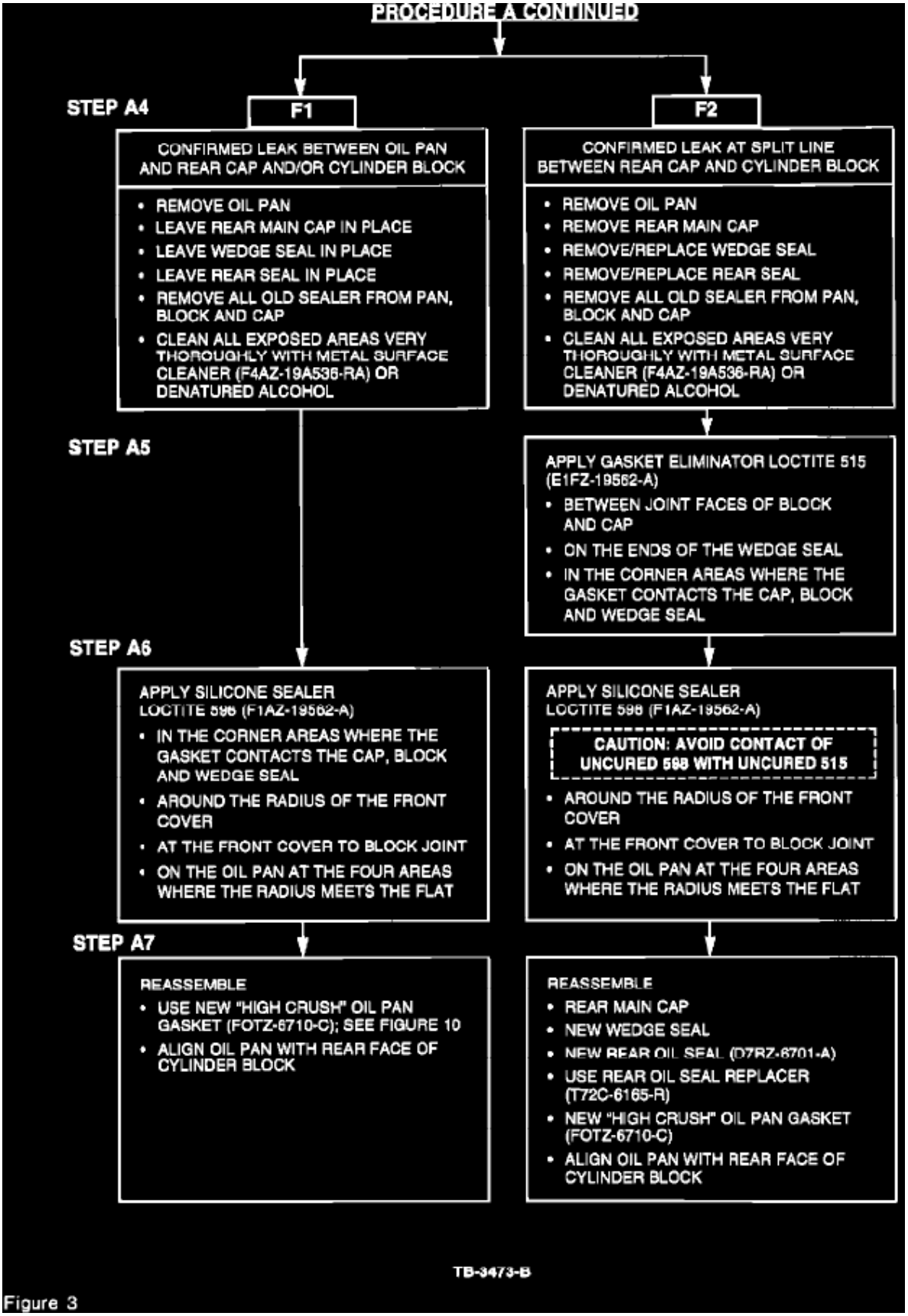
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

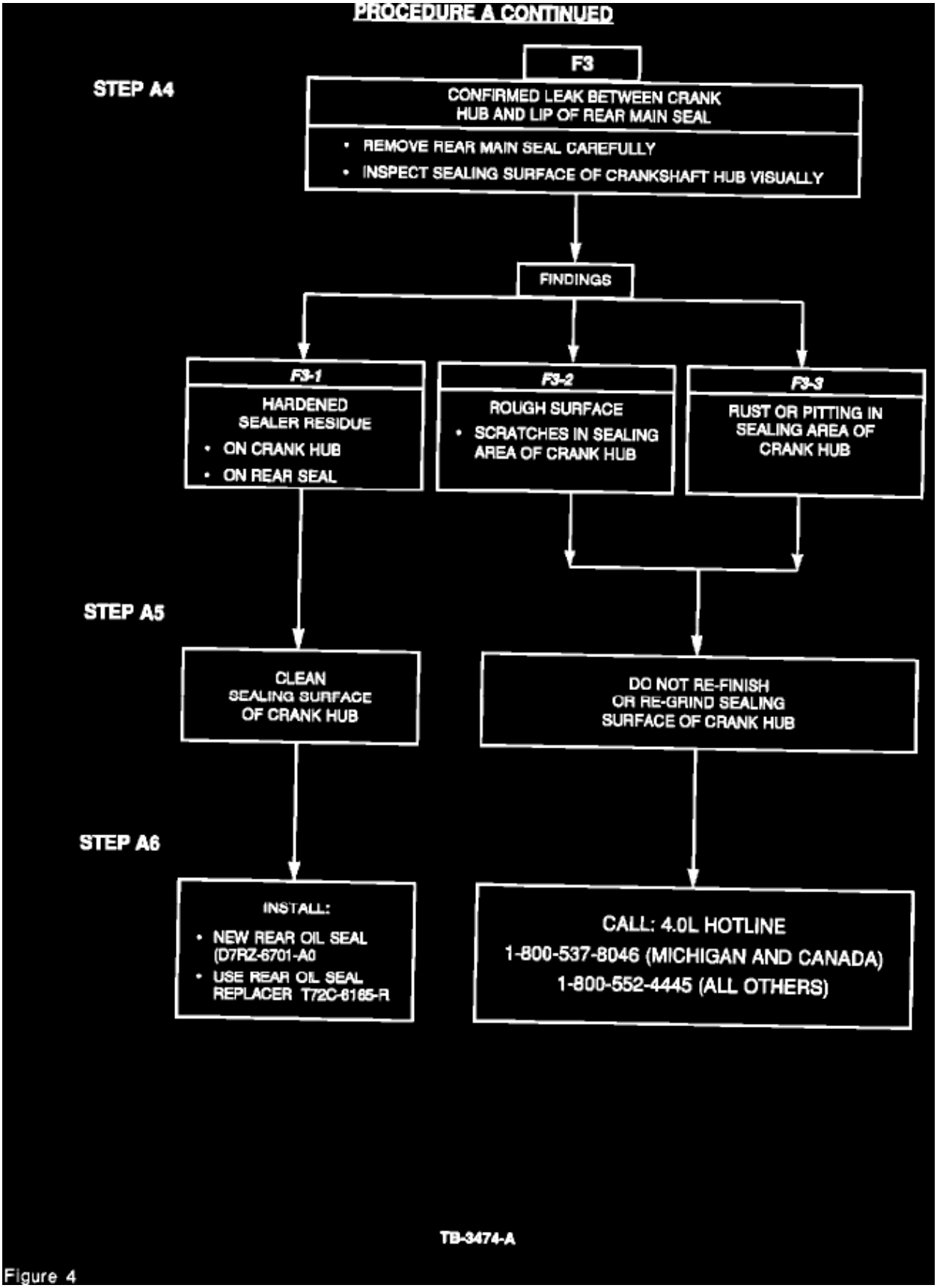


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

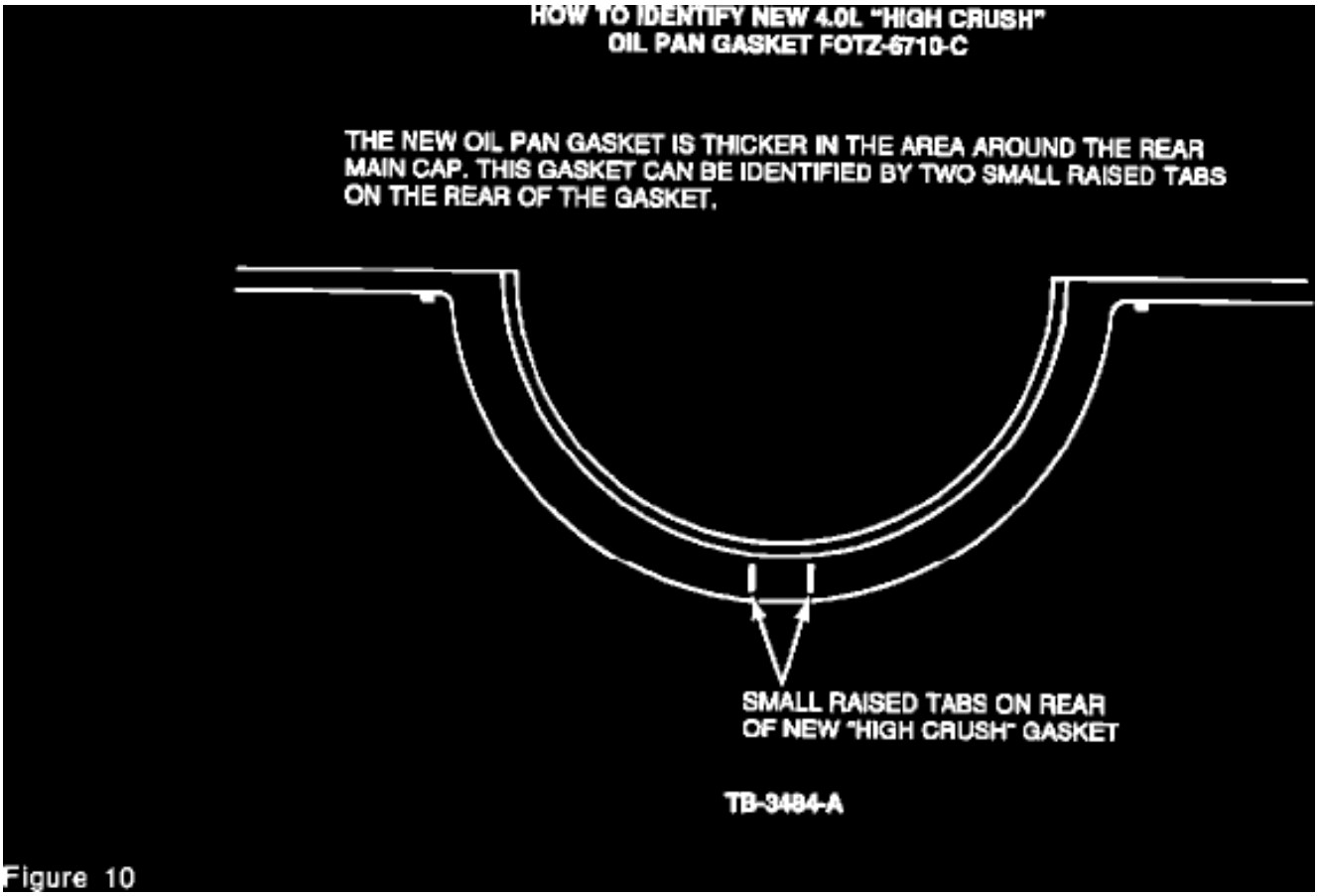


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

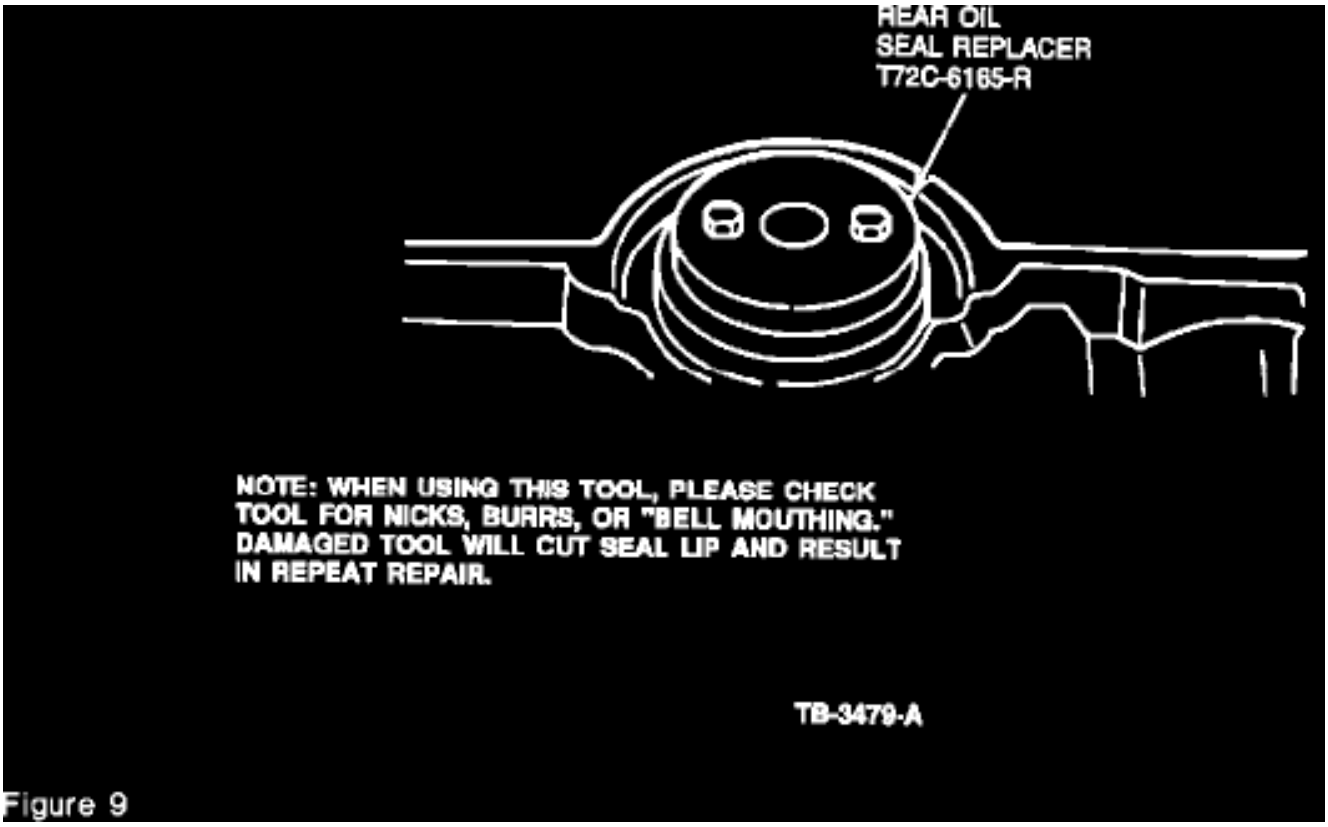


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

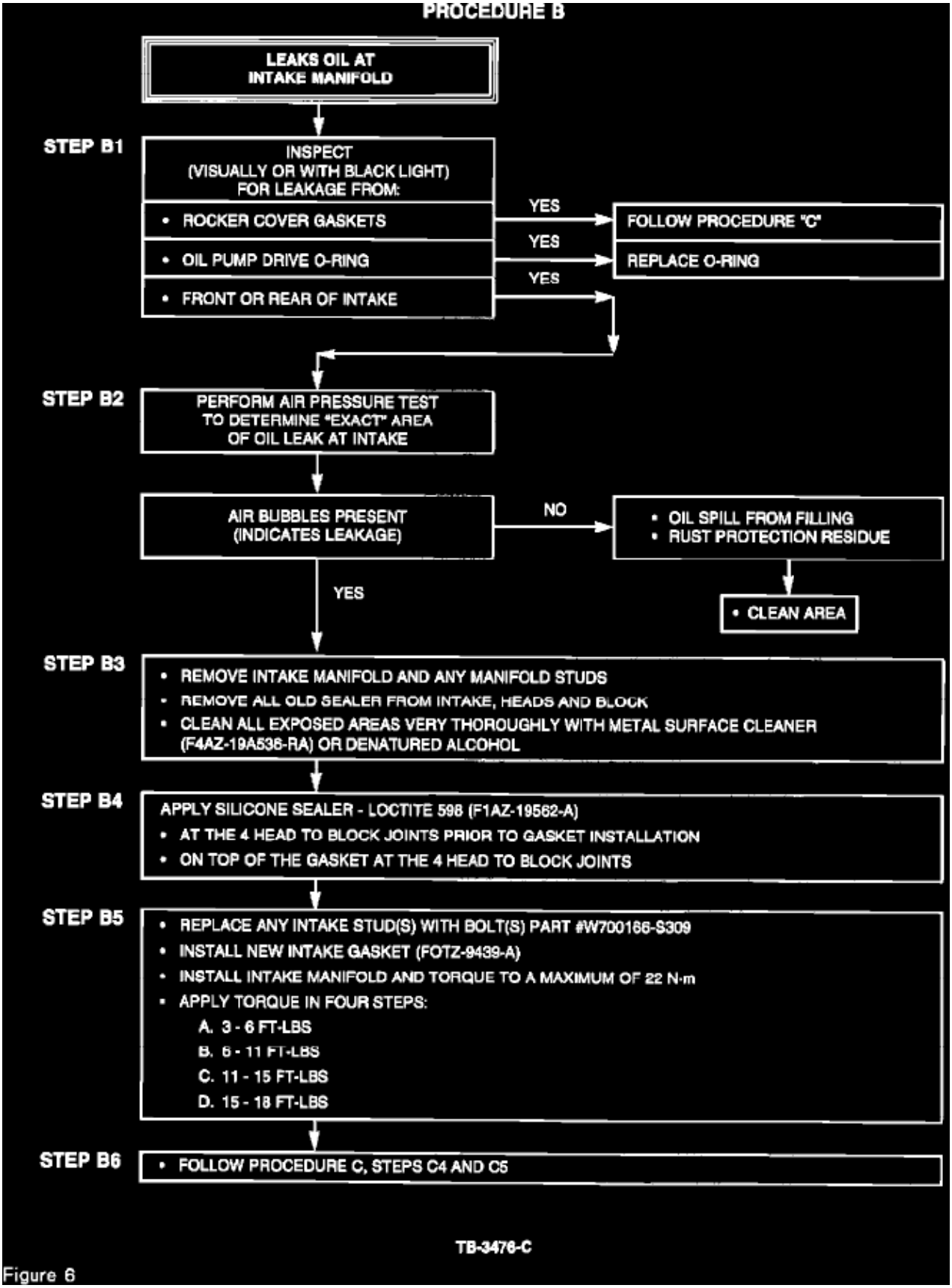


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

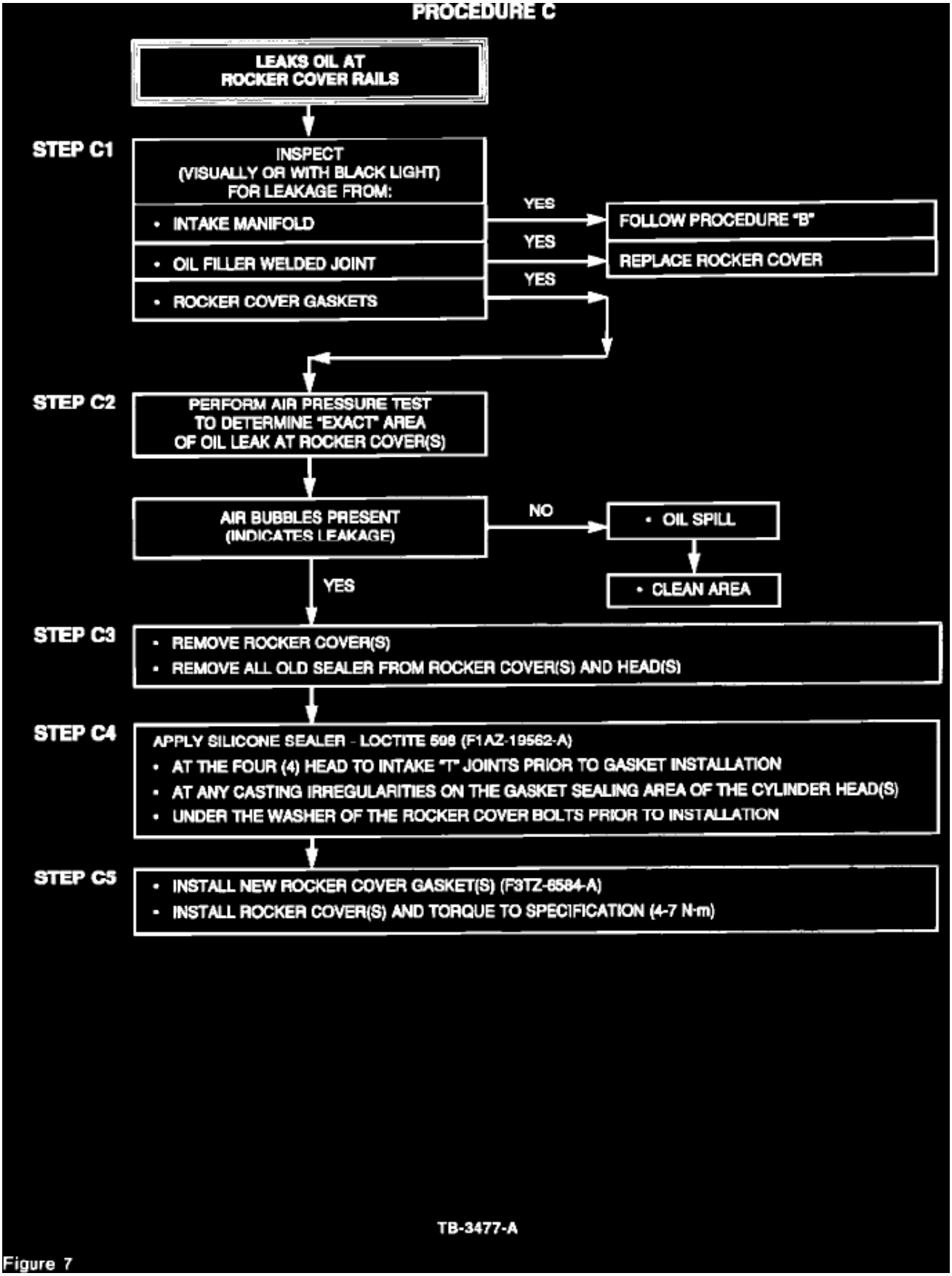


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

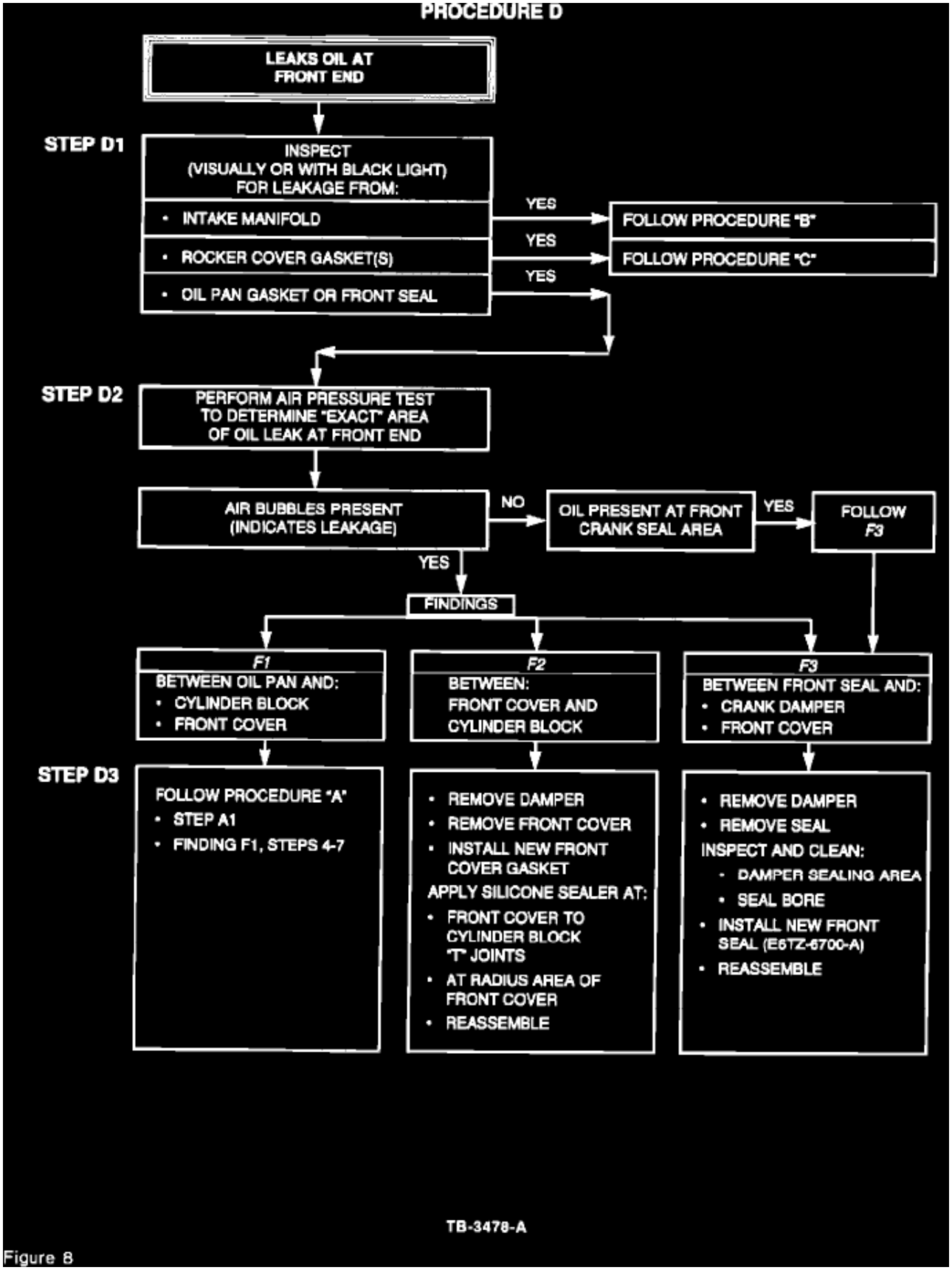


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

Crankshaft Main Bearing Seal: All Technical Service Bulletins Rear Main Oil Seal Replacement - Service Tip

Article No. 95-1-8

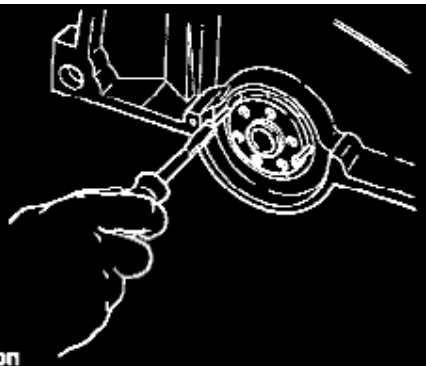
01/16/95

^ LEAK - REAR MAIN OIL SEAL REPLACEMENT - VEHICLES WITH 4.0L ENGINES - SERVICE TIP

^ REAR MAIN SEAL - 4.0L - NEW INSTALLATION TOOL

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: A redesigned tool for installation of rear main seals is available and must be used for all rear main seal replacements. Prior released tools (T72C-6165) and (T72C-6165-R) must not be used. Usage of obsolete tools may cause oil leaks due to seal damage, crankshaft journal damage or mispositioning of the seal.



Installation

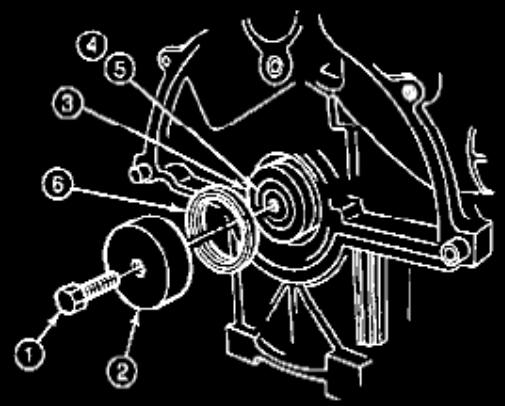
Crankshaft rear oil seals used for service applications can come either with or without a metallic crankshaft sleeve. Special Service Tool T95T-6701-A, Rear Crankshaft Seal Replacer, is used for both applications.

The rear crankshaft seal adapter and two (2) mounting screws attach to the crankshaft. The threaded hole in the center of the crankshaft seal adapter is used by the rear crankshaft seal replacer to draw down and locate the crankshaft rear oil seal.

The rear crankshaft seal protector is used for installing seals without a metallic sleeve. It is not used when installing a rear main oil seal with a sleeve.

CAUTION: Do not remove the metal sleeve from the seal.

CAUTION: This installation procedure requires the used of hand tools only. The used of power tools or hammering on the installer can damage the sleeve and seal.



Item	Part Number	Description
1	—	Bolt (Part of T95T-6701-A)
2	T95T-6701-A2	Rear Crankshaft Seal Replacer
3	T95T-6701-A1	Rear Crankshaft Seal Protector
4	T95T-6701-A4	Bolts
5	T95T-6701-A3	Rear Crankshaft Adapter
6	6701	Crankshaft Rear Oil Seal

Seal Installation With Metal Sleeve

1. Attach the rear crankshaft adapter to the rear of the crankshaft using the supplied mounting screws.
2. Apply a few drops of clean engine oil to the inboard side of the seal/sleeve at the area where the seal contacts the sleeve.
3. Apply a very light film of clean engine oil on the inner diameter of the sleeve and outer diameter of seal.
4. Slide the seal/sleeve over the rear crankshaft seal adapter with flange to the rear of the engine.
5. **NOTE: It is normal for the seal to sit approximately 0.76mm (0.030 inch) deeper than the sleeve flange. DO NOT ADJUST.**

   Use the rear crankshaft seal replacer and supplied bolt to push the rear seal into the cylinder block.

   Remove rear crankshaft seal adapter.

TB-4149-A

Figure 1

ACTION: If an oil leak is detected, refer to TSB 94-12-13 for proper diagnosis of the oil leak. If, after diagnosis, it is determined that a new rear main seal needs to be installed, use the procedure

found in TSB 94-12-13. Be sure to use the new Rear Oil Seal Replacer Tool (T95T-6701-A) when installing a new rear main seal. Refer to Figure 1 for more details.

OTHER APPLICABLE ARTICLES: 94-12-13 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 401000, 499000

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

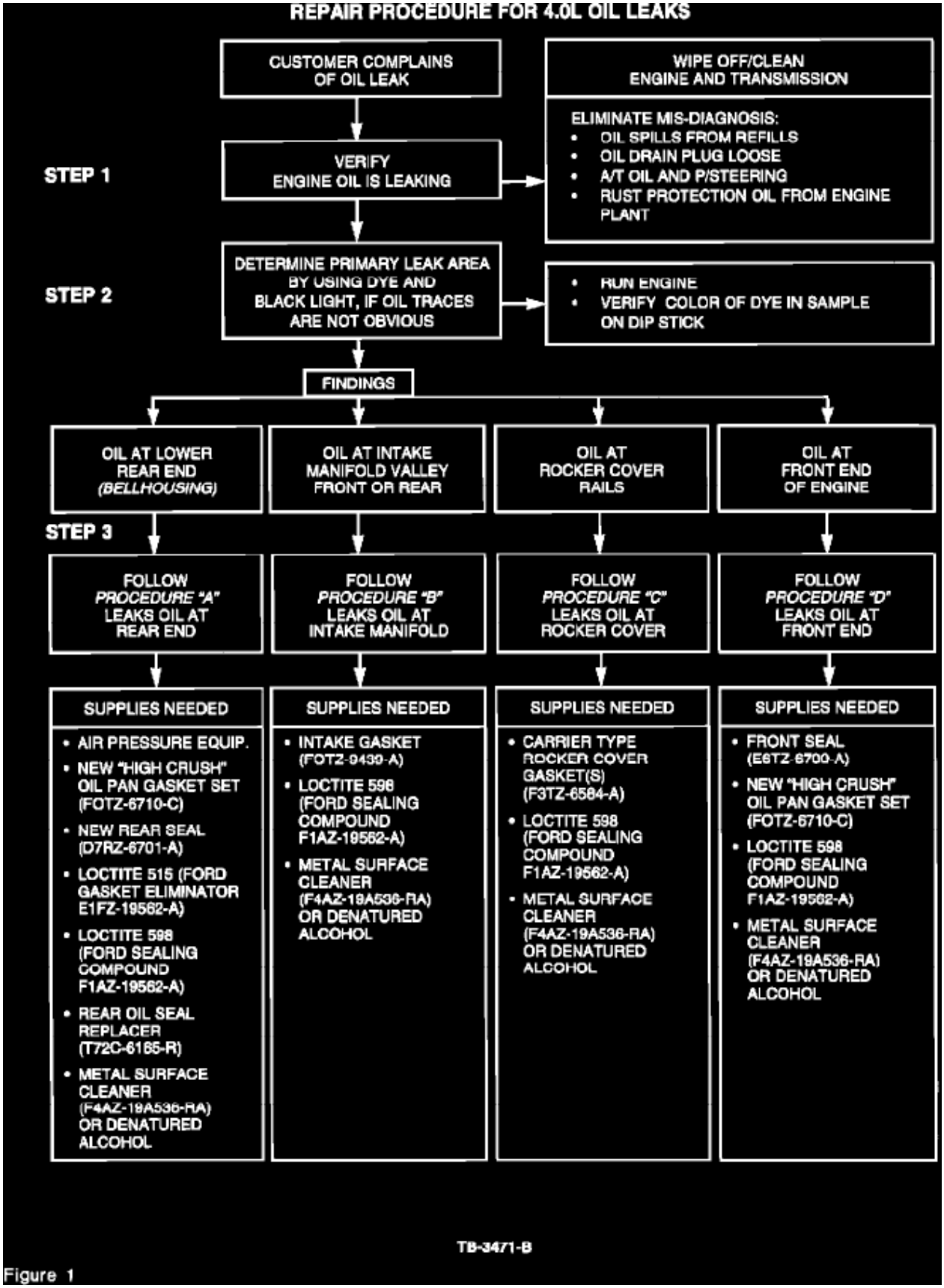


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

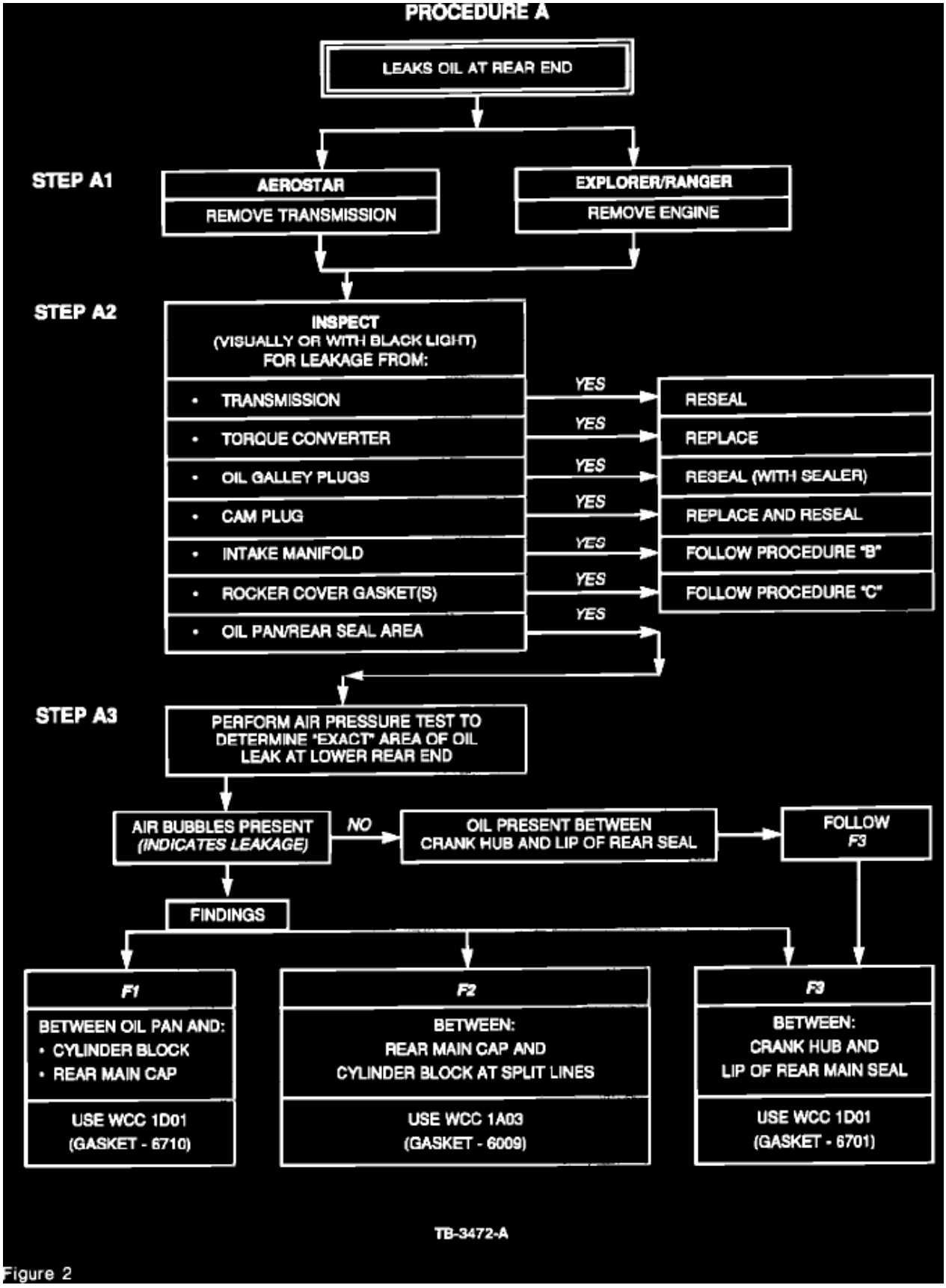

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

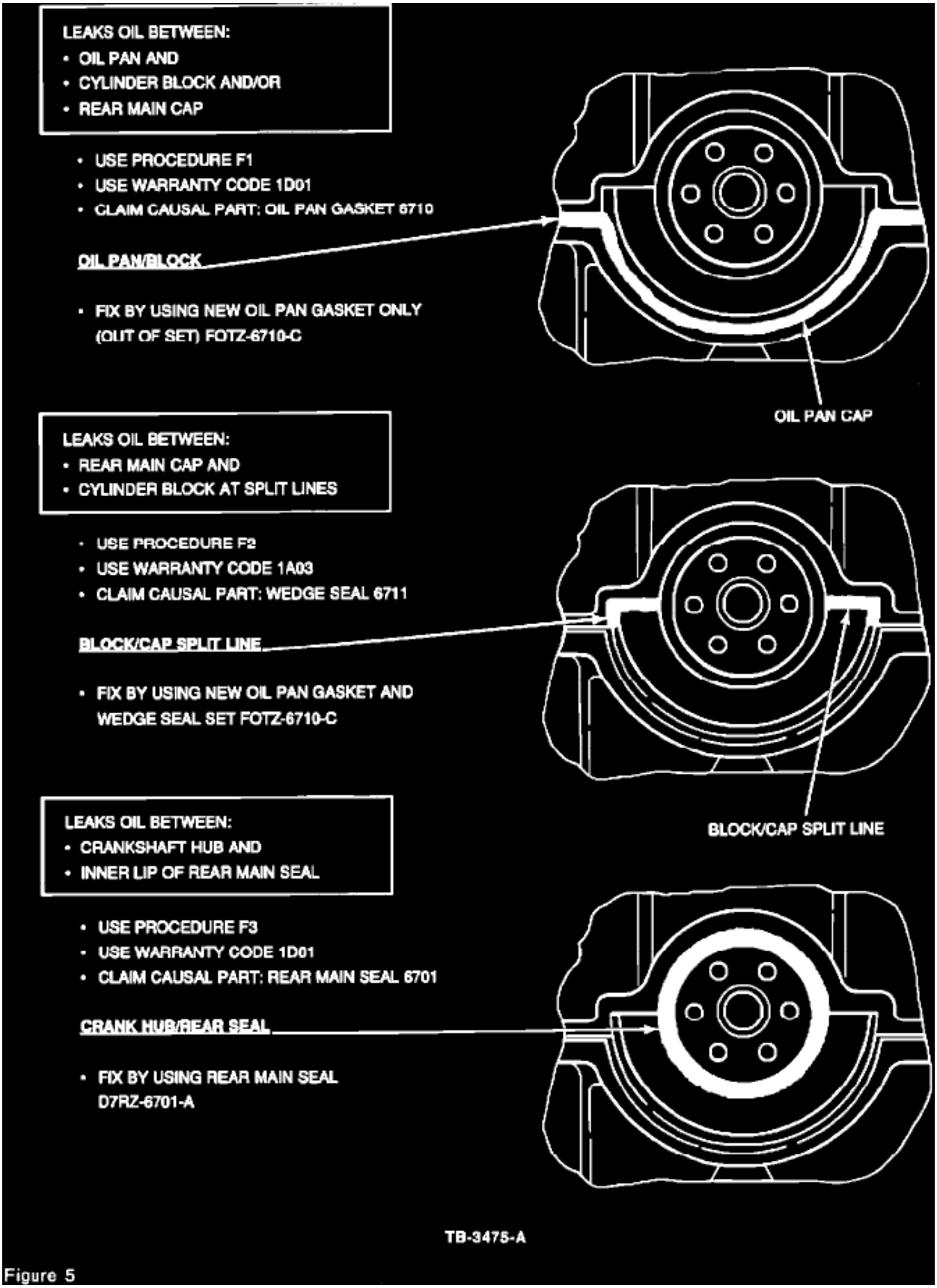


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

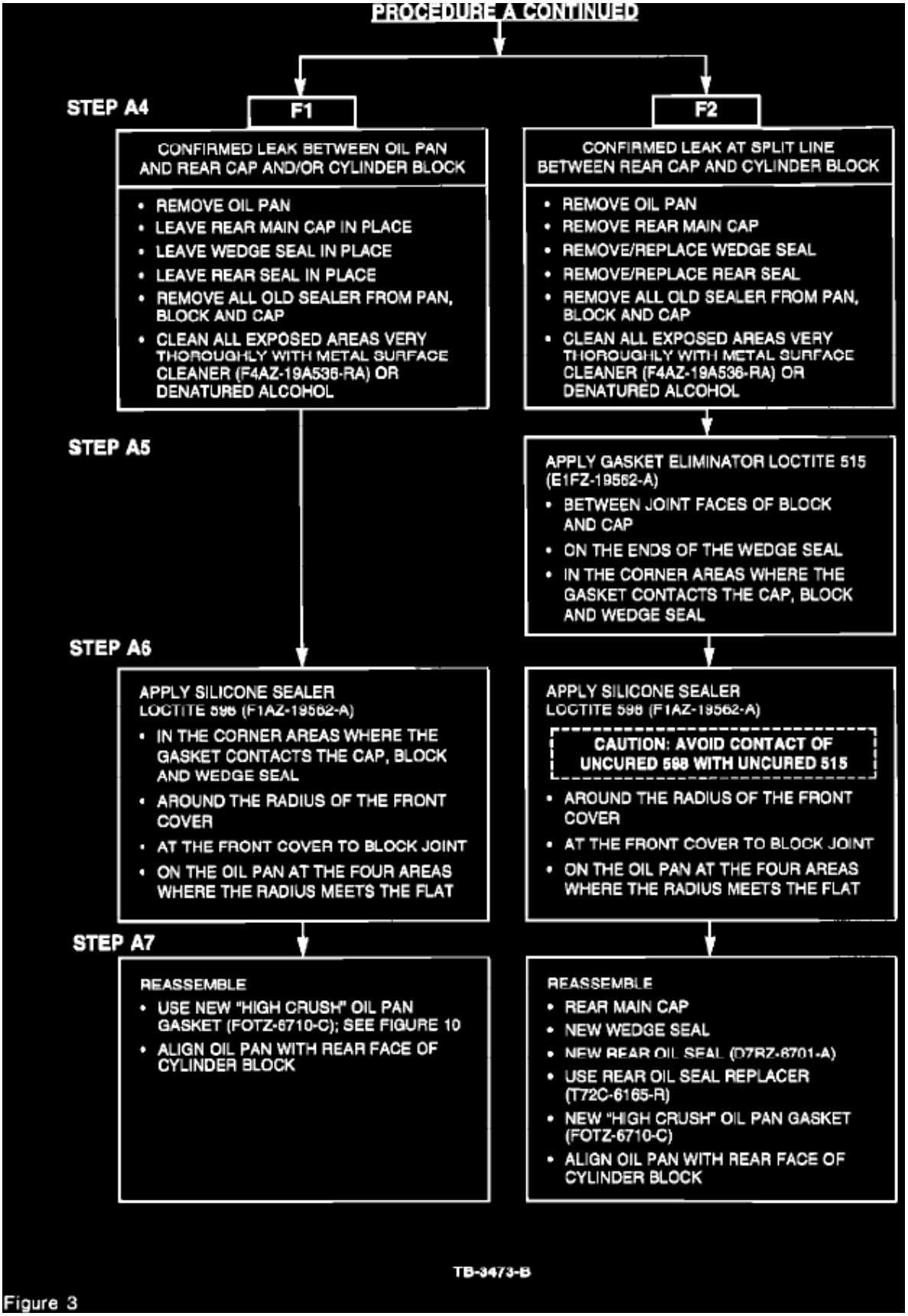
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

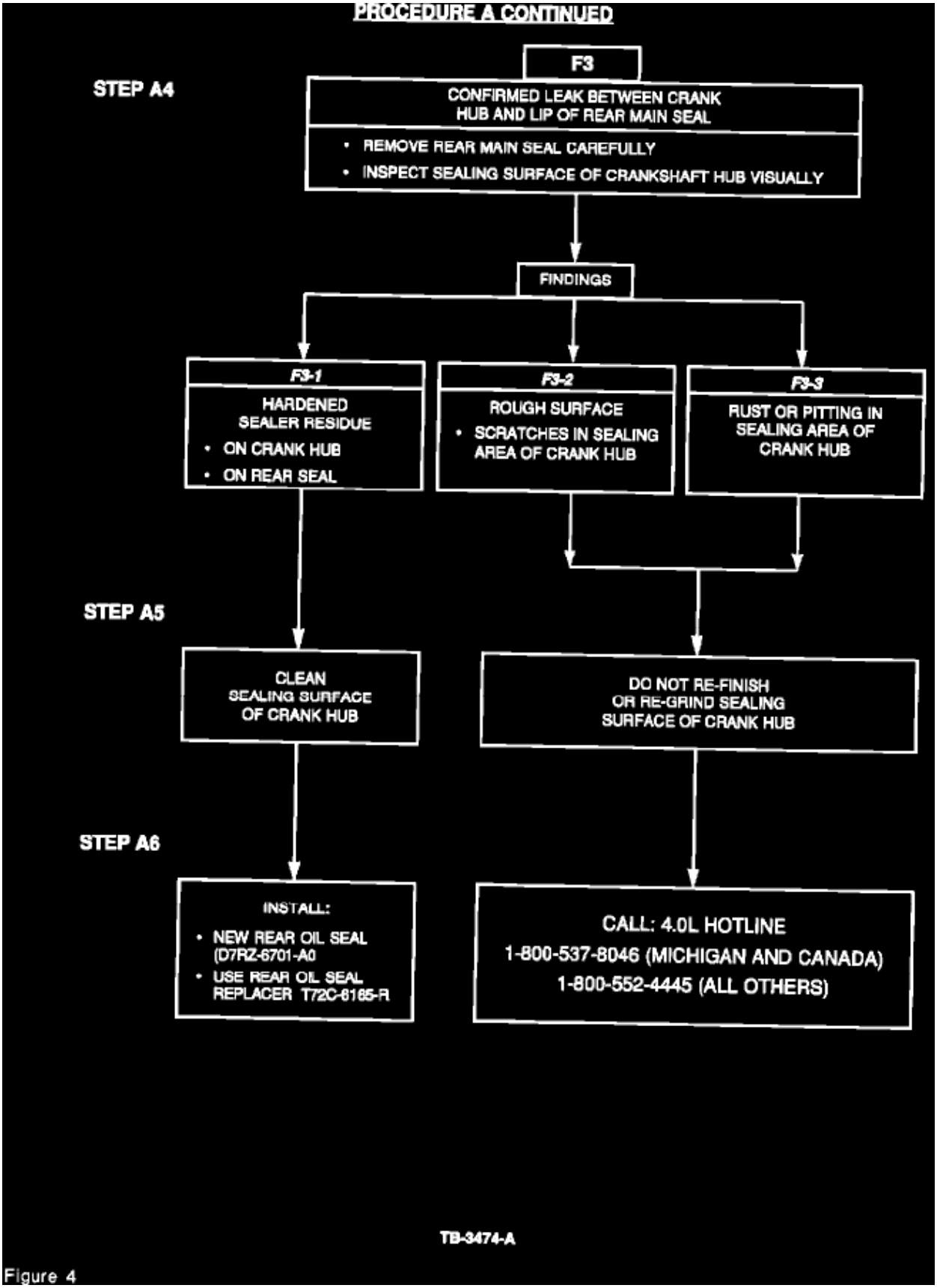


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

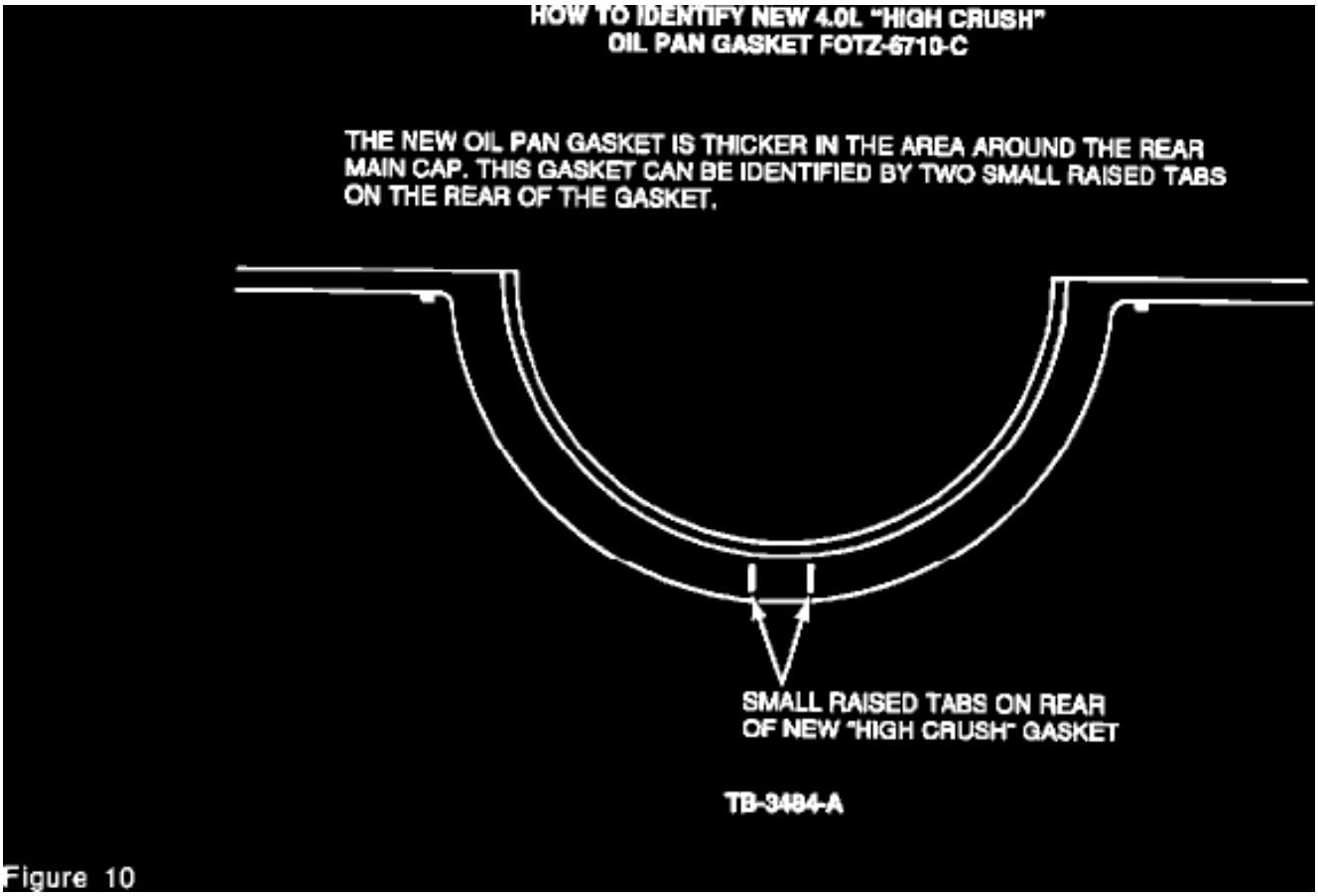


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

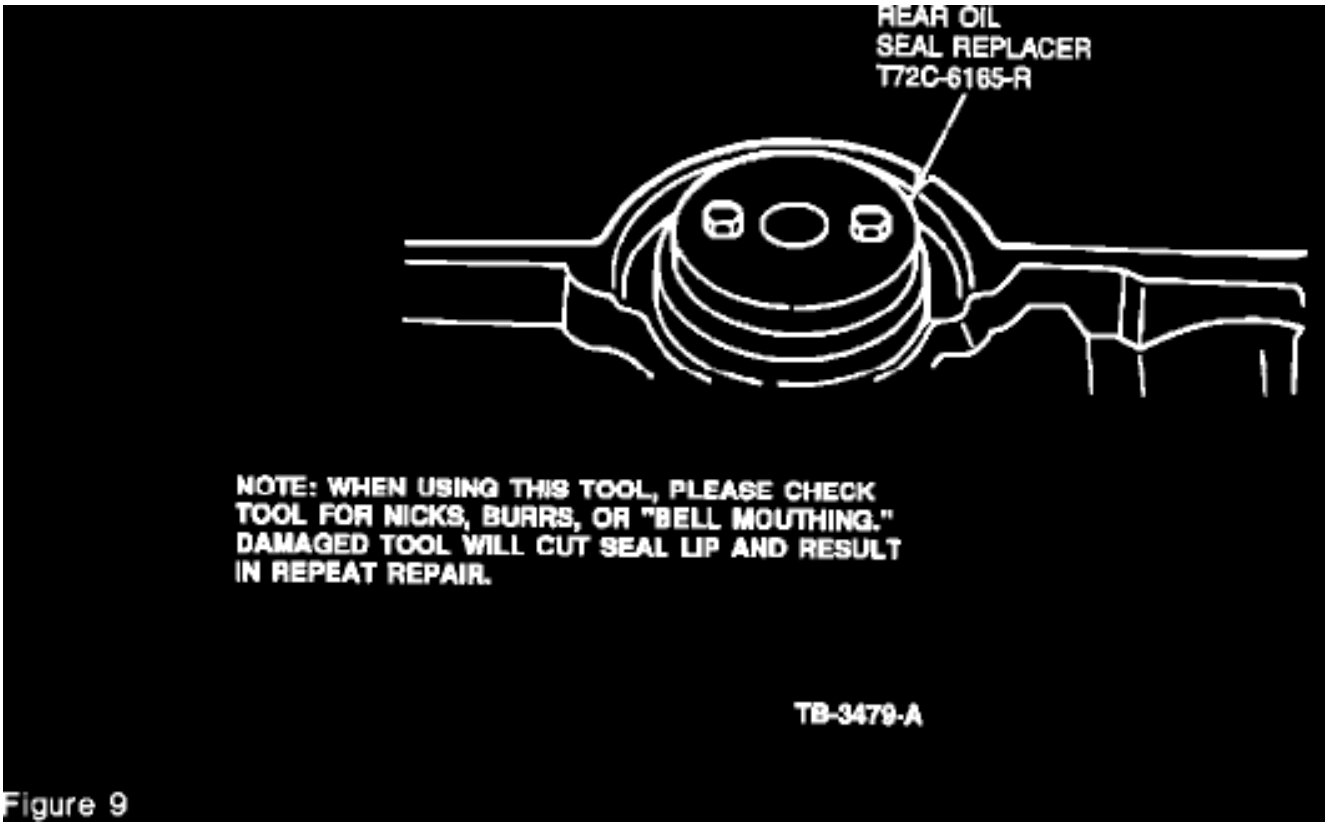


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

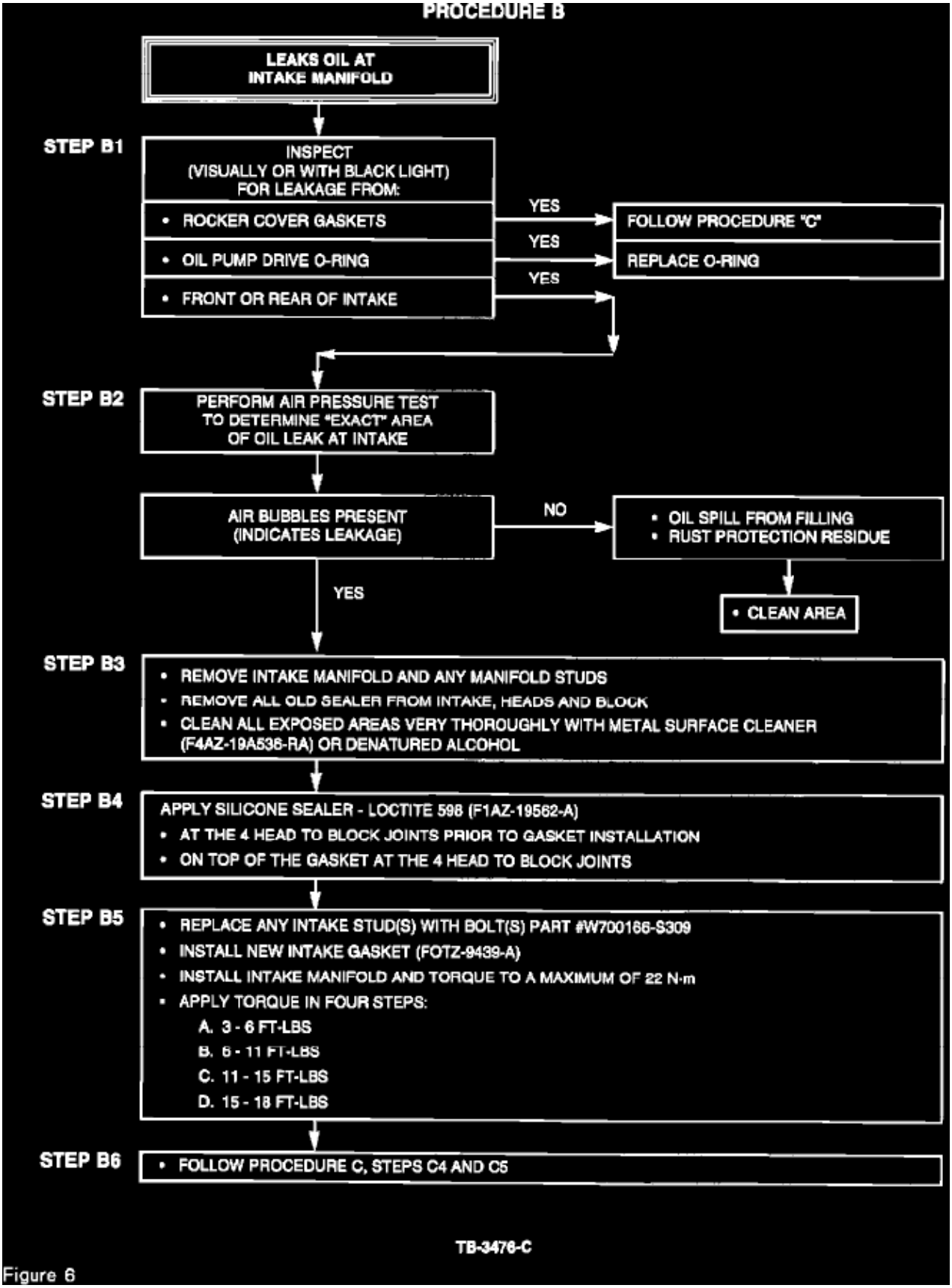


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

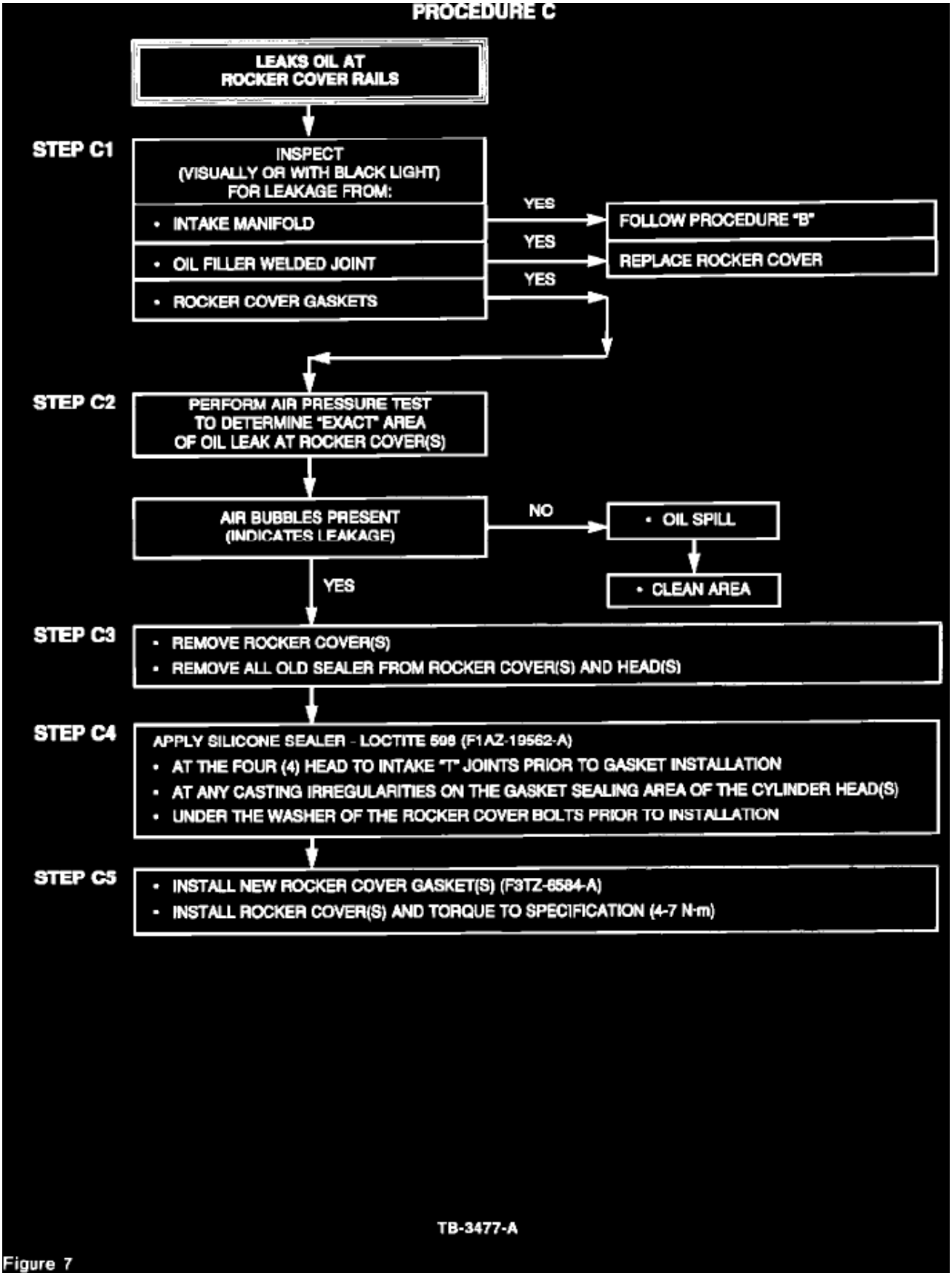


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

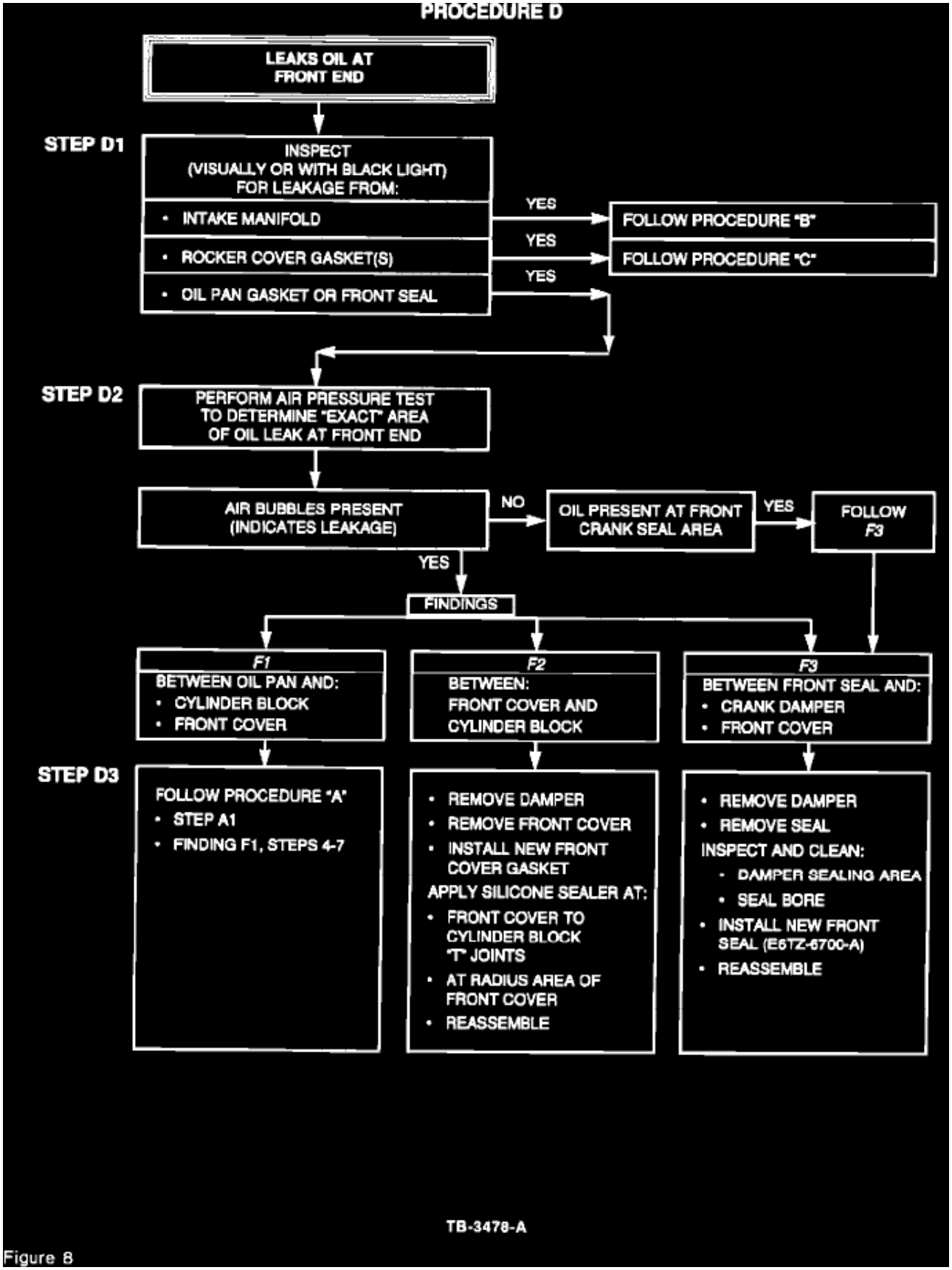


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

Crankshaft Main Bearing Seal: All Technical Service Bulletins Rear Main Oil Seal Replacement - Service Tip

Article No. 95-1-8

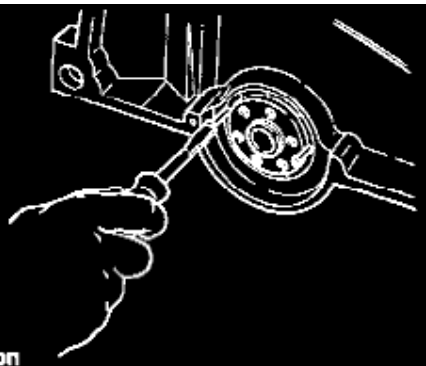
01/16/95

^ LEAK - REAR MAIN OIL SEAL REPLACEMENT - VEHICLES WITH 4.0L ENGINES - SERVICE TIP

^ REAR MAIN SEAL - 4.0L - NEW INSTALLATION TOOL

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: A redesigned tool for installation of rear main seals is available and must be used for all rear main seal replacements. Prior released tools (T72C-6165) and (T72C-6165-R) must not be used. Usage of obsolete tools may cause oil leaks due to seal damage, crankshaft journal damage or mispositioning of the seal.



Installation

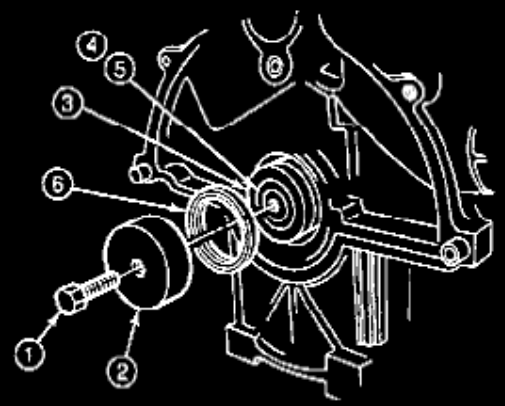
Crankshaft rear oil seals used for service applications can come either with or without a metallic crankshaft sleeve. Special Service Tool T95T-6701-A, Rear Crankshaft Seal Replacer, is used for both applications.

The rear crankshaft seal adapter and two (2) mounting screws attach to the crankshaft. The threaded hole in the center of the crankshaft seal adapter is used by the rear crankshaft seal replacer to draw down and locate the crankshaft rear oil seal.

The rear crankshaft seal protector is used for installing seals without a metallic sleeve. It is not used when installing a rear main oil seal with a sleeve.

CAUTION: Do not remove the metal sleeve from the seal.

CAUTION: This installation procedure requires the used of hand tools only. The used of power tools or hammering on the installer can damage the sleeve and seal.



Item	Part Number	Description
1	—	Bolt (Part of T95T-6701-A)
2	T95T-6701-A2	Rear Crankshaft Seal Replacer
3	T95T-6701-A1	Rear Crankshaft Seal Protector
4	T95T-6701-A4	Bolts
5	T95T-6701-A3	Rear Crankshaft Adapter
6	6701	Crankshaft Rear Oil Seal

Seal Installation With Metal Sleeve

1. Attach the rear crankshaft adapter to the rear of the crankshaft using the supplied mounting screws.
2. Apply a few drops of clean engine oil to the inboard side of the seal/sleeve at the area where the seal contacts the sleeve.
3. Apply a very light film of clean engine oil on the inner diameter of the sleeve and outer diameter of seal.
4. Slide the seal/sleeve over the rear crankshaft seal adapter with flange to the rear of the engine.
5. **NOTE: It is normal for the seal to sit approximately 0.76mm (0.030 inch) deeper than the sleeve flange. DO NOT ADJUST.**

   Use the rear crankshaft seal replacer and supplied bolt to push the rear seal into the cylinder block.

   Remove rear crankshaft seal adapter.

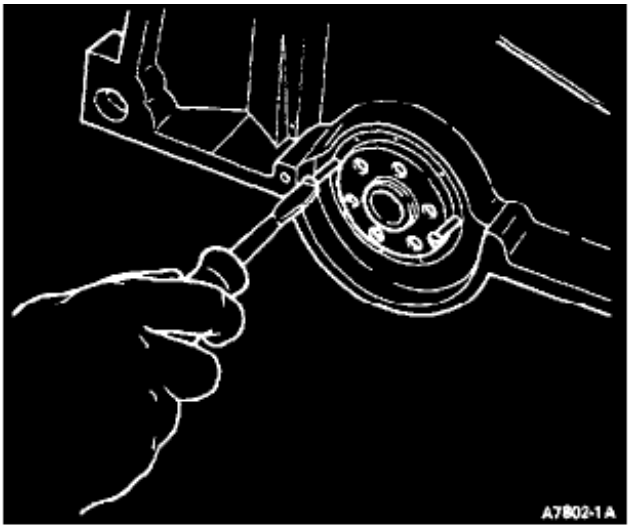
TB-4149-A

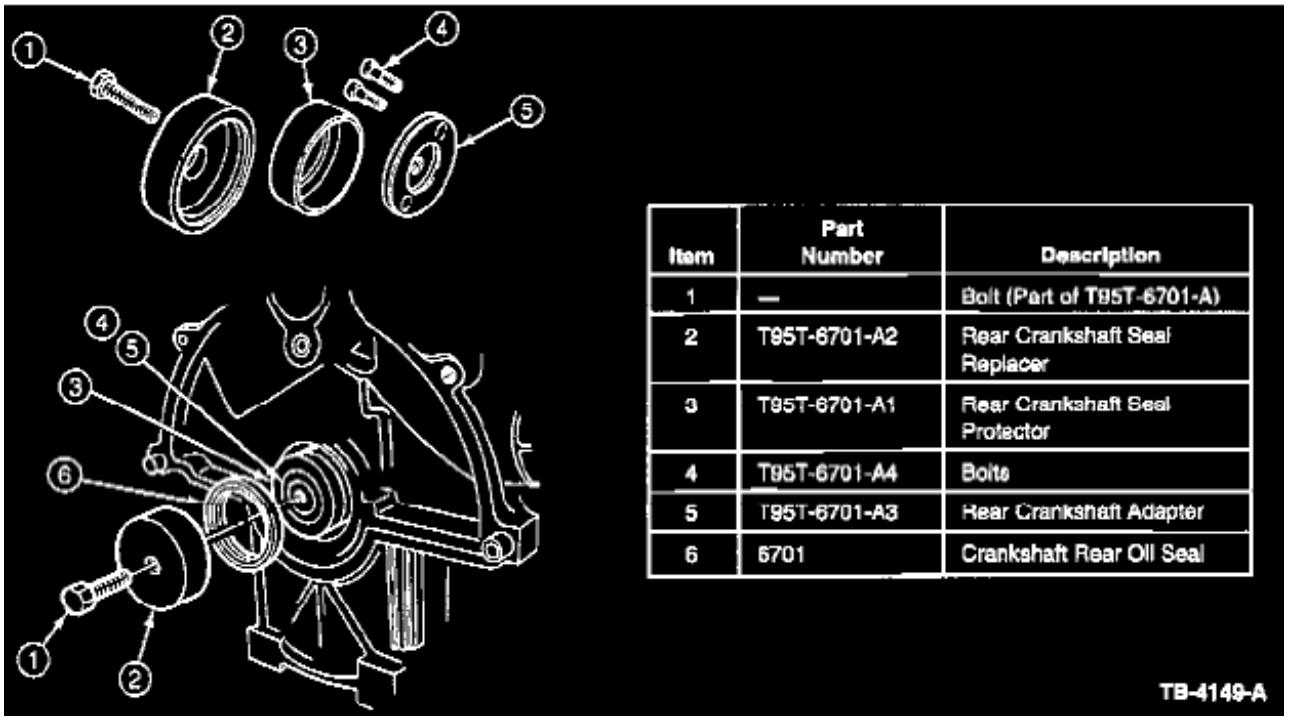
Figure 1

ACTION: If an oil leak is detected, refer to TSB 94-12-13 for proper diagnosis of the oil leak. If, after diagnosis, it is determined that a new rear main seal needs to be installed, use the procedure

found in TSB 94-12-13. Be sure to use the new Rear Oil Seal Replacer Tool (T95T-6701-A) when installing a new rear main seal. Refer to Figure 1 for more details.

OTHER APPLICABLE ARTICLES: 94-12-13 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 401000, 499000





Item	Part Number	Description
1	—	Bolt (Part of T95T-6701-A)
2	T95T-6701-A2	Rear Crankshaft Seal Replacer
3	T95T-6701-A1	Rear Crankshaft Seal Protector
4	T95T-6701-A4	Bolts
5	T95T-6701-A3	Rear Crankshaft Adapter
6	6701	Crankshaft Rear Oil Seal

Crankshaft Main Bearing Seal: Service and Repair

*** THIS ARTICLE REFLECTS CHANGES MADE BY TSB 9518 DATED JANUARY 16, 1995

REMOVAL

1. Remove the transmission. 2. Remove flywheel.

Rear Main Seal Removal

3. Use an awl to punch two holes in the crankshaft rear oil seal. Punch the holes on opposite sides of the crankshaft and just above the bearing

cap-to-cylinder block split line. Install a sheet metal screw in each hole. Use two large screwdrivers or small pry bars and pry against both screws at the same time to remove the crankshaft rear oil seal. It may be necessary to place small blocks of wood against the cylinder block to provide a fulcrum point for the pry bars. Use caution throughout this procedure to avoid scratching or otherwise damaging the crankshaft oil seal surface.

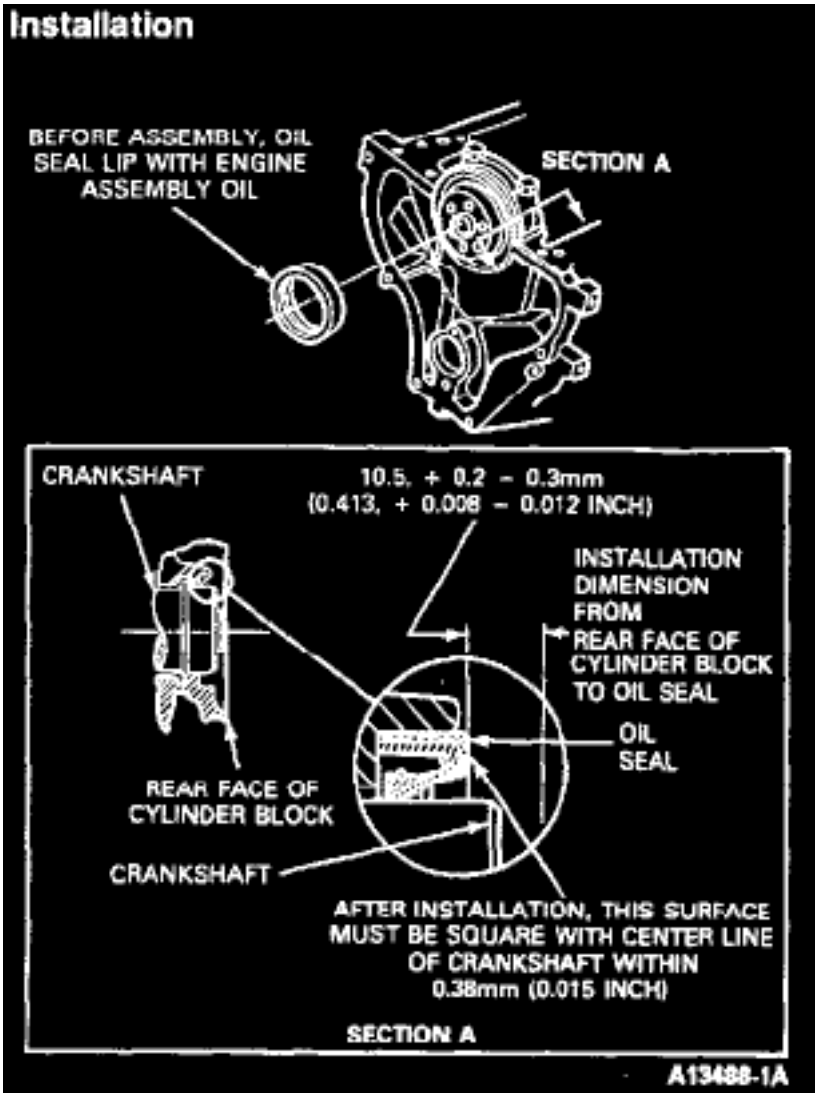
4. Clean the oil seal recess in the cylinder block and main bearing cap. Inspect and clean the oil seal contact surface on the crankshaft.

INSTALLATION

CAUTION: This installation procedure requires the use of hand tools only. The use of power tools or hammering on the installer can damage the sleeve and seal.

Rear Main Seal Installation Tool

1. Attach the rear crankshaft adapter to the rear of the crankshaft using the supplied mounting screws.



Rear Main Oil Seal Installation

2. Apply a few drops of clean engine oil to the inboard side of the seal/sleeve at the area where the seal contacts the sleeve. 3. Apply a very light film of clean engine oil on the inner diameter of the sleeve and outer diameter of seal. 4. Slide the seal/sleeve over the rear crankshaft seal adapter with flange to the rear of the engine.

NOTE: It is normal for the seal to sit approximately 0.76 mm (0.030 inch) deeper than the sleeve flange. Do not adjust.

5. Use the rear crankshaft seal replacer and supplied bolt to push the rear seal into the cylinder block. 6. Remove the rear crankshaft seal adapter. 7. Install flywheel. Tighten flywheel bolts in two stages.

a. First stage - 12-15 Nm (9-11 ft lb) b. Second stage - 68-74 Nm (50-55 ft lb)

8. Install transmission.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

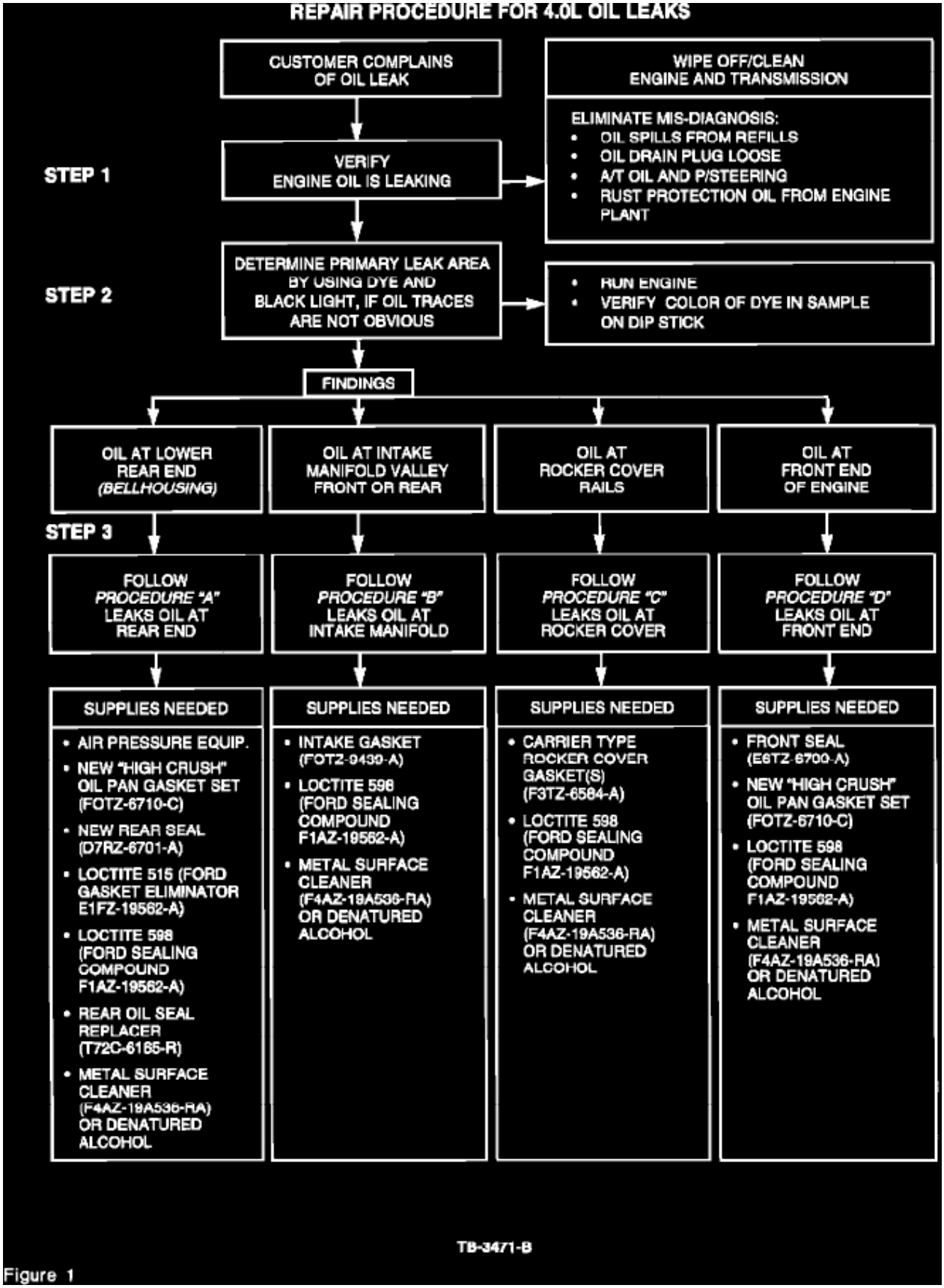


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

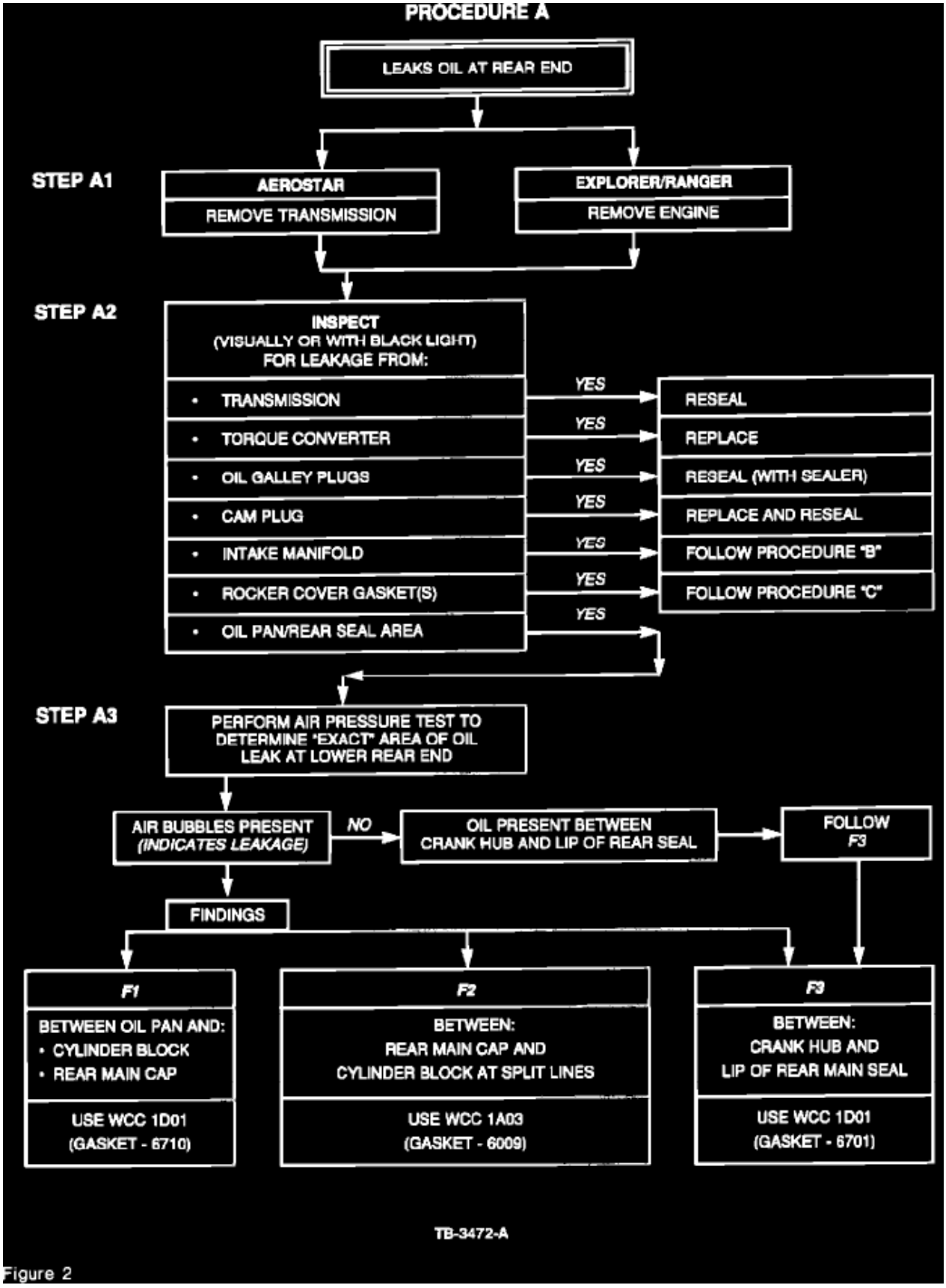

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

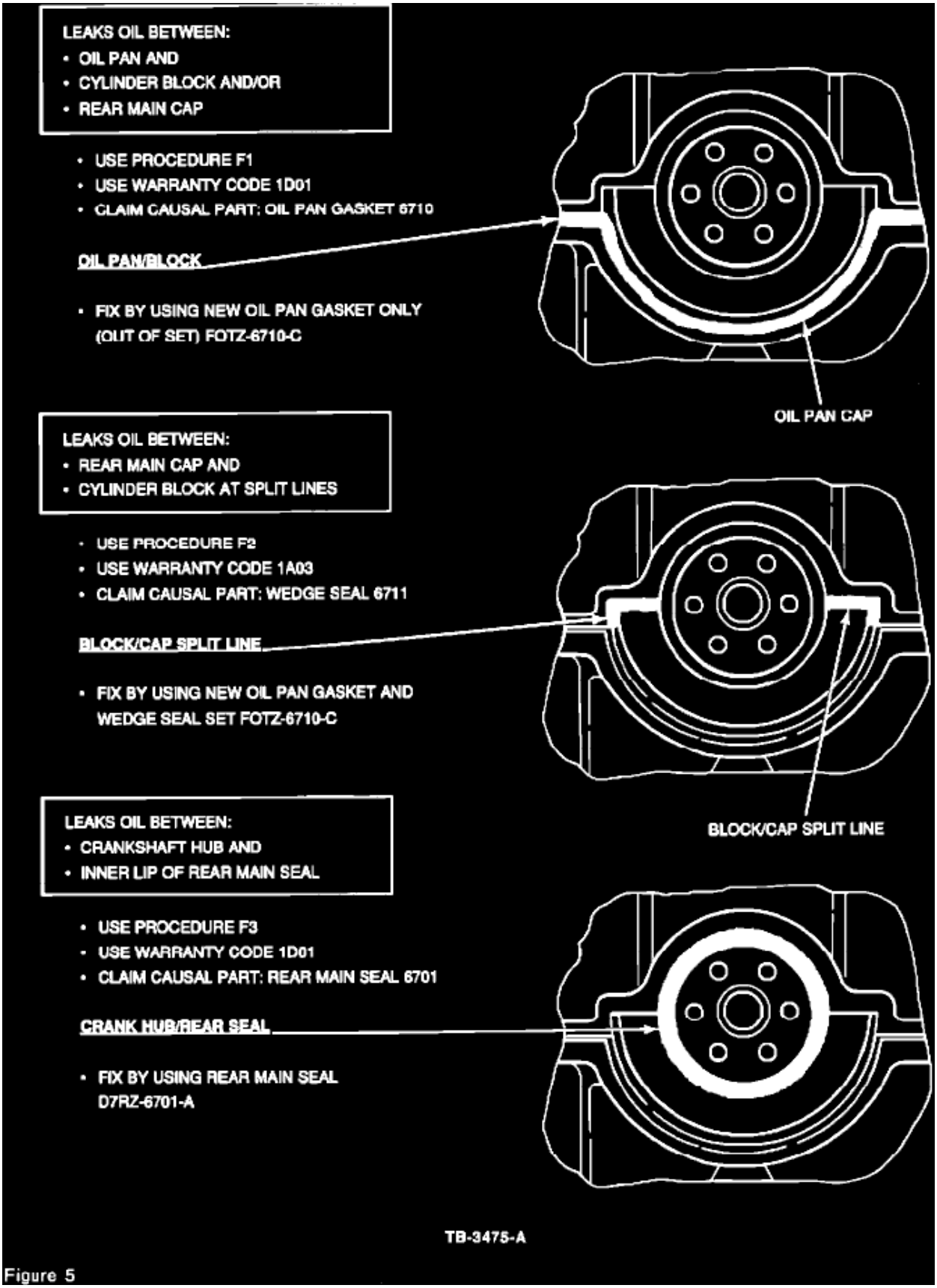


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

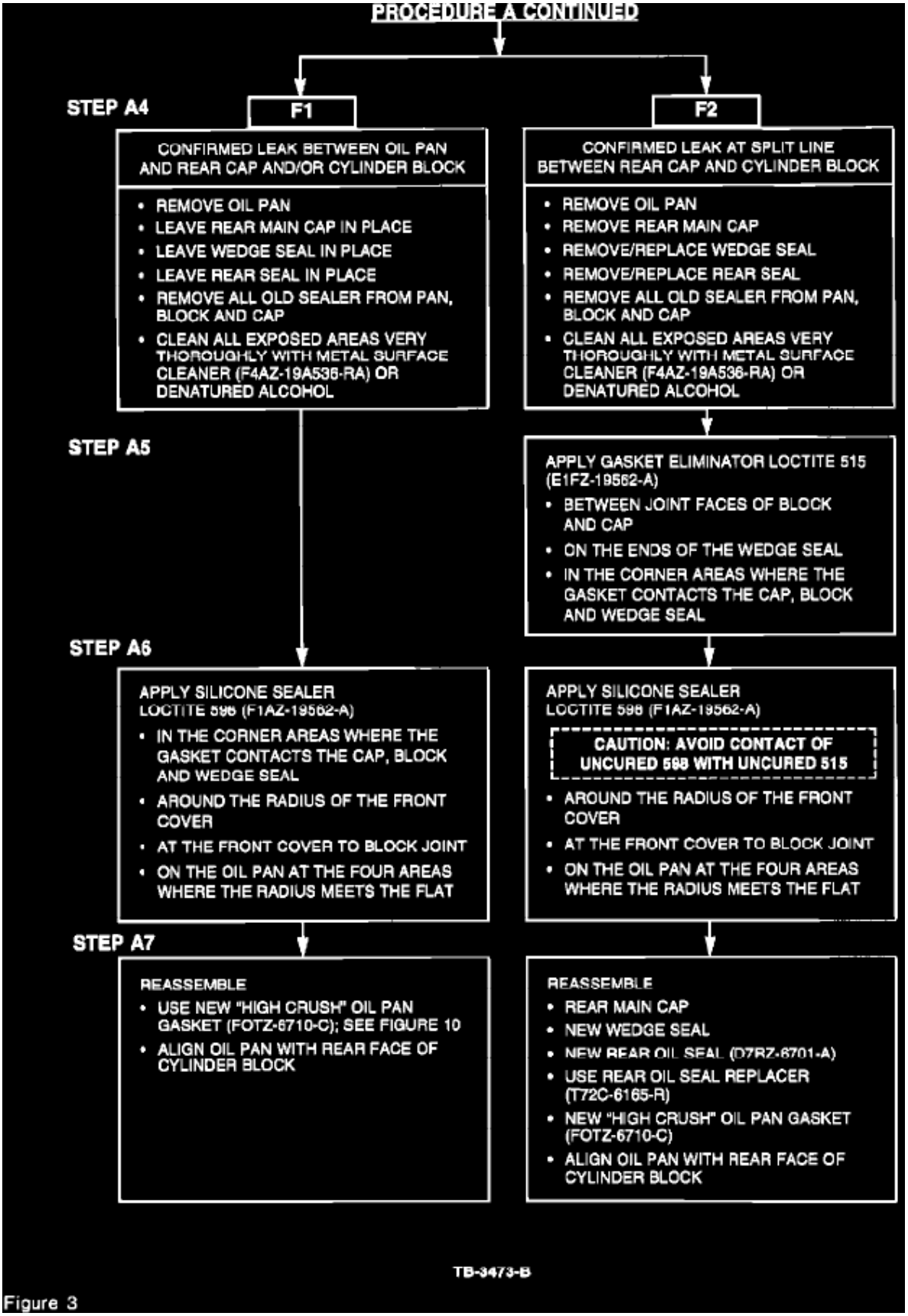
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

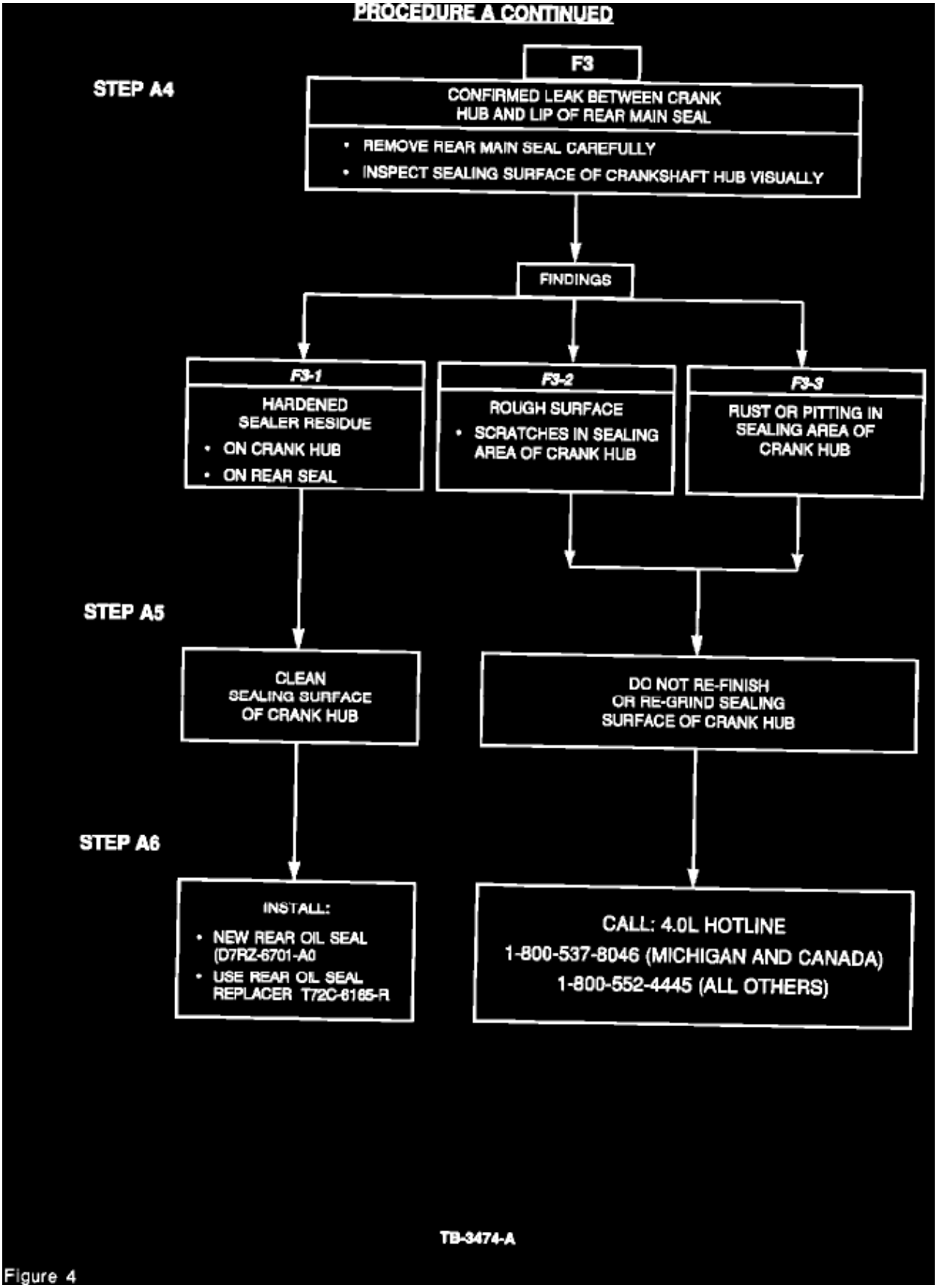


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

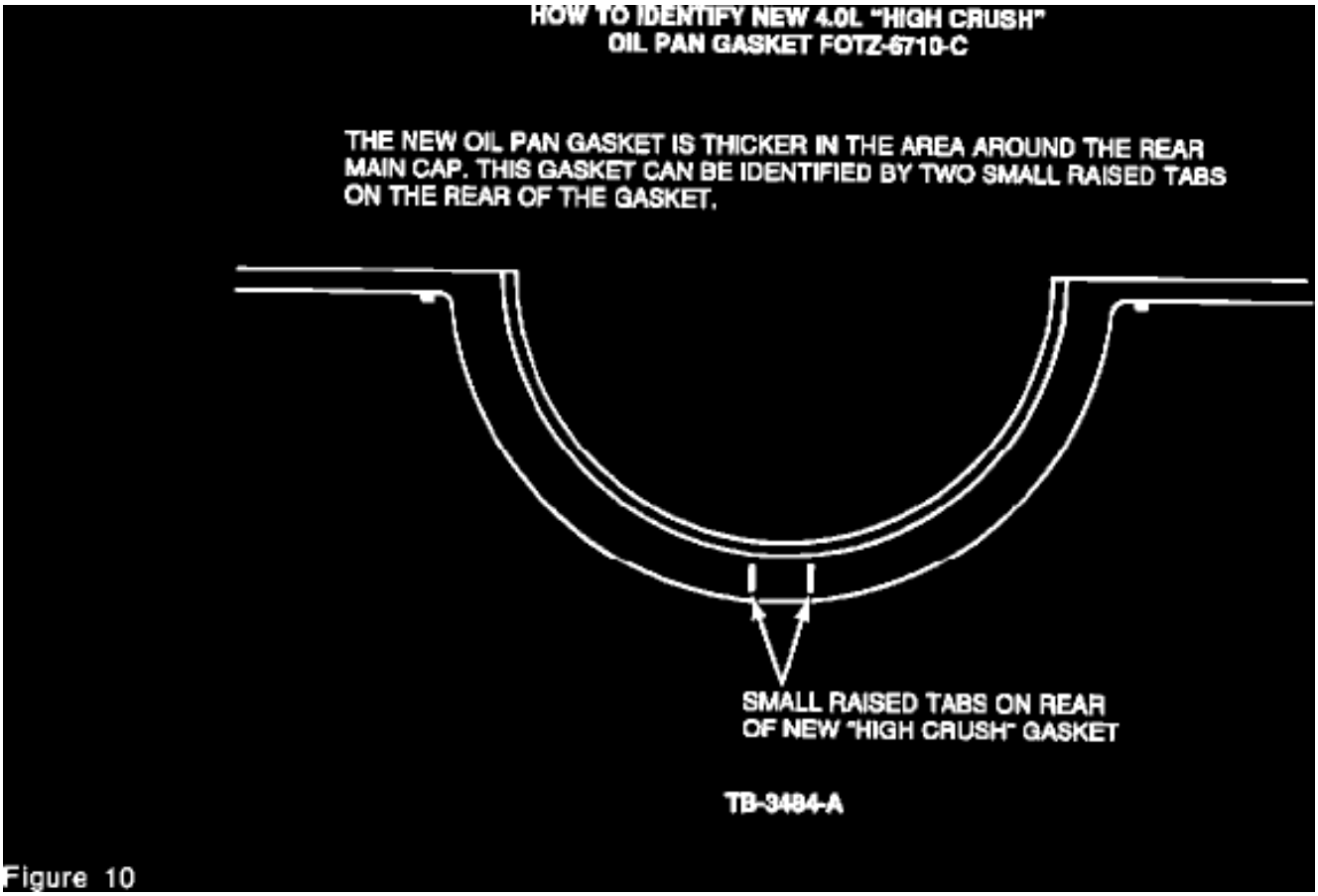


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

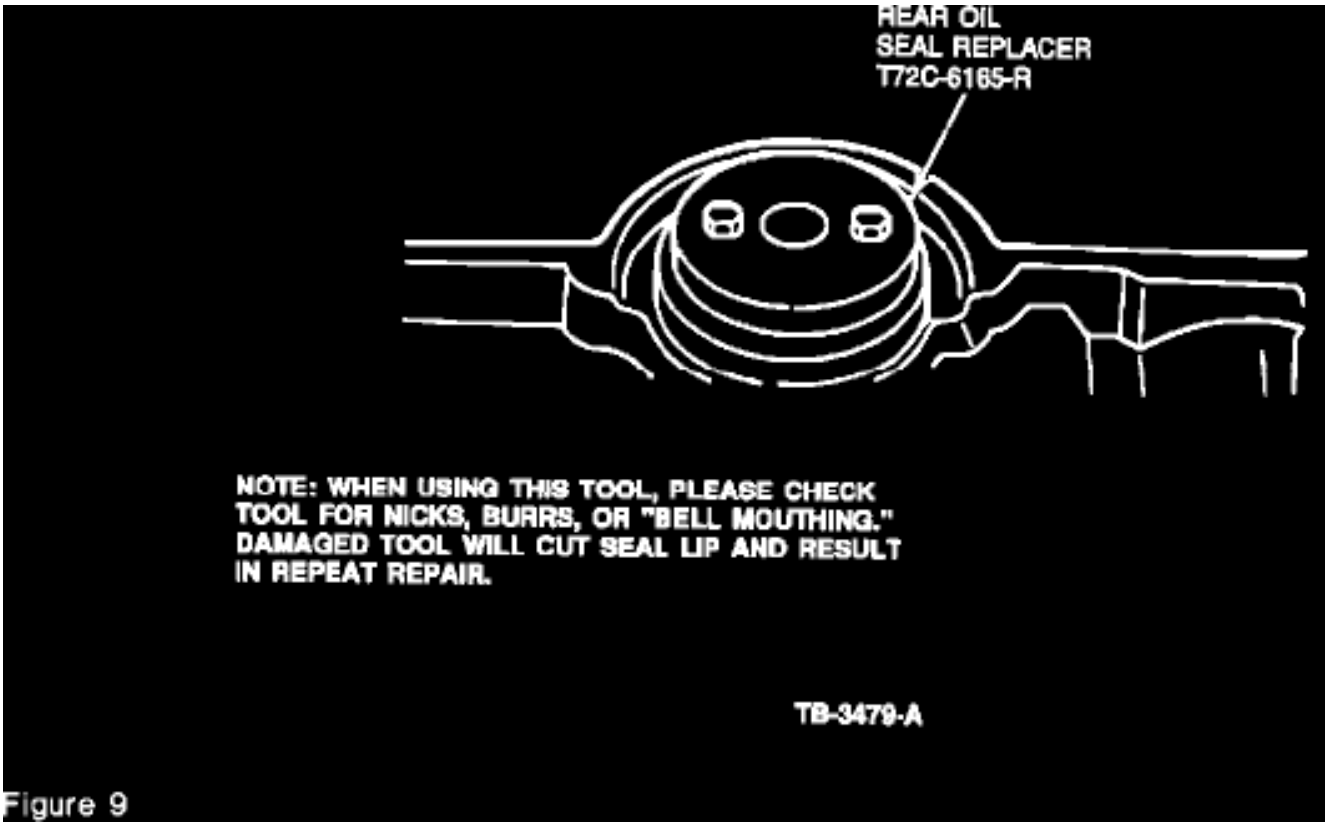


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

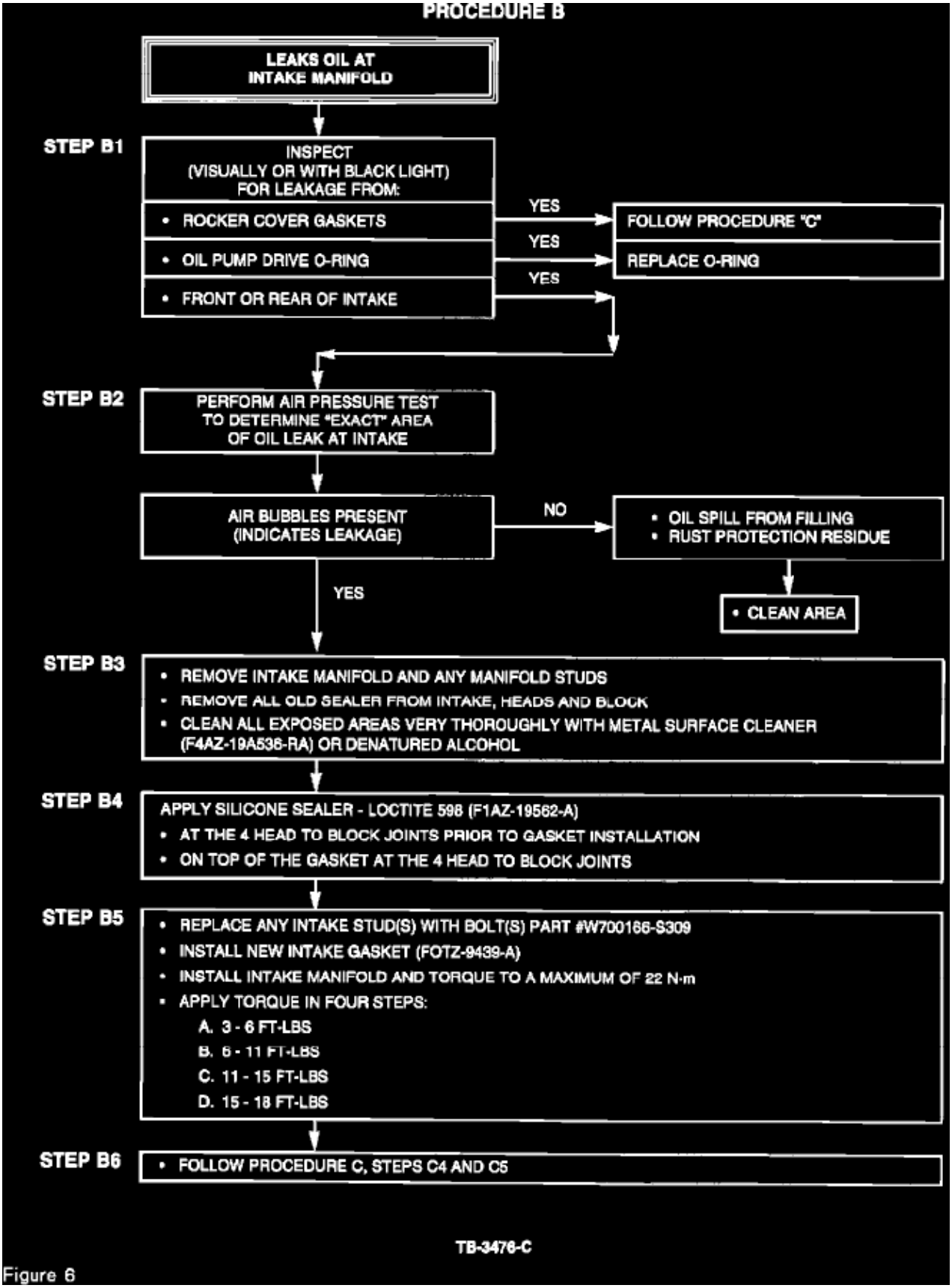


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

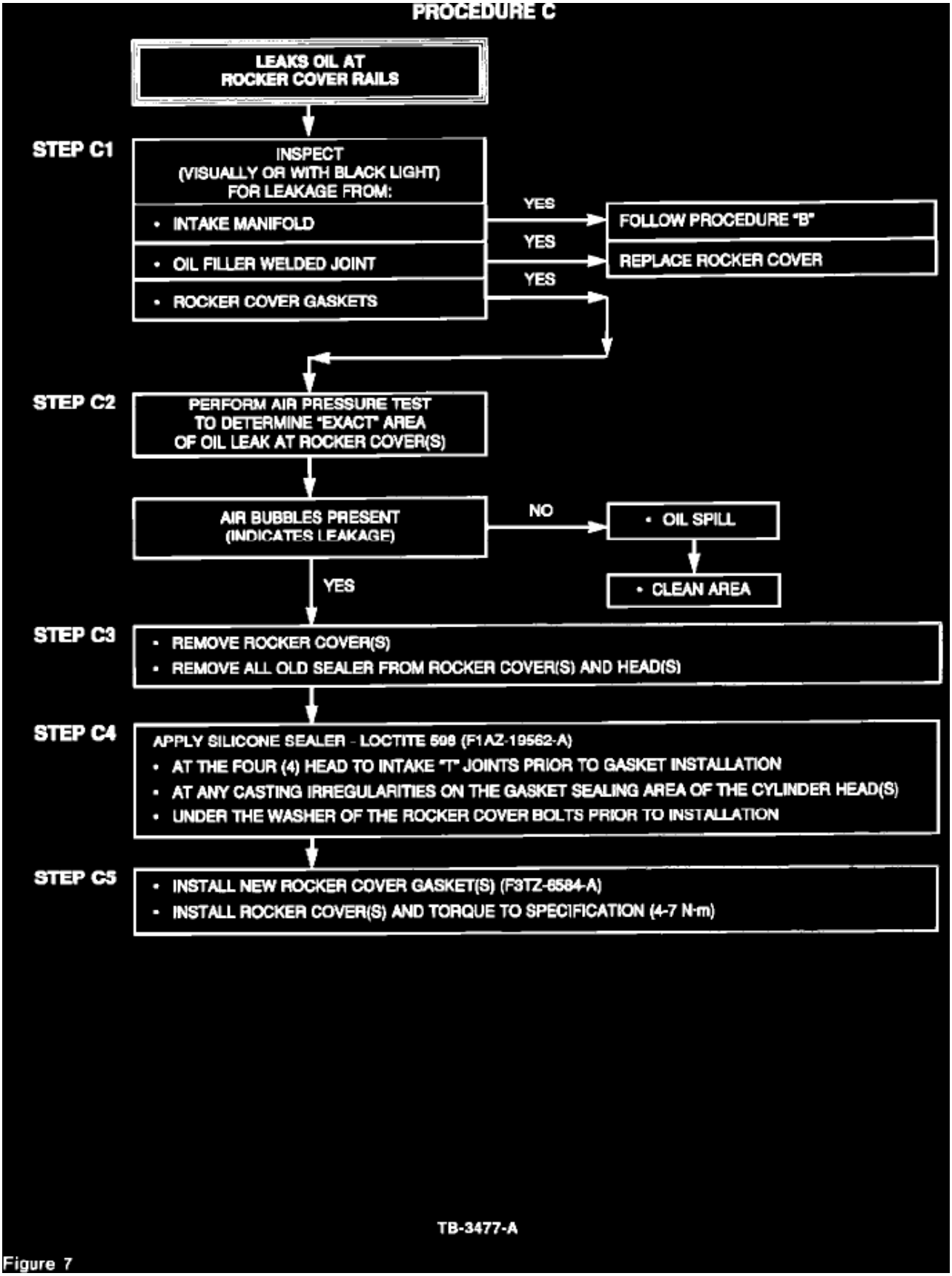


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

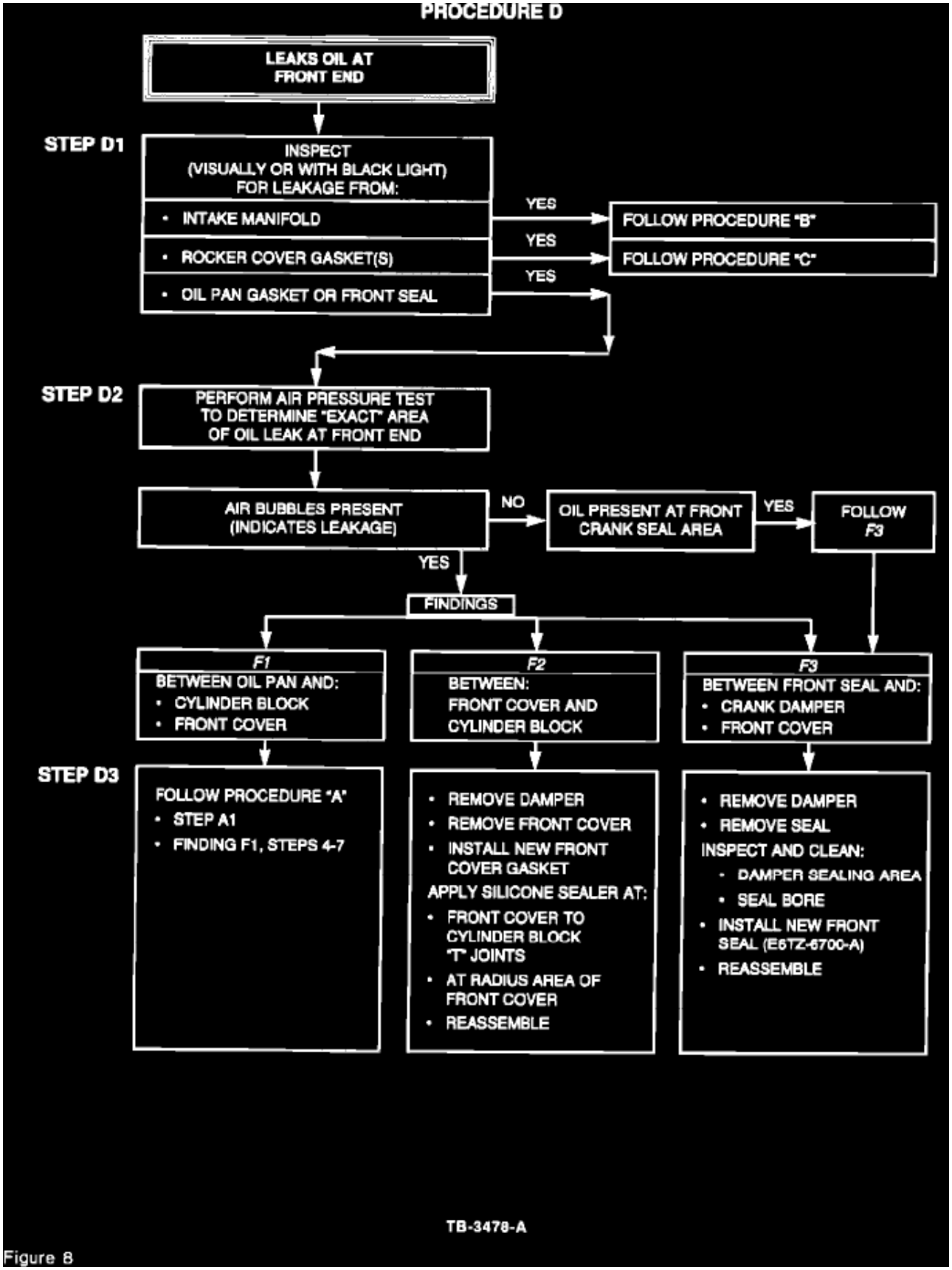


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

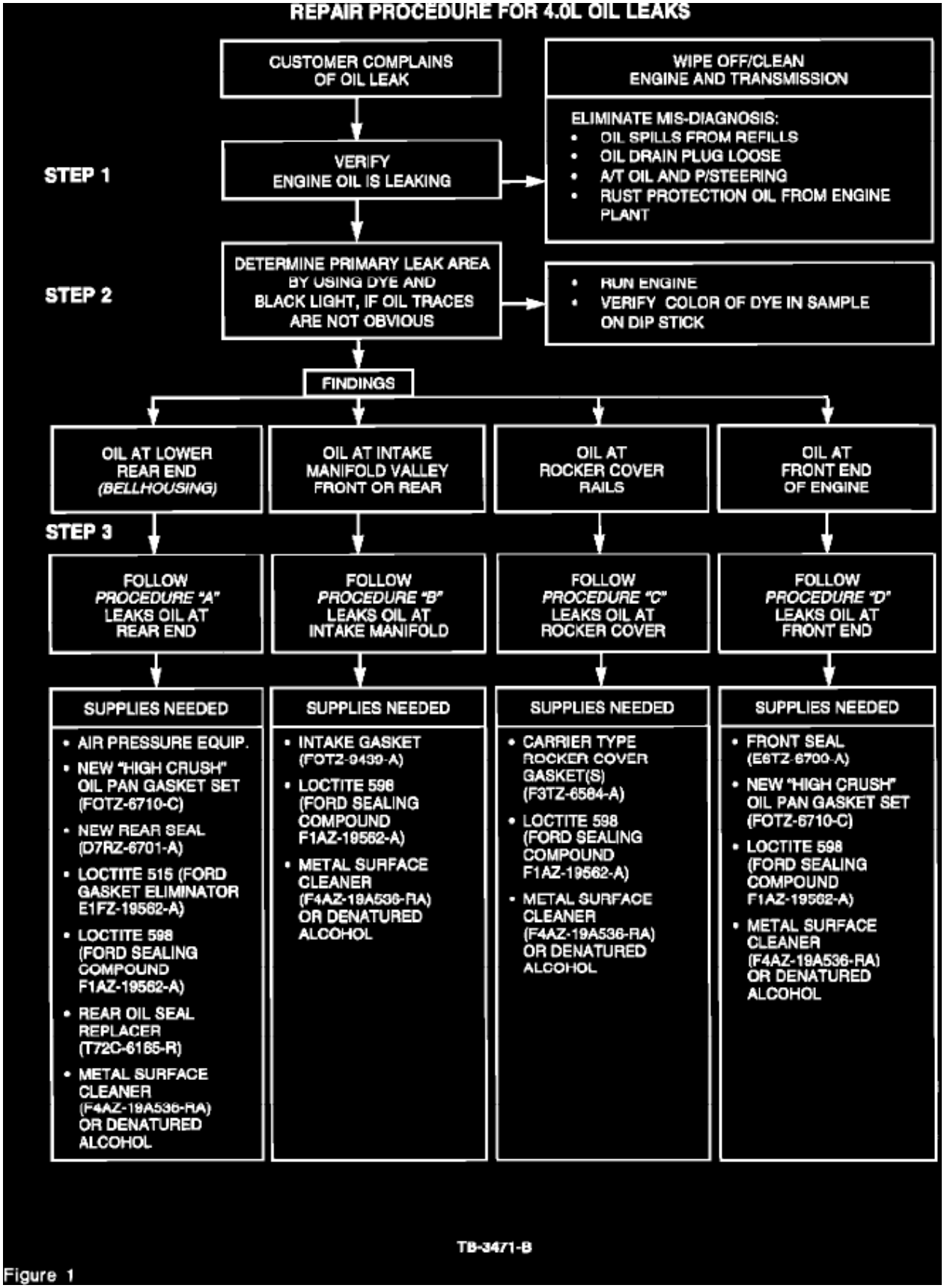


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

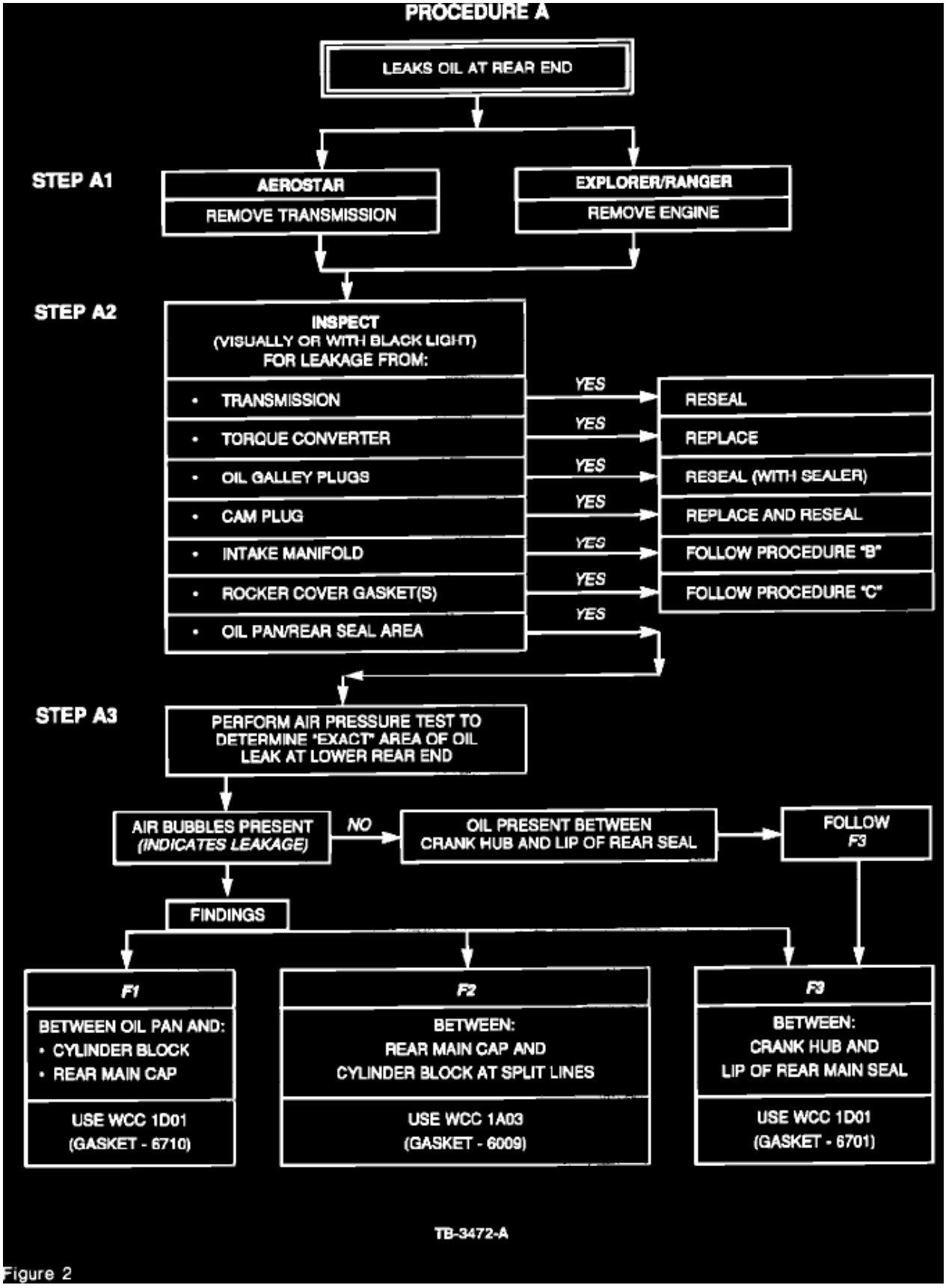

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

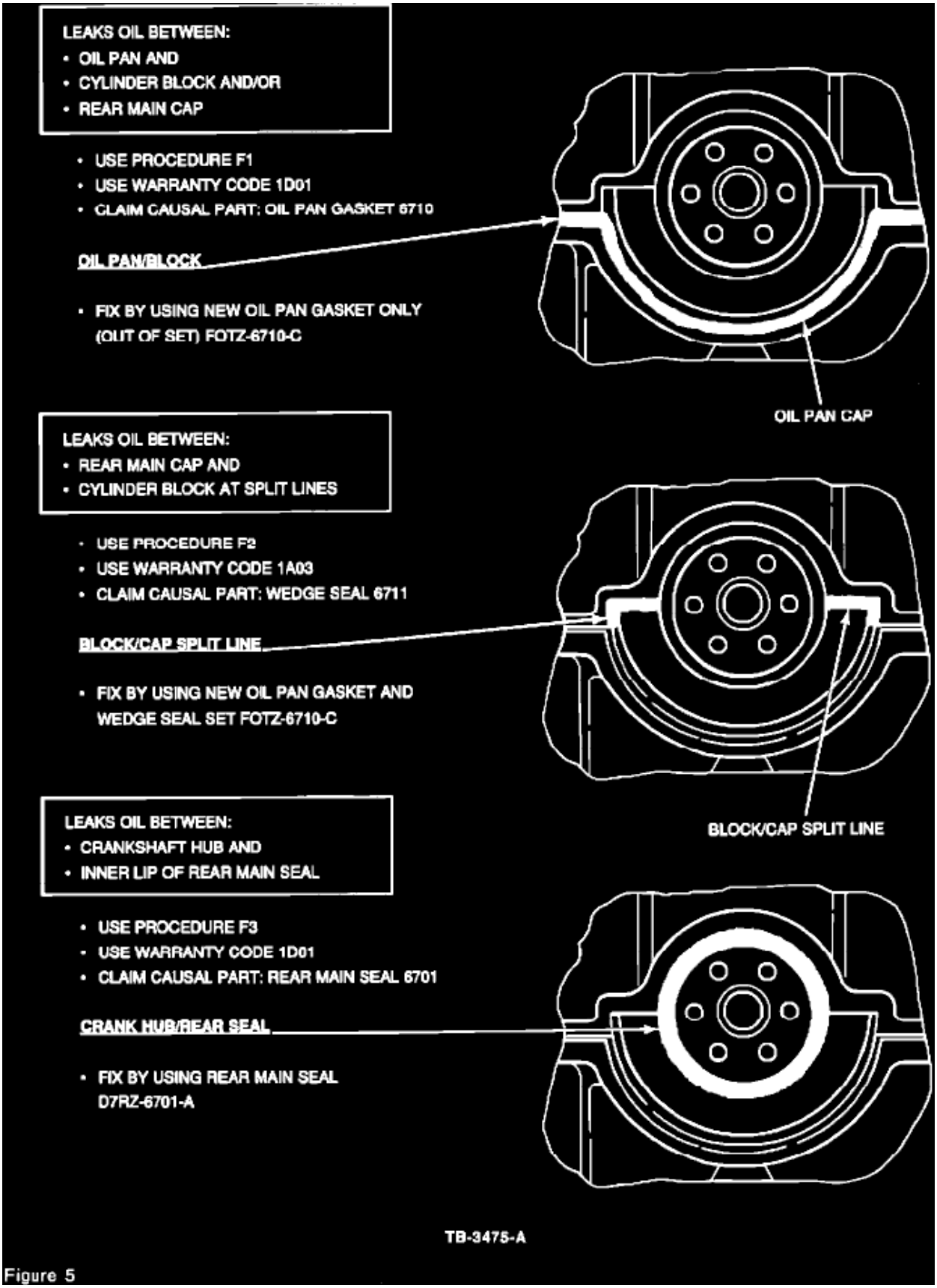


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

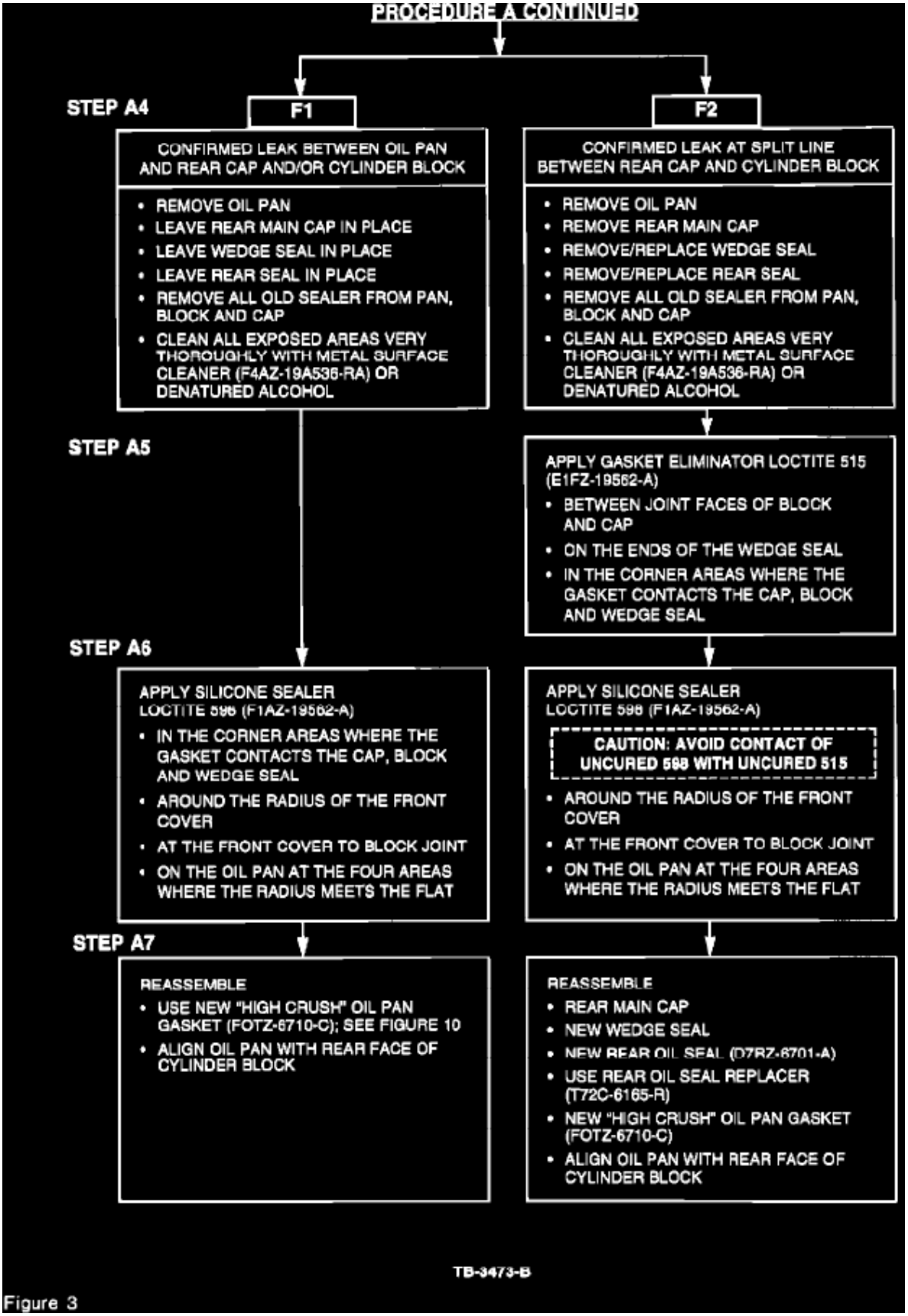
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

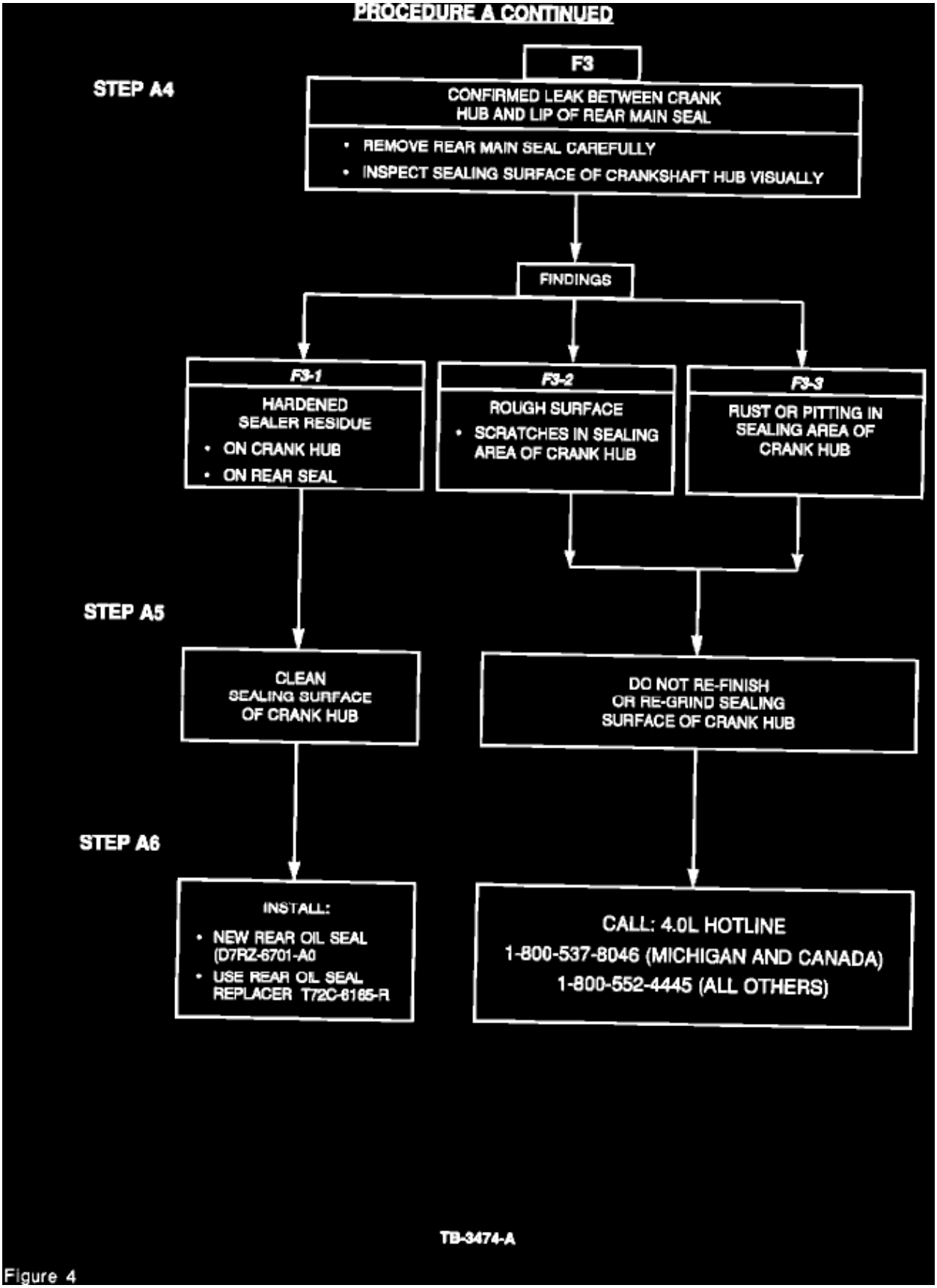


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

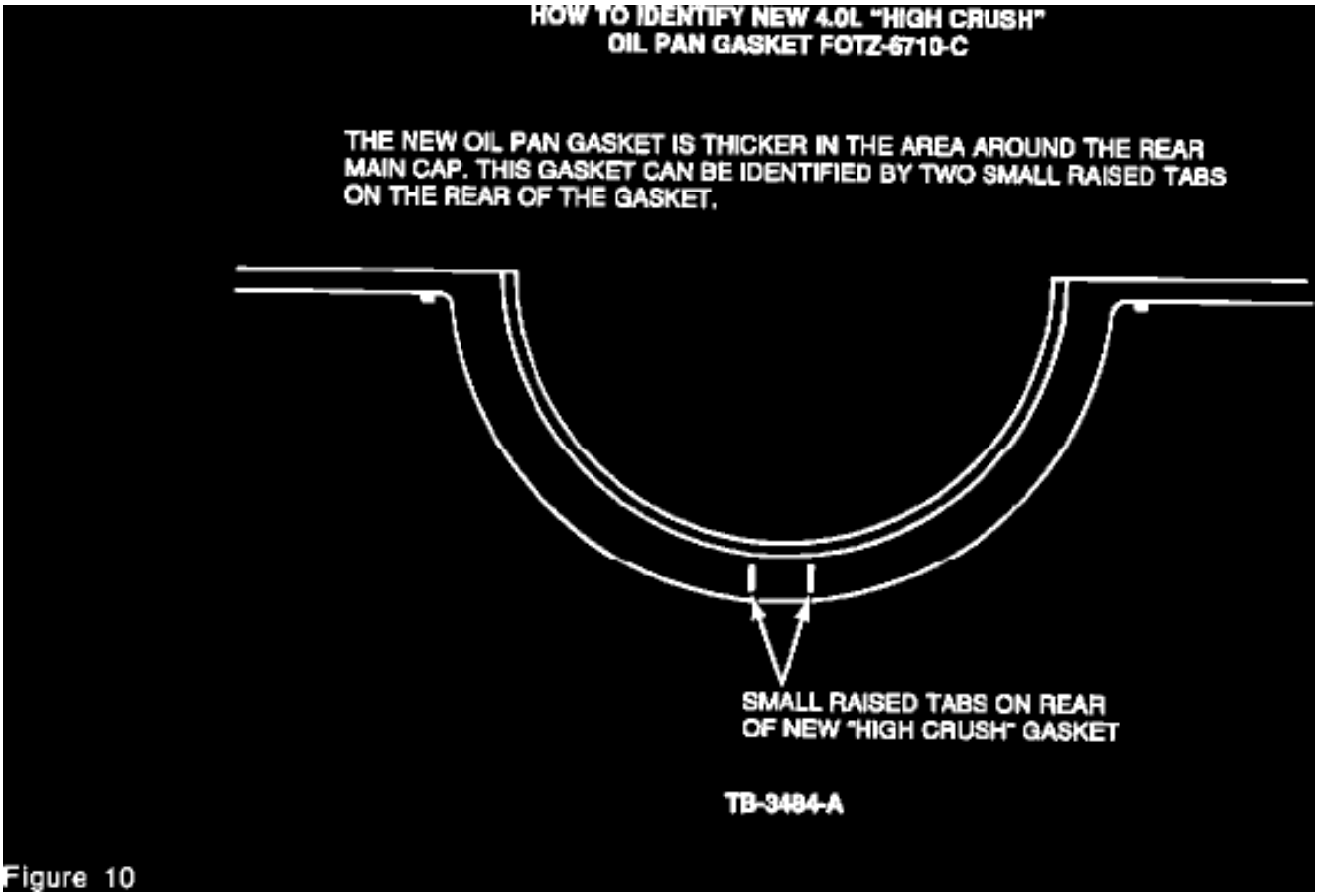


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

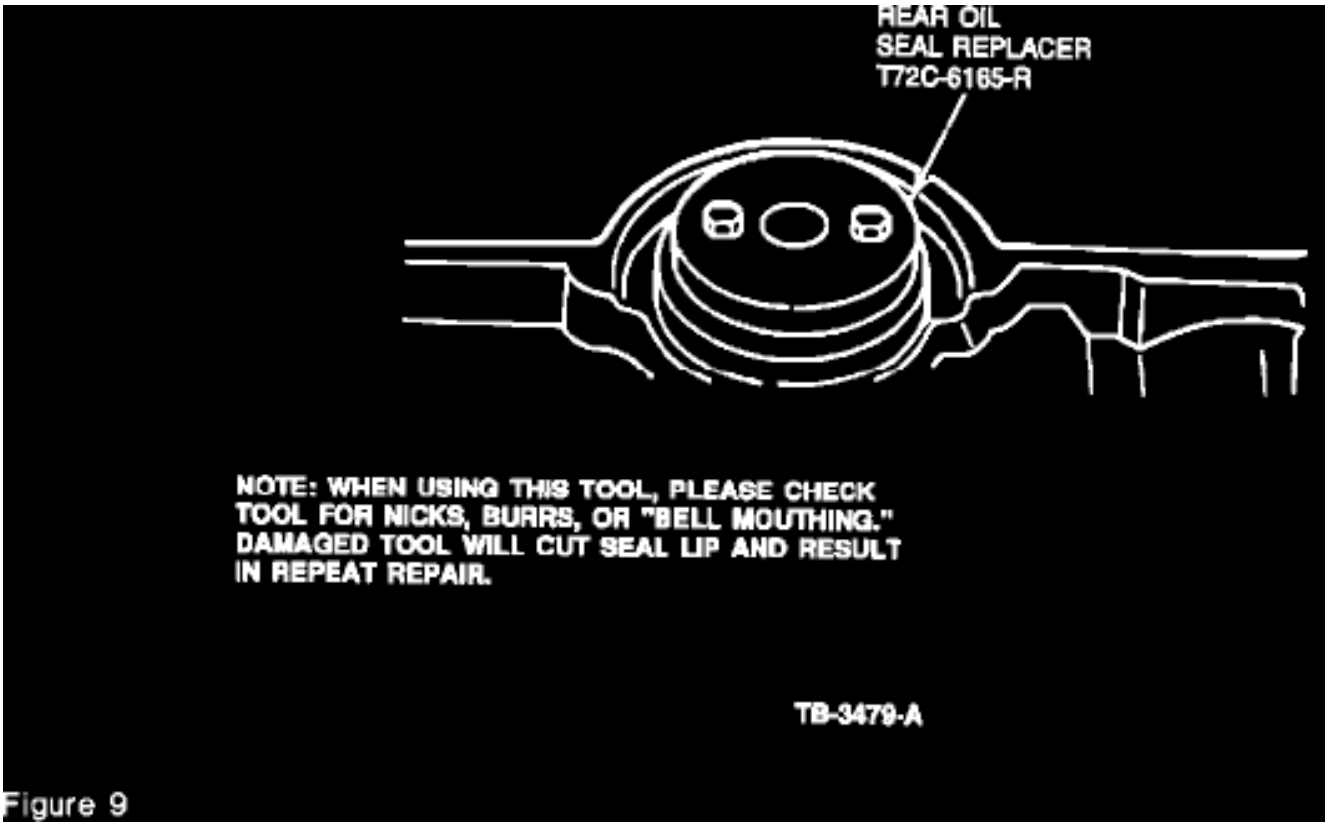


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

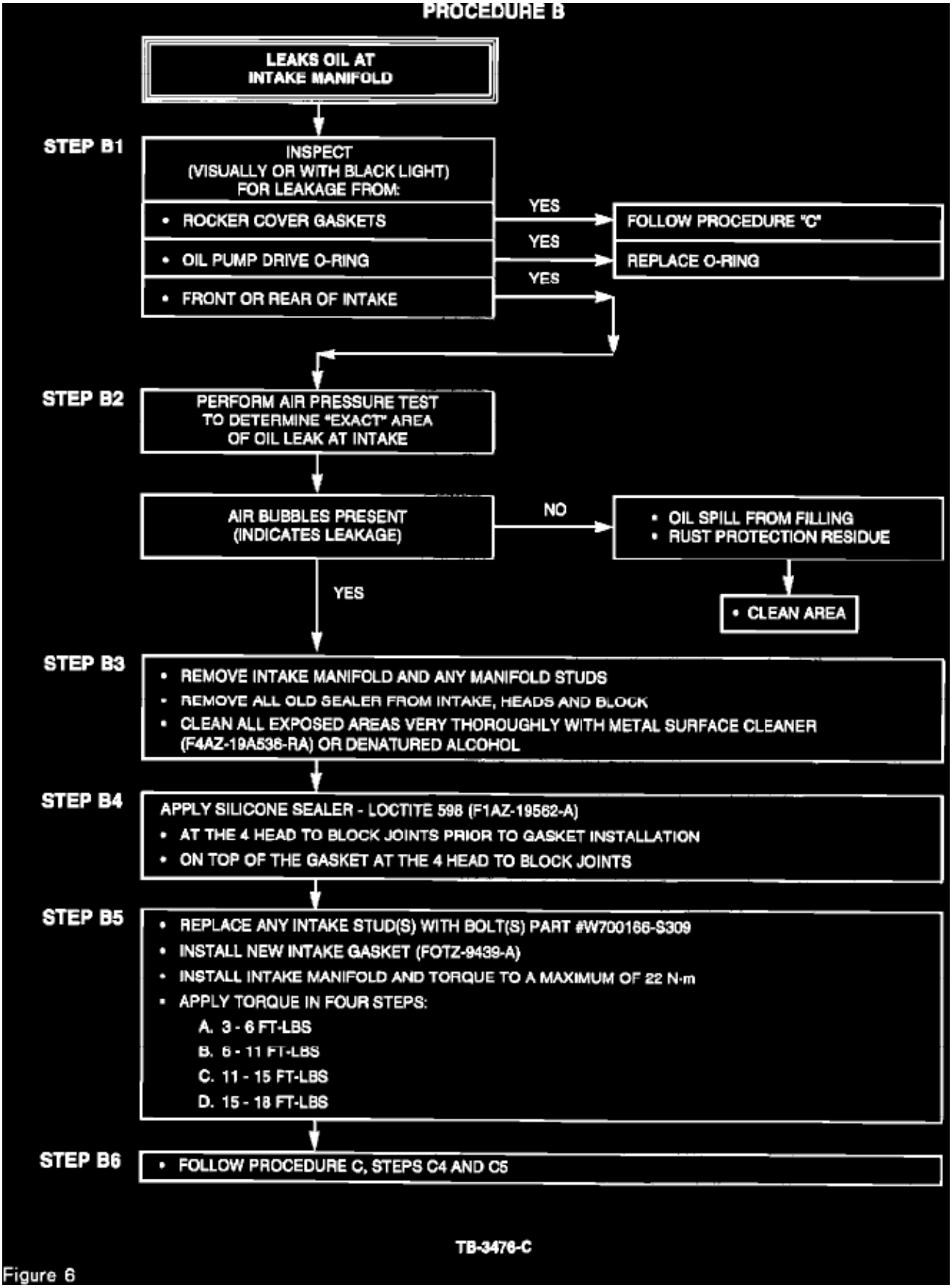


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

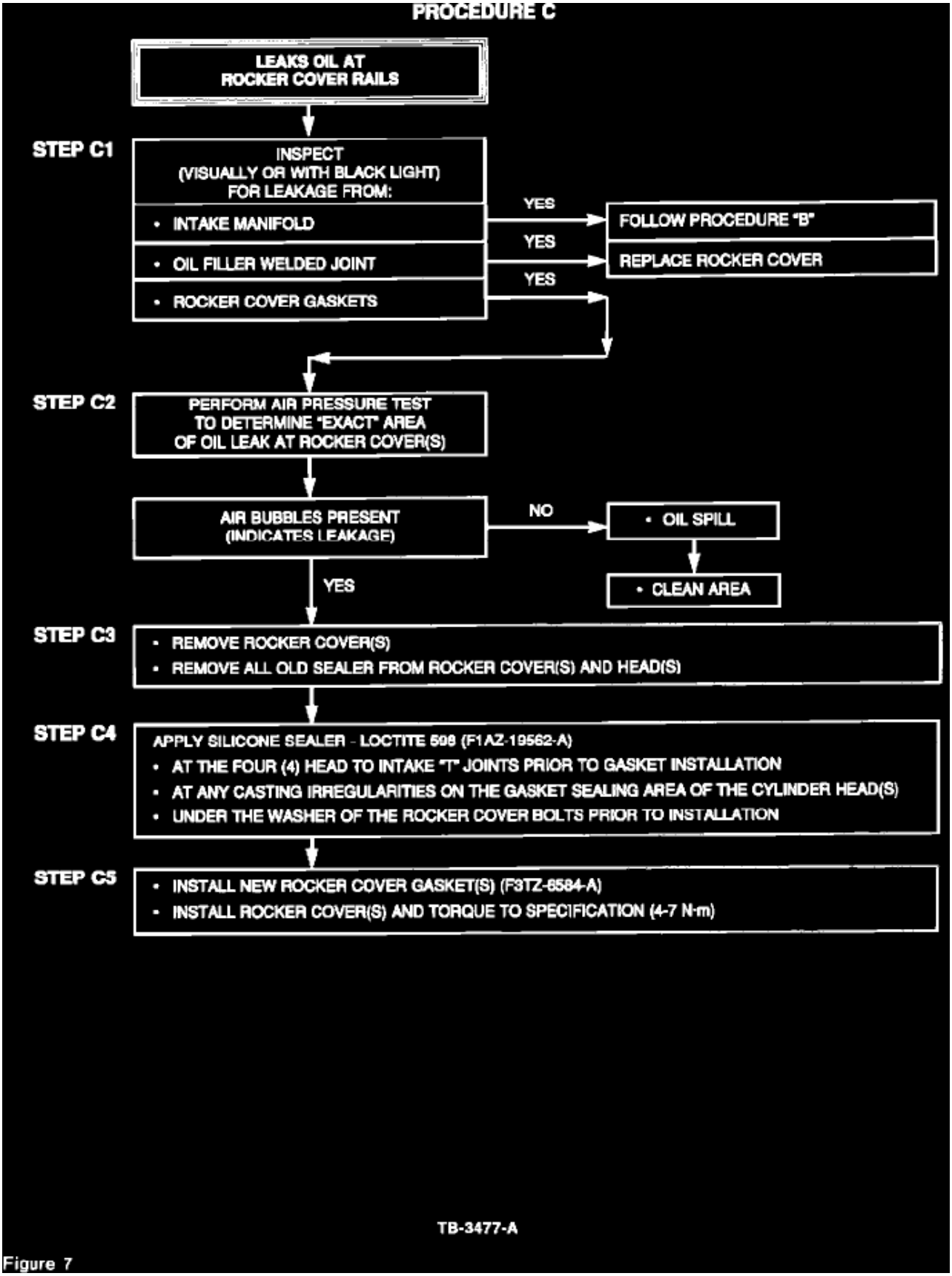


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

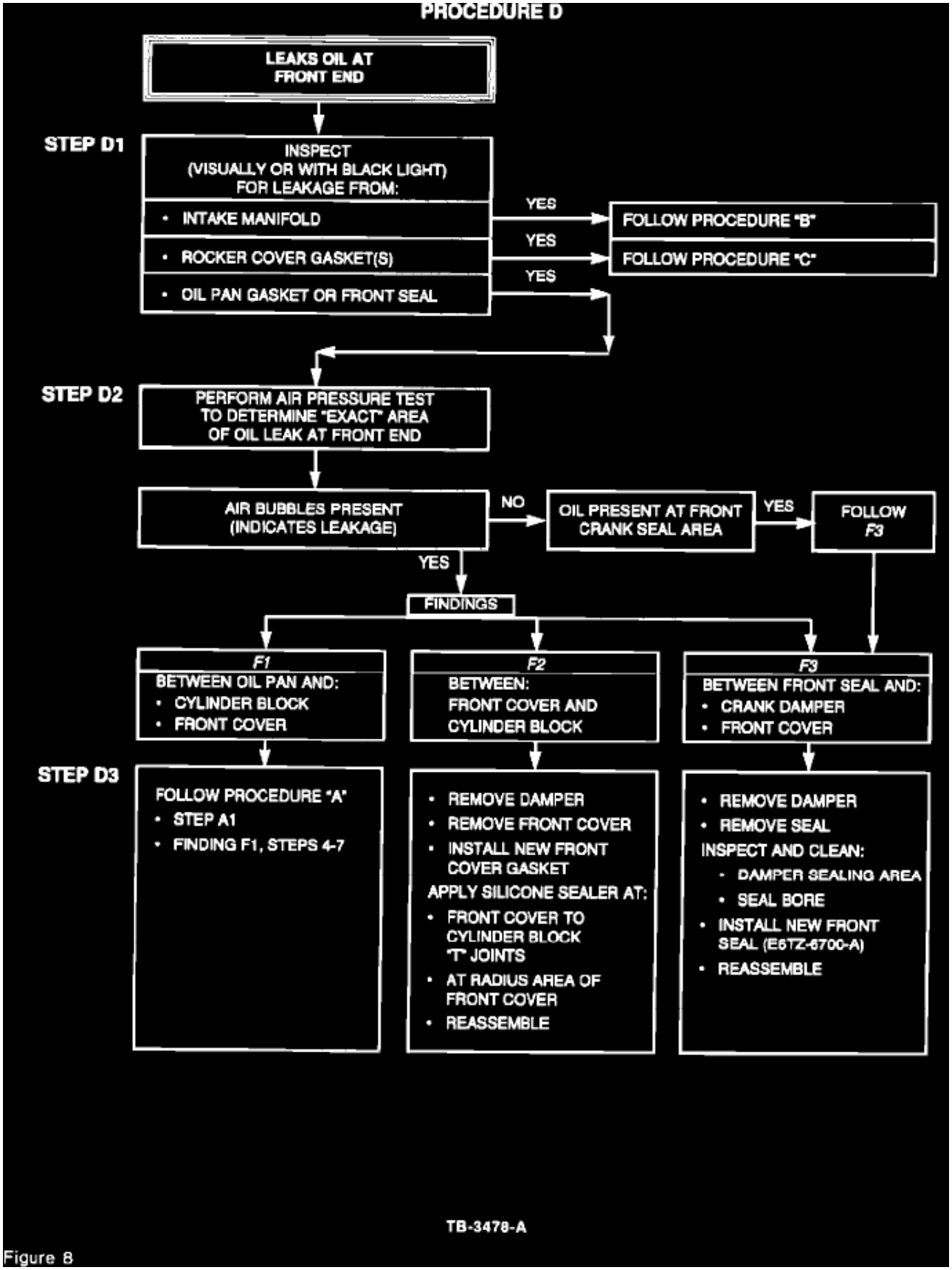


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

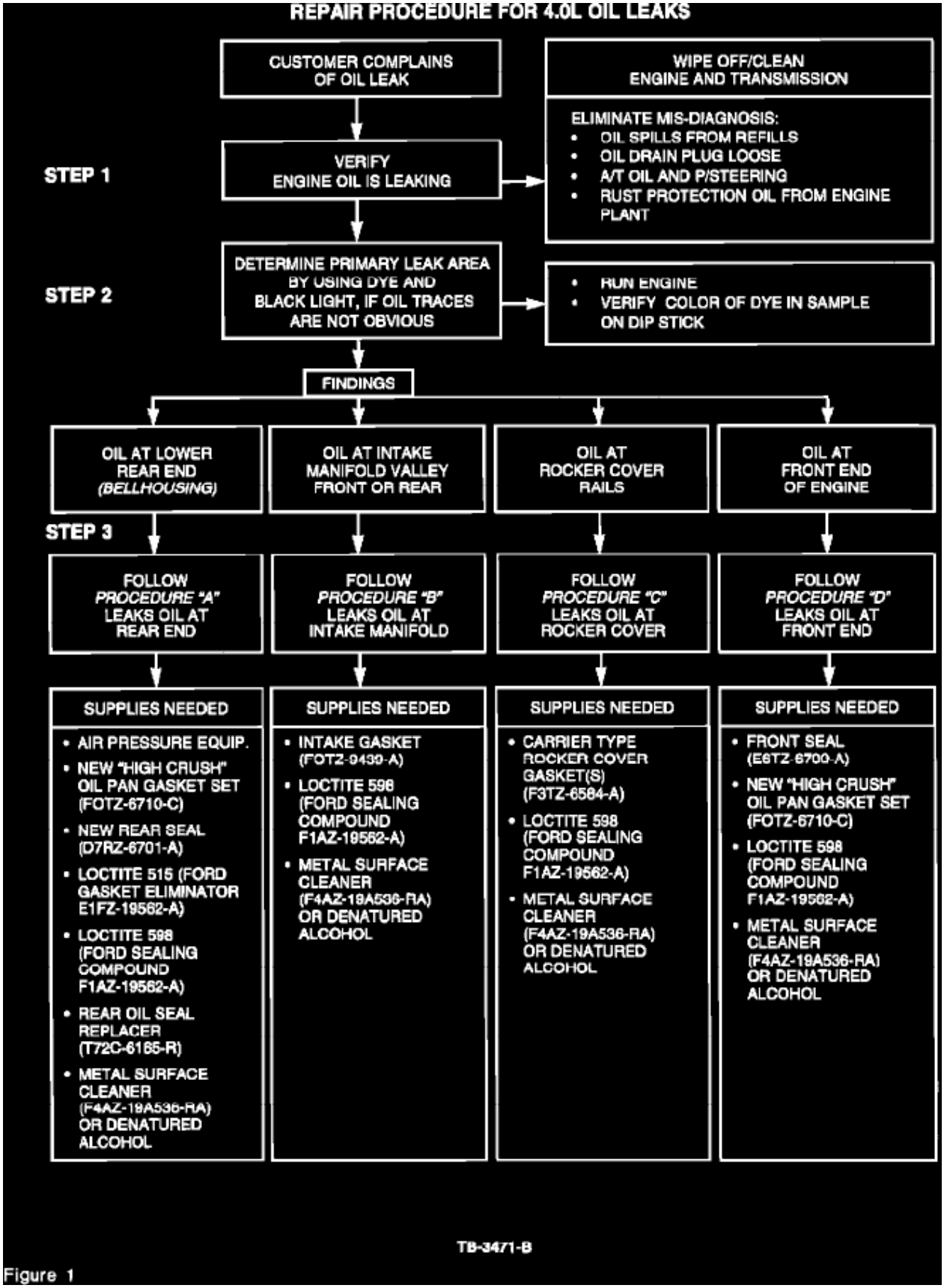


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

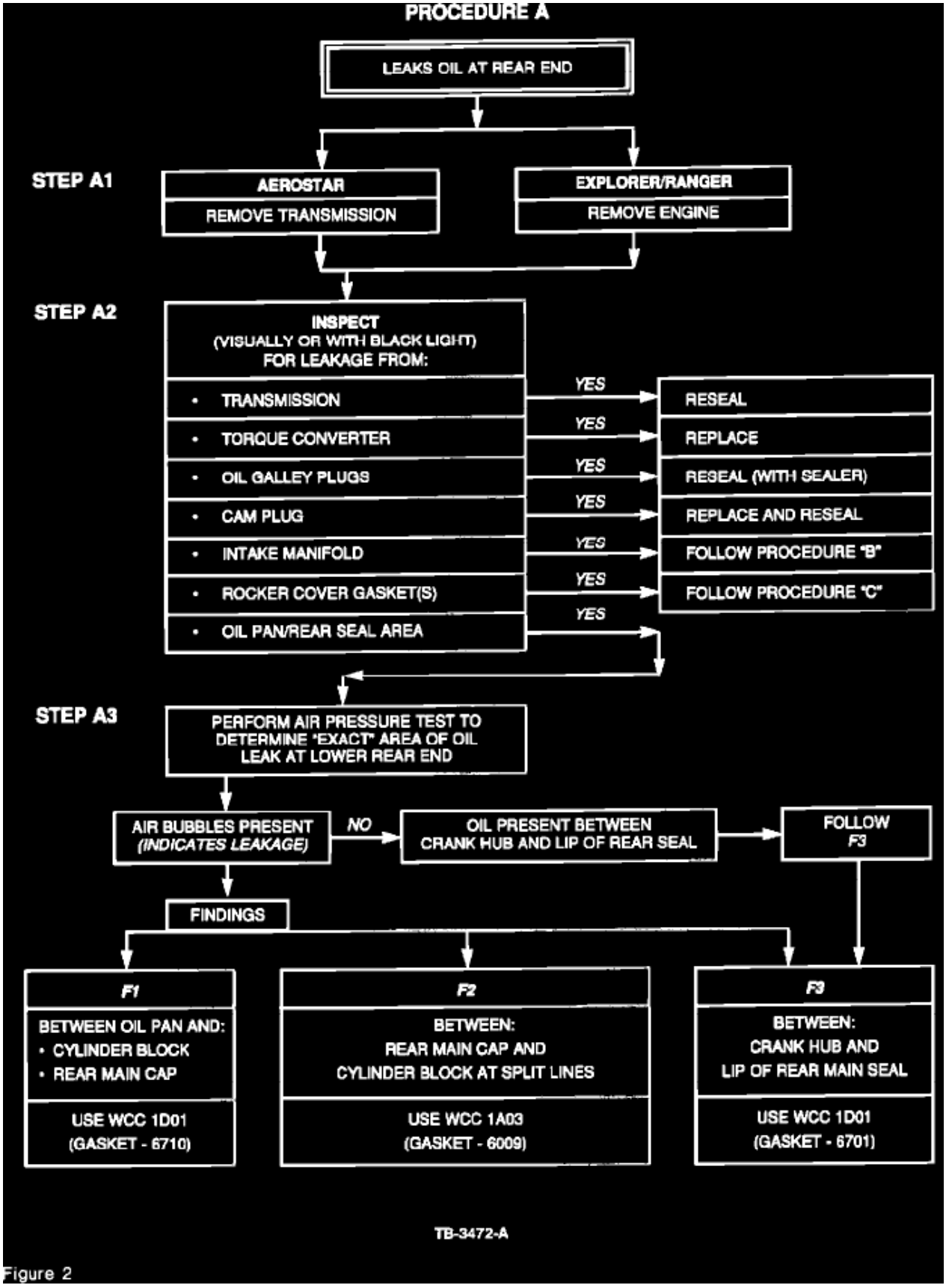

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

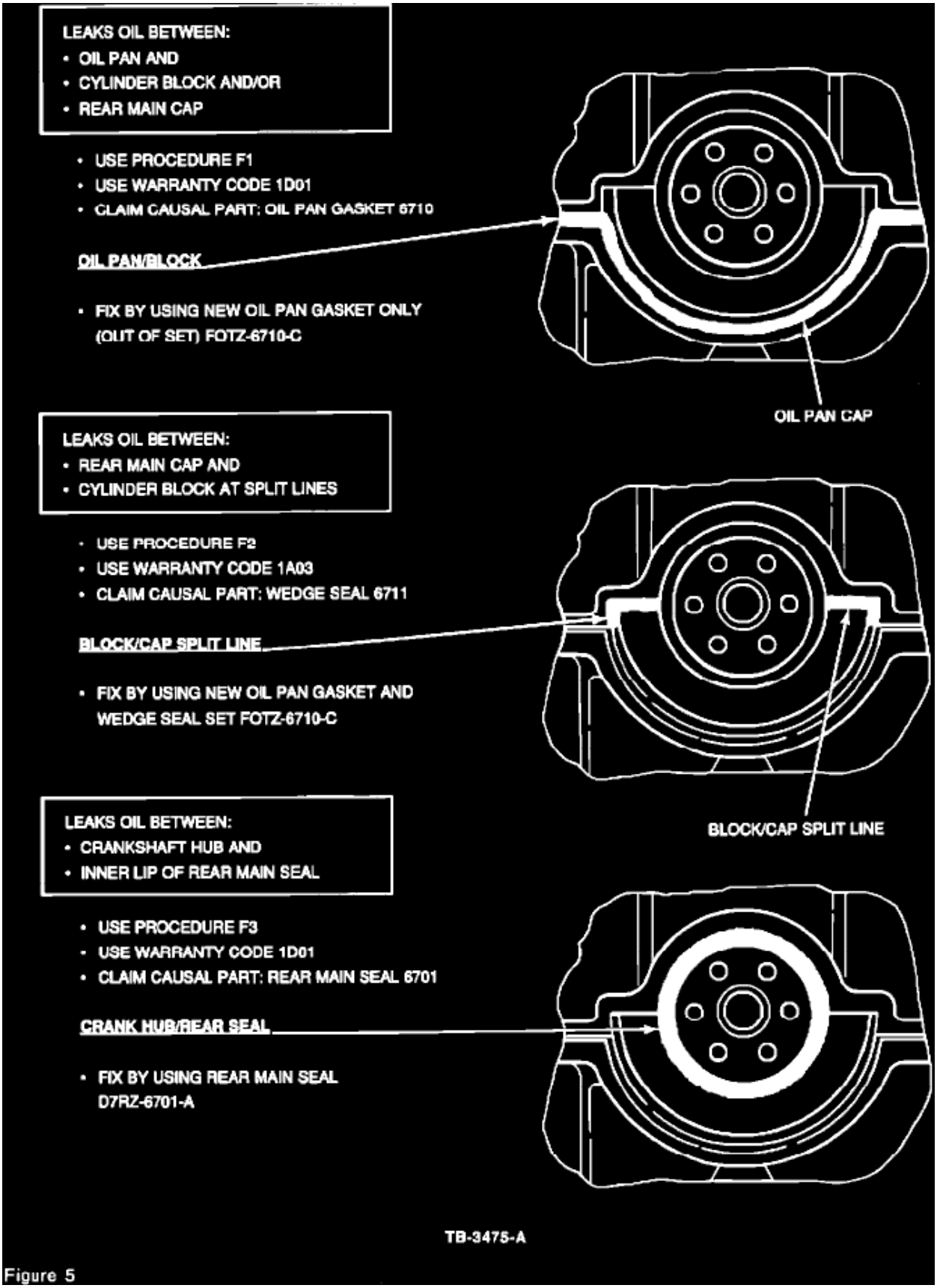


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

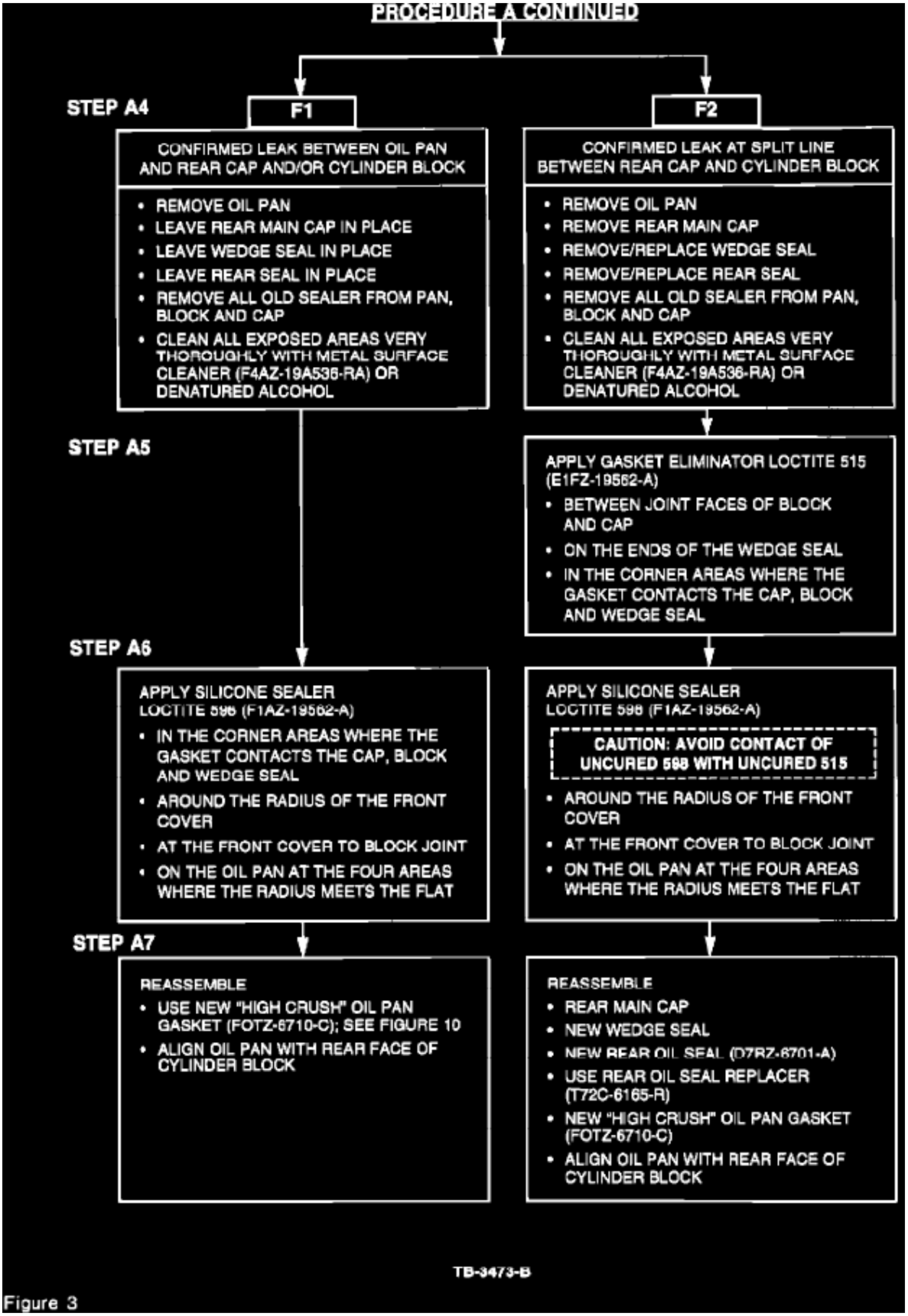
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

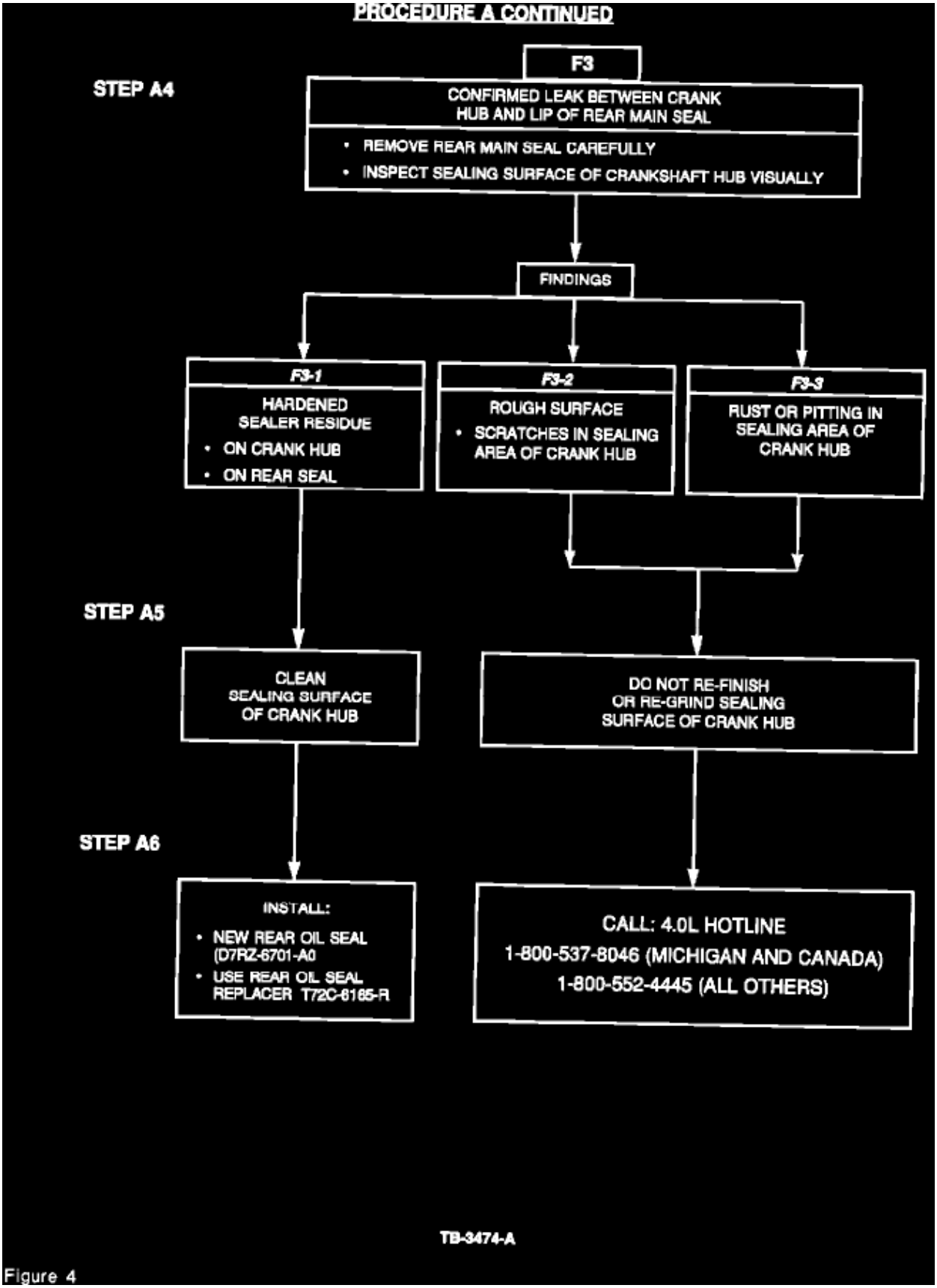


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

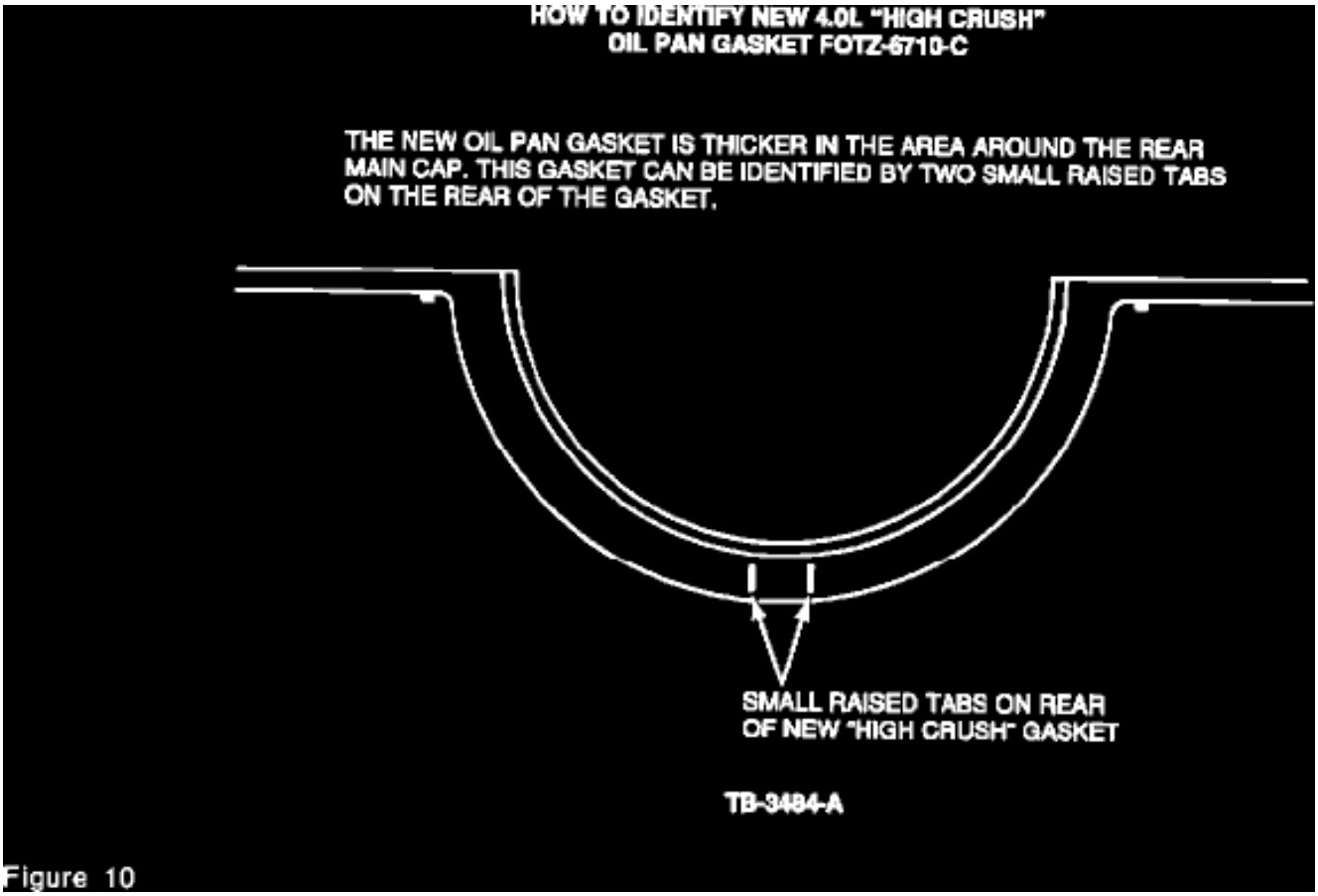


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

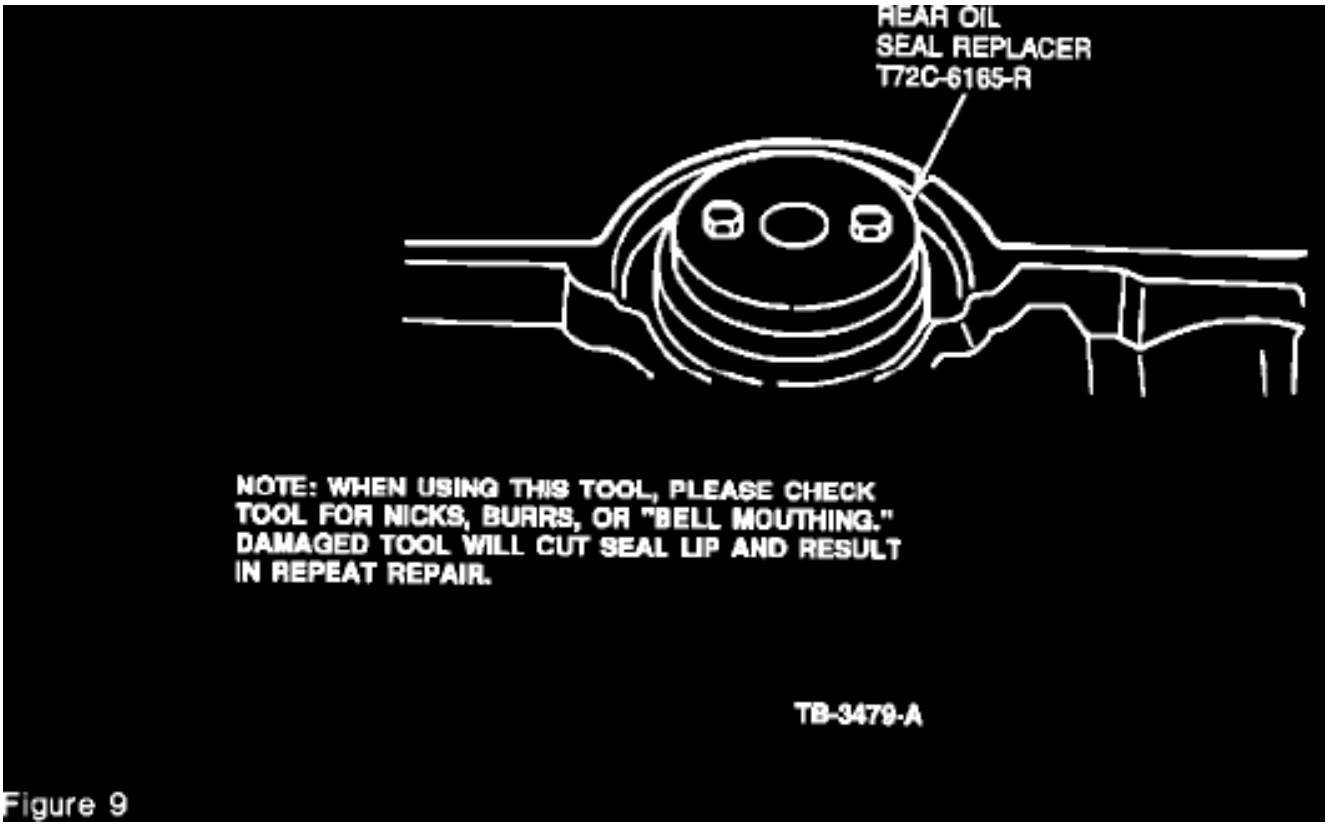


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

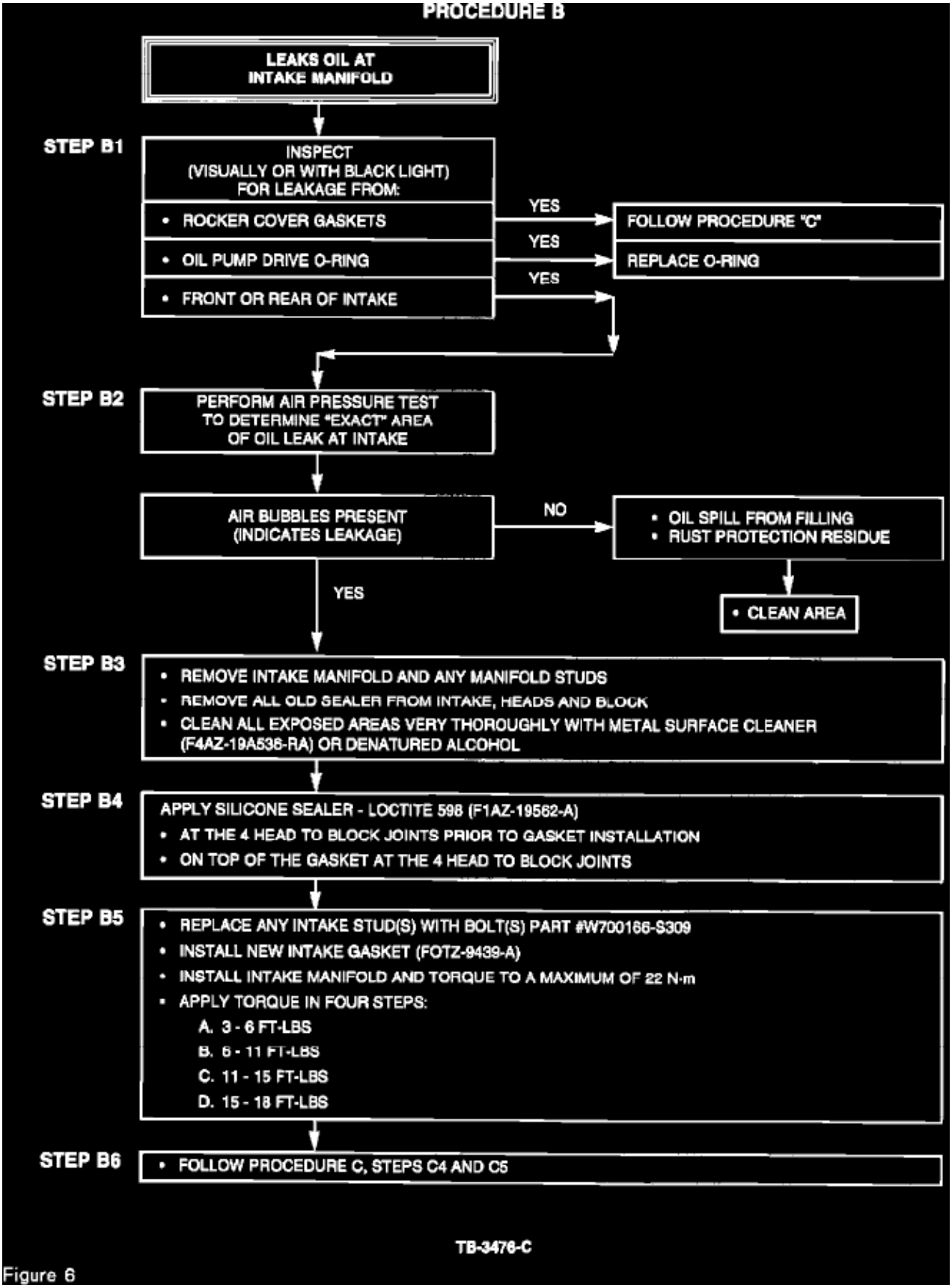


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

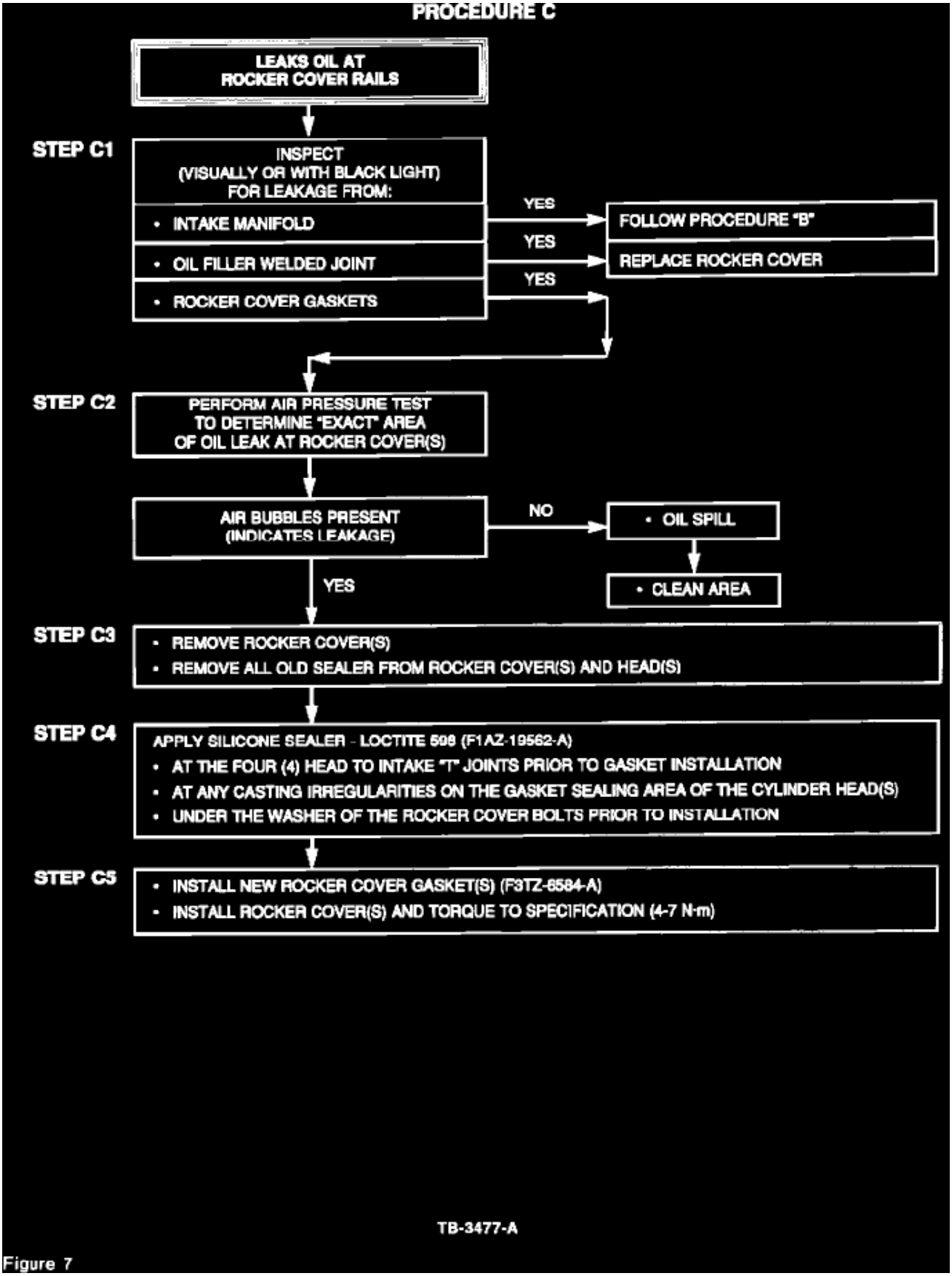


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

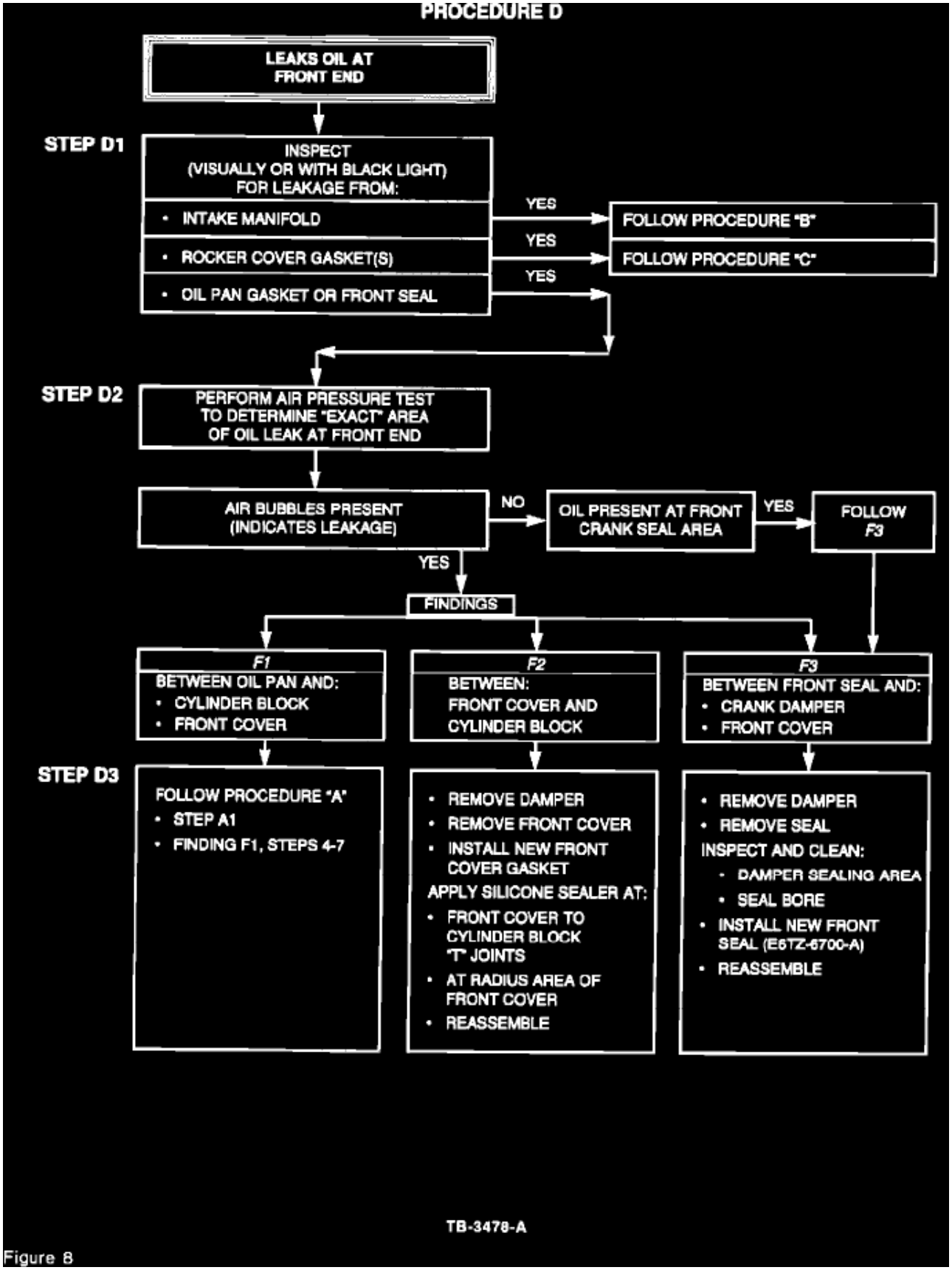


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

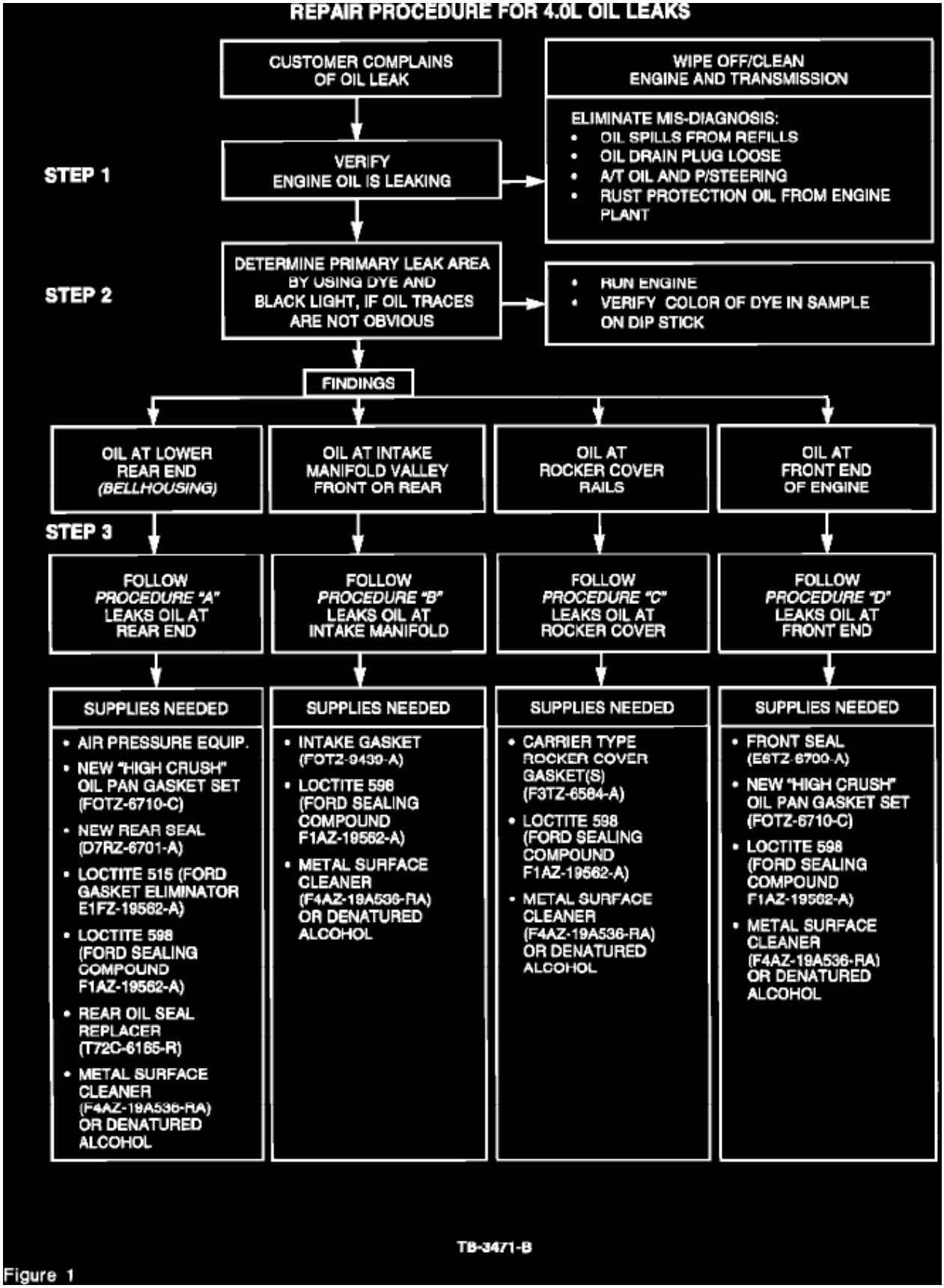


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

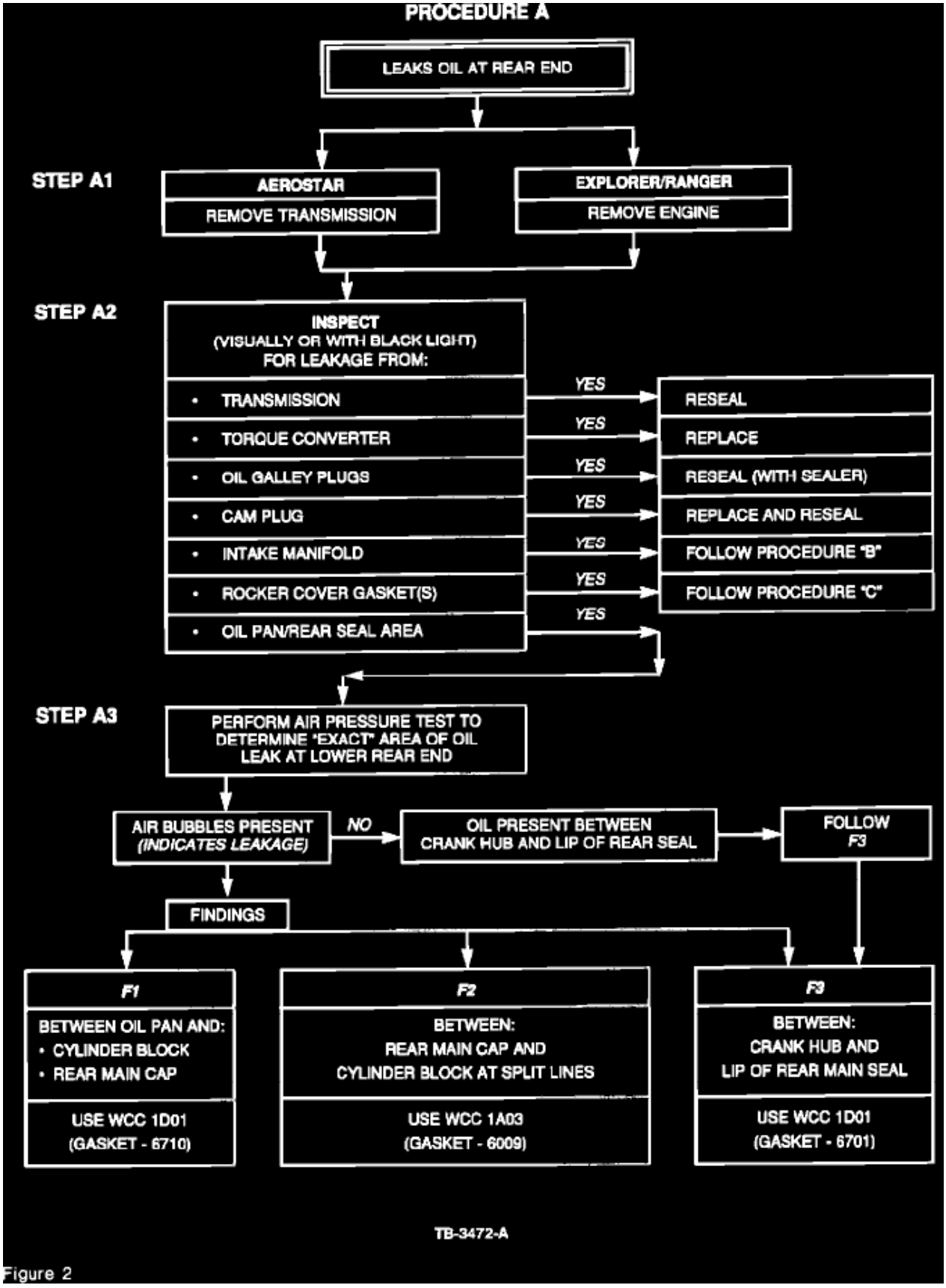

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

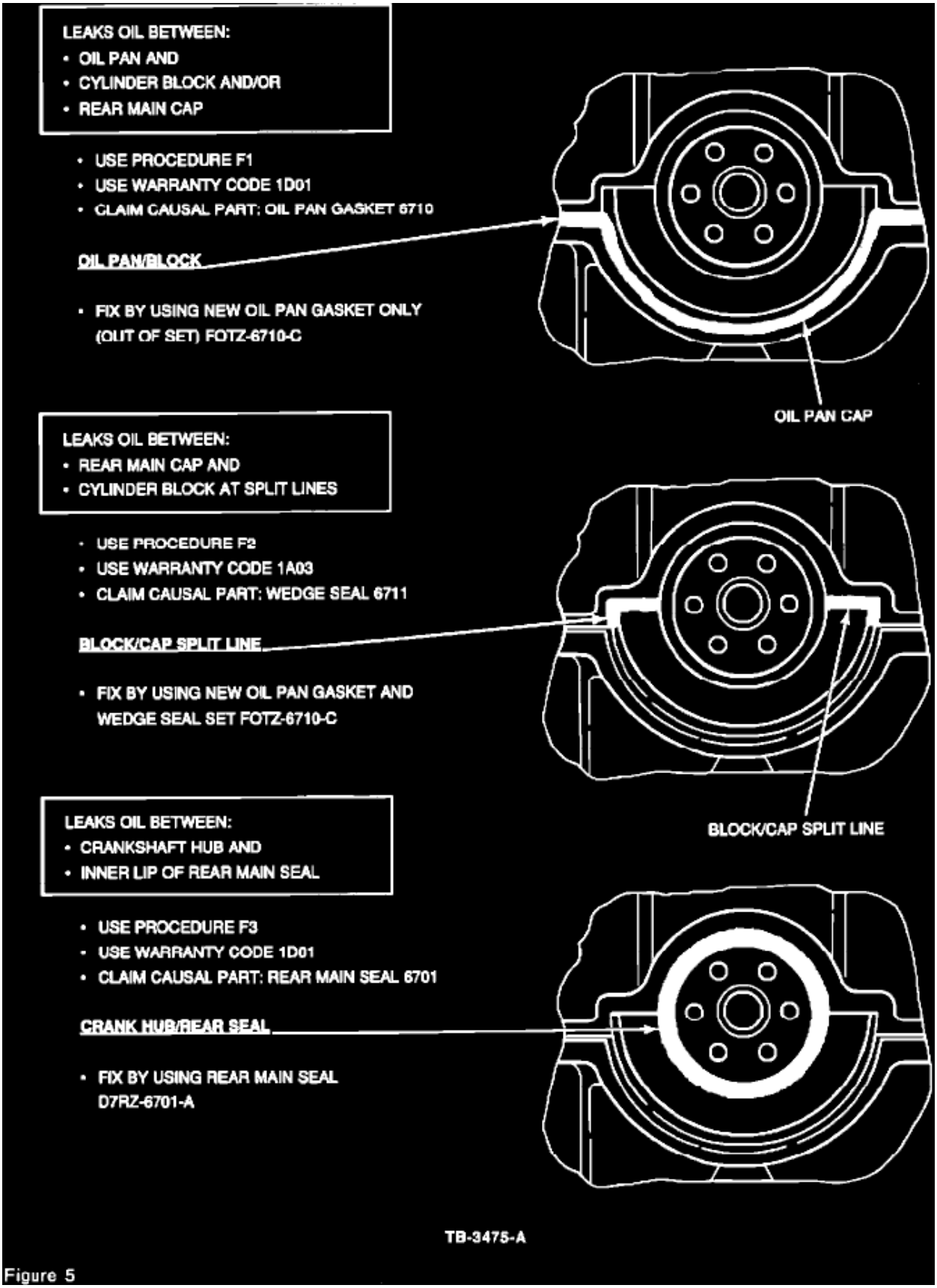


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

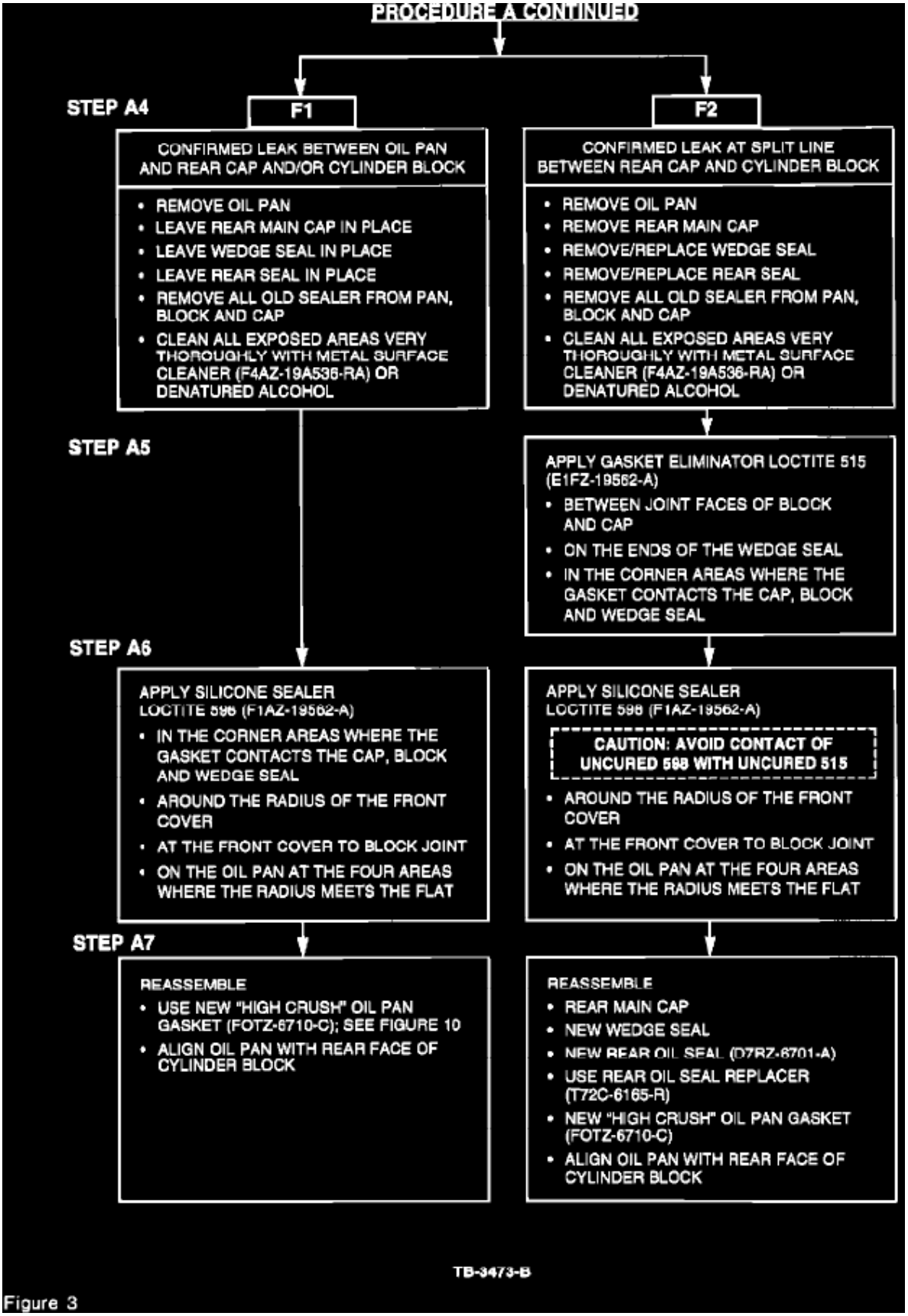
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

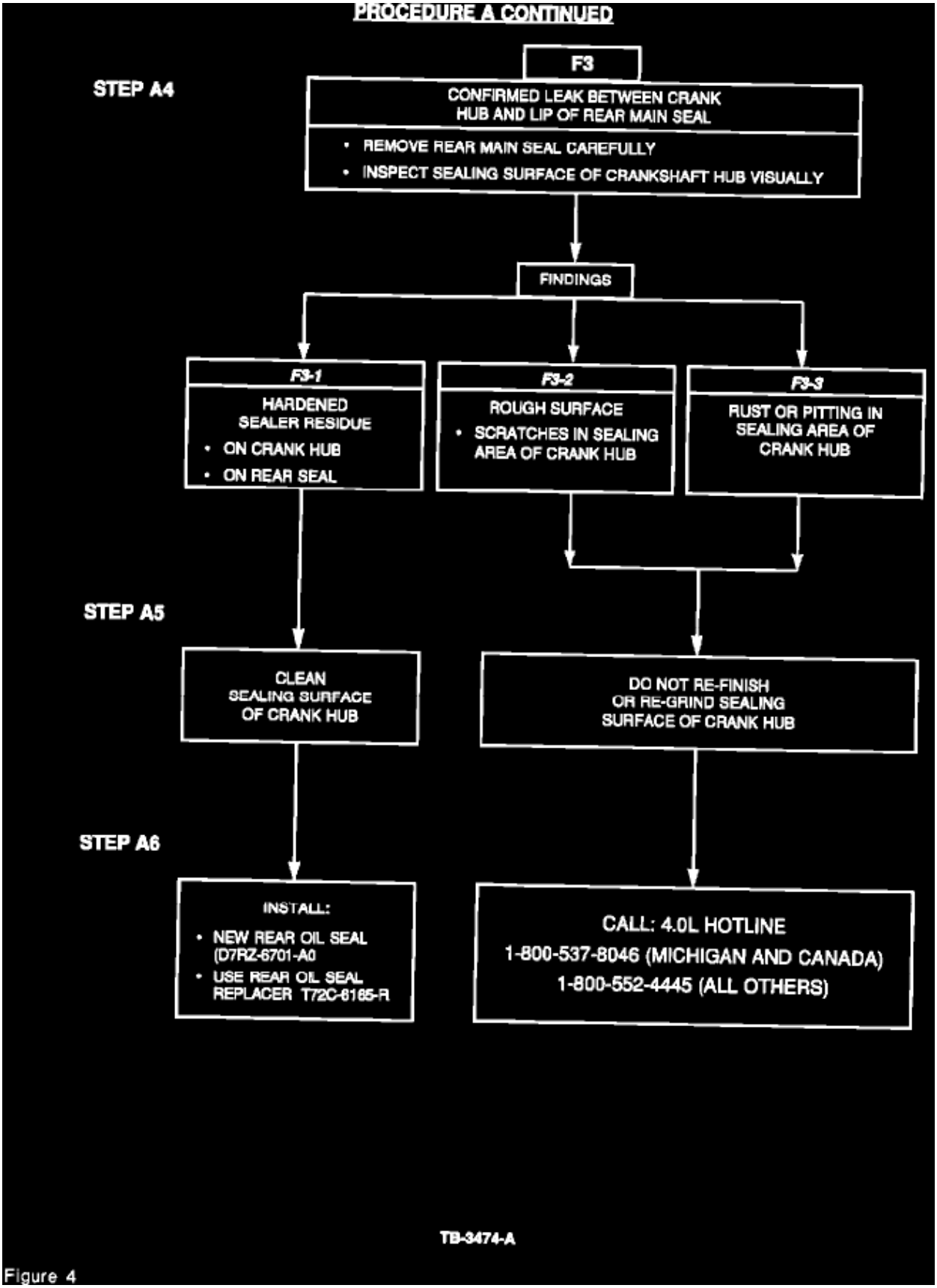


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

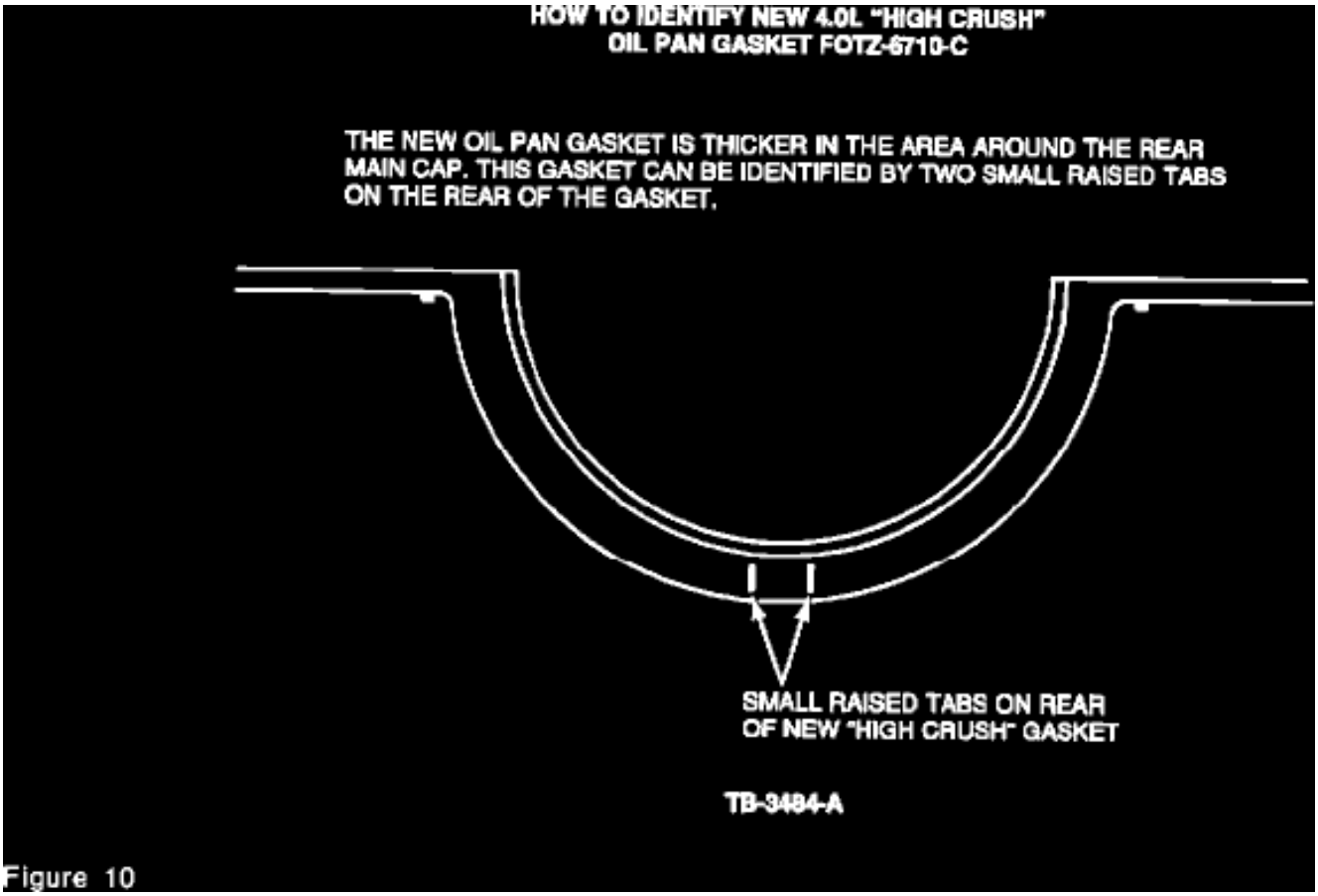


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

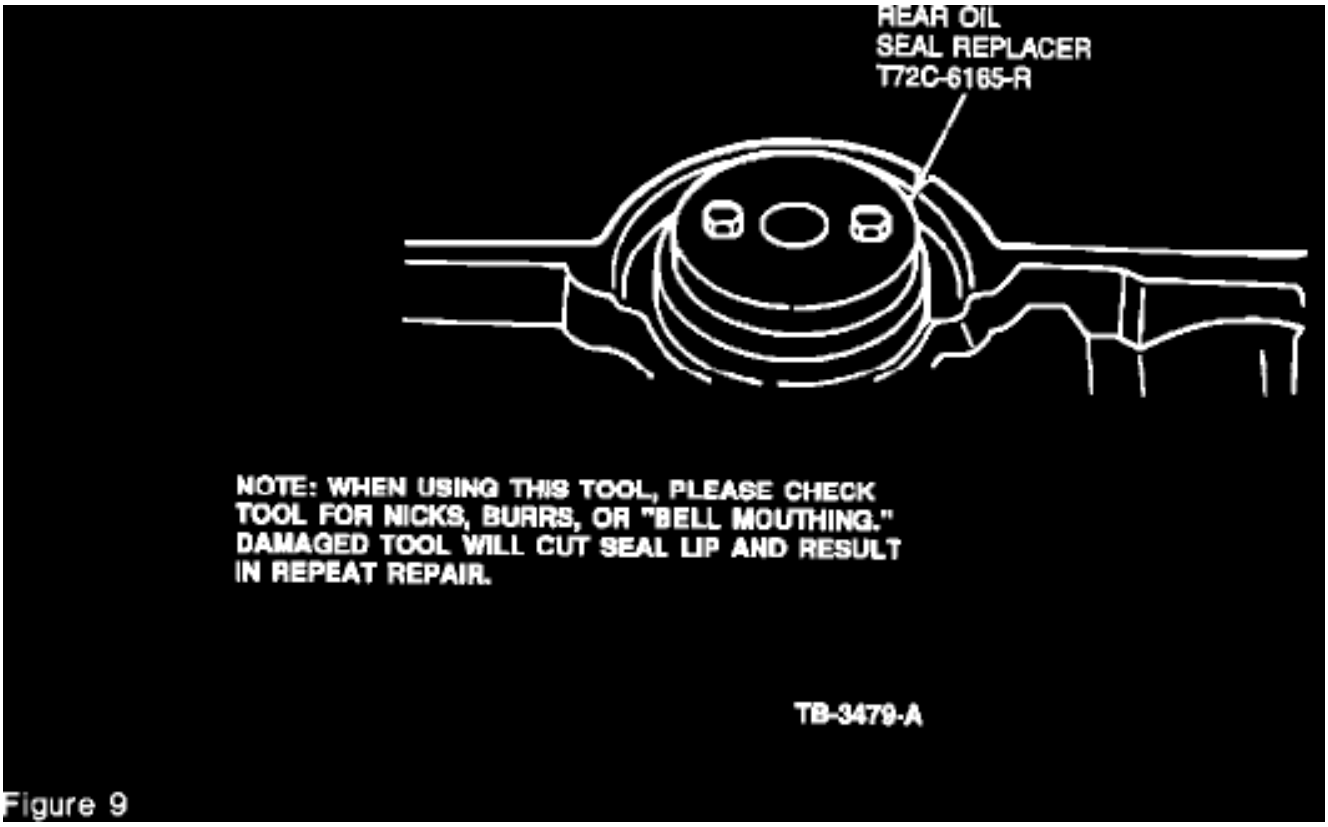


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

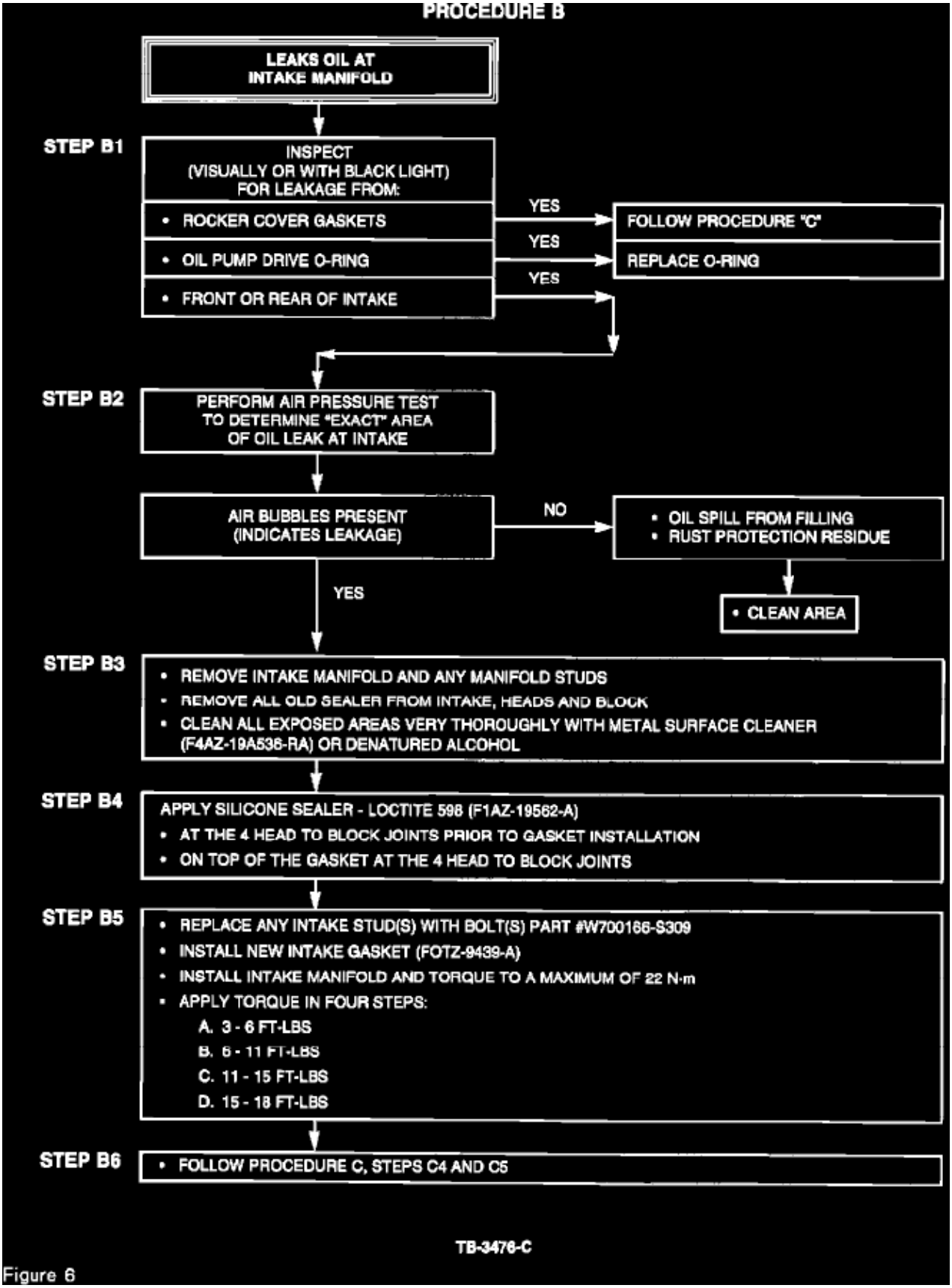


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

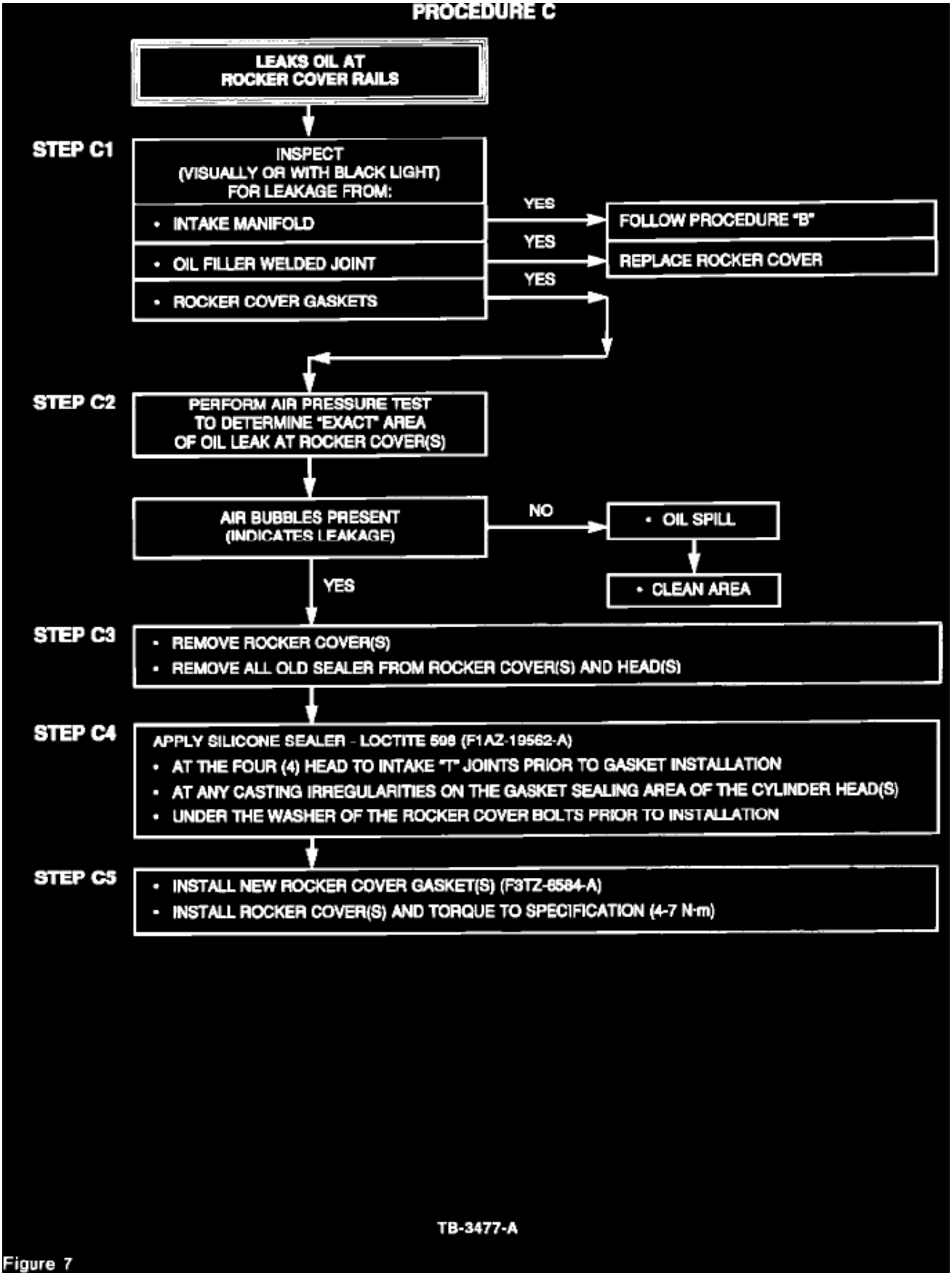


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

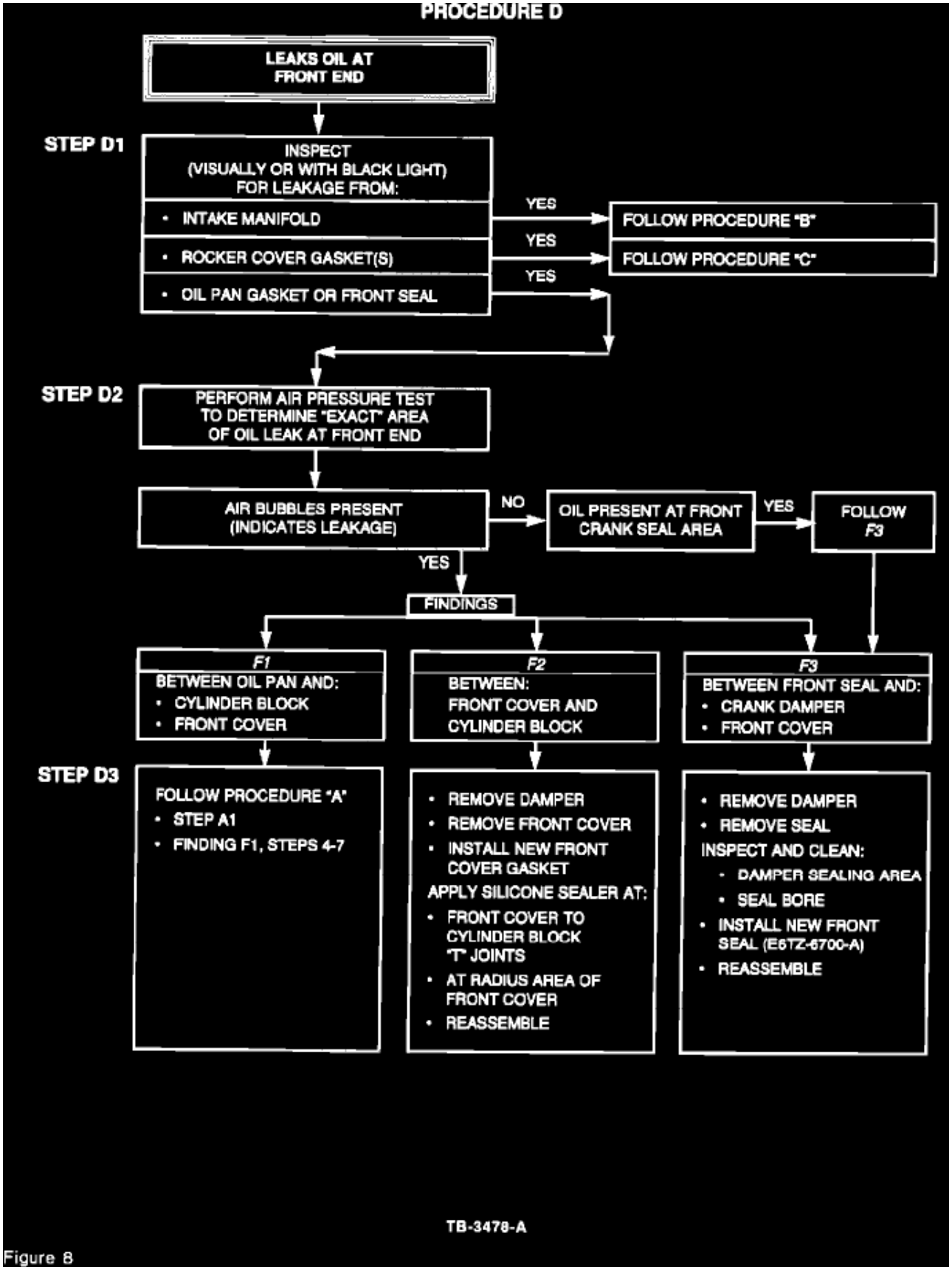


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
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W700166-S309	Bolt - Intake Manifold	C
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Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

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941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

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ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

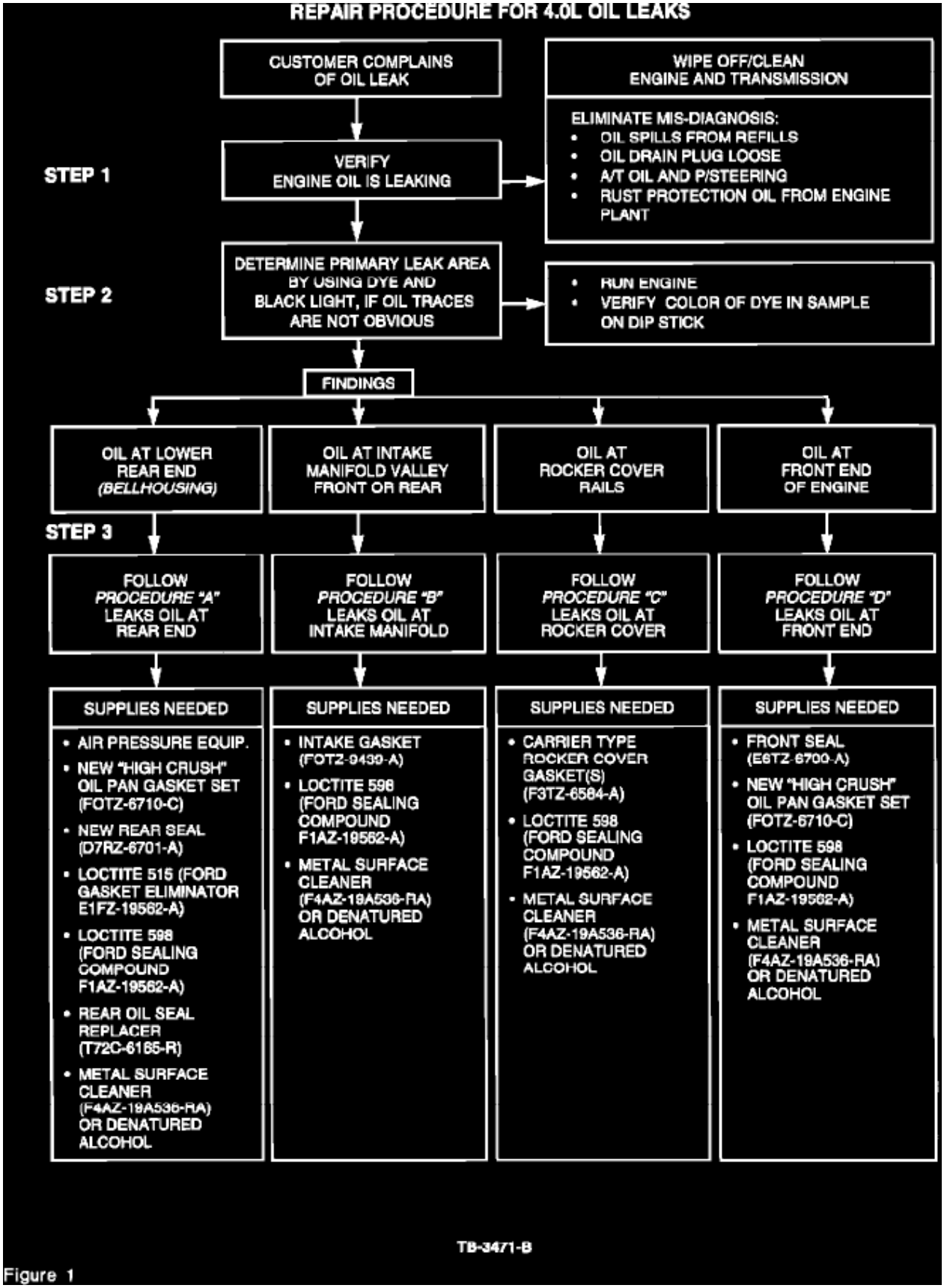


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

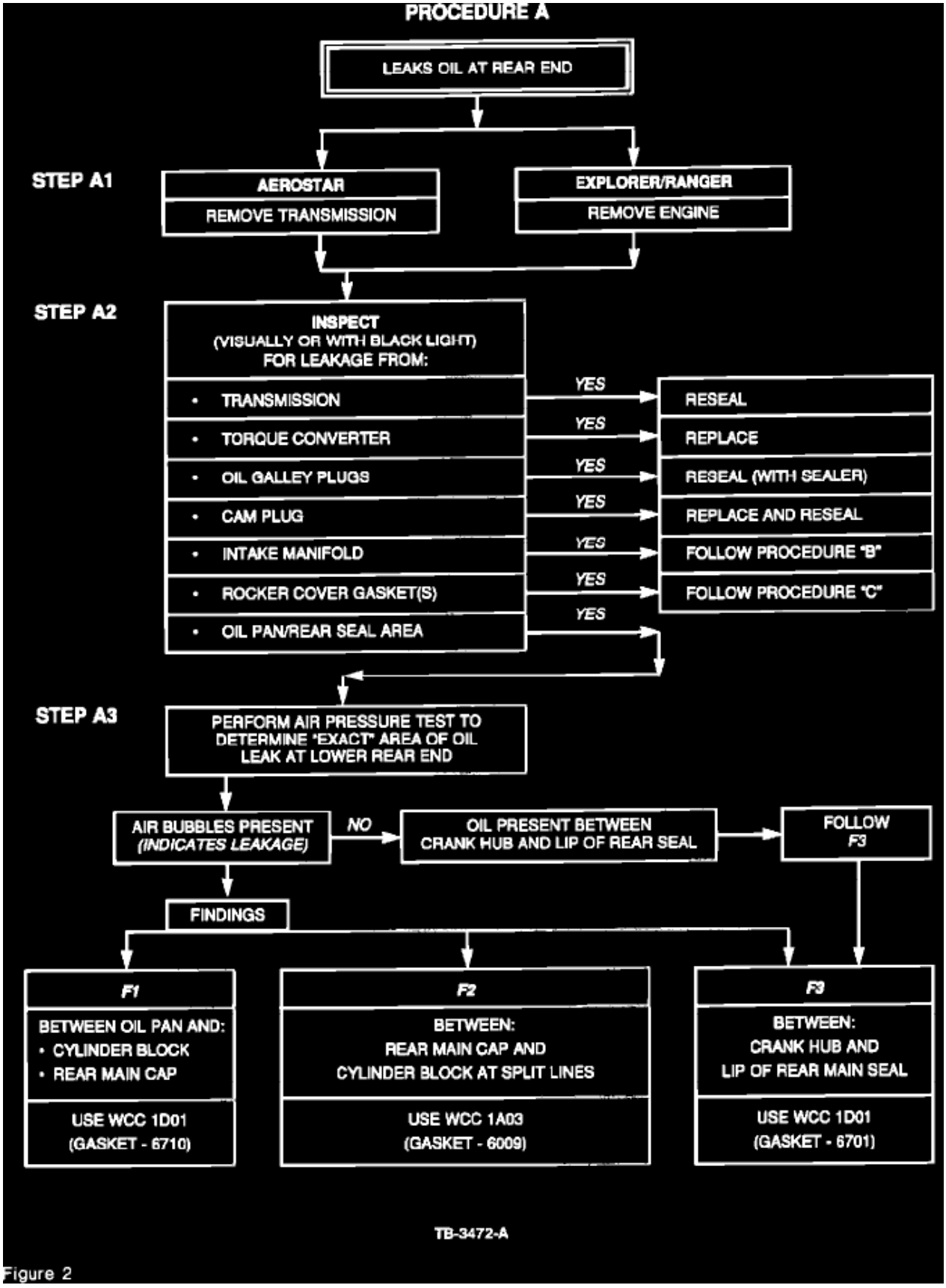

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

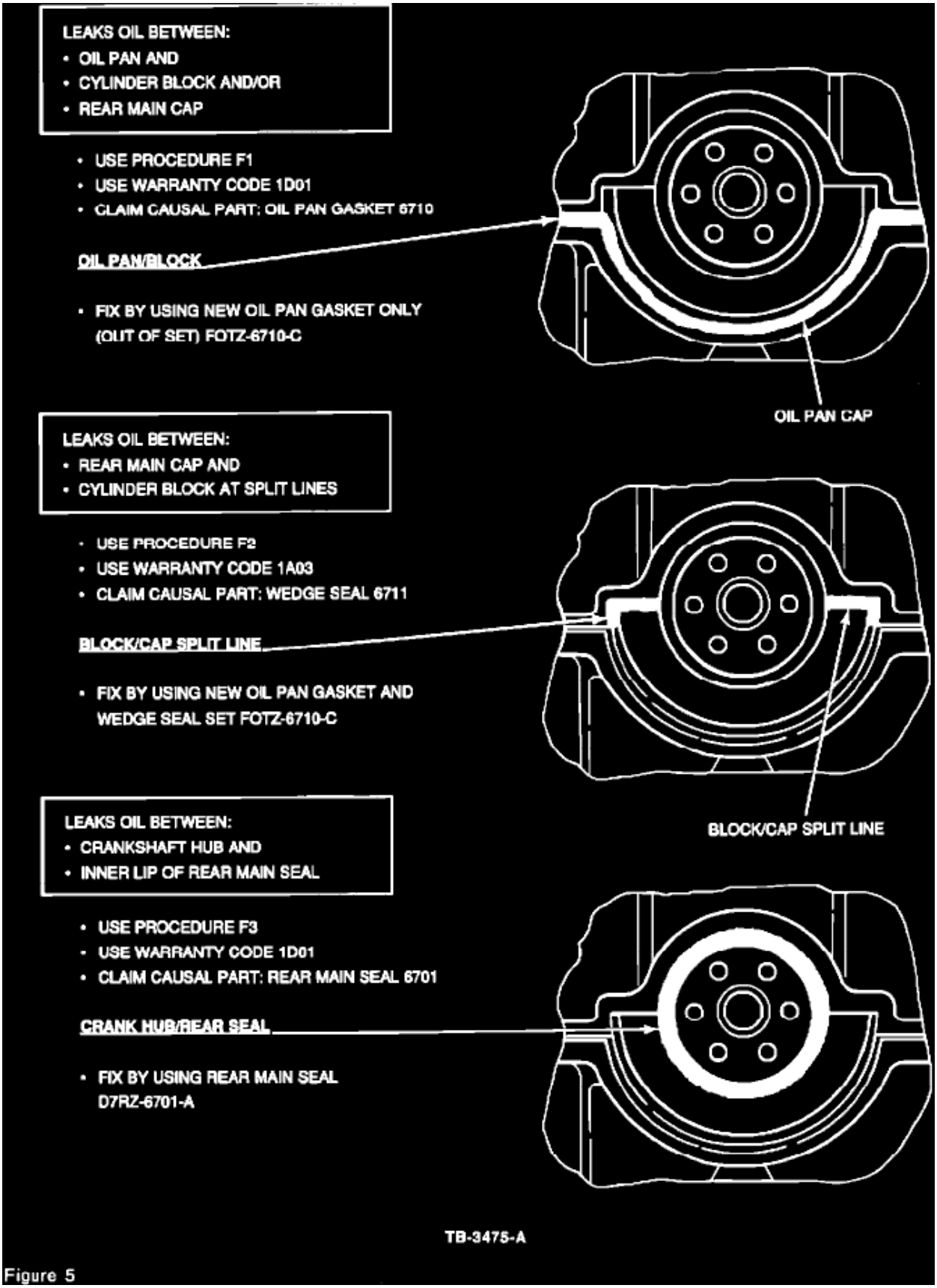


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

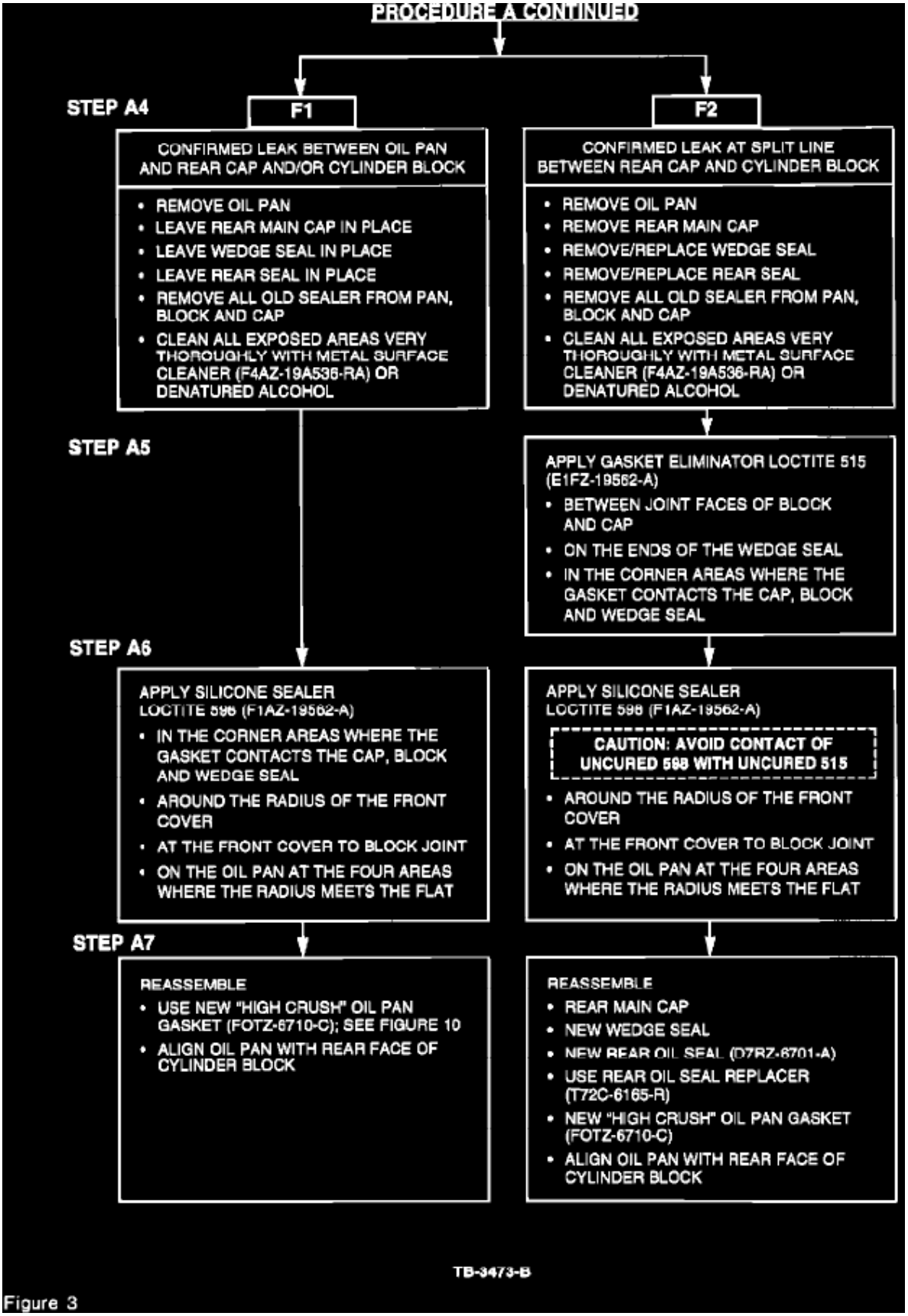
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

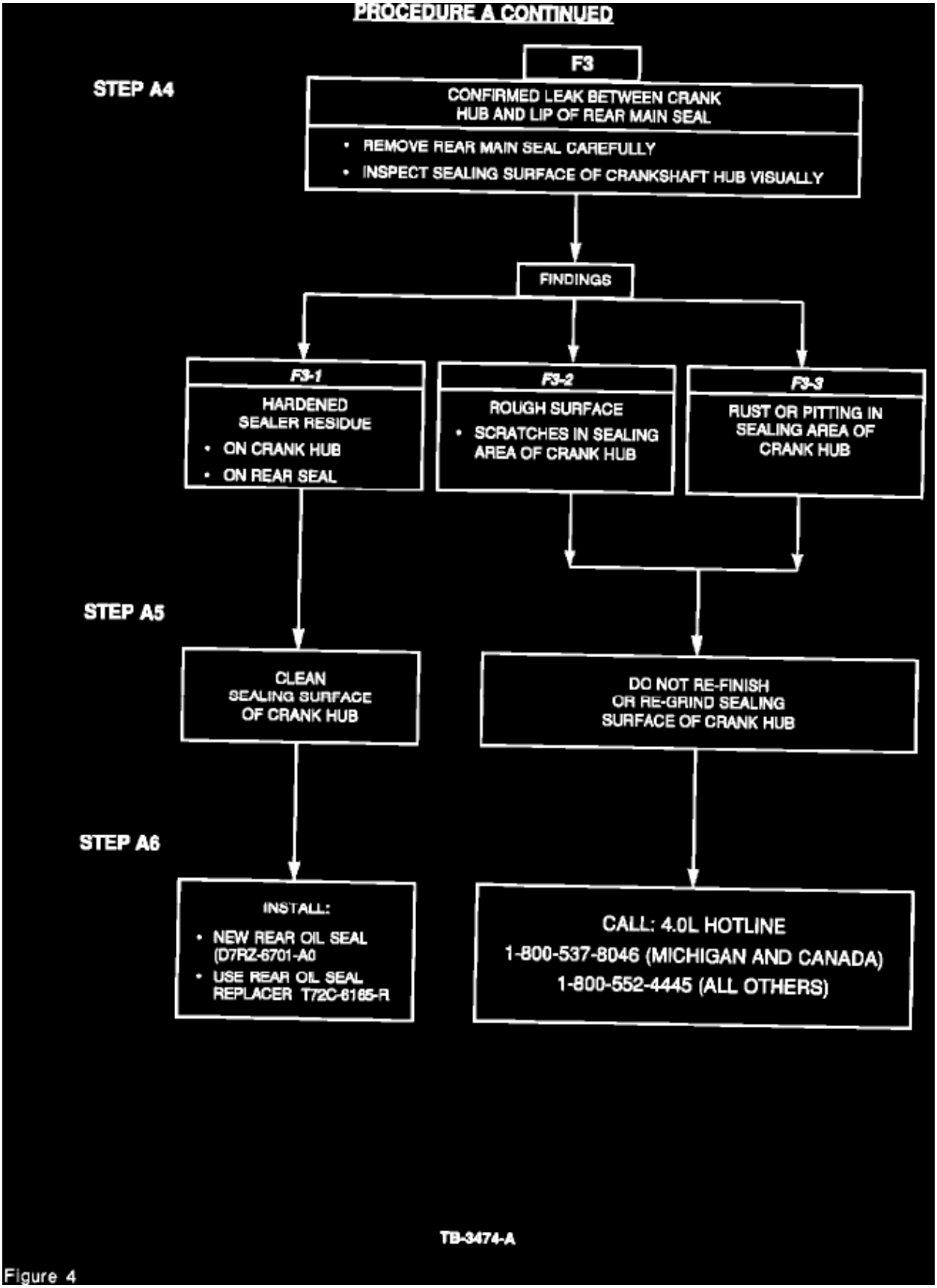


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

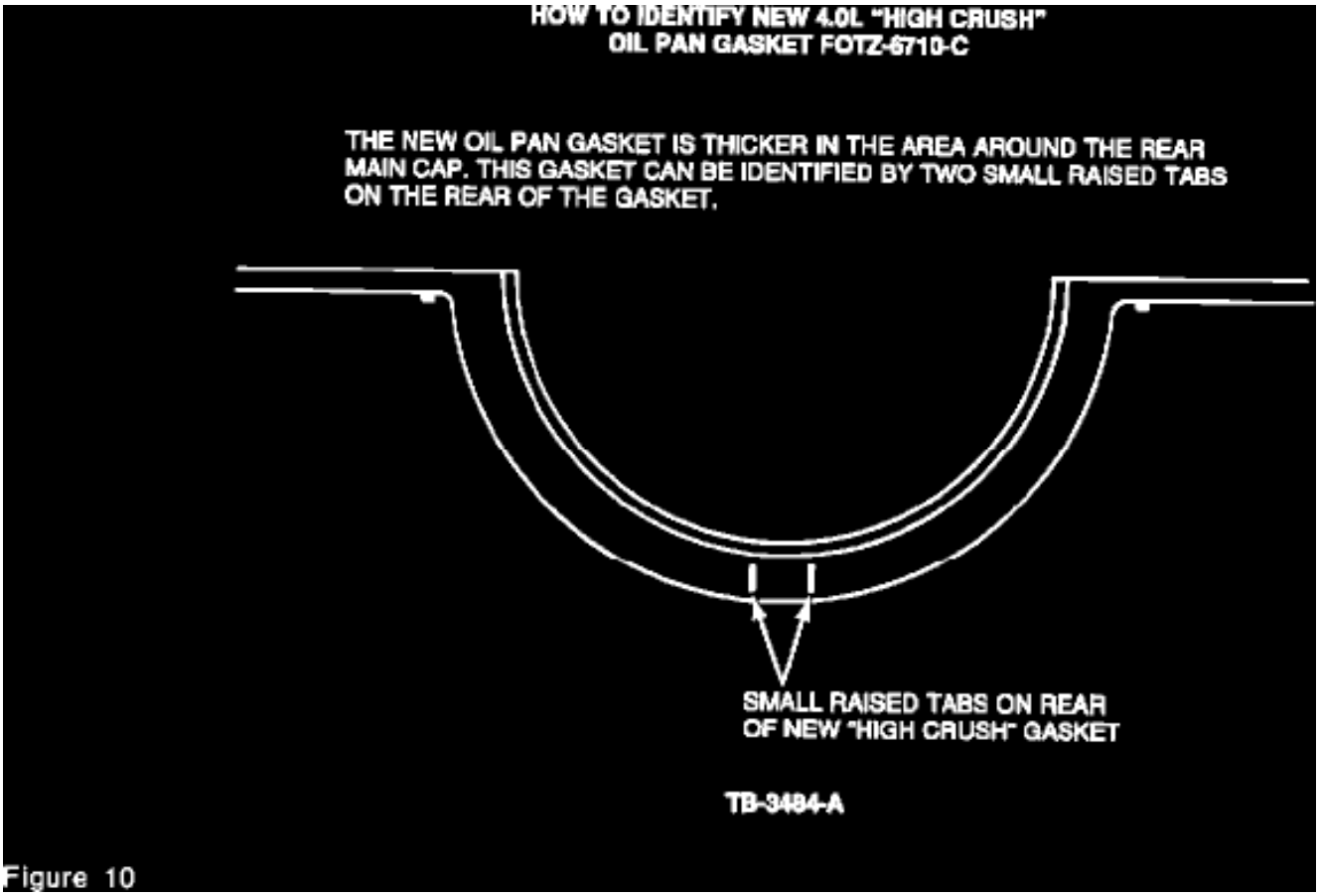


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

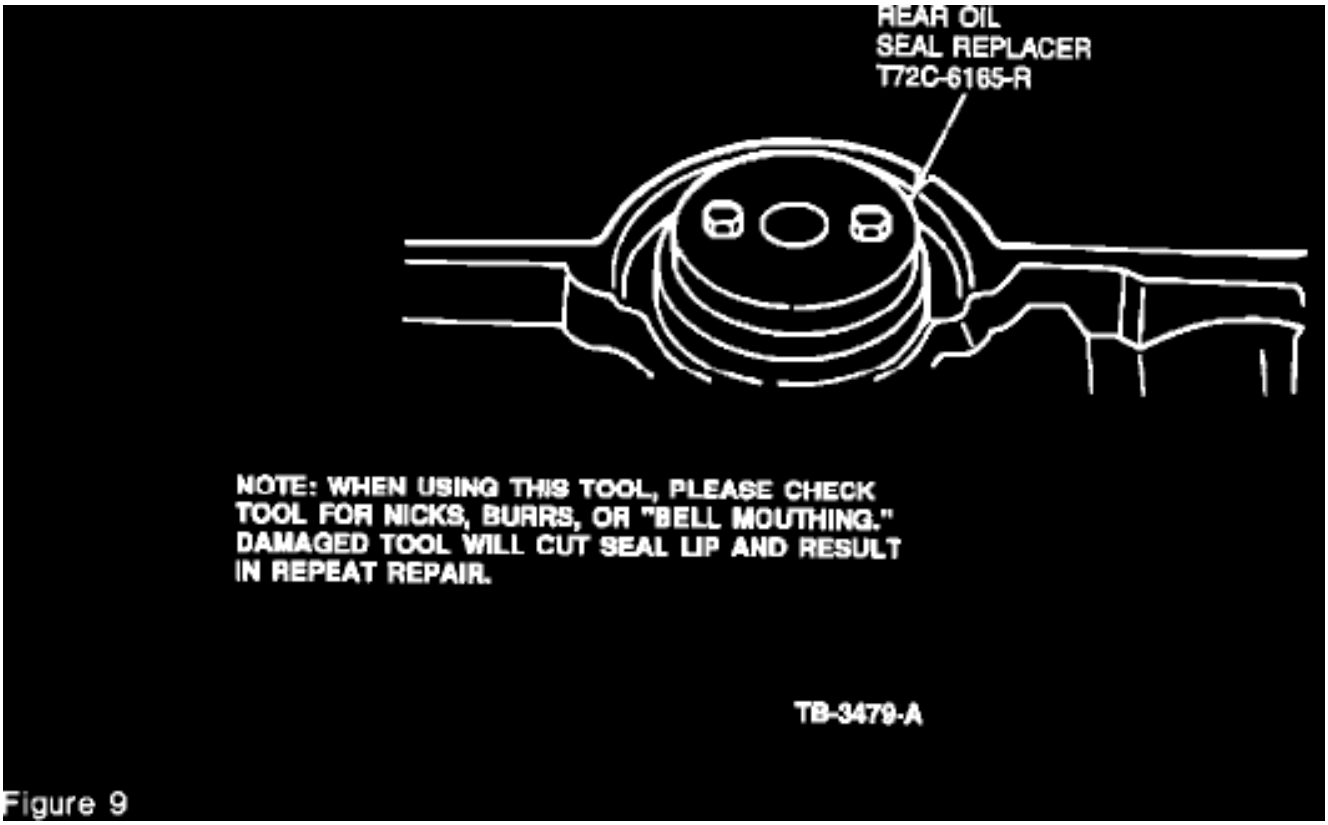


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

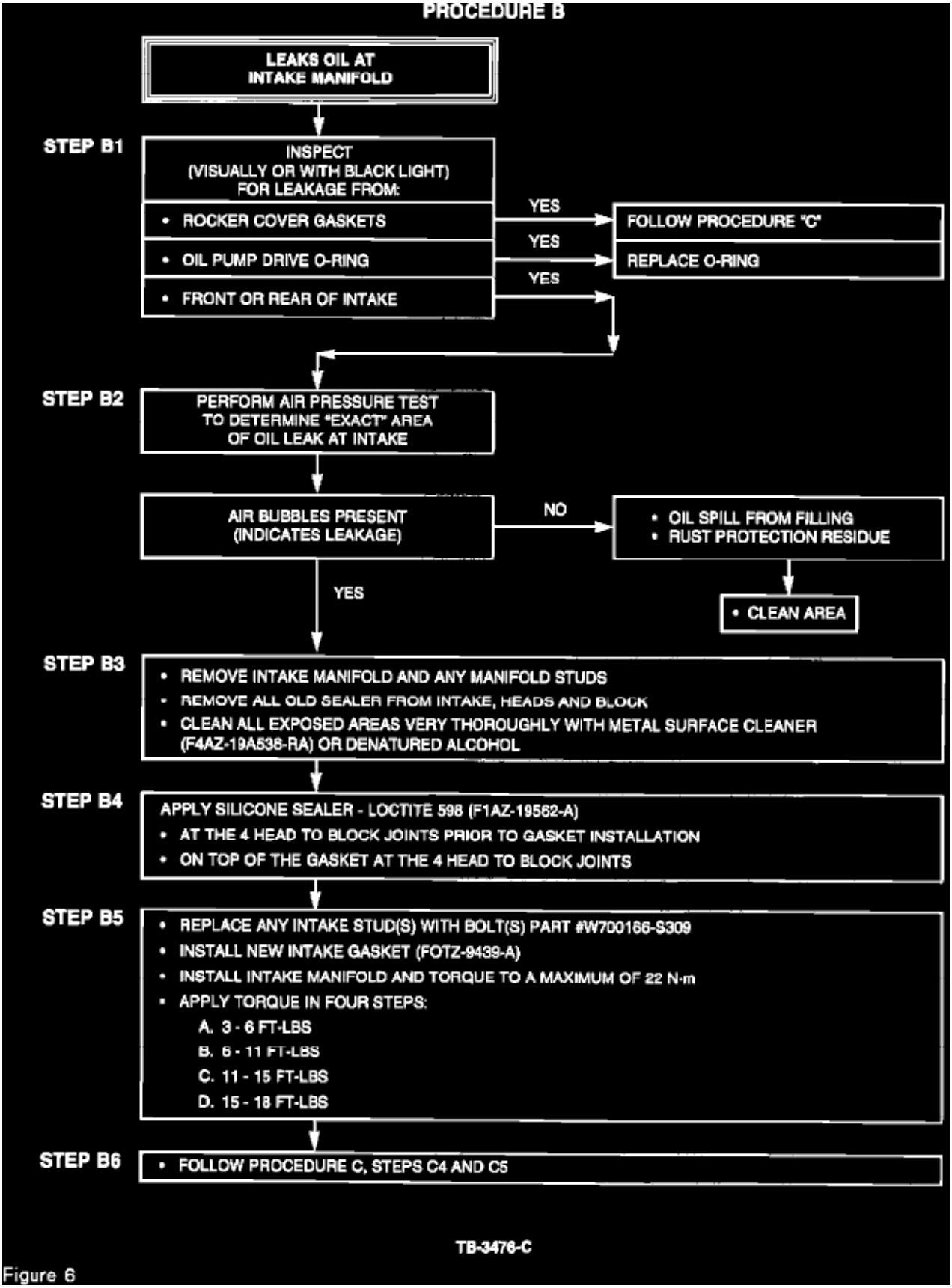


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

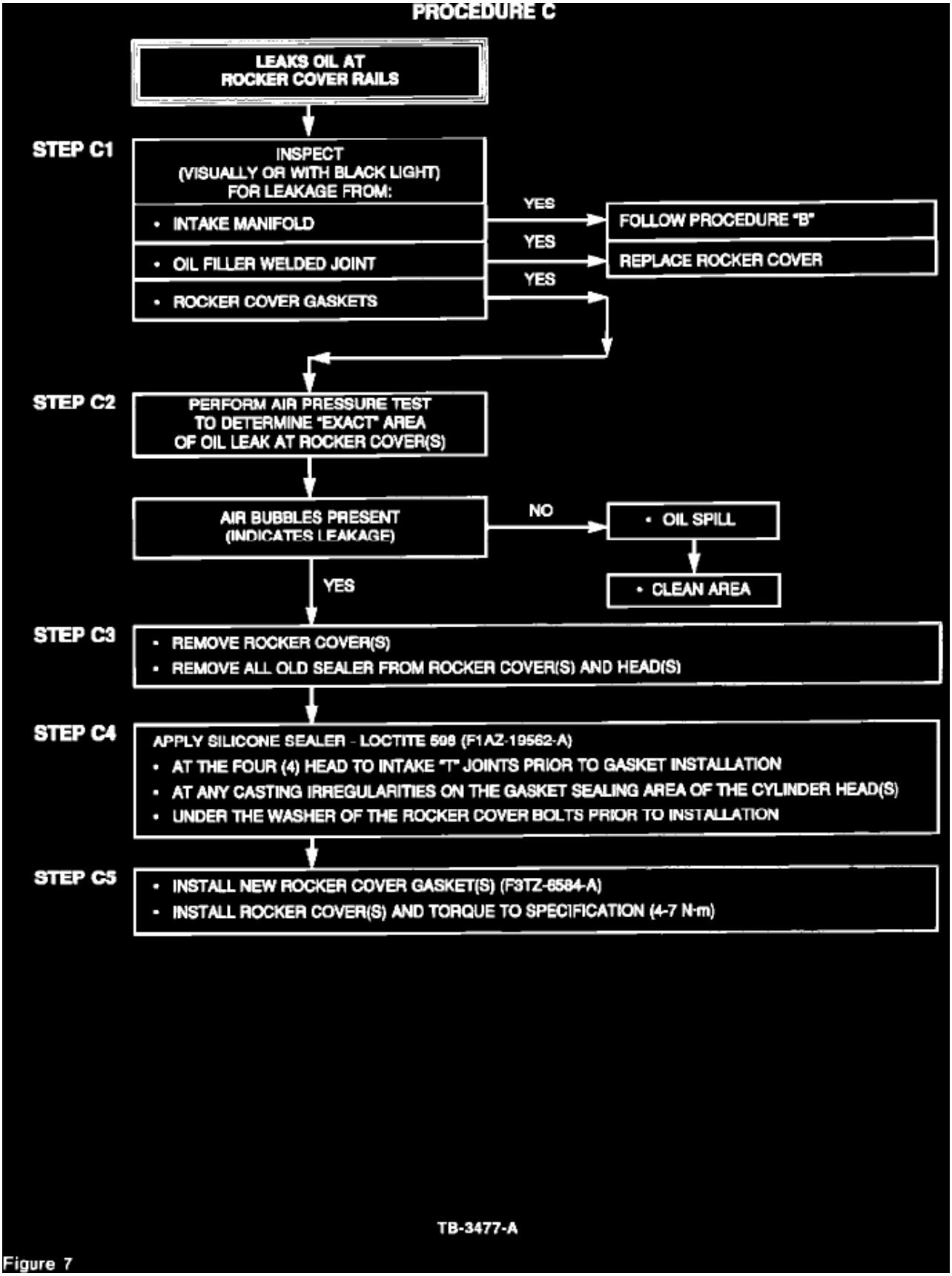


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

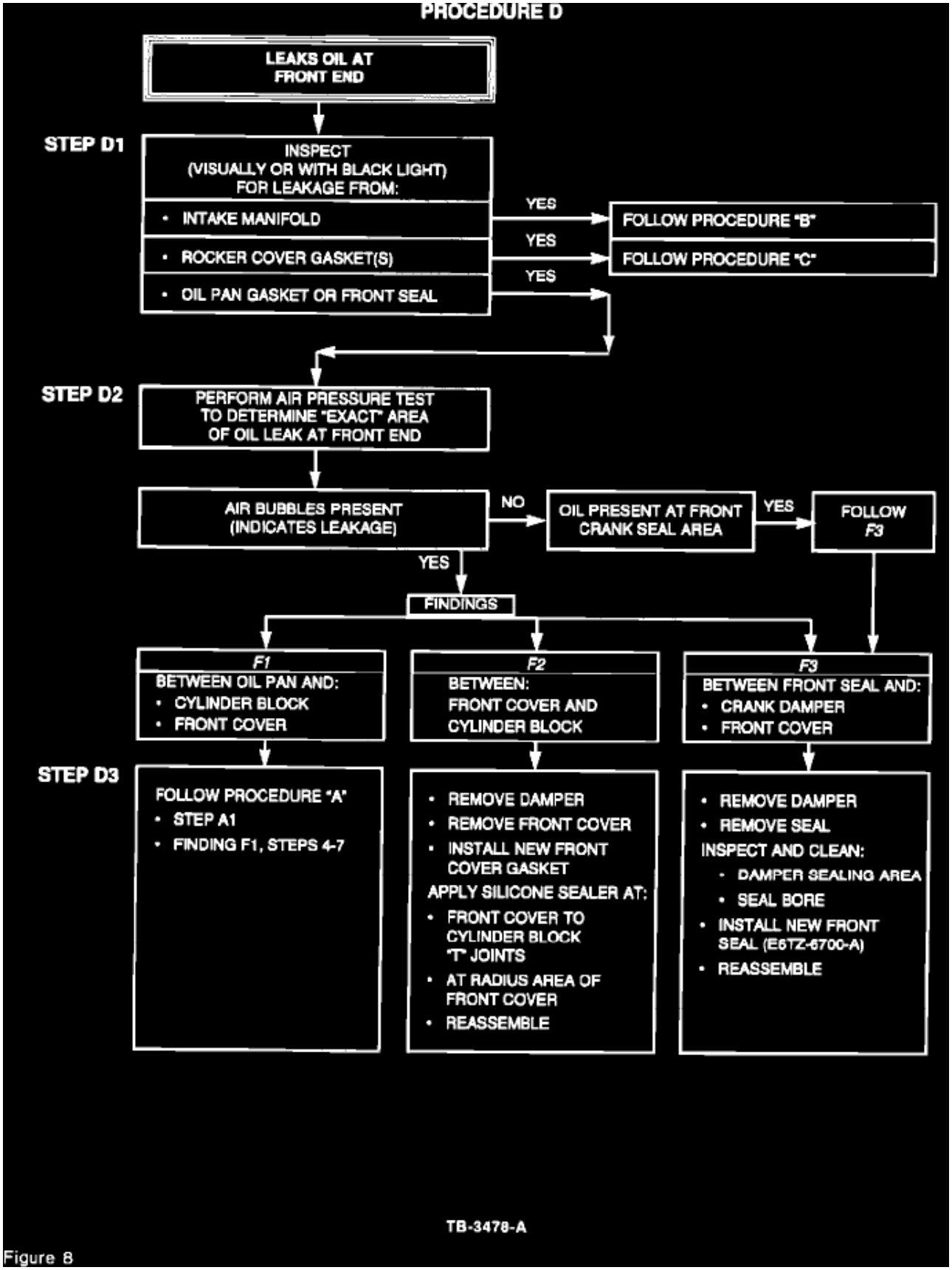


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E6TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

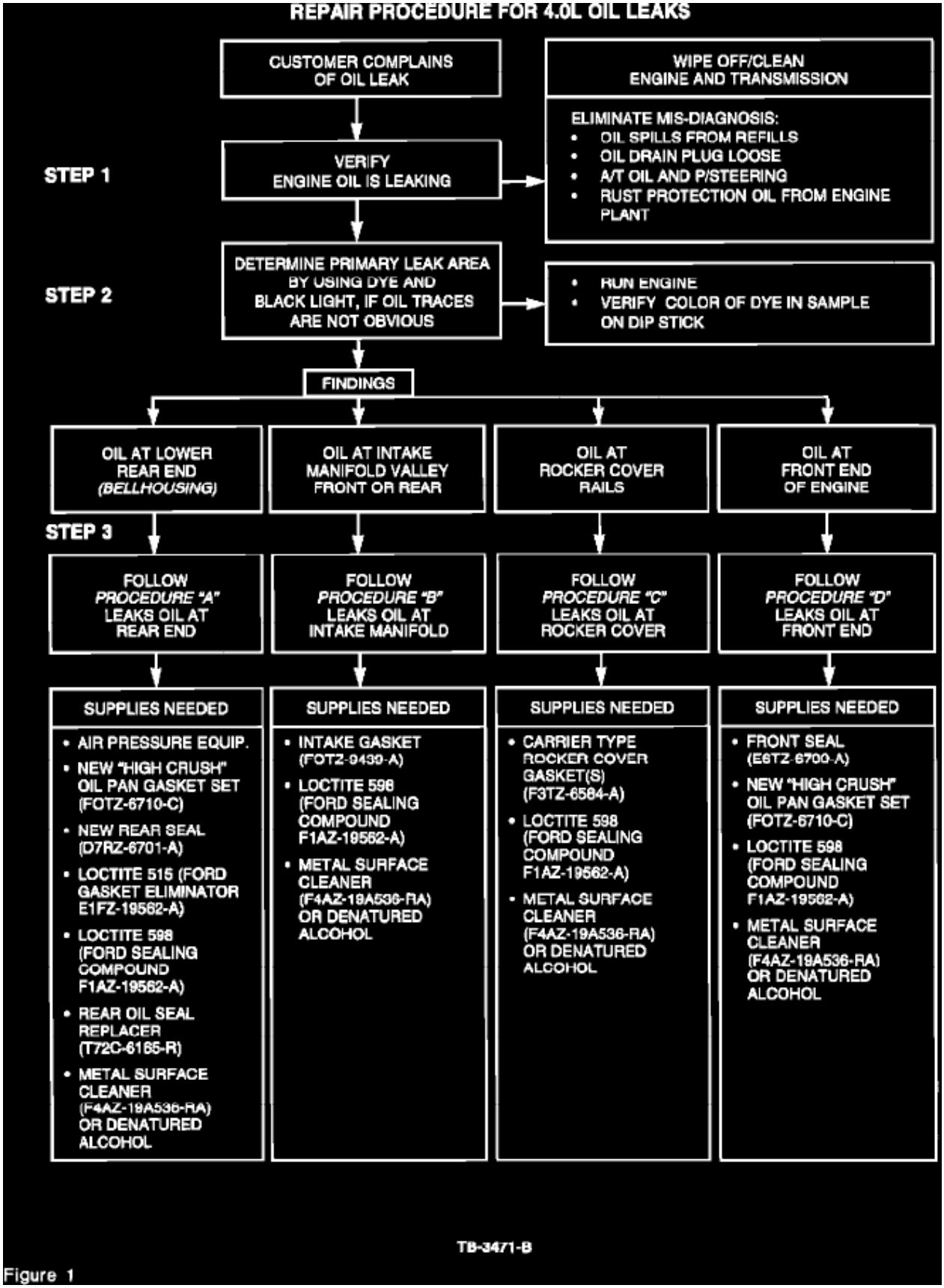


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

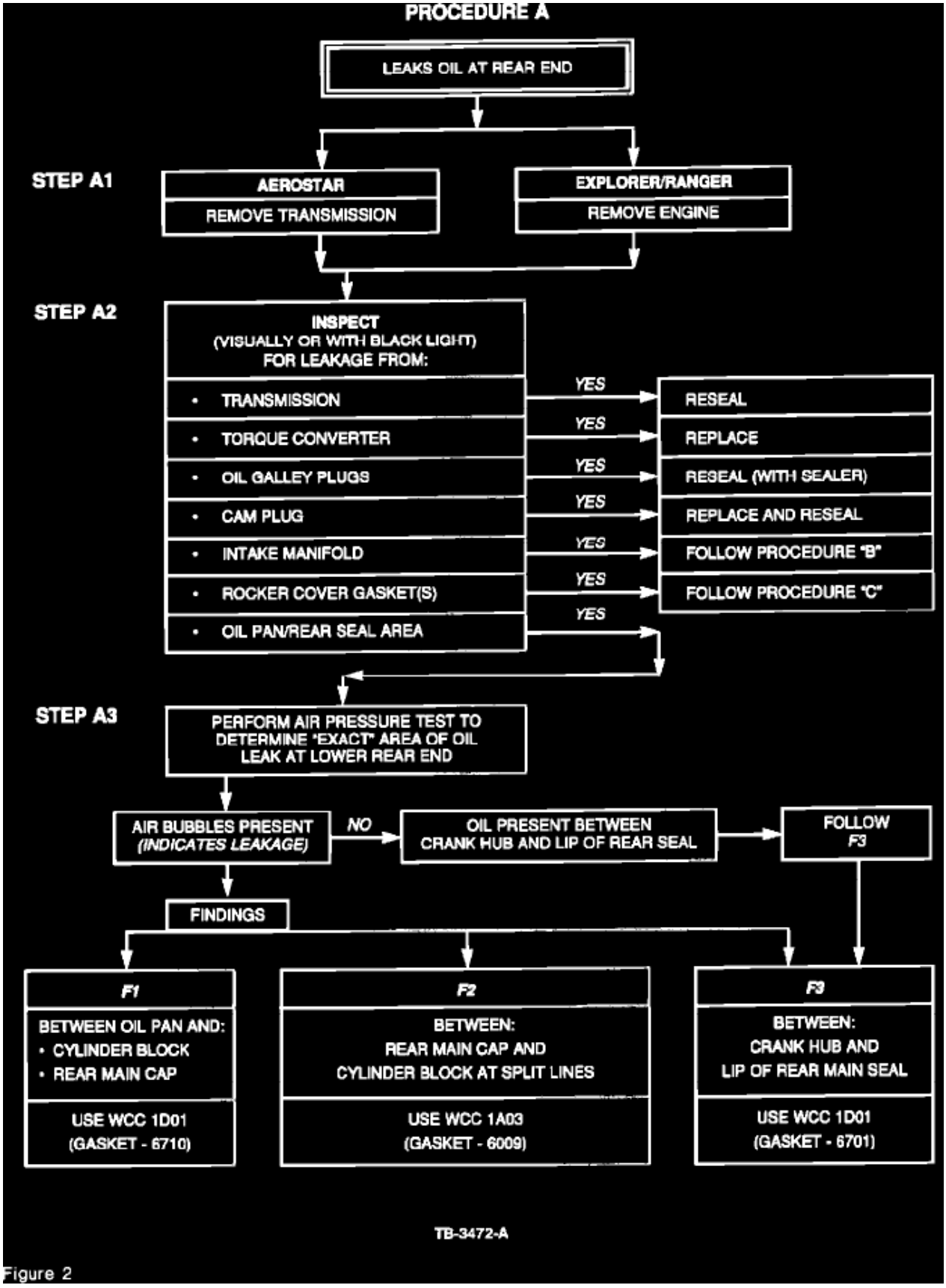

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

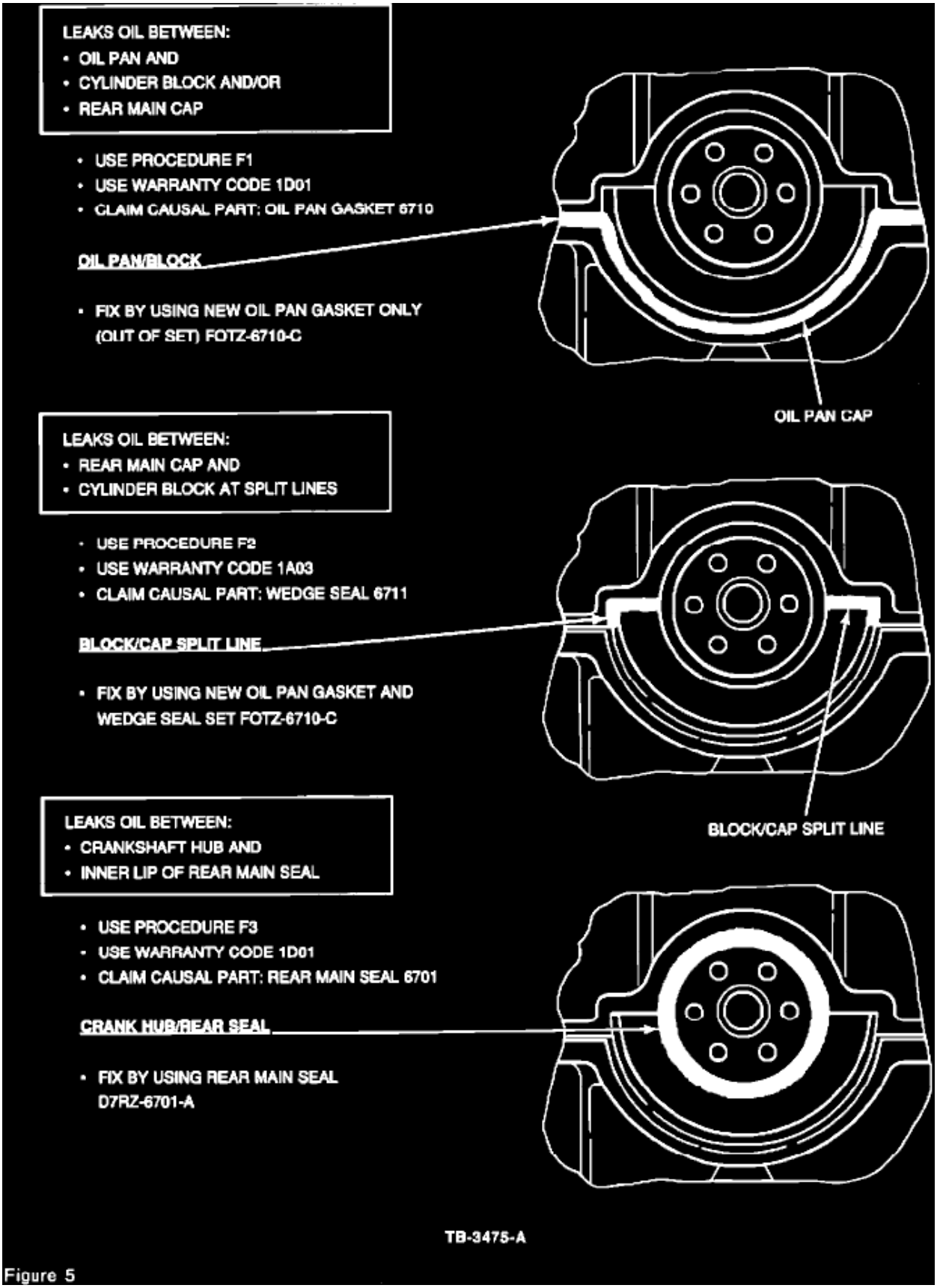


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

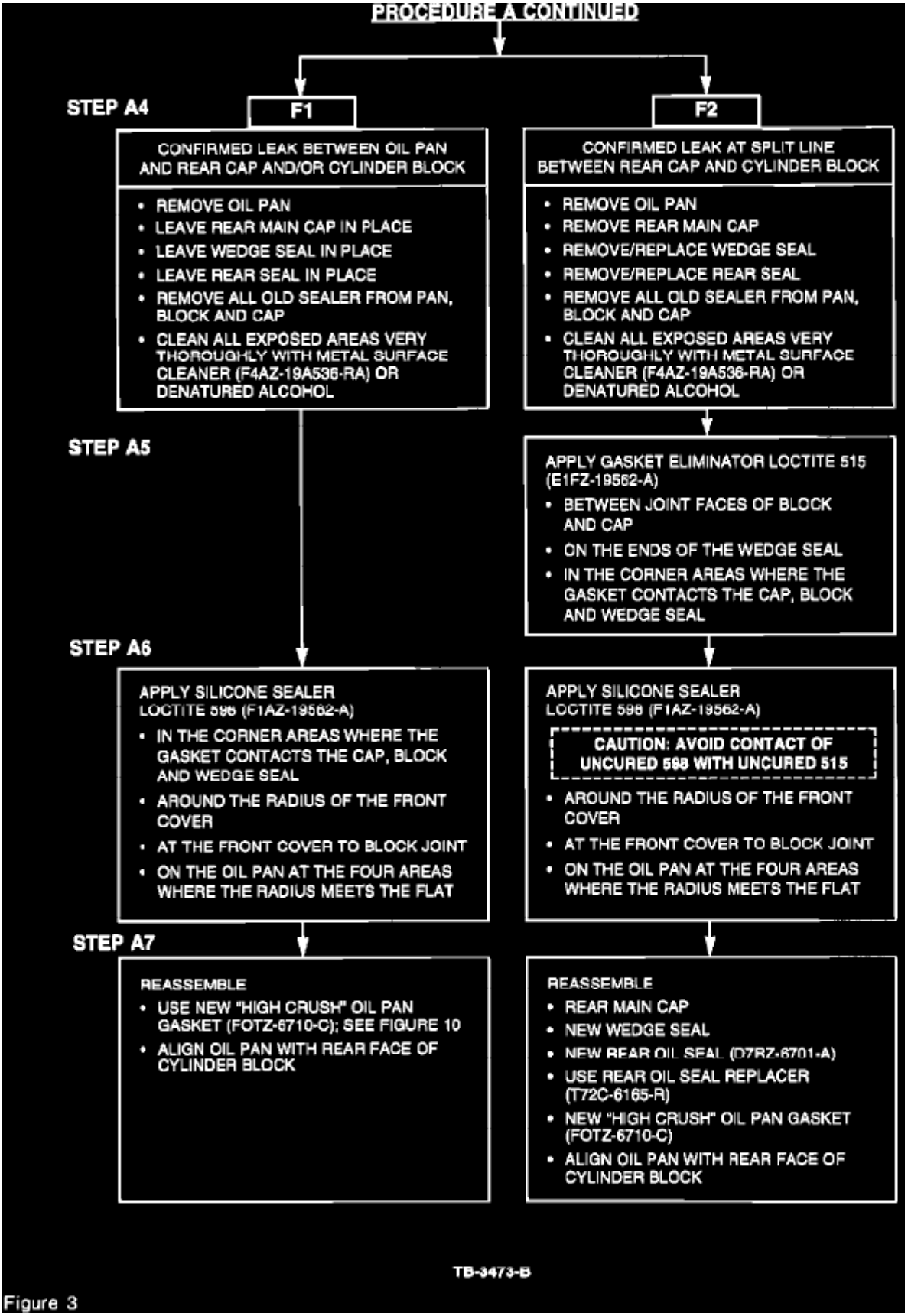
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

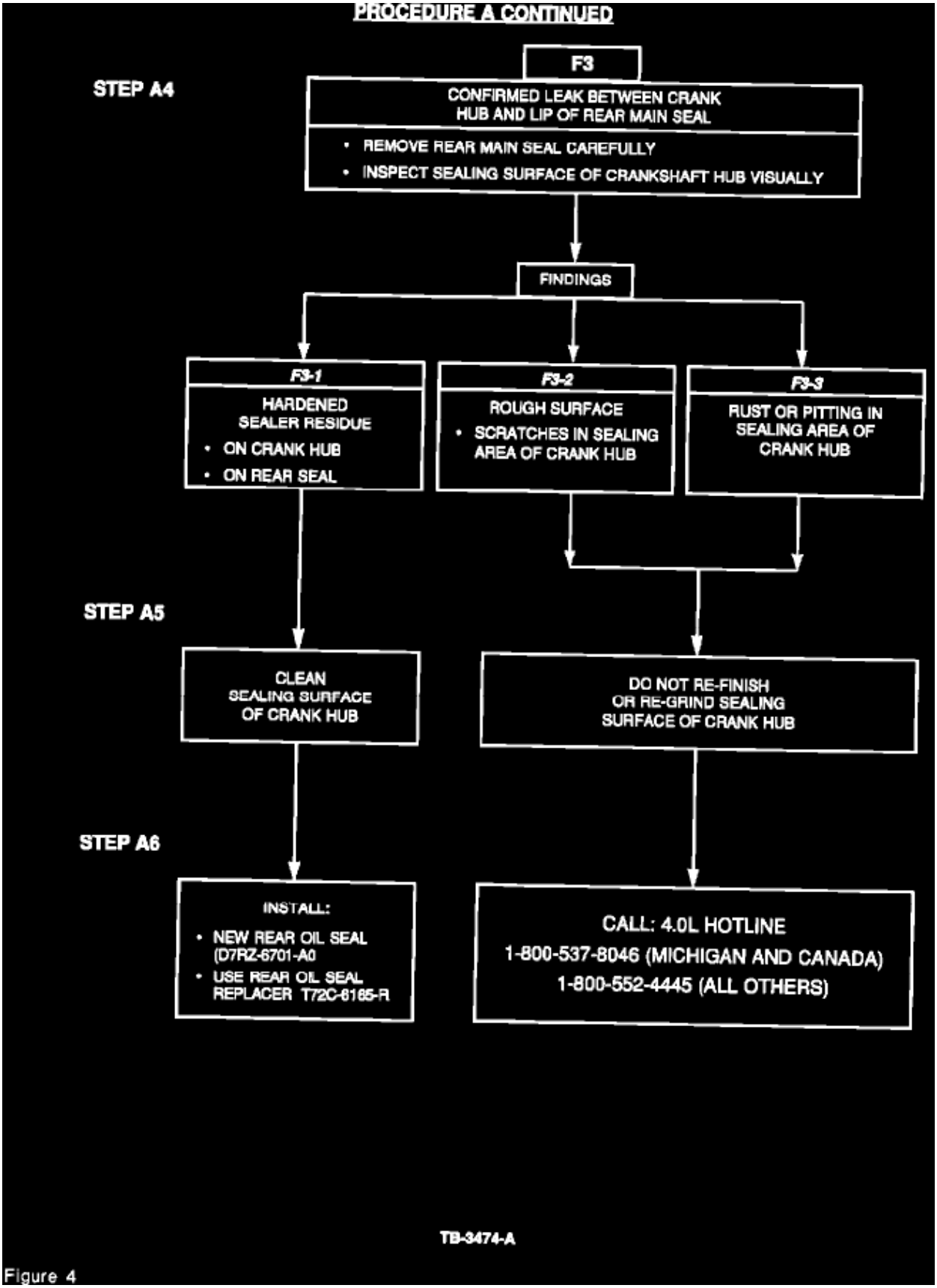


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

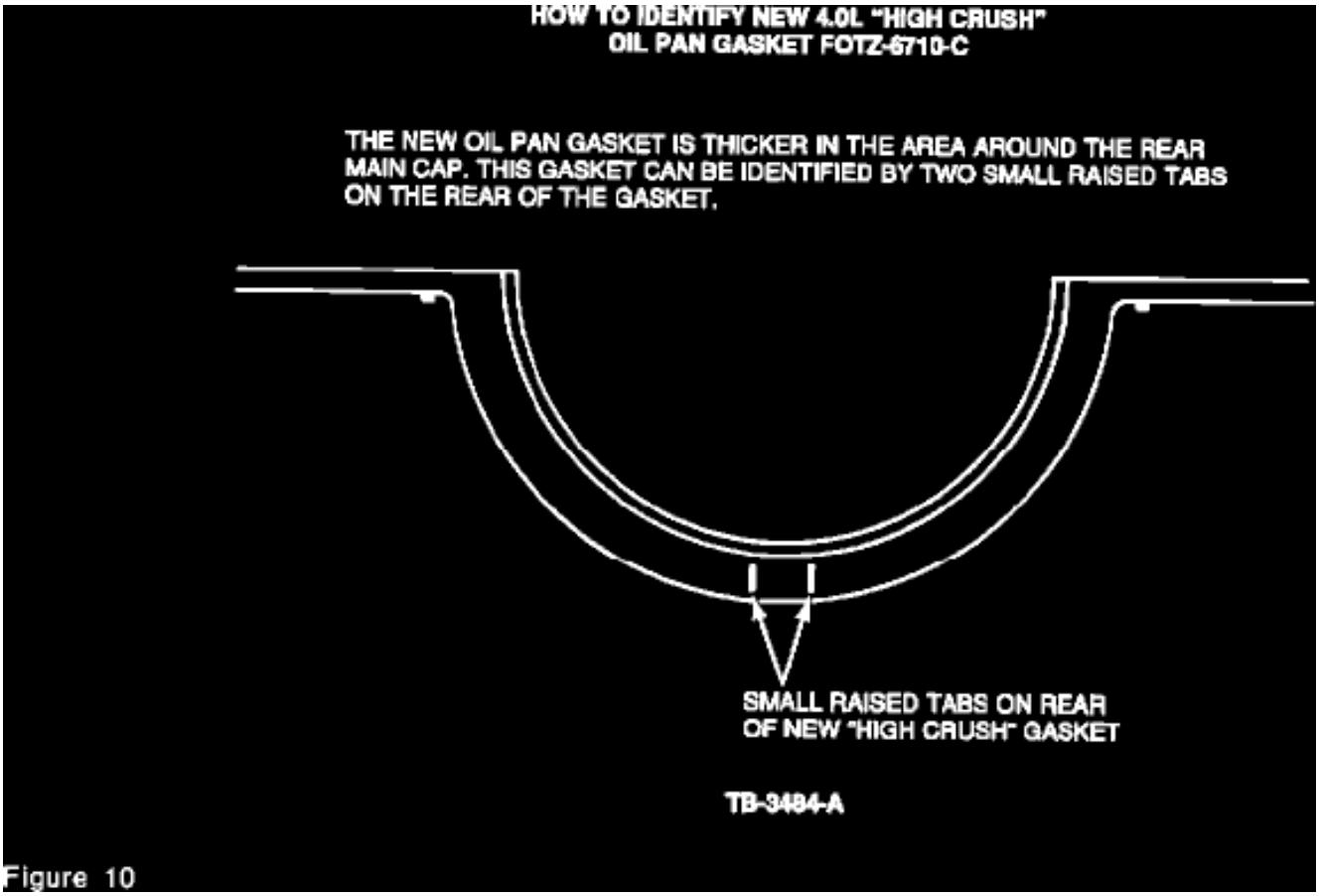


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

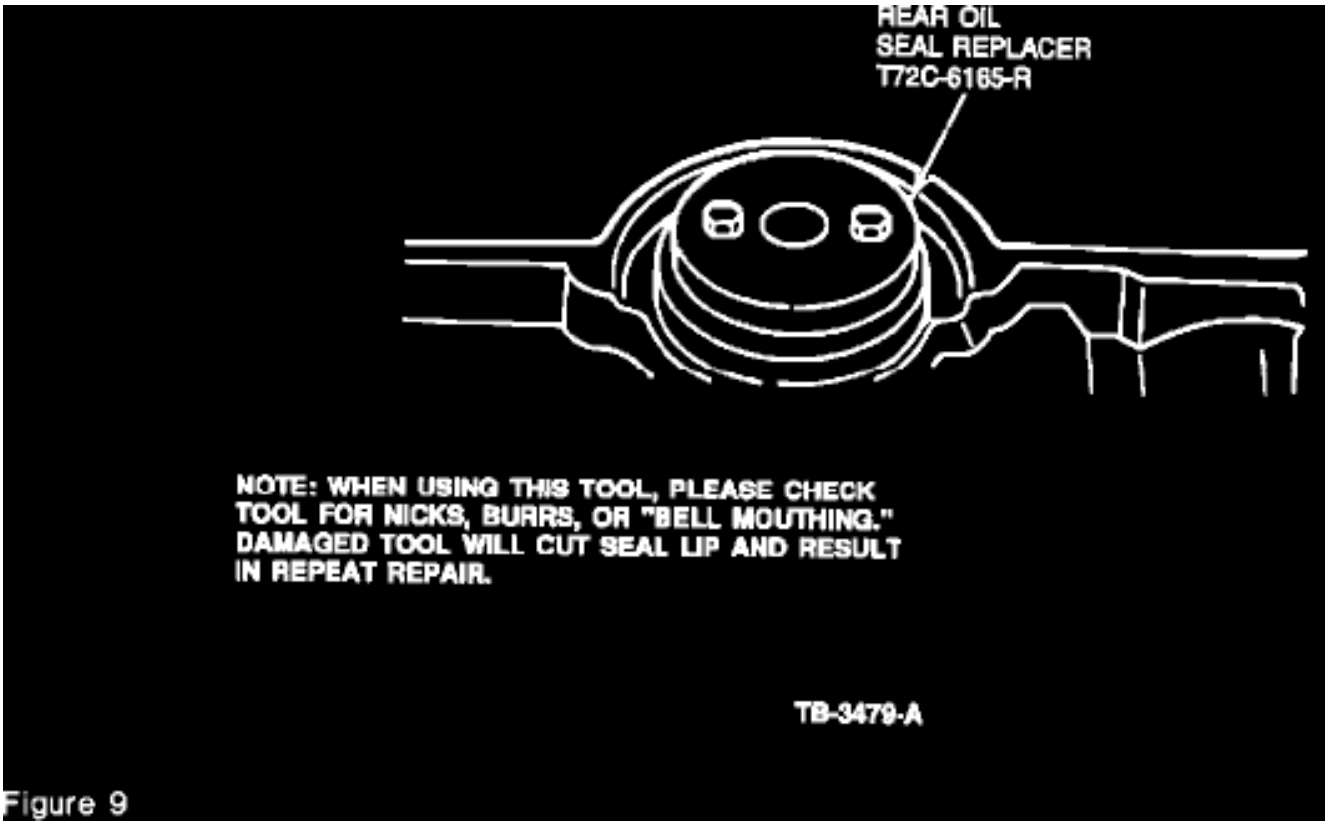


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

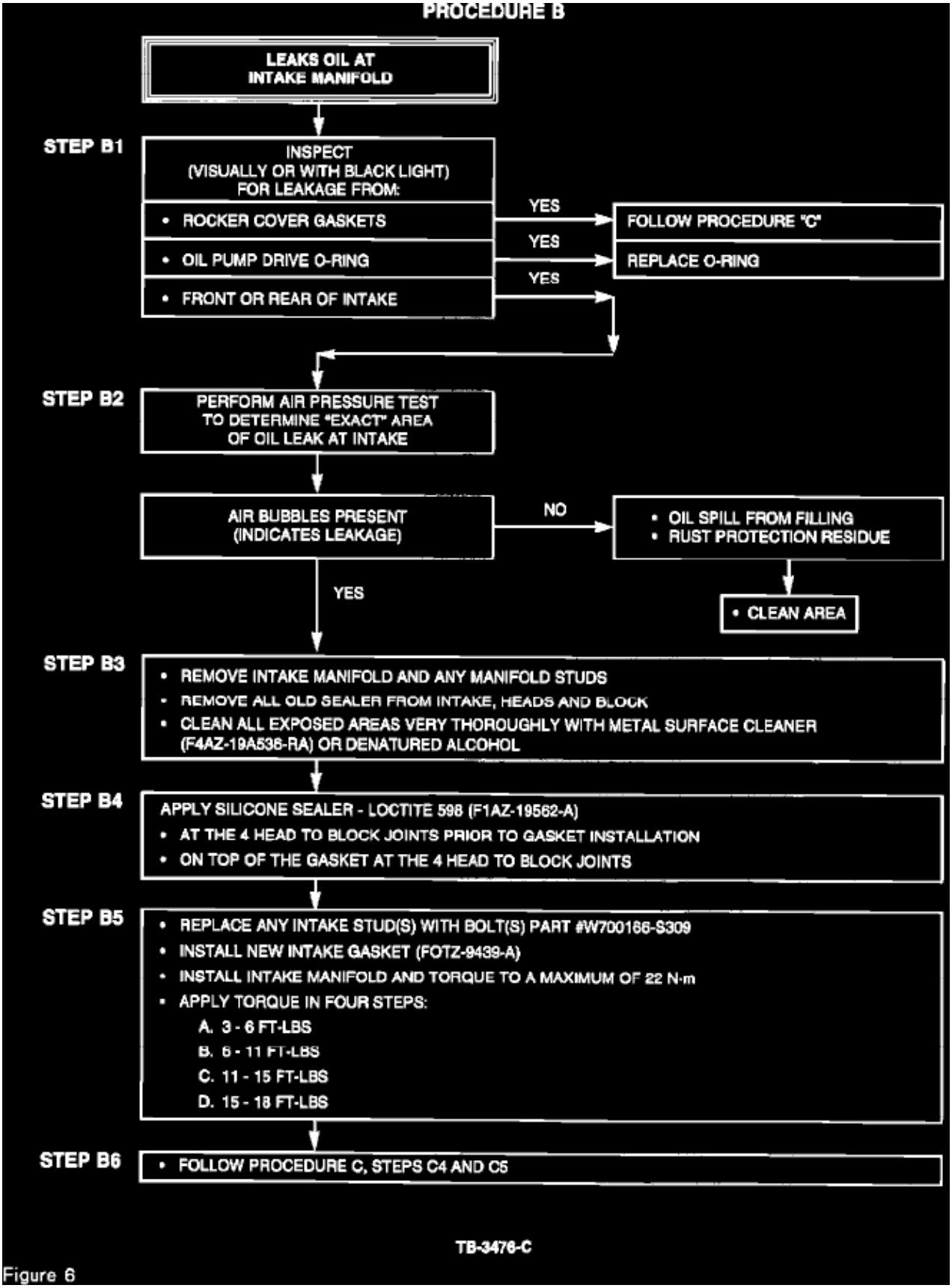


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

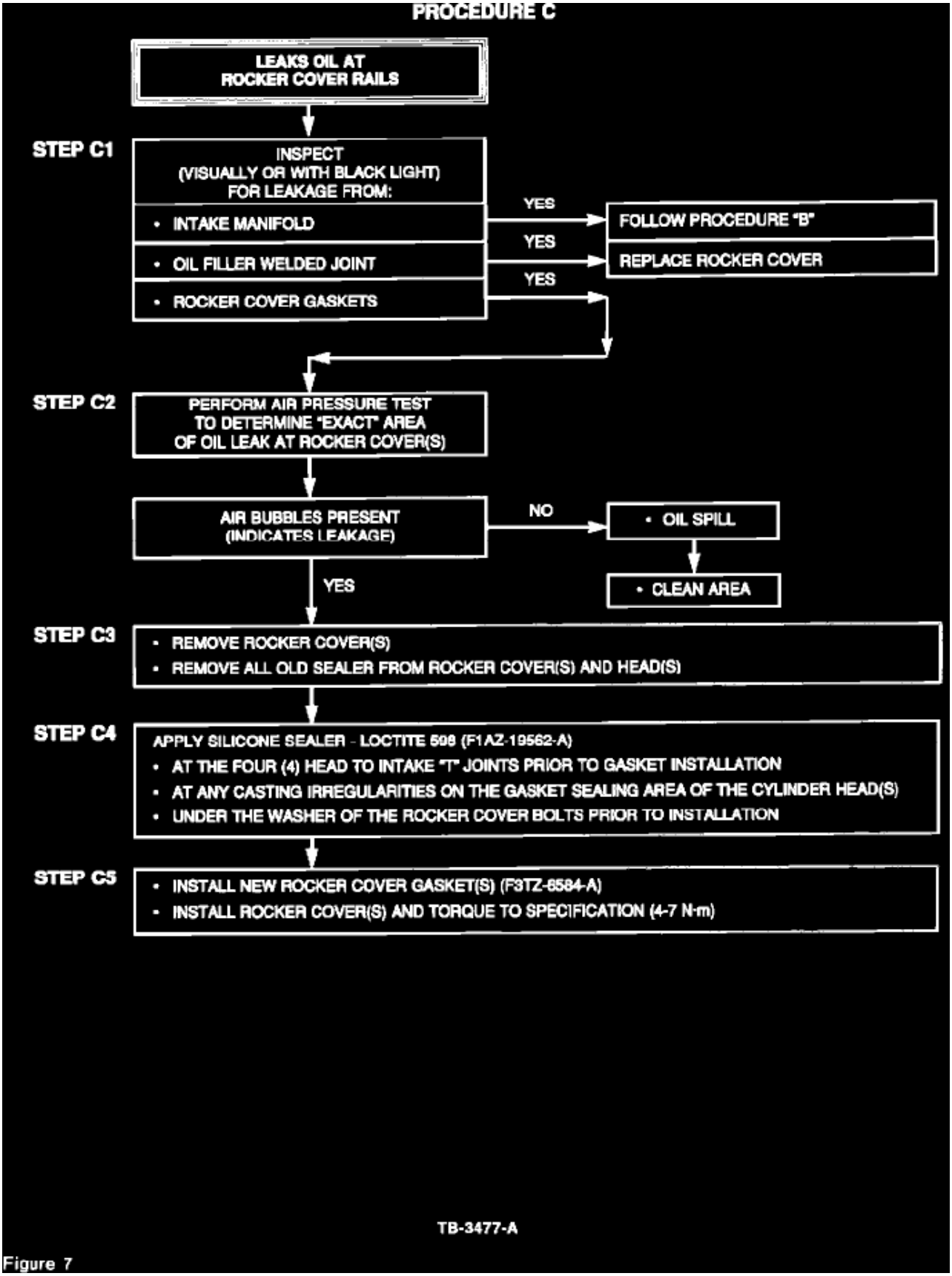


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

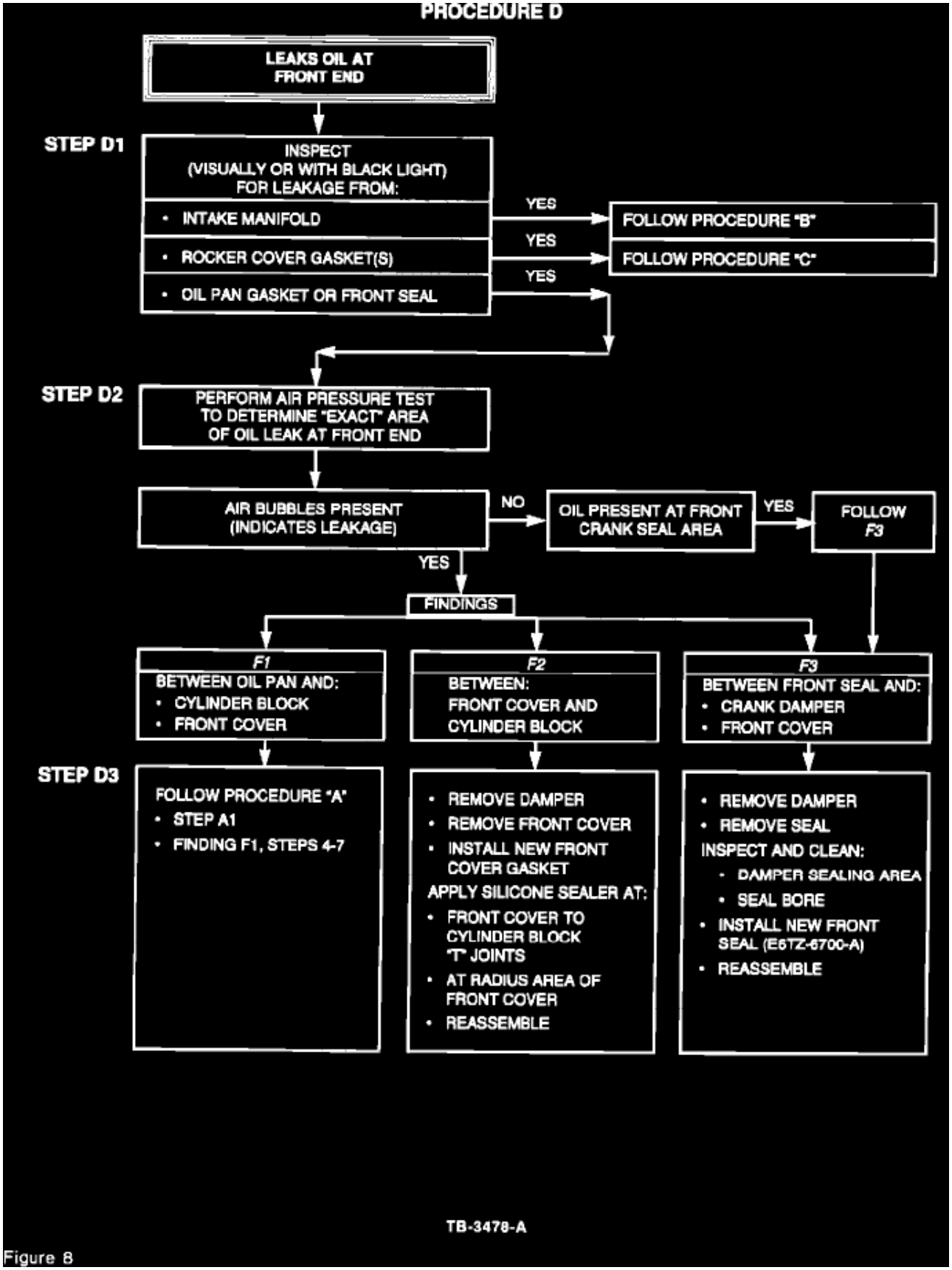
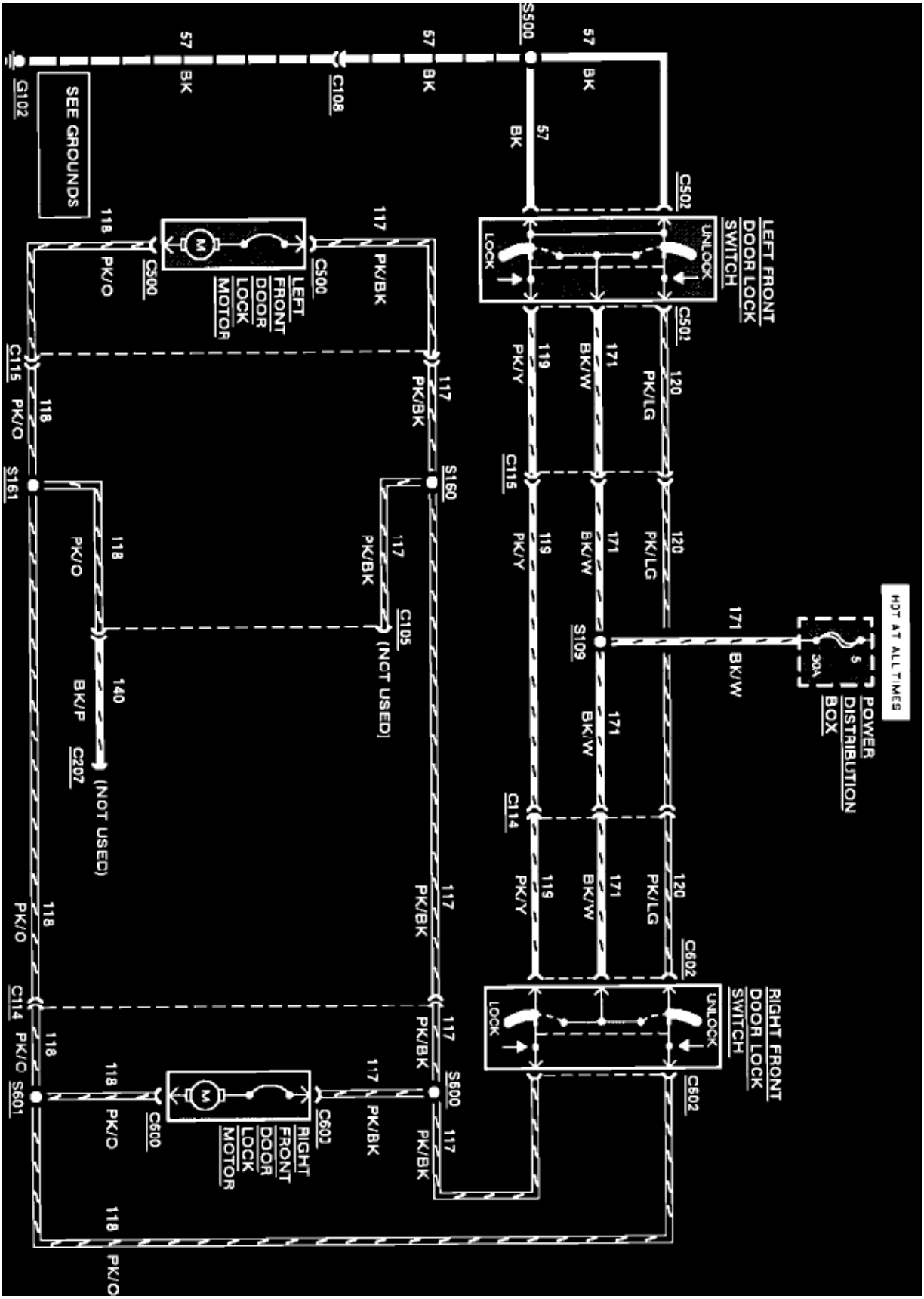


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.


HOT AT ALL TIMES
POWER DISTRIBUTION BOX
30A
LEFT FRONT DOOR LOCK SWITCH
RIGHT FRONT DOOR LOCK SWITCH
UNLOCK
LOCK
LEFT FRONT DOOR LOCK MOTOR
RIGHT FRONT DOOR LOCK MOTOR
SEE GROUNDS
G102
S500
S109
S160
S161
S600
S601
C105 (NOT USED)
C108
C114
C115
C202 (NOT USED)
C500
C501
C502
C600
C602
171 BK/W
57 BK
120 PK/LG
119 PK/Y
117 PK/BK
118 PK/O
140 BK/P

Power Door Locks

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

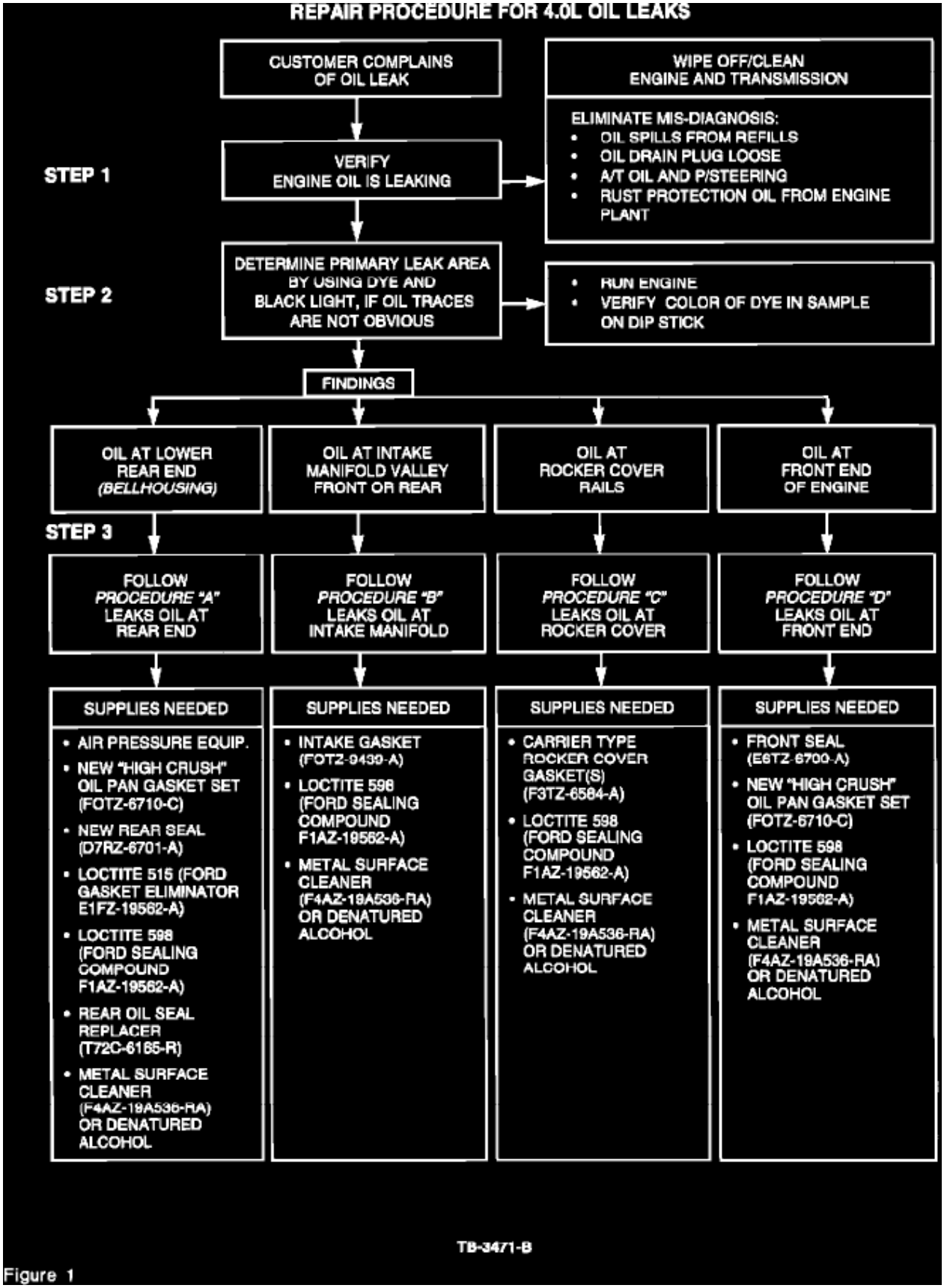


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

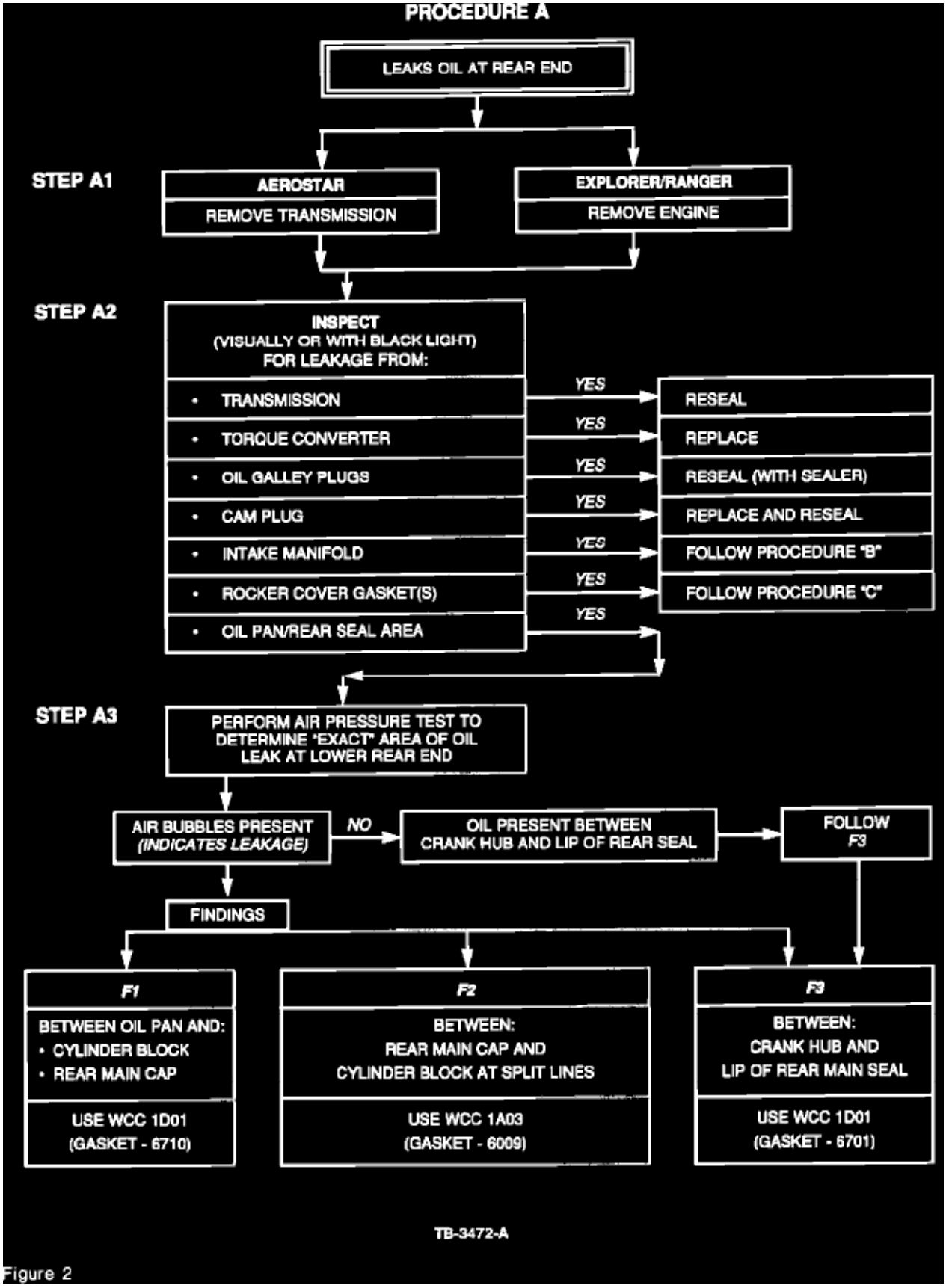

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

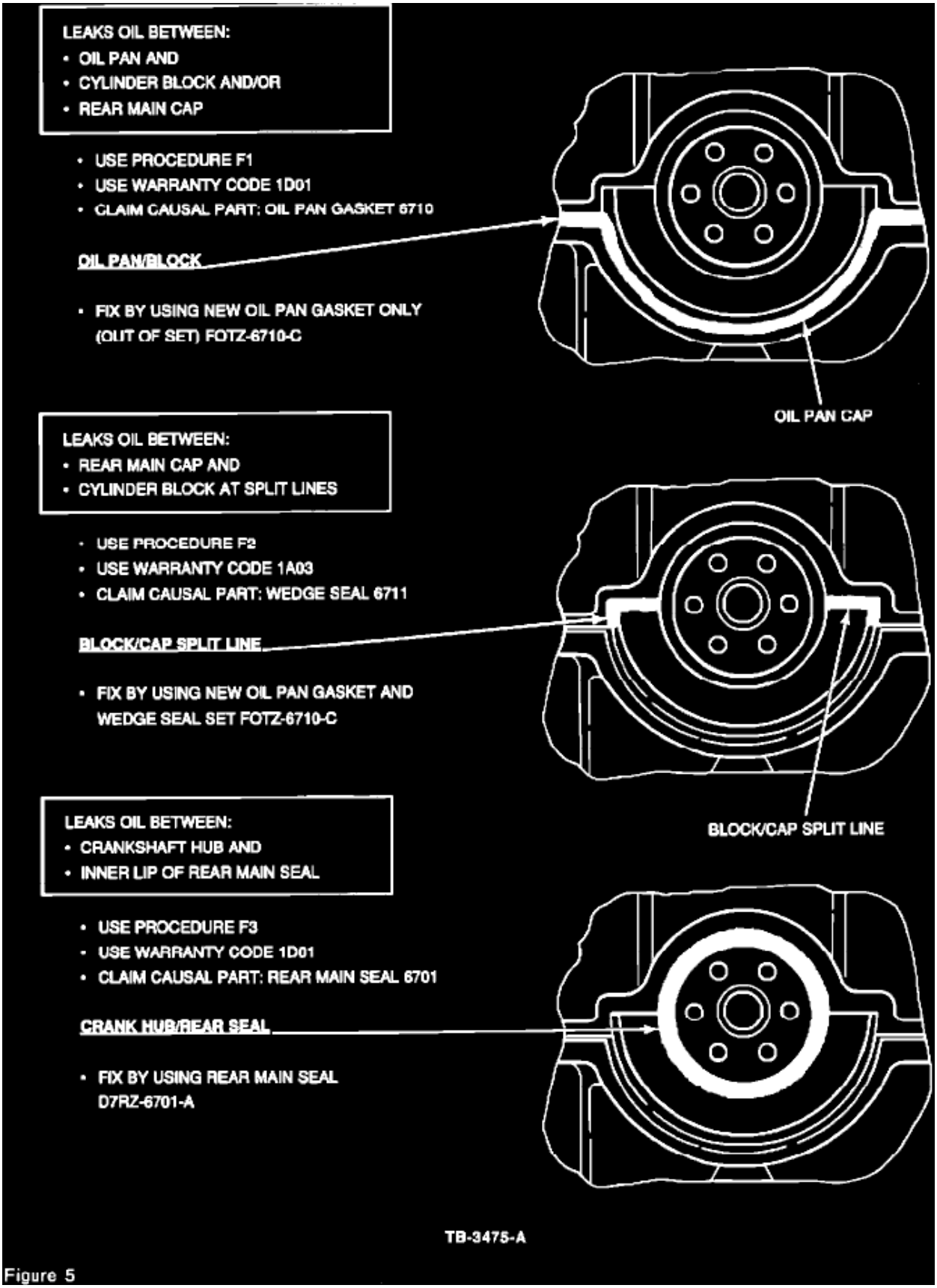


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

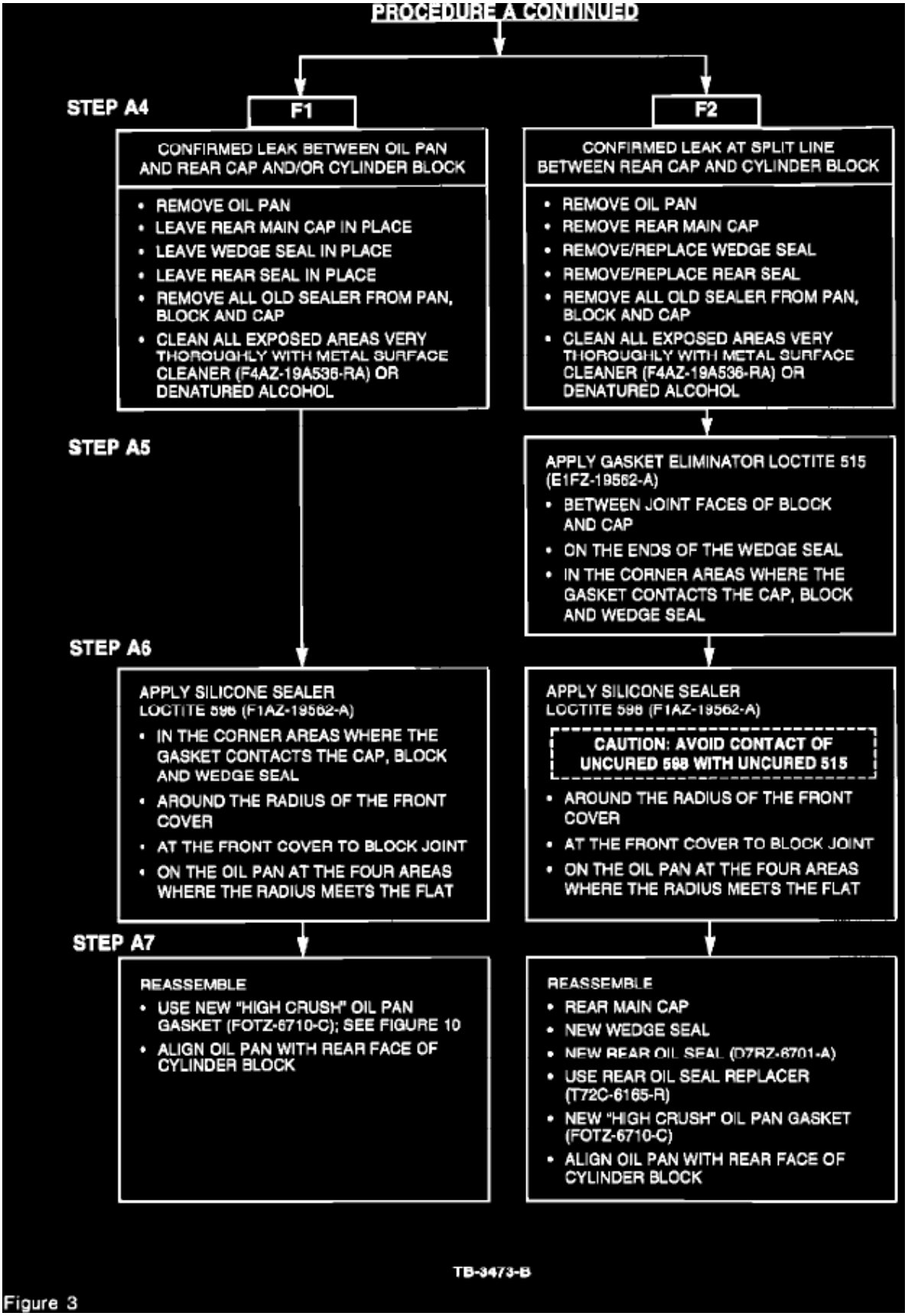
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

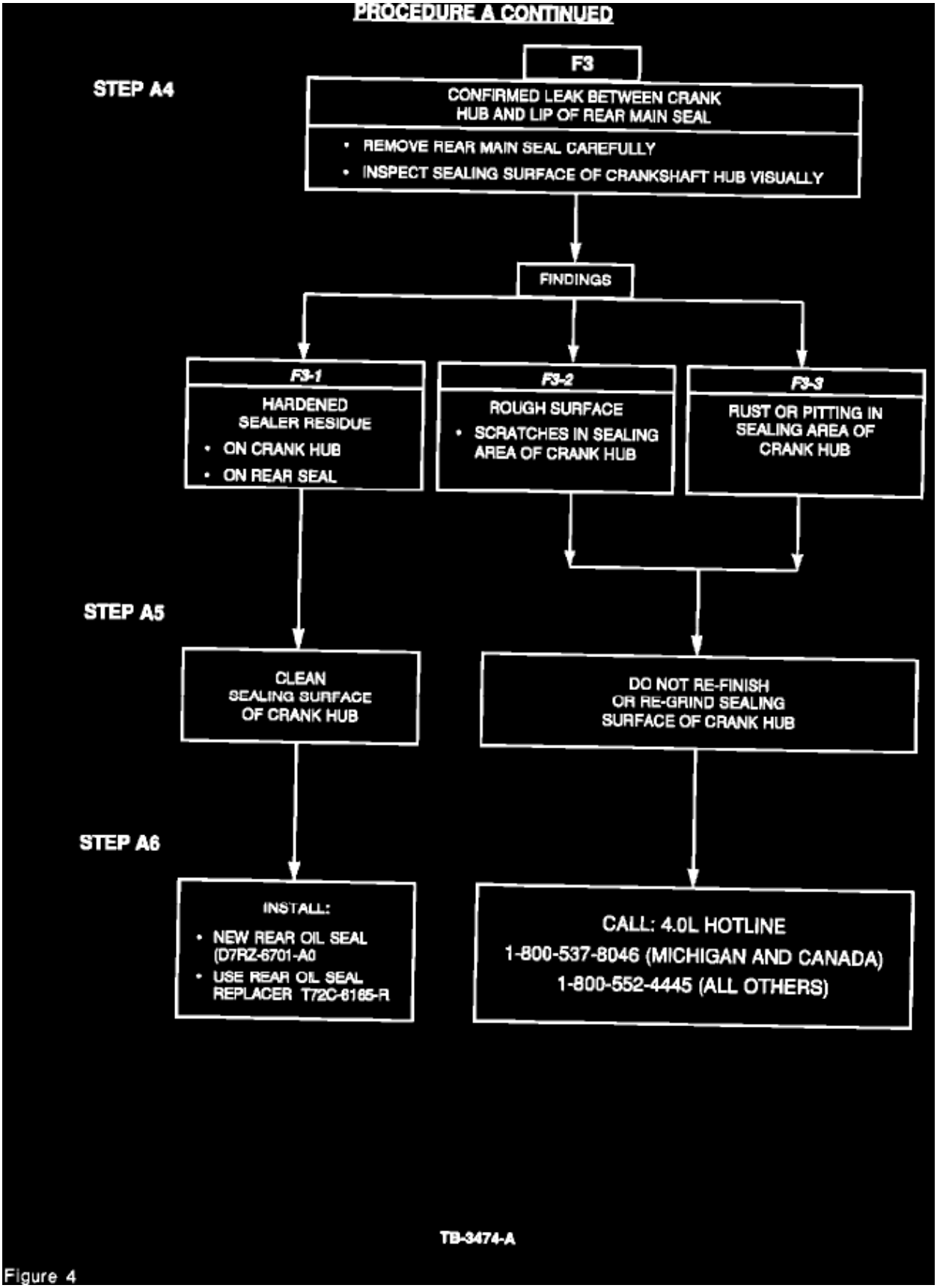


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

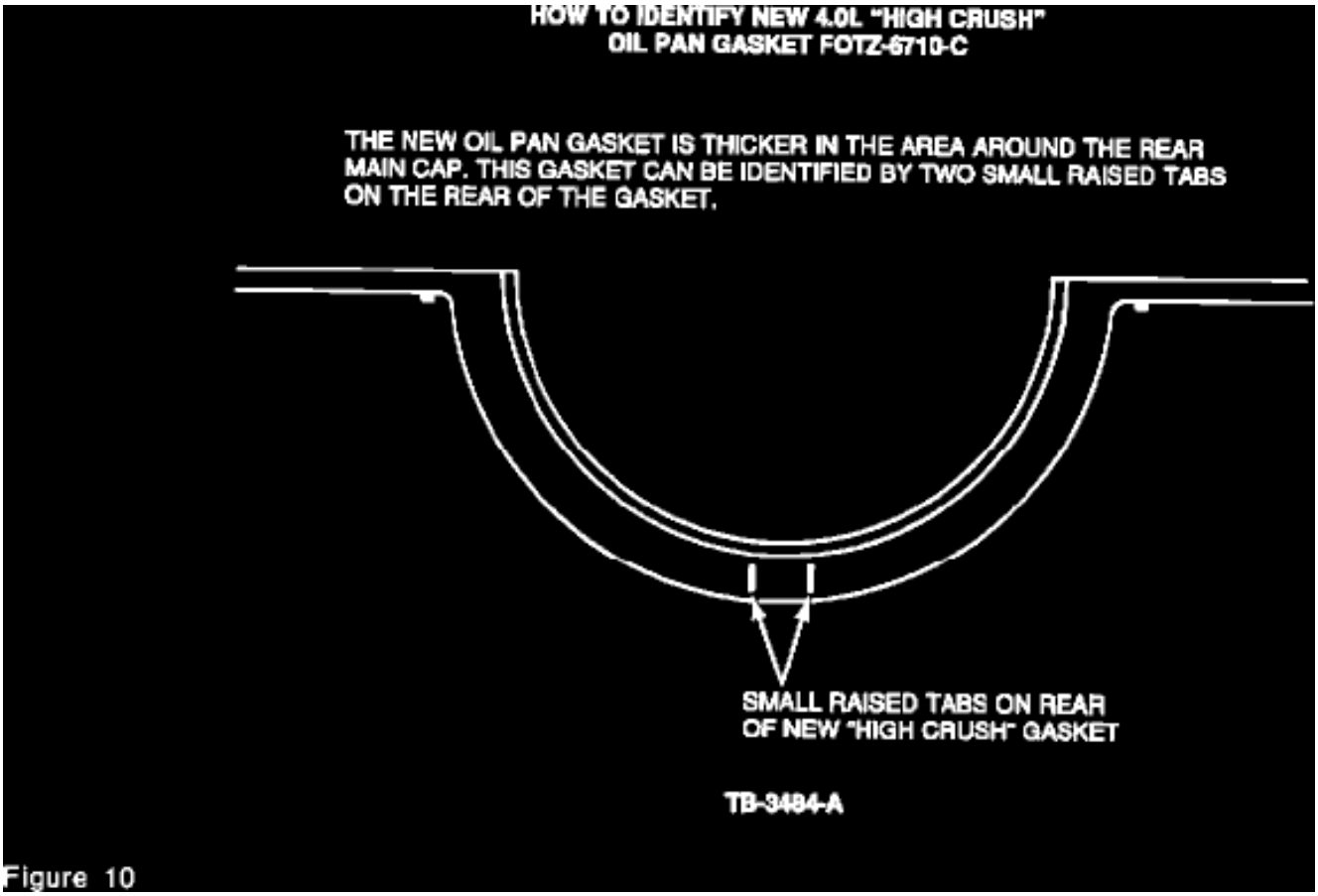


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

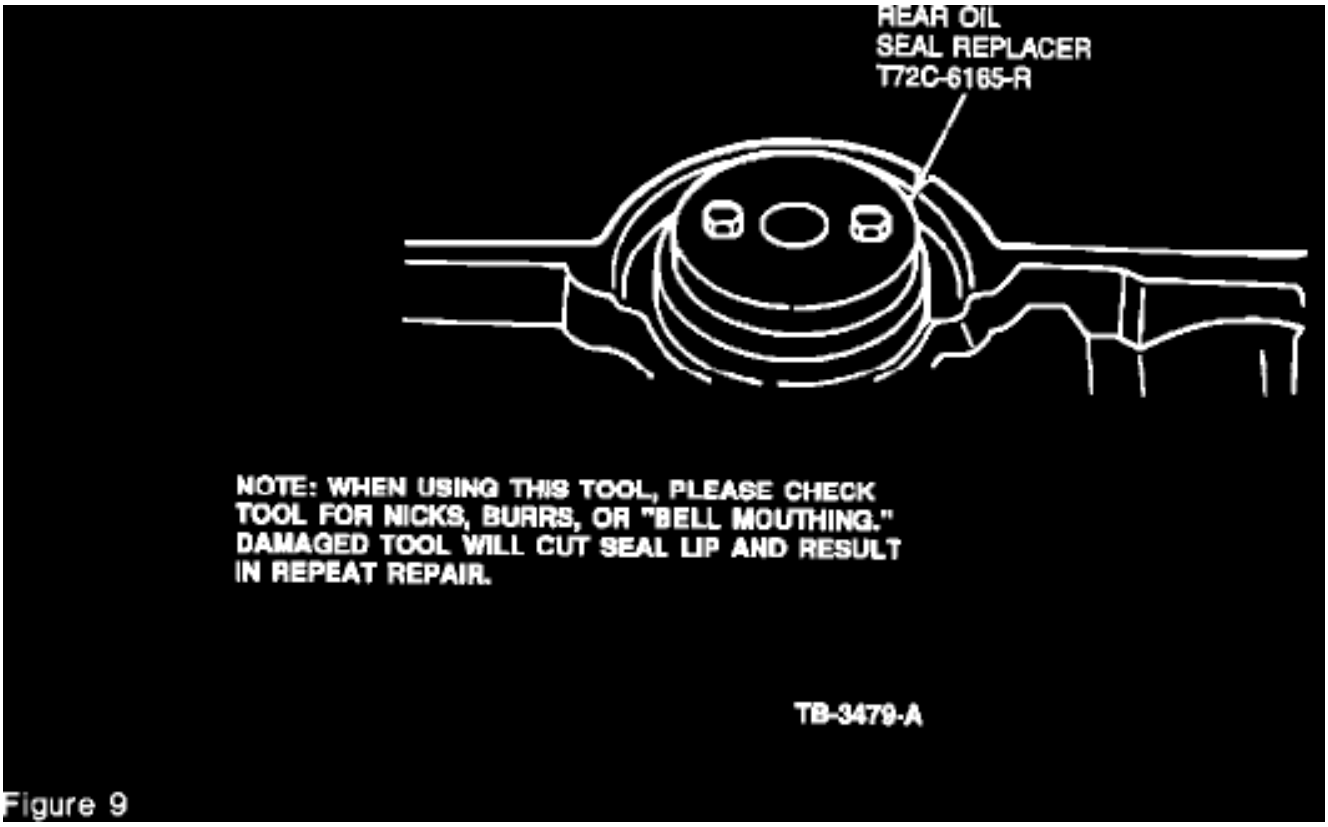


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

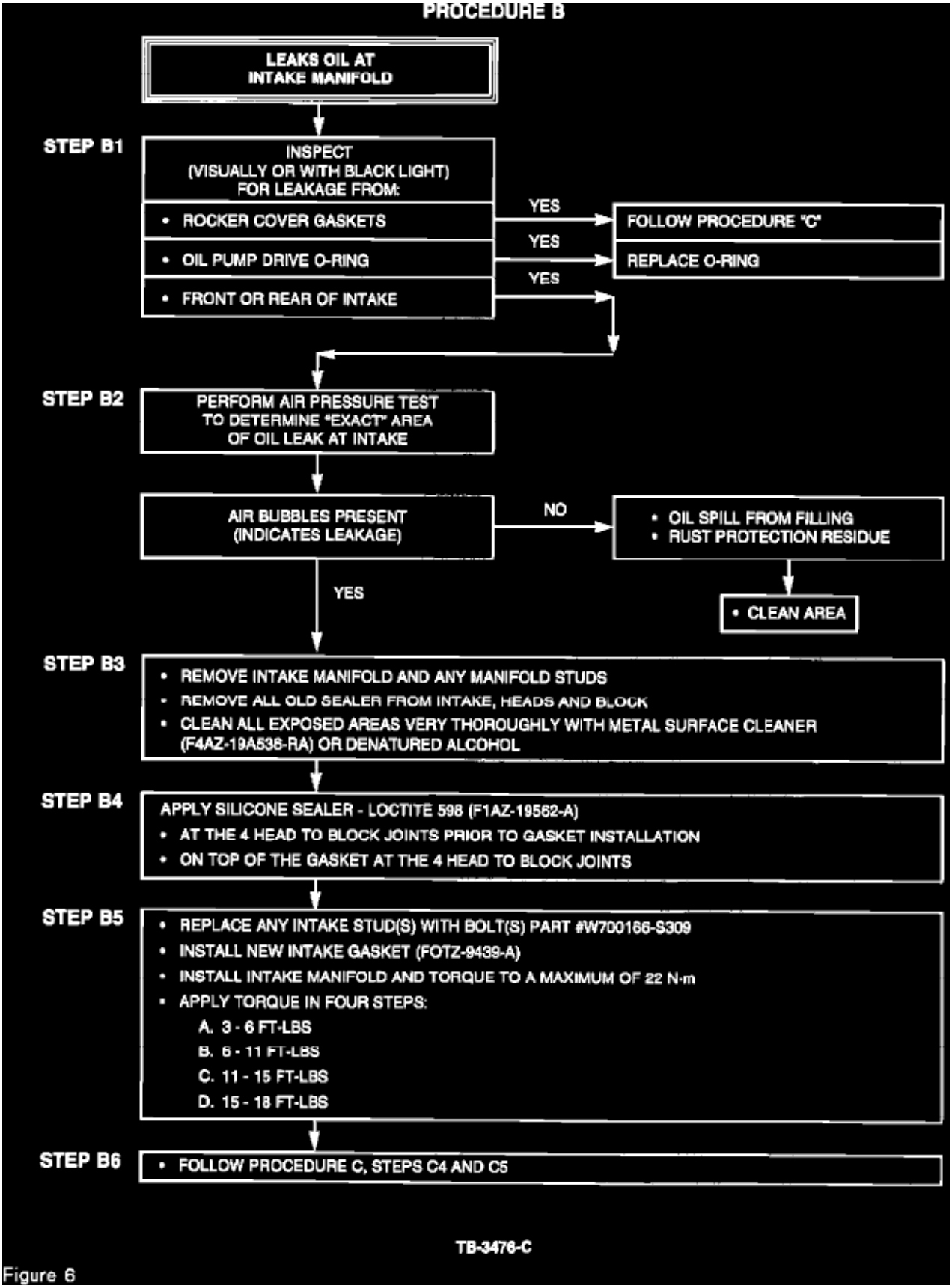


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

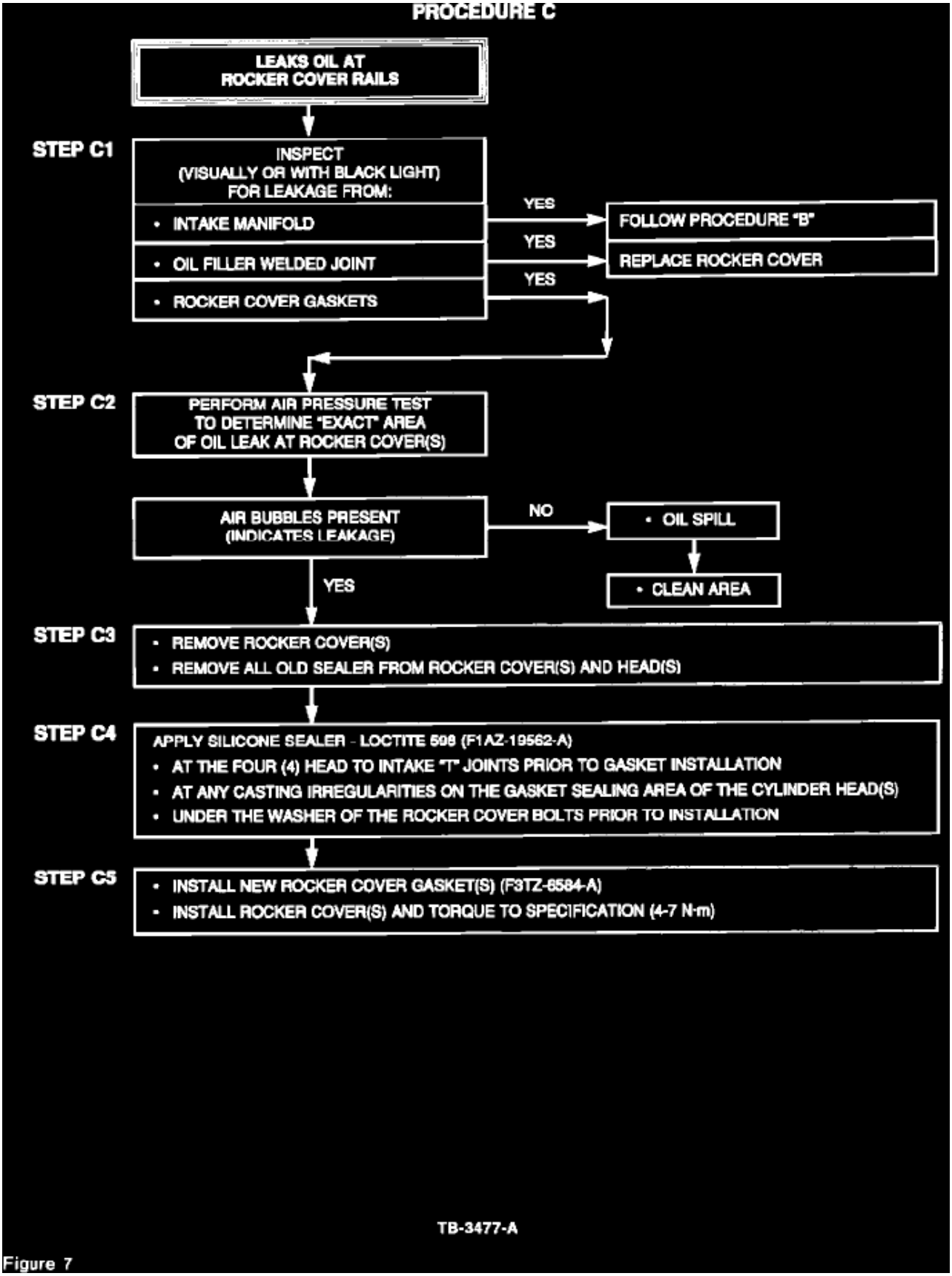


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

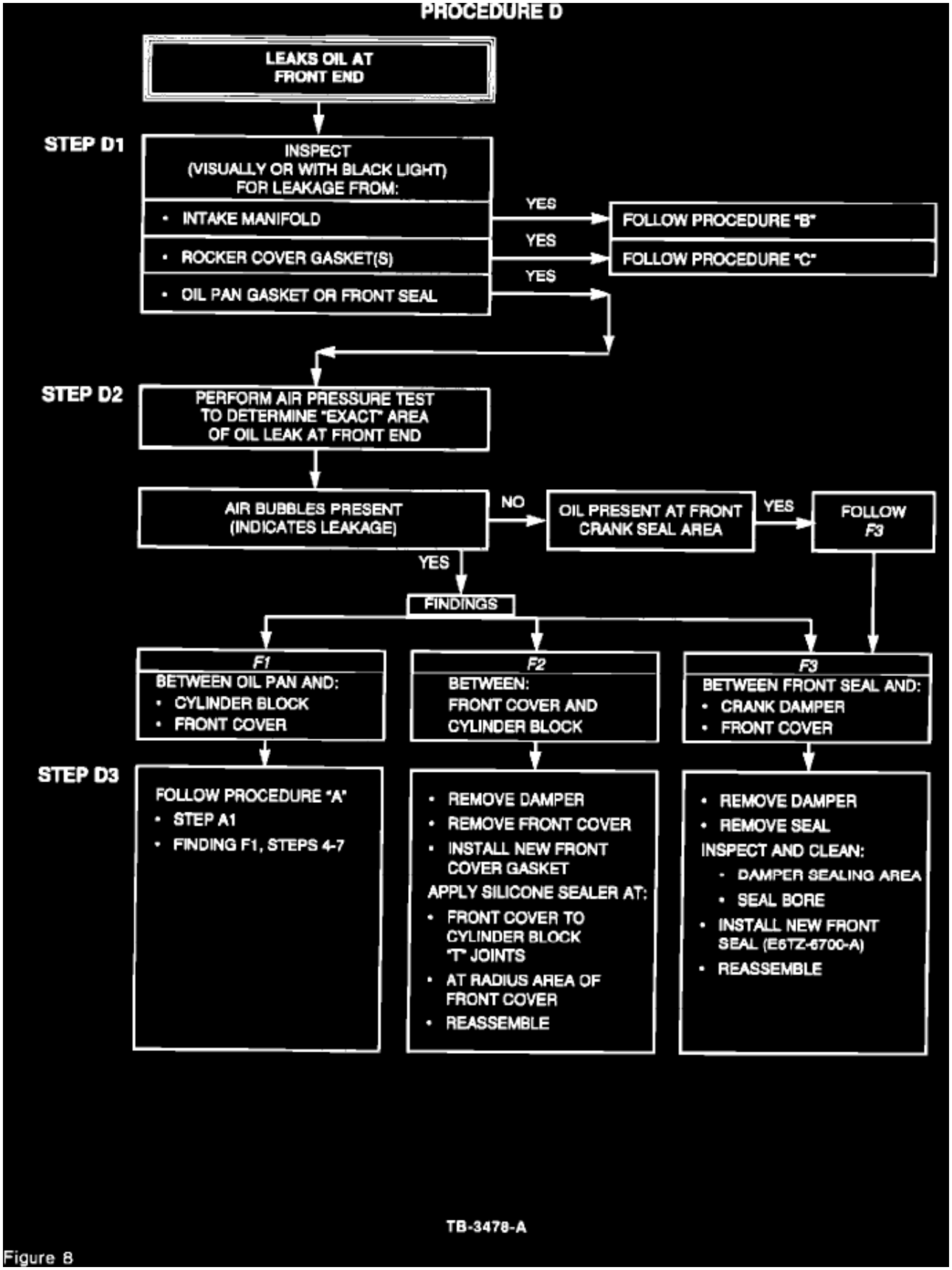


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Catalytic Converter: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

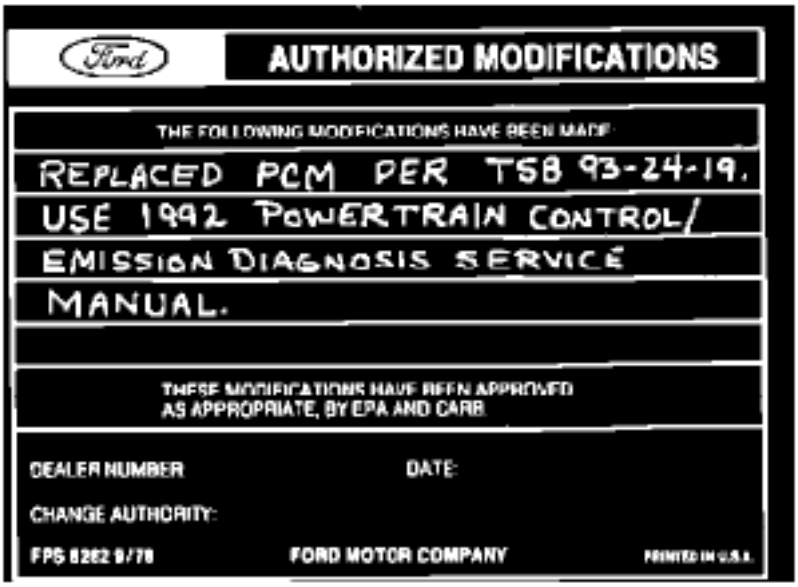
b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART		
APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

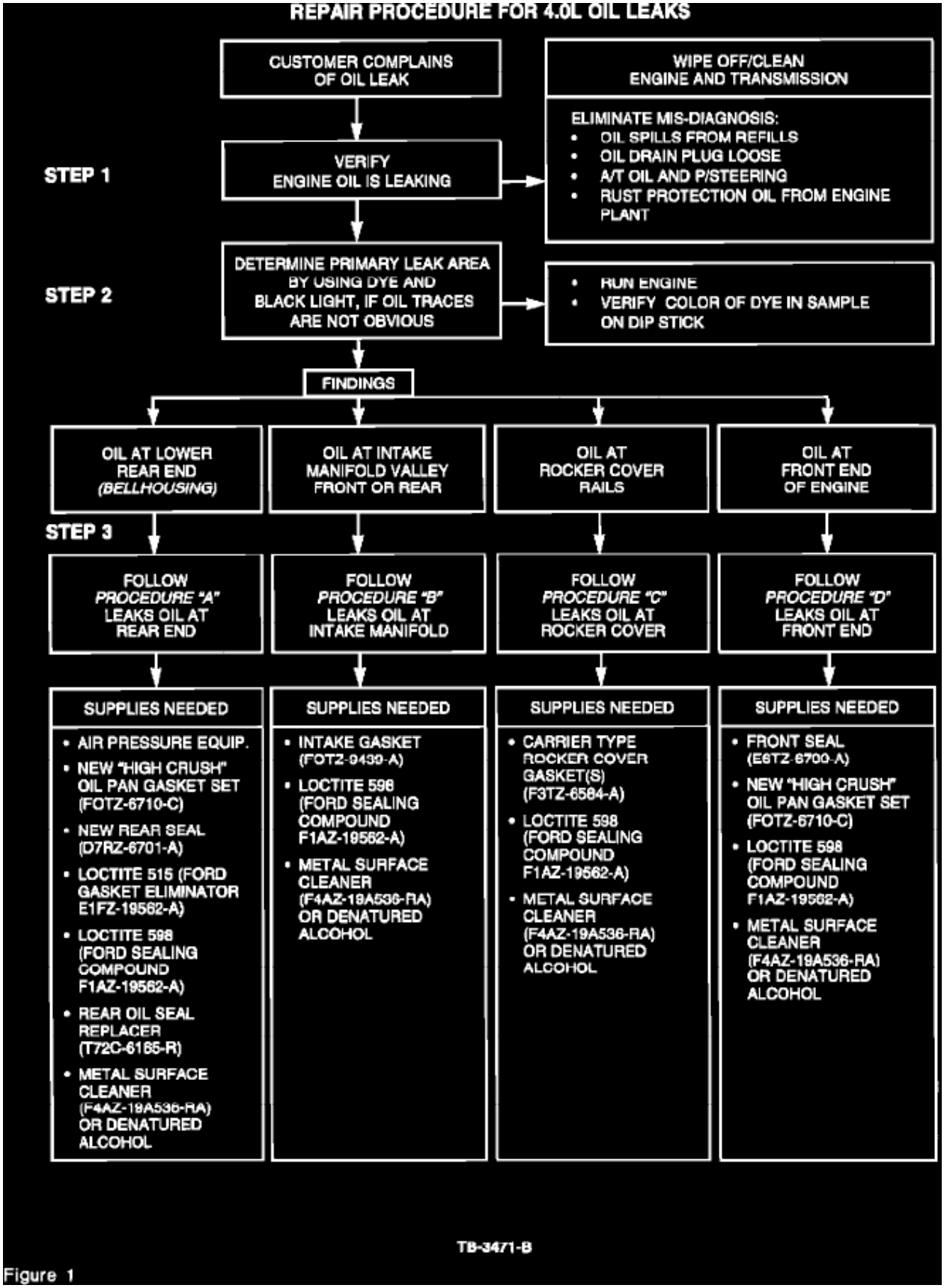


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

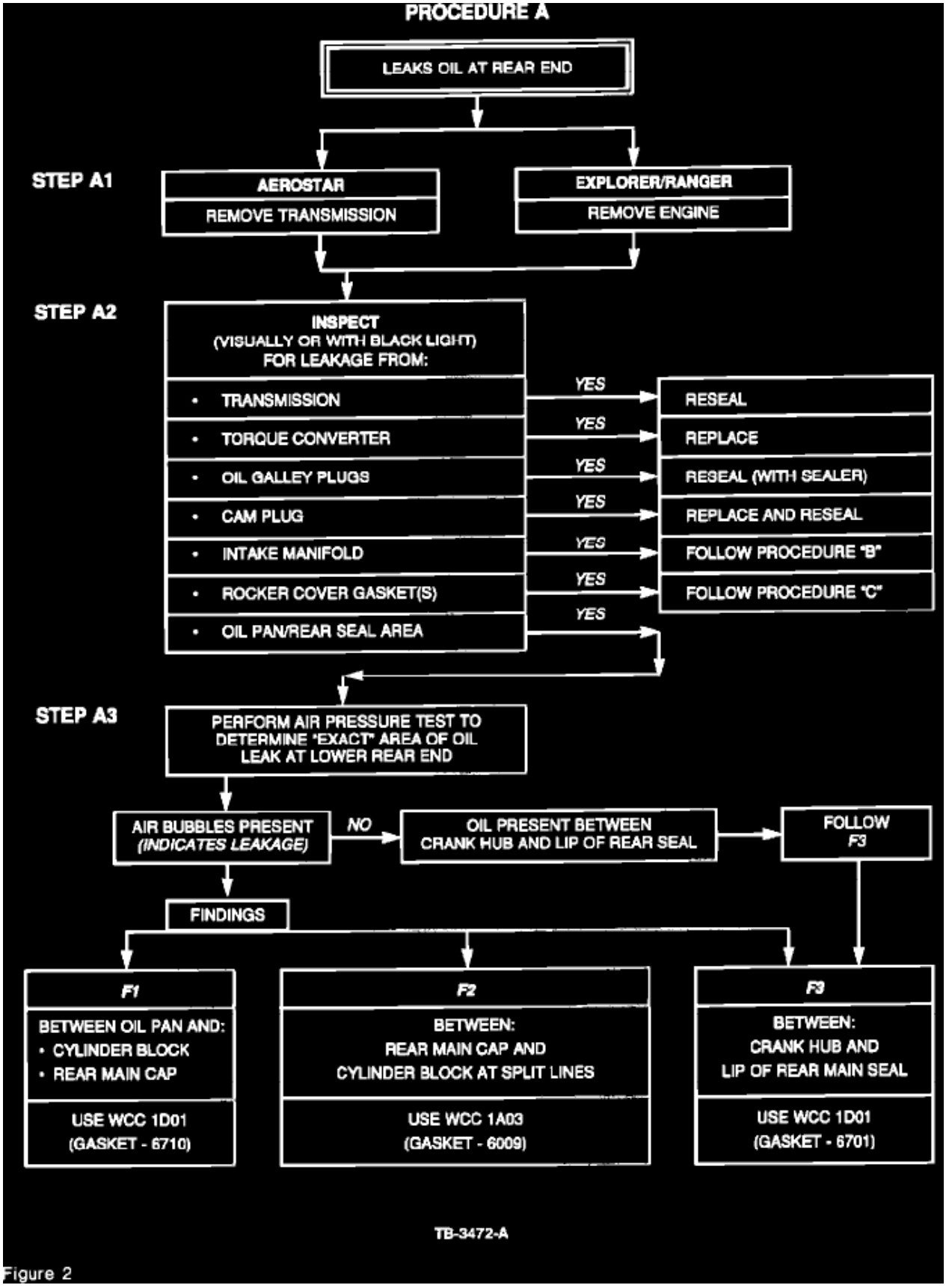

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

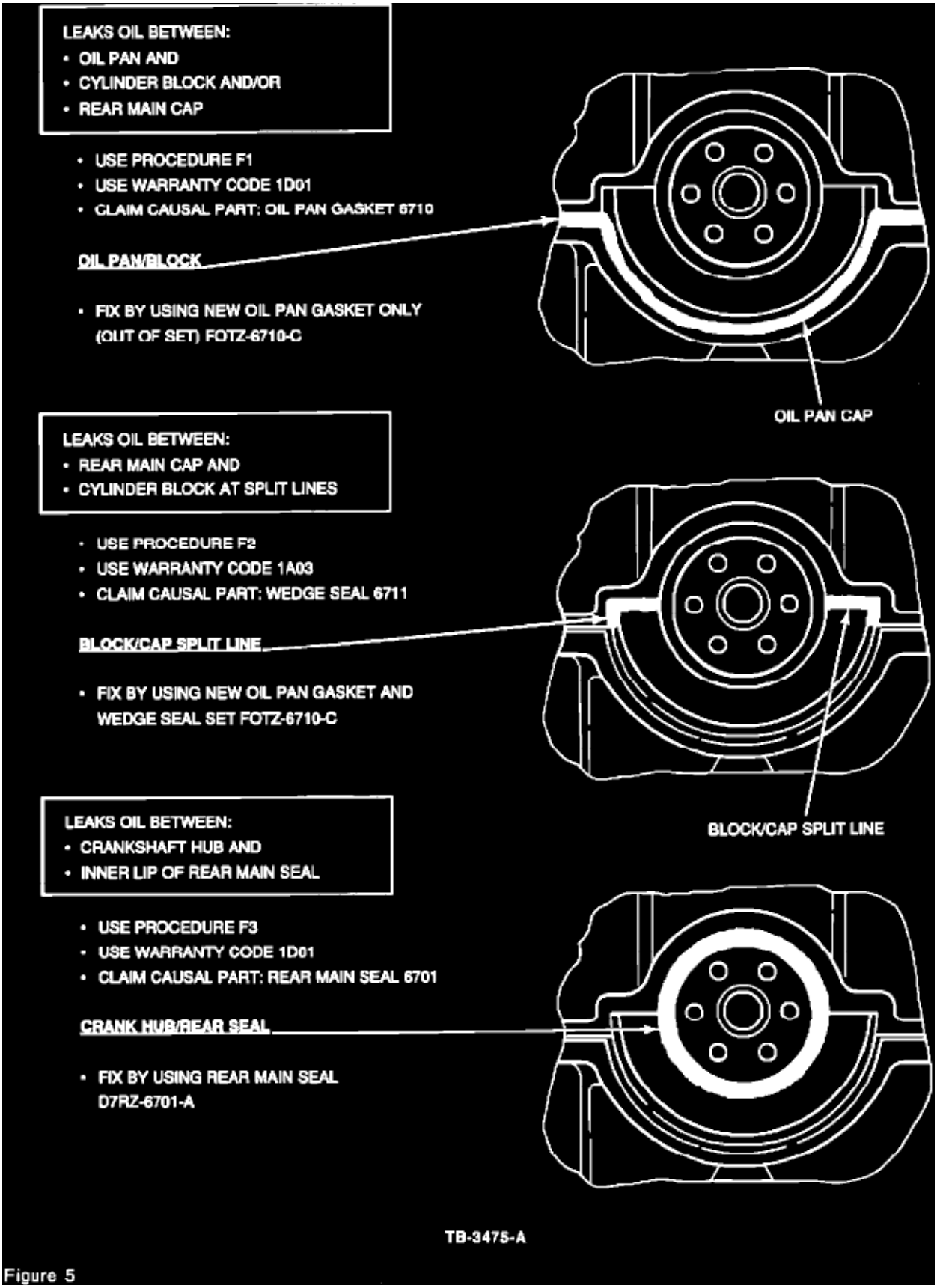


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

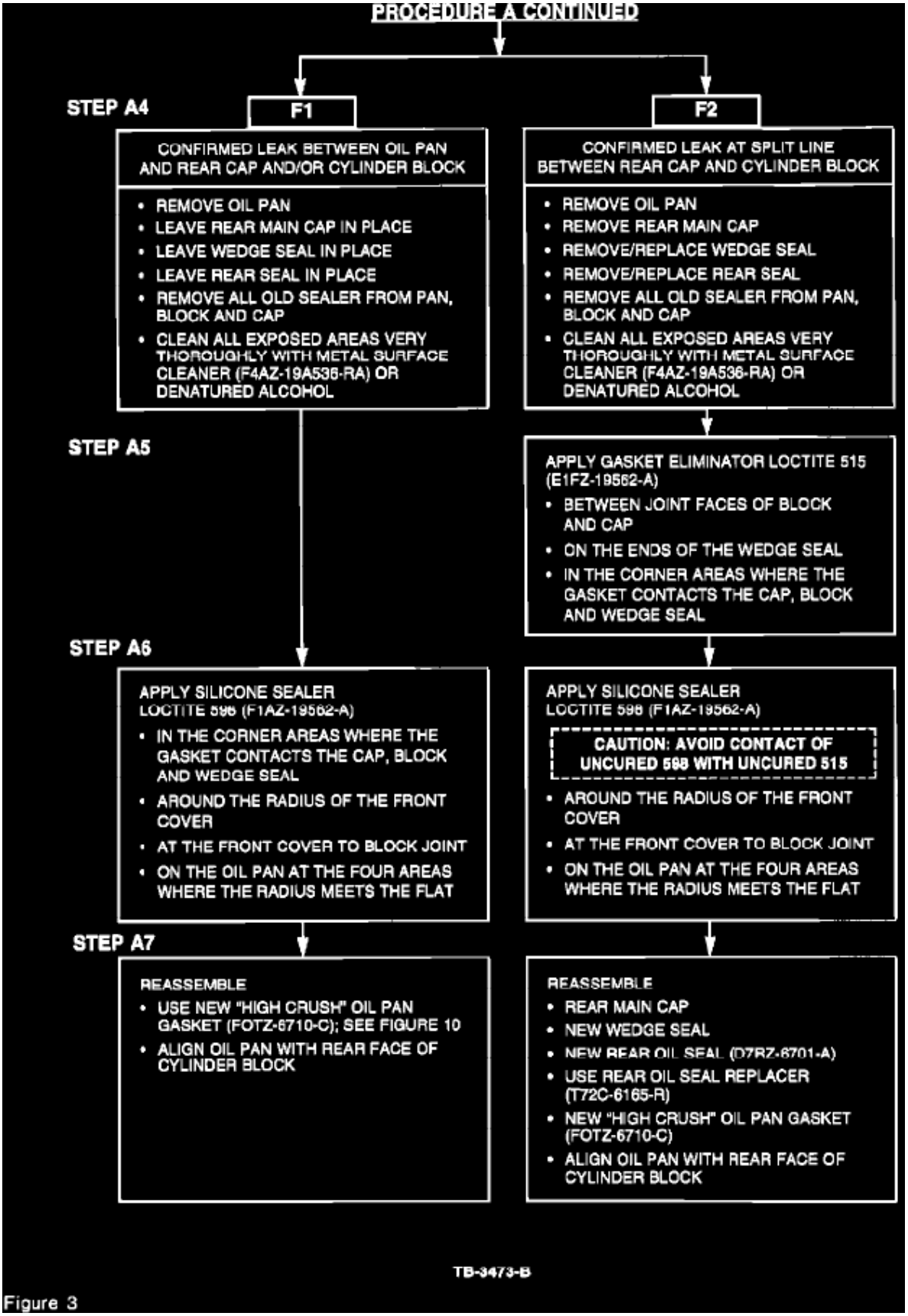
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

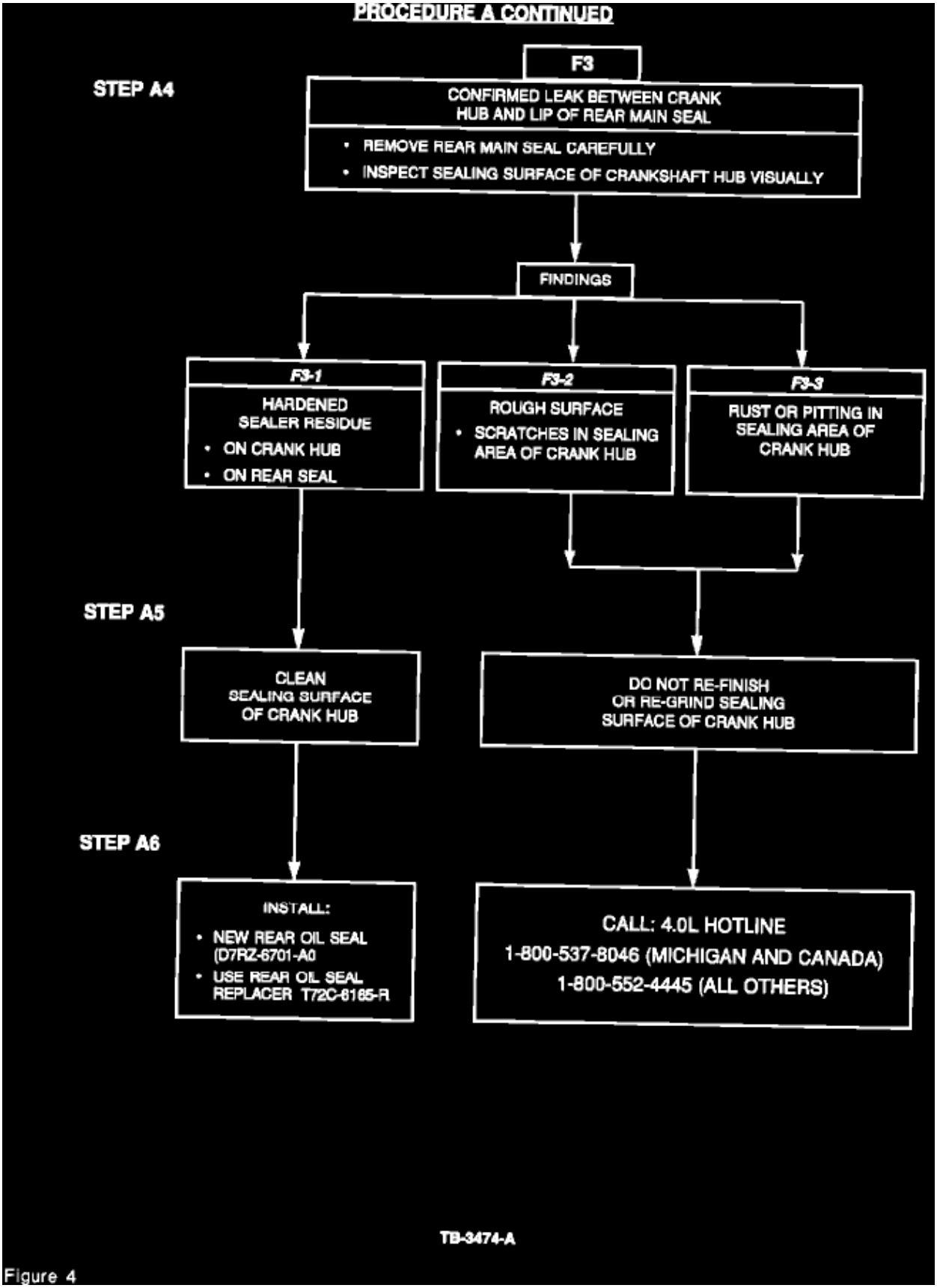


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

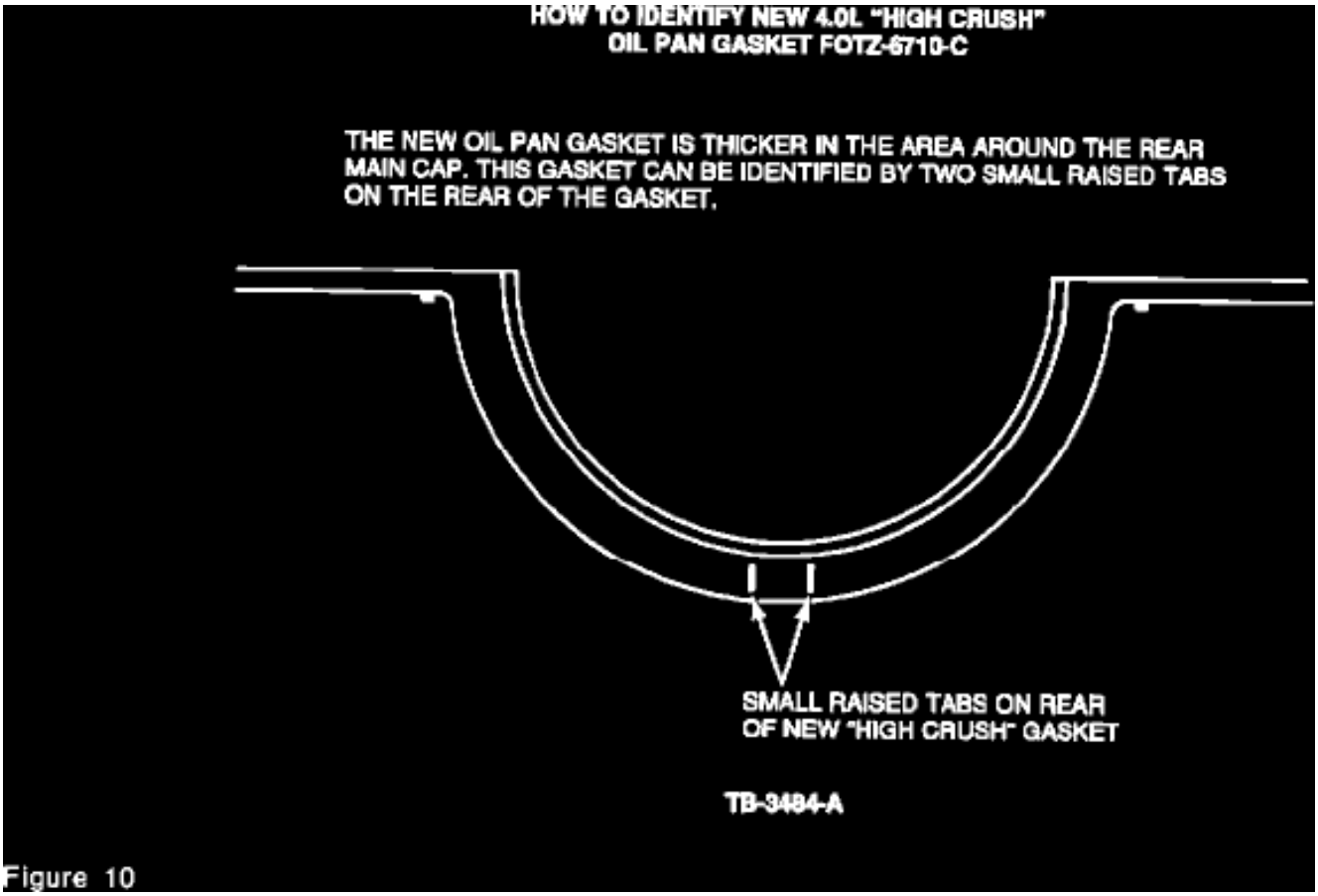


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

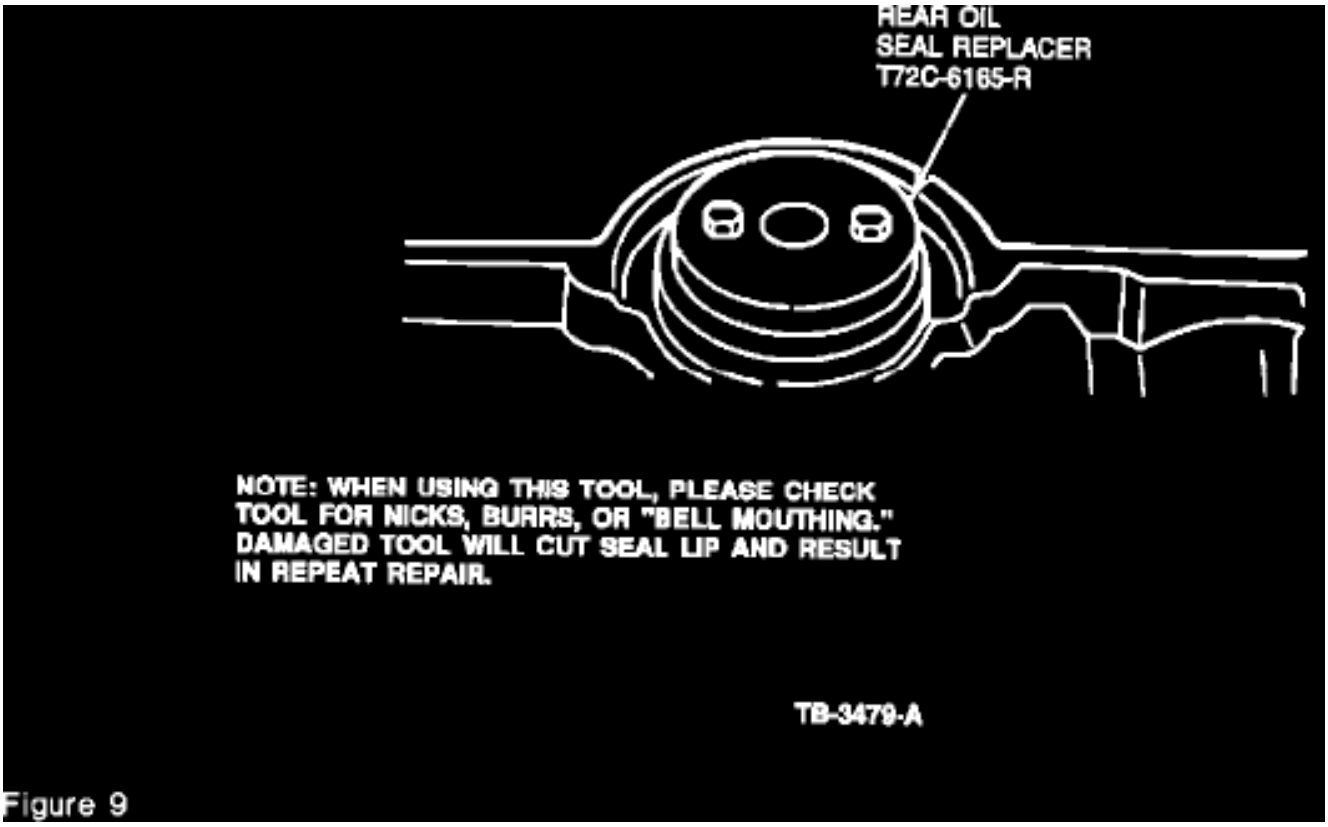


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

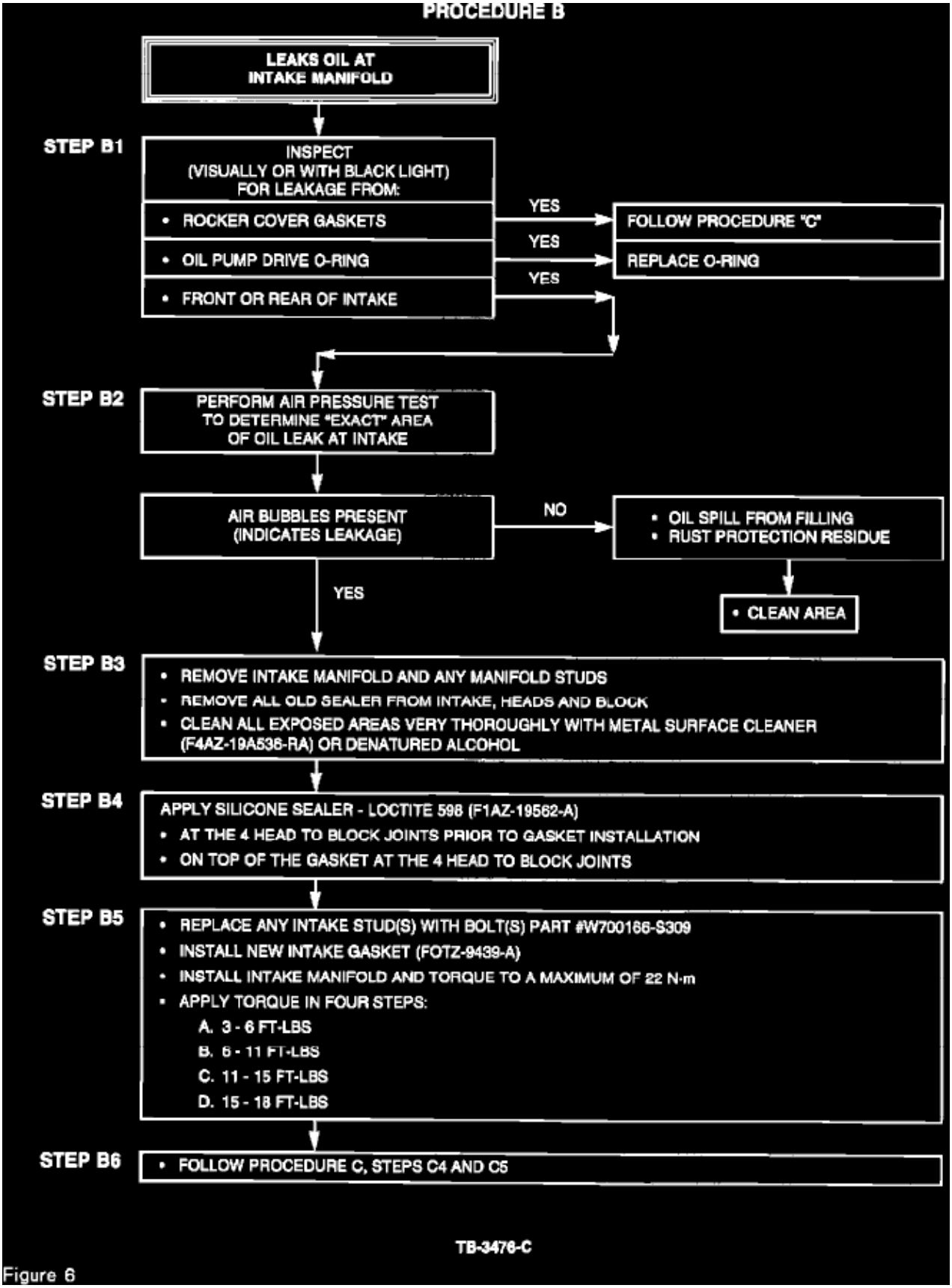


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

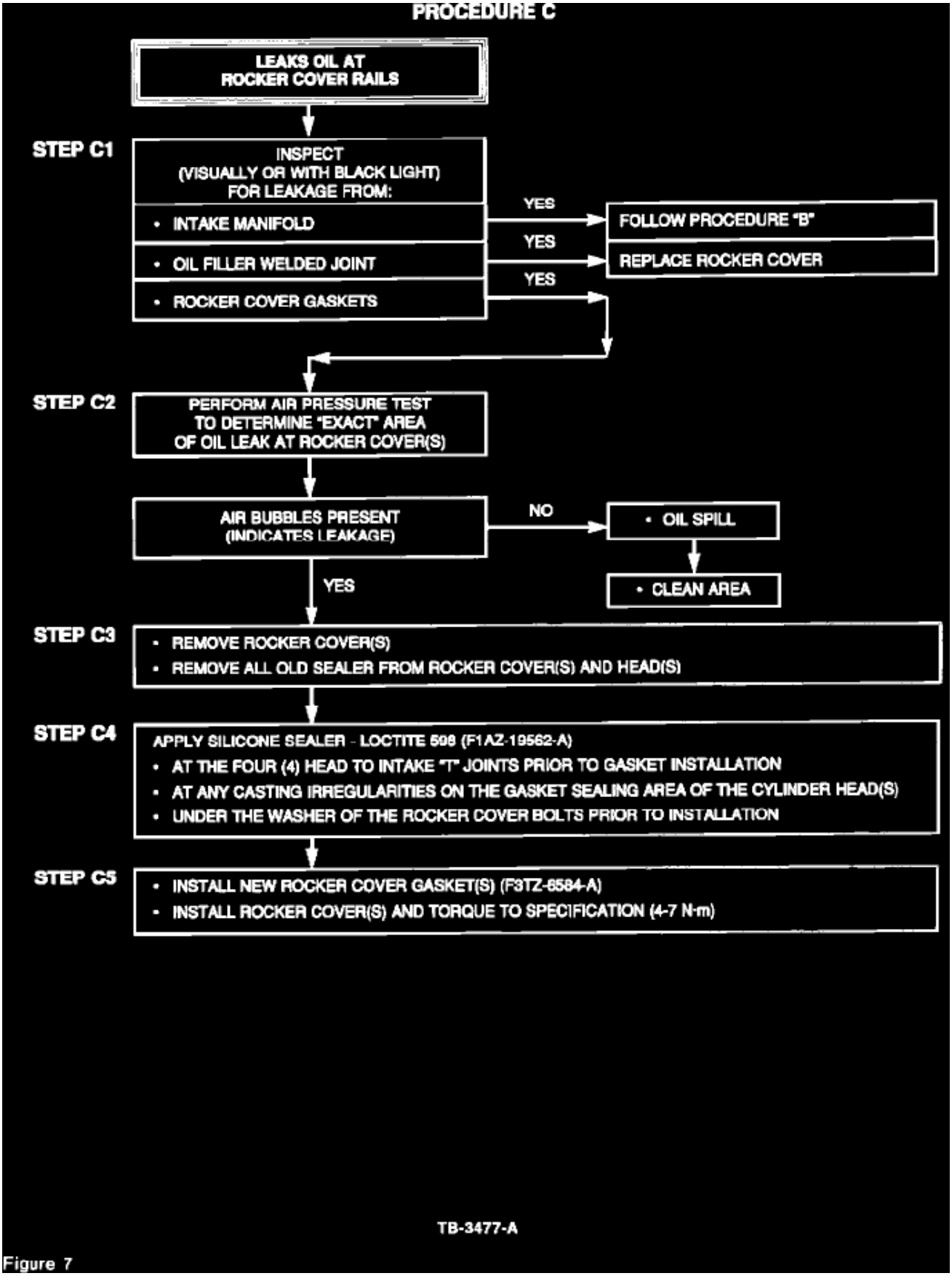


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

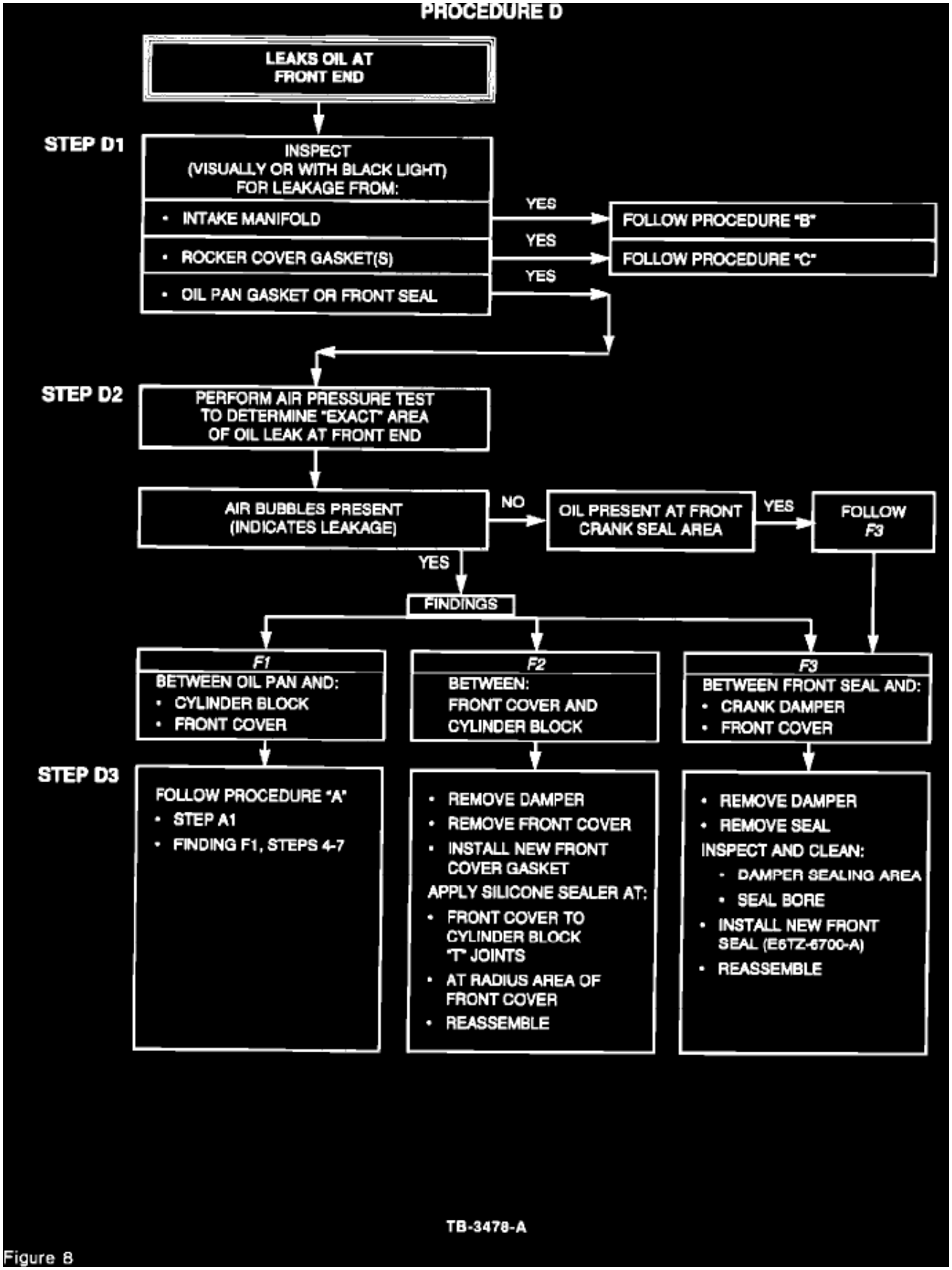


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

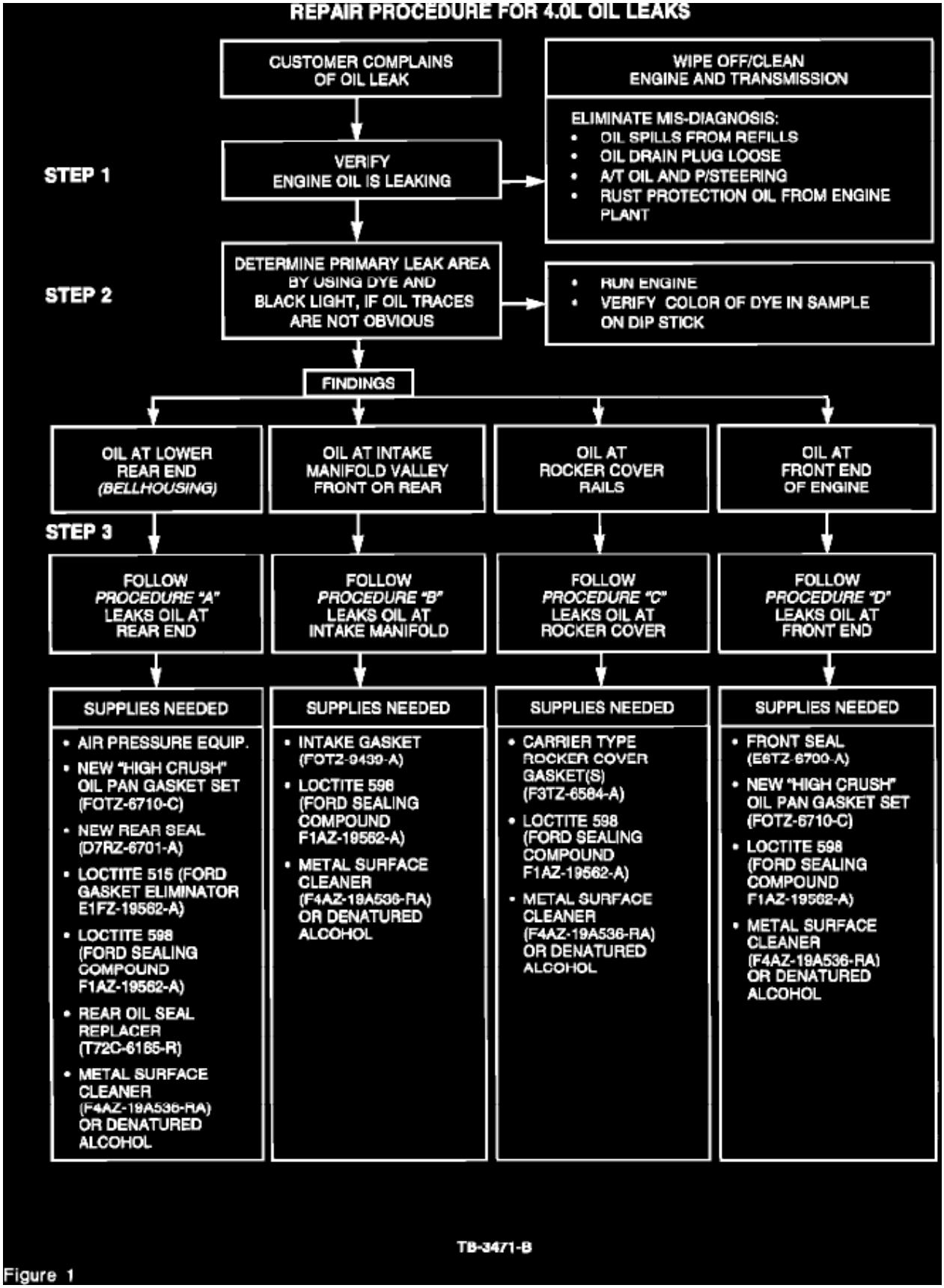


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

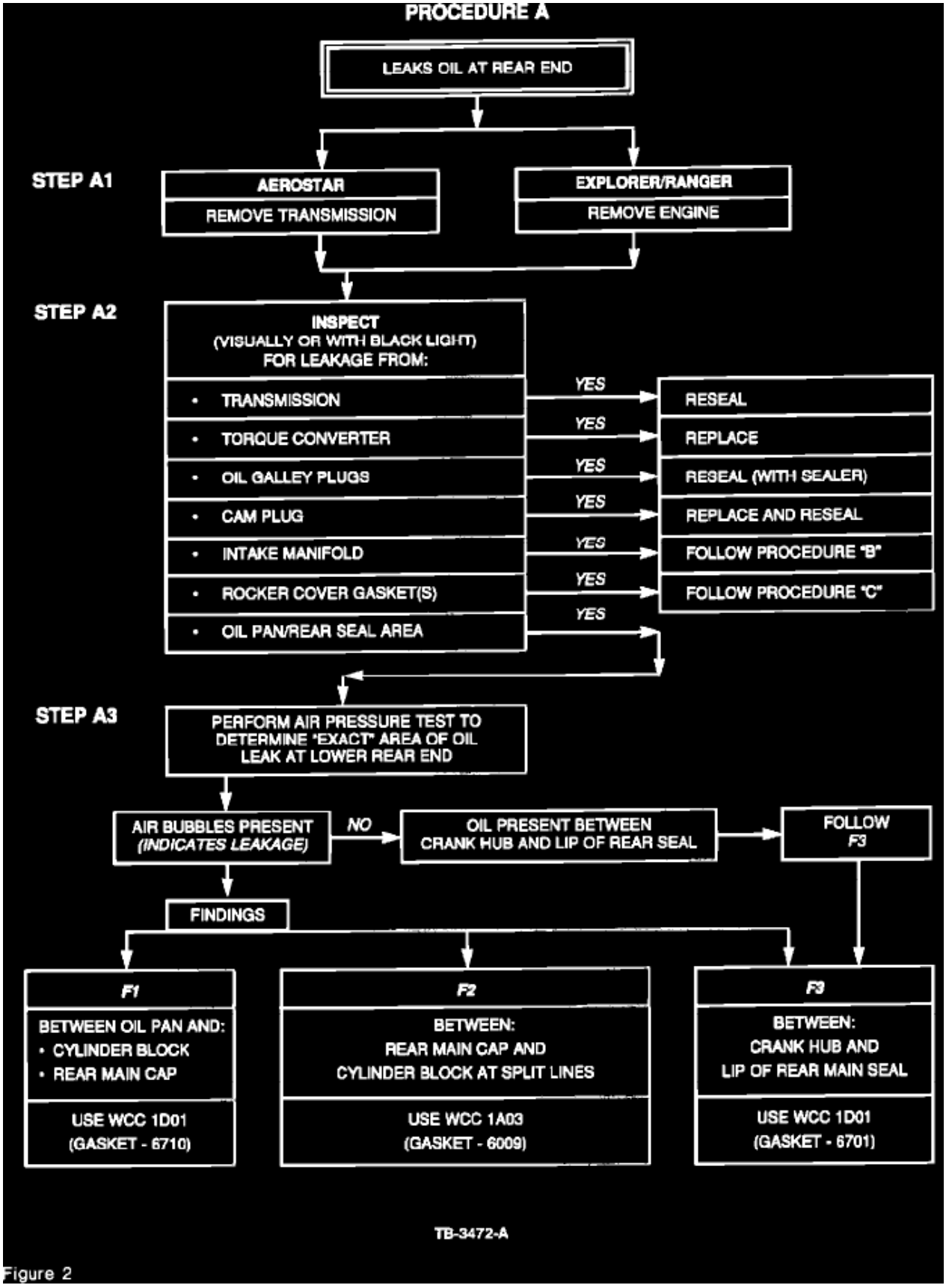

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

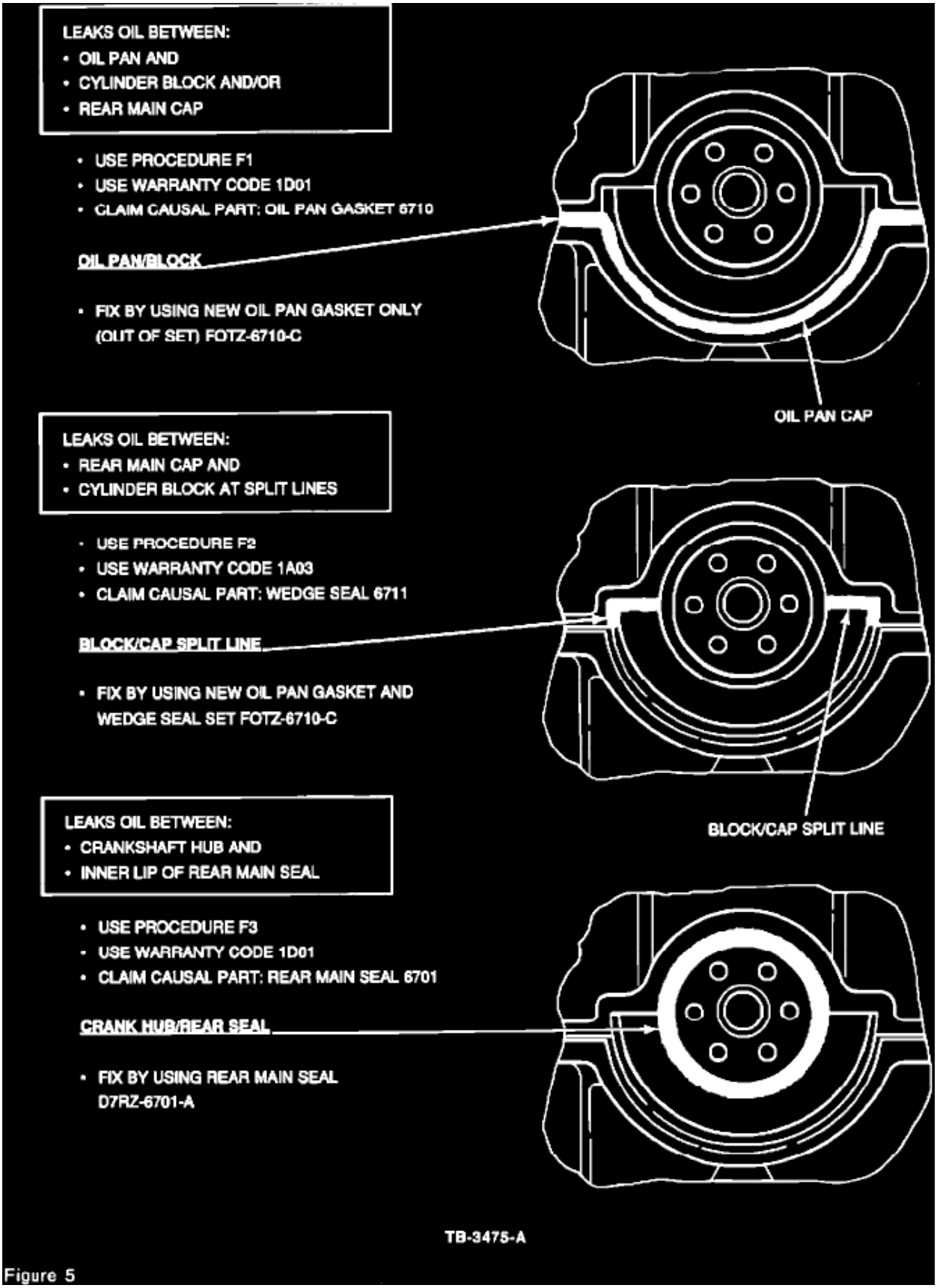


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

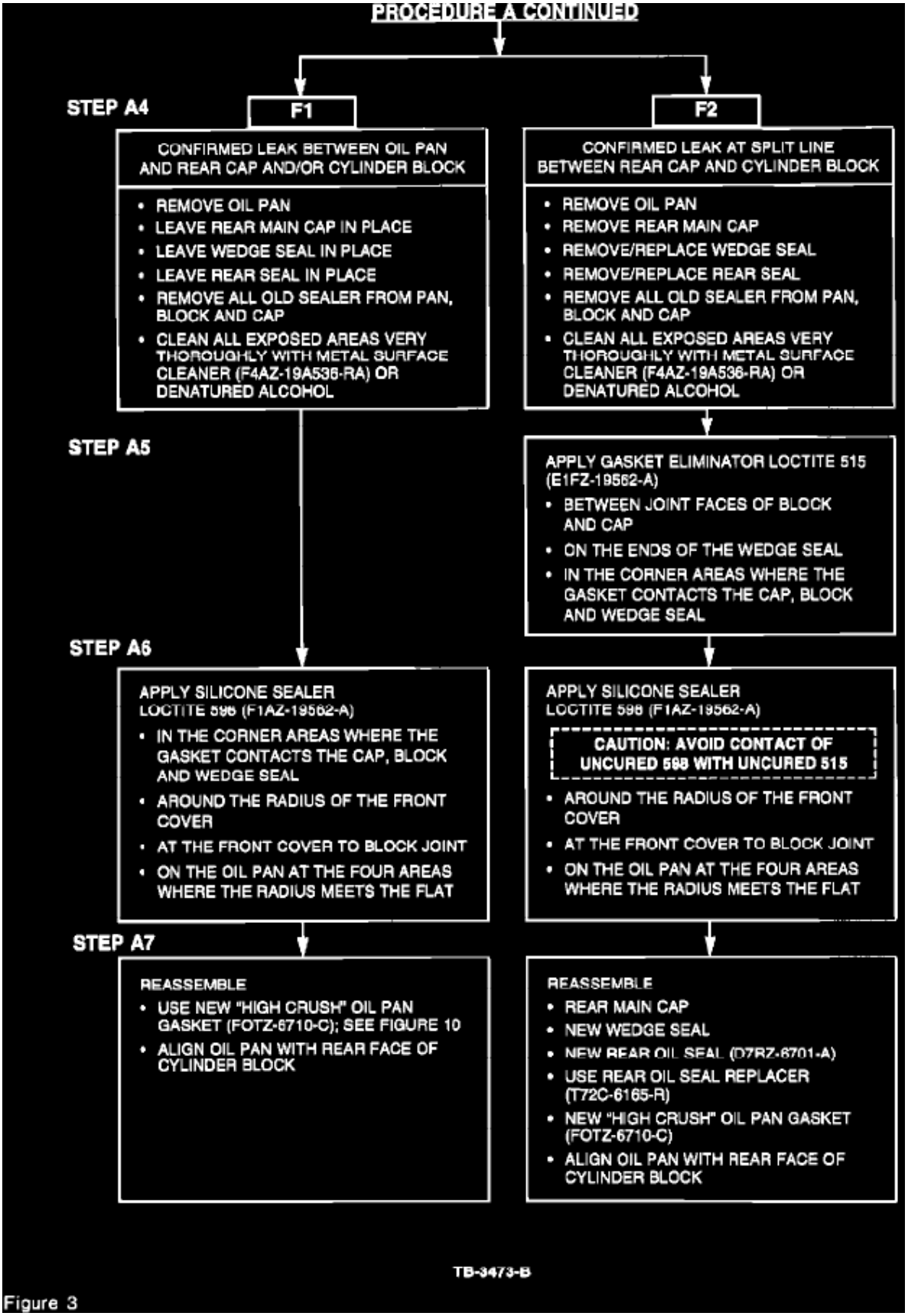
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

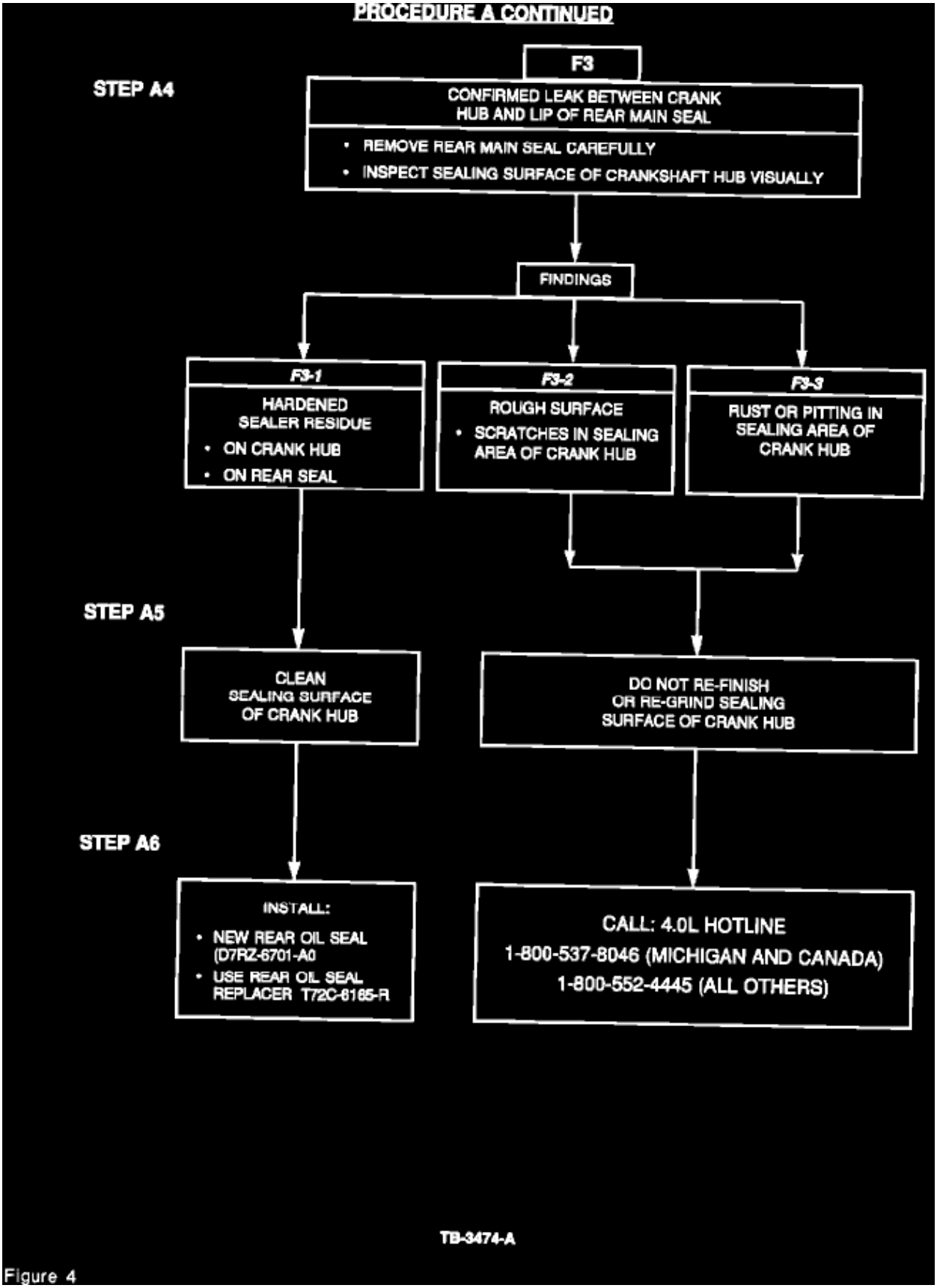


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

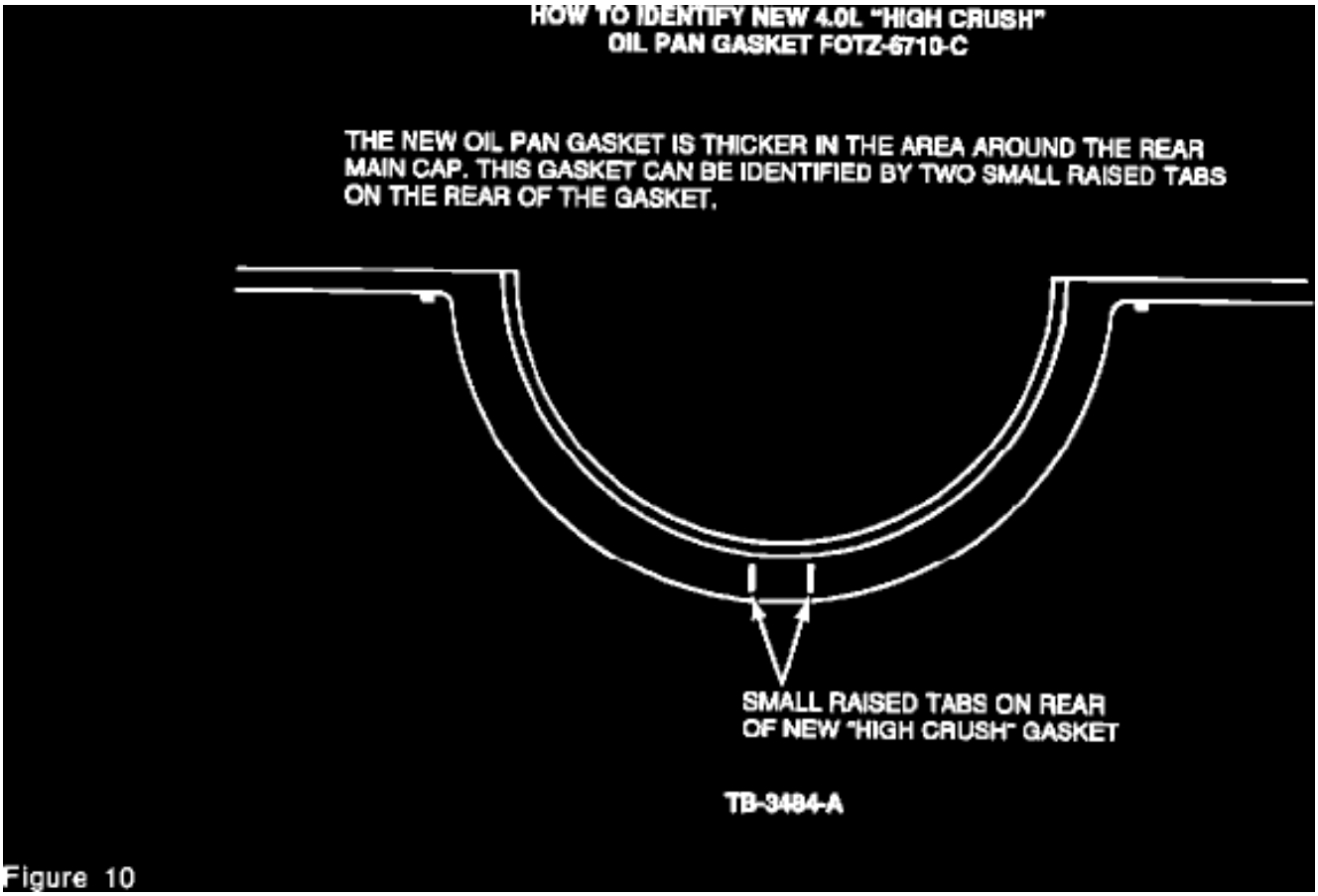


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

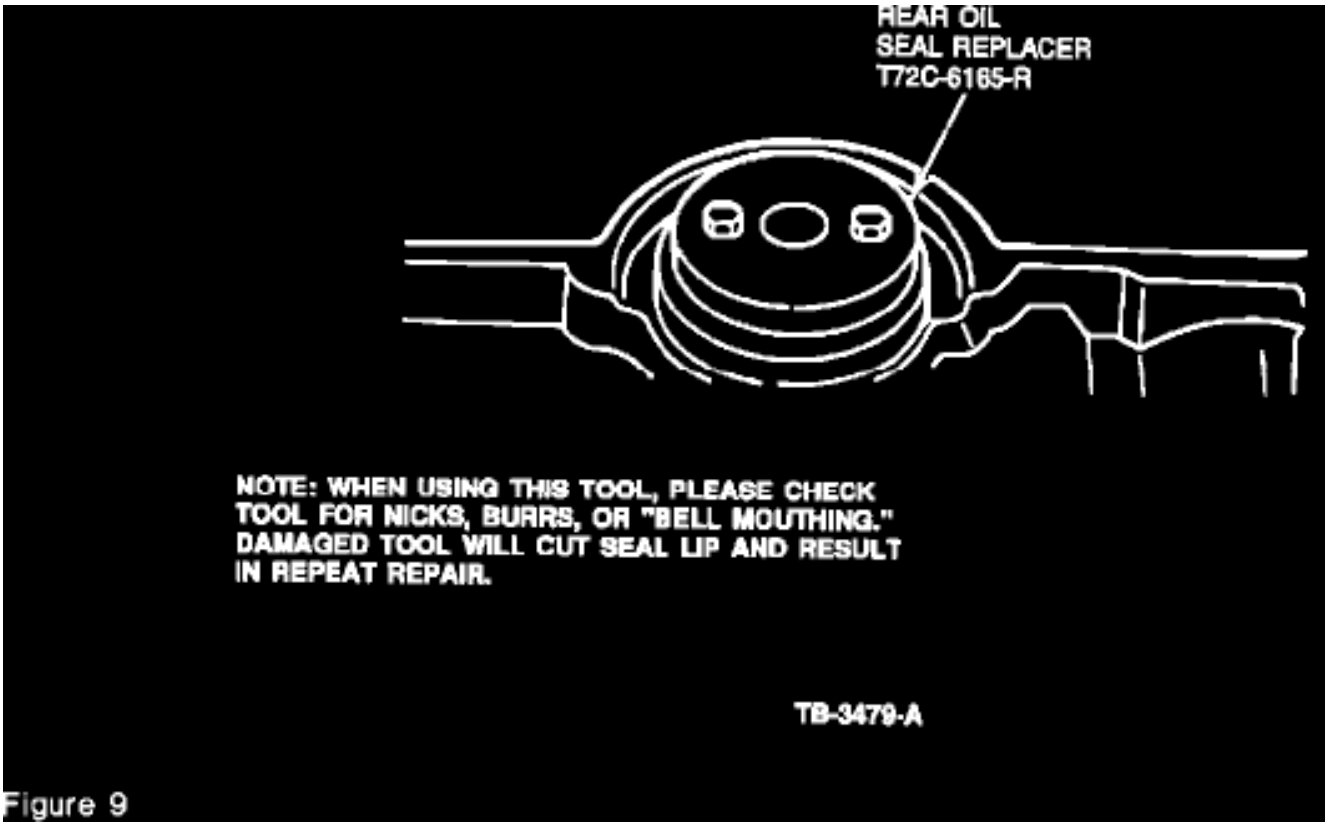


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

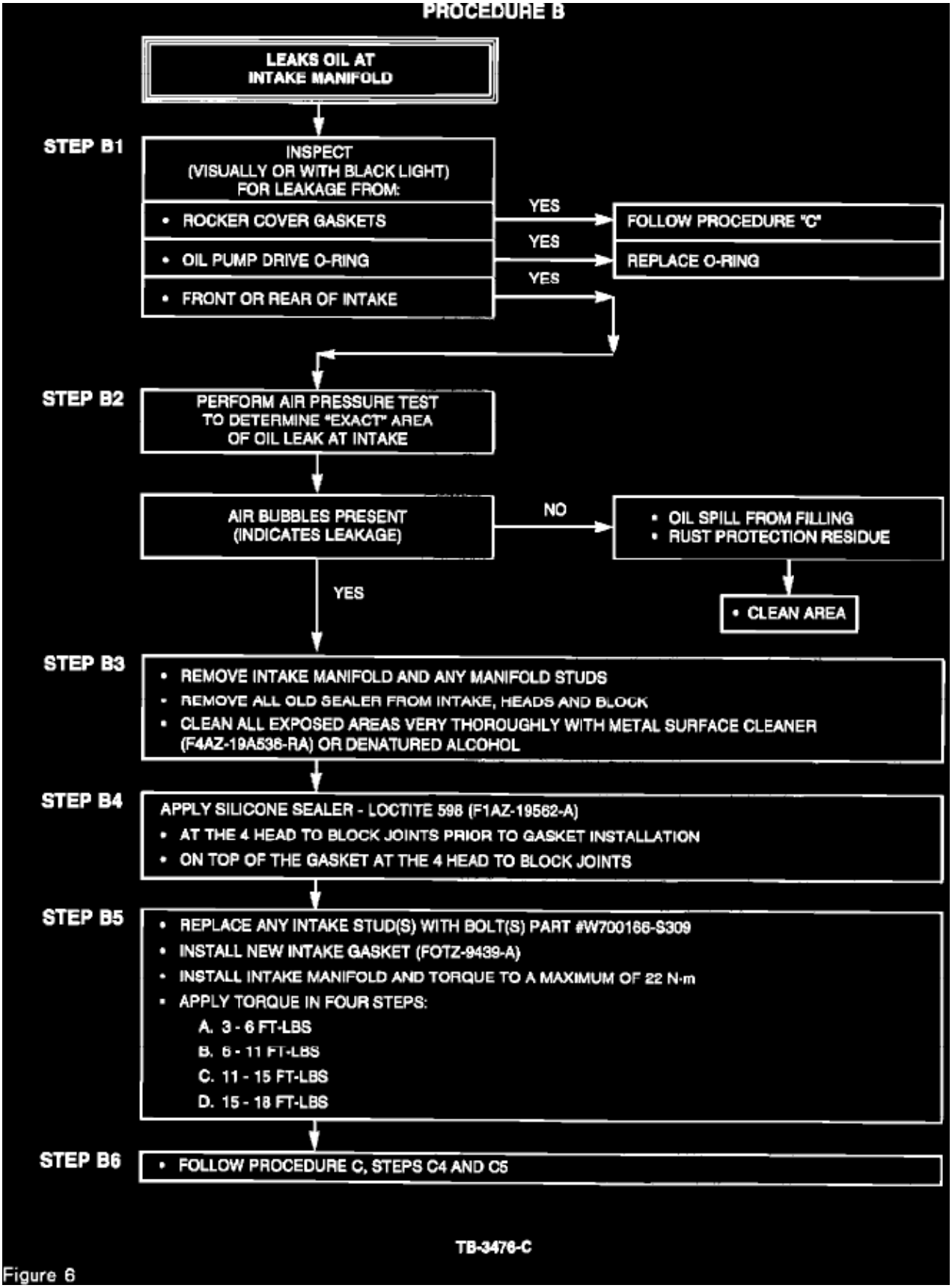


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

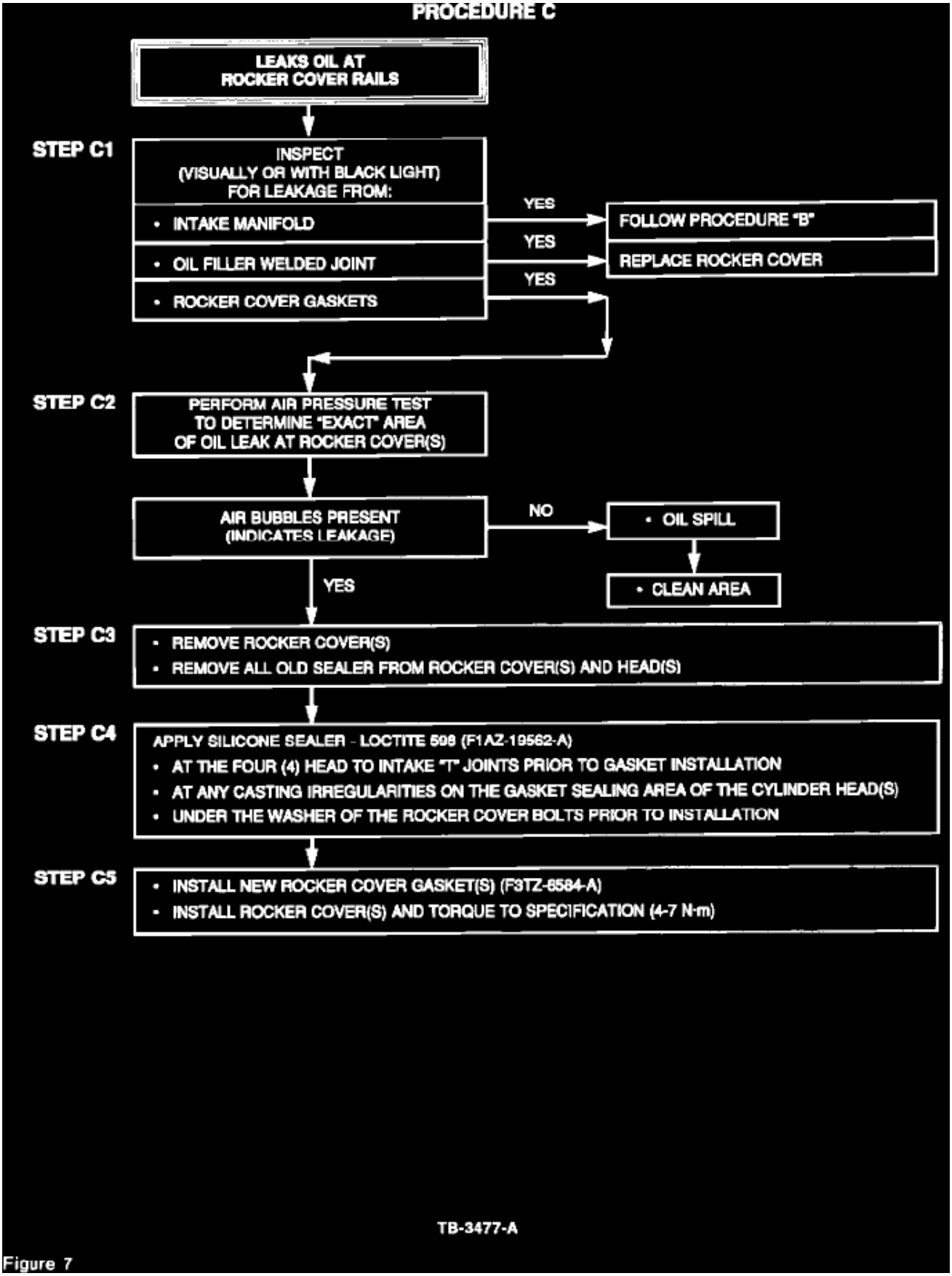


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

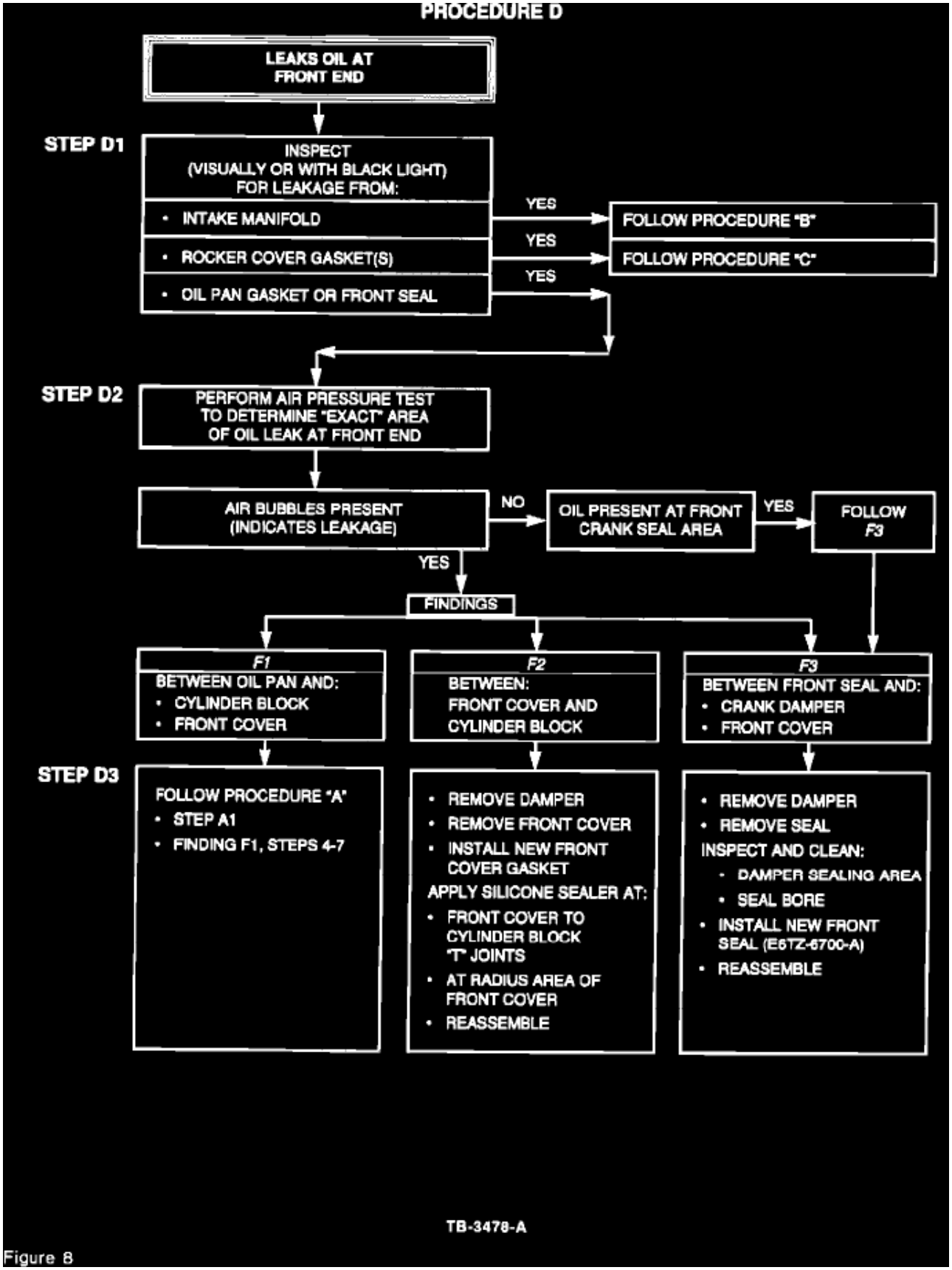


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

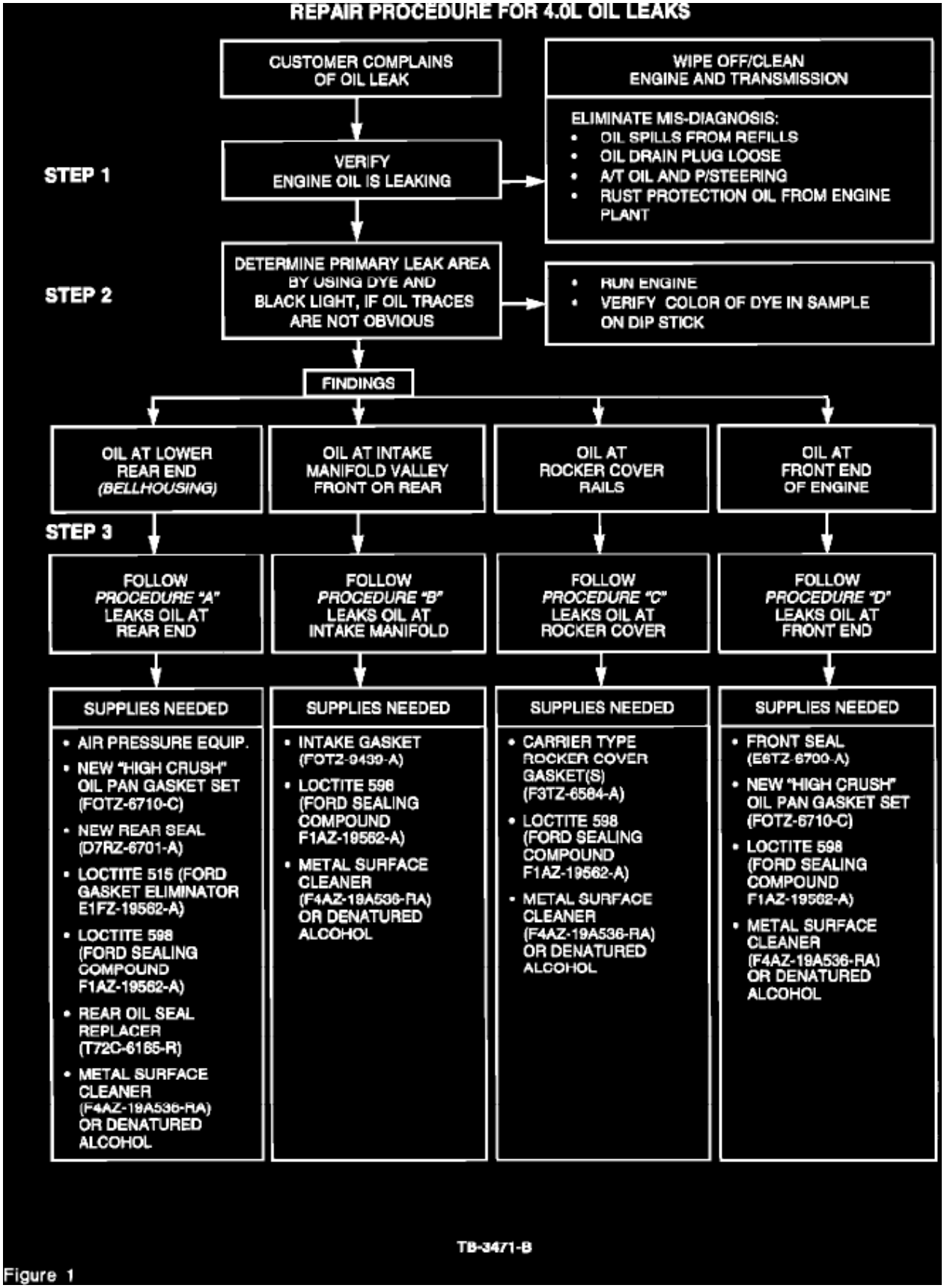


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

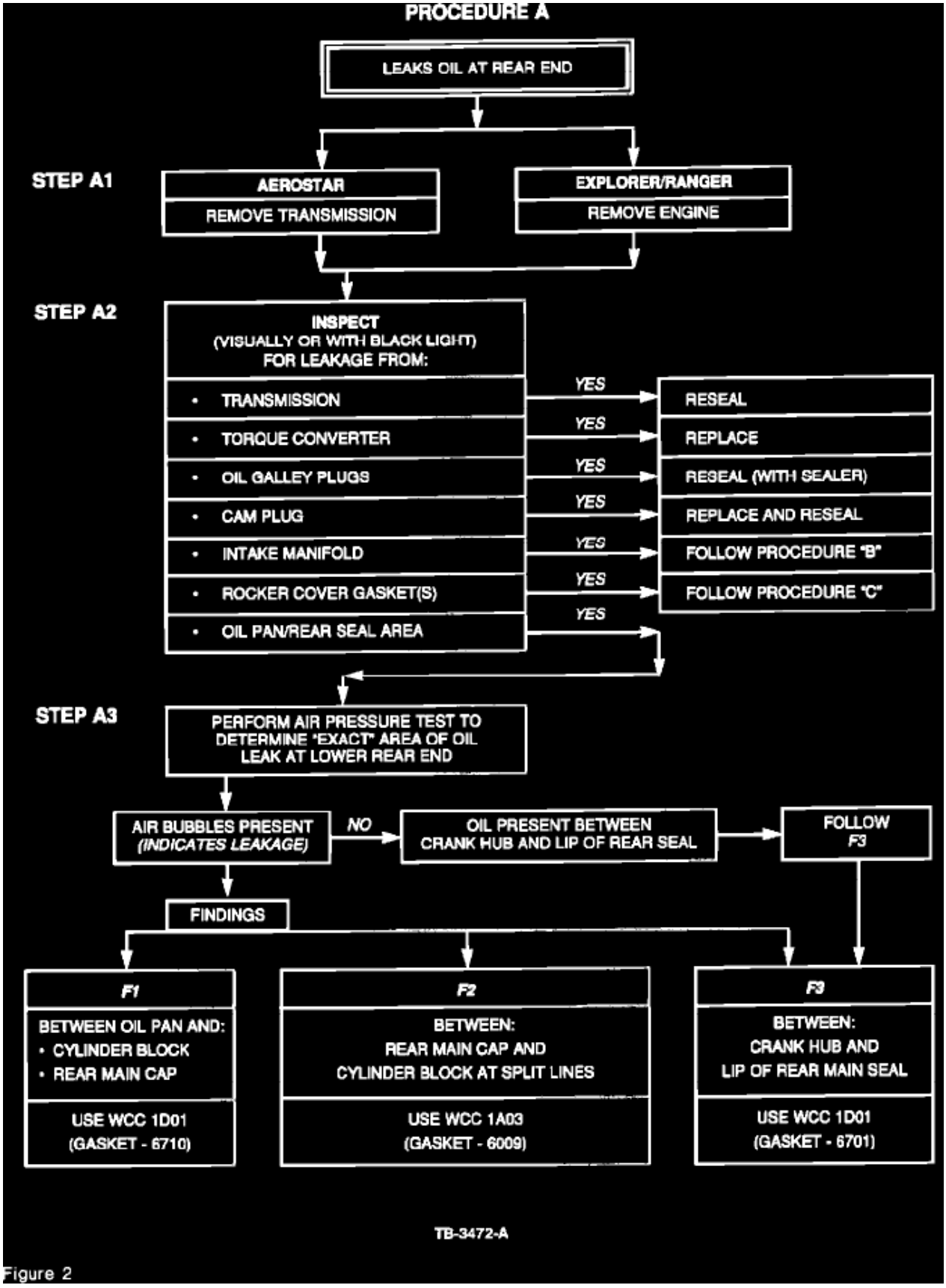

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

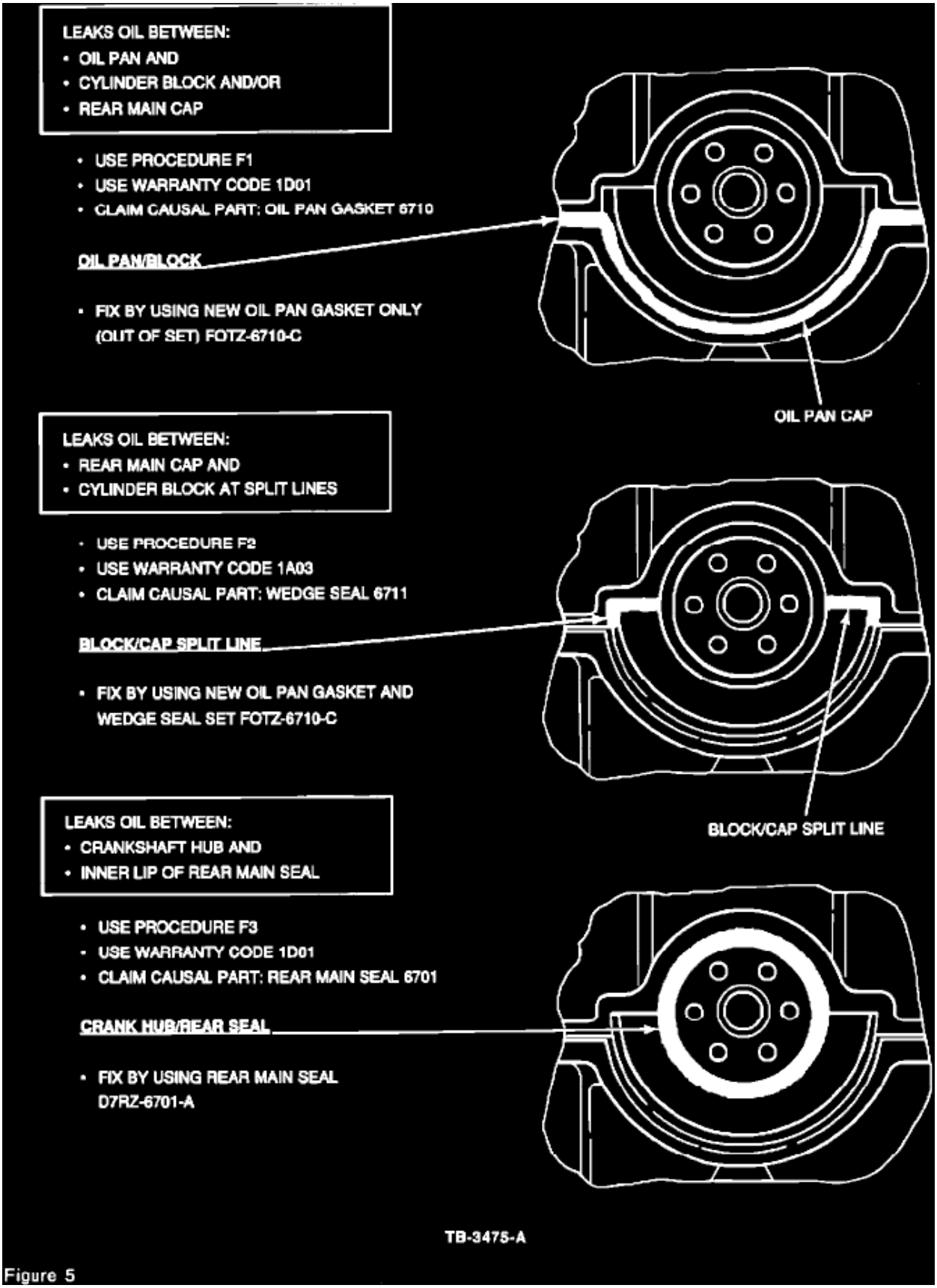


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

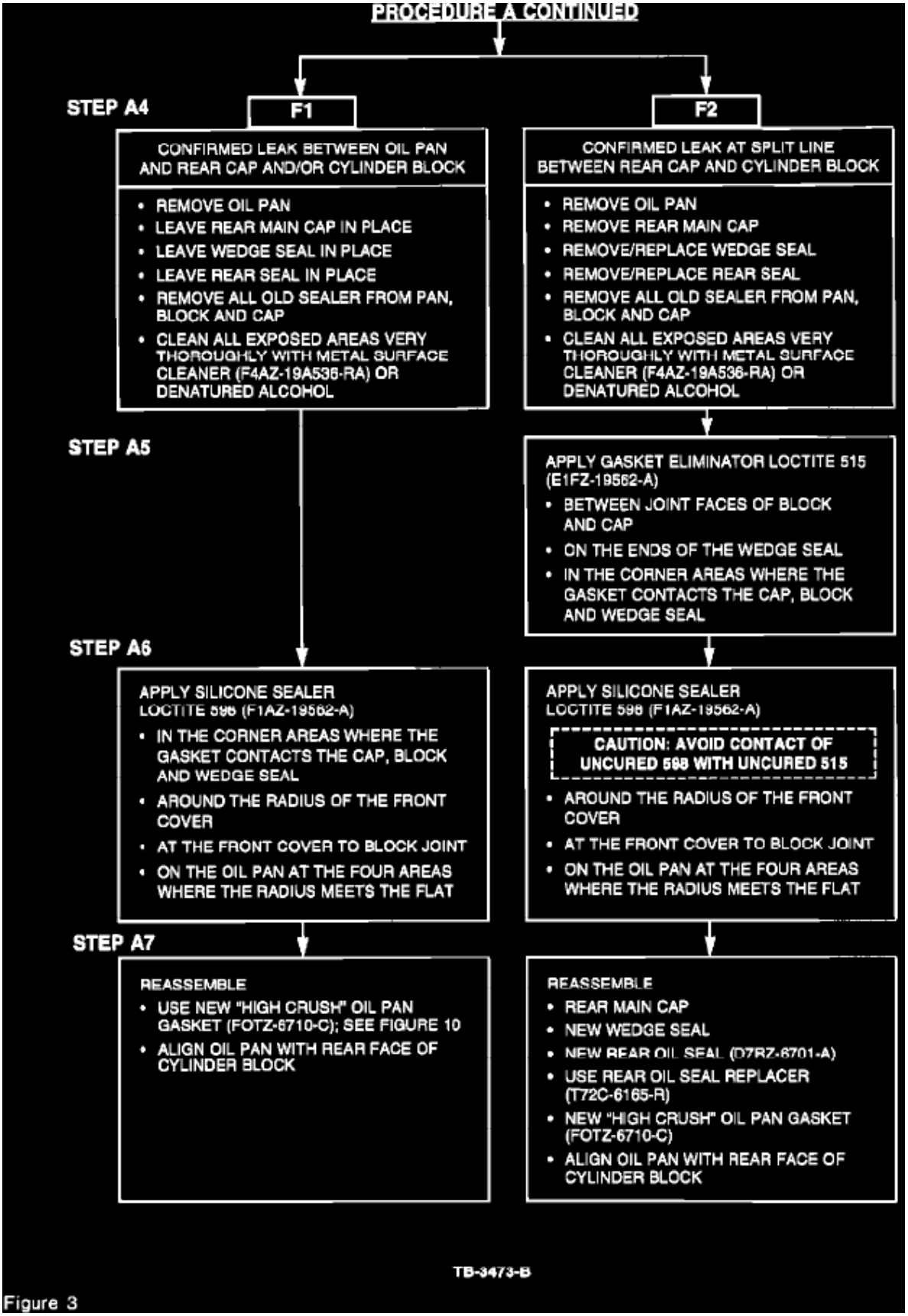
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

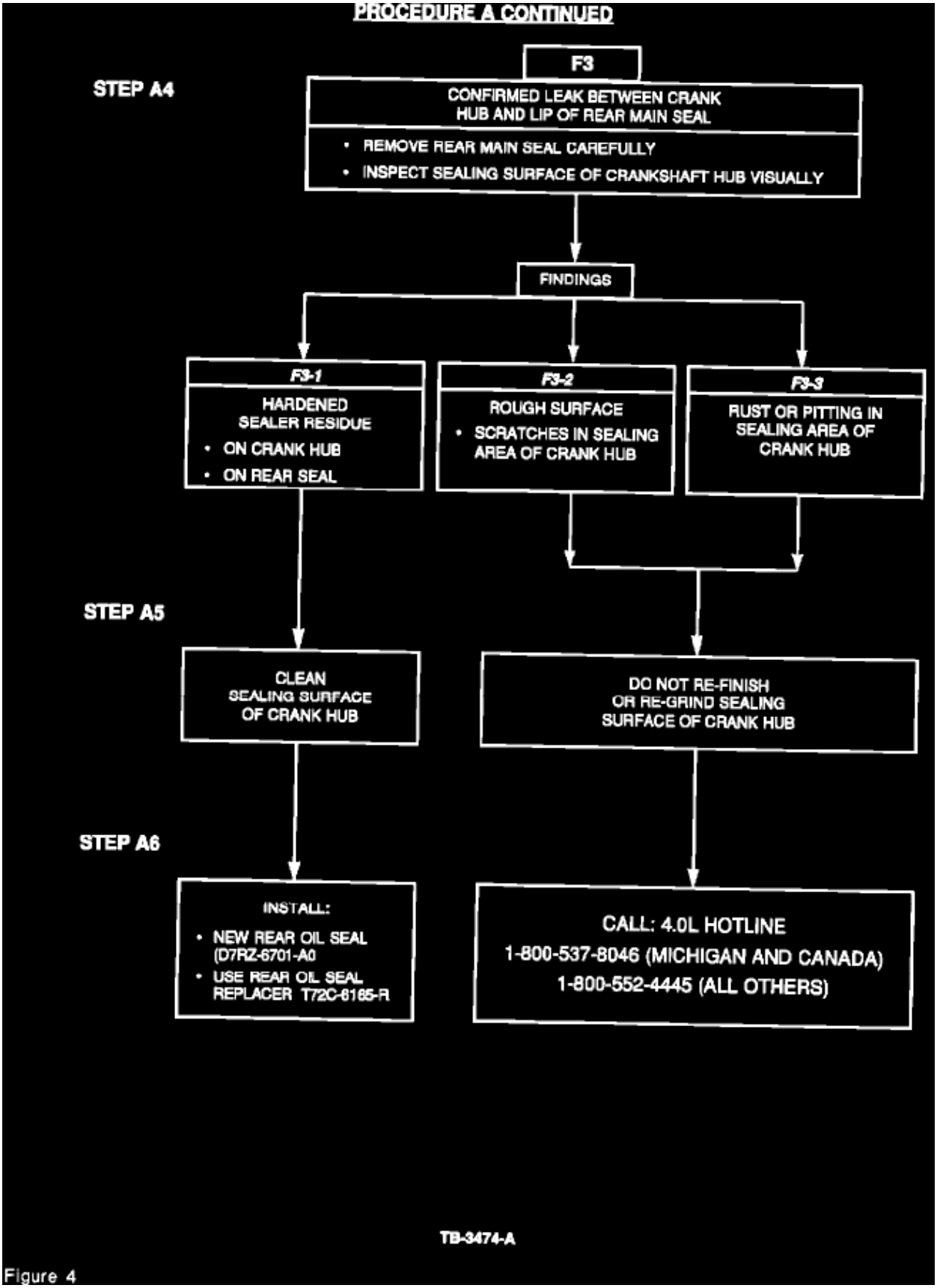


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

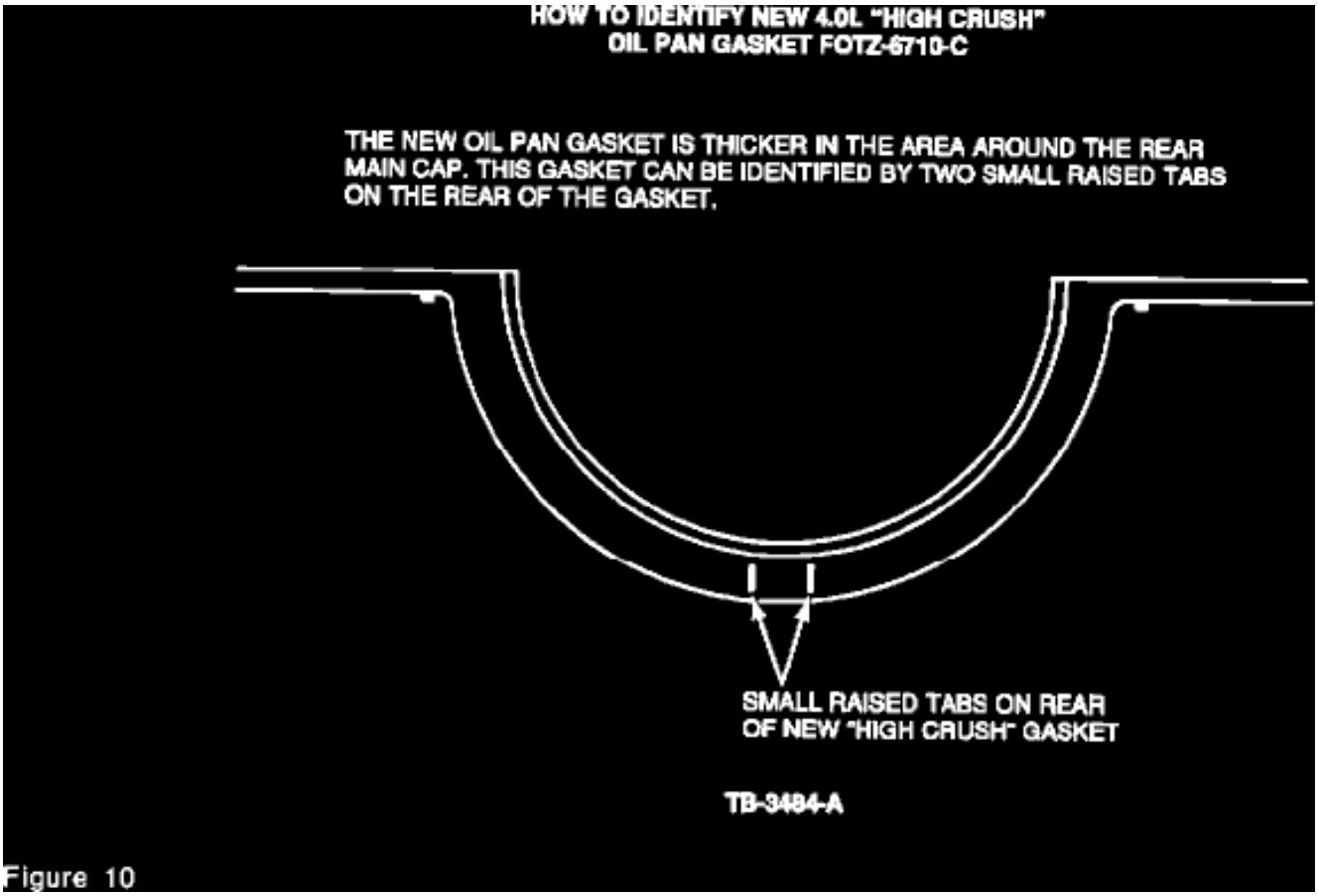


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

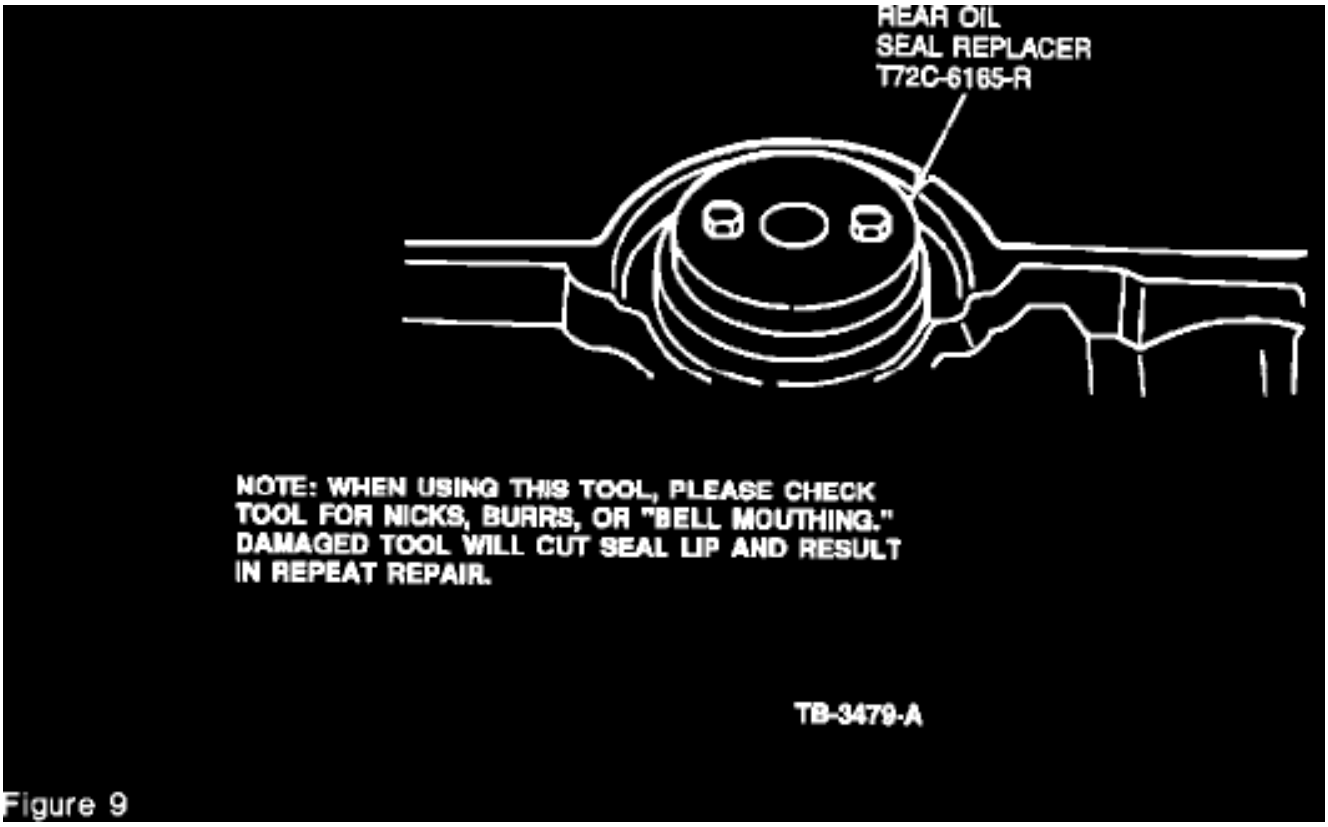


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

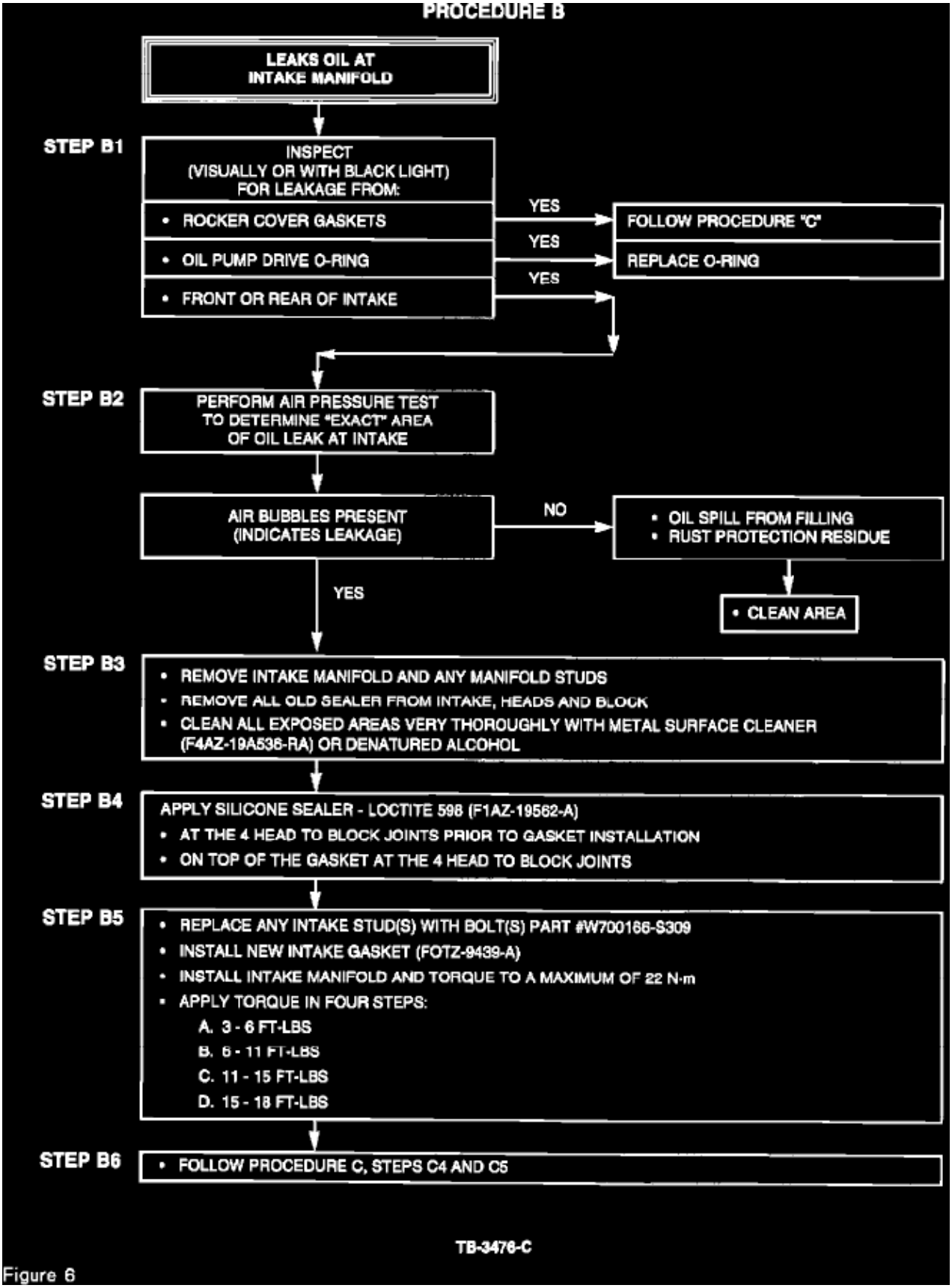


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

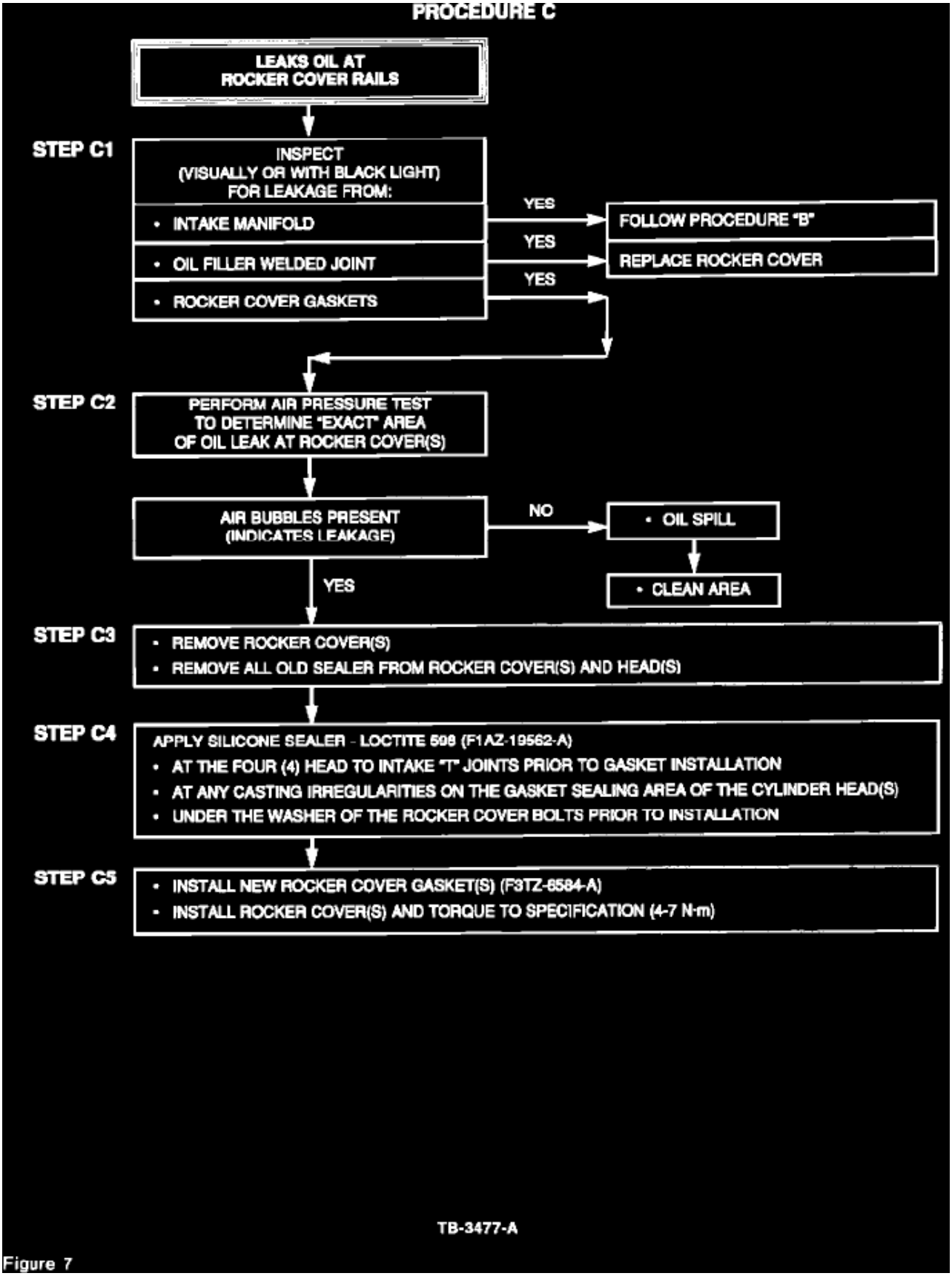


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

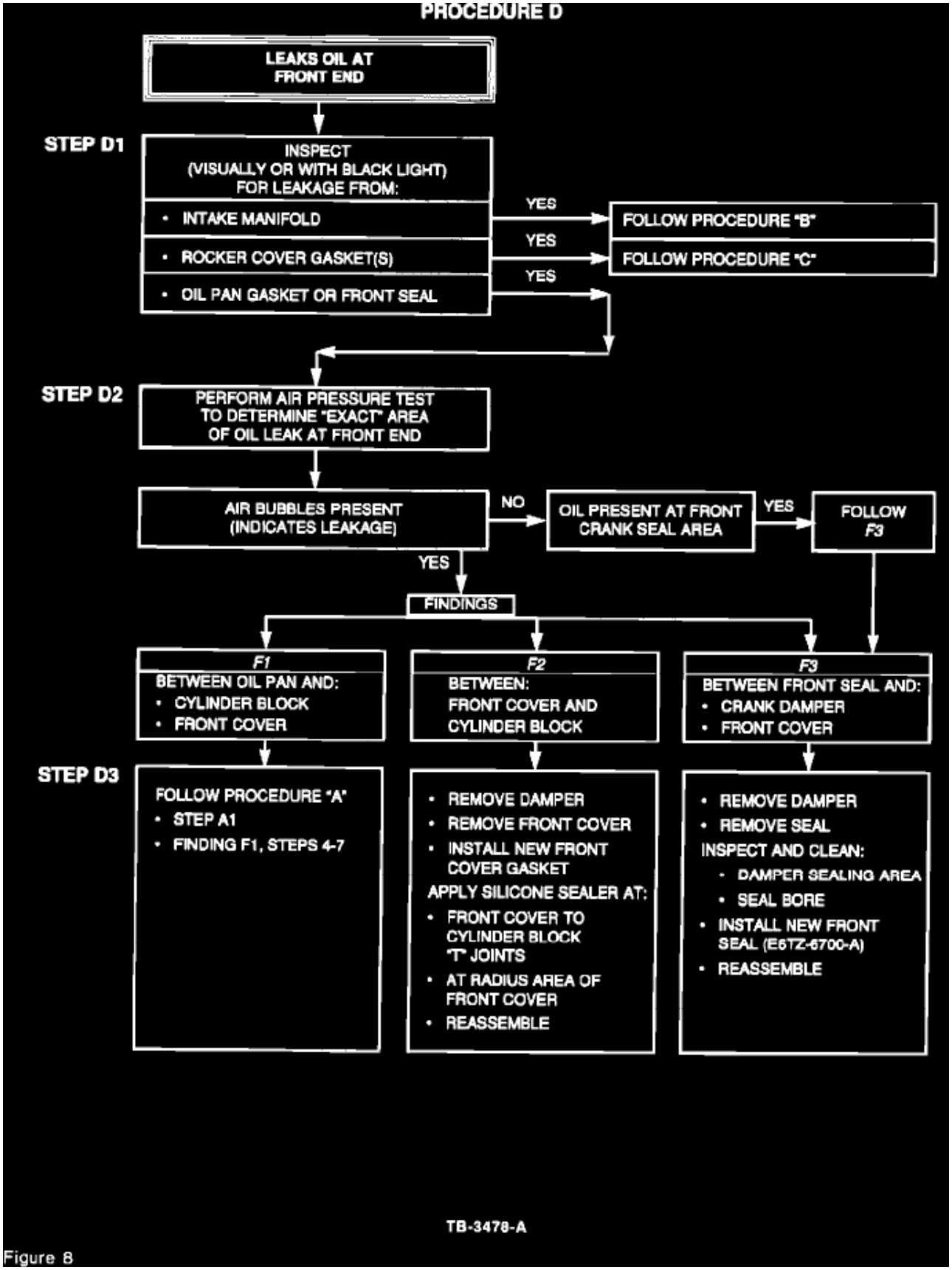


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

PART NUMBER	PART NAME	CLASS
E1FZ-19562-A	Ford Gasket Eliminator	AM
F1AZ-19562-A	Ford Silicone Sealer	B
D7RZ-6701-A	Rear Main Oil Seal	AM
F4AZ-19A536-RA	Metal Surface Cleaner	V
F0TZ-9439-A	Intake Manifold Gasket	B
F3TZ-6584-A	Rocker Cover Gasket	B
E8TZ-6700-A	Front Seal	B
F2TZ-6711-A	Wedge Set	B
W700166-S309	Bolt - Intake Manifold	C
F0TZ-6710-C	Oil Pan Gasket	B

Technical Service Bulletin # 941213 Date: 940615

Engine - Multiple Oil Leaks

Article No. 94-12-13

06/15/94

LEAKS - OIL - OIL PAN, REAR MAIN SEAL, ROCKER COVERS, INTAKE MANIFOLD - 4.0L ENGINE

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 94-10-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper For 1992/93 Models, Basic And Powertrain Warranty Coverage For 1991 And Prior Model Vehicles

OPERATION DESCRIPTION TIME

941213A Perform Air Pressure Check 0.4 Hr.

Only

941213B Additional Time To Steam 0.5 Hr.

Clean Engine And Transmission (Includes Time To Clean Inside Bellhousing Area, If Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

USE ACTUAL USE

DEFECTIVE APPROPRIATE

PART NUMBER CONDITION CODE

OASIS CODES: 401000, 490000, 499000, 623000

General Information

LIGHT TRUCK: 1990-93 AEROSTAR, RANGER 1991-93 EXPLORER

This TSB is being republished in its entirety to correct the type of cleaner being used in Figures 1, 3, and 6.

ISSUE: The many sources of leaks which typically appear at the lower end, front end, intake manifold valley, and rocker cover rails have led to mis-diagnosis as to the source of the leak and improper repair procedures, repeat repairs, and customer dissatisfaction.

ACTION: This TSB article has been developed to list the latest sealing techniques and associated part numbers for:

^ Oil Pan

^ Rear Main Seal

^ Rocker Covers

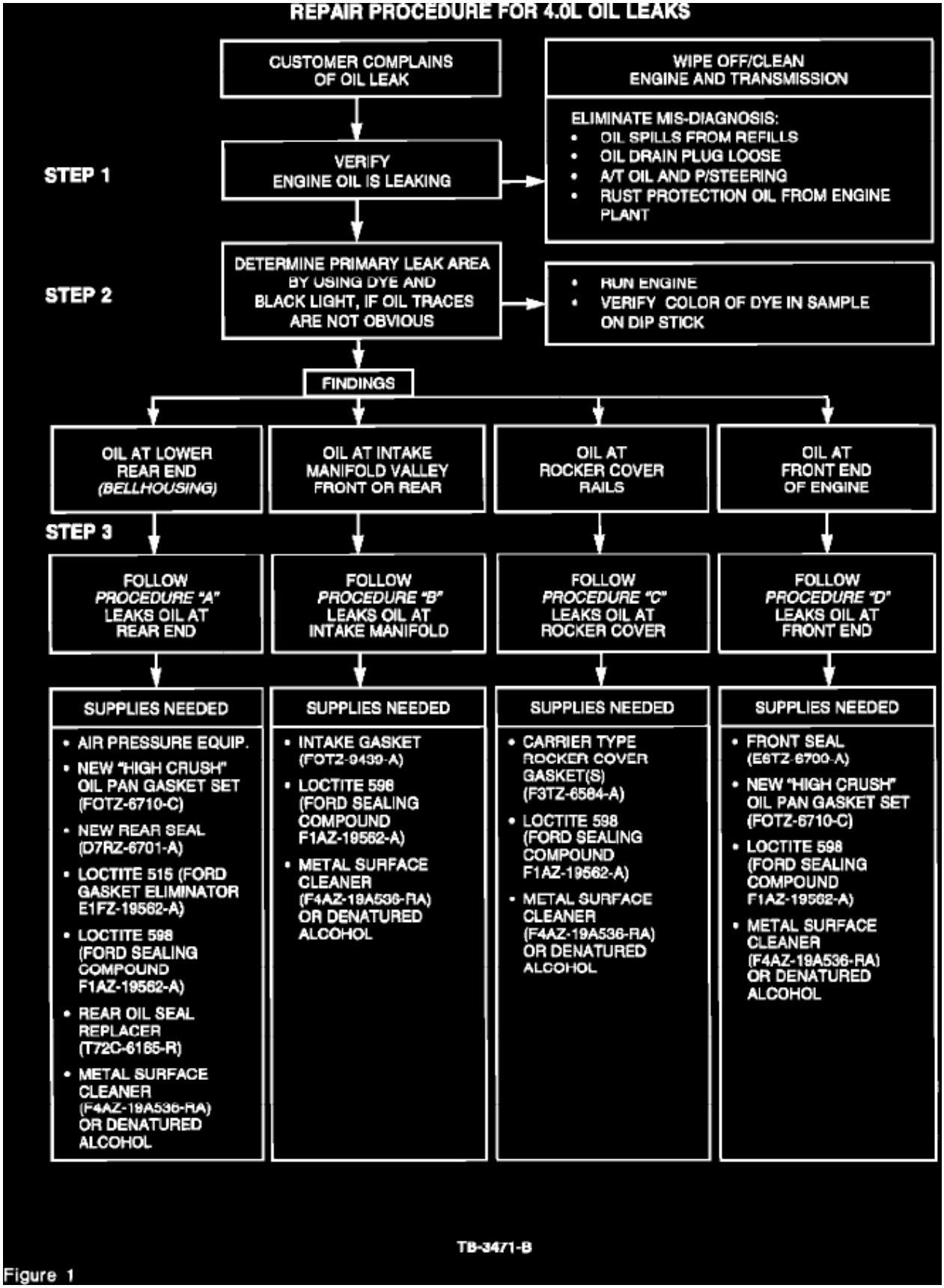


Figure 1

^ Intake Manifold

This article attempts to fully address all issues as one, in order to provide a diagnostic guide which leads to proper diagnosis and repair the first time. Use the following procedures to verify the location of the oil leak and perform the repair.

Service Procedure - Diagnosis

1. Perform Steps 1 and 2 of the block diagram shown in Figure 1. Perform a visual inspection to determine the general area of the oil leak.

2. After determining the "Findings" of Step 2, perform Step 3 by following Procedures A, B, C or D, whichever is appropriate, up to, but not including the air pressure test.

NOTE:

WHEN THE FINDINGS RESULT IN FOLLOWING PROCEDURE "A" FOR "LEAKS OIL AT REAR END", IT IS VERY IMPORTANT TO FOLLOW THE BLOCK DIAGRAM INSTRUCTIONS TO REMOVE THE TRANSMISSION, IF AN AEROSTAR, AND TO REMOVE THE ENGINE, IF AN EXPLORER/RANGER. THE PRACTICE OF REMOVING EXPLORER/RANGER OIL PANS WITH ENGINE IN VEHICLE CAN RESULT IN FAULTY DIAGNOSIS AND/OR REPAIR FOR THE PURPOSES OF THIS TSB.

If the leak has not been located and corrected at this point, then fabricate a device that is capable of applying a constant 1 to 3 psi of air pressure to the engine crankcase. The Rotunda Leak Tester 134-00003, or equivalent, which contains a pressure regulator and gauge capable of a 1 to 3 psi range, may be used.

3. Verify the location of the oil leak by pressurizing the engine crankcase with a constant supply of 3 psi of air pressure and the use of leak detection solution (liquid detergent and water). This process will verify the exact location of the leak. Dye and black light will verify a leak is present, but may not verify the exact location of the leak.

a. Assemble the necessary hose and fittings to connect an air pressure regulator and air pressure gauge to the shop air supply and to the engine crankcase through the dipstick tube.

b. Test the device to make sure 1-3 psi of air pressure can be maintained. Bursts of pressure over 3 psi can damage engine seals.

c. Before starting the test, make sure the regulator valve is completely closed so as not to accidentally apply a big burst of air to the engine when starting the test.

d. Attach the outlet (regulated) hose from the regulator/gauge device to the dipstick.

e. To trap air in the engine, plug any ports and passages (PCV valve, air inlet connection) that will allow air to escape.

f. Slowly open the regulator valve until 1-3 psi of air pressure registers on the gauge.

g. Keeping air pressure applied, brush or squirt a solution of liquid detergent and water or commercially available liquid leak detector (Snoop, Bubbles) to the primary area identified in Step 2 of the block diagram.

^ If the primary area is in the rear seal area, apply the solution to the rear seal, rear cap, rear cap to cylinder block and oil pan gasket areas.

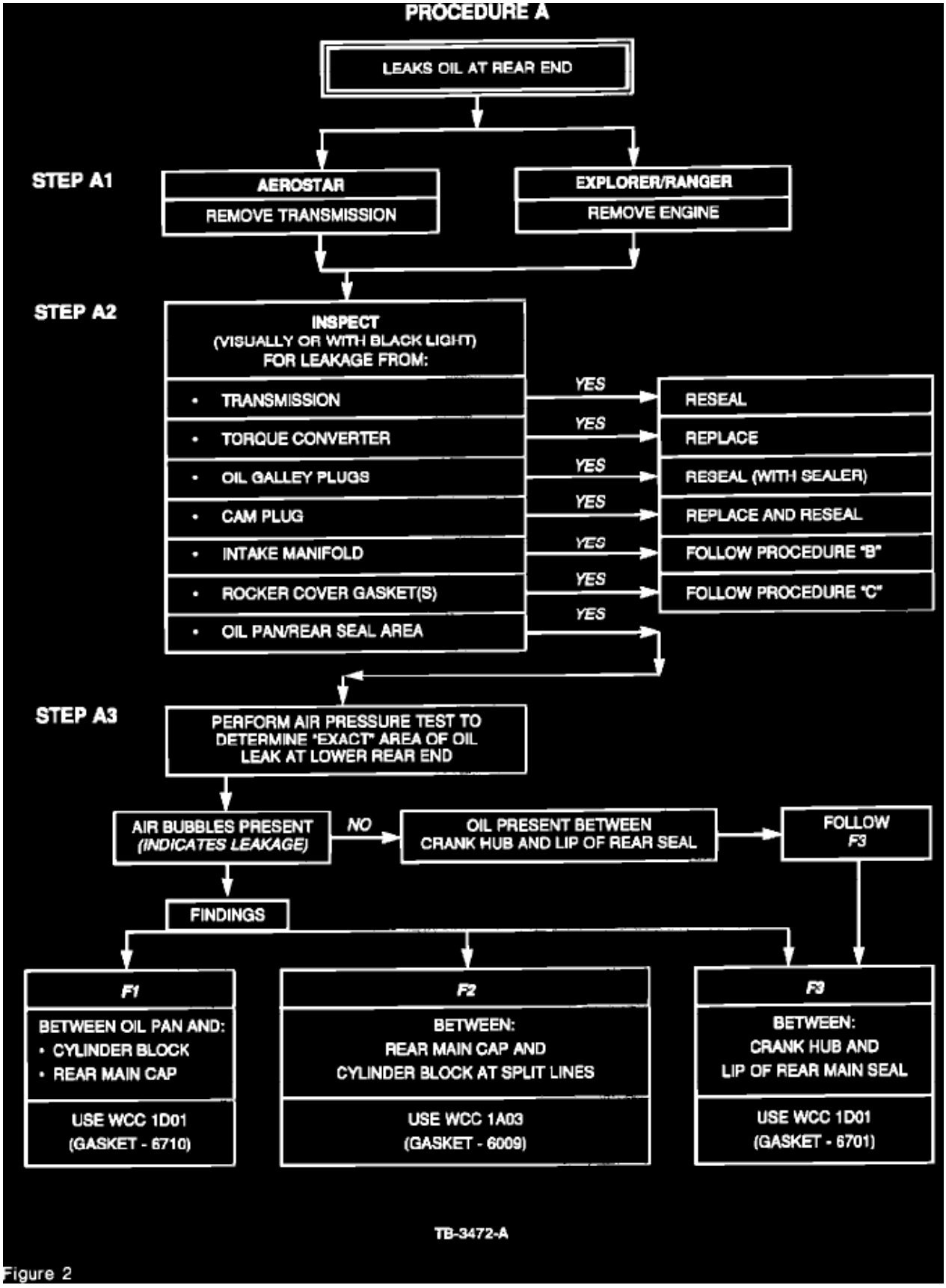

PROCEDURE A
LEAKS OIL AT REAR END
STEP A1
AEROSTAR
REMOVE TRANSMISSION
EXPLORER/RANGER
REMOVE ENGINE
STEP A2
INSPECT
(VISUALLY OR WITH BLACK LIGHT)
FOR LEAKAGE FROM:
• TRANSMISSION
• TORQUE CONVERTER
• OIL GALLEY PLUGS
• CAM PLUG
• INTAKE MANIFOLD
• ROCKER COVER GASKET(S)
• OIL PAN/REAR SEAL AREA
YES
RESEAL
REPLACE
RESEAL (WITH SEALER)
REPLACE AND RESEAL
FOLLOW PROCEDURE "B"
FOLLOW PROCEDURE "C"
STEP A3
PERFORM AIR PRESSURE TEST TO
DETERMINE "EXACT" AREA OF OIL
LEAK AT LOWER REAR END
AIR BUBBLES PRESENT
(INDICATES LEAKAGE)
NO
OIL PRESENT BETWEEN
CRANK HUB AND LIP OF REAR SEAL
FOLLOW
F3
FINDINGS
F1
BETWEEN OIL PAN AND:
• CYLINDER BLOCK
• REAR MAIN CAP
USE WCC 1D01
(GASKET - 6710)
F2
BETWEEN:
REAR MAIN CAP AND
CYLINDER BLOCK AT SPLIT LINES
USE WCC 1A03
(GASKET - 6009)
F3
BETWEEN:
CRANK HUB AND
LIP OF REAR MAIN SEAL
USE WCC 1D01
(GASKET - 6701)
TB-3472-A

Figure 2

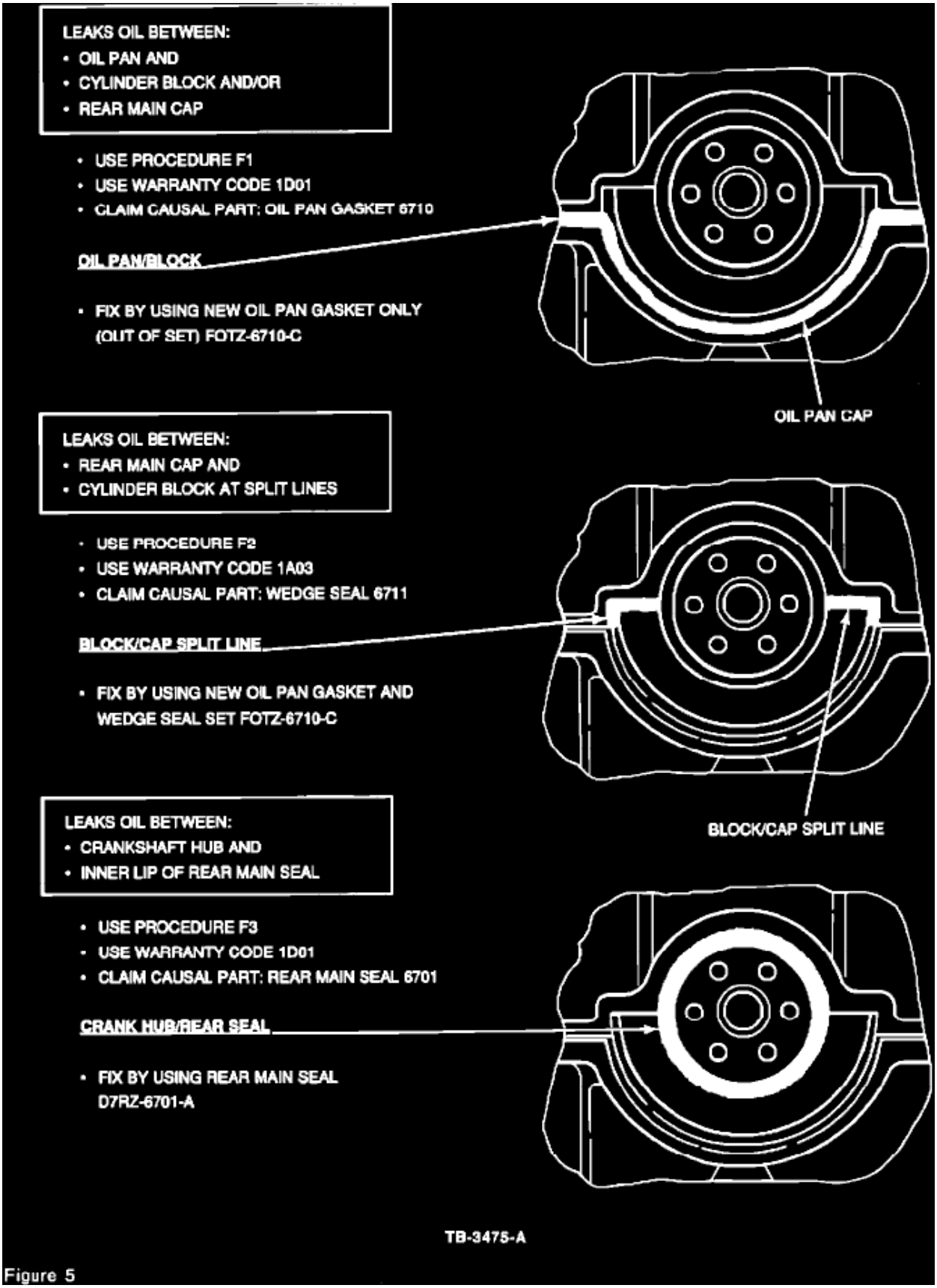


Figure 5

^ If bubbles are detected only at the oil pan gasket, between the oil pan and the cylinder block, or between the oil pan and the rear main cap, only the oil pan gasket needs replacing. Note

Procedure A, Figure 2, Step A3/F1, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A1.

^ If bubbles are detected between the rear main cap and the cylinder block, the rear cap must be removed and resealed. Note Procedure A, Figure 2, Step A3/F2, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A2.

^ If bubbles are detected between the rear seal lip and crank hub, a new rear oil seal will be required. Under certain circumstances, as outlined in the block diagram, it will be necessary to call the 4.OL Hotline. Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Proceed to SERVICE PROCEDURE - REPAIR REAR END OIL LEAK, Procedure A3.

^ If no bubbles are detected, but oil is present in the area between the crank hub and the lip of the rear seal, carefully remove the seal and inspect the crankshaft rear seal journal. (A leak may occur

at the rear seal only when the engine is running.) Note Procedure A, Figure 2, Step A3/F3, and pictorial, Figure 5. Follow repair procedures outlined on the block diagram.

NOTE:

ANY APPEARANCE OF RUST, PITTING, POROSITY, OR NICKS ON THE REAR SEAL JOURNAL WILL CAUSE A LEAK.

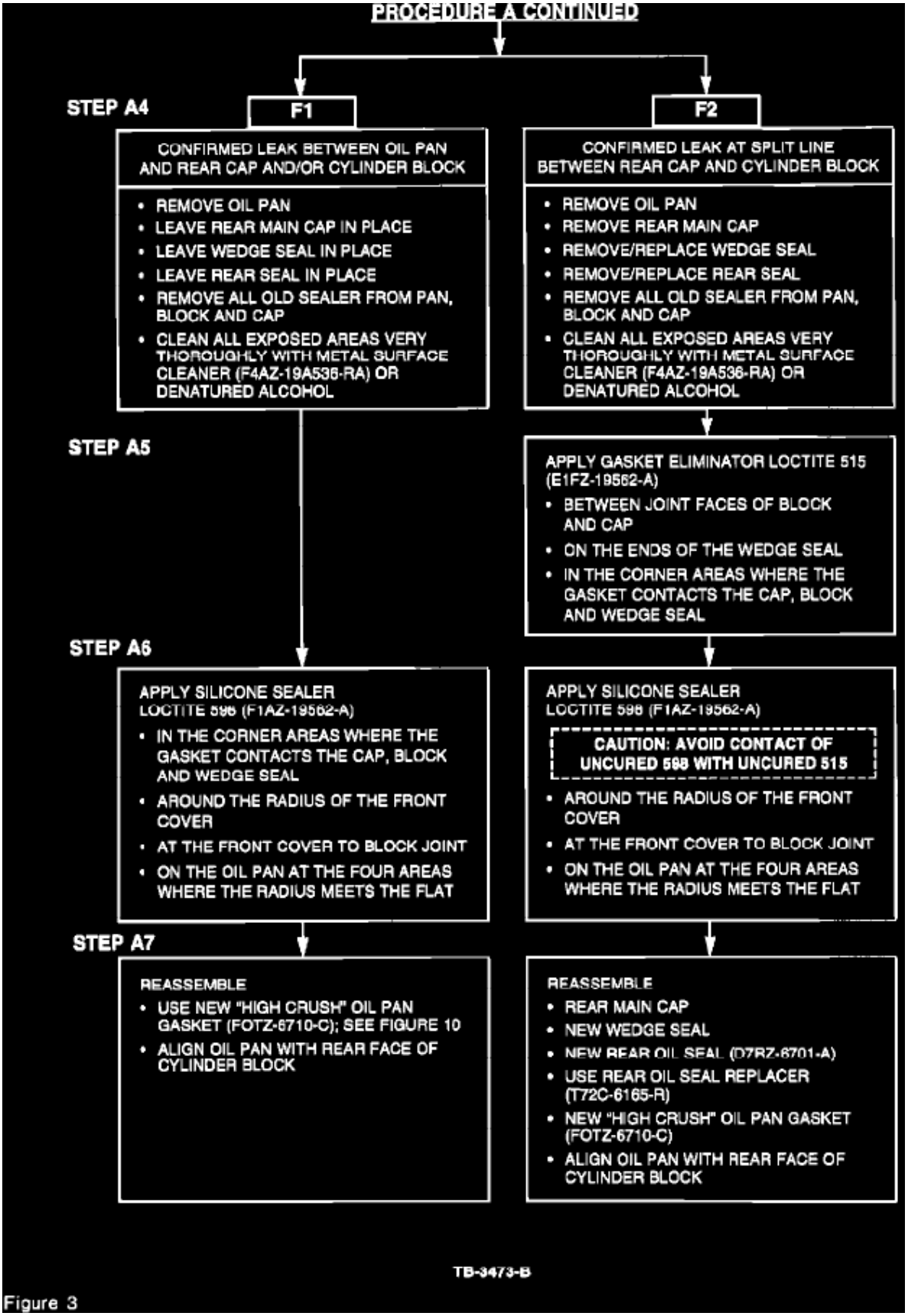
^ If bubbles are detected at the front or rear of the intake manifold gasket, a new intake manifold gasket (FOTZ-9439-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT INTAKE MANIFOLD, PROCEDURE B.

^ If bubbles are detected at the rocker cover rails, new rocker cover gaskets (F3TZ-6584-A) will have to be installed. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT ROCKER COVER RAILS, PROCEDURE C.

^ If bubbles are detected at the front end of the engine, a new front seal (E6TZ-6700-A) or oil pan gasket (FOTZ-6710-C) will be required. Proceed to SERVICE PROCEDURE - REPAIR FOR OIL LEAKS AT THE FRONT END, PROCEDURE D.

Service Procedure - Repair

REAR END OIL LEAK - PROCEDURE A


PROCEDURE A CONTINUED
STEP A4
F1
CONFIRMED LEAK BETWEEN OIL PAN AND REAR CAP AND/OR CYLINDER BLOCK
• REMOVE OIL PAN
• LEAVE REAR MAIN CAP IN PLACE
• LEAVE WEDGE SEAL IN PLACE
• LEAVE REAR SEAL IN PLACE
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
F2
CONFIRMED LEAK AT SPLIT LINE BETWEEN REAR CAP AND CYLINDER BLOCK
• REMOVE OIL PAN
• REMOVE REAR MAIN CAP
• REMOVE/REPLACE WEDGE SEAL
• REMOVE/REPLACE REAR SEAL
• REMOVE ALL OLD SEALER FROM PAN, BLOCK AND CAP
• CLEAN ALL EXPOSED AREAS VERY THOROUGHLY WITH METAL SURFACE CLEANER (F4AZ-19A536-RA) OR DENATURED ALCOHOL
STEP A5
APPLY GASKET ELIMINATOR LOCTITE 515 (E1FZ-19562-A)
• BETWEEN JOINT FACES OF BLOCK AND CAP
• ON THE ENDS OF THE WEDGE SEAL
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
STEP A6
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
• IN THE CORNER AREAS WHERE THE GASKET CONTACTS THE CAP, BLOCK AND WEDGE SEAL
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
APPLY SILICONE SEALER LOCTITE 598 (F1AZ-19562-A)
CAUTION: AVOID CONTACT OF UNCURED 598 WITH UNCURED 515
• AROUND THE RADIUS OF THE FRONT COVER
• AT THE FRONT COVER TO BLOCK JOINT
• ON THE OIL PAN AT THE FOUR AREAS WHERE THE RADIUS MEETS THE FLAT
STEP A7
REASSEMBLE
• USE NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C); SEE FIGURE 10
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
REASSEMBLE
• REAR MAIN CAP
• NEW WEDGE SEAL
• NEW REAR OIL SEAL (D7RZ-6701-A)
• USE REAR OIL SEAL REPLACER (T72C-6165-R)
• NEW "HIGH CRUSH" OIL PAN GASKET (FOTZ-6710-C)
• ALIGN OIL PAN WITH REAR FACE OF CYLINDER BLOCK
TB-3473-B
Figure 3

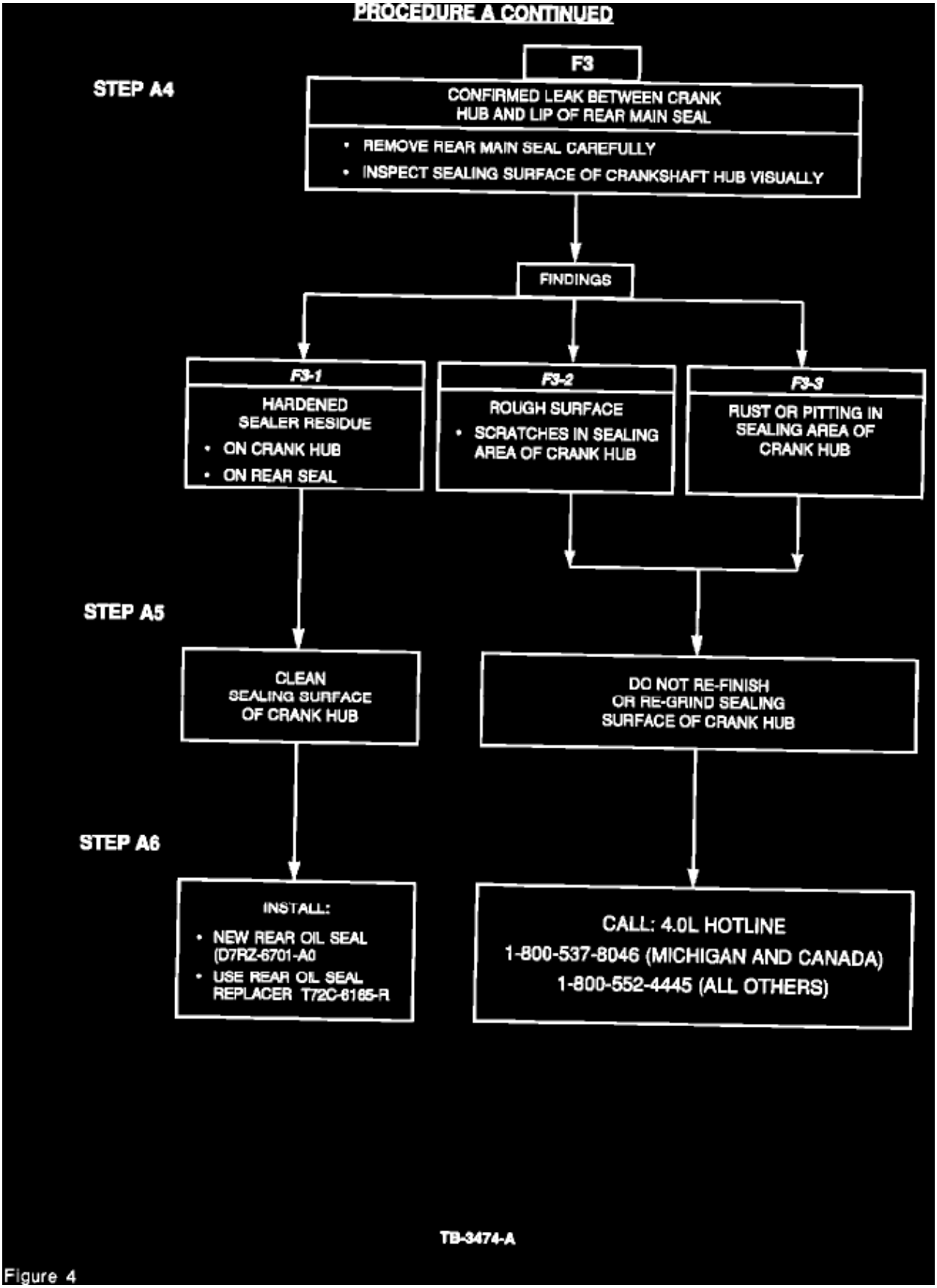


Figure 4

1. Repair procedure for a leak at oil pan gasket between the oil pan and cylinder block, or between the oil pan and the rear main cap. See block diagram Procedure A, Step A4/F1, Figures 3 and 4.

a. Remove the oil pan from the engine and remove the old gasket from the oil pan. Do not remove the rear main cap or wedge seal from the engine.

b. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

c. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap. Take special care to scrape/scratch all the old sealer from the exposed areas of the rear cap, wedge seal and cylinder block. This is a critical sealing area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER BLOCK.

d. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

e. Clean the transmission "BELLHOUSING" area, the rear of the cylinder block and the rear engine plate of ALL oil residue.

f. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corner of the radius areas at the front and rear of the oil pan.

g. Place the oil pan gasket (FOTZ-6710-C) in place in the groove in the oil pan.

h. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the corners where the rear main cap meets the cylinder block, at the corner areas of the radius area on the front cover and the front cover to cylinder block joint.

i. Set the oil pan in place and snug the four (4) pan nuts.

j. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .0100" (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

k. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

2. Repair procedure for a leak between the rear main cap and the cylinder block. See block diagram Procedure A, Step A4/F2.

a. Remove the oil pan, windage tray, oil pump and rear main cap from the engine.

b. Remove the rear main oil seal from the crankshaft and thoroughly inspect the main seal journal of the crankshaft for signs of rust, pitting, nicks or porosity.

c. Clean ALL the oil and old sealer from the oil pan, taking special care to remove ALL the old sealer from the oil pan gasket groove in the oil pan. Thoroughly wash the oil pan.

d. Clean ALL the old sealer from the rear main bearing cap USING A SCRAPER AND WIRE WHEEL. The original Loctite sealer used during production assembly becomes extremely hard after it has cured. It is extremely important that ALL the old sealer be removed from the joint faces and grooves.

e. Clean ALL the oil and old sealer from the oil pan sealing area on the cylinder block and rear main cap joint area.

CAUTION:

PREVENT CYLINDER BLOCK CONTAMINATION. ALWAYS USE NECESSARY PRECAUTIONS TO PREVENT OLD SEALER OR GASKET MATERIAL FROM FALLING INTO THE CYLINDER

BLOCK.

f. Clean ALL the oil and old sealer from the "WEDGE SEAL" that fits around the rear main bearing cap in the oil pan gasket groove. Preferably use a new "WEDGE SEAL".

g. After all the parts have been cleaned, they must be wiped down with a cleaner that leaves no residue or film such as Metal Surface Cleaner (F4AZ-19A536-RA) or denatured alcohol.

CAUTION:

NEVER USE CARBURETOR CLEANER OR OTHER PETROLEUM PRODUCTS ON AREAS TO BE SEALED. THEY LEAVE A HYDROCARBON RESIDUE THAT RESISTS THE ADHESIVE ACTION OF SEALANTS. AVOID THE USE OF SOAP AND WATER AS CLEANERS. SOAP FILM RESISTS THE SEALANTS ADHESIVE ACTION.

h. Clean the transmission "BELLHOUSING AREA", the rear of the cylinder block and the rear engine plate of ALL oil residue.

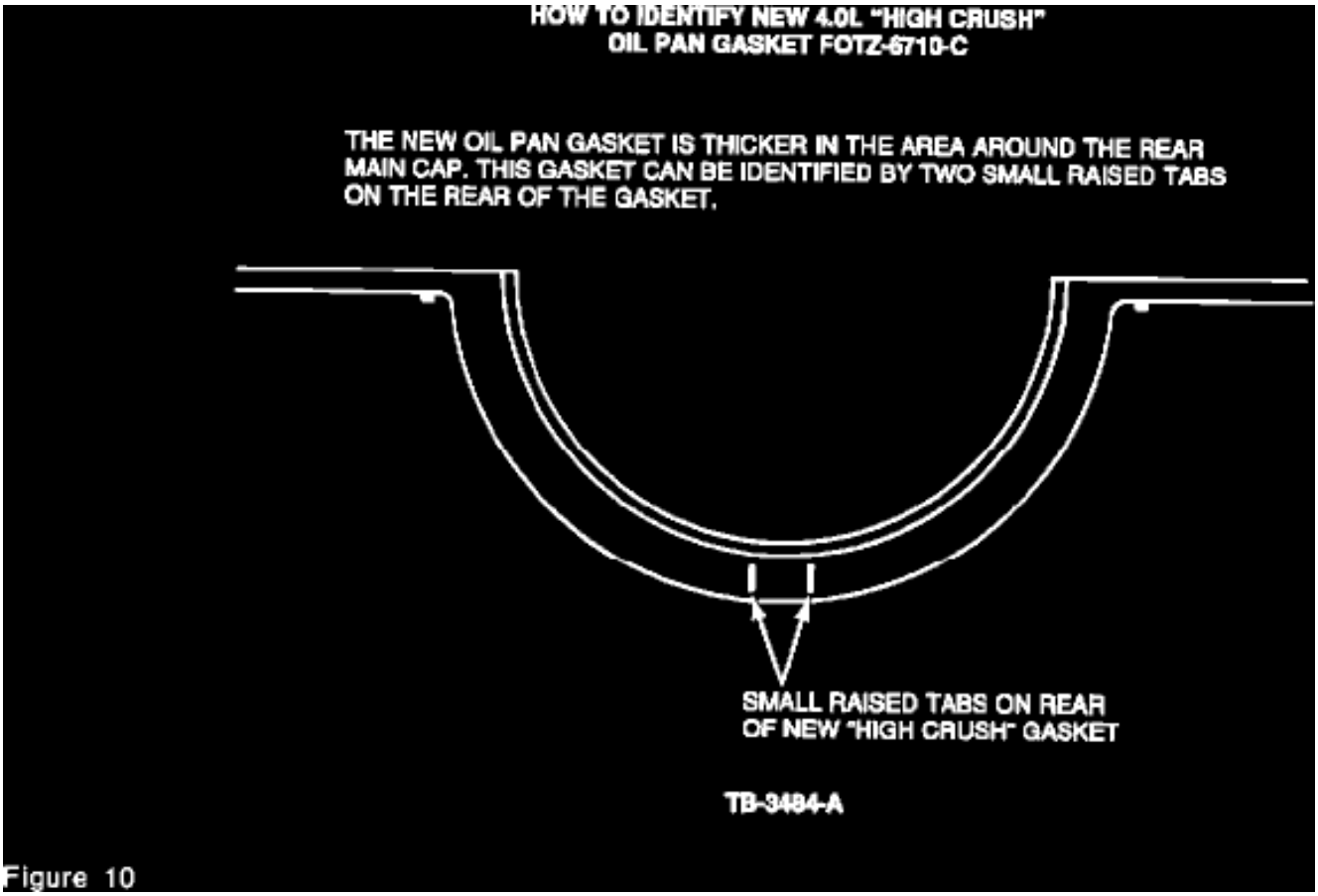


Figure 10

i. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) on the cylinder block along the corners of the rear main bearing cap joint area and on the joint face, approximately 1/2 inch (12.7 mm) from the rear of the block.

j. Verify that the lower rear main bearing insert is in place. Install the rear main bearing cap and snug the bolts.

k. Align the rear main bearing cap to cylinder block by moving the bearing fore or aft (approx. 1/2 inch (12.7 mm) inward in the rear oil seal bore) so that the rear seal stop of the block and cap line up. This will assure that the rear main oil seal will seat squarely when installed in the bore.

l. Torque the rear main cap bolts to 66-77 lb.ft. (90-104 N-m).

m. Fill the cavities for the "WEDGE SEAL" on both sides of the rear main cap with Ford Gasket Eliminator (E1FZ-19562-A).

n. Place "WEDGE SEAL" in place and use a flat bladed screwdriver to fully seat the "WEDGE SEAL", forcing the excessive sealer out.

o. Place a bead of Ford Gasket Eliminator (E1FZ-19562-A) in the corners of the oil pan gasket groove of the rear main cap where the cap meets the cylinder block.

p. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) at the corner areas of the radius area on the front cover and at the front cover to cylinder block joint.

q. Reinstall the oil pump and windage tray. Torque to 13-15 lb.ft. (17-21 N-m).

r. Place a bead of Ford Silicone Sealer (F1AZ-19562-A) in the oil pan gasket groove at the corners of the radius areas at the front and rear of the oil pan.

s. Place the oil pan gasket (FOTZ-6710-C), Figure 10, in place in the groove in the oil pan.

t. Set the oil pan in place and snug the four (4) oil pan bolts.

u. Align the rear face of the oil pan with the rear face of the cylinder block.

NOTE:

IF THE REAR FACE OF THE OIL PAN CANNOT BE ALIGNED WITHIN .01000 (.254 mm) OF THE REAR FACE OF THE CYLINDER BLOCK, THE APPROPRIATE SHIMS MUST BE USED.

v. Install the remaining oil pan bolts and torque to 5-7 lb.ft. (7-10 N-m).

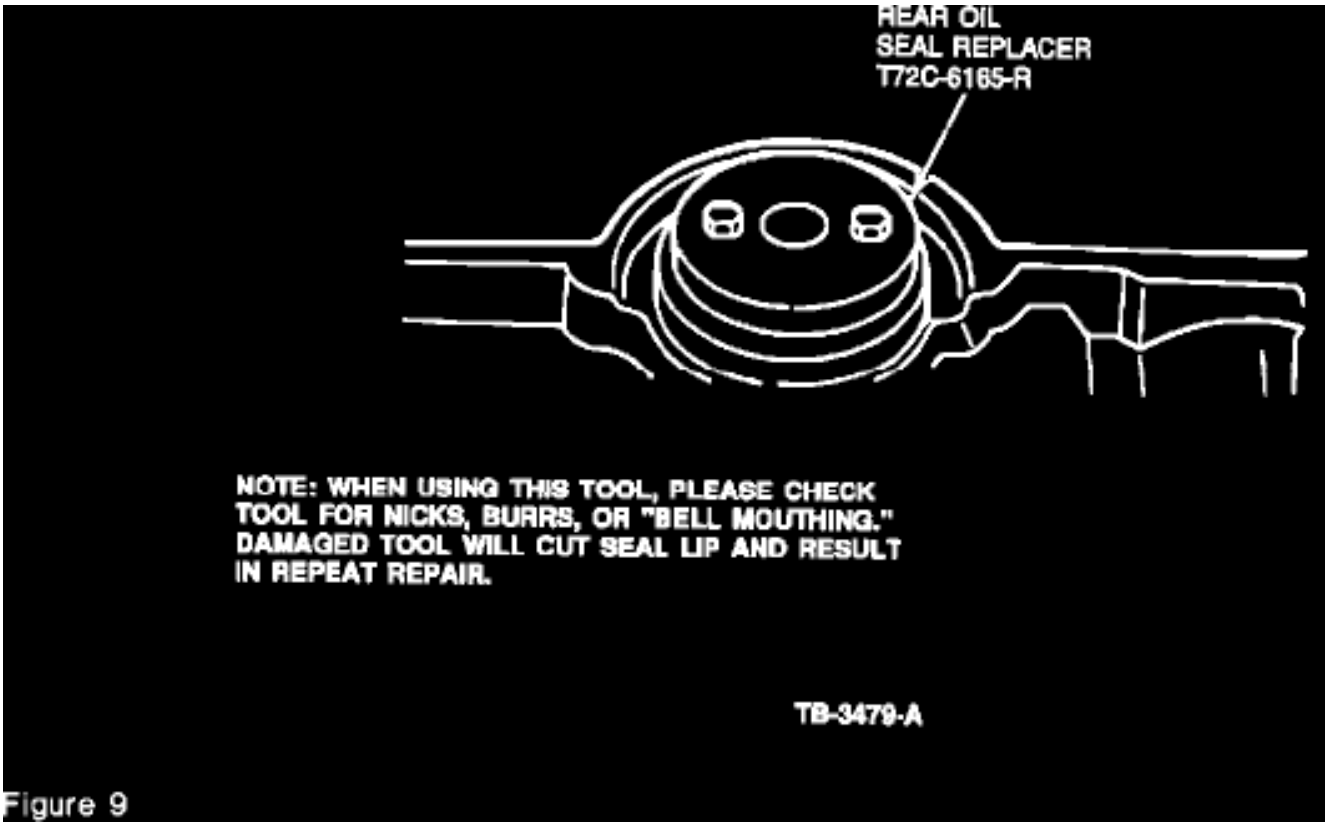


Figure 9

w. Coat the rear main oil seal (D7RZ-6701-A) with oil. Install the rear seal in the seal bore using Rear Oil Seal Replacer T72C-6165-R. This tool uses two flywheel bolts to draw the seal into position. Refer to Figure 9.

CAUTION:

DO NOT USE THE OLD STYLE HAMMER OPERATED TOOL.

3. Repair procedure for a leak between the rear main seal and the crankshaft. See block diagram, Procedure A, Step A4/F3.

a. Any presence of rust on the rear seal journal will cause a leak.

b. Any presence of pitting, porosity or nicks on the rear seal journal will cause a leak.

NOTE:

IF A LEAK IS PRESENT BETWEEN THE REAR MAIN SEAL AND CRANKSHAFT, PLEASE NOTIFY THE 4.0L "HOTLINE" AT (800) 537-8046 OR (800) 552-4445 PRIOR TO ANY ATTEMPT TO REPAIR THIS CONDITION.

Service Procedure - Repair For Oil Leaks At Intake Manifold

PROCEDURE B

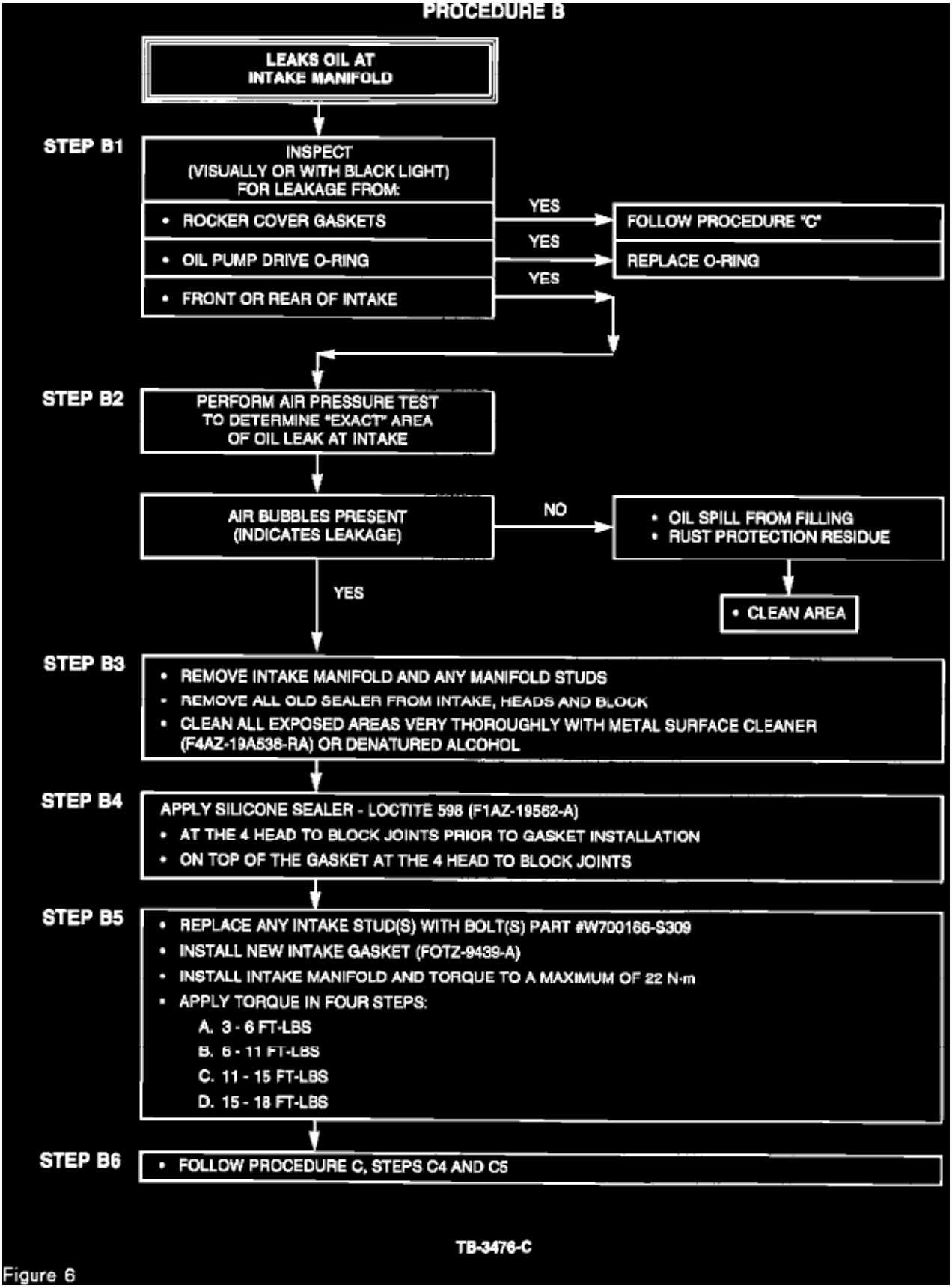


Figure 6

1. If the air pressure test showed no air bubbles, follow Procedure B2 to clean area of oil spill or other contamination.

2. If the air pressure test showed air bubbles present, follow Steps B3 through B6. Refer also to the Service Manual for the applicable year for further information pertinent to removal and installation of the intake manifold.

Service Procedure - Repair For Oil Leaks At Rocker Cover Rails

PROCEDURE C

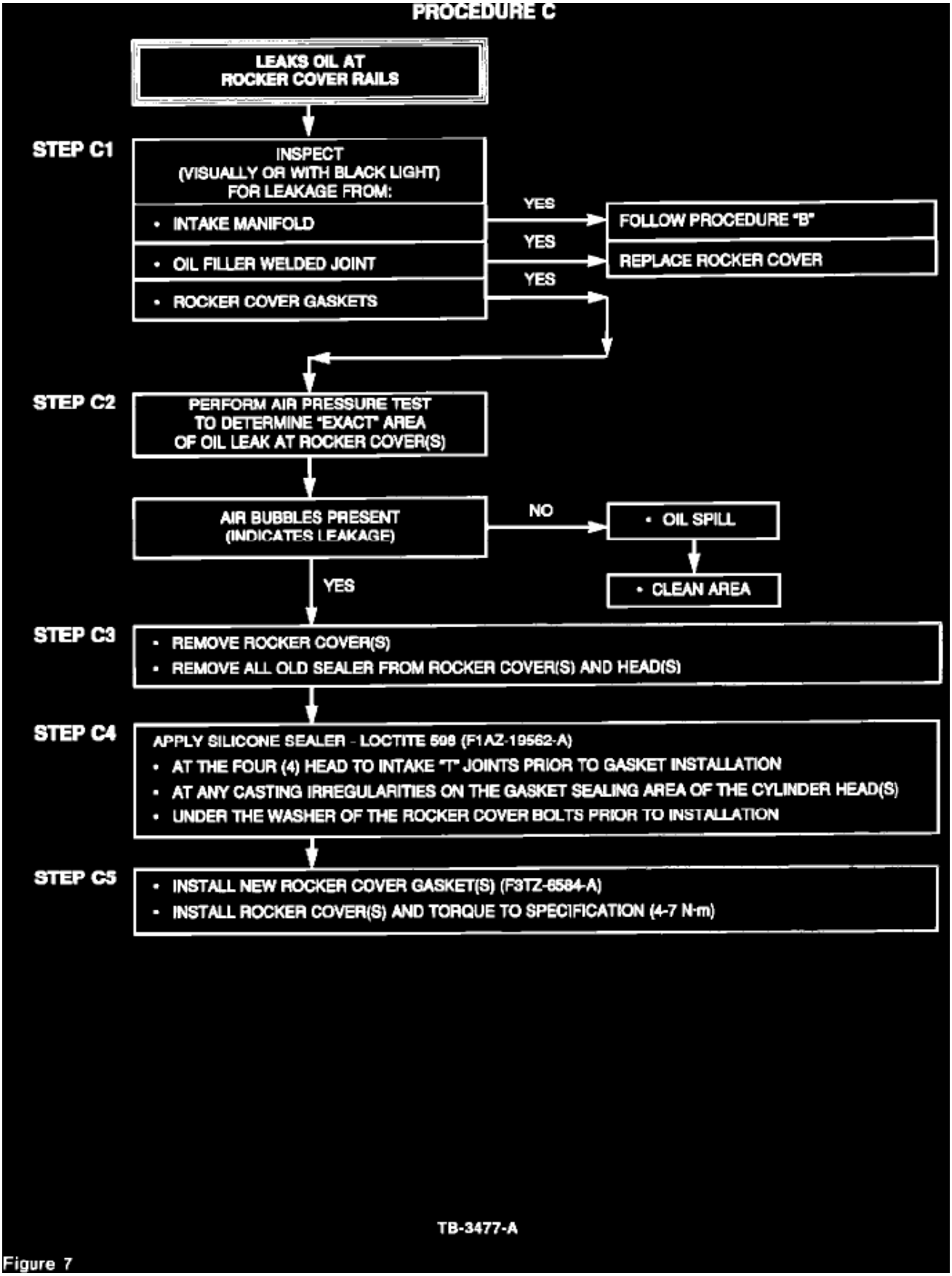


Figure 7

1. If the air pressure test showed no air bubbles, follow Procedure C2 to clean the area of any oil spill.

2. If the air pressure test showed air bubbles present, follow Steps C3 through C5.

Service Procedure - Repair For Oil Leaks At Front End

PROCEDURE D

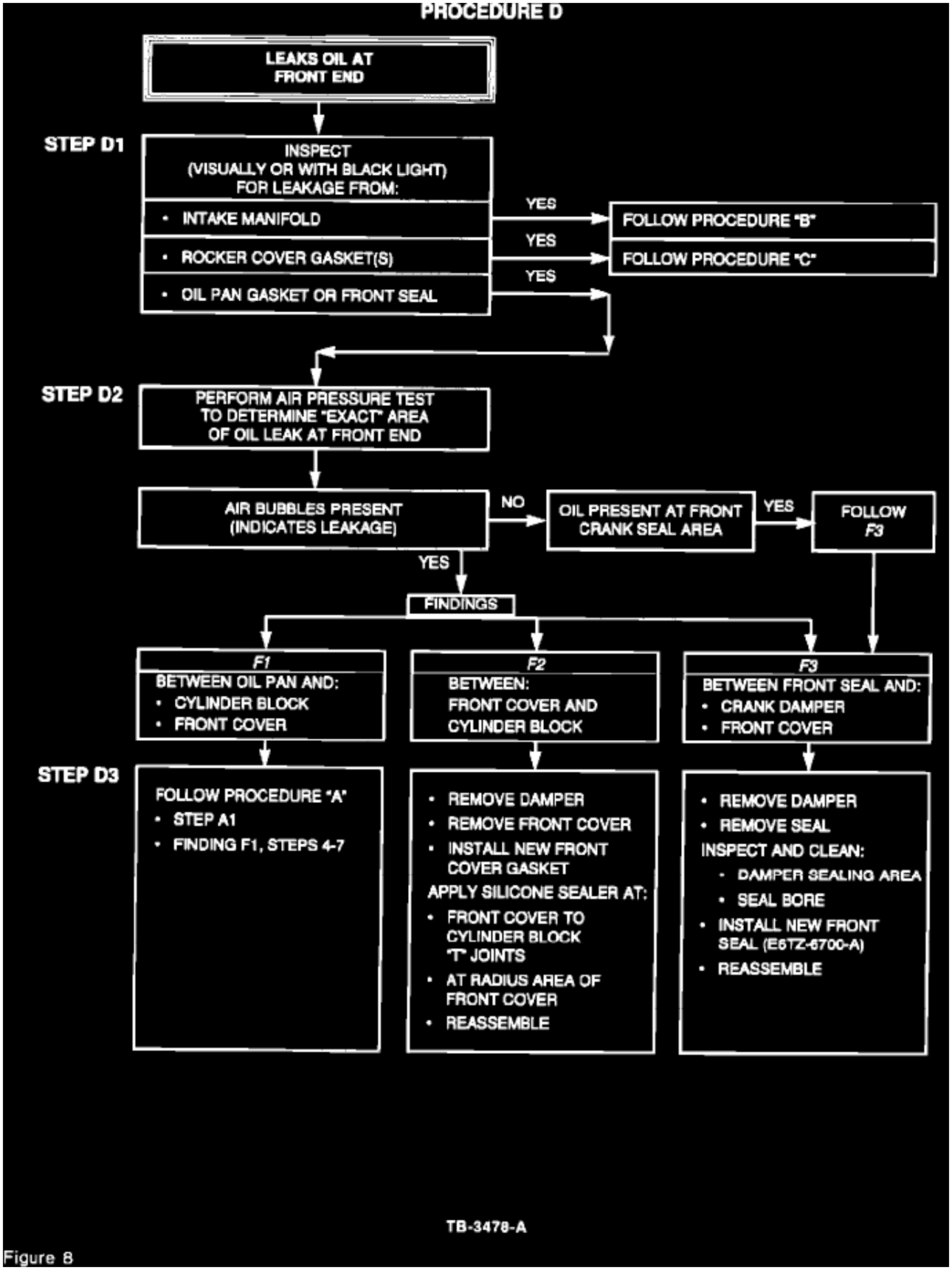


Figure 8

1. If the air pressure test showed no air bubbles, follow Procedure D, F3.

2. If the air pressure test showed air bubbles present, follow Procedure D, F1 or F2 as appropriate.

Rocker Cover Gasket - Installation Revision

Article No. 91-5B-28

03/22/91

^ SHOP MANUAL - 1988 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1989 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1990 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1991 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

LIGHT TRUCK: 1988-91 AEROSTAR, RANGER 1990 BRONCO II 1991 EXPLORER

ISSUE: Service procedures for the installation of new rocker cover gasket and new conical spring washer screws have been revised in the following Shop Manuals on the pages indicated:

^ 1988 Ranger/Bronco II Pages 21-20-7 and 8

^ 1989 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01D-15

^ 1991 Explorer Supplement Page 03-01D-11

^ 1991 Aerostar/Explorer/Ranger Pages 03-01D-10 and 11

ACTION: Refer to the pages following this TSB article for the updated procedures.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

490000

REMOVAL AND INSTALLATION (Continued)

Valve Rocker Arm Cover and Rocker Arm

Removal

1. Remove spark plug wires using Spark Plug Wire Remover T74P-6666-A or equivalent.
2. Disconnect fuel supply and return lines using Spring Lock Coupling Disconnect Tool T81P-19623-G2, or equivalent and position out of way. Install white "Tell-Tale" rings in male connector to ensure positive indication of proper mating when re-assembling.

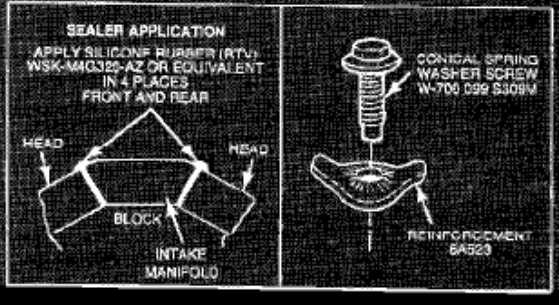
NOTE: Air conditioned vehicles only: Remove dipstick tube and bracket to access LH lifting eye. Remove LH lifting eye.

3. Remove PCV valve hose and breather.
4. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
5. With a light plastic hammer, tap rocker arm covers to break seal.
6. Remove rocker covers.
7. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly and oil baffle.

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



REMOVAL AND INSTALLATION (Continued)

8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W 700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

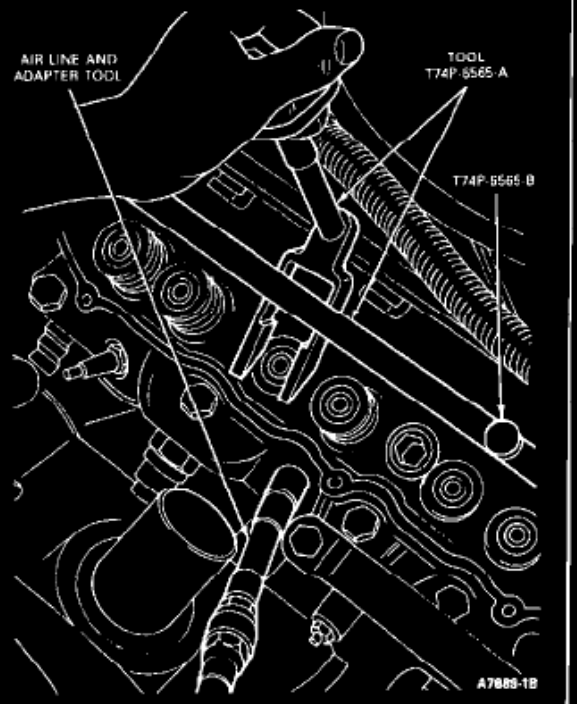
Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

Compressing Valve Spring-In Chassis—Typical

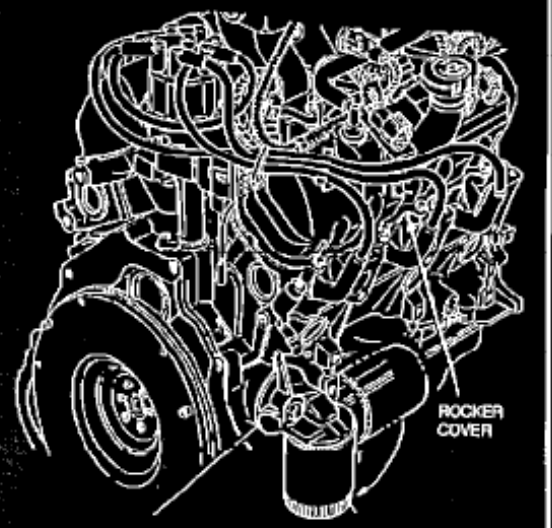


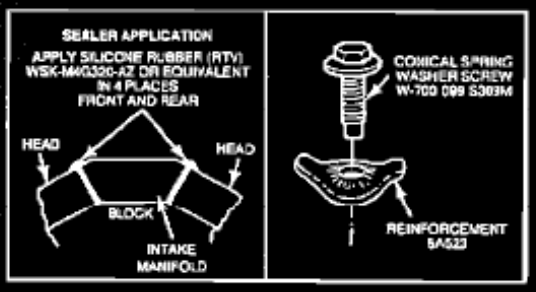
REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.





8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

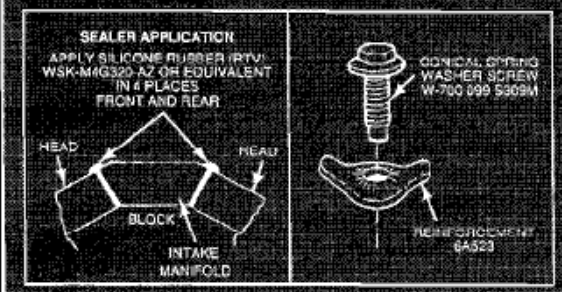
Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit), Part # W-700 099 S309M.
11. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Connect the fuel supply quick connect redundant clip over the fuel supply connection. Tighten the fuel return connection specification using care to avoid bending the fuel rail.
17. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

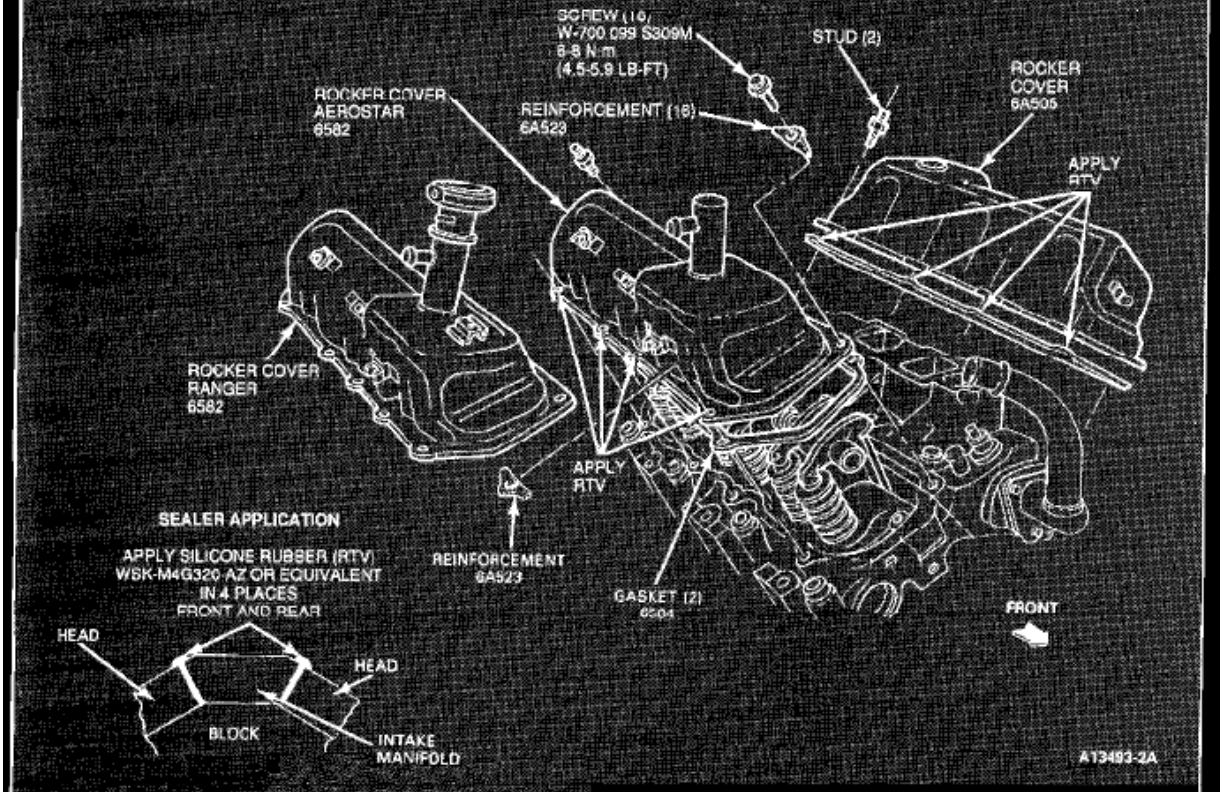
CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86L-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part #W-700 099 S309M.



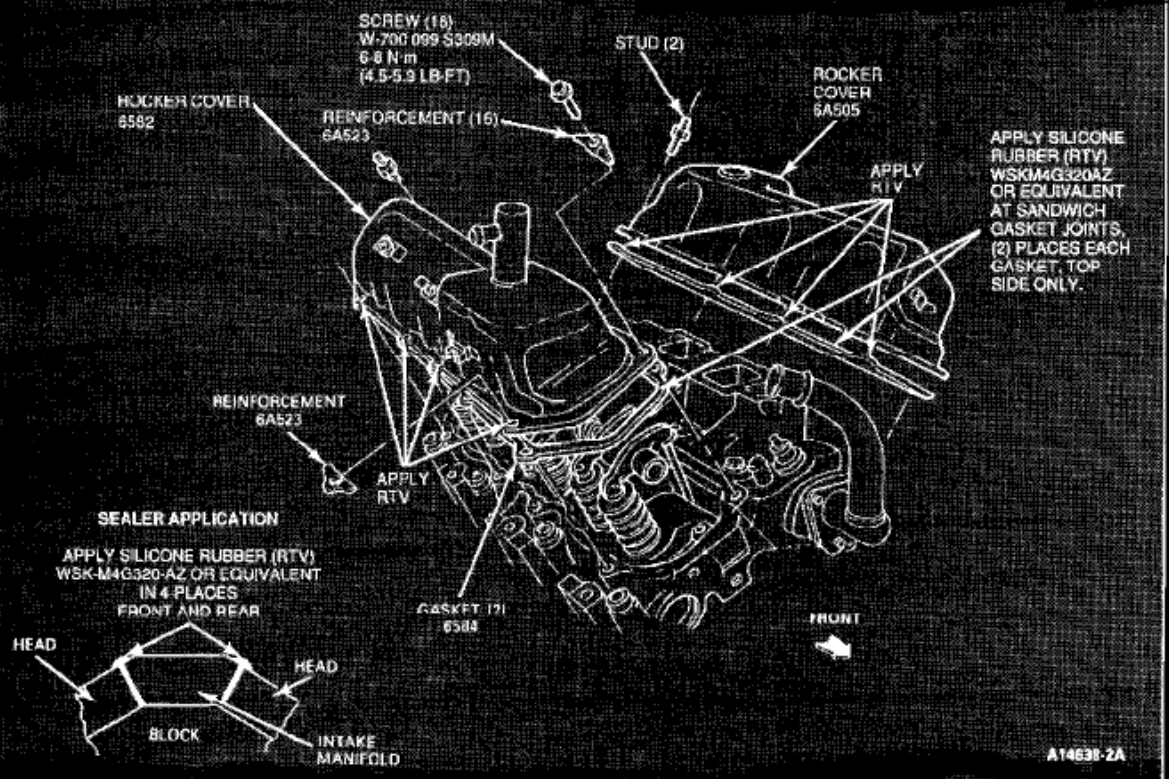
CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.

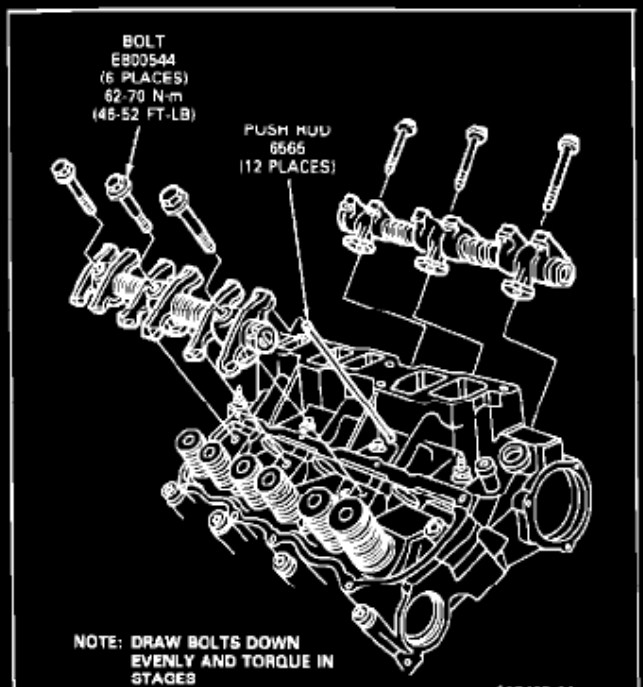


CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

IN VEHICLE SERVICE (Continued)

6. Remove the accessory drive belt from the alternator.
7. Remove the alternator from the engine.
8. Drain the cooling system.
9. Remove the upper radiator hose from the engine.
10. Remove the D.I.S. ignition coil and bracket assembly.
11. Remove the low pressure A/C hose bracket from the upper intake (if still installed).
12. Remove vacuum hose from the air cleaner.
13. Remove PCV valve hose and breather.
14. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
15. With a light plastic hammer, tap rocker arm covers to break seal.
16. Remove rocker covers.
17. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly.

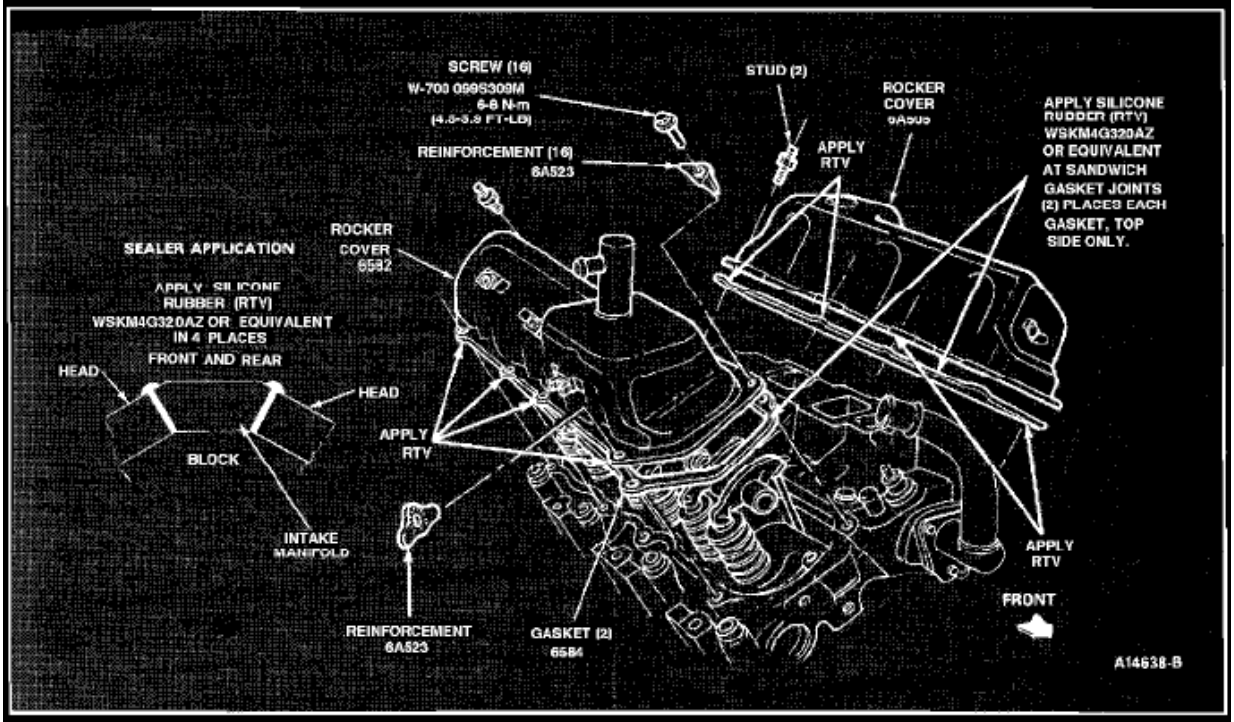


Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
5. Peel the plastic film from the gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head / intake manifold.
6. Install rocker arm covers with new gaskets.

Revised 3/91

IN VEHICLE SERVICE (Continued)



CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700-099-S309M.
9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 ft. lb).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A / C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to Section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.

   CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

Rocker Cover Gasket - Installation Revision

Article No. 91-5B-28

03/22/91

^ SHOP MANUAL - 1988 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

^ SHOP MANUAL - 1989 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

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^ SHOP MANUAL - 1991 - SERVICE PROCEDURE FOR INSTALLATION OF NEW ROCKER COVER GASKET REVISED

LIGHT TRUCK: 1988-91 AEROSTAR, RANGER 1990 BRONCO II 1991 EXPLORER

ISSUE: Service procedures for the installation of new rocker cover gasket and new conical spring washer screws have been revised in the following Shop Manuals on the pages indicated:

^ 1988 Ranger/Bronco II Pages 21-20-7 and 8

^ 1989 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01C-5

^ 1990 Aerostar/Ranger/Bronco II Page 03-01D-15

^ 1991 Explorer Supplement Page 03-01D-11

^ 1991 Aerostar/Explorer/Ranger Pages 03-01D-10 and 11

ACTION: Refer to the pages following this TSB article for the updated procedures.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

490000

REMOVAL AND INSTALLATION (Continued)

Valve Rocker Arm Cover and Rocker Arm

Removal

1. Remove spark plug wires using Spark Plug Wire Remover T74P-6666-A or equivalent.
2. Disconnect fuel supply and return lines using Spring Lock Coupling Disconnect Tool T81P-19623-G2, or equivalent and position out of way. Install white "Tell-Tale" rings in male connector to ensure positive indication of proper mating when re-assembling.

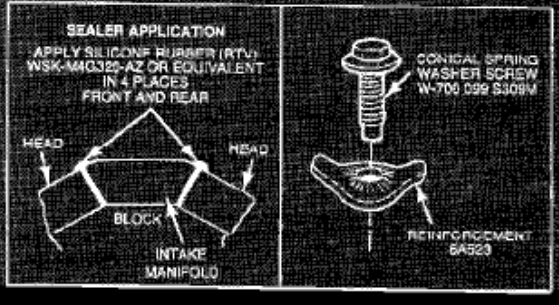
NOTE: Air conditioned vehicles only: Remove dipstick tube and bracket to access LH lifting eye. Remove LH lifting eye.

3. Remove PCV valve hose and breather.
4. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
5. With a light plastic hammer, tap rocker arm covers to break seal.
6. Remove rocker covers.
7. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly and oil baffle.

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



REMOVAL AND INSTALLATION (Continued)

8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W 700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

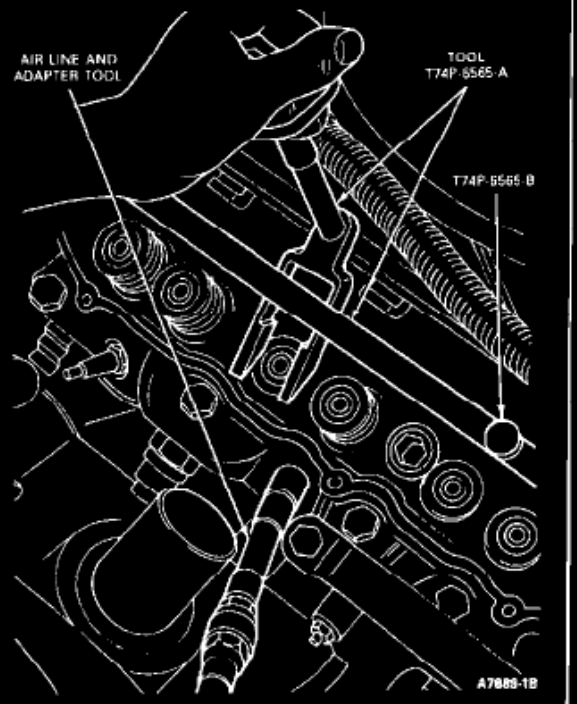
Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

Compressing Valve Spring-In Chassis—Typical

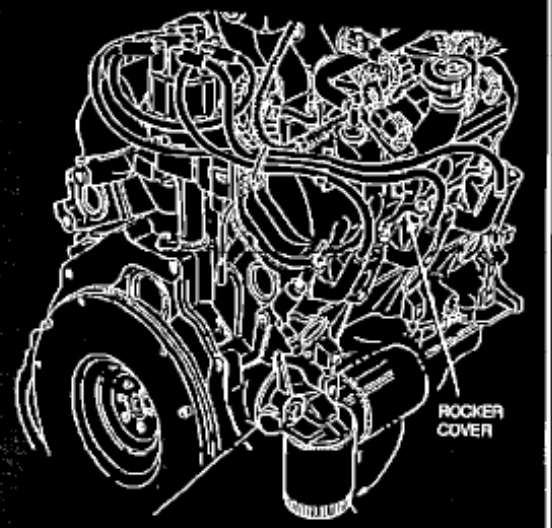


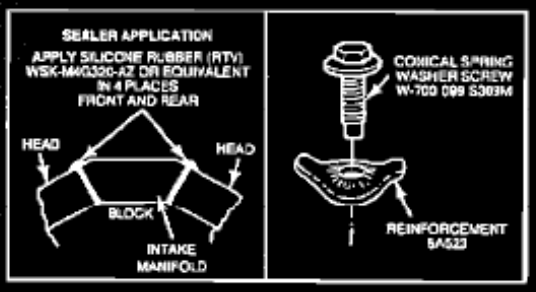
REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.





8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.
11. Tighten screws to a torque of 4.5-5.9 ft. lb. (6-8 N·m).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Position Thermactor air hose and wiring harness in their original places.
17. Connect fuel supply and return lines to fuel rail, ensuring connectors are properly mated by observing white "Tell-Tale" rings displayed when connected.
18. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

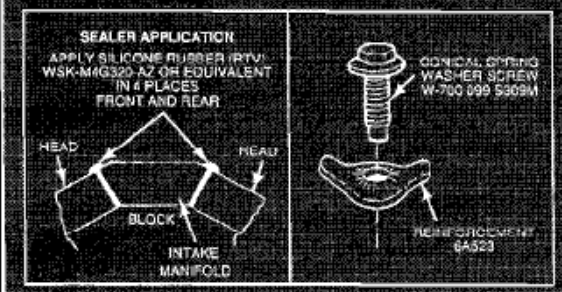
Using the Valve Spring Compressor Lever T86P-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Removing or Installing Rocker Arm Assembly

Installation

1. Loosen the valve lash adjusting screws a few turns.
2. Apply SF-type engine oil to the assembly to provide initial lubrication.
3. Apply oil baffle and rocker arm shaft assembly to the cylinder head. Guide adjusting screws onto push rods.
4. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
5. Adjust valve lash. Refer to Valve Clearance.
6. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
7. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.



8. Install rocker arm covers with new gaskets.
9. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
10. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit), Part # W-700 099 S309M.
11. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
12. Connect kickdown linkage (automatic transmission only).
13. After ensuring all rocker arm cover load distribution washers (patch pieces) are installed in their original position, tighten rocker arm cover screws to specification.
14. Install spark plug wires.
15. Install PCV valve hose and breather.
16. Connect the fuel supply quick connect redundant clip over the fuel supply connection. Tighten the fuel return connection specification using care to avoid bending the fuel rail.
17. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

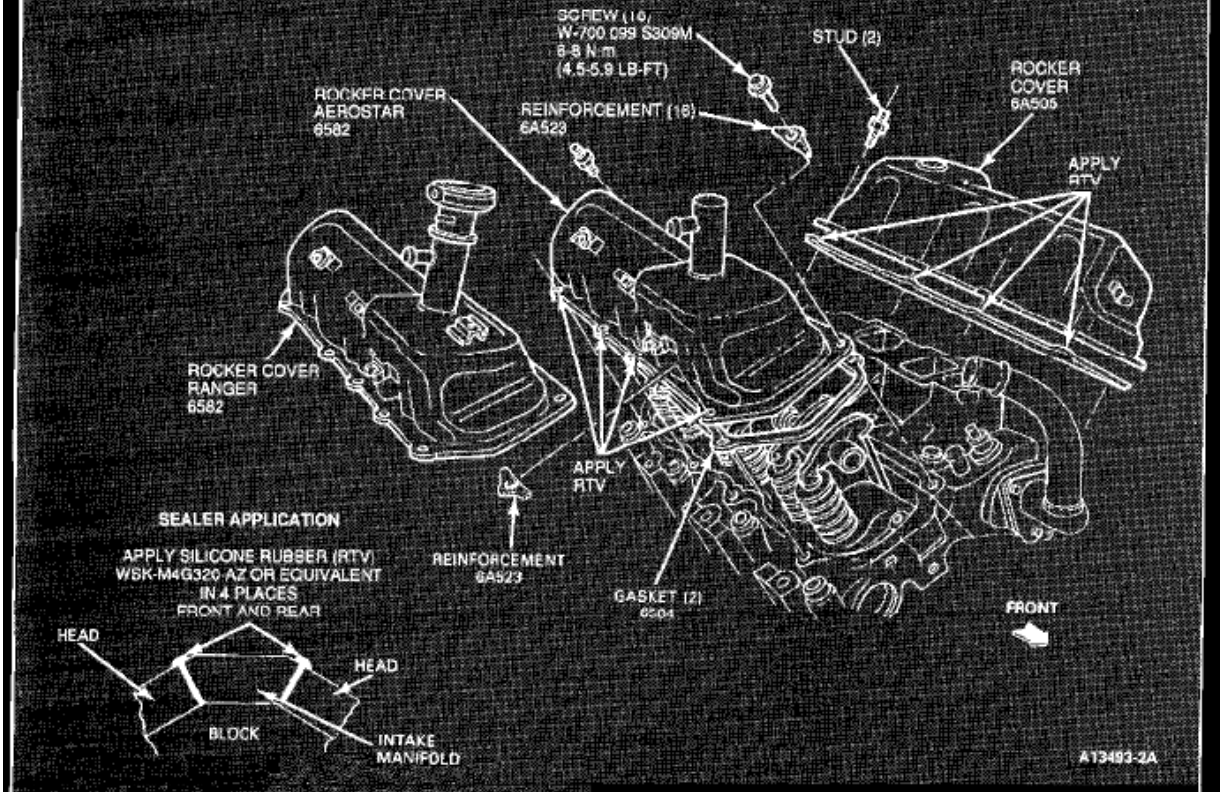
CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).

Using the Valve Spring Compressor Lever T86L-6565-A and Valve Spring Compressor Bar T74P-6565-B or equivalents, compress the valve spring and remove the valve spring retainer locks, spring retainer and the valve spring. **If air pressure fails to hold the valve in the closed position during this operation, it can be presumed that the valve is not seating or is damaged. If this condition occurs, remove the cylinder head for further inspection.**

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part #W-700 099 S309M.



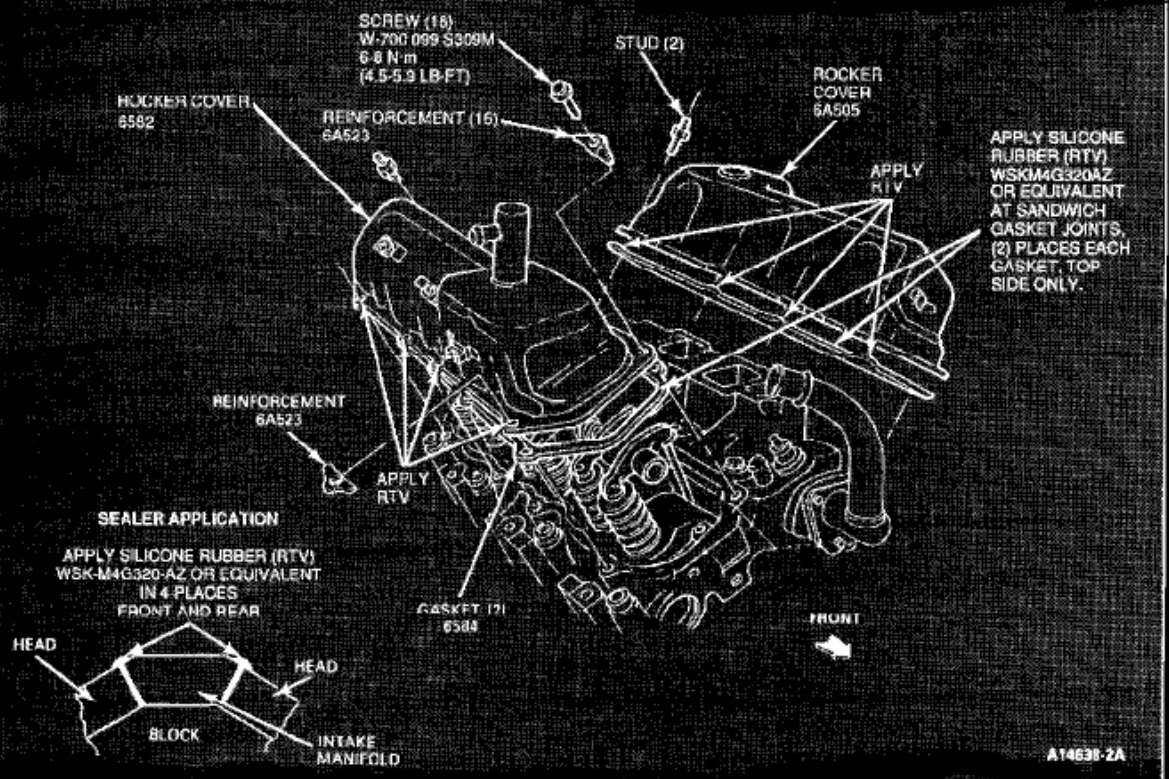
CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

REMOVAL AND INSTALLATION (Continued)

Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds, and rocker arm cover gasket surfaces.
5. Peel the plastic film from the new gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T Joints of cylinder head/intake manifold.
6. Install rocker arm covers with new gaskets.
7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of the rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700 099 S309M.

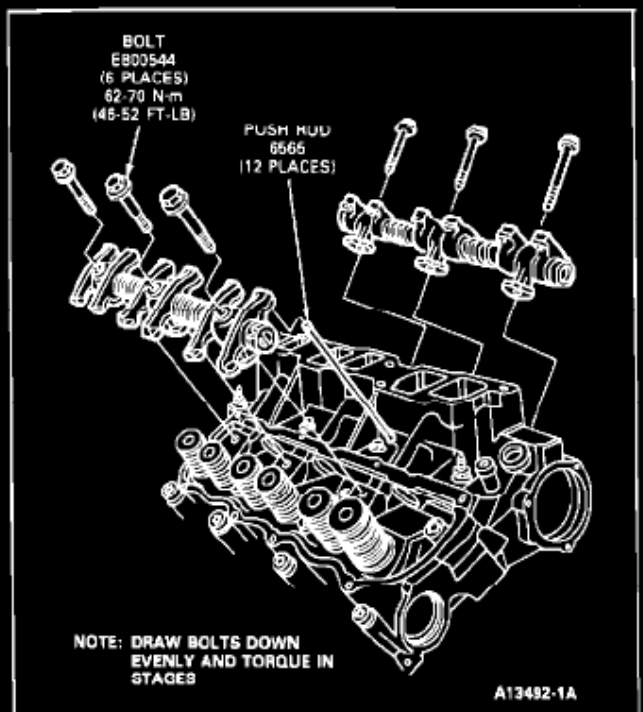


CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 LB-FT).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A/C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

IN VEHICLE SERVICE (Continued)

6. Remove the accessory drive belt from the alternator.
7. Remove the alternator from the engine.
8. Drain the cooling system.
9. Remove the upper radiator hose from the engine.
10. Remove the D.I.S. ignition coil and bracket assembly.
11. Remove the low pressure A/C hose bracket from the upper intake (if still installed).
12. Remove vacuum hose from the air cleaner.
13. Remove PCV valve hose and breather.
14. Remove rocker arm cover attaching screws and load distribution washers (patch pieces). Ensure the washers are installed in their original position.
15. With a light plastic hammer, tap rocker arm covers to break seal.
16. Remove rocker covers.
17. Remove rocker arm shaft stand attaching bolts by loosening the bolts two turns at a time, in sequence. Lift off rocker arm and shaft assembly.

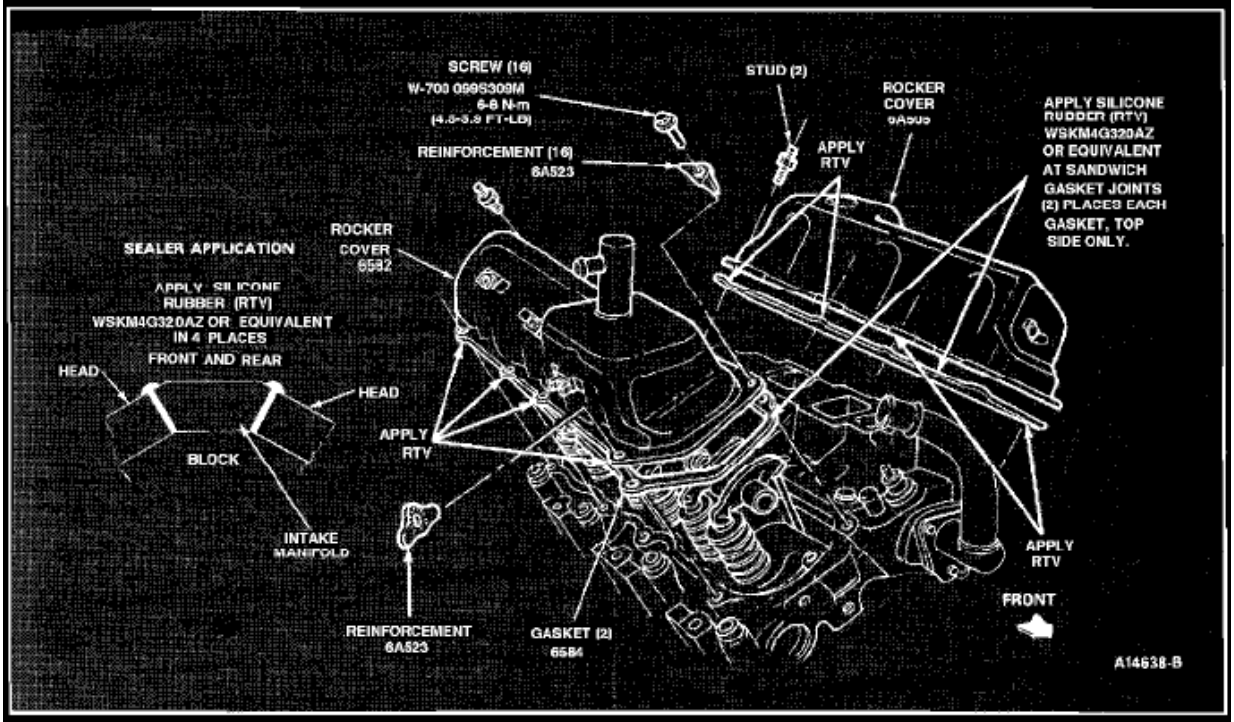


Installation

1. Apply SF-type engine oil to the valve train assembly to provide initial lubrication.
2. Install rocker arm shaft assembly to the cylinder head. Guide the rocker arms onto push rods.
3. Install and tighten rocker arm stand attaching bolts to specifications, two turns at a time, in sequence.
4. Clean all gasket material from cylinder heads, intake manifolds and rocker arm cover gasket surfaces.
5. Peel the plastic film from the gasket and stick the self adhesive side to the rocker cover. Apply RTV (or equivalent) to the T-Joints of cylinder head / intake manifold.
6. Install rocker arm covers with new gaskets.

Revised 3/91

IN VEHICLE SERVICE (Continued)



CAUTION: Failure to install a new rocker cover gasket and rocker cover reinforcement pieces will result in oil leaks.

7. Apply an 8mm ball (approx.) of RTV (or equivalent) to the bolt holes of the exhaust side of rocker cover (4 holes each side).
8. Install patch pieces together with new conical spring washer screws for 2.9L (4.0L initial fit). Part # W-700-099-S309M.
9. Tighten screws to a torque of 6-8 N·m (4.5-5.9 ft. lb).
10. Install upper intake manifold, if removed.
11. On RH side, install the D.I.S. ignition coil and bracket assembly.
12. On RH side, install vacuum hose to the air cleaner and A / C low pressure hose bracket.
13. On RH side, install the upper radiator hose and fill and bleed the cooling system. Refer to Section 03-03, Engine Cooling.
14. On RH side, install the alternator and accessory drive belt. Check belt tension. Refer to Section 03-05, Accessory Drive for proper procedure.
15. On RH side, install air inlet duct and oil fill tube hose.
16. Install spark plug wires.
17. Install PCV valve hose and breather.
18. Connect fuel supply and return lines to fuel rail as outlined in Section 03-04D.
19. Start engine and check for oil and fuel leaks.

Valve Spring, Retainer and Stem Seal

Broken valve springs or leaking valve stem seals and retainer may be replaced without removing the cylinder head provided damage to the valve or valve seat has not occurred.

Removal

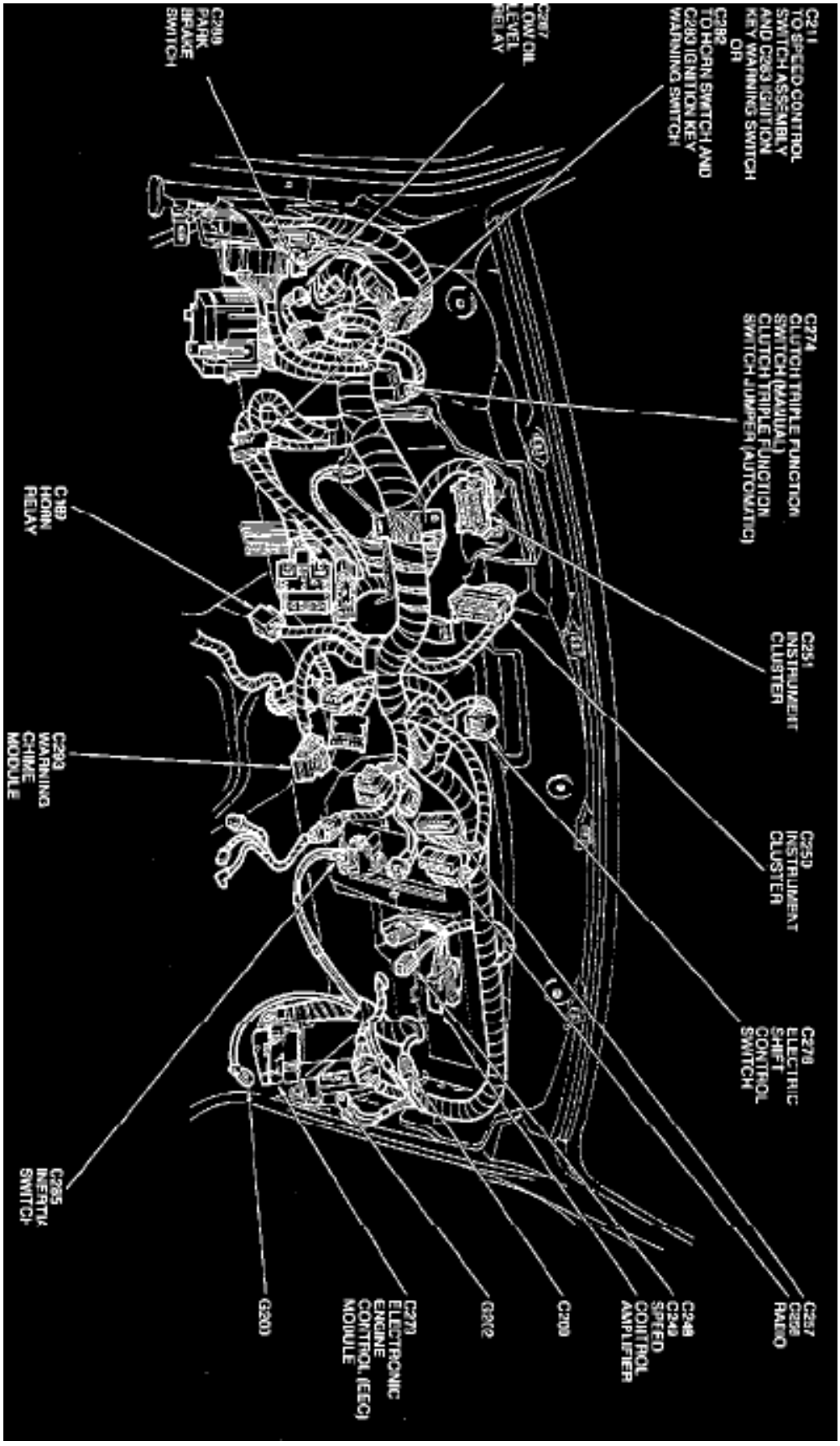
1. Remove the valve rocker arm cover and valve rocker arm shaft as described under Valve Rocker Arm Cover and Rocker Arm. Remove the applicable spark plug wire and spark plug.
2. Remove both valve push rods of the cylinder to be serviced.
3. Install an air line with an adapter in the spark plug hole.

   CAUTION: Engine may turn over when air pressure is applied. Remove all objects from fan area (lights, extension cords, etc.).
4. Turn on the air supply. **Air pressure may turn the crankshaft until the piston reaches the bottom of the stroke.**

Oil Level Sensor: Specifications

Low Oil Level Sensor ..... 17-21 Nm (13-20 ft lb)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Sensors and Switches - Engine > Oil Level Sensor > Component Information > Locations > Low Oil Level Relay

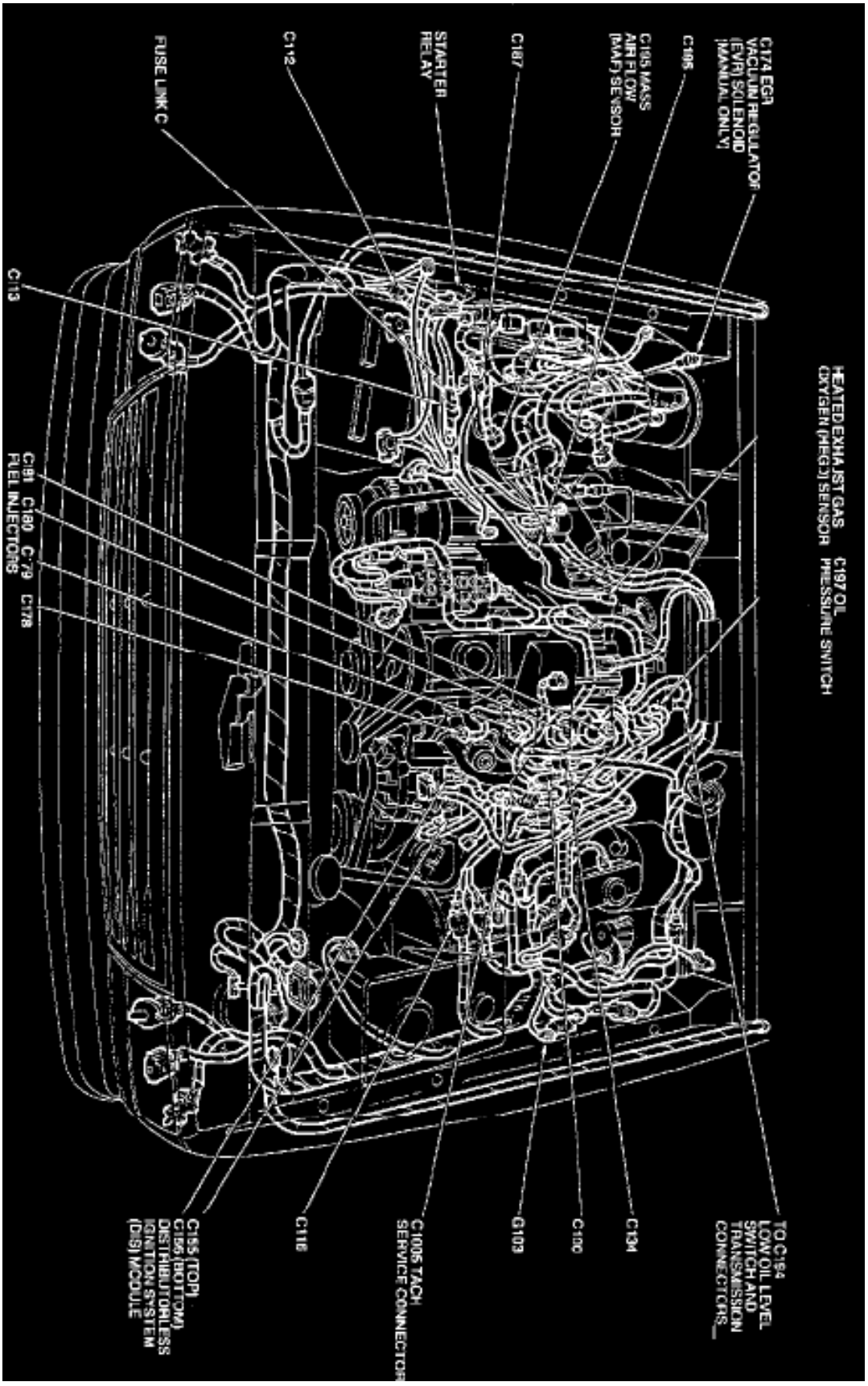


Oil Level Sensor: Locations Low Oil Level Relay

I/P Components

Behind Lower RH Side Of I/P, On Bracket

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Sensors and Switches - Engine > Oil Level Sensor > Component Information > Locations > Low Oil Level Relay > Page 1911



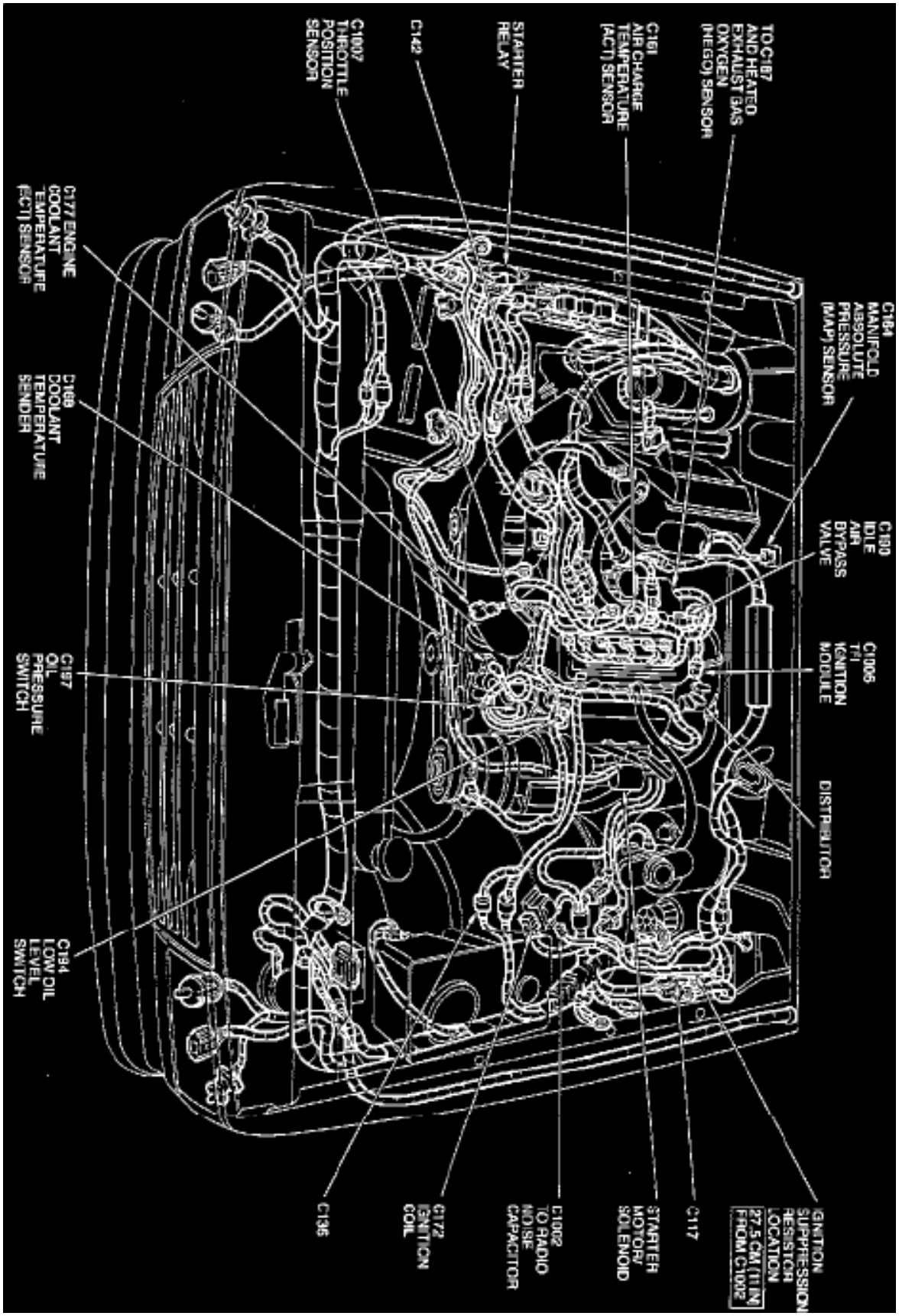
Oil Level Sensor: Locations Low Oil Level Switch (2.3L/4-140)

Engine Compartment Components.

Lower LH Rear Of Engine, Below Oil Filter

Applicable to: 2.3L/4-140

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Sensors and Switches - Engine > Oil Level Sensor > Component Information > Locations > Low Oil Level Relay > Page 1912

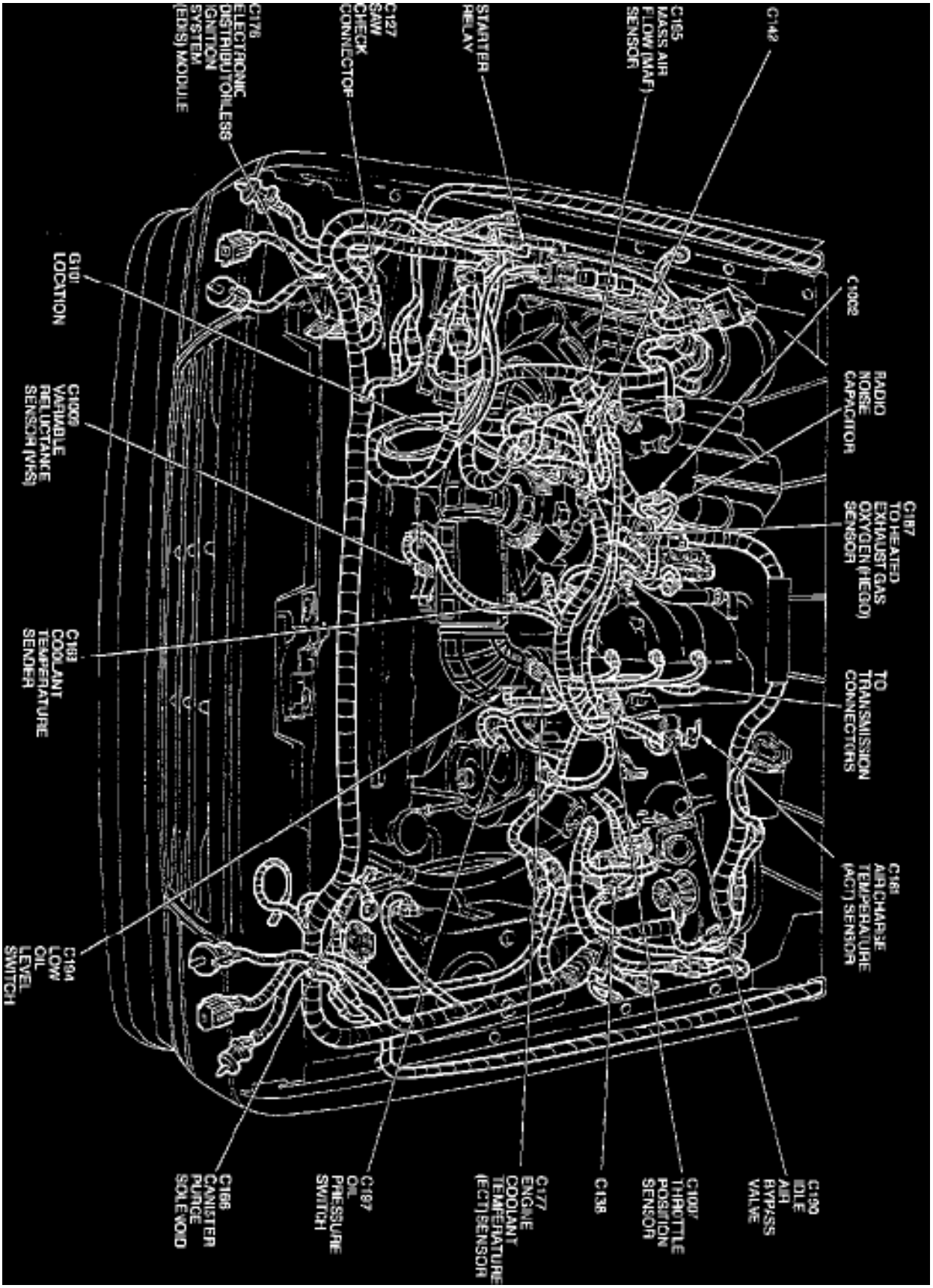


Oil Level Sensor: Locations Low Oil Level Switch (2.9L/V6-179 & 4.0L/V6-244)

Engine Compartment Components.

Lower LH Rear Of Engine

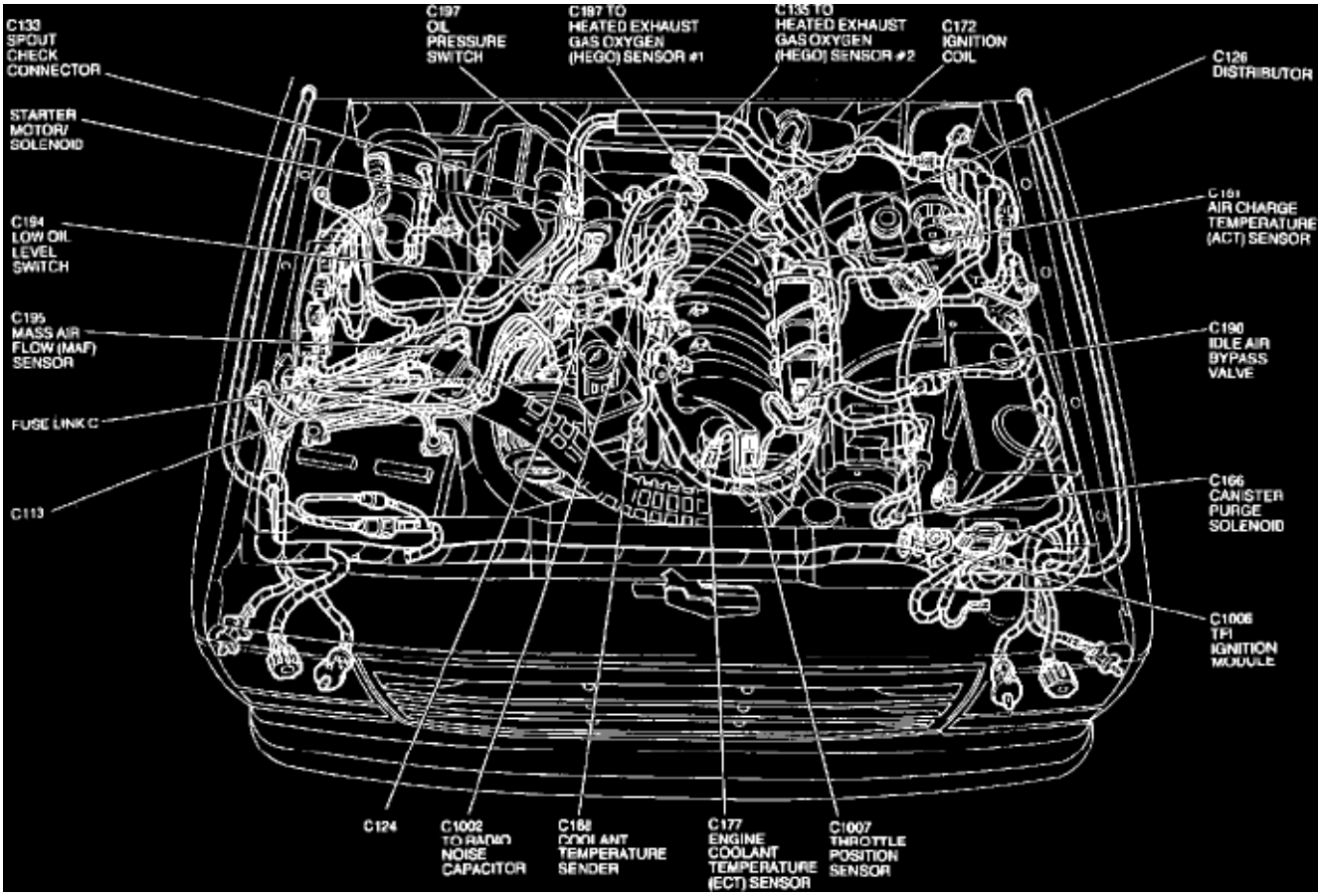
Applicable to: 2.9L/V6-179


C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1909
VARIABLE
RELUCTANCE
SENSOR (VRS)
C163
COOLANT
TEMPERATURE
SENDER
C194
LOW
OIL
LEVEL
SWITCH
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C166
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C199
IDLE
AIR
BYPASS
VALVE
C100
THROTTLE
POSITION
SENSOR
C138
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C187
OIL
PRESSURE
SWITCH
C166
CANISTER
PURGE
SOLENOID

Engine Compartment Components.

Lower LH Rear Of Engine

Applicable to: 4.0L/V6-244



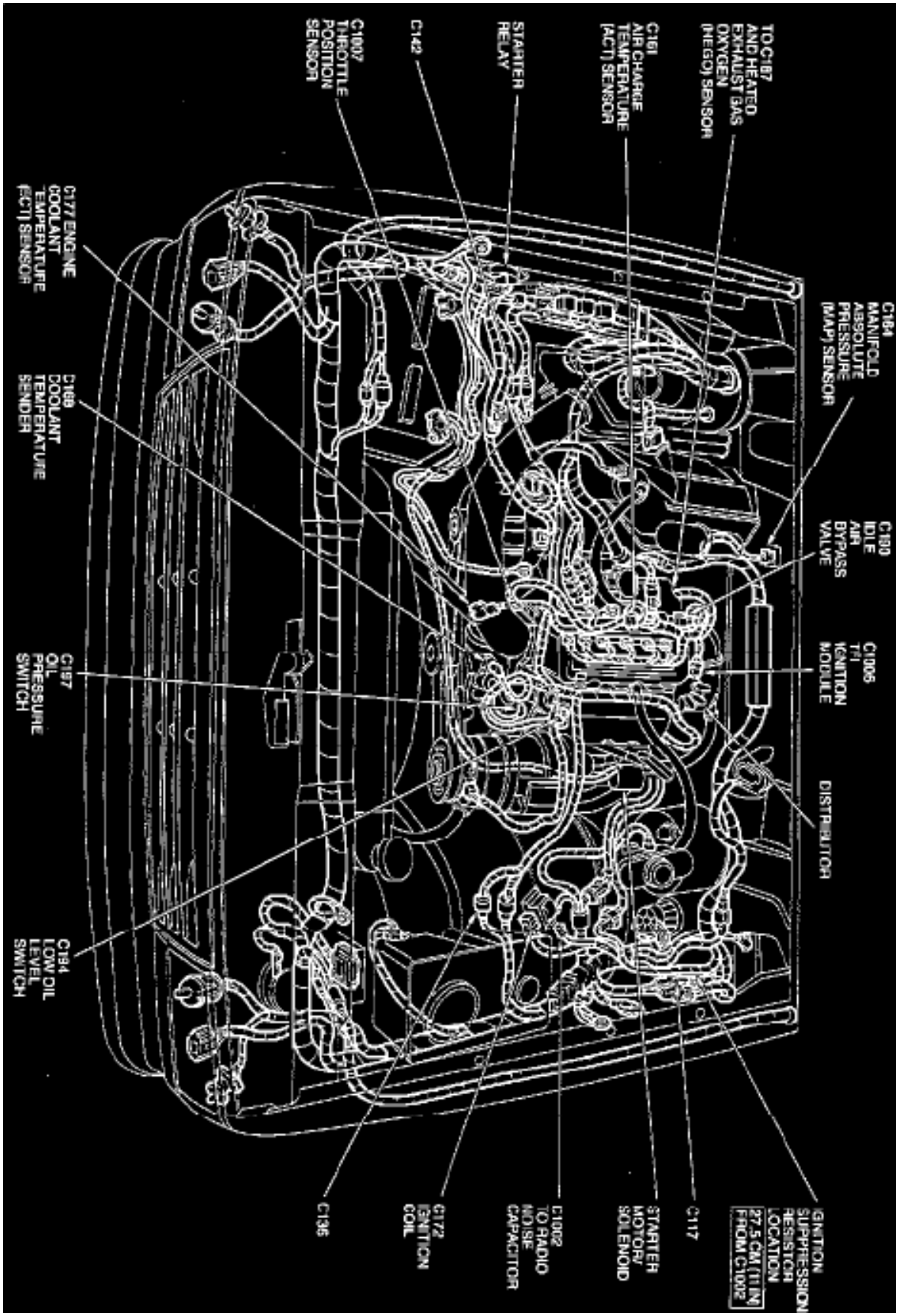
Oil Level Sensor: Locations Low Oil Level Switch (3.0L/V6-181)

Engine Compartment Components.

Lower RH Side Of Engine

Applicable to: 3.0L/V6-181

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Sensors and Switches - Engine > Oil Pressure Switch <--> [Oil Pressure Sender] > Component Information > Locations



Oil Pressure Switch: Locations

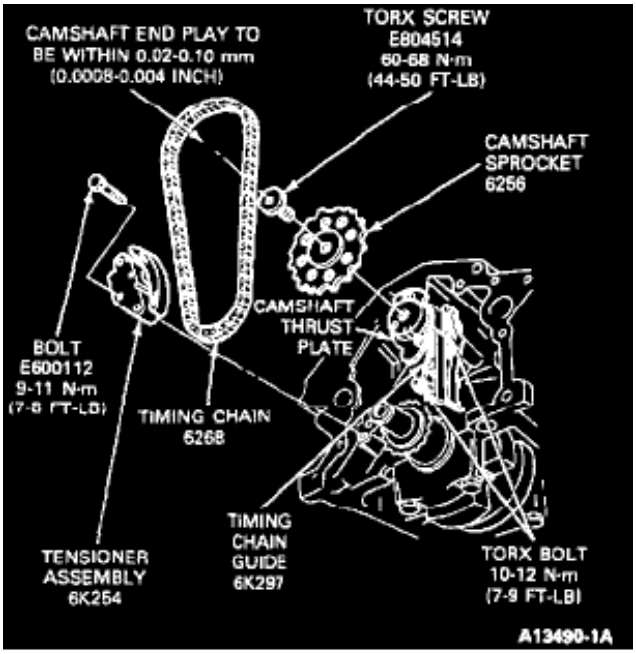
Engine Compartment Components.

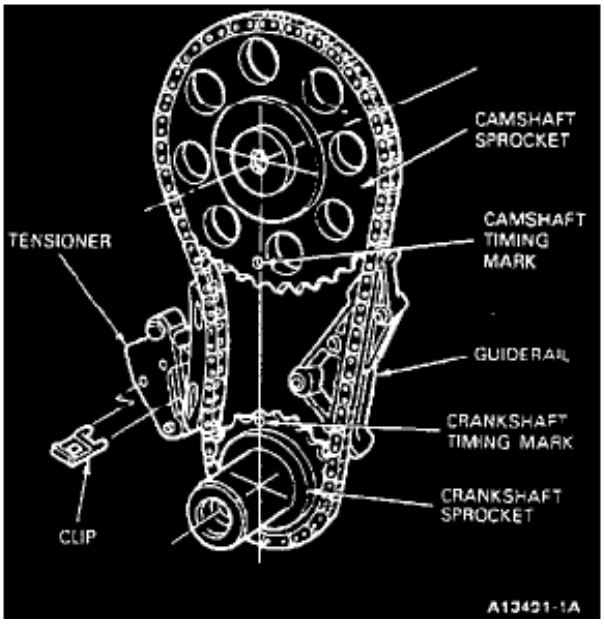
Lower LH Rear Of Engine

Applicable to: 2.9L/V6-179

Camshaft Gear/Sprocket: Specifications

Camshaft Sprocket Retaining Bolt	60-68 Nm (44-50 ft lb)


CAMSHAFT END PLAY TO BE WITHIN 0.02-0.10 mm (0.0008-0.004 INCH)
TORX SCREW E804514 60-68 N·m (44-50 FT-LB)
CAMSHAFT SPROCKET 6256
CAMSHAFT THRUST PLATE
BOLT E600112 9-11 N·m (7-8 FT-LB)
TIMING CHAIN 6268
TENSIONER ASSEMBLY 6K254
TIMING CHAIN GUIDE 6K297
TORX BOLT 10-12 N·m (7-9 FT-LB)
A13490-1A


CAMSHAFT SPROCKET
TENSIONER
CAMSHAFT TIMING MARK
GUIDERAIL
CRANKSHAFT TIMING MARK
CRANKSHAFT SPROCKET
CLIP
A13491-1A

Camshaft Gear/Sprocket: Service and Repair

REMOVAL

1. Drain the cooling system and crankcase. Remove the oil pan and radiator. 2. Remove the cylinder front cover and water pump, drive belt and crankshaft damper. 3. Remove the camshaft sprocket retaining bolt and the crankshaft sprocket key. 4. Remove the crankshaft and camshaft sprockets with the timing chain.

Timing Chain, Sprockets And Tensioner

5. Remove the timing chain tensioner and guide.

INSTALLATION

1. Install the timing chain guide to the cylinder block with the pin of the guide inserted into the oil hole in the block. Install the two retaining bolts,

and tighten to 10-12 Nm (7-9 ft lb).

2. Position the camshaft so the timing mark will align with the crankshaft. Position the crankshaft so the timing mark will align with the camshaft. 3. Install the crankshaft sprocket, camshaft sprocket and timing chain together. 4. Install the timing chain tensioner with the clip in place to lock the tensioner in the retracted position. Tighten tensioner bolts to 9-11 Nm (7-8 ft lb)

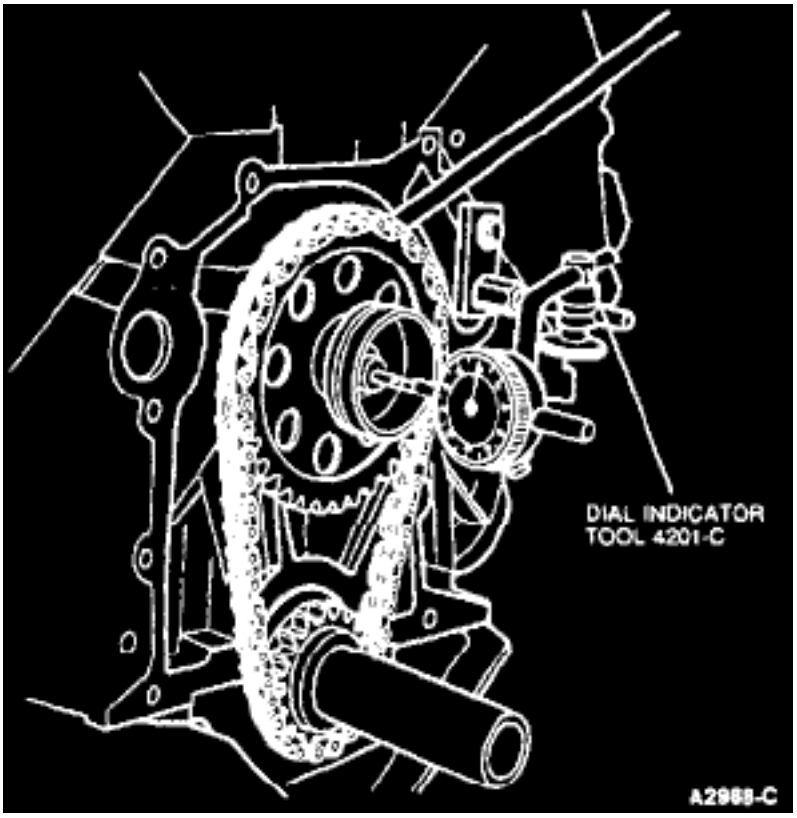
.

Timing Marks

5. Install the crankshaft key and check the timing marks on the crankshaft sprocket and camshaft sprocket for correct alignment.

NOTE: Make sure that the tensioner side of the timing chain is held inward, and that the guide side of the chain is straight and tight.

6. Install the camshaft sprocket retaining bolt, and tighten to 60-68 Nm (44-50 ft lb). 7. Remove the clip from the tensioner assembly.



8. Check the camshaft end play.

Camshaft End Play

CAUTION: Prying against the camshaft gear with the valve train load on the camshaft can break or damage the gear. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

a. Push camshaft toward rear of engine. Install Dial Indicator TOOL-4201-C or equivalent so indicator point is on camshaft sprocket attaching

screw.

b. Zero dial indicator. Pull camshaft forward and release it. Compare dial indicator reading with specifications. Camshaft end play specification is

0.0203-0.1016 mm (0.0008-0.004 in) and camshaft end play service limit is 0.2286 mm (0.009 in). If end play is excessive, replace camshaft thrust plate.

c. Remove dial indicator. d. After replacing thrust plate, check end play again. If it is still out of specified range, inspect camshaft and cylinder head/cylinder block for

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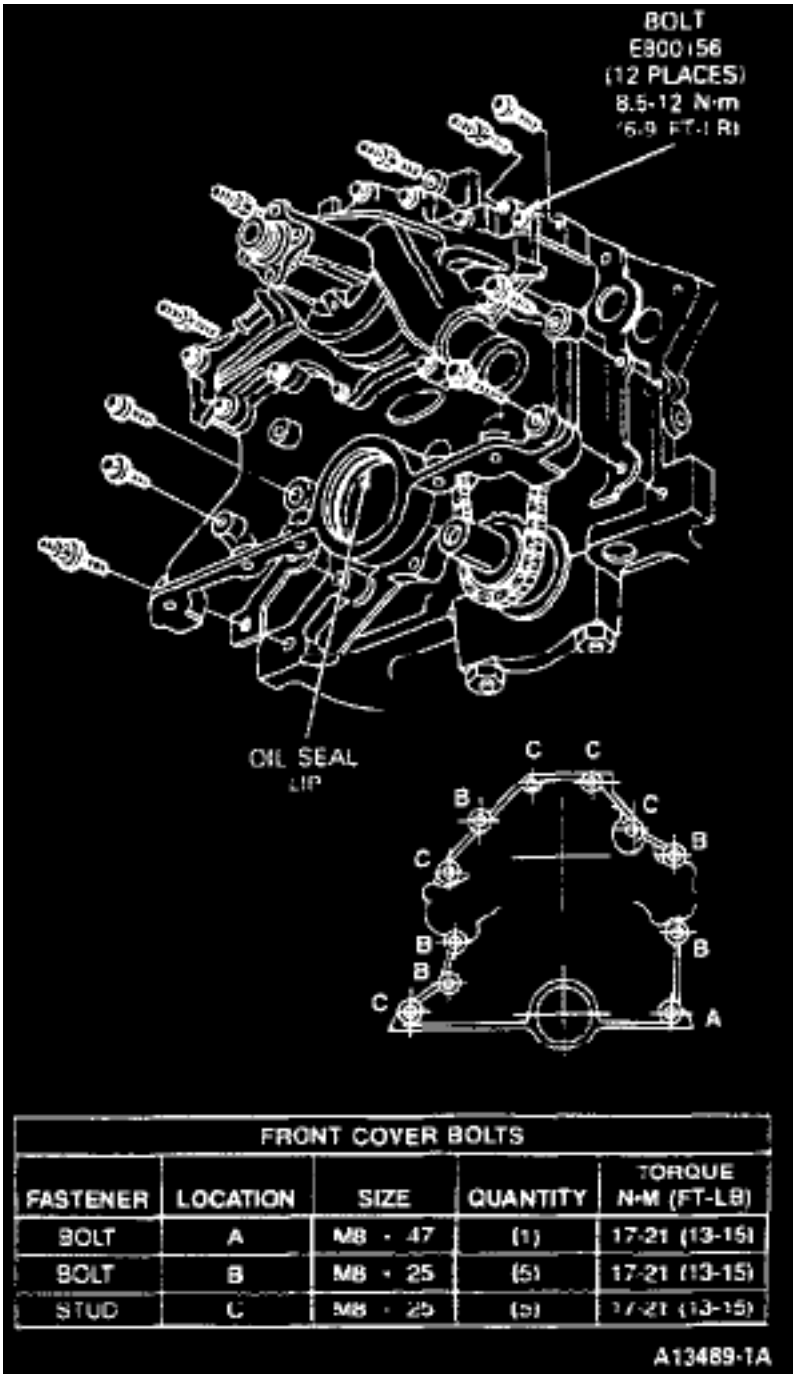


FRONT COVER BOLTS				
FASTENER	LOCATION	SIZE	QUANTITY	TORQUE N·M (FT-LB)
BOLT	A	M8 - 47	(1)	17-21 (13-15)
BOLT	B	M8 - 25	(5)	17-21 (13-15)
STUD	C	M8 - 25	(5)	17-21 (13-15)

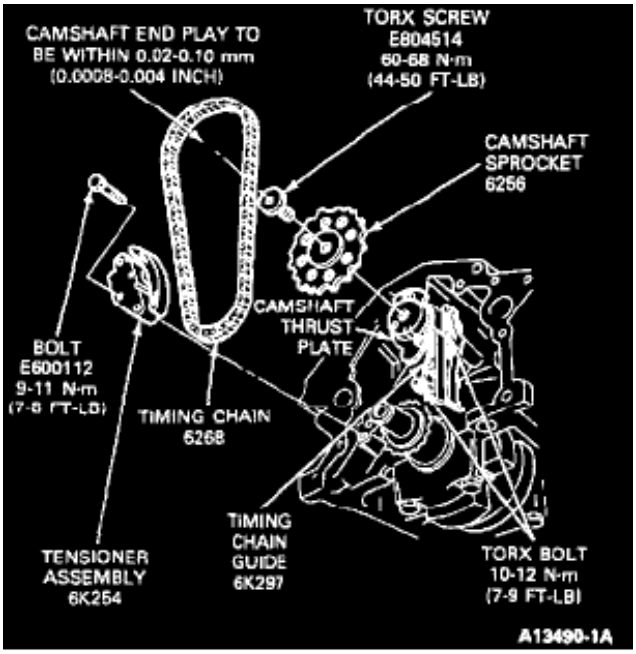
Timing Cover And Bolts

9. Install the cylinder front cover. Tighten front cover attaching screws to 17-21 Nm (13-15 ft lb). Install the oil pan and radiator.

10. Fill and bleed the cooling system. 11

Fill the crankcase with clean engine oil of the recommended grade and viscosity.

12. Start the engine and operate at fast idle. Check for coolant and oil leaks.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CAMSHAFT THRUST PLATE
BOLT E600112 9-11 N·m (7-8 FT-LB)
TIMING CHAIN 6268
TENSIONER ASSEMBLY 6K254
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TORX BOLT 10-12 N·m (7-9 FT-LB)
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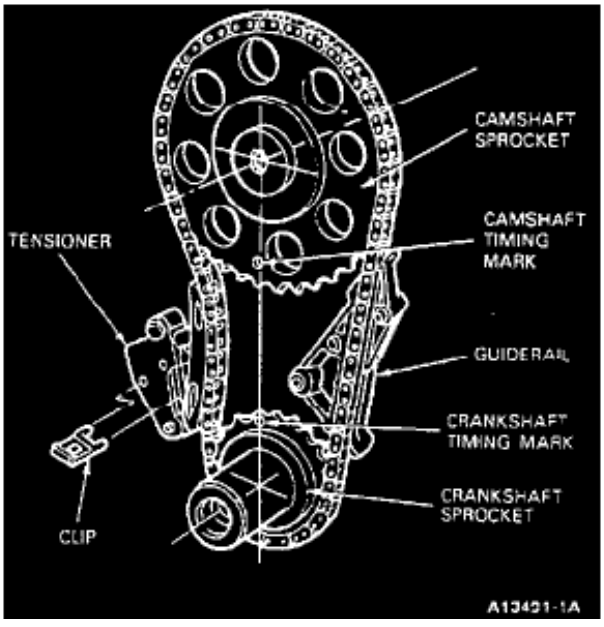

CAMSHAFT SPROCKET
TENSIONER
CAMSHAFT TIMING MARK
GUIDERAIL
CRANKSHAFT TIMING MARK
CRANKSHAFT SPROCKET
CLIP
A13491-1A

Crankshaft Gear/Sprocket: Service and Repair

REMOVAL

1. Drain the cooling system and crankcase. Remove the oil pan and radiator. 2. Remove the cylinder front cover and water pump, drive belt and crankshaft damper. 3. Remove the camshaft sprocket retaining bolt and the crankshaft sprocket key. 4. Remove the crankshaft and camshaft sprockets with the timing chain.

Timing Chain, Sprockets And Tensioner

5. Remove the timing chain tensioner and guide.

INSTALLATION

1. Install the timing chain guide to the cylinder block with the pin of the guide inserted into the oil hole in the block. Install the two retaining bolts,

and tighten to 10-12 Nm (7-9 ft lb).

2. Position the camshaft so the timing mark will align with the crankshaft. Position the crankshaft so the timing mark will align with the camshaft. 3. Install the crankshaft sprocket, camshaft sprocket and timing chain together. 4. Install the timing chain tensioner with the clip in place to lock the tensioner in the retracted position. Tighten tensioner bolts to 9-11 Nm (7-8 ft lb)

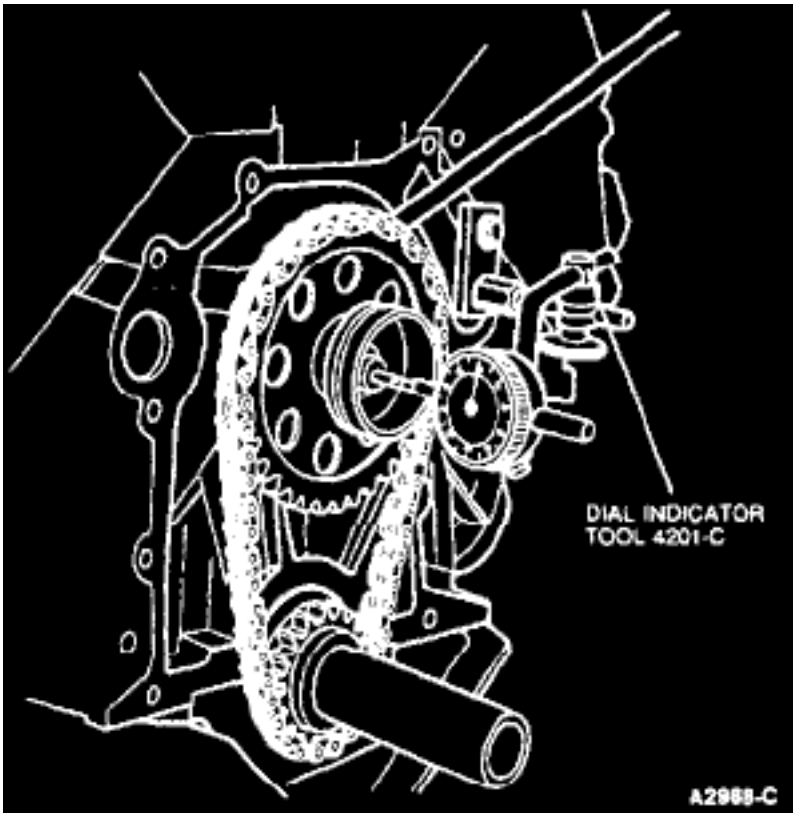
.

Timing Marks

5. Install the crankshaft key and check the timing marks on the crankshaft sprocket and camshaft sprocket for correct alignment.

NOTE: Make sure that the tensioner side of the timing chain is held inward, and that the guide side of the chain is straight and tight.

6. Install the camshaft sprocket retaining bolt, and tighten to 60-68 Nm (44-50 ft lb). 7. Remove the clip from the tensioner assembly.



8. Check the camshaft end play.

Camshaft End Play

CAUTION: Prying against the camshaft gear with the valve train load on the camshaft can break or damage the gear. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

a. Push camshaft toward rear of engine. Install Dial Indicator TOOL-4201-C or equivalent so indicator point is on camshaft sprocket attaching

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c. Remove dial indicator. d. After replacing thrust plate, check end play again. If it is still out of specified range, inspect camshaft and cylinder head/cylinder block for

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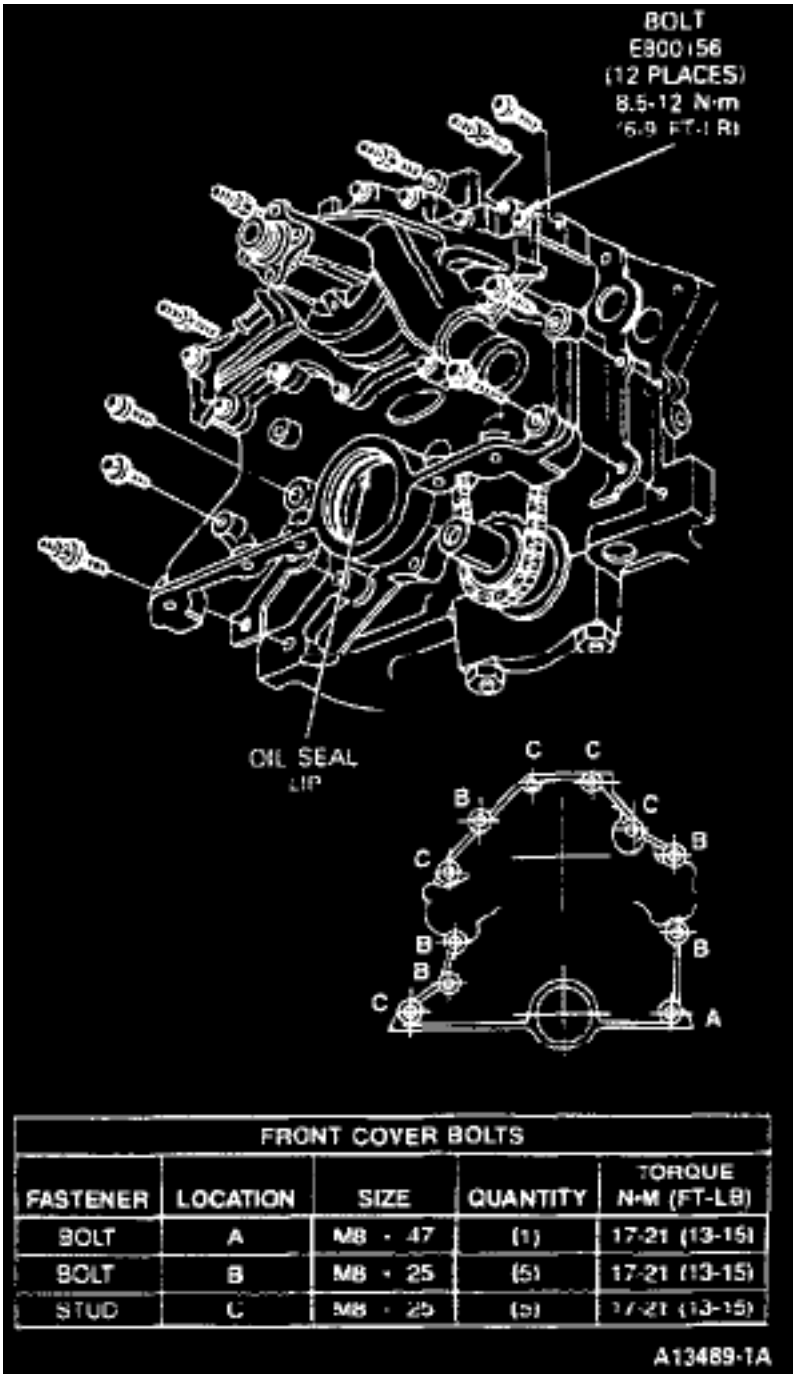

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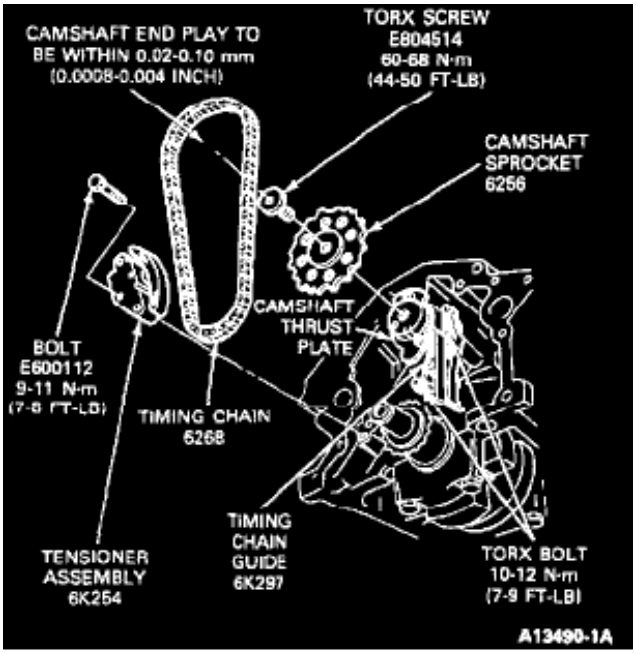
Timing Cover And Bolts

9. Install the cylinder front cover. Tighten front cover attaching screws to 17-21 Nm (13-15 ft lb). Install the oil pan and radiator.

10. Fill and bleed the cooling system. 11

Fill the crankcase with clean engine oil of the recommended grade and viscosity.

12. Start the engine and operate at fast idle. Check for coolant and oil leaks.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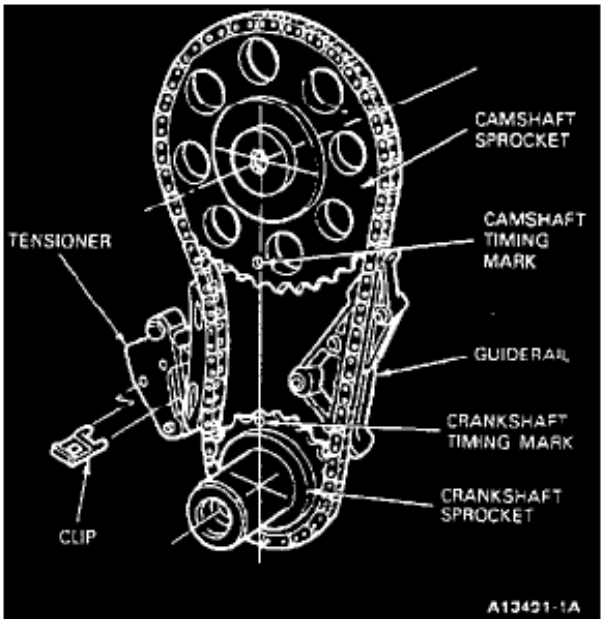
CAMSHAFT SPROCKET
CAMSHAFT TIMING MARK
TENSIONER
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CRANKSHAFT TIMING MARK
CRANKSHAFT SPROCKET
CLIP
A13491-1A

Timing Chain: Service and Repair

REMOVAL

1. Drain the cooling system and crankcase. Remove the oil pan and radiator. 2. Remove the cylinder front cover and water pump, drive belt and crankshaft damper. 3. Remove the camshaft sprocket retaining bolt and the crankshaft sprocket key. 4. Remove the crankshaft and camshaft sprockets with the timing chain.

Timing Chain, Sprockets And Tensioner

5. Remove the timing chain tensioner and guide.

INSTALLATION

1. Install the timing chain guide to the cylinder block with the pin of the guide inserted into the oil hole in the block. Install the two retaining bolts,

and tighten to 10-12 Nm (7-9 ft lb).

2. Position the camshaft so the timing mark will align with the crankshaft. Position the crankshaft so the timing mark will align with the camshaft. 3. Install the crankshaft sprocket, camshaft sprocket and timing chain together. 4. Install the timing chain tensioner with the clip in place to lock the tensioner in the retracted position. Tighten tensioner bolts to 9-11 Nm (7-8 ft lb)

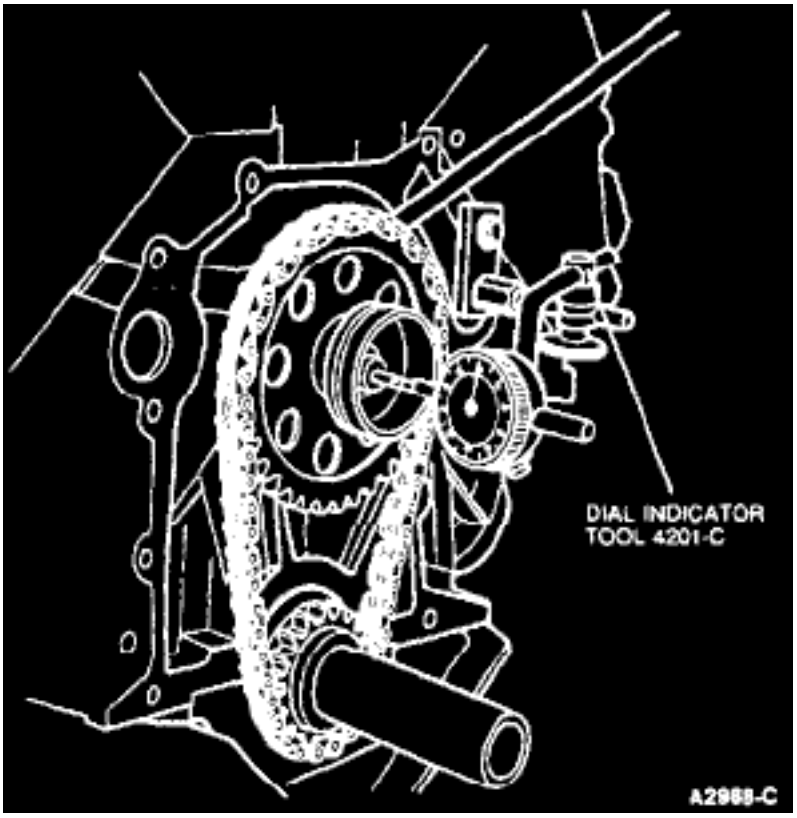
.

Timing Marks

5. Install the crankshaft key and check the timing marks on the crankshaft sprocket and camshaft sprocket for correct alignment.

NOTE: Make sure that the tensioner side of the timing chain is held inward, and that the guide side of the chain is straight and tight.

6. Install the camshaft sprocket retaining bolt, and tighten to 60-68 Nm (44-50 ft lb). 7. Remove the clip from the tensioner assembly.



8. Check the camshaft end play.

Camshaft End Play

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c. Remove dial indicator. d. After replacing thrust plate, check end play again. If it is still out of specified range, inspect camshaft and cylinder head/cylinder block for

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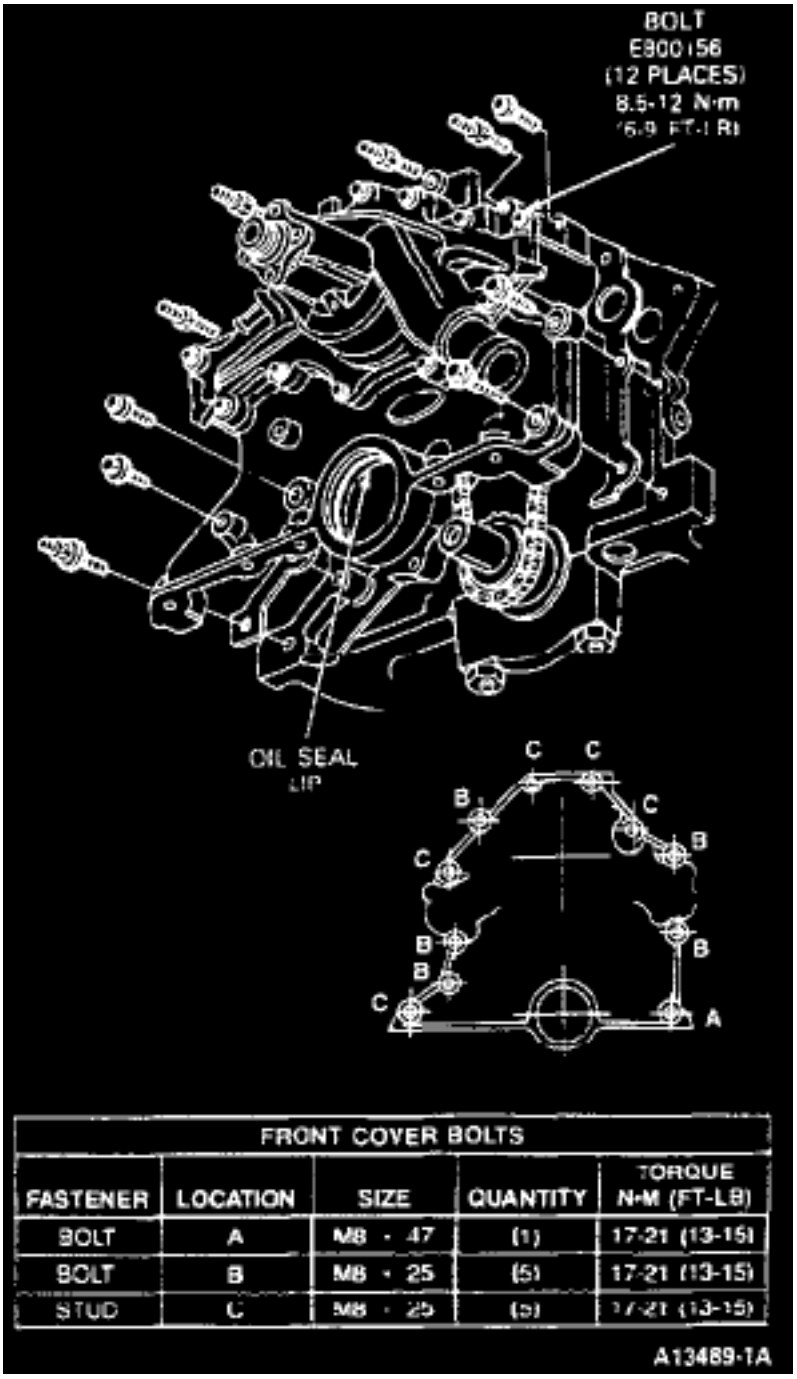

FRONT COVER BOLTS				
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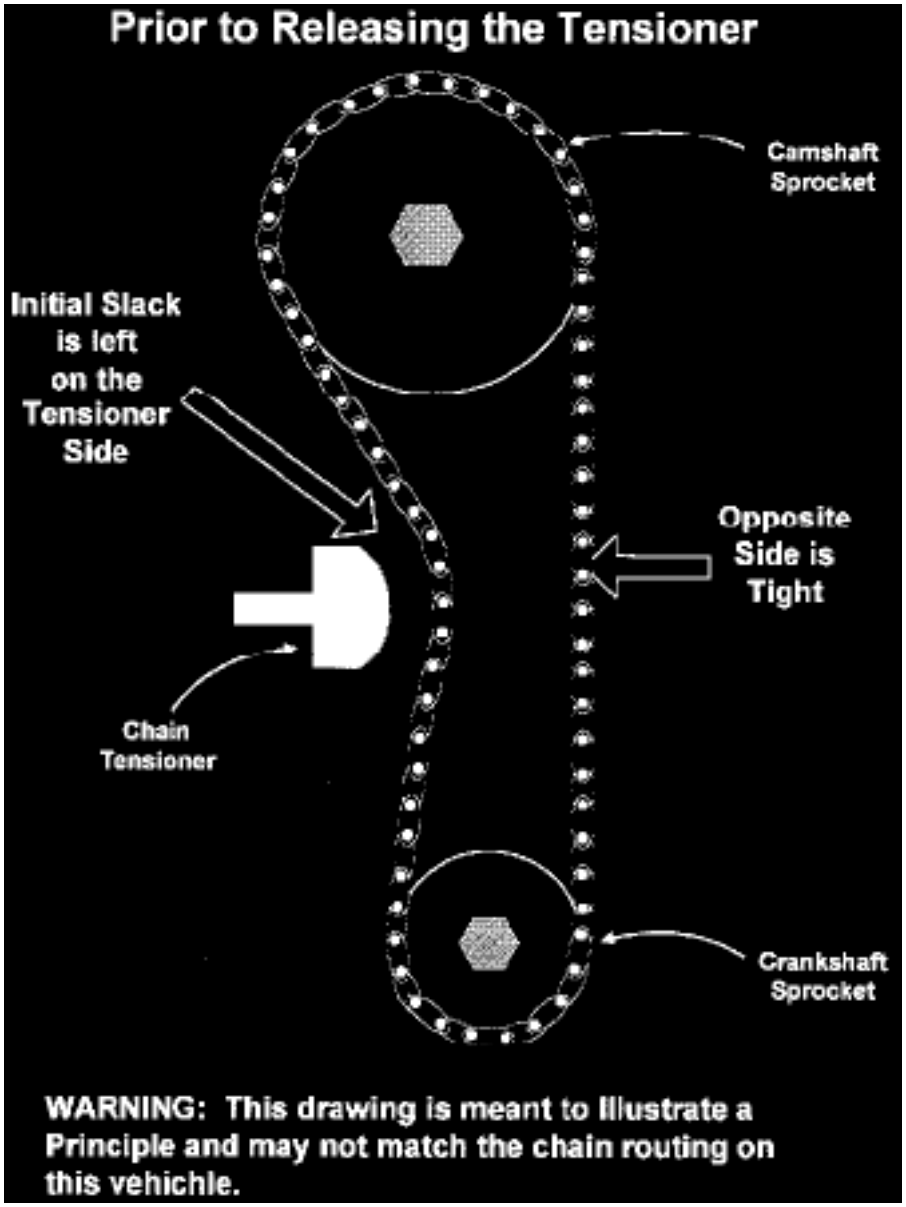
BOLT	A	M8 - 47	(1)	17-21 (13-15)
BOLT	B	M8 - 25	(5)	17-21 (13-15)
STUD	C	M8 - 25	(5)	17-21 (13-15)

A13489-1A

Timing Cover And Bolts

9. Install the cylinder front cover. Tighten front cover attaching screws to 17-21 Nm (13-15 ft lb). Install the oil pan and radiator.

10. Fill and bleed the cooling system. 11. Fill the crankcase with clean engine oil of the recommended grade and viscosity. 12. Start the engine and operate at fast idle. Check for coolant and oil leaks.



Timing Chain: Fundamentals and Basics

TIMING CHAIN REPLACEMENT HINTS AND TIPS

- Always replace both the timing chain and both sprockets as a combined unit. -

A worn timing chain will not properly fit the teeth of a new sprocket and will result in a premature failure.

- A new timing chain will rapidly wear away the teeth of an old sprocket.

NOTE: Since the water pump and drive belts will need to be removed during this procedure, it is important to note any related deficiencies prior to starting the procedure. -

Inspect the water pump for signs of leakage and inspect the pulley for any looseness or wobble. If any wobble is detected the water pump should be replaced.

- Inspect the drive belts and replace if necessary.

- Inspect the drive belt idler/tensioner pulleys for looseness and wobble. Replace any pulley which does not spin freely or has any wobble.

- Inspect the cooling fan clutch for proper operation. -

Under cold conditions the clutch should be disengaged, allowing the fan to spin freely.

- Under hot conditions the clutch should tighten up, coupling the fan to the water pump pulley/shaft.

- Rotate the engine to number 1 Top Dead Center prior to removing the timing chain.

NOTE: The alignment marks on the camshaft and crankshaft gears are positioned at number 1 Top Dead Center.

- When removing the water pump, any bolts which show signs of corrosion should be replaced and the holes/threads should be chased or re-tapped.

- Oil pan removal is required to remove the timing cover. Bolts from the oil pan extend through the bottom of the timing cover. Removing the bolts and loosening the remaining pan bolts to remove the timing cover will tend to cause oil leakage from the pan gasket.

NOTE: To prevent leakage, when the oil pan is removed or the bolts are loosened, the gasket should always be replaced.

- When tightening the oil pan bolts always use a torque wrench. Correct sealing requires the gasket to be evenly torqued across its entire sealing surface.

- Do not turn the crankshaft or camshaft with the pulleys off. Using slip joint pliers or pipe wrenches to turn the crankshaft will damage the surface and affect the press fit of the pulley.

- Silicone sealant should be used very sparingly. Excessive sealant which squeezes out on the inside of the gasket can accumulate and restrict the oil pump pickup screen or the coolant heater core.

- Inspect the chain guides and tensioner foot and replace if excessively worn.

NOTE: If the chain guides are worn past 50% of their original thickness the guides may not last the life of the new chain and should be replaced.

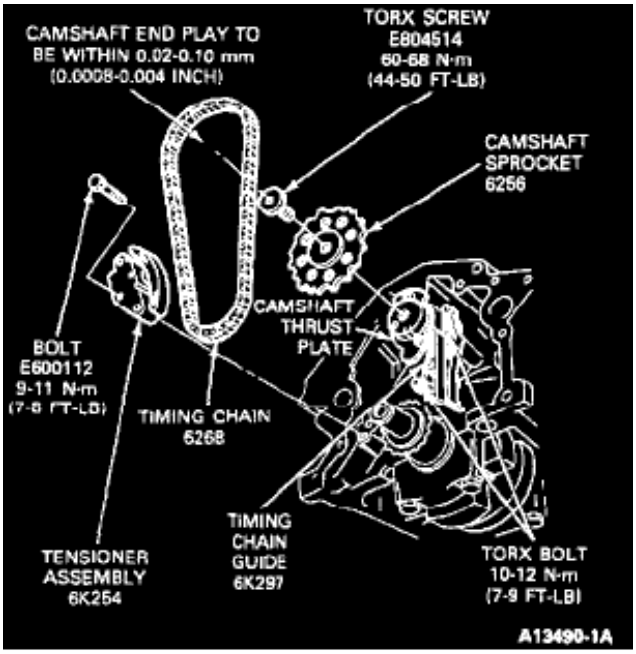
- When installing the chain leave the initial slack on the tensioner side, the opposite side should be tight. If any slack is left on the side opposite of the tensioner, upon initially rotating the engine the camshaft/crankshaft alignment will be incorrect.

Timing Chain Guide: Specifications

Timing Chain Guide Bolts ..... 10-12 Nm (7-9 ft lb)

Timing Chain Tensioner: Specifications

Timing Chain Tensioner Bolts ..... 9-11 Nm (7-8 ft lb)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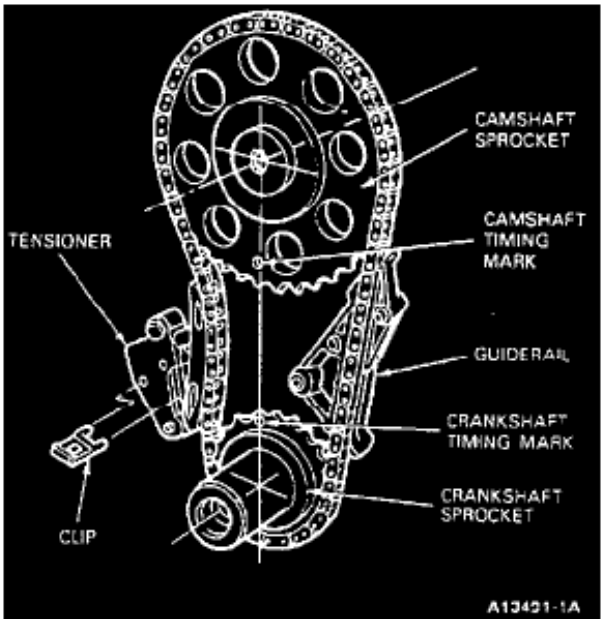
CAMSHAFT SPROCKET
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TENSIONER
GUIDERAIL
CRANKSHAFT TIMING MARK
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CLIP
A13491-1A

Timing Chain Tensioner: Service and Repair

REMOVAL

1. Drain the cooling system and crankcase. Remove the oil pan and radiator. 2. Remove the cylinder front cover and water pump, drive belt and crankshaft damper. 3. Remove the camshaft sprocket retaining bolt and the crankshaft sprocket key. 4. Remove the crankshaft and camshaft sprockets with the timing chain.

Timing Chain, Sprockets And Tensioner

5. Remove the timing chain tensioner and guide.

INSTALLATION

1. Install the timing chain guide to the cylinder block with the pin of the guide inserted into the oil hole in the block. Install the two retaining bolts,

and tighten to 10-12 Nm (7-9 ft lb).

2. Position the camshaft so the timing mark will align with the crankshaft. Position the crankshaft so the timing mark will align with the camshaft. 3. Install the crankshaft sprocket, camshaft sprocket and timing chain together. 4. Install the timing chain tensioner with the clip in place to lock the tensioner in the retracted position. Tighten tensioner bolts to 9-11 Nm (7-8 ft lb)

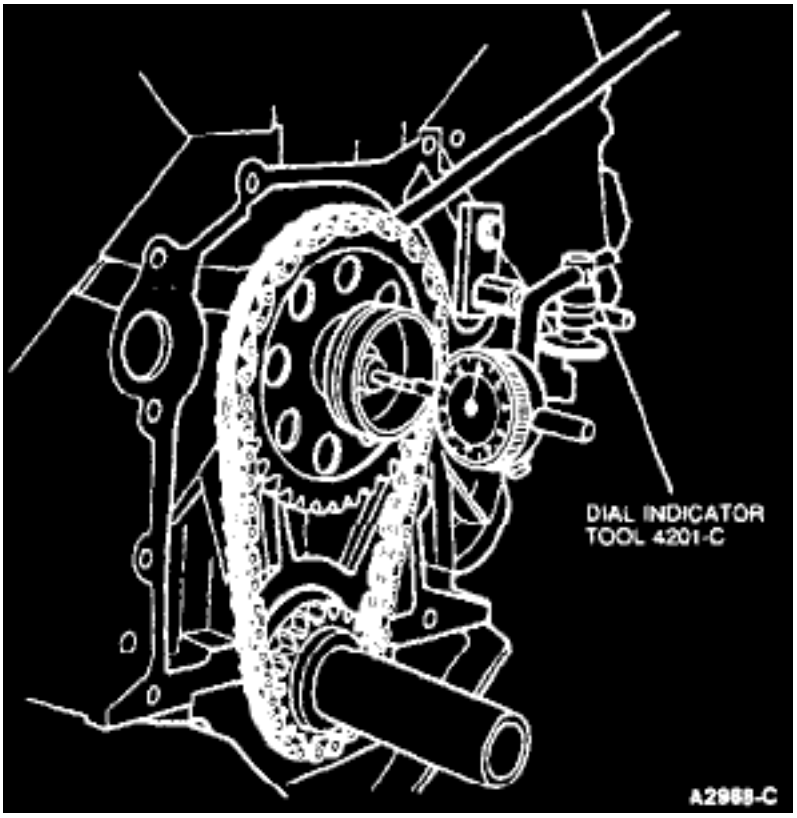
.

Timing Marks

5. Install the crankshaft key and check the timing marks on the crankshaft sprocket and camshaft sprocket for correct alignment.

NOTE: Make sure that the tensioner side of the timing chain is held inward, and that the guide side of the chain is straight and tight.

6. Install the camshaft sprocket retaining bolt, and tighten to 60-68 Nm (44-50 ft lb). 7. Remove the clip from the tensioner assembly.



8. Check the camshaft end play.

Camshaft End Play

CAUTION: Prying against the camshaft gear with the valve train load on the camshaft can break or damage the gear. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

a. Push camshaft toward rear of engine. Install Dial Indicator TOOL-4201-C or equivalent so indicator point is on camshaft sprocket attaching

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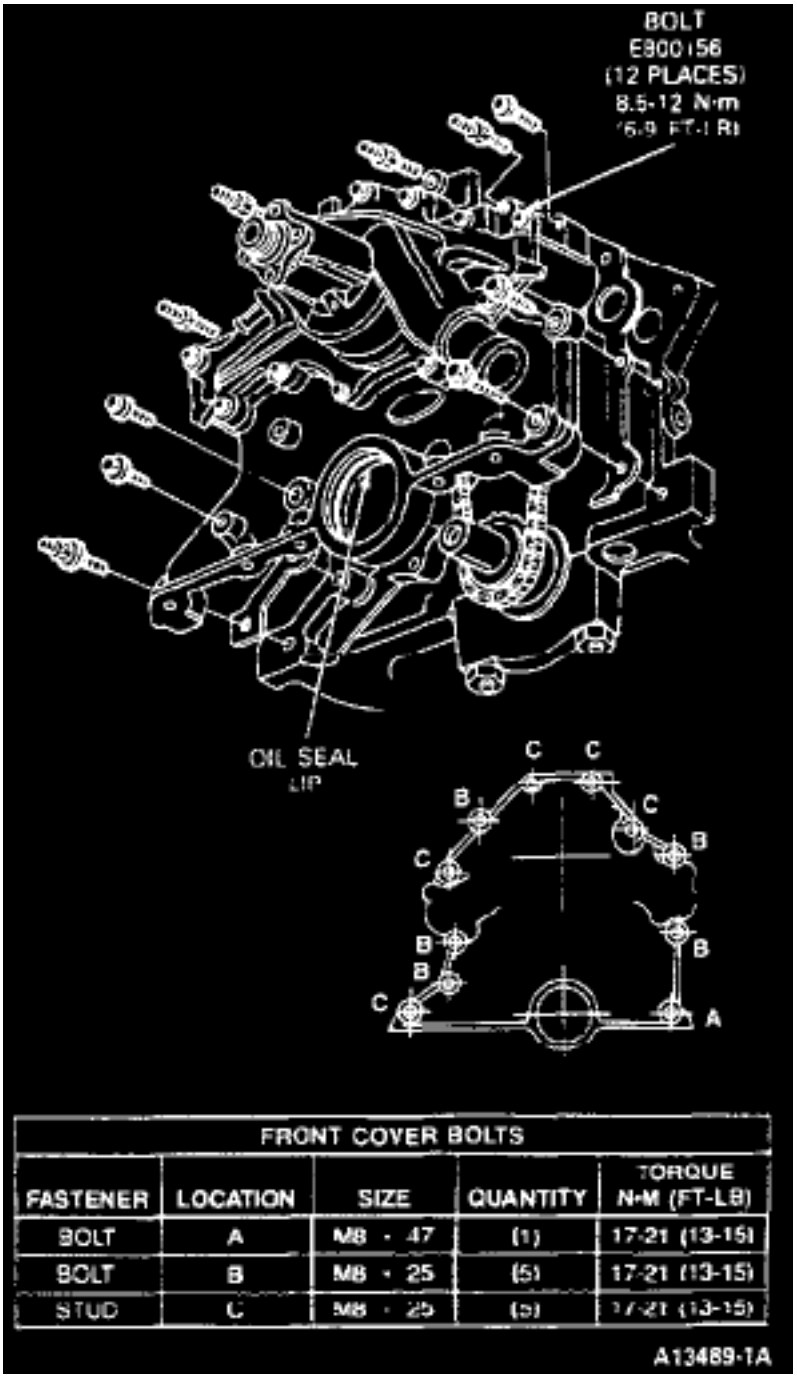

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FASTENER	LOCATION	SIZE	QUANTITY	TORQUE N·M (FT-LB)
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STUD	C	M8 - 25	(5)	17-21 (13-15)

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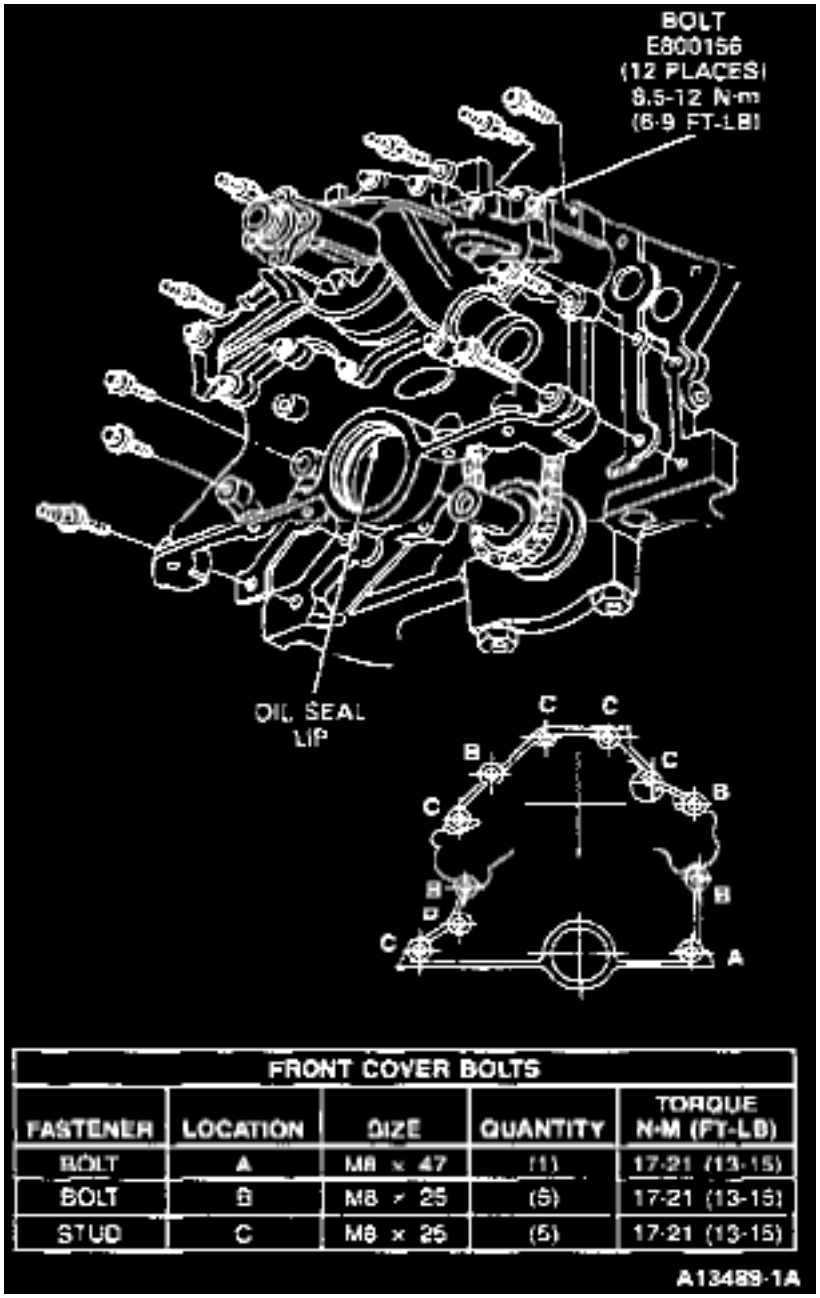
Timing Cover And Bolts

9. Install the cylinder front cover. Tighten front cover attaching screws to 17-21 Nm (13-15 ft lb). Install the oil pan and radiator.

10. Fill and bleed the cooling system. 11. Fill the crankcase with clean engine oil of the recommended grade and viscosity. 12. Start the engine and operate at fast idle. Check for coolant and oil leaks.

Timing Cover: Specifications

Timing Components Front Cover Bolts	17-21 Nm (13-15 ft lb)



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STUD	C	M8 x 25	(5)	17-21 (13-15)

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Timing Cover: Service and Repair

REMOVAL

1. Remove oil pan. 2. Drain the coolant. Remove the radiator. 3. Remove air conditioner compressor and power steering bracket, if so equipped. 4. Remove alternator and drive belt(s). 5. Remove fan. 6. Remove water pump, heater and radiator hoses. 7. Remove the drive pulley/damper assembly from the crankshaft. 8. Remove the crankshaft position sensor assembly. 9. Remove front cover retaining bolts. If necessary, tap cover lightly with a plastic hammer to break gasket seal. Remove front cover.

INSTALLATION

1. Clean the front cover mating surfaces of gasket material. Apply sealing compound to the gasket surfaces on the cylinder block and back side of the

front cover plate. Install guide sleeves.

2. Apply sealing compound to front cover gasket surface. Place gasket in position on front cover.

Engine Front Cover

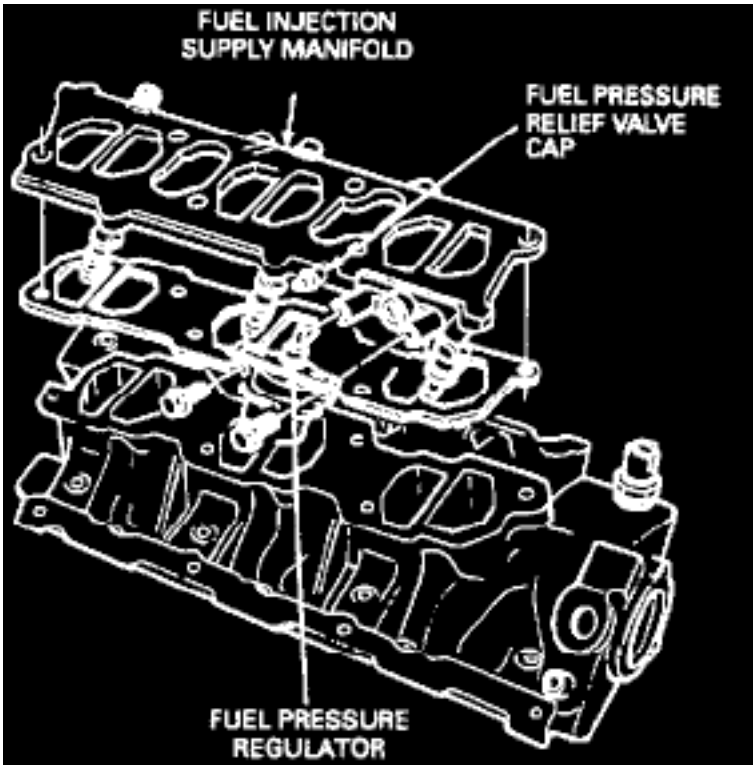
3. Place front cover on engine and start all retaining bolts two or three turns. Note the different bolt lengths. 4. Tighten front cover attaching bolts to 17-21 Nm (13-15 ft lb). 5. Install the crankshaft position sensor. 6. Install belt drive pulley/damper assembly. Tighten attaching bolt to 40-50 Nm (30-37 ft lb), then turn an additional 80-90° tighter. 7. Install oil pan. 8. Install water pump, heater hose, air conditioner compressor, alternator, and drive belt(s). Adjust drive belt tension. 9. Fill and bleed the cooling system.

10. Operate the engine at fast idle speed and check for coolant and oil leaks.

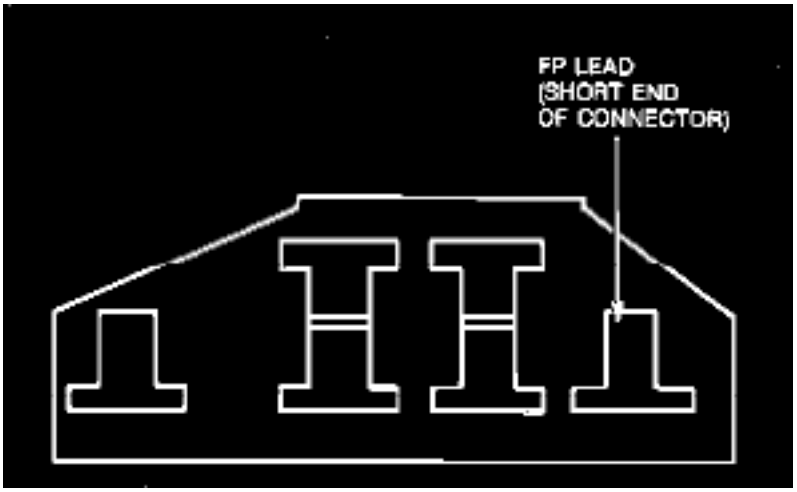
Fuel Pressure: Specifications

Key On Engine Off 35 - 45 psi

Key On Engine Running 30 - 40 psi



Fuel Injection Supply Manifold



Fuel Pressure: Testing and Inspection

STO Connector

STATIC PRESSURE TEST

1. Check for adequate fuel supply. 2. Turn key OFF 3. Install fuel pressure gauge to test port on fuel rail. 4. Install test lead to fuel pump lead of STO test connector. 5. Turn Key On Engine Off (KOEO). 6. Ground test lead to run fuel pump. 7. Check to determine if fuel pressure is within acceptable limits. Refer to SPECIFICATIONS.

a. If pressure is low but greater than 3 psi (indicates fuel pump is running but not enough pressure) check for:

^ Plugged fuel filter

^ Kinked fuel line

^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

^ Disconnect the fuel return line and note if fuel is being returned during this low pressure condition. If fuel is being returned, replace the fuel pressure regulator. Reconnect the fuel return line.

b. If pressure is less than 3 psi (pump not running) check for:

^ Defective fuse link

^ Inertia switch open

^ Wiring at fuel pump/tank connector loose or open

^ Fuel pump ground connection at chassis loose or defective

^ Improper fuel pump relay operation

If fuel supply and return lines are OK, and electrical supply and ground are OK, and fuel pressure is still low, replace fuel pump.

DYNAMIC PRESSURE TEST

1. Disconnect and plug the vacuum line to the pressure regulator.

2. Start engine and run at idle. Check to determine if fuel pressure is within acceptable limits.

a. If pressure is low check for:

^ Plugged fuel filter ^ Restricted fuel line ^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

3. Reconnect the vacuum line to the regulator.

If fuel supply and return lines are OK, and electrical supply and ground is OK, and fuel pressure is still low, replace fuel pump.

LEAKAGE TEST

1. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate operating pressure. 2. Remove ground from test lead and note pressure on gauge. Pressure should remain within 2 psi for 3 minutes after lead is ungrounded.

a. If pressure is not maintained check for leaking fuel

^ Lines ^ Connectors ^ Injectors

b. Disconnect fuel return line and plug engine side. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate

operating pressure. If pressure holds replace regulator and retest. Reconnect the fuel return line.

If pressure is not maintained replace fuel pump.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Tune-up and Engine Performance Checks > Idle Speed > System Information > Technical Service Bulletins > Customer Interest: > 91257 > Dec > 91 > Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

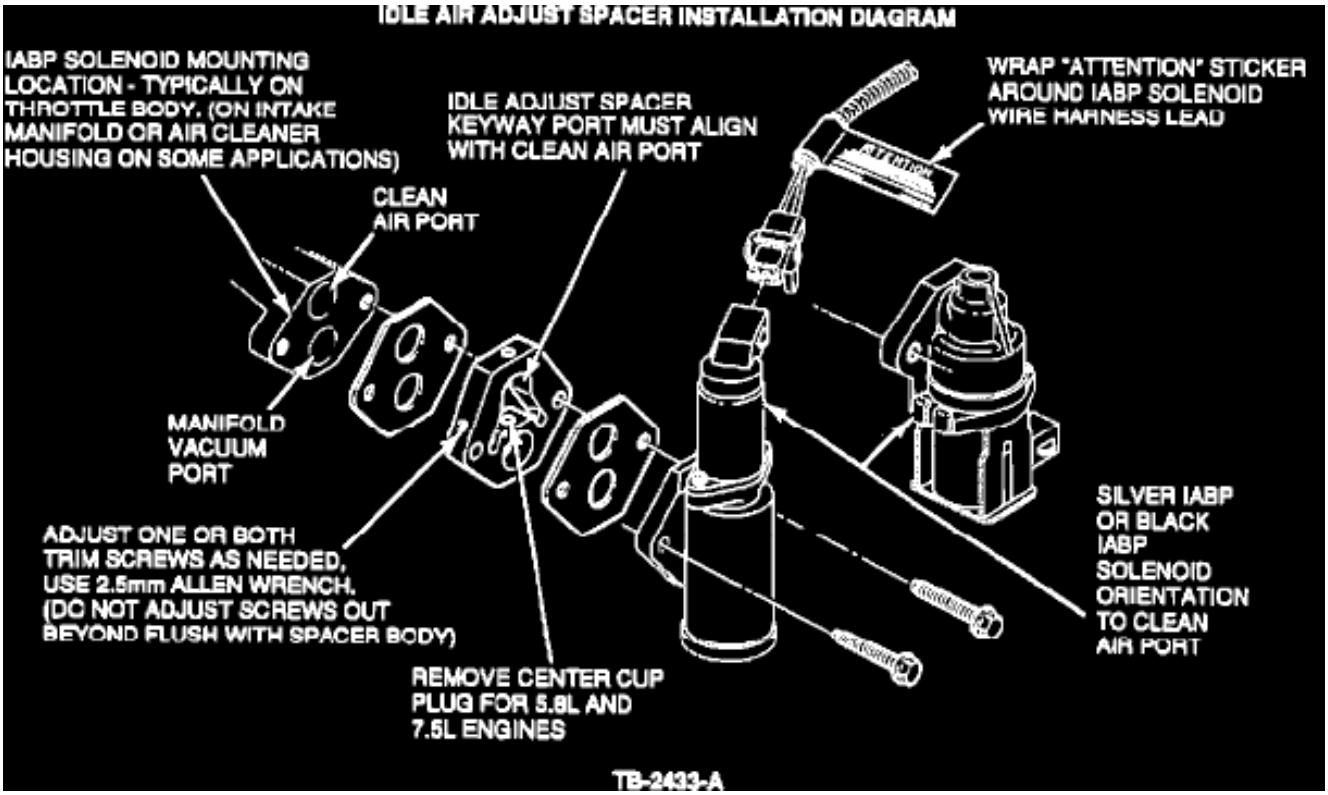
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

TB-2434-A

Figure 3

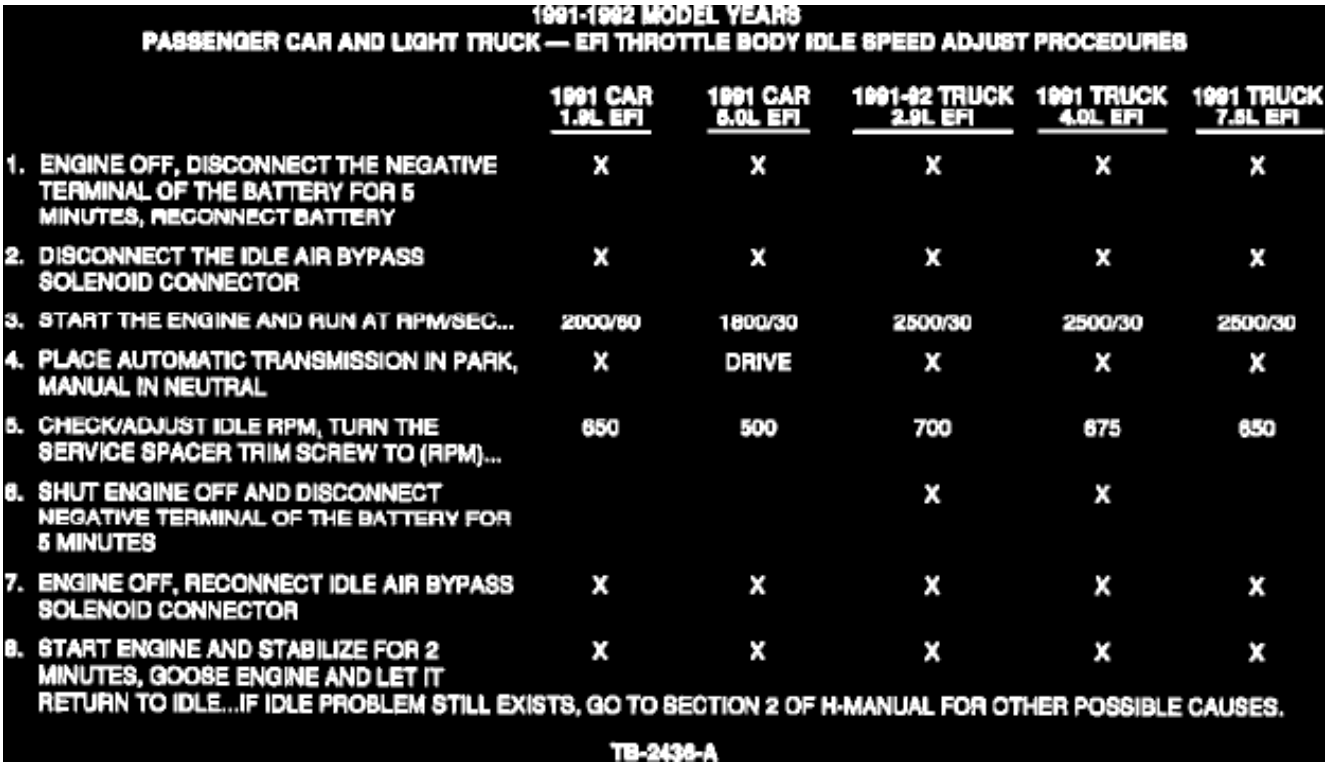
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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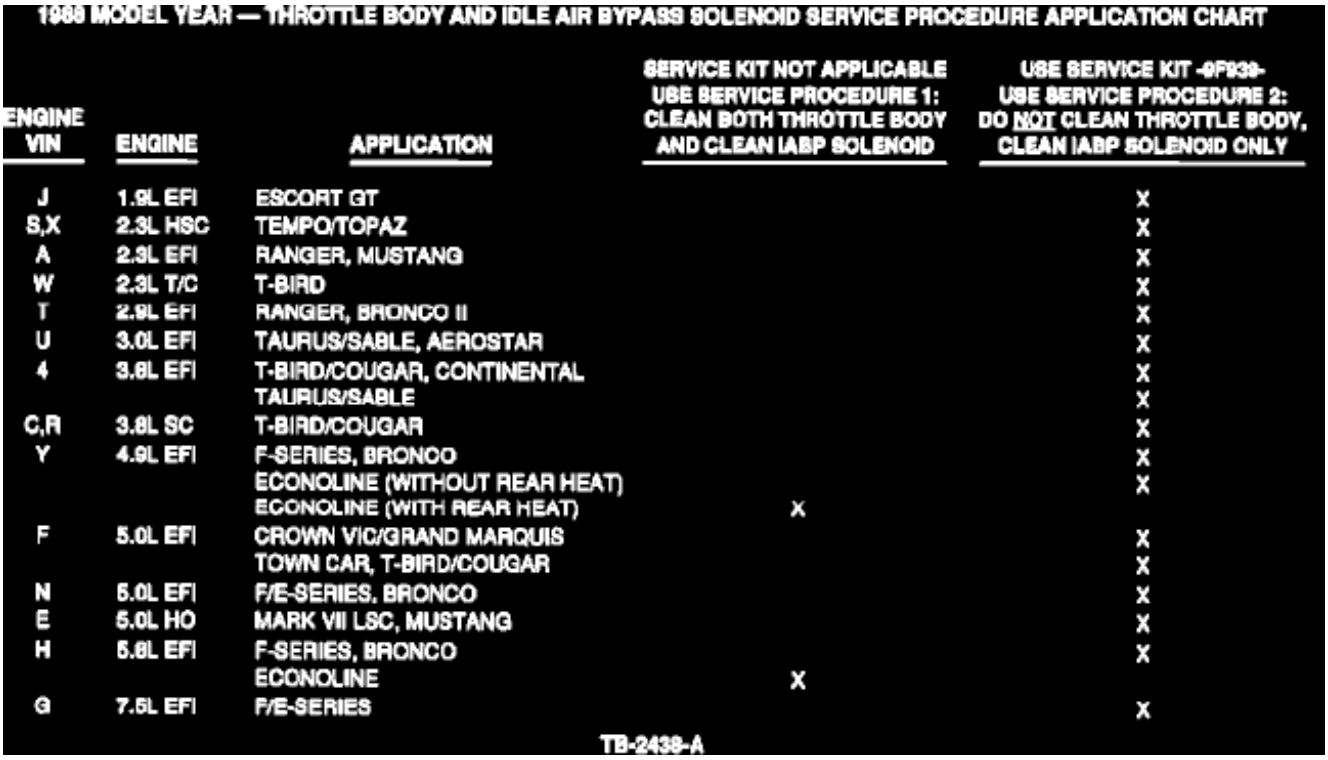
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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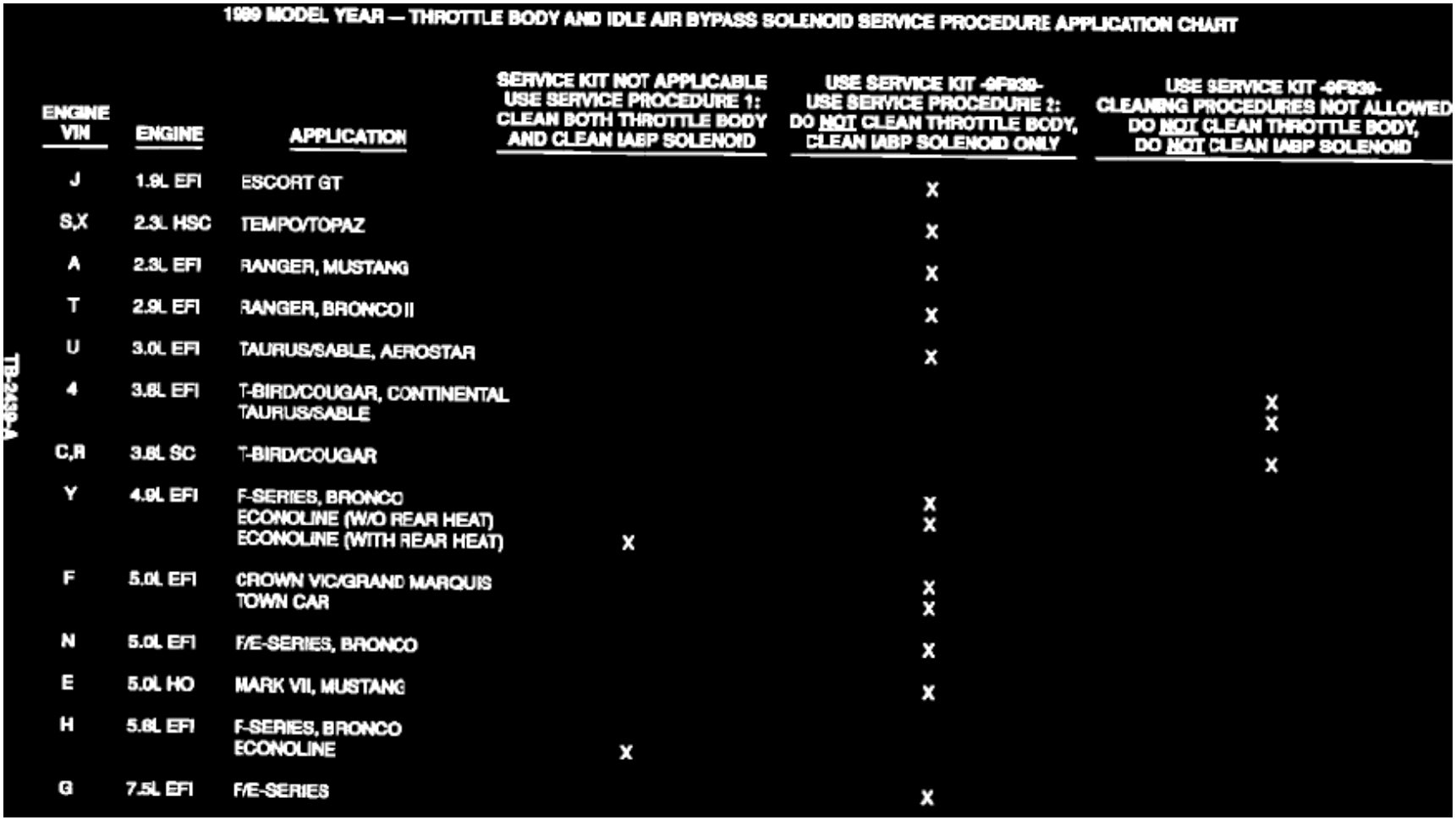
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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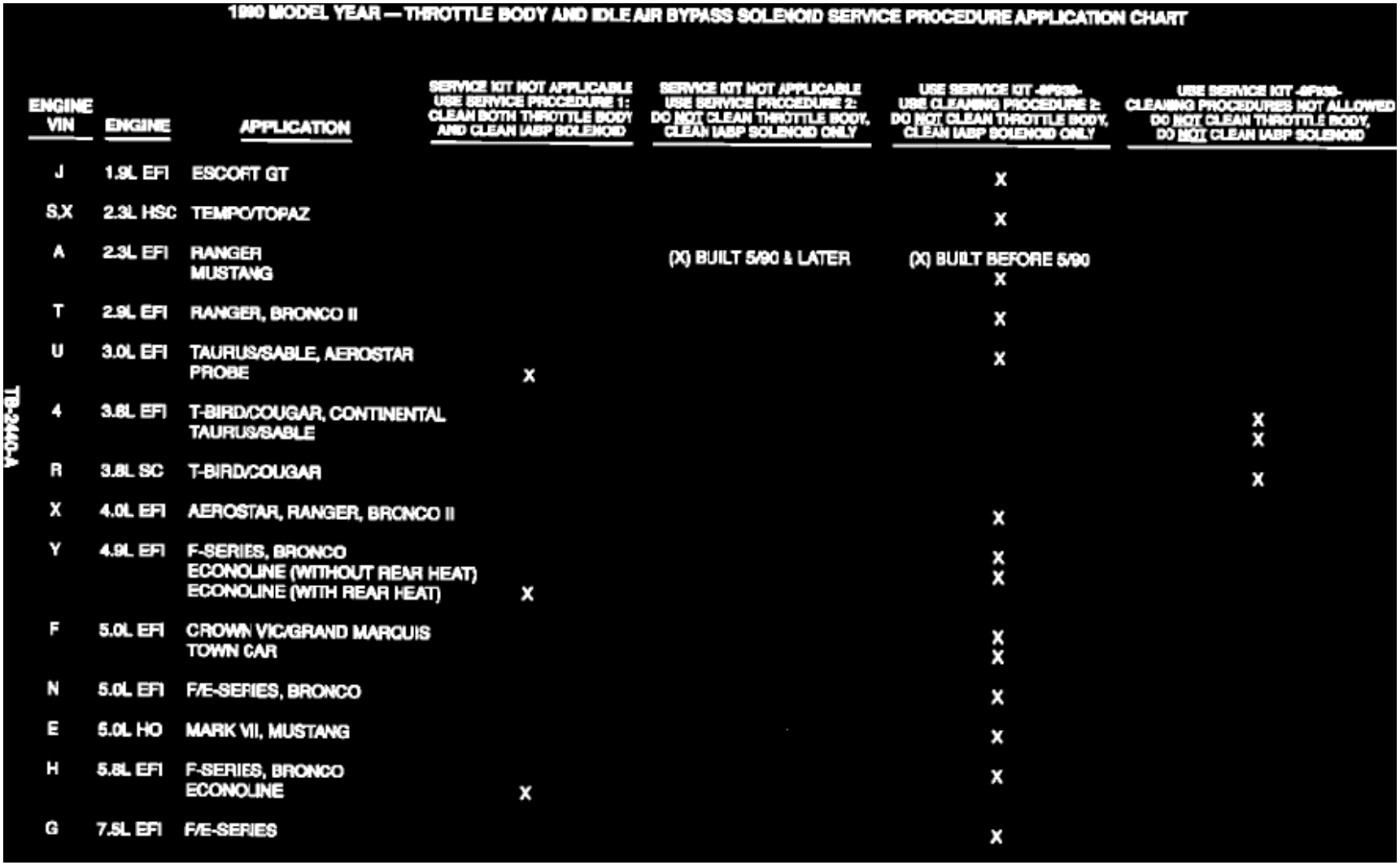
Figure 9

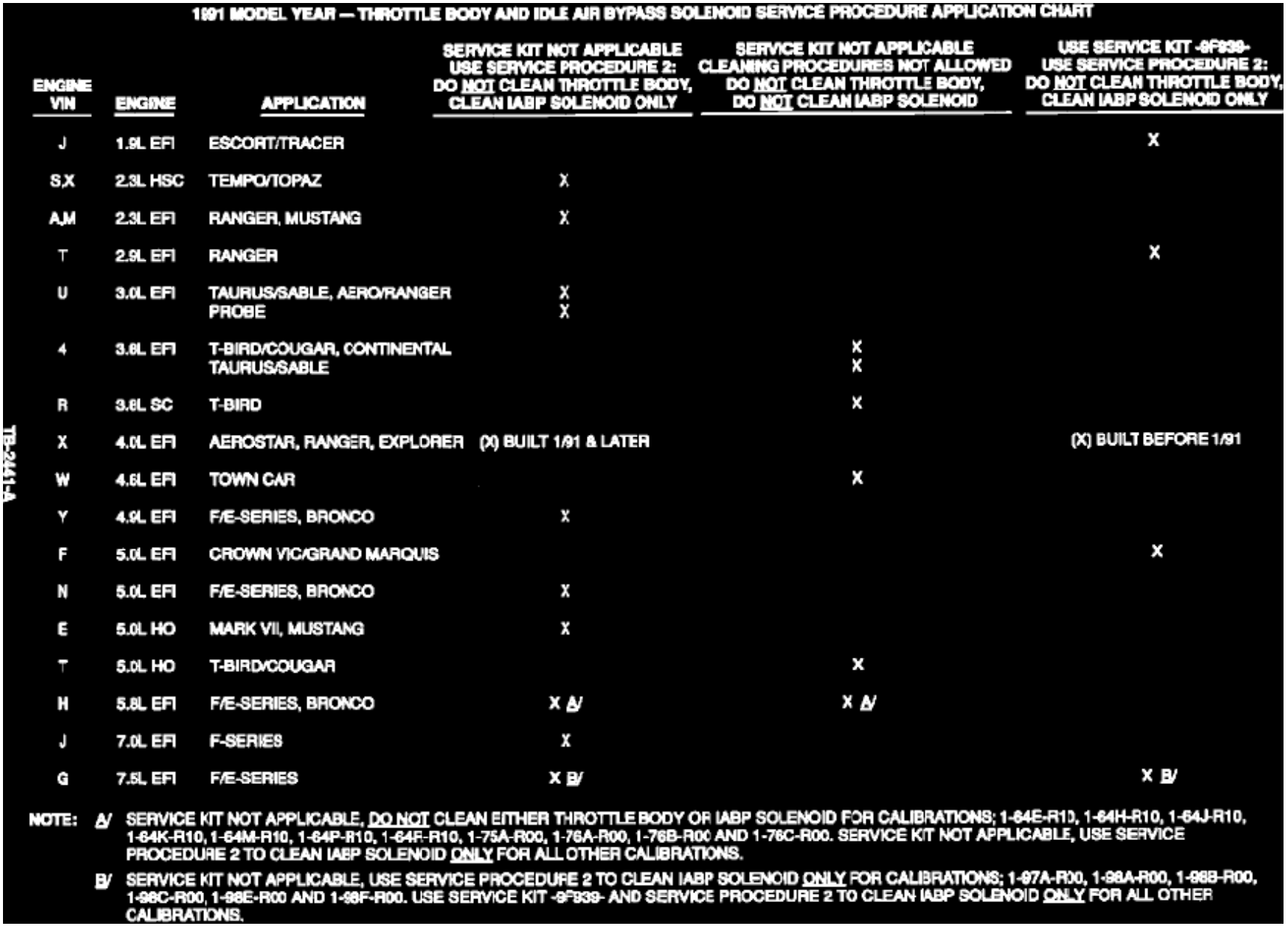


1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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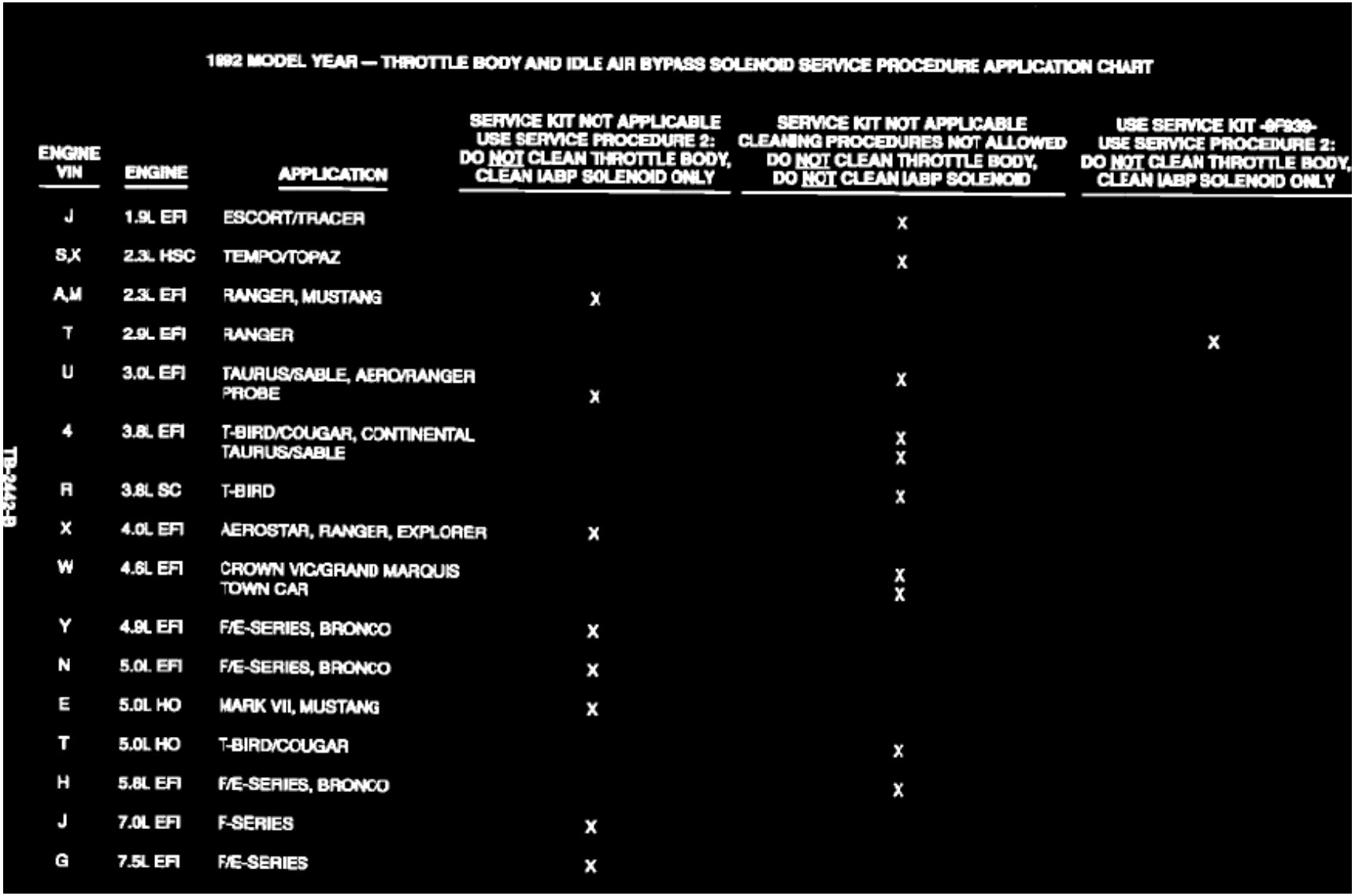
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Engine > Tune-up and Engine Performance Checks > Idle Speed > System Information > Technical Service Bulletins > All Technical Service Bulletins for Idle Speed: > 91257 > Dec > 91 > Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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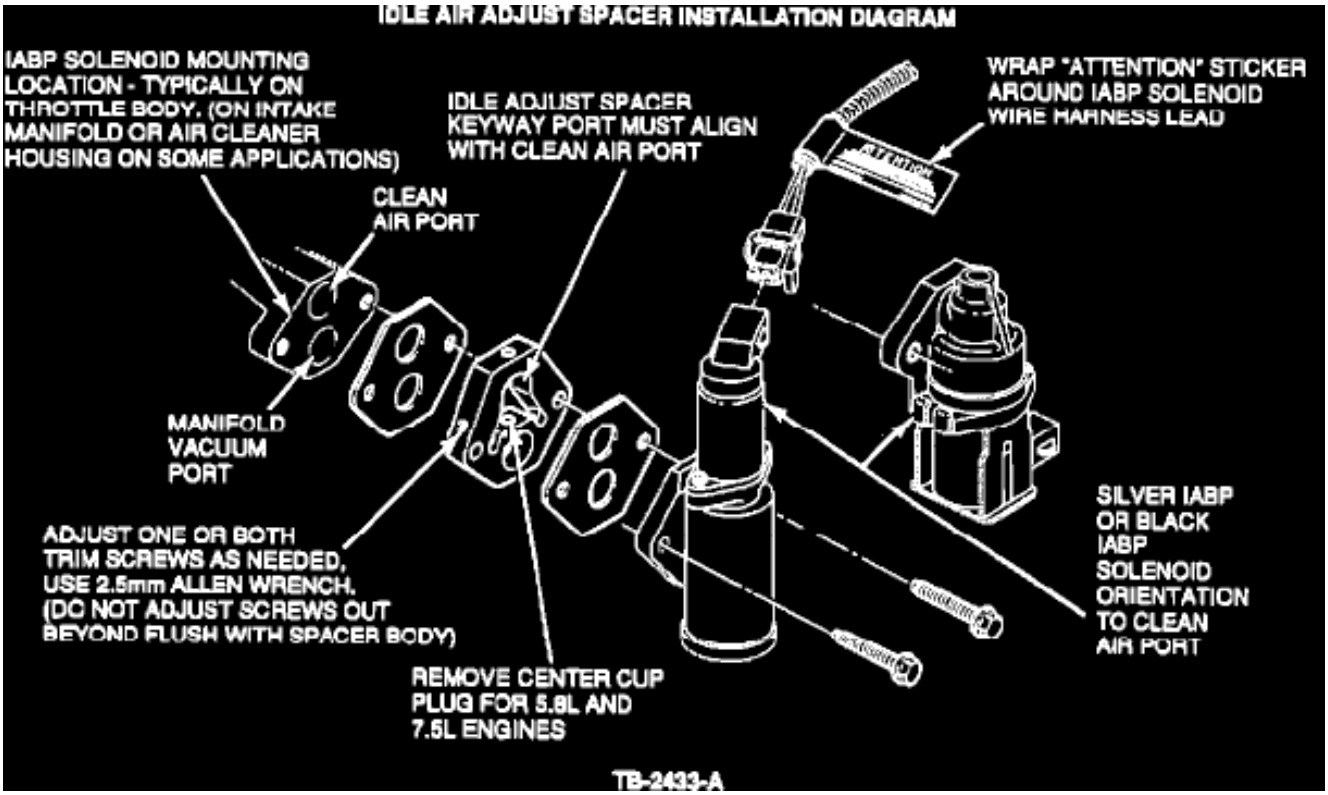
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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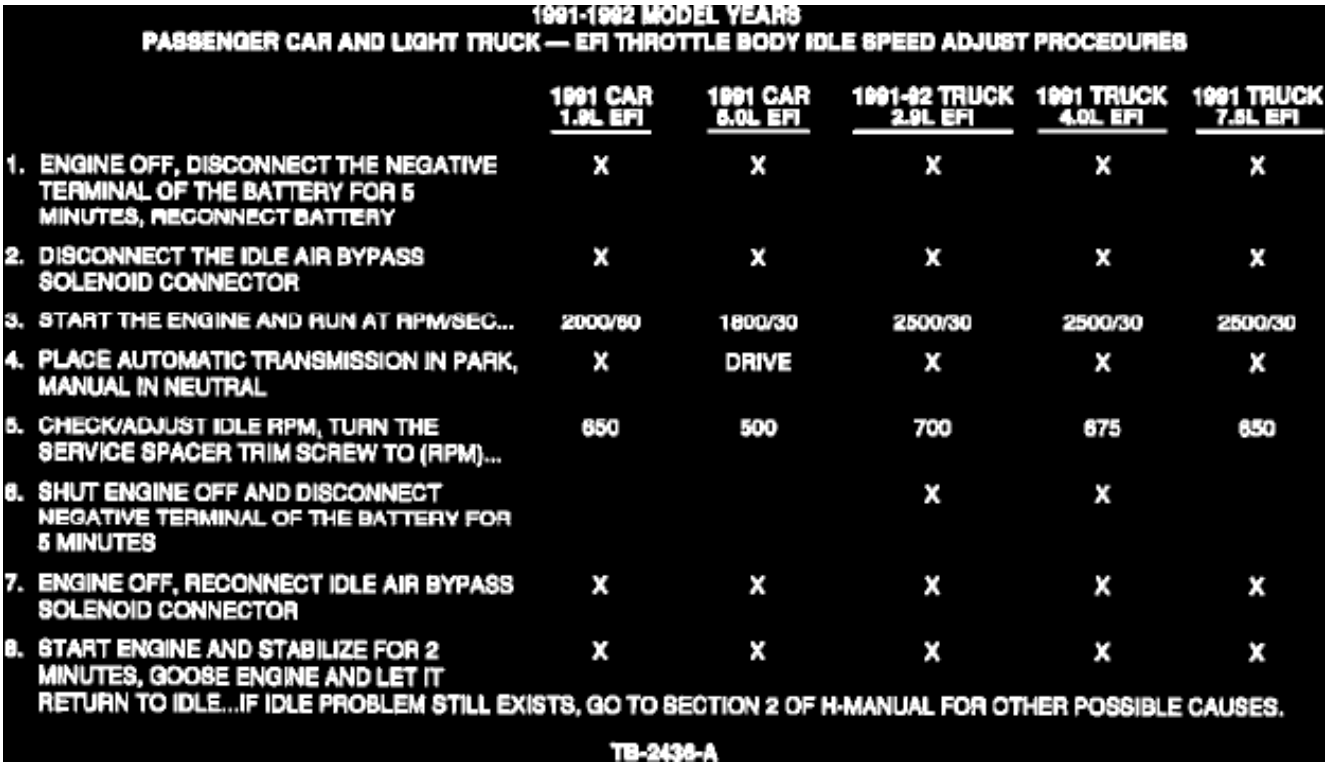
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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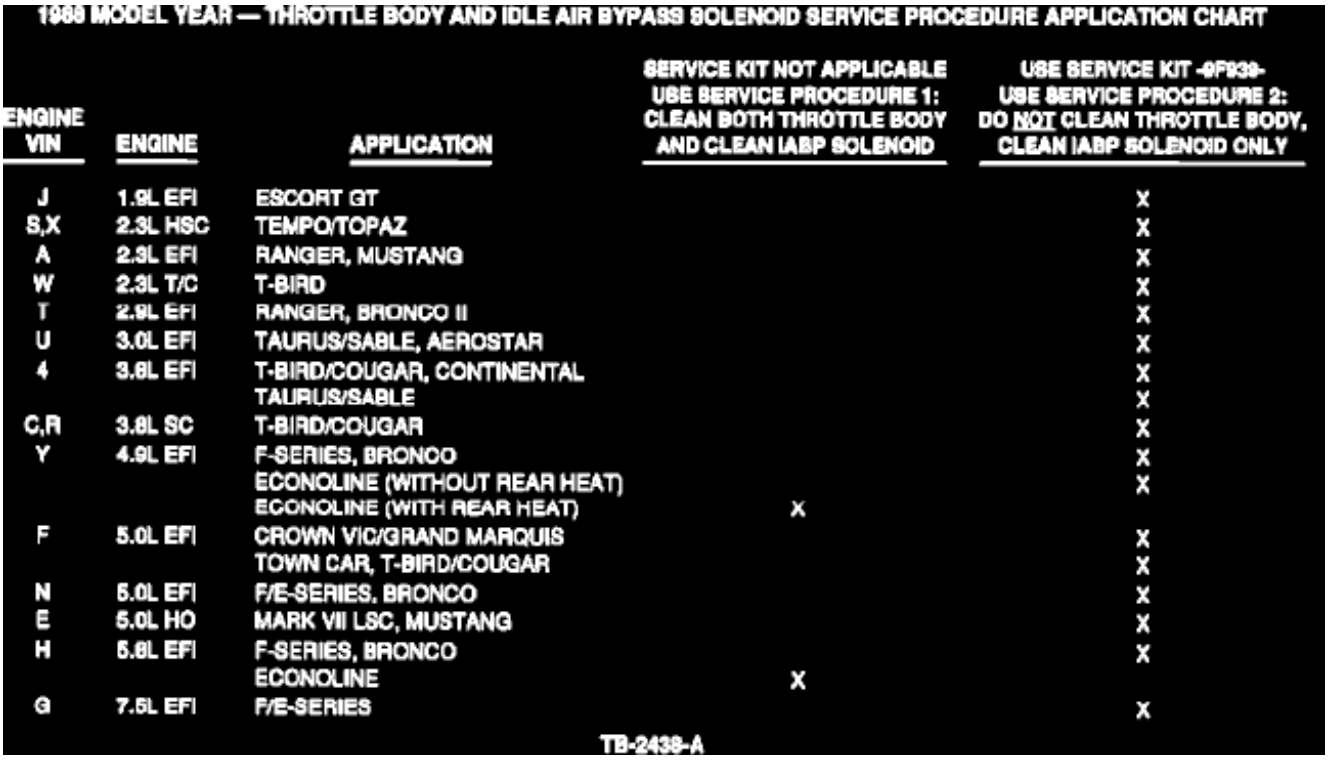
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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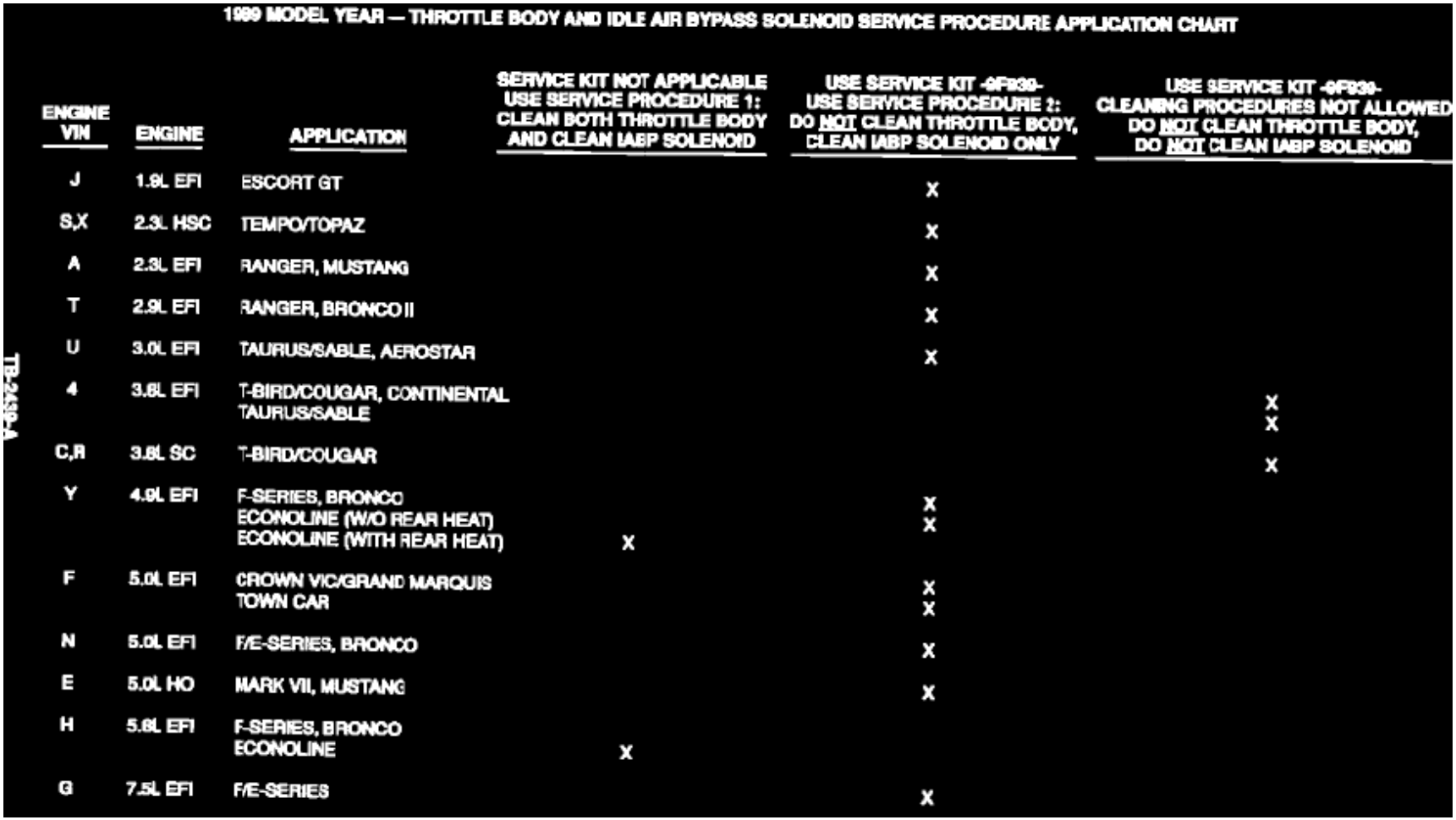
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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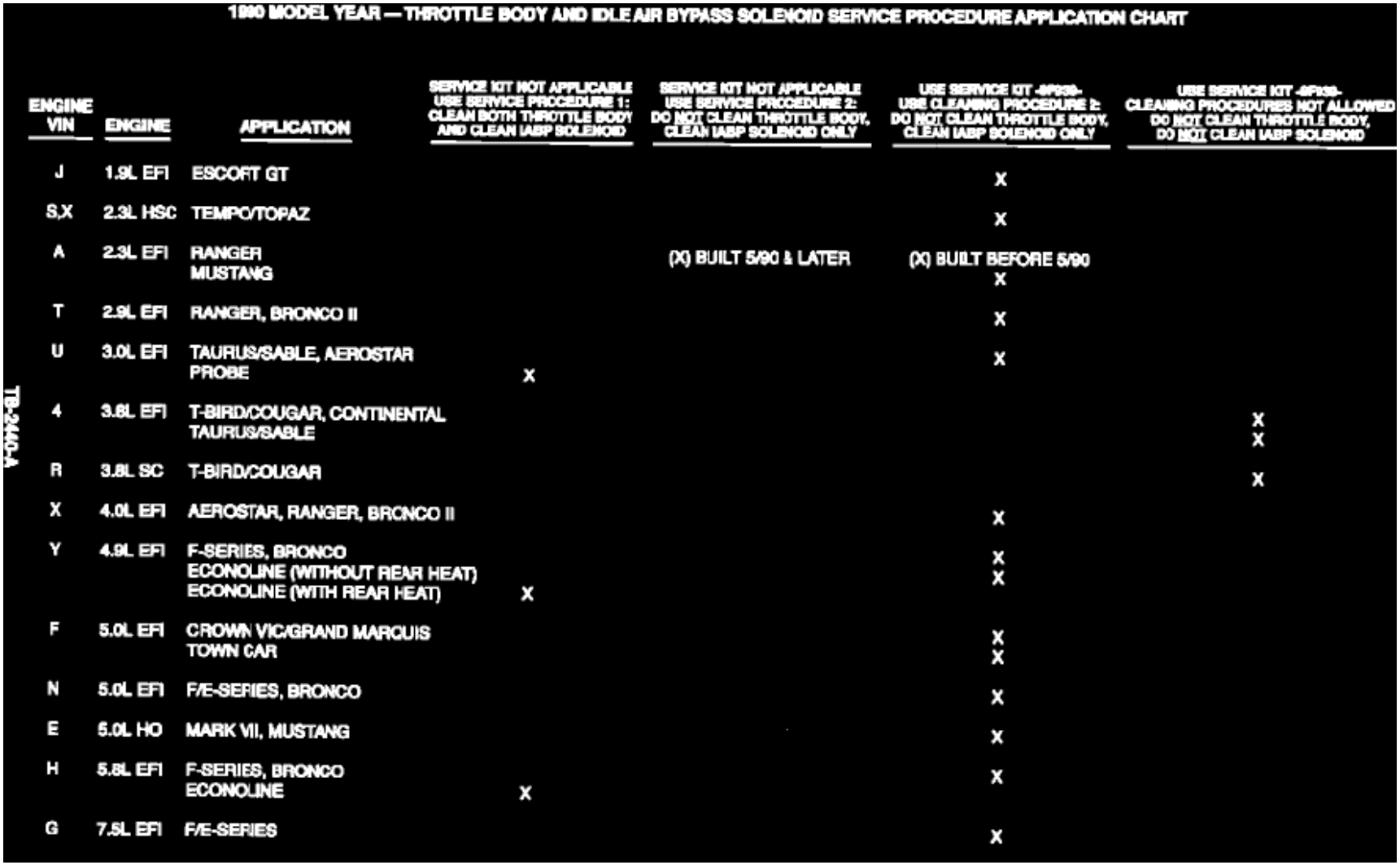
Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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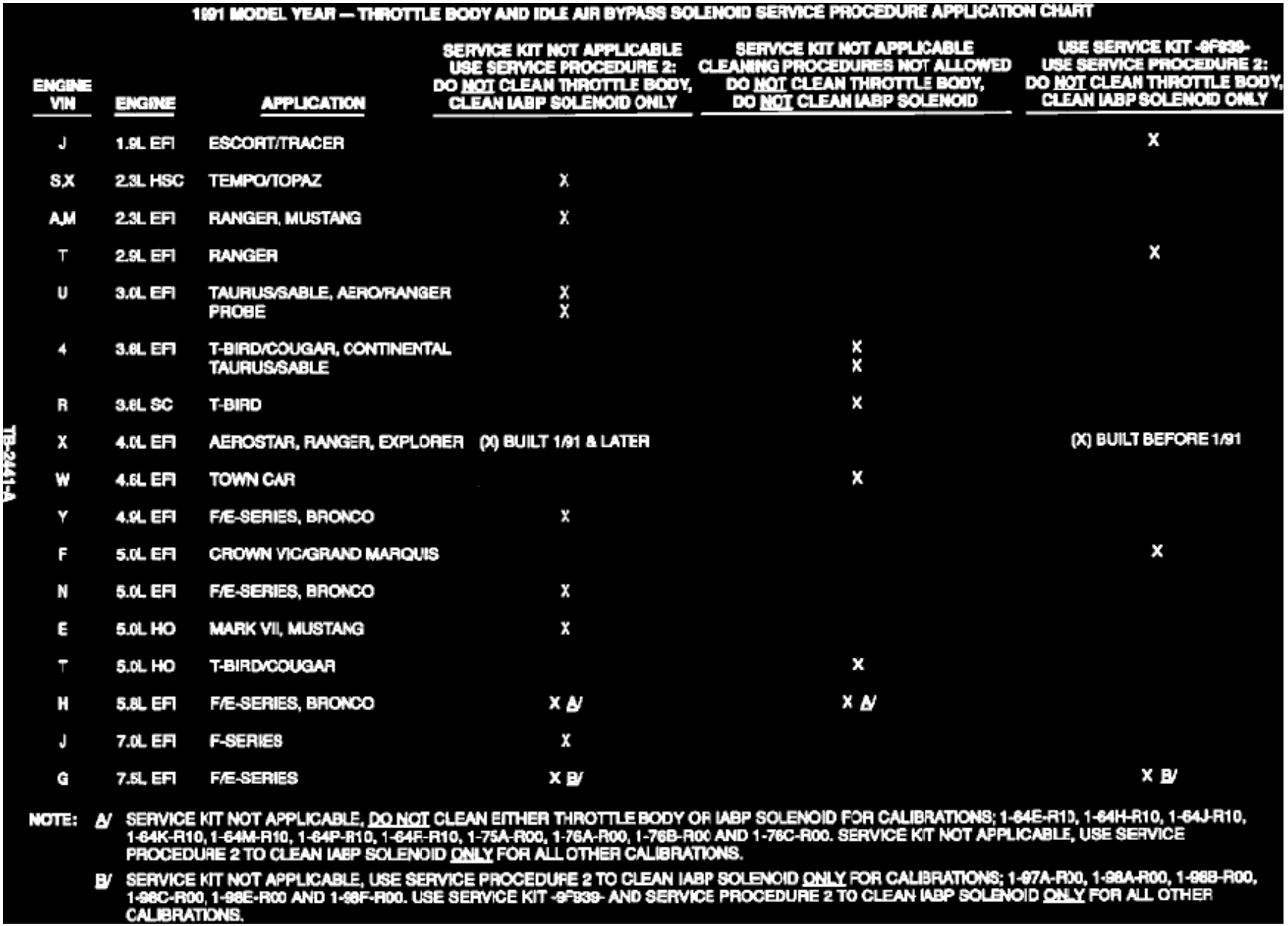
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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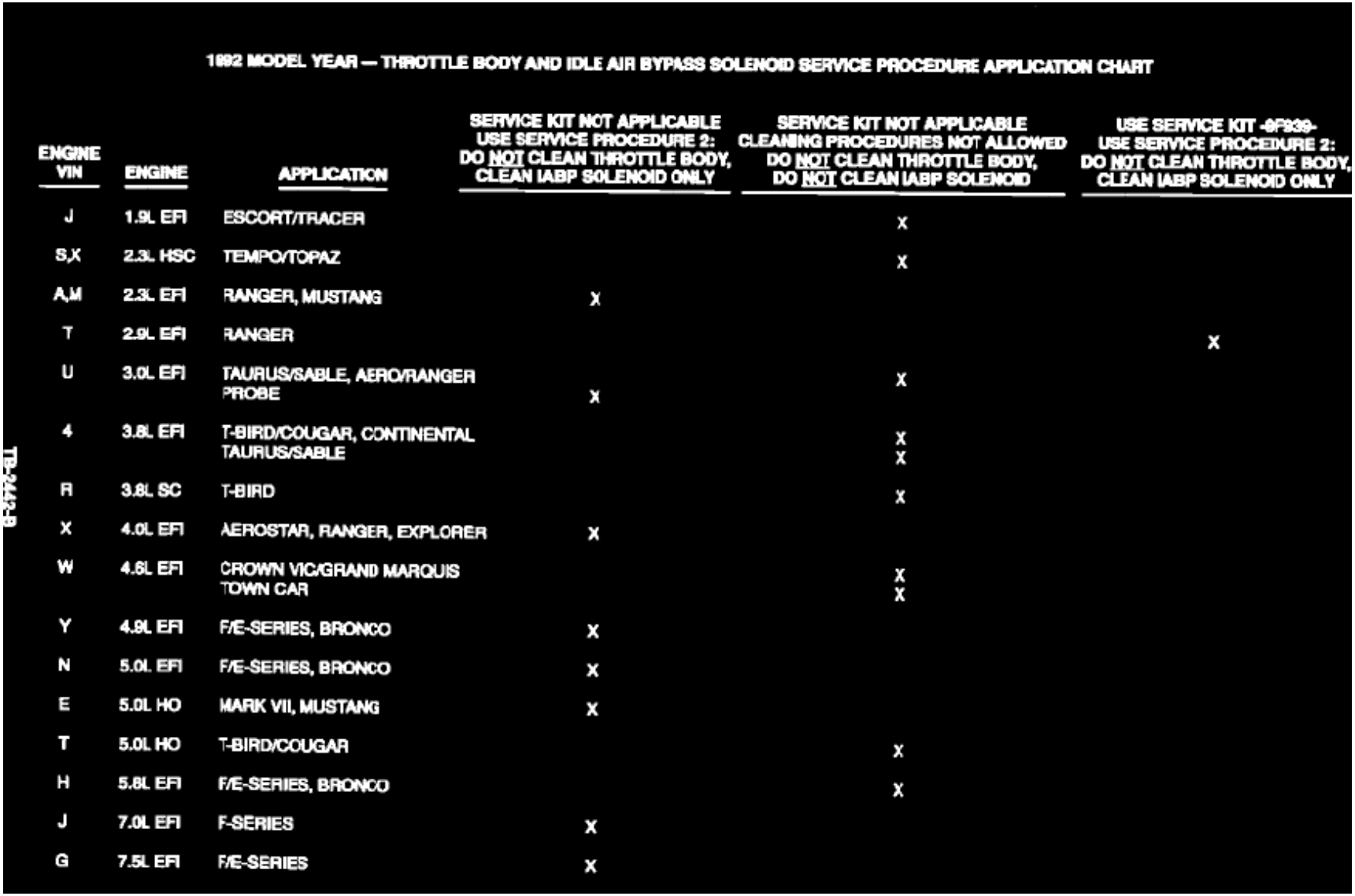
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Component Descriptions

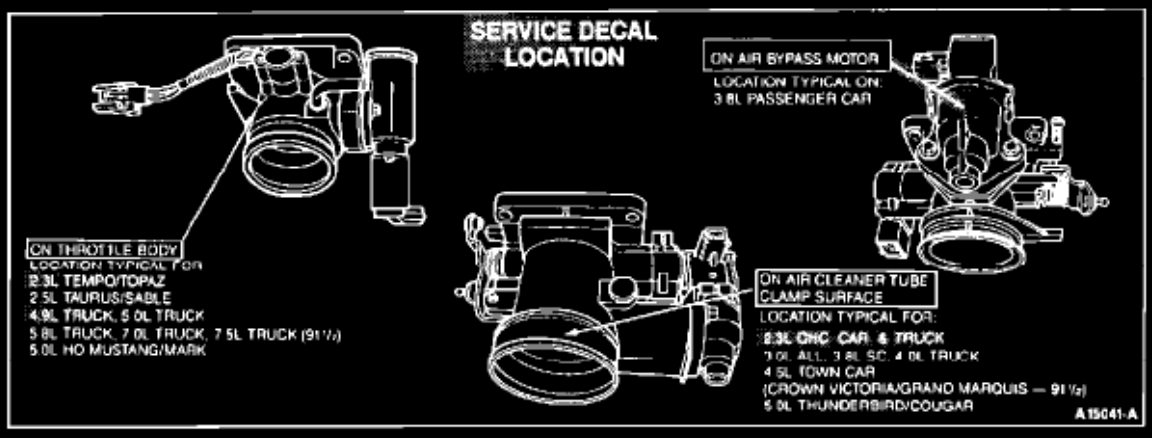


Figure 3

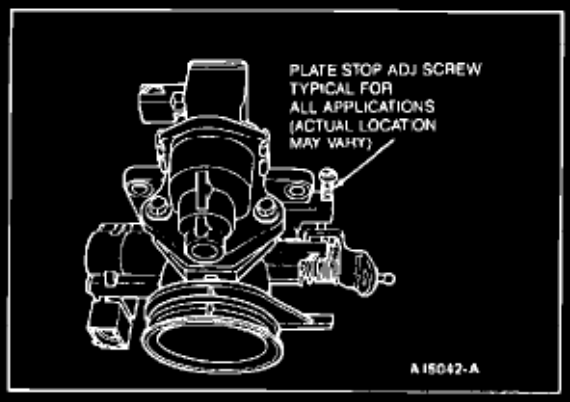


Figure 4

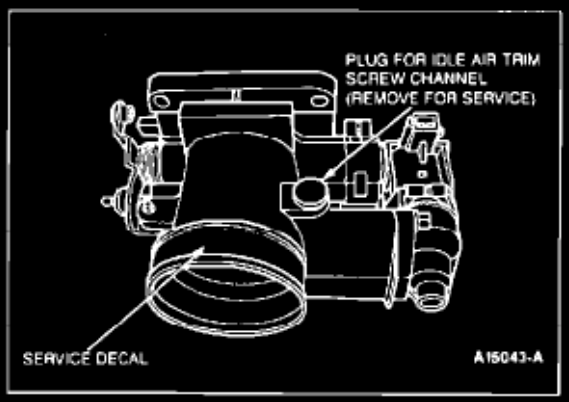


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

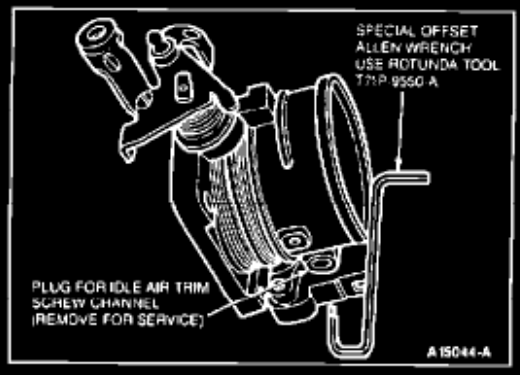
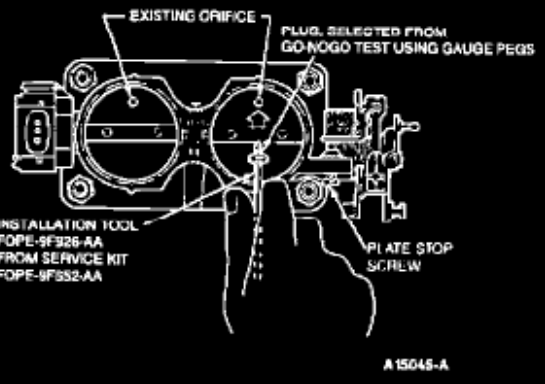


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT F-250 O-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off (disconnect idle speed control--air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Component Descriptions

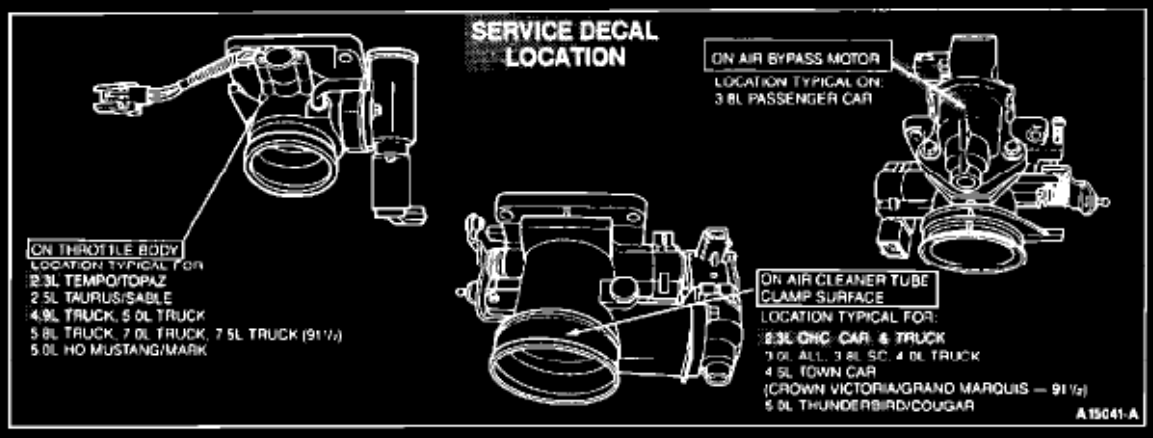


Figure 3

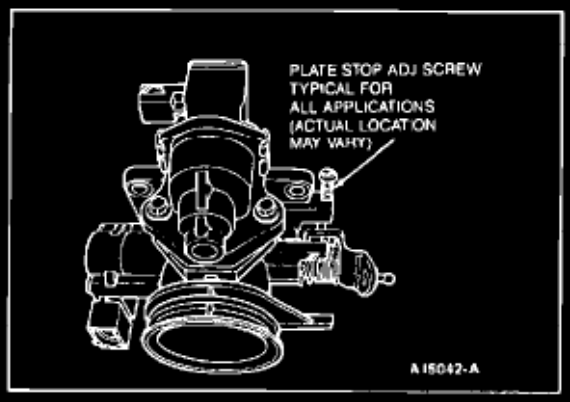


Figure 4

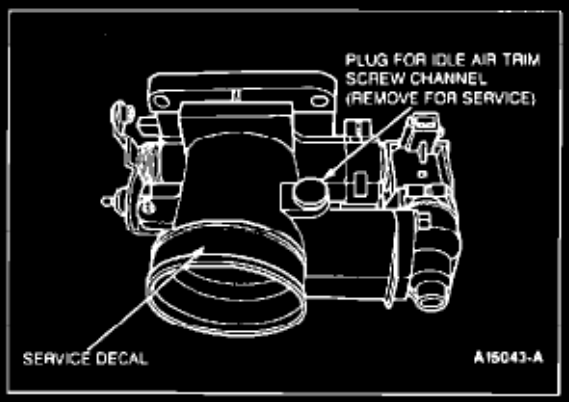


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

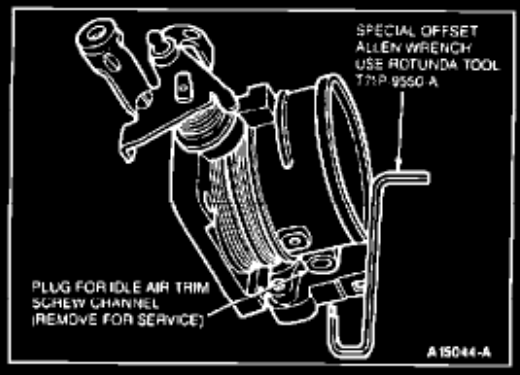
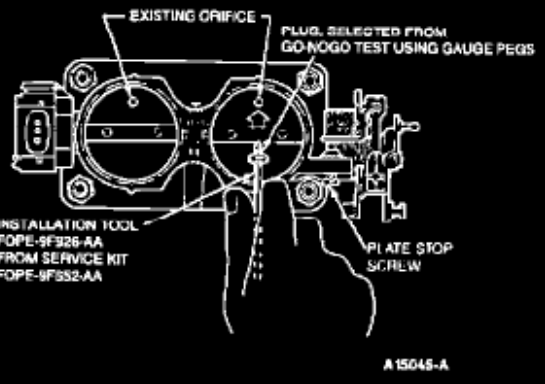


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT F-250 O-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9, if you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Idle Speed: By Symptom

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-
APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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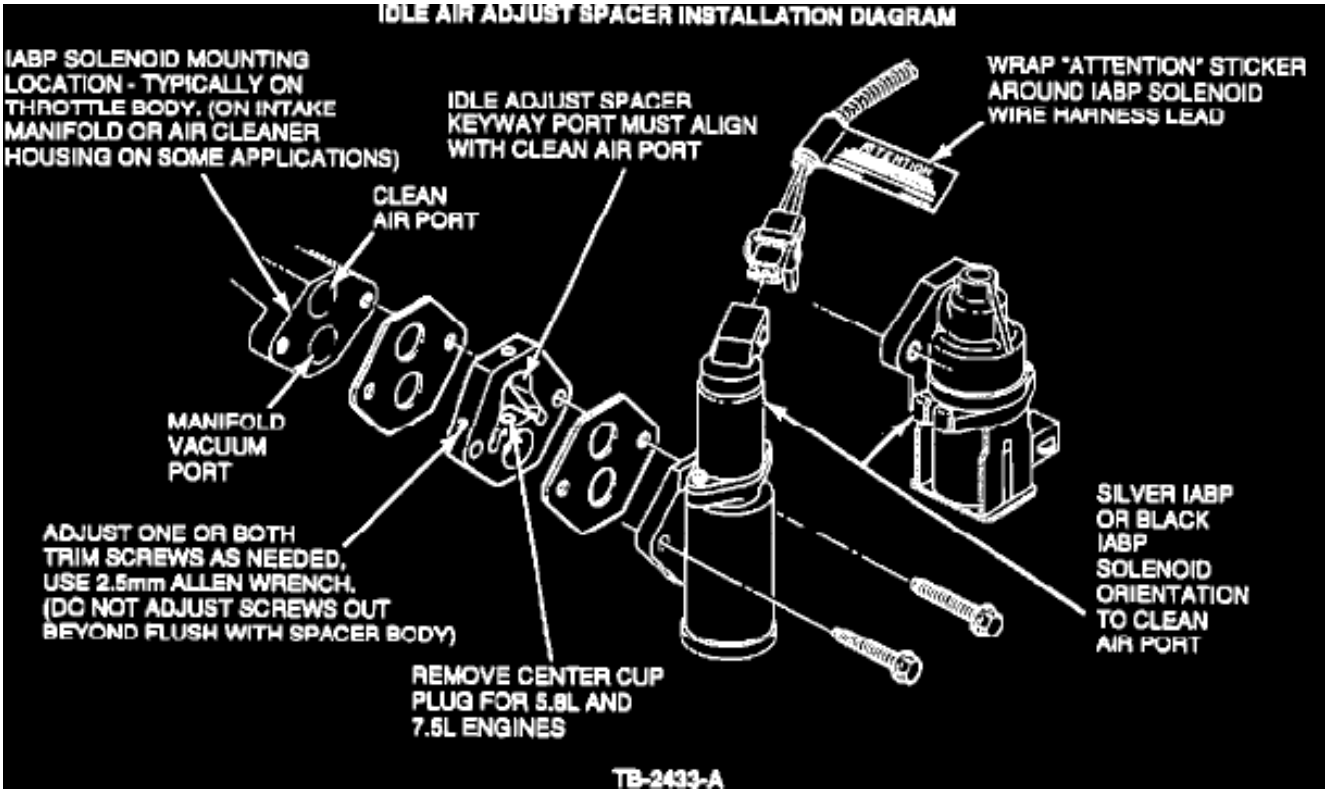
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1986 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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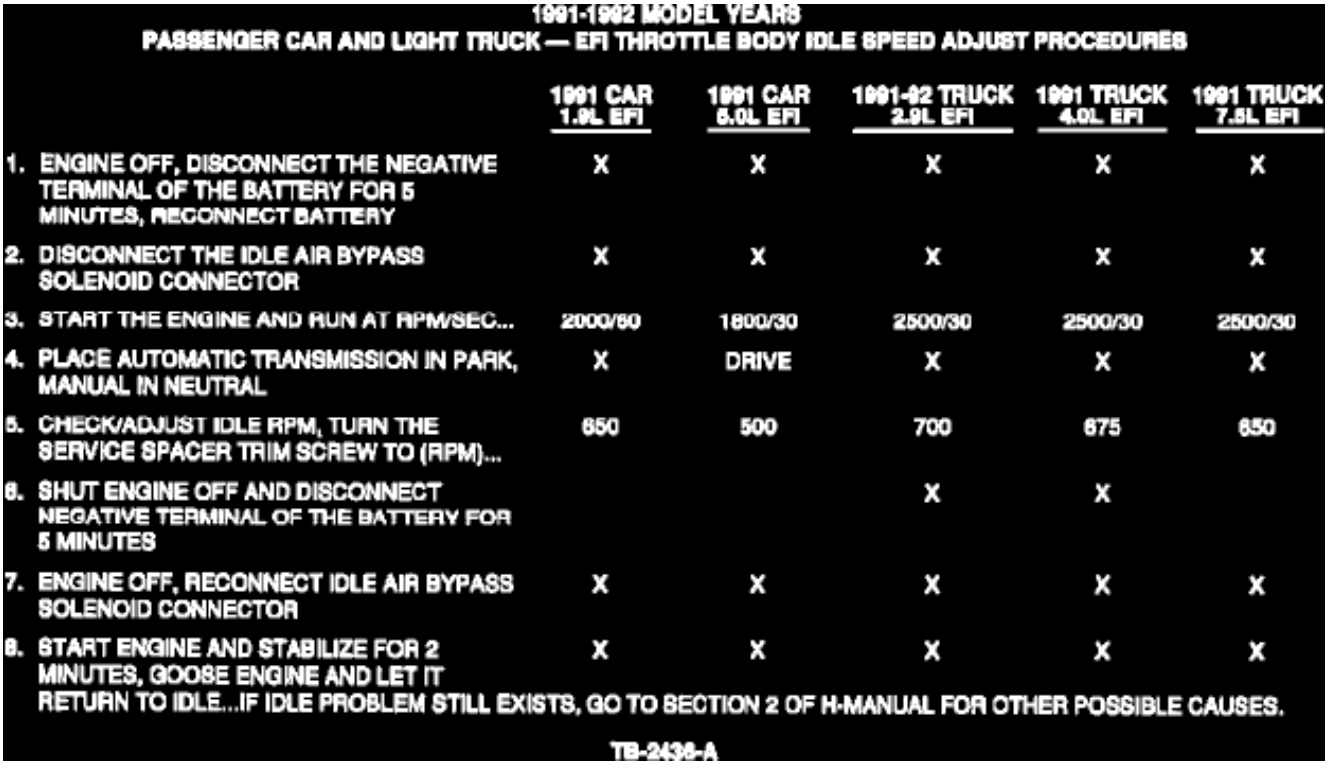
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT)		X	
		ECONOLINE (WITH REAR HEAT)	X	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

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Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F836- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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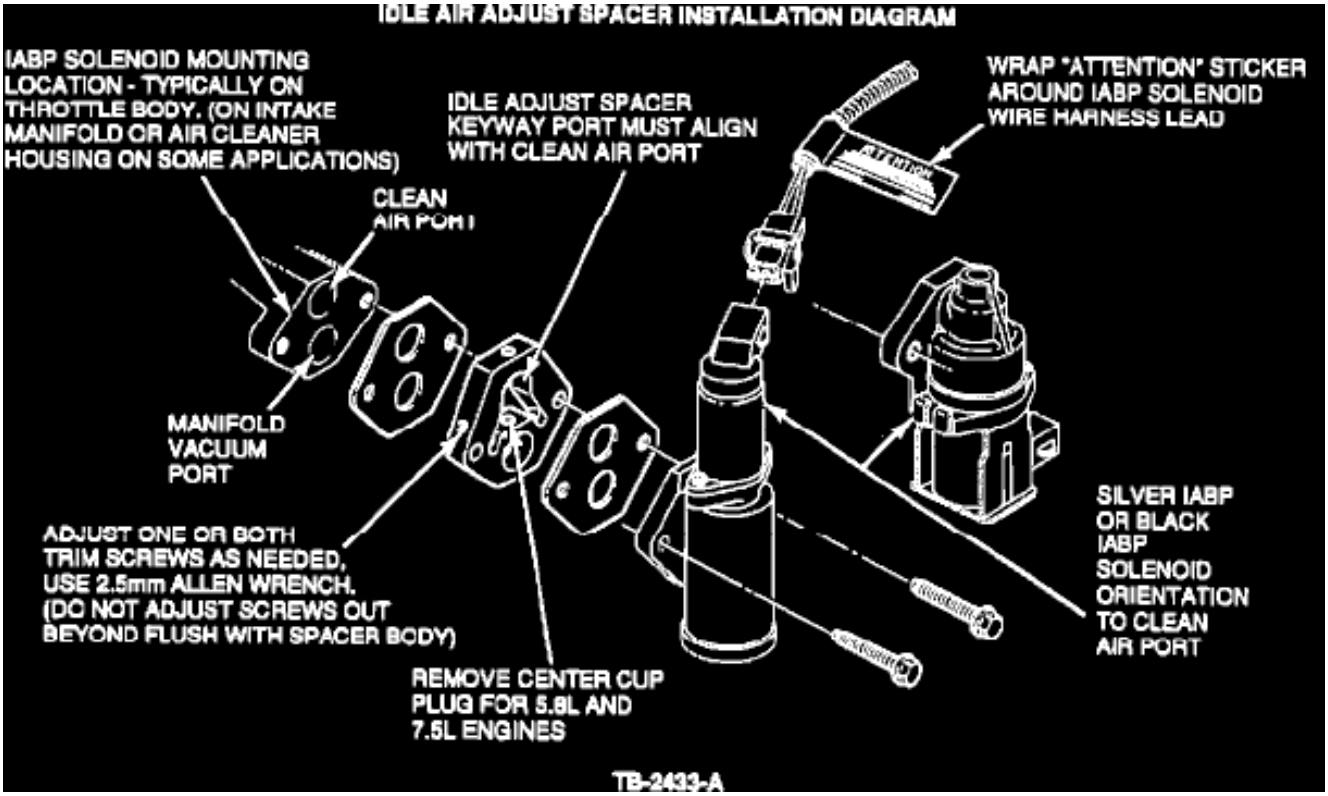
^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.



The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets

^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1986 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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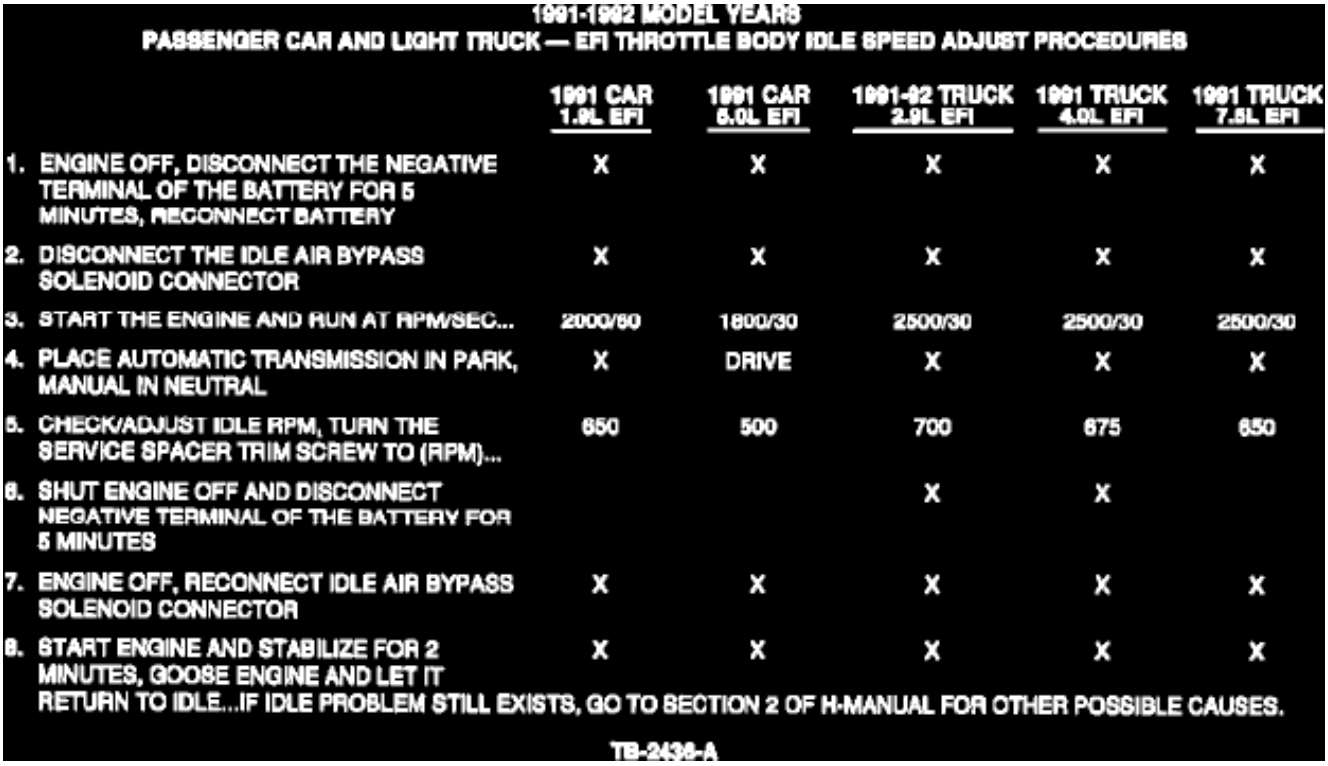
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT)		X	
		ECONOLINE (WITH REAR HEAT)	X	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

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Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -XP88- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -XP88- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F836- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Idle Speed: Adjustments With 90TF-AA Throttle Body

*** UPDATED BY TSB 9111B4, 6/14/91; TSB 9025B2, 12/90

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5

Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-125 rpm.

RPM TOO LOW a.

Turn the plate stop screw to reach an idle speed of 675 +/- 25 rpm.

NOTE: During engine break-in reduce the idle rpm by 100 rpm. RPM TOO HIGH a.

Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6, if necessary.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

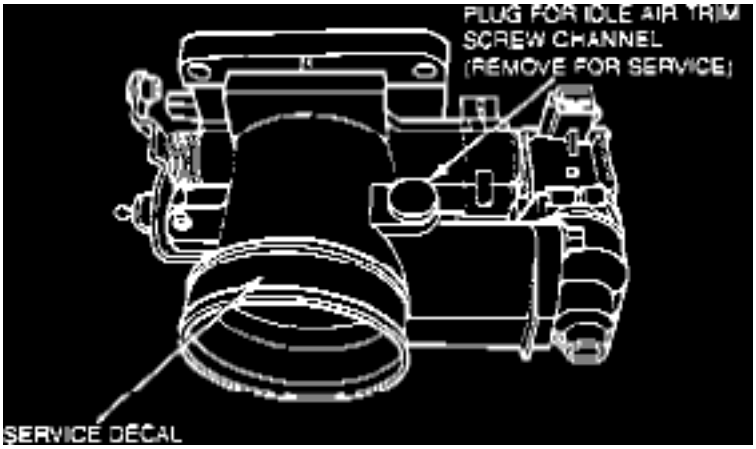
Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND

DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.



Idle Speed: Adjustments With 91TF-AA Throttle Body

*** UPDATED BY TSB 91-11B-4 6/14/91

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed. The idle speed setting procedure has been revised considerably to reflect the expanded application of the Self-Test idle speed options and because the throttle body incorporates an orifice in the throttle plate to control idle airflow as part of the sludge tolerant design.

Air Trim Screw Channel Cover

Throttle bodies with sludge tolerant design (introduced 1991 1/2 model vehicles) are clearly identified with a Yellow/Black decal. This decal warns that the throttle plate stop screw must not be adjusted counterclockwise (backed off), as this will not reduce the engine speed but may cause the throttle plate to stick in the bore. Backing out the screw may be required if the throttle body has been previously serviced (a plug in the throttle plate orifice may be present) or the plate stop screw tampered with (TPS Self-Test output out of range). The decal also warns that the throttle body must NOT be cleaned inside the bore, as this cleaning will impair the sensitive coating. The sludge accumulation will not affect the idle air flow. The cleaning procedure for the ISC-BPA still applies.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

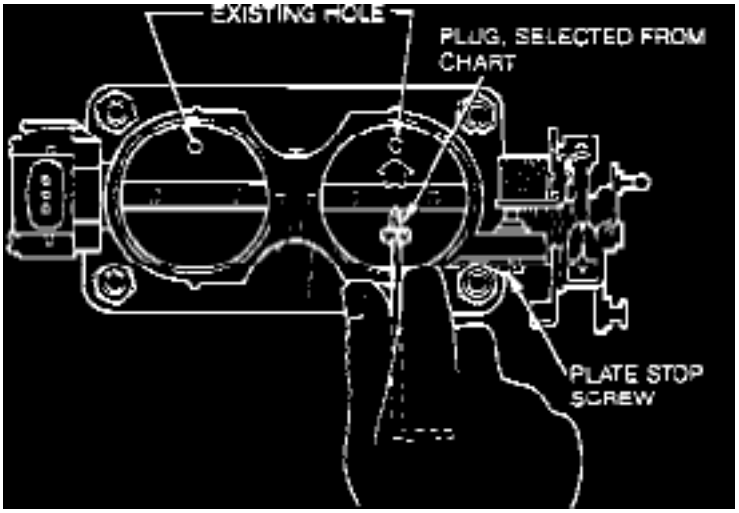
STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5



Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-120 rpm.

Throttle Plate Orifice Plug

NOTE: A plug in the throttle body orifice will decrease idle rpm. Where as an orifice without a plug will increase idle rpm. Orifice plugs and installation tools are available in service kit # FOPZ-9F652-A.

RPM TOO LOW a.

Do not clean the throttle body, check for the plate orifice plug. ^

If there is no plug, turn the screw clockwise to the desired rpm.

^ If there is a plug from previous service, remove the plug, and adjust the screw in either direction as required. NOTE: Screw must be in contact with the lever pad after adjustment.

RPM TOO HIGH a.

Turn the engine OFF.

b. Disconnect air cleaner hose.

c. Temporarily block the orifice in the throttle plate with tape. If the orifice already has a plug from previous service proceed to Step (e).

d. RESTART the engine, and check the idle speed, using a tachometer. NOTE: On vehicles with Mass Air Flow Sensors, reconnect the air intake duct hose before checking rpm. If the engine stalls, crack open the plate stop screw, but DO NOT over adjust.

e. If rpm continues to be fast, perform KOEO Self-Test. ^

If TPS output code is within range, remove tape from throttle plate, and check for other possible causes.

^ If TPS output is out of range, adjust screw for proper TPS code. Lever must be in contact with the screw.

^ If rpm is still fast, terminate this procedure, then check for other possible causes.

f. If rpm drops to 675 or lower, or engine stalls, turn the engine OFF, disconnect the air cleaner hose, and remove tape from throttle plate.

g. Install the plug with proper color code depending on throttle plate orifice size.

h. Reconnect the air cleaner hose. START the engine, and check the idle rpm using a tachometer. Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved. NOTE: Do not turn the plate stop screw counterclockwise. This may cause the throttle plate to stick at idle.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

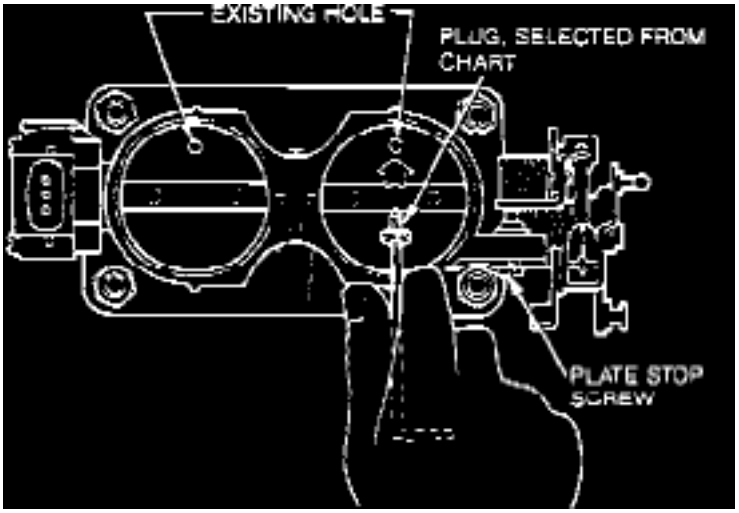
START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.

PROCEDURES FOR PLUG INSTALLATION

STEP 1

Remove air inlet tube(s) from throttle body.



Throttle Plate Orifice Plug

STEP 2

Select the proper color plug by using the Go/No-Go gauge pegs, included in the service kit (FOPZ-9F652-A).

STEP 3

Starting with the largest diameter gauge peg, attempt to insert through the throttle plate orifice.

STEP 4

If the gauge peg goes through the orifice, use the corresponding color plug. If the gauge peg does not go through, proceed with the next smaller gauge peg for Go/No-Go Test. NOTE: It is important that the largest Go/No-Go combination is used to determine the proper plug size.

STEP 5

If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe plate clean and then return to Step 3 to determine the proper plug size.

STEP 6

Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.

STEP 7

Open and snap closed the throttle several times to verify proper plug retention.

STEP 8

Reconnect the air inlet tube(s).

STEP 9

Reset idle rpm per engine requirement using the throttle plate stop screw.

Air Cleaner Fresh Air Duct/Hose: Technical Service Bulletins Engine - Water Entry Through Air Intake System

Article No. 94-3-8

02/09/94

^ AIR INTAKE - 2.9L, 3.0L, 4.0L EFI ENGINES - WATER ENTRY THROUGH AIR INTAKE SYSTEM

^ ENGINE - 2.9L, 3.0L, 4.0L EFI - POSSIBLE INTERNAL DAMAGE FROM WATER ENTRY THROUGH AIR INTAKE SYSTEM

LIGHT TRUCK: 1986-90 BRONCO II 1986-94 RANGER 1991-94 EXPLORER

This article is being republished in its entirety to add 1993-94 4.0L Ranger, 1993-94 3.0L Ranger and 1993-94 4.0L Explorer vehicles.

ISSUE: Reports have been received of internal engine damage caused by water entering the engine through the air intake system. This condition may occur when the vehicle is driven in normal wet conditions, such as water splash/spray from other vehicles, or when driven through shallow water. Improvements were made to the EFI engine air intake systems that have greatly reduced the number of reported incidences.

ACTION: Dealers should be assured that warranty repairs will be covered unless there Is evidence of owner misuse. This warranty repair policy will remain effective unless you are notified that a waterproof air intake system has been released.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-21-10 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

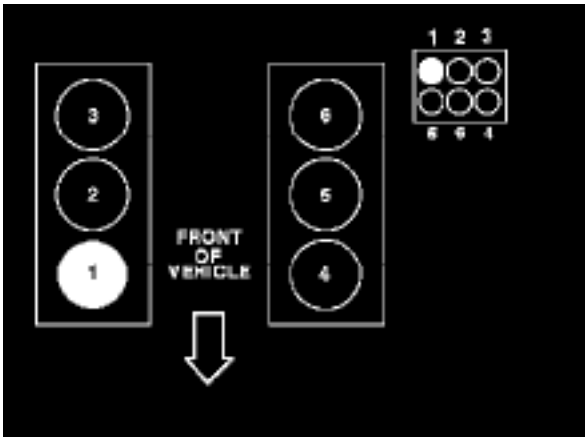
3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.



Firing Order: Specifications

V6 Firing Order: 1 4 2 5 3 6

Octane Adjust Shorting Bar - Revised Procedures

Article No. 91-11B-6

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1989 - PAGE 17-289 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGE 17-329 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGE 5-22 - EEC-IV QUICK TEST STEP 12.0 - CAR DIAGNOSIS BY SYMPTOM CHART REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 6-305 THROUGH 6-307 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

FORD: 1989-91 TAURUS, THUNDERBIRD 1991 ESCORT, MUSTANG

LINCOLN-MERCURY: 1989-90 COUGAR 1991 TRACER

LIGHT TRUCK: 1989-91 RANGER 1991 AEROSTAR, EXPLORER

ISSUE: Additional information regarding removal of the Octane Adjust Shorting Bar is required to assure compliance with Federal (EPA) Emission Standards. The following Manuals are affected on the pages indicated:

^ 1989 Engine/Emissions Diagnosis Page 17-289

^ 1990 Engine/Emissions Diagnosis Page 17-329

^ 1991 Engine/Emissions Diagnosis Page 5-22 and Pages 6-305 through 307

ACTION: Refer to the pages in this TSB article for the additional information.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 690000

Octane Adjust	Pinpoint Test	KP

Note

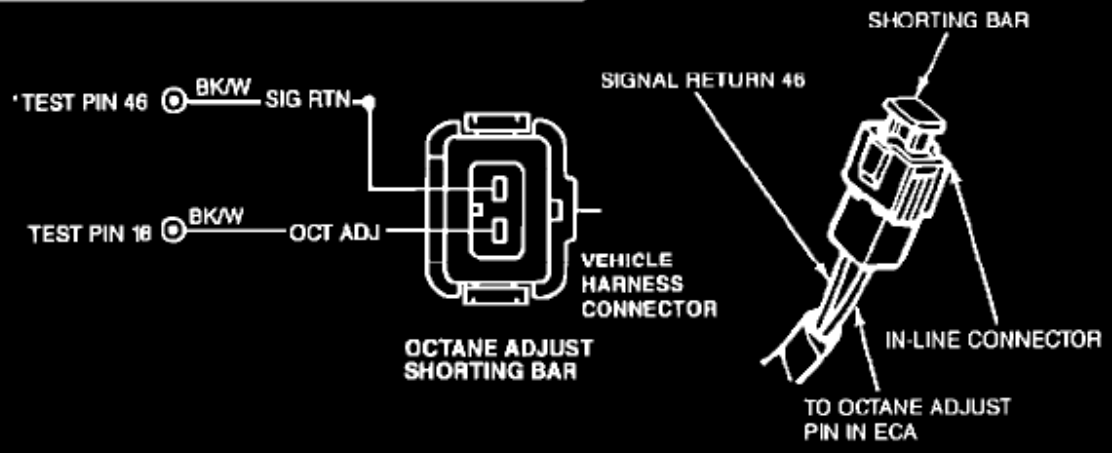
You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: Signal Return, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



OCTANE ADJUST SHORTING BAR LOCATIONS

APPLICATION	LOCATION
2.3L EFI Truck	Passenger side of fender apron, taped to the self-test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to self-test connector.

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9686-D

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

Octane Adjust

Pinpoint Test **KP**

Octane Adjust Shorting Bar Locations

Application	Location
1.9L MA SEFI	Near EEC-IV power relay, fuel pump relay and processor in passenger compartment.
2.3L EFI Truck	Passenger side of fender apron, taped to the Self-Test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to Self-Test connector.
4.0L MA EFI Aerostar	Driver side, engine cowl near windshield wiper motor take-out (alongside MAP take-out).
4.0L MA EFI Ranger/ Bronco II	Passenger side of fender apron, taped to the Self-Test connector.

Test Pin 18 (44 and 43) OCT ADJ

Application	Wire Color
2.3L EFI Truck 3.0L SEFI SHO 3.8L SEFI SC	DK/W
4.0L Aerostar	O
4.0L Ranger	W/R
1.9L MA SEFI	GR/W

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

NOTE: Use a higher octane grade of fuel to address the spark knock concern. **DO NOT** remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

EEC-IV QUICK TEST STEP: Diagnosis By Symptom

12.0

12.0 CAR DIAGNOSIS BY SYMPTOM CHART

Symptom	Pinpoint Test Step Direction												
	1.9L MA SEFI	2.3L OHC EFI	2.3L HSC EFI	2.5L AXODE SEFI	3.0L EFI PROBE	3.0L AXODE SEFI	3.0L SHO SEFI	3.8L AXODE SEFI	3.8L RWD SEFI	3.8L SC SEFI	4.6L 2V SEFI	5.0L SEFI	5.0L MA SEFI
Stumble after hot restart	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21
Fuel pump runs with engine off	—	—	—	X14	X14	X14	X14	X14	—	—	J22	J22	
Gasoline fumes under hood	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Black Exhaust Smoke	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Spark knock	KP5	KP5	—	—	DG1 or SEC. 11	—	KP5	—	—	KP5	KP5	—	—
Cooling fan does not operate Low speed cooling fan does not operate High speed cooling fan does not operate	KF10	X18	—	X18	X18	X18	X18	X18	—	X18	—	—	—
Low speed cooling fan always on	KF25	X35	—	X35	X35	X35	X35	X35	—	X35	—	—	—
High speed cooling fan always on	KF25	—	—	X40	X40	X40	x40	—	X40	X40	—	—	—

Revised 5/91

Octane Adjust

Pinpoint Test

KP

NOTE: The Octane Adjust shorting bar is similar in shape to the SPOUT in-line connector and on some applications the PSPS circuit will also have a shorting bar connector. **DO NOT** remove the shorting bar unless you have been directed by an application specific Technical Service Bulletin (TSB).

Test Pin 18, 29 or 44 OCT ADJ

Application	Wire Color
1.9L Escort/Tracer	GR/W
Car: 2.3L Mustang Truck: 2.3L Ranger 4.0L Explorer	DG
3.0L SHO	PK
3.8L SC	BK/W
4.0L Ranger	O
4.6L MA SEFI	W/R

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
3.8L SC SEFI	BK/W
All Others	GY/R

DELETION

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

TEST STEP	RESULT ▶	ACTION TO TAKE
KP1 VISUALLY INSPECT OCTANE ADJUST IN-LINE CONNECTOR SERVICE CODE 57/341		
Service Code 57/341 indicates Octane Adjust shorting bar is not in or the OCT ADJ circuit is open. • Key off. • Visually inspect Octane Adjust in-line connector. • **Is the shorting bar removed?**	Yes ▶ No ▶	GO to KP2. GO to KP4.
KP2 CHECK FOR MODIFICATION DECAL		
• Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	Testing complete. If vehicle has spark knock concern, GO to Section 2. GO to KP3.
KP3 CHECK FOR SERVICE CODE 57/341		
• Replace Octane Adjust shorting bar. • Key off. • Activate self-test. • **Is service code 57/341 present?**	Yes ▶ No ▶	GO to KP4. Testing complete. EEC system OK.
KP4 CHECK CONTINUITY OF OCTANE ADJUST CIRCUIT		
NOTE: There should be continuity from OCT ADJ circuit thru the in-line connector and shorting bar to SIG RTN circuit. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 46 and OCT ADJ Test Pin at the breakout box (see schematic for appropriate OCT ADJ circuit test pin). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE open OCT ADJ circuit or shorting bar or SIG RTN circuit. REMOVE breakout box. RERUN Quick Test.

Octane Adjust

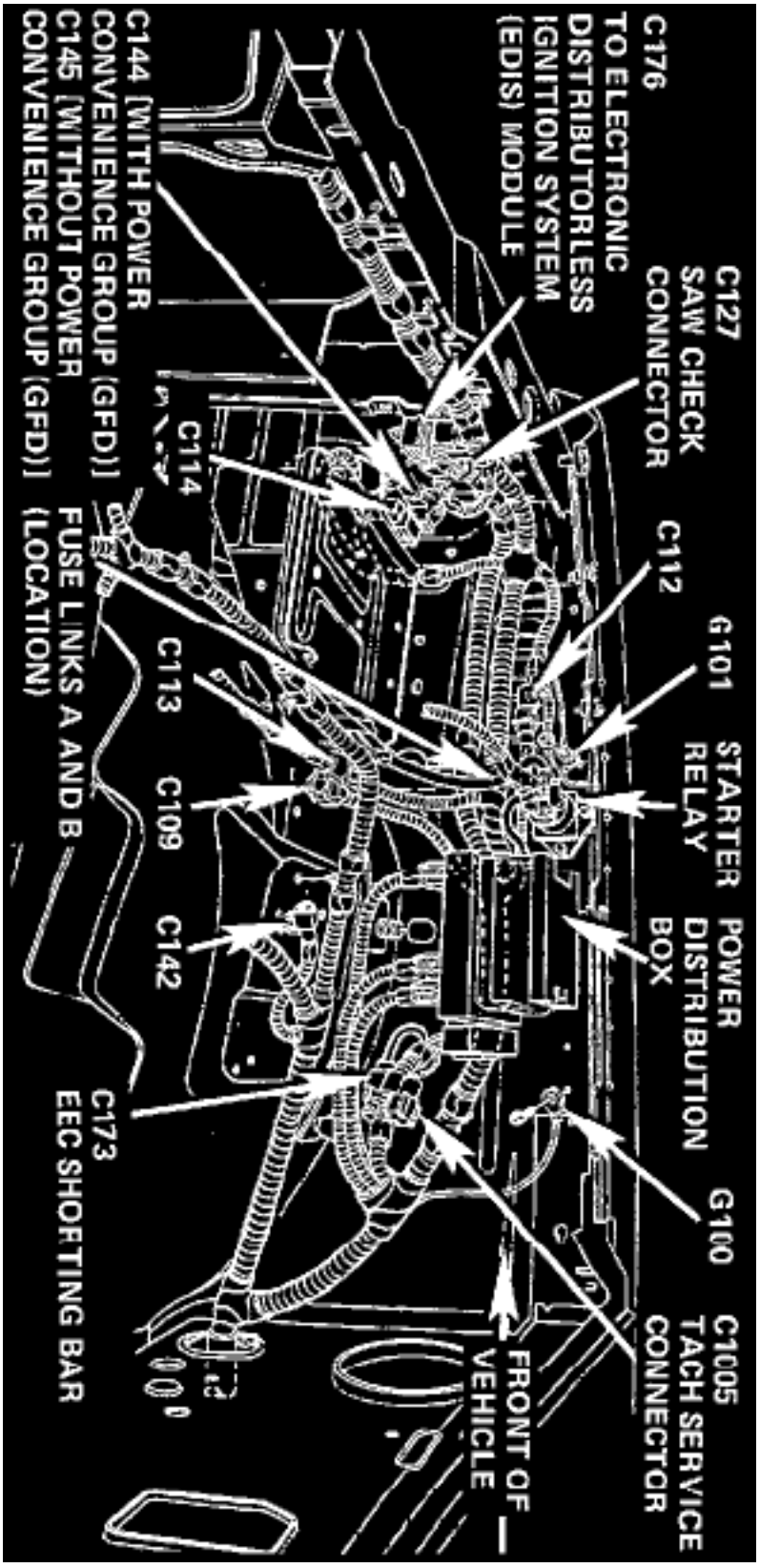
Pinpoint Test **KP**

TEST STEP	RESULT	ACTION TO TAKE
KP5 CHECK FOR SERVICE CODE 11 • Start engine and idle vehicle at operating temperature. • Key off. • Activate self-test. • Key on, engine off. • **Is service code 11 or 111 present?**	Yes ▶ No ▶	GO to KP6. **For service code 57/341:** GO to KP1. **For all other codes:** RETURN to Quick Test.
KP6 VERIFY IN-LINE CONNECTOR SHORTING BAR IS INSTALLED • Key off. • Visually inspect Octane Adjust in-line connector. • **Is shorting bar installed?**	Yes ▶ No ▶	GO to KP8. GO to KP7.
KP7 CHECK FOR MODIFICATION DECAL • Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	GO to KP10. REPLACE shorting bar. GO to Section 2 to address spark knock concern.
KP8 CHECK FOR TSB • Is there a Technical Service Bulletin (TSB) authorizing the removal of the Octane Adjust shorting bar?	Yes ▶ No ▶	GO to KP9. GO to Section 2 to address spark knock concern.
KP9 REMOVE SHORTING BAR • Remove shorting bar only if there is a TSB authorization. • Drive vehicle to verify spark knock. • **Is spark knock present?**	Yes ▶ No ▶	GO to KP10. Testing complete. EEC system OK.

Octane Adjust	Pinpoint Test	KP

TEST STEP	RESULT ▶	ACTION TO TAKE
KP10 CHECK OCTANE ADJUST CIRCUIT FOR A SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • Measure resistance between OCT ADJ circuit at the in-line connector and Test Pin 40/60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	GO to KP11.
	No ▶	SERVICE short circuit. REMOVE breakout box. If spark knock is still present, GO to Section 2.
KP11 CHECK PROCESSOR INTEGRITY • Key off. • Shorting bar removed because of TSB authorization. • Breakout box installed, processor connected. • Key on. • Measure voltage between Octane Adjust circuit and Test Pin 40/60 at the breakout box. • **Is voltage greater than 4.0 volts?**	Yes ▶	REMOVE breakout box. If spark knoock is still present, GO to Section 2.
	No ▶	REPLACE processor. REMOVE breakout box. If spark knock is still present, GO to Section 2.

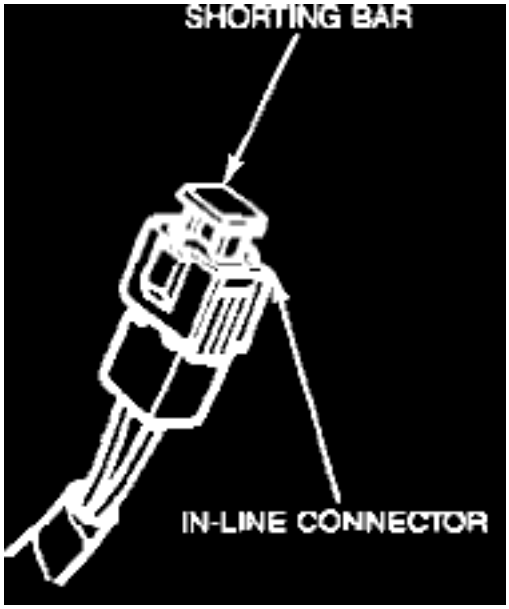
New 5/91


C127
SAW CHECK
CONNECTOR
C176
TO ELECTRONIC
DISTRIBUTORLESS
IGNITION SYSTEM
(EDIS) MODULE
C112
G101
STARTER
RELAY
POWER
DISTRIBUTION
BOX
G100
C1005
TACH SERVICE
CONNECTOR
C114
C113
C109
C142
C144 [WITH POWER
CONVENIENCE GROUP (GFD)]
C145 [WITHOUT POWER
CONVENIENCE GROUP (GFD)]
FUSE LINKS A AND B
(LOCATION)
C173
EEC SHIFTING BAR
FRONT OF
VEHICLE

Ignition Timing Connector: Locations

Component Location

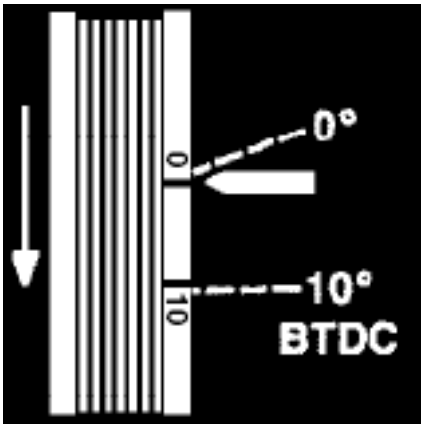
The SPOUT connector (SAW check connector C127) is located at the RH front of the engine compartment in front of the battery.



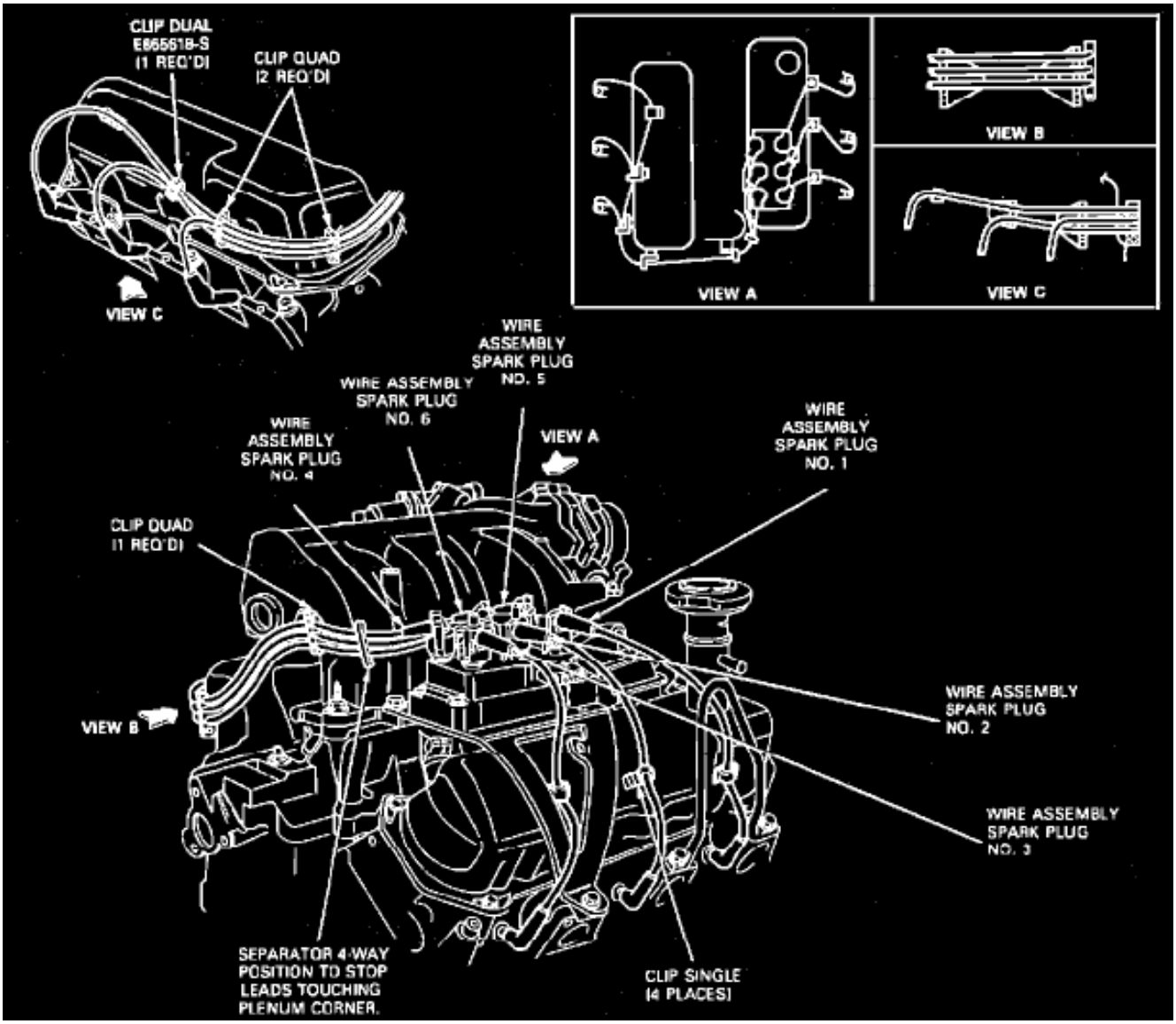
Ignition Timing Connector: Description and Operation

In-line Connector With Shorting Bar

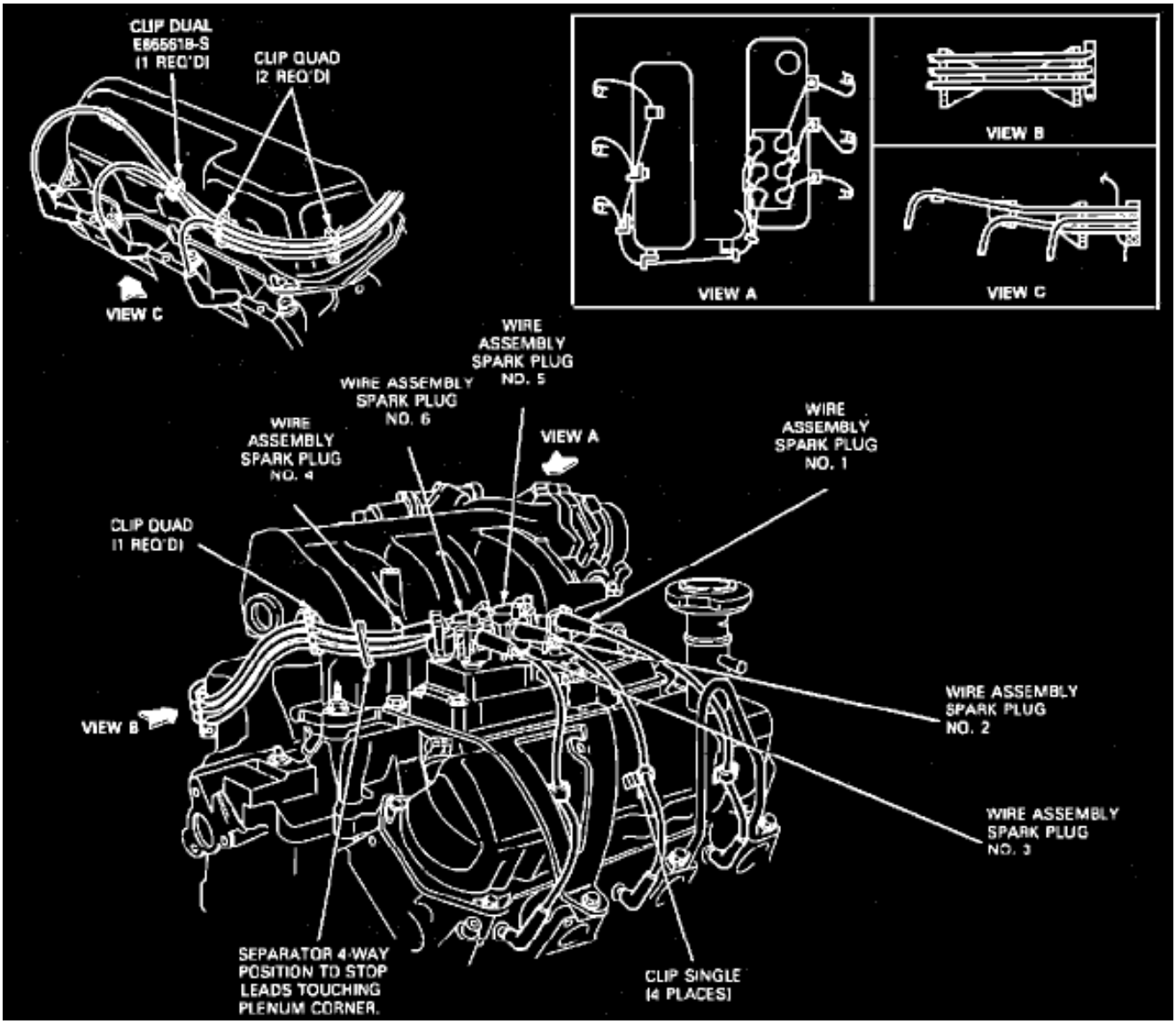
The octane adjustment switch is used to retard the ignition timing three to four degrees. When the switch jumper is INSTALLED, the timing is normal. With the jumper REMOVED, the timing is retarded. This is done to allow for optimum spark advance for effective combustion of the air/fuel mixture.



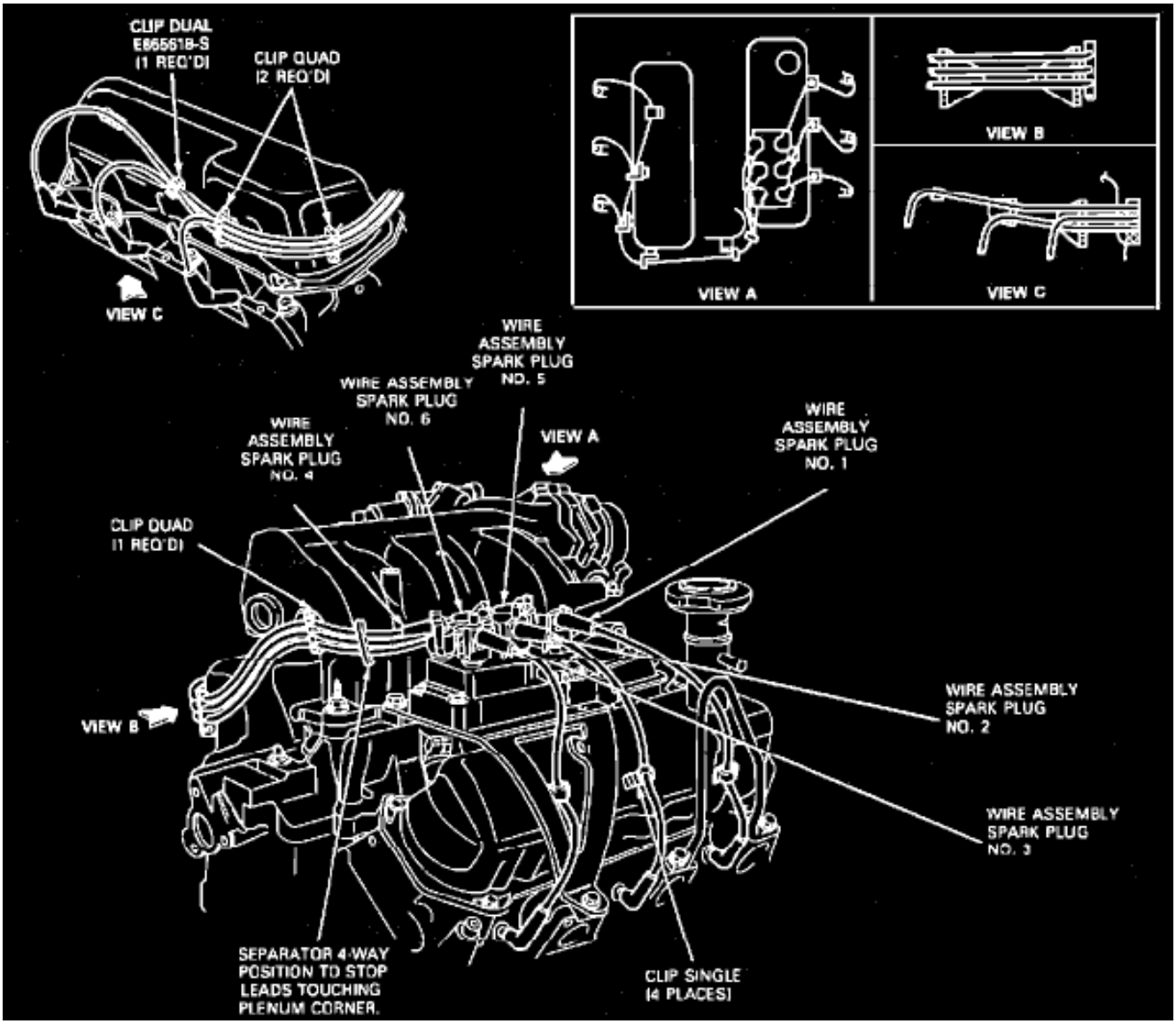
Timing Marks



Spark Plug Wire Assembly



Spark Plug Wire Assembly



Ignition Cable: Service and Repair

Spark Plug Wire Assembly

Removal:

1. When removing spark plug wires from the spark plugs, use the spark plug wire remover T74P-6666-A or equivalent. Grasp and twist the boot back and forth on the plug insulator to free the boot.

2. Use the special tool or equivalent to pull the boot from the plug. Do not pull on the wire directly, as it may become separated from the connector inside the boot.

3. To remove the wires from the coil pack, squeeze the locking tabs of the coil wire retainer and remove using a twisting and pulling motion. Do not pull on the wire.

INSTALLATION:

CAUTION: Proper installation of spark plug wires is critical to vehicle operation. If one spark plug wire is not properly installed on the spark plug or ignition coil, both spark plugs connected to that coil may not fire under load.

1. Whenever a high tension wire is removed for any reason from a spark plug or ignition coil, or a new high tension wire is installed, Silicone Dielectric Compound D7AZ-19A331-A or equivalent must be applied to the boot prior to installation. Using a small tool, coat the entire interior surface of the boot.

2. Install each wire on the proper ignition coil terminal. The terminal cylinder numbers are identified on the ignition coil pack. Ensure that both coil boot retainer locking tabs have engaged.

3. Remove the wire retaining brackets from the old wiring set and install the brackets on the new wires in the same position. Install the wires and retaining brackets on the engine.

4. Connect the wires to the proper Spark plugs.

Spark Plug: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Article No. 92-3-8

01/29/92

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AWSF42C Spark Plug (Pkg / 10) BG

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OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Spark Plug: Specifications Spark Plug Gap

SPARK PLUG

Electrode Gap ..... 0.052-0.056 in (1.3-1.4 mm)

Spark Plug: Specifications Tightening Torque

SPARK PLUG

Tightening Torque ..... 10-16 ft lb (14-22 Nm)

Compression Check: Specifications

Compression Pressure .....
PSI of lowest cylinder must be within 75% of highest

Valve Clearance: Locations

Valve Arrangement (Front To Rear)

.....

L.H. I-E-I-E-I-E Valve Arrangement (Front To Rear)

.....

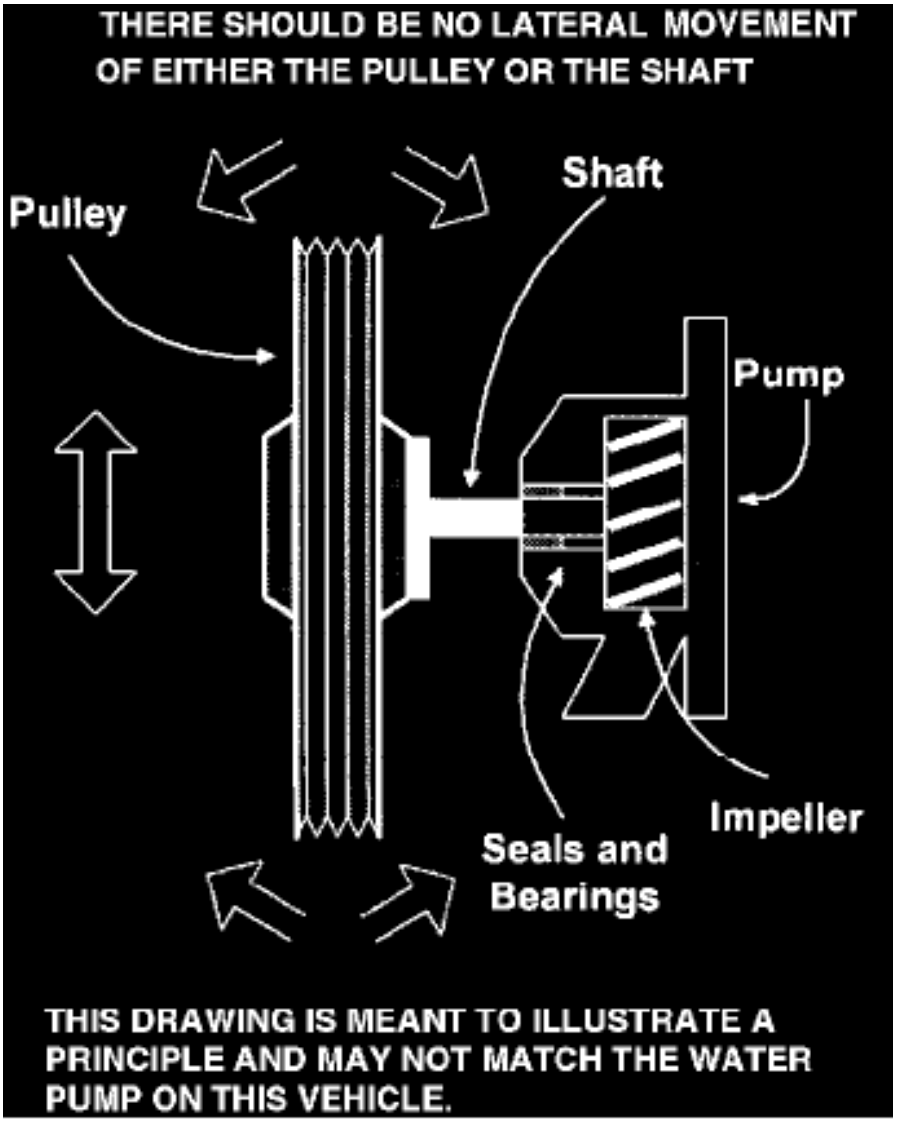
R.H. E-I-E-I-E-I

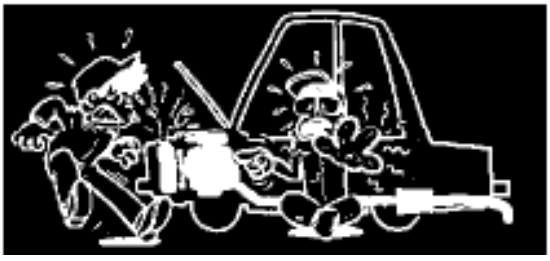
Valve Clearance: Adjustments

The hydraulic roller tappets have non-adjustable rocker arms. The tappets are not adjustable, and if found to be excessively worn or noisy, should be tested and replaced.

Water Pump: Specifications

Water Pump Assembly Attaching Bolts ..... 8.5-12 Nm (6-9 ft lb) Water Pump Pulley Bolts .... 24-30 Nm (18-23 ft lb)


THERE SHOULD BE NO LATERAL MOVEMENT
OF EITHER THE PULLEY OR THE SHAFT
Pulley
Shaft
Pump
Impeller
Seals and
Bearings
THIS DRAWING IS MEANT TO ILLUSTRATE A
PRINCIPLE AND MAY NOT MATCH THE WATER
PUMP ON THIS VEHICLE.



Water Pump: Testing and Inspection Verifying Water Pump Problem

VERIFYING WATER PUMP PROBLEM

Check for Loose Water Pump Pulley

As the pump shaft seals and bearings wear with age the pulley/shaft may develop a wobble or lateral runout.

- With the engine off and the key removed from the ignition, attempt to move the pulley from side to side and back and forth. There should be no detectable movement. The pulley should turn smoothly, with no rough spots.

- The water pump should be replaced if any pulley wobble is detected. If the water pump is not replaced the pump shaft may eventually seize or break.

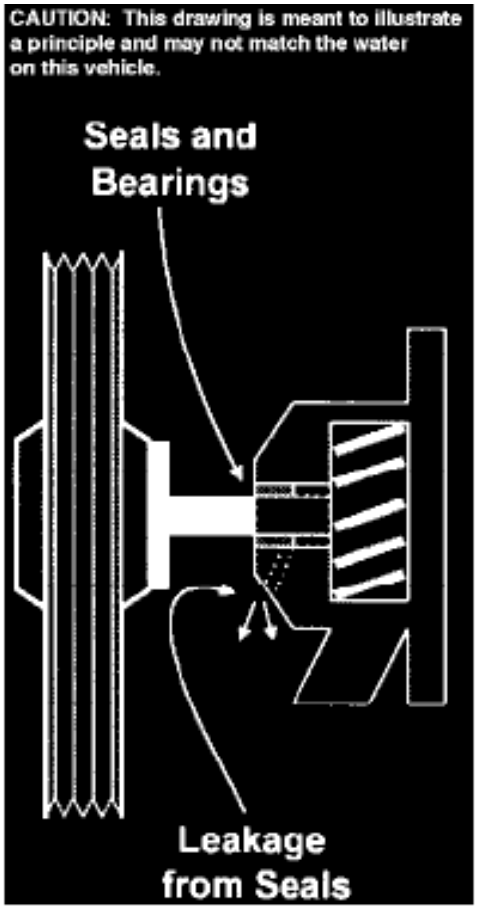
NOTE: Incorrect belt tension (too tight) may cause premature wear of the bearings and seals.

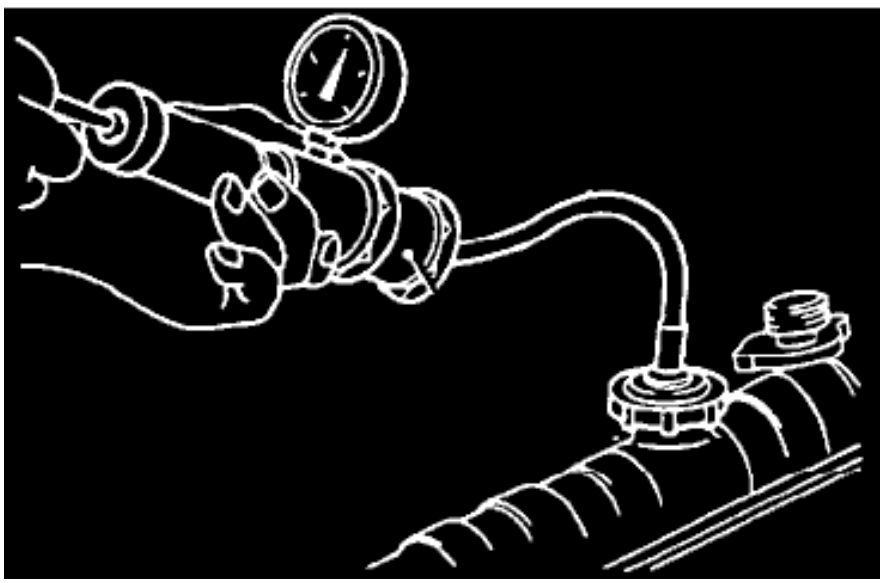
WARNING: Never remove a radiator cap while the engine is hot. Severe personal injury may result.

Inspect for Leakage

1. With the engine "OFF" and cold:

- Check coolant level and refill if necessary.


CAUTION: This drawing is meant to illustrate a principle and may not match the water on this vehicle.
Seals and Bearings
Leakage from Seals



- Inspect the water pump for leakage. Closely check the following areas: -

Inspection (weep) hole.

- Pump shaft.

- Gasket.

2. Pressurize the cooling system with a pressure tester and again check for leaks. Do not exceed the rated pressure of the radiator cap.

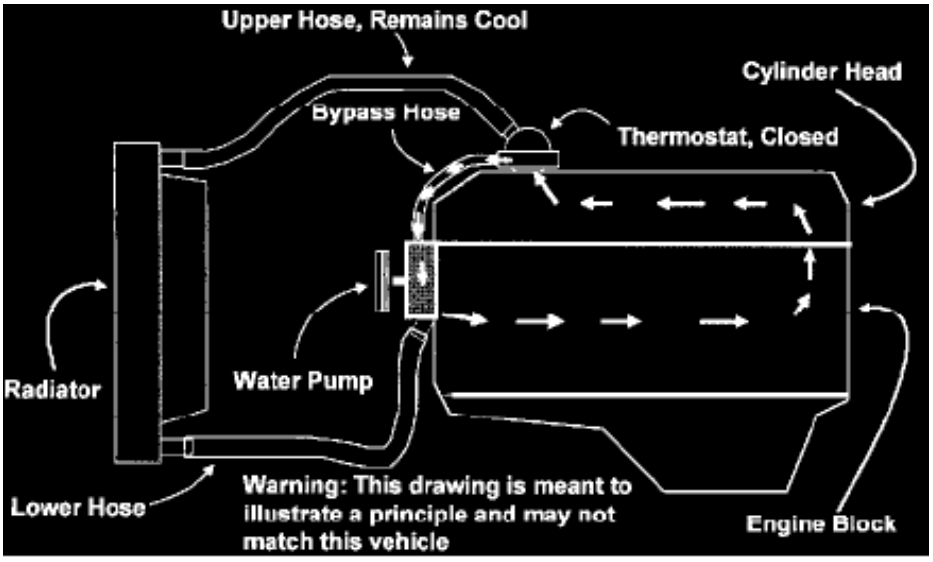
NOTE: If any leaks are found, verify that they are not originating from a component near or above the water pump (i.e. thermostat, loose radiator hoses, intake gasket, engine coolant temperature sensor)

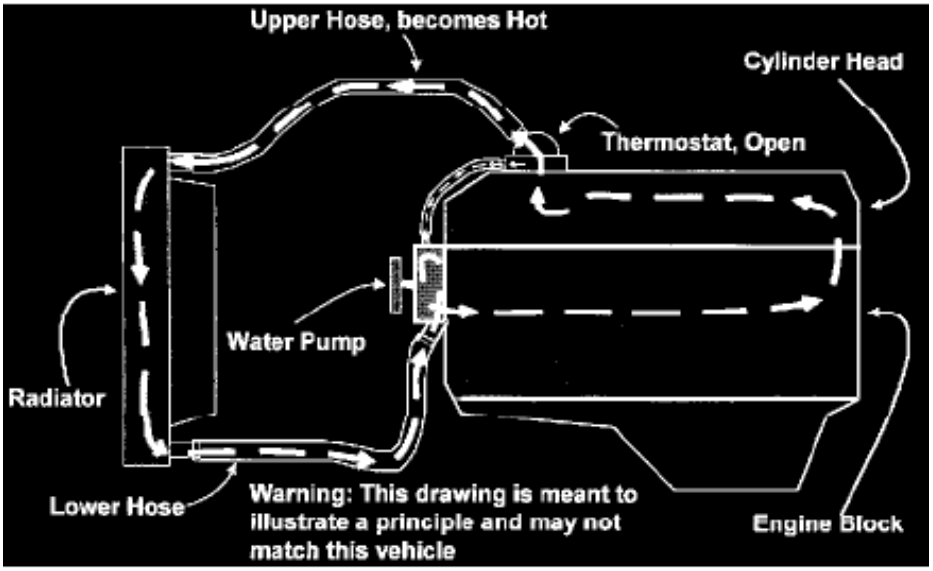
CAUTION: When finished, immediately re-install the radiator cap.

3. If no leaks are found, start and warm the engine until the thermostat opens. Stop the engine and check for fresh leakage around the water pump

shaft.

NOTE: Occasionally water pumps will only leak around the shaft seals while the shaft is rotating.


Upper Hose, Remains Cool
Cylinder Head
Bypass Hose
Thermostat, Closed
Radiator
Water Pump
Lower Hose
Warning: This drawing is meant to illustrate a principle and may not match this vehicle
Engine Block


Upper Hose, becomes Hot
Cylinder Head
Thermostat, Open
Water Pump
Radiator
Lower Hose
Warning: This drawing is meant to illustrate a principle and may not match this vehicle
Engine Block

Water Pump: Testing and Inspection After Repairs Operational Check

COOLING SYSTEM OPERATIONAL CHECK

IMPORTANT: Always verify the operation of the thermostat and cooling fan prior to driving the vehicle after a cooling system repair.

HOW

- With the cooling system filled with coolant and the radiator cap installed, start the engine and allow the coolant to warm up.

- The upper radiator hose should remain cool to the touch until the coolant within the engine block and head has reached the thermostat opening temperature.

-

The thermostat opening should be indicated by a rapid warm up of the upper radiator hose.

- If upper hose gradually warms up, the thermostat may be stuck open (assuming the engine is started cold)

- If the coolant temperature reaches the normal operating temperature (as indicated by the temperature gauge) before the upper hose becomes warm, the engine should be turned off, and the cooling system allowed to cool down. The thermostat may be stuck closed and should be removed and tested.

WARNING: Never remove a radiator cap while the engine is hot. Severe personal injury may result.

- After the cooling system has warmed up, turn off the engine, and verify the cooling fan clutch has engaged. -

The clutch should offer resistance when attempting to rotate the fan by hand.

- When the engine is cold the fan should spin freely on the clutch.

WHY

Thermostat Closed, Cold Engine - With the thermostat closed, coolant flow through the radiator is blocked forcing the coolant to re-circulate through the block and head. This allows for a rapid warm up. During this time there should be little or no coolant flow through the upper radiator hose.

Thermostat Open, Warm Engine - Once the coolant has reached normal operating temperature, the thermostat begins to open, allowing coolant flow through the upper hose and into the radiator. The thermostat will continue to regulate the amount of coolant flow to the radiator to maintain a "Minimum" operating temperature.

Water Pump: Testing and Inspection After Repairs Leak Check

AFTER REPAIRS LEAK CHECK

PURPOSE

Initially fill the cooling system and check for leaks prior to starting the engine and bleeding the system. Although the system will not be completely full, any leaks which are detected may be fixed before the engine and cooling system are hot.

NOTE: It is much easier to repair a leak on a cold engine than on a hot engine.

HOW

- Fill the cooling system until the radiator is full.

- Apply pressure to the system with a pressure tester.

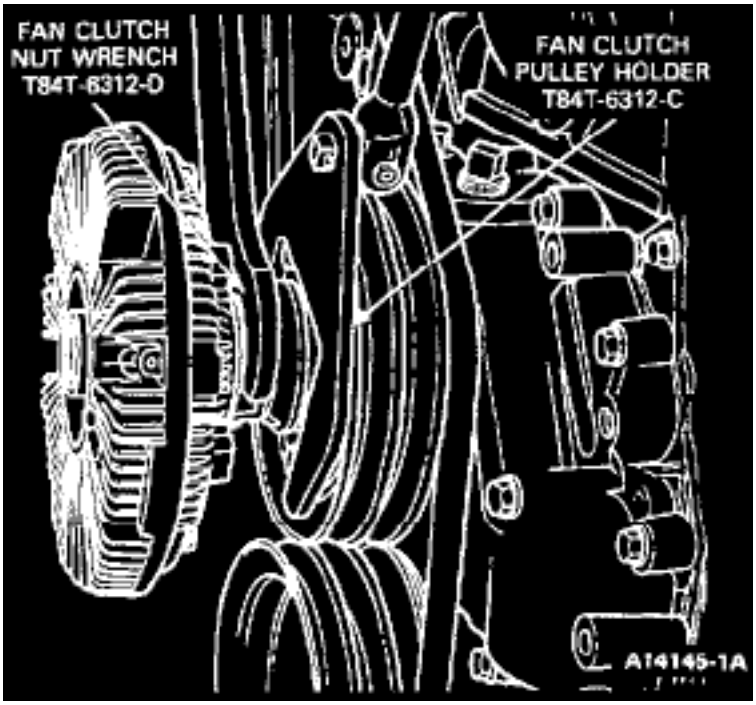
- Carefully check for leaks around: -

All hoses and clamps.

- Water pump sealing surfaces.

- Any cooling system component which was removed or replaced.

- If no leaks are detected continue with the fill and bleed procedure.



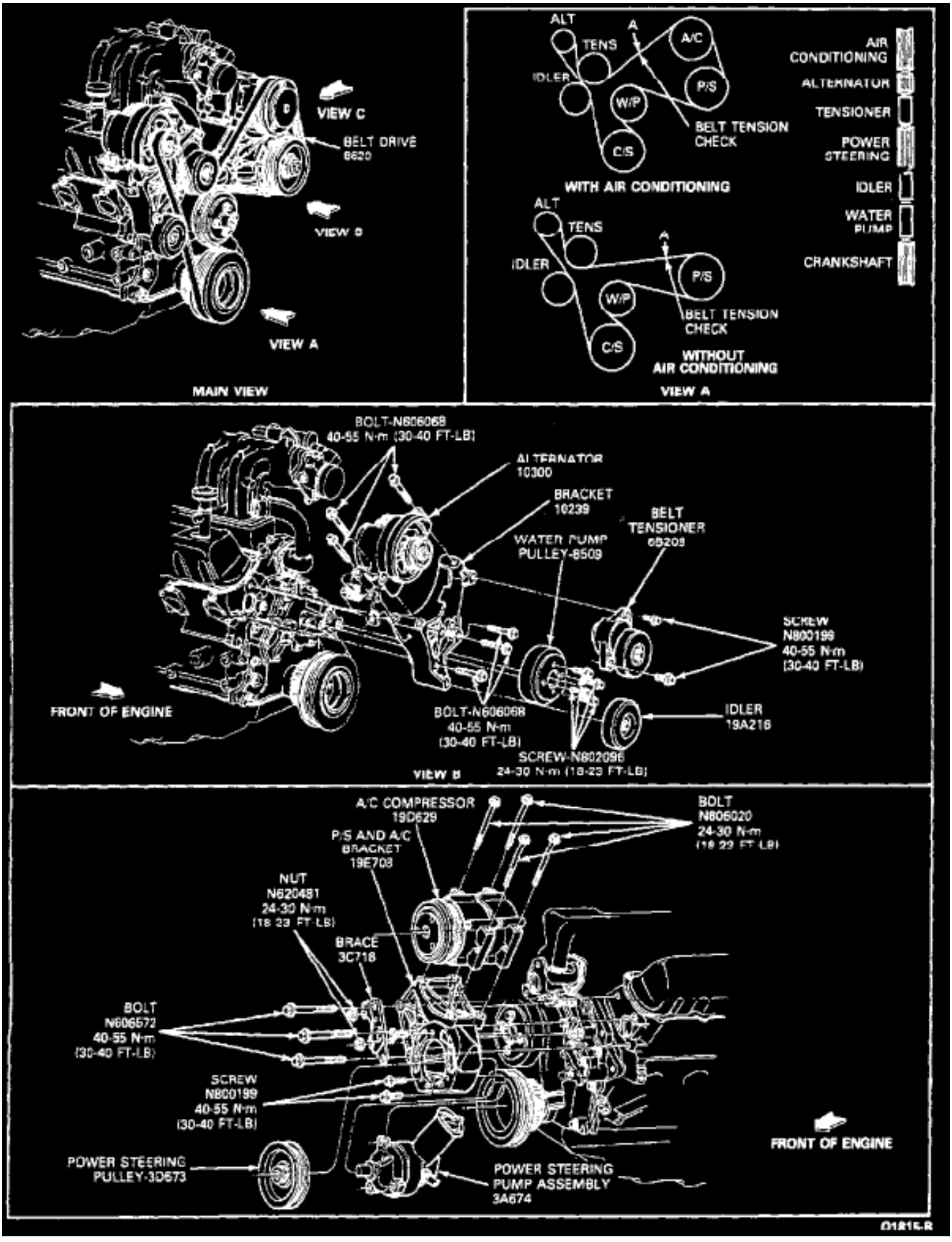
Water Pump: Service and Repair Removal

REMOVAL

1. Drain the coolant. Detach the radiator lower hose and the heater return hose from the water pump.

Fan Clutch Tools

2. Remove fan and clutch assembly using Fan Clutch Pulley Holder T84T-6312-C and Fan Clutch Nut Wrench T84T-6312-D or equivalents. 3. Loosen the alternator mounting bolts and remove the belt. Vehicles with A/C, remove alternator and bracket. 4. Remove the water pump pulley. 5. Remove the water pump assembly attaching bolts and remove water pump assembly.


VIEW C
BELT DRIVE
8620
VIEW B
VIEW A
MAIN VIEW
ALT
TENS
IDLER
A
A/C
P/S
W/P
C/S
BELT TENSION CHECK
WITH AIR CONDITIONING
WITHOUT AIR CONDITIONING
VIEW A
AIR CONDITIONING
ALTERNATOR
TENSIONER
POWER STEERING
IDLER
WATER PUMP
CRANKSHAFT
BOLT-N606068
40-55 N·m (30-40 FT-LB)
ALTERNATOR
10300
BRACKET
10239
BELT TENSIONER
8620B
WATER PUMP PULLEY-8509
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
FRONT OF ENGINE
BOLT-N606068
40-55 N·m
(30-40 FT-LB)
IDLER
19A216
SCREW-N802096
24-30 N·m (18-23 FT-LB)
VIEW B
A/C COMPRESSOR
19D629
P/S AND A/C BRACKET
19E708
BOLT
N606020
24-30 N·m
(18-22 FT-LB)
NUT
N620481
24-30 N·m
(18-23 FT-LB)
BRACE
3C718
BOLT
N606572
40-55 N·m
(30-40 FT-LB)
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
POWER STEERING PULLEY-3D673
POWER STEERING PUMP ASSEMBLY
3A674
FRONT OF ENGINE
D1215-R

Water Pump: Service and Repair Installation

INSTALLATION

1. Remove all gasket material from the sealing surfaces on front cover and water pump assembly. Apply sealer to both sides of the new gasket and

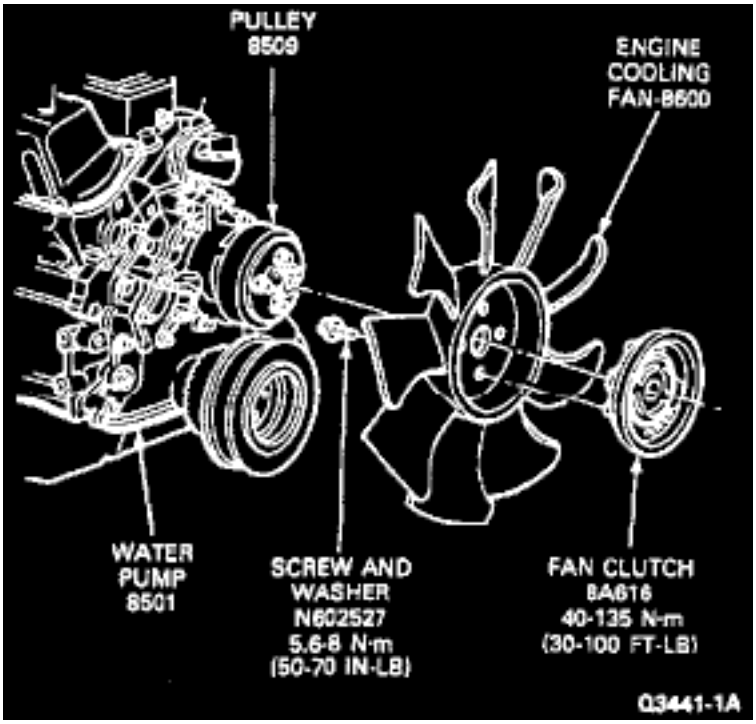
place the gasket on the water pump.

2. Position the water pump assembly to the front cover with two bolts finger-tight. Tighten all water pump assembly attaching bolts to 8.5-12 Nm

(6-9 ft lb).

Drive Belt Routing

3. Install water pump pulley. Tighten bolts to 24-30 Nm (18-23 ft lb). With A/C, install bracket and alternator. Install belt and adjust tension. 4. Connect both hoses to water pump and tighten hose clamps. Fill and bleed cooling system.



Fan And Clutch

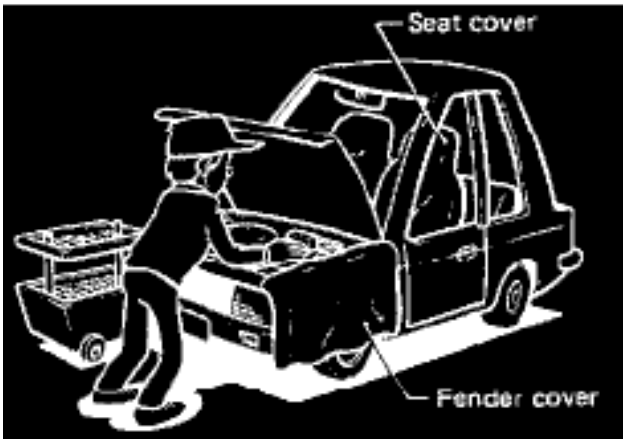
5. Install fan and clutch assembly using Fan Clutch Pulley Holder T84T-6312-C and Fan Clutch Nut Wrench T84T-6312-D or equivalents. Tighten

to 40-135 Nm (30-100 ft lb).

6. Start the engine and check for leaks.

T84T-6312-C

T84T-6312-D


Seat cover
Fender cover

Water Pump: Tools and Equipment

RECOMMENDED TOOLS

Fan Clutch Holding Tool

Fan Clutch Wrench

- Fan clutch wrenches, necessary for removing fan clutch: -

Clutch Holding Tool, T84T-6312-C

- Fan Clutch Nut Wrench, T84T-6312-D

- Drip pan - For draining coolant.

- Gasket scraper.

-

Torque Wrenches: -

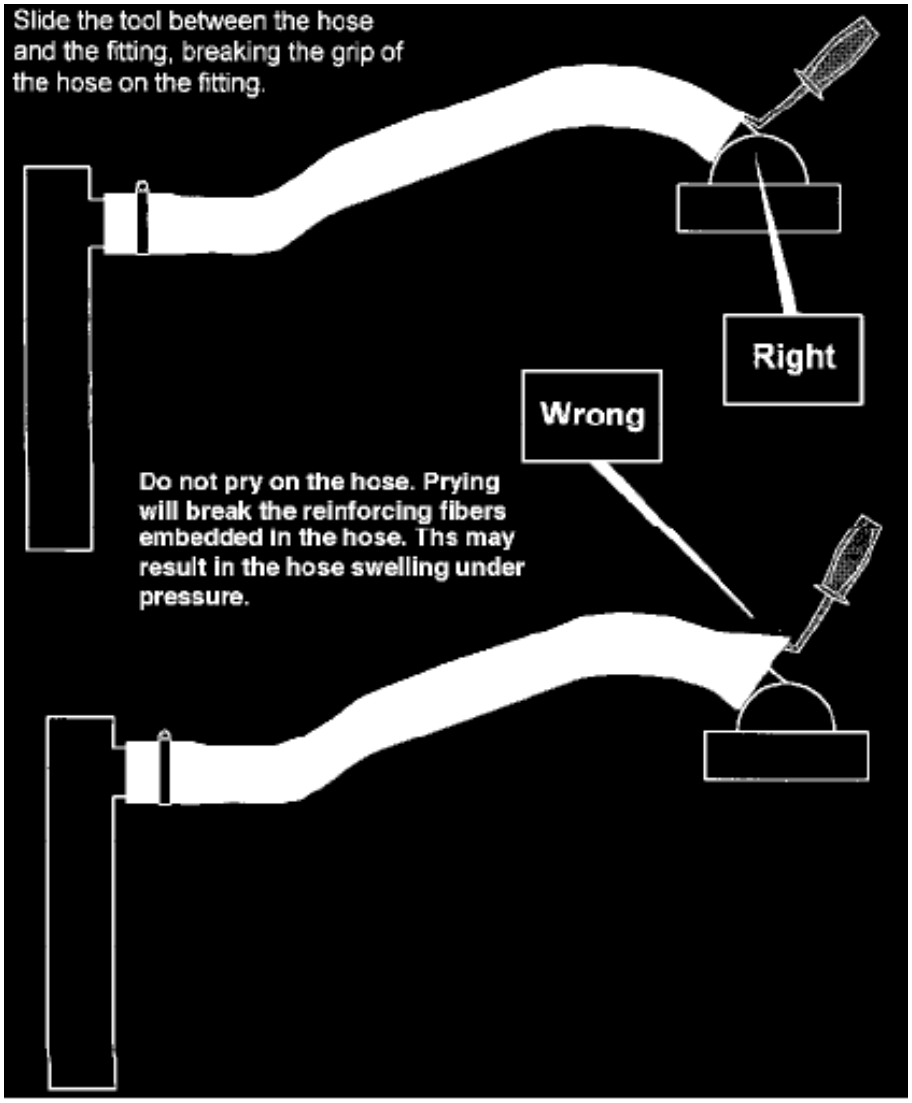
Low Range (0-50 ft-lb) for covers and brackets.

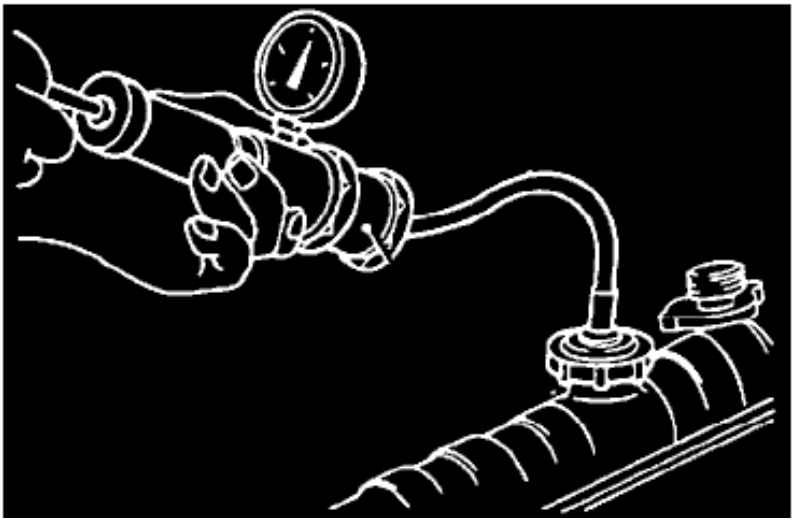
- High Range (0-150 ft-lb) for fan clutch.

- Full set of Metric sockets and wrenches.

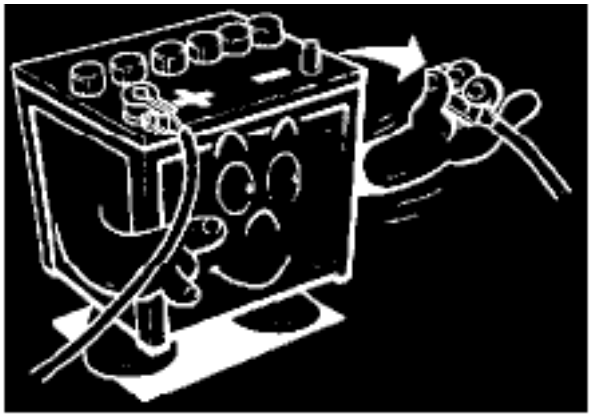
- Fender covers.

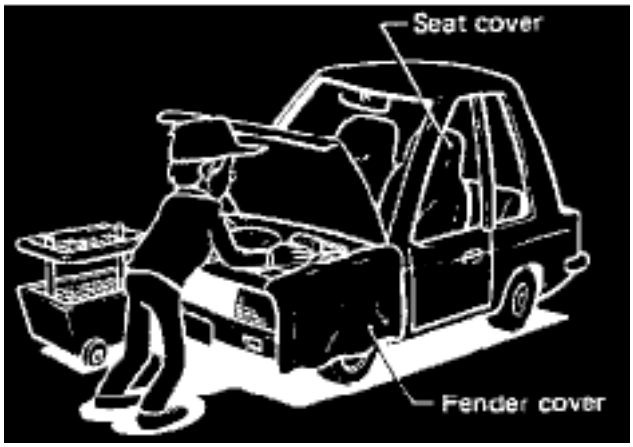
OPTIONAL


Slide the tool between the hose and the fitting, breaking the grip of the hose on the fitting.
Right
Wrong
Do not pry on the hose. Prying will break the reinforcing fibers embedded in the hose. Ths may result in the hose swelling under pressure.



- Radiator hose removal tool.
- Cooling system pressure tester.





Water Pump: Fundamentals and Basics Initial Preparations

INITIAL PREPARATIONS

Disconnect Battery

When working near or around the cooling fan or drive belts, accidentally engaging the starter or cooling fan can result in serious personal injury.

The negative battery terminal should be disconnected prior to commencing work and should not be reconnected until after the water pump is installed and the engine is ready to restart.

Fender Covers

Fender covers will prevent damage to the vehicles finish while performing the job.

NOTE: A fender cover folded over the radiator will prevent accidental damage to the radiator. The radiator can be easily damaged should a wrench slip off of a bolt while working on the water pump.

Coolant Drip Pan

Pre-position a drip pan under the vehicle to prevent any incidental spills.

Water Pump: Fundamentals and Basics Gasket Removal and Inspection

REMOVAL

- Remove all traces of the old gasket material. It only takes a very small amount of left over material to cause the new gasket to leak.

- Never reuse gaskets. After a gasket has been initially installed and removed it will no longer be able to compensate for the varying expansion rates of the water pump and block. An old gasket may seal initially but as the engine heats up cools down, the old gasket will be prone to leakage.

- When removing the gasket with a gasket scraper, be very careful not to gouge the sealing surface. Very small scratches in the sealing surface are likely to leak.

HINT: Always sharpen your gasket scraper prior to starting a job. A dull scraper is more likely to slip and gouge the sealing surface.

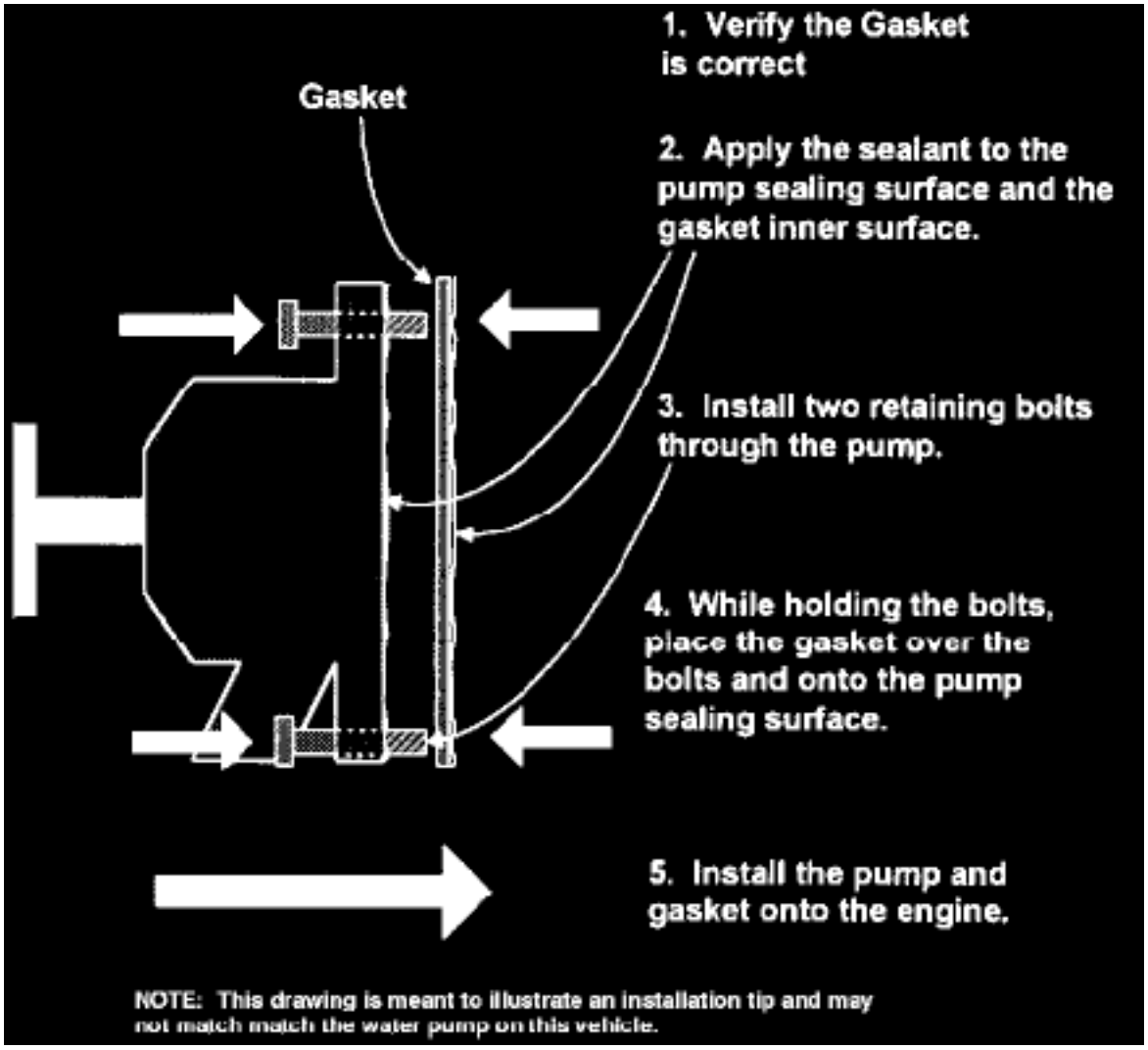
- If you are using a buffing wheel to clean the gasket surface, be very careful not to burn the surface.

CAUTION: Buffing wheels can rapidly remove metal from the sealing surface, be very careful and check your work frequently.

INSPECTION

- Verify the timing cover has not been damaged by the impeller. If a worn out water pump (shaft wobbles) is operated over a length of time the impeller (which also wobbles inside the pump) may wear into the timing cover. If the timing cover shows any signs of wear it should be replace.

- Verify the gasket sealing surfaces are free of all gasket material, dirt, gouges, and contaminants (such as coolant or oil).



Water Pump: Fundamentals and Basics Installation Tips and Hints

WATER PUMP INSTALLATION NOTES

- Compare the old pump to the new pump and verify: -

Shaft lengths match exactly.

- Retaining bolt holes match exactly.

-

Install the fan retaining studs into the shaft flange prior to installing the pump. The studs are much easier to install with the pump out of the vehicle.

- Prior to applying the sealant to the gasket and pump, practice installing the pump to the engine. If any problems are encountered they will be easier to solve without the silicone applied.

- Verify the retaining bolts and bolt holes have clean threads. Re-tap or chase the threads as necessary.

-

To simplify the gasket installation process and minimize errors, install the gasket as follows:

1. Verify the gasket is correct. 2. Apply the sealant to the pump sealing surface and the gasket inner surface. Apply only a light film of sealant to the sealing surfaces.

CAUTION: Excess sealant will squeeze out on the inside of the pump and may block the radiator or heater core coolant passages.

3. Install two retaining bolts through the pump.

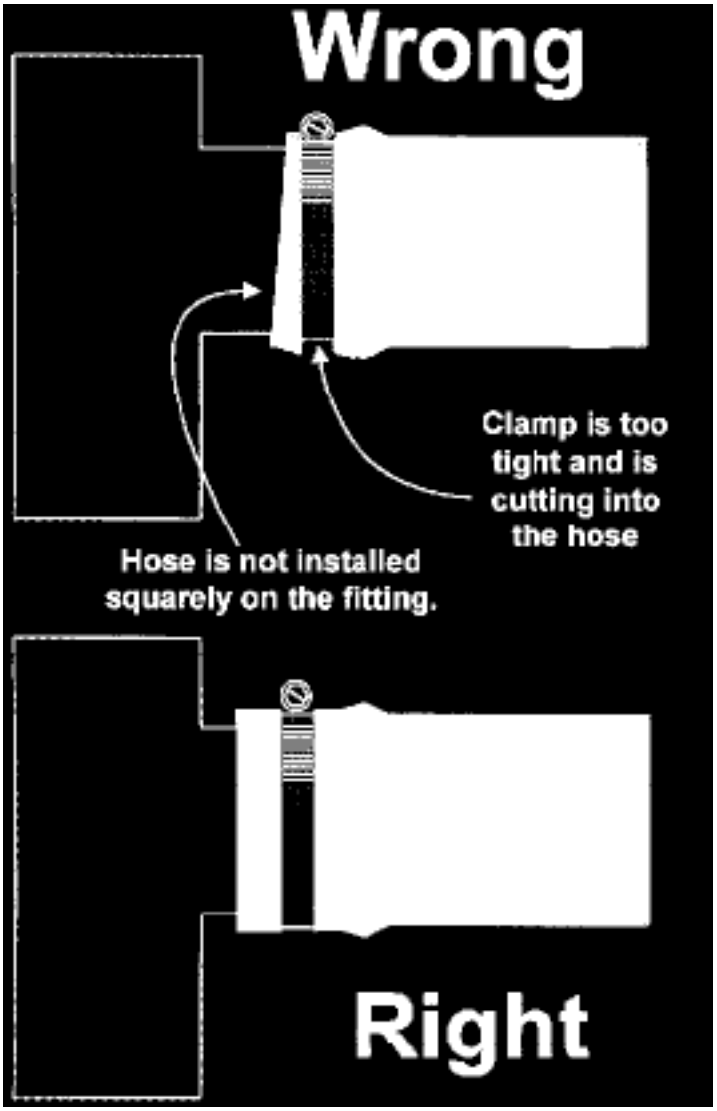
NOTE: This will help maintain the correct alignment of gasket in the next step.

4. While holding the bolts, place the gasket over the bolts and onto the pump sealing surface. 5. Install the pump and gasket onto the engine.

-

Do not over tighten the retaining bolts, use a torque wrench to properly tighten the bolts to the correct specification.

CAUTION: Water pump retaining bolts may be easily broken or stripped, do not tighten the retaining bolts with an air wrench or impact gun.



- When tightening hose clamps: -

Position the hose squarely on the fitting.

- Verify the hose clamp is clear of the retaining rim on the fitting. Do not over tighten the clamps.

- While working on the cooling system it is a good habit to clean the radiator and A/C condenser fins of bugs and dirt. This build up of debris can seriously reduce the cooling ability of the system.

Water Pump: Fundamentals and Basics Recommended Parts

RECOMMENDED PARTS

- New water pump and gasket.

- RTV sealant (for sealing water pump gasket).

- Engine Coolant: See: Cooling System/Specifications/Capacity Specifications

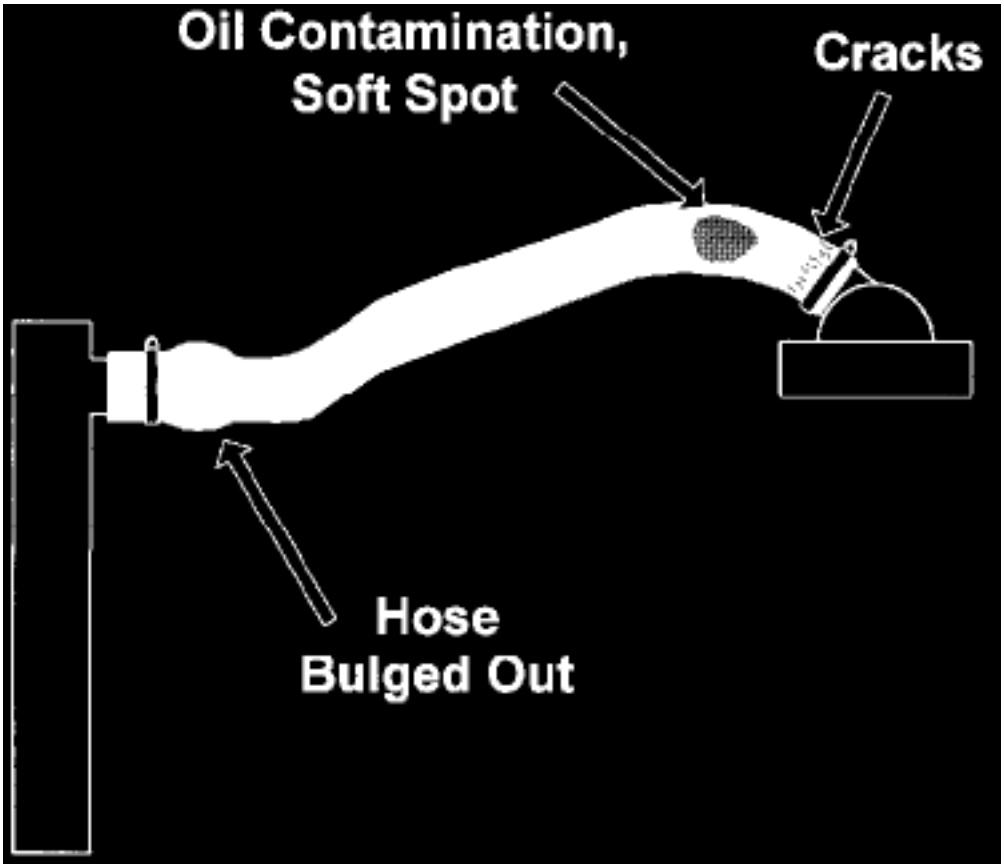
NOTE: For optimum performance, use 50/50 mixture of high quality ethylene glycol coolant and water.

OPTIONAL, PENDING INSPECTION

- Radiator hoses.

- Drive belts.

- Hose clamps.



Water Pump: Fundamentals and Basics Removal Tips and Hints

WATER PUMP REMOVAL TIPS AND HINTS

FROZEN AND BROKEN BOLTS

Frozen and broken bolts are often a major problem when removing water pumps. Coolant can seep into the bolt holes resulting in corrosion and frozen bolts. Prior to starting the job, spray all water pump retaining bolts with a penetrating oil.

Upon removal, any bolt or nut which shows signs of corrosion should be replaced. The threads of the associated bolt hole should be re-tapped or chased.

COOLANT HOSES

Inspect the hoses for the following: -

Cracks, especially near the hose clamps.

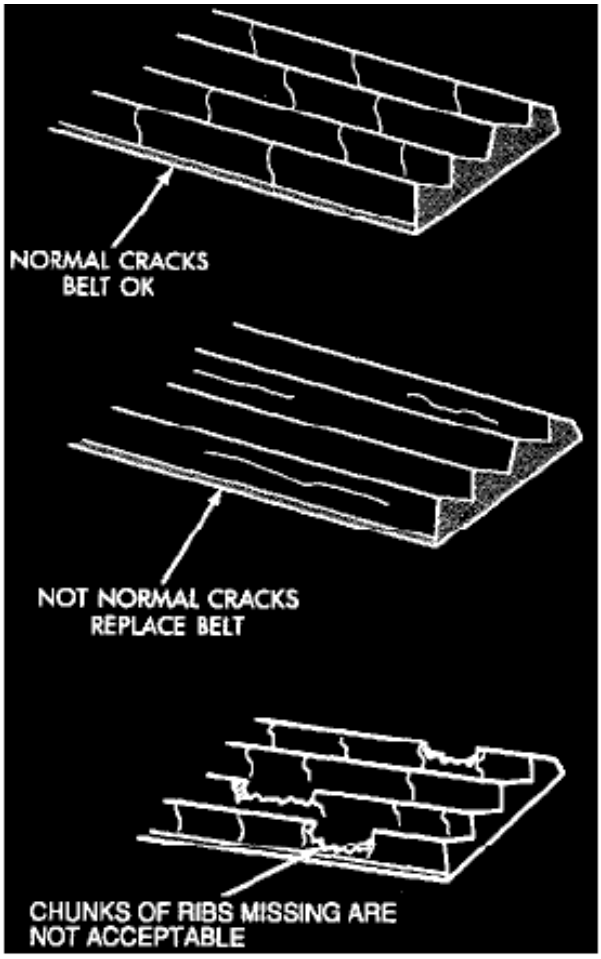
- Swelling, look for areas of the hose that appear unnaturally bulged outwards.

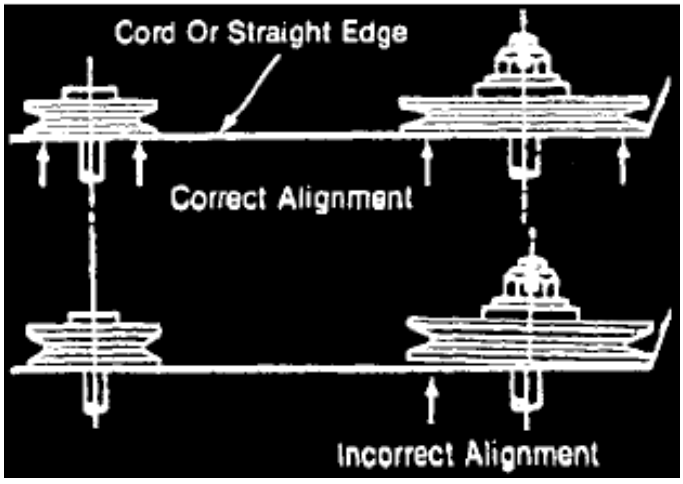
NOTE: This is often caused by improper removal techniques.

- Oil contamination and soft spots - Oil contamination breaks down the structure of the rubber and significantly weakens the hose.

NOTE: The oil leak should be fixed prior to replacing the hose.

- Hard or brittle hoses, as the hoses age the rubber looses its resiliency and becomes brittle. The hoses need to be able to flex to compensate for the movement of the engine.


NORMAL CRACKS
BELT OK
NOT NORMAL CRACKS
REPLACE BELT
CHUNKS OF RIBS MISSING ARE
NOT ACCEPTABLE


Cord Or Straight Edge
Correct Alignment
Incorrect Alignment

DRIVE BELTS

- Small cracks that run across that run across the ribbed surface of the belt from rib to rib , are considered normal, These are not reasons to replace the belt.

- If chunks of belt material are missing between the cracks, the belt should be replaced.

- Cracks running along the rib (not across) are not normal. Any belts with cracks running along the rib should be replaced.

- Replace the belt if it has excessive wear, frayed cords or severe glazing.

Drive Pulleys

- Verify the pulleys have no side to side wobble, and rotate freely. Replace if necessary.

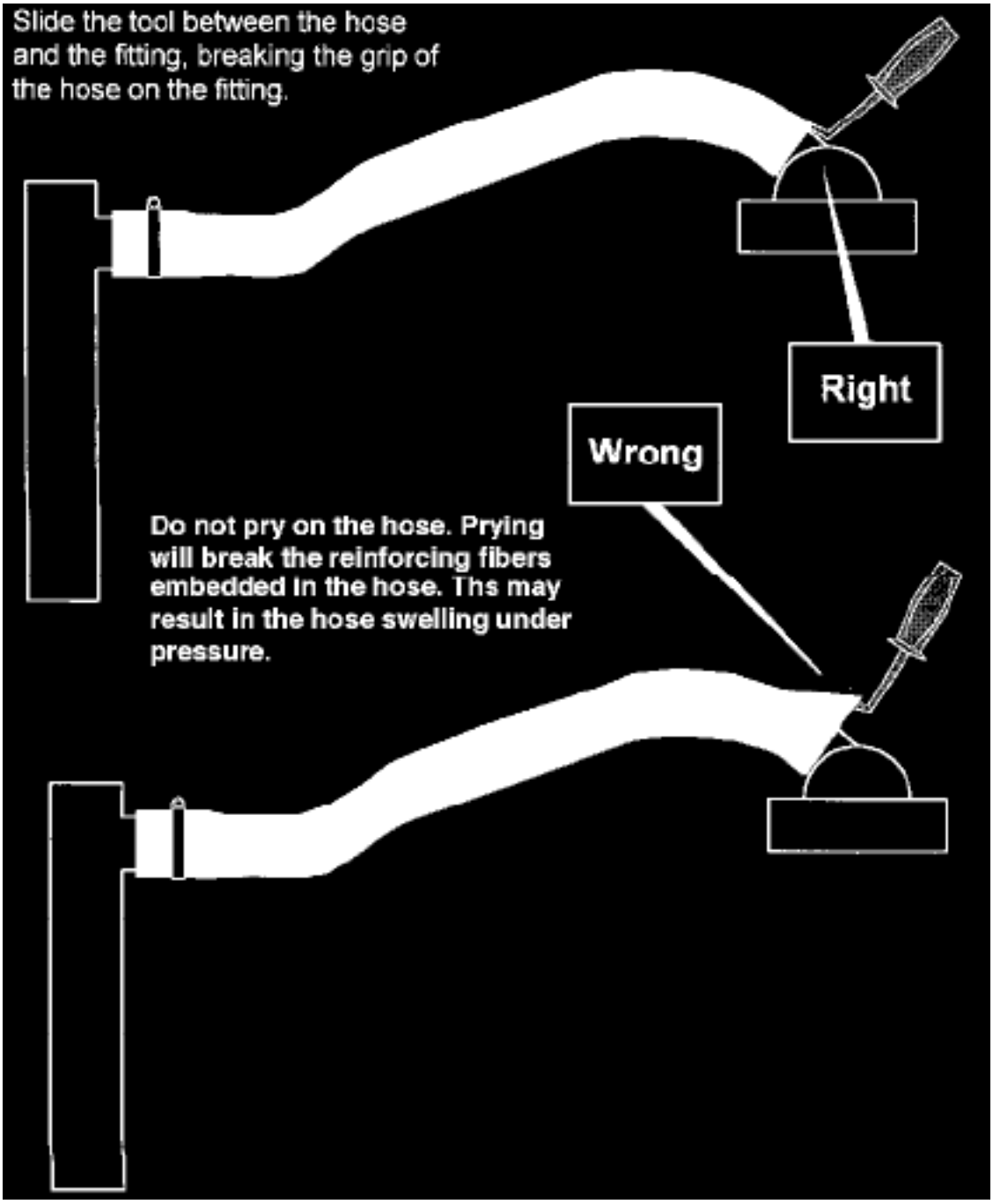
- Verify the pulleys are properly aligned. Adjust or replace as necessary.

Belt Removal

Do not attempt to bump the drive belts off with the starter. This practice can damage the belt, pulley, and technician. Removing the belt by relaxing the tension will allow you to correctly adjust the tension when installing the belt.

DRIP PAN

Prior to removing any hose or the water pump, place a large drip pan under the engine. Although the coolant may be drained from the radiator, there is still a large amount of residual coolant trapped in the hoses and water pump.



HOSE REMOVAL

- Prior to pulling the hose from the fitting, rotate/twist the hose on the fitting to break the grip of any corrosion present.

- If the hose is to be replaced, it may be quicker to cut hose from the fitting.

CAUTION: When cutting the hose be careful not to damage the fitting.

- A radiator hose removal tool may help free up stubborn hoses.

CAUTION: -

Do not use any device to pry the hose off of the fitting.

- If at any time a tearing or ripping sound is heard (though the hose appears fine) the hose should be replaced. The sound is coming from the internal reinforcing fibers embedded in the hose. Once the fibers have been broken the hose will be subject to swelling and rupture when pressure is applied.

WATER PUMP REMOVAL

After removing the retaining bolts the water pump may still be stuck to the engine. The original gasket sealant may cause the pump to firmly stick to engine. A few soft blows from a rubber mallet or block of wood will generally loosen the pump.

CAUTION: -

Verify that ALL of the retaining bolts are removed.

- Do not pry between the pump and the gasket. This may damage the pump sealing surface.

- Upon breaking the seal, a large amount of coolant trapped in the block will generally pour out from the water pump opening. Be sure to have a drip pan prepositioned.

Coolant: Technical Service Bulletins Engine Coolant - Propylene Glycol Recommendations

Article No. 01-23-6

11/26/01

^ ENGINE COOLANT - PROPYLENE GLYCOL - FORD MOTOR COMPANY POSITION ON ENGINE COOLANTS MADE FROM PROPYLENE GLYCOL

^ ENGINE COOLANT - PROPYLENE GLYCOL-BASED - FORD MOTOR COMPANY POSITION ON PROPYLENE GLYCOL-BASED ENGINE COOLANTS

FORD: 1989-1993 FESTIVA 1989-1994 TEMPO 1989-1997 PROBE, THUNDERBIRD 1989-2002 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS 1994-1997 ASPIRE 1995-2000 CONTOUR 2000-2002 FOCUS 2002 THUNDERBIRD 1989-1990 BRONCO II 1989-1996 BRONCO 1989-1997 AEROSTAR, F SUPER DUTY 1989-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2002 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION 2001-2002 ESCAPE, EXPLORER SPORT TRAC, EXPLORER SPORT 2000-2002 F-650, F-750

LINCOLN: 1989-1992 MARK VII 1989-2002 CONTINENTAL, TOWN CAR 1993-1998 MARK VIII 2000-2002 LS 1998-2002 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1989-1994 TOPAZ 1989-1997 COUGAR 1989-2002 GRAND MARQUIS, SABLE 1991-1994 CAPRI 1991-1999 TRACER 1995-2000 MYSTIQUE 1999-2002 COUGAR 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

MERKUR: 1989 SCORPIO, XR4TI

This article is being republished in its entirety to update the model year coverage.

ISSUE This TSB article describes Ford Motor Company's position on the use of propylene glycol-based engine coolants.

ACTION

Ford Motor Company does not recommend nor endorse the use of engine coolants made with propylene glycol in Ford vehicles. Ford Motor Company currently recommends the use of ethylene glycol-based engine coolants.

Published information suggests that engine coolants made with propylene glycol may provide engine cooling performance equivalent to engine coolants made with ethylene glycol. However, different brands of engine coolant provide varying corrosion protection for the cooling system. Ford does not have performance data for the multitude of engine coolants available in the aftermarket and therefore cannot recommend the use of any coolant except those sold by Ford Customer Service Division. Consult the vehicle's Owner's Guide to determine the appropriate Ford Customer Service Division coolant for the vehicle.

Furthermore, claims of toxicological and environmental advantages of propylene glycol over ethylene glycol may be misleading. When significant new information is developed, Ford will review this policy.

Ford Motor Company specifications recommend that vehicles be maintained using certain ethylene glycol-based engine coolants. Those specifications do not refer to engine coolants made with propylene glycol. Although the Ford New Vehicle Limited Warranty is not automatically voided upon the use of a coolant made with propylene glycol, if such use results in damage to the vehicle or its components, the cost of repairing the damage would not be covered by the Ford New Vehicle Limited Warranty.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 96-16-4 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 402000

Coolant: Technical Service Bulletins Recycled Engine Coolant - Service Tips

Article No. 95-18-2

09/11/95

^ COOLANT - USE OF RECYCLED ENGINE, COOLANT - SERVICE TIP

^ COOLING SYSTEM - USE OF RECYCLED ENGINE, COOLANT - SERVICE TIP

FORD: 1980 and after CROWN VICTORIA, MUSTANG, THUNDERBIRD 1981 and after ESCORT 1982-88 EXP 1984-94 TEMPO 1986 and after TAURUS 1988-93 FESTIVA 1989 and after PROBE 1994 and after ASPIRE 1995 and after CONTOUR

LINCOLN-MERCURY: 1980 and after CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1981-86 CAPRI 1981-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1986 and after SABLE 1987-89 TRACER 1991-94 CAPRI 1991 and after TRACER 1993 and after MARK VIII 1995 and after MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1980 and after F-150-350 SERIES 1981 and after ECONOLINE 1982 and after BRONCO 1983 and after RANGER 1984-90 BRONCO II 1986 and after AEROSTAR 1988 and after F SUPER DUTY 1991 and after EXPLORER 1993 and after VILLAGER 1995 and after WINDSTAR

This TSB is being republished in its entirety to include warranty information when using recycled coolant

ISSUE: Ford Motor Company authorizes the use of recycled engine coolant that, when properly processed and reinhibited, meets Ford specification ESE-M97B44-A. At this time, the Rotunda Coolant Recycler (181-00003) process is the only approved coolant recycling method available through Ford that is capable of producing recycled engine coolant that meets Ford specification ESE-M97B44-A.

ACTION: Refer to the following Service Procedure for coolant processing and reinhibiting using Rotunda Coolant Recycler (181-00003).

NOTE:

WHILE TESTING SHOWS THAT RECYCLED ENGINE COOLANT CAN PROVIDE ACCEPTABLE PERFORMANCE, THE COOLANT PRODUCED FROM ROTUNDA EQUIPMENT IS INTENDED FOR USE WITHIN DEALERSHIPS ON WARRANTY AND CUSTOMER PAY REPAIRS ONLY AND NOT INTENDED FOR RETAIL SALE. THERE ARE REGULATORY, PACKAGING AND LABELING CONCERNS

ASSOCIATED WITH THE RETAIL SALE OF CHEMICAL PRODUCTS.

CAUTION:

THE REINHIBITOR CHEMICALS PROVIDED WITH THIS EQUIPMENT ARE NOT APPROPRIATE FOR USE ON MEDIUM/HEAVY TRUCK APPLICATIONS.

WARNING:

ROTUNDA PREMIUM COOLANT REINHIBITORS # 1 AND # 2 HAVE BEEN SPECIFICALLY FORMULATED TO WORK WITH ROTUNDA COOLANT RECYCLER (181-00003).

USE OF ANY OTHER CHEMICAL ADDITIVES WITH THIS SYSTEM WILL VOID ALL WARRANTIES FOR THE EQUIPMENT AND FOR THE FINAL COOLANT PRODUCT.

SERVICE PROCEDURE

DIRECTIONS FOR PROCESSING USED ENGINE COOLANT WITH ROTUNDA COOLANT RECYCLER

1. Close the drain valve on the unit.

2. Open the fill valve.

3. Pour used engine coolant into the funnel on the side of the unit.

NOTE:

MAXIMUM CAPACITY 15 25 GALLONS (95 L).

4. Insert the outlet hoses of the recycler into clean, properly labeled containers. One (1) container is for the outlet process water and the other container is for distilled ethylene glycol.

5. Push the "ON" switch on the front to start the operation. The unit will process 1 gallon (3.8 L) per hour of operation and will automatically shut off when cycle is complete.

6. Add reinhibitor following the directions in this article.

7. Open the drain valve to drain the residue from the distillation vessel. Dispose of residue in accordance with all local. state and federal regulations.

ADDING REINHIBITOR CHEMICALS

1. Process the coolant according to the directions listed in this article

2. Thoroughly mix 4 fl oz (118 ml) of Reinhibitor # 1 to each gallon of distilled ethylene glycol.

3. Thoroughly mix 4 fl oz (118 ml) of Reinhibitor # 2 to each gallon of distilled ethylene glycol.

4. Mix well.

5. Check the pH level of the coolant. The pH level must be between 9 and 11.

6. Add enough water to the concentrated coolant to produce a 50/50 mixture of coolant and water.

NOTE:

THE CONCENTRATED COOLANT MUST BE MIXED WITH WATER TO MEET THE NECESSARY ENGINE FREEZE PROTECTION.

7. Check the coolant freeze point of the 50% coolant solution. Freeze point should be -34°F (-37°C).

Consult the Rotunda Coolant Recycler Manual for more detailed operating instructions. Call 1-800-ROTUNDA, 8 AM to 8 PM EST, for inquiries regarding the Rotunda Coolant Recycler and to order the Reinhibitor (187-R0001).

PART NUMBER PART NAME

Rotunda # 187-R0001 Rotunda Premium Coolant Reinhibitor

WARRANTY CLAIMS: Dealer can claim recycled engine coolant by Ford approved process via a warranty repair on an 1863 claim as follows:

Part Number: RECCOOL (not a valid part number, but it is recognized on an 1863 claim).

Quantity: Indicate the number of QUARTS of recycled coolant used.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 95-16-6 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 402000

Coolant: Technical Service Bulletins Cooling System - Proper Fluid Concentrations

Article No. 93-1-10

01/05/93

COOLING SYSTEM - PROPER FLUID CONCENTRATIONS

FORD: 1988 EXP 1988-93 CROWN VICTORIA, ESCORT, FESTIVA, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1989-93 PROBE

LINCOLN-MERCURY: 1988-89 TRACER 1988-92 MARK VII 1988-93 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1991-93 CAPRI, TRACER 1993 MARK VIII

MERKUR: 1988-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1988-90 BRONCO II 1988-93 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-93 EXPLORER 1993 VILLAGER

ISSUE: It is important to confirm the coolant fluid concentration during any repair of a vehicle's cooling system. A 50/50 concentration of Ford cooling system fluid, or an equivalent solution meeting Ford specifications, and water is best for all normal operating conditions.

ACTION: Check the coolant fluid concentration and use a 50/50 solution concentration for optimum results.

CAUTION: IF THE CONCENTRATION IS ALLOWED TO VARY TO ANY LARGE EXTENT EITHER WAY, COOLING SYSTEM CONCERNS CAN RESULT. IF THE COOLING SYSTEM FLUID LEVEL IS BELOW THE 50/50 CONCENTRATION, OVERHEATING CAN OCCUR. CONCENTRATIONS ABOVE 50/50 CAN CONTRIBUTE TO EXCESSIVE AND EVEN PREMATURE FAILURE OF THE WATER PUMP (MORE IS NOT BETTER).

1. Obtain a balanced mixture ratio of 50/50 cooling system fluid to water. Premix the two fluids in a separate container by adding equal volumes of coolant and water.

2. Be aware that overfilling of the coolant system is just as bad as not maintaining the proper coolant concentration level. If the coolant system is overfilled, and the system is allowed to expand dropping the excess coolant past the expansion tank, many of the vital coolant additives will be lost out the overflow pipe. This reduces the protection to the engine.

3. Pour in only enough coolant as specified for the system, and top off as necessary.

NOTE: TOP OFF ONLY WITH A PREMIXED 50/50 SOLUTION.

4. Check the coolant concentration, once the coolant system has been properly filled, to be sure that it is truly within the allowed tolerance range.

a. Use only a hand held refractometer such as a Rotunda Optical Antifreeze/Battery Tester # 021-00046 or equivalent to verify results. The acceptable coolant/water concentration range is: Minimum (45/55); Maximum (60/40).

b. If the coolant system is found to be low on coolant, top off only from a premixed solution.

c. If a weak concentration is found, add straight coolant sparingly until concentration readings are within acceptable levels.

d. If too strong a concentration is found, remove a small volume of coolant, and add water sparingly until coolant readings again fall within the specified levels.

NOTE: MAKE SURE THE COOLANT IS THOROUGHLY MIXED BEFORE TAKING READINGS.

A cooling system is only as effective as the condition of the system coolant.

^ USE ONLY FORD COOLING SYSTEM FLUID OR AN EQUIVALENT SOLUTION MEETING FORD SPECIFICATIONS.

^ FOR ADDITIONAL INFORMATION, SEE THE APPROPRIATE VEHICLE SERVICE MANUAL OR OWNER GUIDE.

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 402000, 499000

Coolant: Capacity Specifications

COOLANT CAPACITY

With A/C ..... 8.6 qts Without A/C ..... 7.8 qts

Coolant: Fluid Type Specifications

COOLING SYSTEM FLUID, PREMIUM

Ford Part No.

U.S.A (Except Oregon)
.....
E2FZ-19549-AA or -B Canada .....
..... CXC-8-B Oregon .....
.....
F5FZ-19549-CC

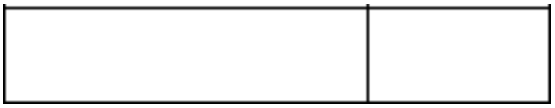
Ford Specification .....
..... ESE-M97B44-A

COOLING SYSTEM FLUSH

Ford Part No. .....
..... F1AZ-19A503-A Ford Specification .....
..... ESR-M14P7-A

Coolant Mixture with Water .....
..... 50%

Warning: Do not mix coolant types. Check the owners manual or refer to your local dealer for the correct coolant type.



Radiator Cooling Fan Temperature Sensor / Switch: Specifications Switch Torque

Switch Torque

Cooling Fan Switch 8-18 ft.lb

Fan Blade: Customer Interest Cooling System - High Coolant Temperature Reading

Article No. 91-8-23

04/17/91

COOLING SYSTEM - 4.0L - HIGH ENGINE COOLANT TEMPERATURE - VEHICLES BUILT FROM 9/9/90 THROUGH 10/15/90 WITH A/C SUPER COOL, SUPER A/C AND TRAILER TOW

LIGHT TRUCK: 1991 EXPLORER, RANGER

ISSUE: High engine coolant temperature may be indicated by a full-scale reading on the instrument panel gauge or by engine coolant boiling during operation in high ambient temperatures. These conditions occur because the earlier production fan and clutches were unable to satisfactorily handle the extra load demands.

ACTION: Install new fan and clutch assemblies with improved cooling capacity characteristics. Refer to the 1991 Aerostar, Explorer, Ranger Shop Manual, Section 03-05, for service details.

NOTE: MAKE SURE THE VEHICLE WAS BUILT BETWEEN 9/9/90 AND 10/15/90.

PART NUMBER PART NAME CLASS

F0TZ-8600-B Fan (Manual & Automatic B

Transmission)

F0TZ-8A616-D Clutch (Manual Transmission) B

F1TZ-8A616-C Clutch (Automatic Transmission) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

910823A Replace Fan And Clutch 0.5 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

8600 53

OASIS CODES: 402000

PART NUMBER	PART NAME	CLASS
F3TZ-8600-A	Fan Blade Assembly	B
F3TZ-8600-B	Fan Blade Assembly	B
F3TZ-8600-C	Fan Blade Assembly	B

Fan Blade: All Technical Service Bulletins Cooling Fan Blade - Revised Design Available

Article No. 92-25-16

Dec. 2, 1992

SERVICE PARTS RETURN OF OBSOLETE FAN BLADE ASSEMBLIES - VEHICLES WITH 4.0L ENGINES

LIGHT TRUCK: 1990-92 AEROSTAR, RANGER 1991-92 EXPLORER

ISSUE: Revised design fan blade assemblies are available and replace the previous fan blade assemblies, F3TZ-8600-A replaces FOTZ-8600-B, F3TZ-8600-B replaces, FOTZ-8600-A and F3TZ-8600-C replaces F1TZ-8600-B. The old fan assemblies are obsolete. They should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

ACTION: Return the obsolete parts FOTZ-8600-A, B and F1TZ-8600-B from your dealership's inventory.

1. Return obsolete parts (FOTZ-8600-A, B and C) to your facing PDC using the least expensive transportation.

2. Complete a separate FPS-340 claim for these parts.

3. Indicate Reason "J" on the claims.

4. In the Remarks Section write "Returned per TSB 92-25-16".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts returned must have been purchased from FPSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 402000

Fan Blade: All Technical Service Bulletins Cooling System - High Coolant Temperature Reading

Article No. 91-8-23

04/17/91

COOLING SYSTEM - 4.0L - HIGH ENGINE COOLANT TEMPERATURE - VEHICLES BUILT FROM 9/9/90 THROUGH 10/15/90 WITH A/C SUPER COOL, SUPER A/C AND TRAILER TOW

LIGHT TRUCK: 1991 EXPLORER, RANGER

ISSUE: High engine coolant temperature may be indicated by a full-scale reading on the instrument panel gauge or by engine coolant boiling during operation in high ambient temperatures. These conditions occur because the earlier production fan and clutches were unable to satisfactorily handle the extra load demands.

ACTION: Install new fan and clutch assemblies with improved cooling capacity characteristics. Refer to the 1991 Aerostar, Explorer, Ranger Shop Manual, Section 03-05, for service details.

NOTE: MAKE SURE THE VEHICLE WAS BUILT BETWEEN 9/9/90 AND 10/15/90.

PART NUMBER PART NAME CLASS

F0TZ-8600-B Fan (Manual & Automatic B

Transmission)

F0TZ-8A616-D Clutch (Manual Transmission) B

F1TZ-8A616-C Clutch (Automatic Transmission) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

910823A Replace Fan And Clutch 0.5 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

8600 53

OASIS CODES: 402000

PART NUMBER	PART NAME	CLASS
F3TZ-8600-A	Fan Blade Assembly	B
F3TZ-8600-B	Fan Blade Assembly	B
F3TZ-8600-C	Fan Blade Assembly	B

Fan Blade: All Technical Service Bulletins Cooling Fan Blade - Revised Design Available

Article No. 92-25-16

Dec. 2, 1992

SERVICE PARTS RETURN OF OBSOLETE FAN BLADE ASSEMBLIES - VEHICLES WITH 4.0L ENGINES

LIGHT TRUCK: 1990-92 AEROSTAR, RANGER 1991-92 EXPLORER

ISSUE: Revised design fan blade assemblies are available and replace the previous fan blade assemblies, F3TZ-8600-A replaces FOTZ-8600-B, F3TZ-8600-B replaces, FOTZ-8600-A and F3TZ-8600-C replaces F1TZ-8600-B. The old fan assemblies are obsolete. They should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

ACTION: Return the obsolete parts FOTZ-8600-A, B and F1TZ-8600-B from your dealership's inventory.

1. Return obsolete parts (FOTZ-8600-A, B and C) to your facing PDC using the least expensive transportation.

2. Complete a separate FPS-340 claim for these parts.

3. Indicate Reason "J" on the claims.

4. In the Remarks Section write "Returned per TSB 92-25-16".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts returned must have been purchased from FPSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 402000

Fan Clutch: Customer Interest Cooling System - High Coolant Temperature Reading

Article No. 91-8-23

04/17/91

COOLING SYSTEM - 4.0L - HIGH ENGINE COOLANT TEMPERATURE - VEHICLES BUILT FROM 9/9/90 THROUGH 10/15/90 WITH A/C SUPER COOL, SUPER A/C AND TRAILER TOW

LIGHT TRUCK: 1991 EXPLORER, RANGER

ISSUE: High engine coolant temperature may be indicated by a full-scale reading on the instrument panel gauge or by engine coolant boiling during operation in high ambient temperatures. These conditions occur because the earlier production fan and clutches were unable to satisfactorily handle the extra load demands.

ACTION: Install new fan and clutch assemblies with improved cooling capacity characteristics. Refer to the 1991 Aerostar, Explorer, Ranger Shop Manual, Section 03-05, for service details.

NOTE: MAKE SURE THE VEHICLE WAS BUILT BETWEEN 9/9/90 AND 10/15/90.

PART NUMBER PART NAME CLASS

F0TZ-8600-B Fan (Manual & Automatic B

Transmission)

F0TZ-8A616-D Clutch (Manual Transmission) B

F1TZ-8A616-C Clutch (Automatic Transmission) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

910823A Replace Fan And Clutch 0.5 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

8600 53

OASIS CODES: 402000

Fan Clutch: All Technical Service Bulletins Cooling System - High Coolant Temperature Reading

Article No. 91-8-23

04/17/91

COOLING SYSTEM - 4.0L - HIGH ENGINE COOLANT TEMPERATURE - VEHICLES BUILT FROM 9/9/90 THROUGH 10/15/90 WITH A/C SUPER COOL, SUPER A/C AND TRAILER TOW

LIGHT TRUCK: 1991 EXPLORER, RANGER

ISSUE: High engine coolant temperature may be indicated by a full-scale reading on the instrument panel gauge or by engine coolant boiling during operation in high ambient temperatures. These conditions occur because the earlier production fan and clutches were unable to satisfactorily handle the extra load demands.

ACTION: Install new fan and clutch assemblies with improved cooling capacity characteristics. Refer to the 1991 Aerostar, Explorer, Ranger Shop Manual, Section 03-05, for service details.

NOTE: MAKE SURE THE VEHICLE WAS BUILT BETWEEN 9/9/90 AND 10/15/90.

PART NUMBER PART NAME CLASS

F0TZ-8600-B Fan (Manual & Automatic B

Transmission)

F0TZ-8A616-D Clutch (Manual Transmission) B

F1TZ-8A616-C Clutch (Automatic Transmission) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

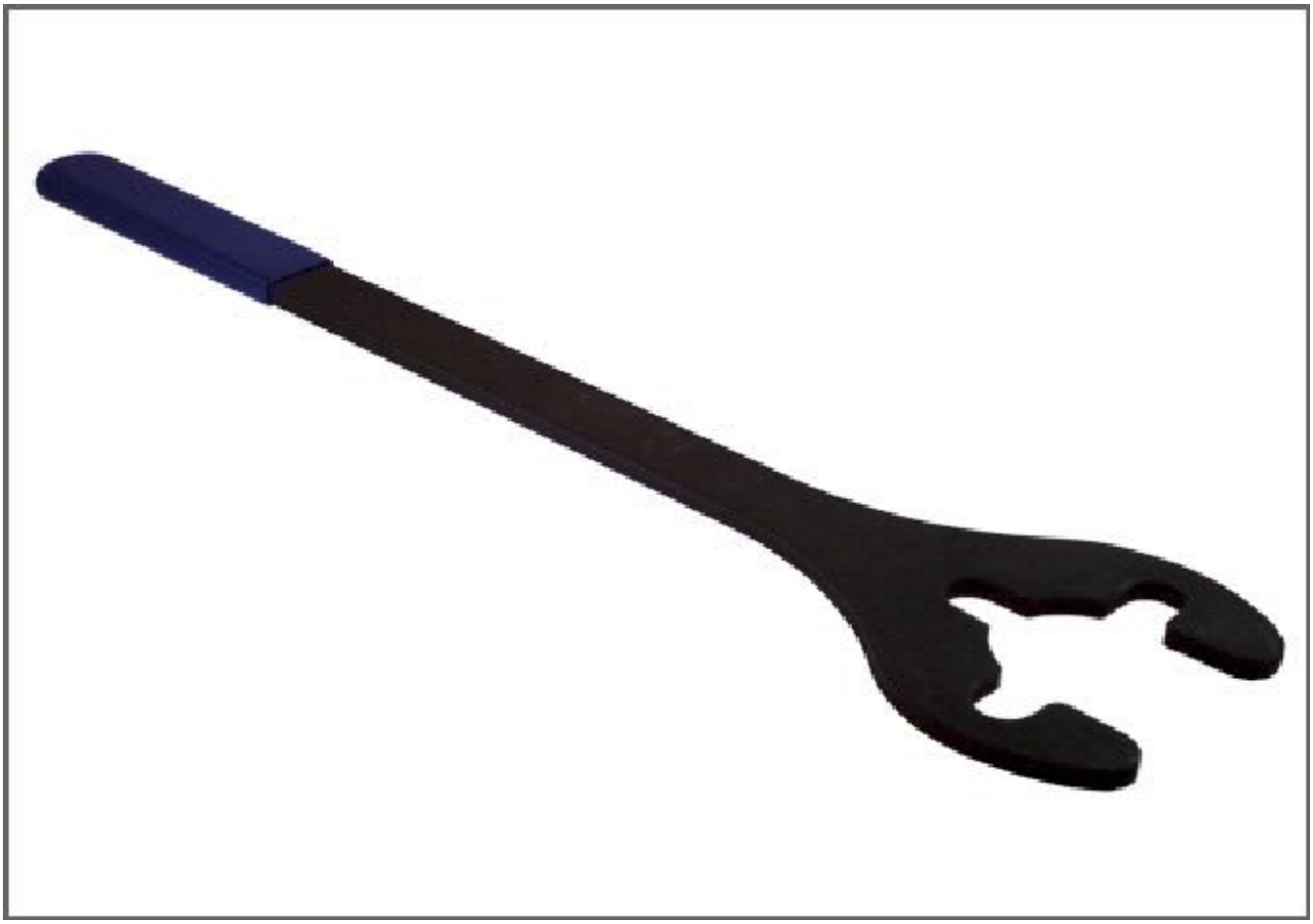
910823A Replace Fan And Clutch 0.5 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

8600 53

OASIS CODES: 402000



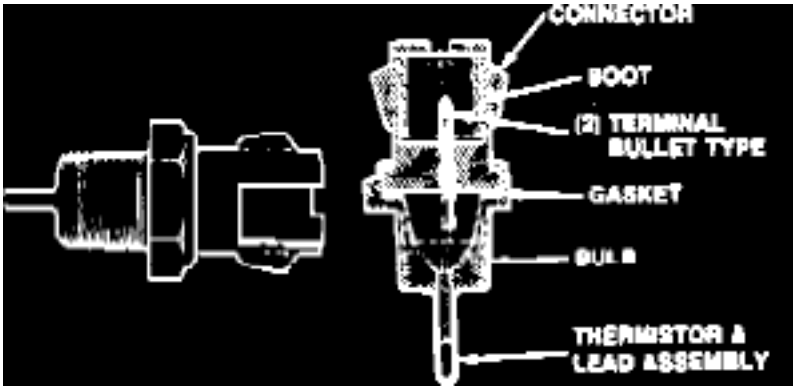
Fan Clutch: Tools and Equipment

Fan Clutch Holding Tool AST tool# 8005

Allows the technician to hold the water pump pulleuy in place while loosening the radiator fan.

2009 Suggested user price: $41.20

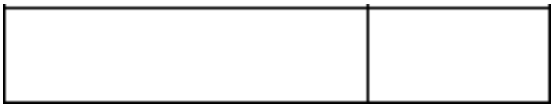
Assenmacher Specialty Tools 1 800 525 2943



Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.



Radiator Cooling Fan Temperature Sensor / Switch: Specifications Switch Torque

Switch Torque

Cooling Fan Switch 8-18 ft.lb

Temperature Sensor (Gauge): Technical Service Bulletins Temperature Gauge - Reads Low/Erratic

Article No. 95-13-2

07/03/95

^ GAUGE - TEMPERATURE-READS IN LOW RANGE - ERRATIC READINGS

^ SERVICE PARTS - RETURN OF OBSOLETE TEMPERATURE SENDERS

FORD: 1981-94 ESCORT 1981-95 MUSTANG, THUNDERBIRD 1983-95 CROWN VICTORIA 1984-94 TEMPO 1986-95 TAURUS

LINCOLN-MERCURY: 1981-92 TOWN CAR 1981-95 COUGAR 1983-95 GRAND MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-95 SABLE 1987-89 TRACER 1991-94 TRACER 1993-95 MARK VIII

LIGHT TRUCK: 1982-95 BRONCO 1983-95 RANGER 1986-94 AEROSTAR 1990-95 F-150-350 SERIES 1991-95 EXPLORER 1992-95 ECONOLINE 1995 WINDSTAR

ISSUE: Temperature Sender F1SZ-10884-A with a build date code prior to 2774 (277th day of 1994) should be purged from your inventory and returned to your facing PDC. These parts are being made obsolete because of an incorrect crimp during assembly. Installing these parts on a vehicle could result in early loss of temperature sender function.

ACTION: Remove and return the suspect parts from your dealership's inventory. The obsolete parts should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

NOTE:

USE TSB ARTICLE 93-24-8 FOR DIAGNOSIS PROCEDURE IN DETERMINING IF LOW GAUGE READINGS COULD BE ASSOCIATED WITH A TEMPERATURE SENDER CONCERN.

1. Perform 100% sort of all stock on hand.

2. Suspect stock has a build date code prior to 2774. Usable stock will have a build date code of 2774 or later.

NOTE:

DATE CODES ARE LOCATED ON THE SIDE OF THE SENDER HEX.

3. Usable stock can be returned to your inventory and released for normal sales.

4. Return suspect part (F1SZ-10884-A) to your facing PDC using the least expensive transportation.

5. If claim is processed electronically via DOES II, use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

6. In the Remarks Section, write "Returned per TSB 95-13-2".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts returned must have been purchased from FCSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

Replacement stock is available for ordering

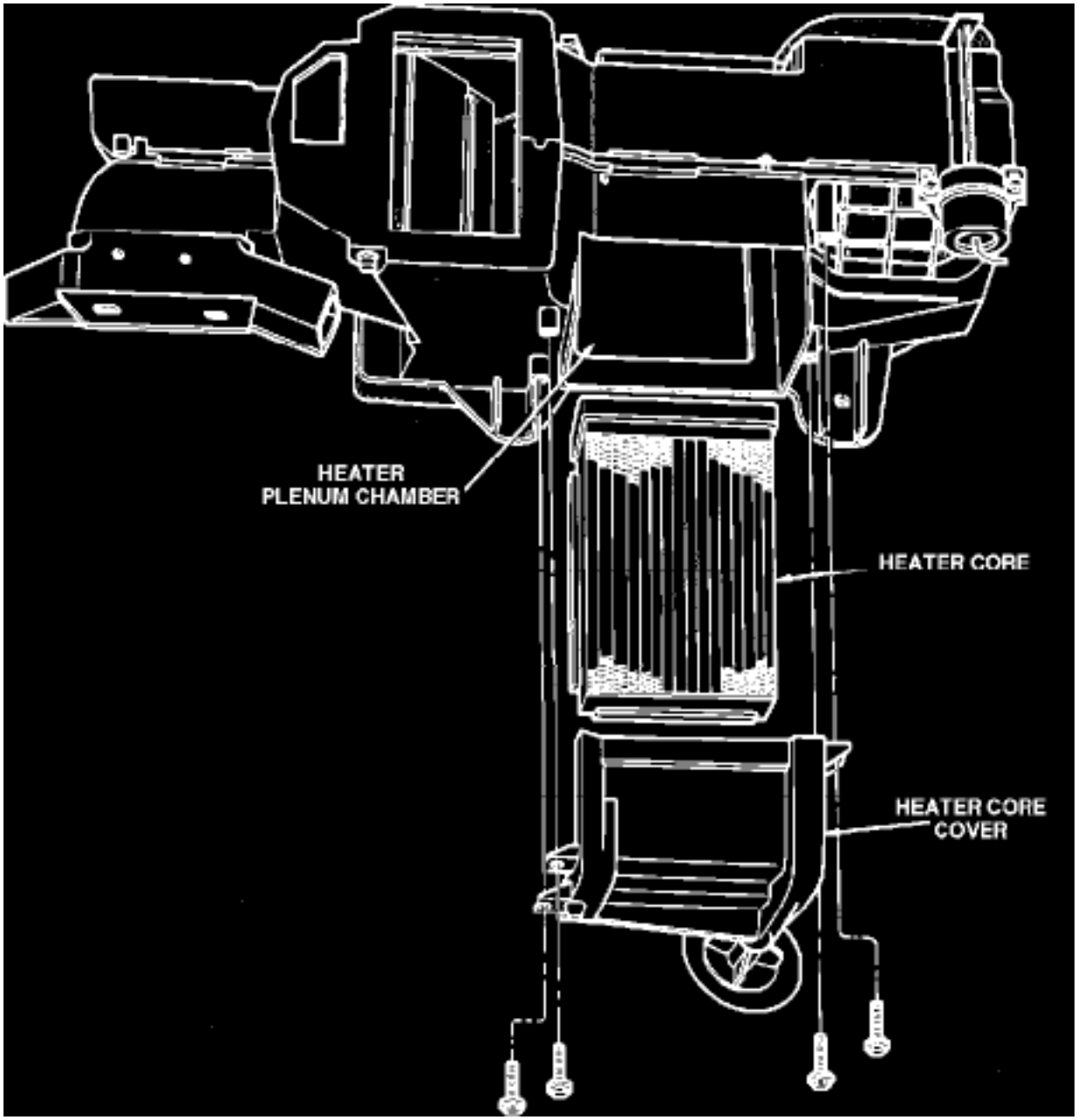
PART NUMBER PART NAME

F1SZ-10884-A Temperature Sender

OTHER APPLICABLE ARTICLES: 93-24-8

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203000, 203200, 204000, 204200, 402000



Heater Core: Service and Repair

Heater Core

REMOVAL

1. Drain cooling system. See: Service and Repair 2. Disconnect hoses from heater core. Plug hoses and core openings to prevent leakage of residual coolant. 3. Working inside the passenger compartment, remove screws attaching heater core access cover and remove the cover. 4. Pull the heater core rearward and down to remove from the plenum.

INSTALLATION

1. Position heater core and seal in the plenum opening. 2. Install heater core access cover. 3. Attach heater hoses to core tubes. Do not overtighten clamps. 4. Refill cooling system. 5. Check system for proper operation.

Temperature Gauge: Customer Interest Temperature Gauge - Fluctuation/Inaccurate

Article No. 95-18-5

09/11/95

TEMPERATURE GAUGE - FLUCTUATING AND/OR INACCURATE HIGH READINGS

FORD: 1990-94 TAURUS, THUNDERBIRD 1991-93 TEMPO 1991-94 ESCORT

LINCOLN-MERCURY: 1990-94 COUGAR SABLE 1991-93 TOPAZ 1991-94 TRACER

LIGHT TRUCK: 1990-91 AEROSTAR 1990-94 RANGER 1991-94 EXPLORER

This TSB article is being republished in its entirety to correct model year application and revise the part descriptions.

ISSUE: Some vehicles may show temperature gauge fluctuations and/or inaccurate (high) readings (affected engines are 3.0L/4.0L Ranger. 4.0L Explore and 1.9L Escort/Tracer). The inaccurate (high) readings may result in a customer concern with the perception of engine overheating. This is caused by Gauge/Sender design characteristics which create a sensitive gauge indication.

ACTION: Replace the gauge and sender with a new Temperature Indication Service Kit. Refer to the following for Additional Concerns and Service Procedure for details.

ADDITIONAL CONCERNS

Please verify the following two (2) concerns before implementing the fix for the above concern.

1. Perform cooling system diagnosis per TSB 93-24-8.

2. Vehicles built from 1/1/93 to 4/1/93 may experience high temperature gauge indications which may have been due to the installation of improperly manufactured temperature sending units. The customer concern is that the gauge indication is beyond the letter "L" in the word "NORMAL". If this condition occurs, inspect the temperature sender for an "A3" stamped date code on the hex of the sending unit. If an "A3" unit is found, replace with "NON-A3" service stock.

3. 1993 Taurus/Sable 3.8L vehicles built 8/16/93 to 8/31/93 may have high temperature gauge readings caused by an incorrect temperature sending unit installed at the assembly plant. The incorrect temperature sending unit can be identified by a blue insulator around the terminal. The correct temperature sending unit has a green insulator. If a temperature sending unit with a blue insulator is found, replace it with an F1SZ-10884-A.

4. Explorer 4.0L vehicles with date code 2204 to 2274 should not be used. Any other date code outside this is acceptable even with an "A3" stamp.

NOTE:

DATE CODES ARE BASED ON THE JULIAN DATE CODE SYSTEM. THE LAST NUMBER DENOTES THE YEAR THAT THE PART WAS MANUFACTURED. FOR EXAMPLE, 2274 (1994 PART) AND 2275 (1995 PART). ANY 1995 PART MAY BE USED.

TEMPERATURE INDICATION SERVICE KIT PROCEDURE

NOTE:

THIS PROCEDURE IS PERFORMED AFTER THE ABOVE TWO (2) STEPS HAVE BEEN DONE.

The installation of the service kit will result in a pointer indicating in the approximate center of the "NORMAL" band while providing protection for a boil-over condition.

The service kit consists of:

PART NUMBER	PART NAME
F4CZ-10E922-A	Temperature Indication Kit - Base (Escort/Tracer 1.9L)
F4CZ-10E922-B	Temperature Indication Kit - With Tachometer (Escort/Tracer - 1.9L)
F43Z-10E922-A	Temperature Indication Kit - Base (Tempo/Topaz)
F46Z-10E922-A	Temperature Indication Kit - With Tachometer (Tempo/Topaz)
F4DZ-10E922-A	Temperature Indication Kit - Base (Taurus)
F44Z-10E922-A	Temperature Indication Kit - With Tachometer (Taurus/Sable)
F4SZ-10E922-A	Temperature Indication Kit - Base (Thunderbird/Cougar)
F4SZ-10E922-B	Temperature Indication Kit - With Tachometer (Thunderbird/Cougar)
F47Z-10E922-A	Temperature Indication Kit Without Tachometer (Ranger - 3.0L And 4.0L Engines)
F47Z-10E922-B	Temperature Indication Kit - With Tachometer (Explorer - 4.0L, Ranger - 3.0L And 4.0L Engines)
F49Z-10E922-A	Temperature Indication Kit (Aerostar)

^ Instructions

^ Temperature Gauge

^ Temperature Sender

The instructions will contain the following steps:

1. Remove BOTH existing temperature sender and temperature gauge from the vehicle.

NOTE:

REFER TO SECTION 13, CONVENTIONAL INSTRUMENT CLUSTER, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE GAUGE REMOVAL AND INSTALLATION INSTRUCTIONS. REFER TO SECTION 03-03, COOLING SYSTEM, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE SENDER REMOVAL AND INSTALLATION PROCEDURES.

2. Install BOTH service kit temperature sender and temperature gauge into the vehicle.

NOTE:

THE SERVICE KIT TEMPERATURE SENDER AND TEMPERATURE GAUGE MUST BE USED TOGETHER.

Parts Block

OTHER APPLICABLE ARTICLES: 93-24-8 SUPERSEDES: 95-15-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

951805A Replace Temperature 1.0 Hr.

Gauge And Sending Unit - Taurus/Sable, Tempo/Topaz, Thunderbird/Cougar, Explorer, Ranger, Aerostar (4X2)

951805B Replace Temperature 1.1 Hr.

Gauge And Sending Unit - Escort/Tracer

951805C Replace Temperature 1.2 Hrs.

Gauge And Sending Unit - Aerostar (4X4)

DEALER CODING

CONDITION

BASIC PART NO. CODE

10883 79

10884 79

OASIS CODES: 204000, 204200, 206000, 402000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Engine, Cooling and Exhaust > Cooling System > Lamps and Indicators - Cooling System > Temperature Gauge > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Temperature Gauge: > 95185 > Sep > 95 > Temperature Gauge - Fluctuation/Inaccurate

Temperature Gauge: All Technical Service Bulletins Temperature Gauge - Fluctuation/Inaccurate

Article No. 95-18-5

09/11/95

TEMPERATURE GAUGE - FLUCTUATING AND/OR INACCURATE HIGH READINGS

FORD: 1990-94 TAURUS, THUNDERBIRD 1991-93 TEMPO 1991-94 ESCORT

LINCOLN-MERCURY: 1990-94 COUGAR SABLE 1991-93 TOPAZ 1991-94 TRACER

LIGHT TRUCK: 1990-91 AEROSTAR 1990-94 RANGER 1991-94 EXPLORER

This TSB article is being republished in its entirety to correct model year application and revise the part descriptions.

ISSUE: Some vehicles may show temperature gauge fluctuations and/or inaccurate (high) readings (affected engines are 3.0L/4.0L Ranger. 4.0L Explore and 1.9L Escort/Tracer). The inaccurate (high) readings may result in a customer concern with the perception of engine overheating. This is caused by Gauge/Sender design characteristics which create a sensitive gauge indication.

ACTION: Replace the gauge and sender with a new Temperature Indication Service Kit. Refer to the following for Additional Concerns and Service Procedure for details.

ADDITIONAL CONCERNS

Please verify the following two (2) concerns before implementing the fix for the above concern.

1. Perform cooling system diagnosis per TSB 93-24-8.

2. Vehicles built from 1/1/93 to 4/1/93 may experience high temperature gauge indications which may have been due to the installation of improperly manufactured temperature sending units. The customer concern is that the gauge indication is beyond the letter "L" in the word "NORMAL". If this condition occurs, inspect the temperature sender for an "A3" stamped date code on the hex of the sending unit. If an "A3" unit is found, replace with "NON-A3" service stock.

3. 1993 Taurus/Sable 3.8L vehicles built 8/16/93 to 8/31/93 may have high temperature gauge readings caused by an incorrect temperature sending unit installed at the assembly plant. The incorrect temperature sending unit can be identified by a blue insulator around the terminal. The correct temperature sending unit has a green insulator. If a temperature sending unit with a blue insulator is found, replace it with an F1SZ-10884-A.

4. Explorer 4.0L vehicles with date code 2204 to 2274 should not be used. Any other date code outside this is acceptable even with an "A3" stamp.

NOTE:

DATE CODES ARE BASED ON THE JULIAN DATE CODE SYSTEM. THE LAST NUMBER DENOTES THE YEAR THAT THE PART WAS MANUFACTURED. FOR EXAMPLE, 2274 (1994 PART) AND 2275 (1995 PART). ANY 1995 PART MAY BE USED.

TEMPERATURE INDICATION SERVICE KIT PROCEDURE

NOTE:

THIS PROCEDURE IS PERFORMED AFTER THE ABOVE TWO (2) STEPS HAVE BEEN DONE.

The installation of the service kit will result in a pointer indicating in the approximate center of the "NORMAL" band while providing protection for a boil-over condition.

The service kit consists of:

PART NUMBER	PART NAME
F4CZ-10E922-A	Temperature Indication Kit - Base (Escort/Tracer 1.9L)
F4CZ-10E922-B	Temperature Indication Kit - With Tachometer (Escort/Tracer - 1.9L)
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F49Z-10E922-A	Temperature Indication Kit (Aerostar)

^ Instructions

^ Temperature Gauge

^ Temperature Sender

The instructions will contain the following steps:

1. Remove BOTH existing temperature sender and temperature gauge from the vehicle.

NOTE:

REFER TO SECTION 13, CONVENTIONAL INSTRUMENT CLUSTER, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE GAUGE REMOVAL AND INSTALLATION INSTRUCTIONS. REFER TO SECTION 03-03, COOLING SYSTEM, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE SENDER REMOVAL AND INSTALLATION PROCEDURES.

2. Install BOTH service kit temperature sender and temperature gauge into the vehicle.

NOTE:

THE SERVICE KIT TEMPERATURE SENDER AND TEMPERATURE GAUGE MUST BE USED TOGETHER.

Parts Block

OTHER APPLICABLE ARTICLES: 93-24-8 SUPERSEDES: 95-15-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

951805A Replace Temperature 1.0 Hr.

Gauge And Sending Unit - Taurus/Sable, Tempo/Topaz, Thunderbird/Cougar, Explorer, Ranger, Aerostar (4X2)

951805B Replace Temperature 1.1 Hr.

Gauge And Sending Unit - Escort/Tracer

951805C Replace Temperature 1.2 Hrs.

Gauge And Sending Unit - Aerostar (4X4)

DEALER CODING

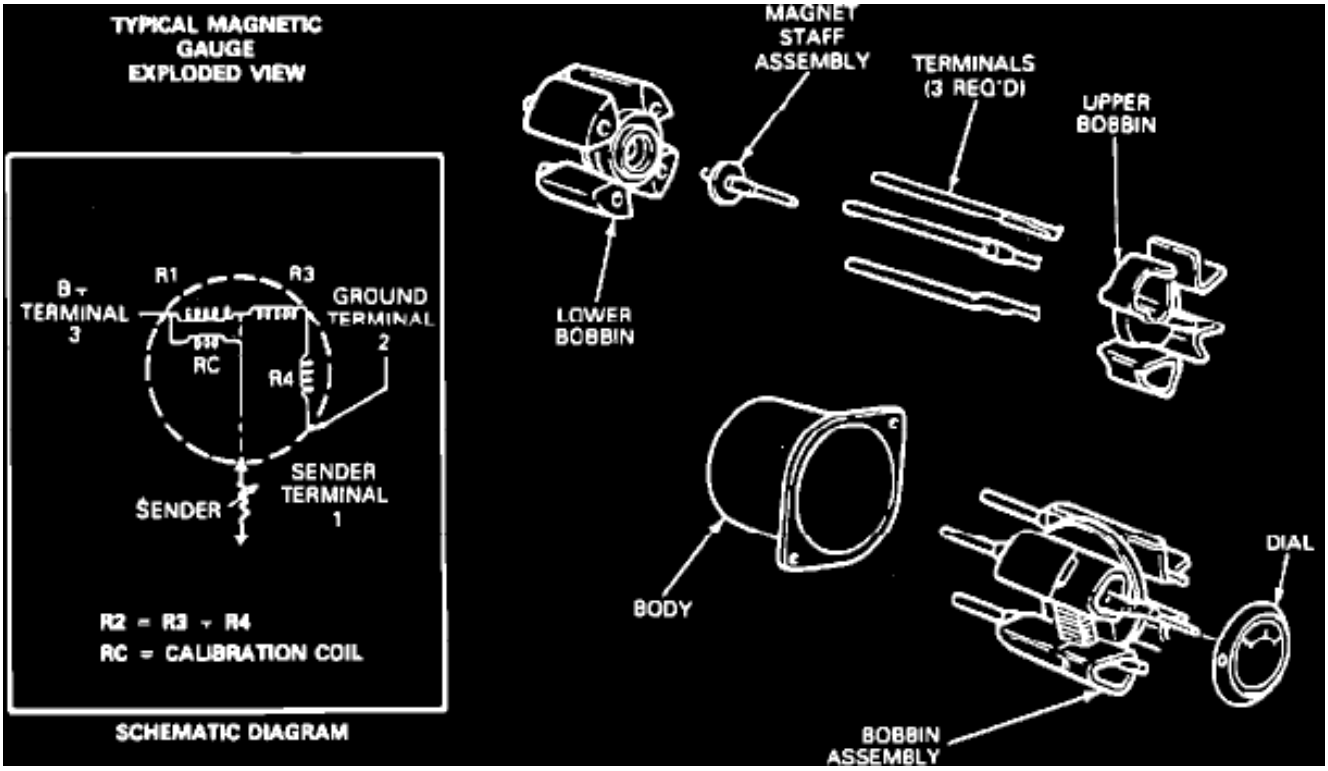
CONDITION

BASIC PART NO. CODE

10883 79

10884 79

OASIS CODES: 204000, 204200, 206000, 402000



Temperature Gauge: Description and Operation

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

This temperature indicating system consists of a sending unit, located on the cylinder head, electrical temperature gauge and an instrument voltage regulator. As engine temperature increases or decreases, the resistance of the sending unit changes, in turn controlling current flow to the gauge. When engine temperature is low, the resistance of the sending unit is high, restricting current flow to the gauge, in turn indicating low engine temperature. As engine temperature increases, the resistance of the ending unit decreases, permitting an increased current flow to the gauge, resulting in an increased temperature reading.

MAGNETIC GAUGE SYSTEM

Fig. 8 Magnetic Guage

The magnetic gauge movement consists of three primary coils, one of which is wound at a 90° angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet which is attached to a shaft and pointer rotates and aligns to this primary field resulting in pointer position. The bobbin/coil assembly is pressed into a metal housing which is attached to the instrument cluster, Fig. 8. These gauges require no adjustments, calibrations or maintenance. This gauge system does not use an IVR.

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	TEMPERATURE OR OIL GAUGE INOPERATIVE		
	• Check complaint.	Gauge pointer does not move ▶	GO to Step A2.
		Gauge pointer moves ▶	GO to Step B1.

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	VERIFY POWER TO CLUSTER		
	• With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test light to verify voltage at B+ terminal of cluster connector.	Other gauges and warning lamps operate correctly: voltage present at cluster ▶	GO to Step B1.
		Other gauges and warning lamps do not operate correctly: no voltage present at cluster ▶	SERVICE wiring to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TESTING SENDER CIRCUIT AT LOW		
	• Insert test box in sender circuit. Disconnect connector at sender and connect test box to cluster side of connector. Set box to LOW (73 ohms).	Temperature gauge reads around the C band ▶	GO to Step B2.
		Oil reads at or below L band ▶	GO to Step B3
		Pointer does not move ▶	GO to Step B4.
B2	TESTING TEMPERATURE SENDER CIRCUIT AT HIGH		
	• TEMPERATURE GAUGE • Set test box to HIGH (9.7 ohms).	Temperature gauge reads around the H grad ▶	REPLACE sender.
		Temperature gauge does not read around the H grad ▶	GO to Step B4.
B3	TESTING ON CABLE SENDER CIRCUIT AT HIGH		
	• OIL GAUGE • Set test box to 0 ohms (short circuit).	Oil gauge reads MID SCALE or slightly above ▶	REPLACE switch.
		Oil gauge does not read MID SCALE or slightly above ▶	GO to Step B4.
B4	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flexible circuit for shorts or open with ohmmeter.	Wiring and flex circuit OK ▶	REPLACE gauge. GO to A1.
		Wiring shorted or open. Flex circuit damaged ▶	REPAIR wiring / flex circuit. GO to A1.

Temperature Gauge: Pinpoint Tests

Fig. 11 Troubleshooting Chart

Fig. 11 Troubleshooting Chart

Fig. 12 Troubleshooting Chart

Temperature Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Temperature Gauge: Tools and Equipment

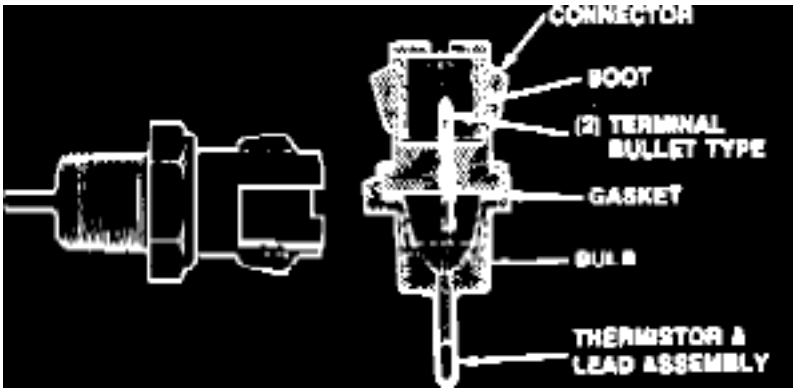
Tester tool No. 021-00055 or equivalent should be used to diagnose these type gauges.

Temperature Warning Lamp/Indicator: Description and Operation

A bimetal temperature switch located in the cylinder head controls operation of a temperature indicator light with a red lens. If engine cooling system is not functioning properly and coolant temperature exceeds a predetermined value, warning light will illuminate.

Temperature Warning Lamp/Indicator: Testing and Inspection

If the red light is not lit when engine is being cranked, check for a burned out bulb, open in light circuit, or a defective ignition switch. If red light is lit when engine is running, check wiring between light and switch for a ground, defective temperature switch, or overheated cooling system. As a test circuit to check whether the red bulb is functioning properly, a wire which is connected to the ground terminal of the ignition switch is tapped into its circuit. When the ignition is in ``Start'' (engine cranking) position, ground terminal is grounded inside the switch and the red bulb will be lit. When engine is started and the ignition switch is in the On position, test circuit is opened and bulb is then controlled by the temperature switch.



Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Radiator Cooling Fan Temperature Sensor / Switch: Specifications Switch Torque

Switch Torque

Cooling Fan Switch 8-18 ft.lb

Temperature Sensor (Gauge): Technical Service Bulletins Temperature Gauge - Reads Low/Erratic

Article No. 95-13-2

07/03/95

^ GAUGE - TEMPERATURE-READS IN LOW RANGE - ERRATIC READINGS

^ SERVICE PARTS - RETURN OF OBSOLETE TEMPERATURE SENDERS

FORD: 1981-94 ESCORT 1981-95 MUSTANG, THUNDERBIRD 1983-95 CROWN VICTORIA 1984-94 TEMPO 1986-95 TAURUS

LINCOLN-MERCURY: 1981-92 TOWN CAR 1981-95 COUGAR 1983-95 GRAND MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-95 SABLE 1987-89 TRACER 1991-94 TRACER 1993-95 MARK VIII

LIGHT TRUCK: 1982-95 BRONCO 1983-95 RANGER 1986-94 AEROSTAR 1990-95 F-150-350 SERIES 1991-95 EXPLORER 1992-95 ECONOLINE 1995 WINDSTAR

ISSUE: Temperature Sender F1SZ-10884-A with a build date code prior to 2774 (277th day of 1994) should be purged from your inventory and returned to your facing PDC. These parts are being made obsolete because of an incorrect crimp during assembly. Installing these parts on a vehicle could result in early loss of temperature sender function.

ACTION: Remove and return the suspect parts from your dealership's inventory. The obsolete parts should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

NOTE:

USE TSB ARTICLE 93-24-8 FOR DIAGNOSIS PROCEDURE IN DETERMINING IF LOW GAUGE READINGS COULD BE ASSOCIATED WITH A TEMPERATURE SENDER CONCERN.

1. Perform 100% sort of all stock on hand.

2. Suspect stock has a build date code prior to 2774. Usable stock will have a build date code of 2774 or later.

NOTE:

DATE CODES ARE LOCATED ON THE SIDE OF THE SENDER HEX.

3. Usable stock can be returned to your inventory and released for normal sales.

4. Return suspect part (F1SZ-10884-A) to your facing PDC using the least expensive transportation.

5. If claim is processed electronically via DOES II, use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

6. In the Remarks Section, write "Returned per TSB 95-13-2".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts returned must have been purchased from FCSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

Replacement stock is available for ordering

PART NUMBER PART NAME

F1SZ-10884-A Temperature Sender

OTHER APPLICABLE ARTICLES: 93-24-8

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203000, 203200, 204000, 204200, 402000

Temperature Gauge: Customer Interest Temperature Gauge - Fluctuation/Inaccurate

Article No. 95-18-5

09/11/95

TEMPERATURE GAUGE - FLUCTUATING AND/OR INACCURATE HIGH READINGS

FORD: 1990-94 TAURUS, THUNDERBIRD 1991-93 TEMPO 1991-94 ESCORT

LINCOLN-MERCURY: 1990-94 COUGAR SABLE 1991-93 TOPAZ 1991-94 TRACER

LIGHT TRUCK: 1990-91 AEROSTAR 1990-94 RANGER 1991-94 EXPLORER

This TSB article is being republished in its entirety to correct model year application and revise the part descriptions.

ISSUE: Some vehicles may show temperature gauge fluctuations and/or inaccurate (high) readings (affected engines are 3.0L/4.0L Ranger. 4.0L Explore and 1.9L Escort/Tracer). The inaccurate (high) readings may result in a customer concern with the perception of engine overheating. This is caused by Gauge/Sender design characteristics which create a sensitive gauge indication.

ACTION: Replace the gauge and sender with a new Temperature Indication Service Kit. Refer to the following for Additional Concerns and Service Procedure for details.

ADDITIONAL CONCERNS

Please verify the following two (2) concerns before implementing the fix for the above concern.

1. Perform cooling system diagnosis per TSB 93-24-8.

2. Vehicles built from 1/1/93 to 4/1/93 may experience high temperature gauge indications which may have been due to the installation of improperly manufactured temperature sending units. The customer concern is that the gauge indication is beyond the letter "L" in the word "NORMAL". If this condition occurs, inspect the temperature sender for an "A3" stamped date code on the hex of the sending unit. If an "A3" unit is found, replace with "NON-A3" service stock.

3. 1993 Taurus/Sable 3.8L vehicles built 8/16/93 to 8/31/93 may have high temperature gauge readings caused by an incorrect temperature sending unit installed at the assembly plant. The incorrect temperature sending unit can be identified by a blue insulator around the terminal. The correct temperature sending unit has a green insulator. If a temperature sending unit with a blue insulator is found, replace it with an F1SZ-10884-A.

4. Explorer 4.0L vehicles with date code 2204 to 2274 should not be used. Any other date code outside this is acceptable even with an "A3" stamp.

NOTE:

DATE CODES ARE BASED ON THE JULIAN DATE CODE SYSTEM. THE LAST NUMBER DENOTES THE YEAR THAT THE PART WAS MANUFACTURED. FOR EXAMPLE, 2274 (1994 PART) AND 2275 (1995 PART). ANY 1995 PART MAY BE USED.

TEMPERATURE INDICATION SERVICE KIT PROCEDURE

NOTE:

THIS PROCEDURE IS PERFORMED AFTER THE ABOVE TWO (2) STEPS HAVE BEEN DONE.

The installation of the service kit will result in a pointer indicating in the approximate center of the "NORMAL" band while providing protection for a boil-over condition.

The service kit consists of:

PART NUMBER	PART NAME
F4CZ-10E922-A	Temperature Indication Kit - Base (Escort/Tracer 1.9L)
F4CZ-10E922-B	Temperature Indication Kit - With Tachometer (Escort/Tracer - 1.9L)
F43Z-10E922-A	Temperature Indication Kit - Base (Tempo/Topaz)
F46Z-10E922-A	Temperature Indication Kit - With Tachometer (Tempo/Topaz)
F4DZ-10E922-A	Temperature Indication Kit - Base (Taurus)
F44Z-10E922-A	Temperature Indication Kit - With Tachometer (Taurus/Sable)
F4SZ-10E922-A	Temperature Indication Kit - Base (Thunderbird/Cougar)
F4SZ-10E922-B	Temperature Indication Kit - With Tachometer (Thunderbird/Cougar)
F47Z-10E922-A	Temperature Indication Kit Without Tachometer (Ranger - 3.0L And 4.0L Engines)
F47Z-10E922-B	Temperature Indication Kit - With Tachometer (Explorer - 4.0L, Ranger - 3.0L And 4.0L Engines)
F49Z-10E922-A	Temperature Indication Kit (Aerostar)

^ Instructions

^ Temperature Gauge

^ Temperature Sender

The instructions will contain the following steps:

1. Remove BOTH existing temperature sender and temperature gauge from the vehicle.

NOTE:

REFER TO SECTION 13, CONVENTIONAL INSTRUMENT CLUSTER, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE GAUGE REMOVAL AND INSTALLATION INSTRUCTIONS. REFER TO SECTION 03-03, COOLING SYSTEM, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE SENDER REMOVAL AND INSTALLATION PROCEDURES.

2. Install BOTH service kit temperature sender and temperature gauge into the vehicle.

NOTE:

THE SERVICE KIT TEMPERATURE SENDER AND TEMPERATURE GAUGE MUST BE USED TOGETHER.

Parts Block

OTHER APPLICABLE ARTICLES: 93-24-8 SUPERSEDES: 95-15-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

951805A Replace Temperature 1.0 Hr.

Gauge And Sending Unit - Taurus/Sable, Tempo/Topaz, Thunderbird/Cougar, Explorer, Ranger, Aerostar (4X2)

951805B Replace Temperature 1.1 Hr.

Gauge And Sending Unit - Escort/Tracer

951805C Replace Temperature 1.2 Hrs.

Gauge And Sending Unit - Aerostar (4X4)

DEALER CODING

CONDITION

BASIC PART NO. CODE

10883 79

10884 79

OASIS CODES: 204000, 204200, 206000, 402000

Temperature Gauge: All Technical Service Bulletins Temperature Gauge - Fluctuation/Inaccurate

Article No. 95-18-5

09/11/95

TEMPERATURE GAUGE - FLUCTUATING AND/OR INACCURATE HIGH READINGS

FORD: 1990-94 TAURUS, THUNDERBIRD 1991-93 TEMPO 1991-94 ESCORT

LINCOLN-MERCURY: 1990-94 COUGAR SABLE 1991-93 TOPAZ 1991-94 TRACER

LIGHT TRUCK: 1990-91 AEROSTAR 1990-94 RANGER 1991-94 EXPLORER

This TSB article is being republished in its entirety to correct model year application and revise the part descriptions.

ISSUE: Some vehicles may show temperature gauge fluctuations and/or inaccurate (high) readings (affected engines are 3.0L/4.0L Ranger. 4.0L Explore and 1.9L Escort/Tracer). The inaccurate (high) readings may result in a customer concern with the perception of engine overheating. This is caused by Gauge/Sender design characteristics which create a sensitive gauge indication.

ACTION: Replace the gauge and sender with a new Temperature Indication Service Kit. Refer to the following for Additional Concerns and Service Procedure for details.

ADDITIONAL CONCERNS

Please verify the following two (2) concerns before implementing the fix for the above concern.

1. Perform cooling system diagnosis per TSB 93-24-8.

2. Vehicles built from 1/1/93 to 4/1/93 may experience high temperature gauge indications which may have been due to the installation of improperly manufactured temperature sending units. The customer concern is that the gauge indication is beyond the letter "L" in the word "NORMAL". If this condition occurs, inspect the temperature sender for an "A3" stamped date code on the hex of the sending unit. If an "A3" unit is found, replace with "NON-A3" service stock.

3. 1993 Taurus/Sable 3.8L vehicles built 8/16/93 to 8/31/93 may have high temperature gauge readings caused by an incorrect temperature sending unit installed at the assembly plant. The incorrect temperature sending unit can be identified by a blue insulator around the terminal. The correct temperature sending unit has a green insulator. If a temperature sending unit with a blue insulator is found, replace it with an F1SZ-10884-A.

4. Explorer 4.0L vehicles with date code 2204 to 2274 should not be used. Any other date code outside this is acceptable even with an "A3" stamp.

NOTE:

DATE CODES ARE BASED ON THE JULIAN DATE CODE SYSTEM. THE LAST NUMBER DENOTES THE YEAR THAT THE PART WAS MANUFACTURED. FOR EXAMPLE, 2274 (1994 PART) AND 2275 (1995 PART). ANY 1995 PART MAY BE USED.

TEMPERATURE INDICATION SERVICE KIT PROCEDURE

NOTE:

THIS PROCEDURE IS PERFORMED AFTER THE ABOVE TWO (2) STEPS HAVE BEEN DONE.

The installation of the service kit will result in a pointer indicating in the approximate center of the "NORMAL" band while providing protection for a boil-over condition.

The service kit consists of:

PART NUMBER	PART NAME
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F4DZ-10E922-A	Temperature Indication Kit - Base (Taurus)
F44Z-10E922-A	Temperature Indication Kit - With Tachometer (Taurus/Sable)
F4SZ-10E922-A	Temperature Indication Kit - Base (Thunderbird/Cougar)
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F47Z-10E922-B	Temperature Indication Kit - With Tachometer (Explorer - 4.0L, Ranger - 3.0L And 4.0L Engines)
F49Z-10E922-A	Temperature Indication Kit (Aerostar)

^ Instructions

^ Temperature Gauge

^ Temperature Sender

The instructions will contain the following steps:

1. Remove BOTH existing temperature sender and temperature gauge from the vehicle.

NOTE:

REFER TO SECTION 13, CONVENTIONAL INSTRUMENT CLUSTER, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE GAUGE REMOVAL AND INSTALLATION INSTRUCTIONS. REFER TO SECTION 03-03, COOLING SYSTEM, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE SENDER REMOVAL AND INSTALLATION PROCEDURES.

2. Install BOTH service kit temperature sender and temperature gauge into the vehicle.

NOTE:

THE SERVICE KIT TEMPERATURE SENDER AND TEMPERATURE GAUGE MUST BE USED TOGETHER.

Parts Block

OTHER APPLICABLE ARTICLES: 93-24-8 SUPERSEDES: 95-15-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

951805A Replace Temperature 1.0 Hr.

Gauge And Sending Unit - Taurus/Sable, Tempo/Topaz, Thunderbird/Cougar, Explorer, Ranger, Aerostar (4X2)

951805B Replace Temperature 1.1 Hr.

Gauge And Sending Unit - Escort/Tracer

951805C Replace Temperature 1.2 Hrs.

Gauge And Sending Unit - Aerostar (4X4)

DEALER CODING

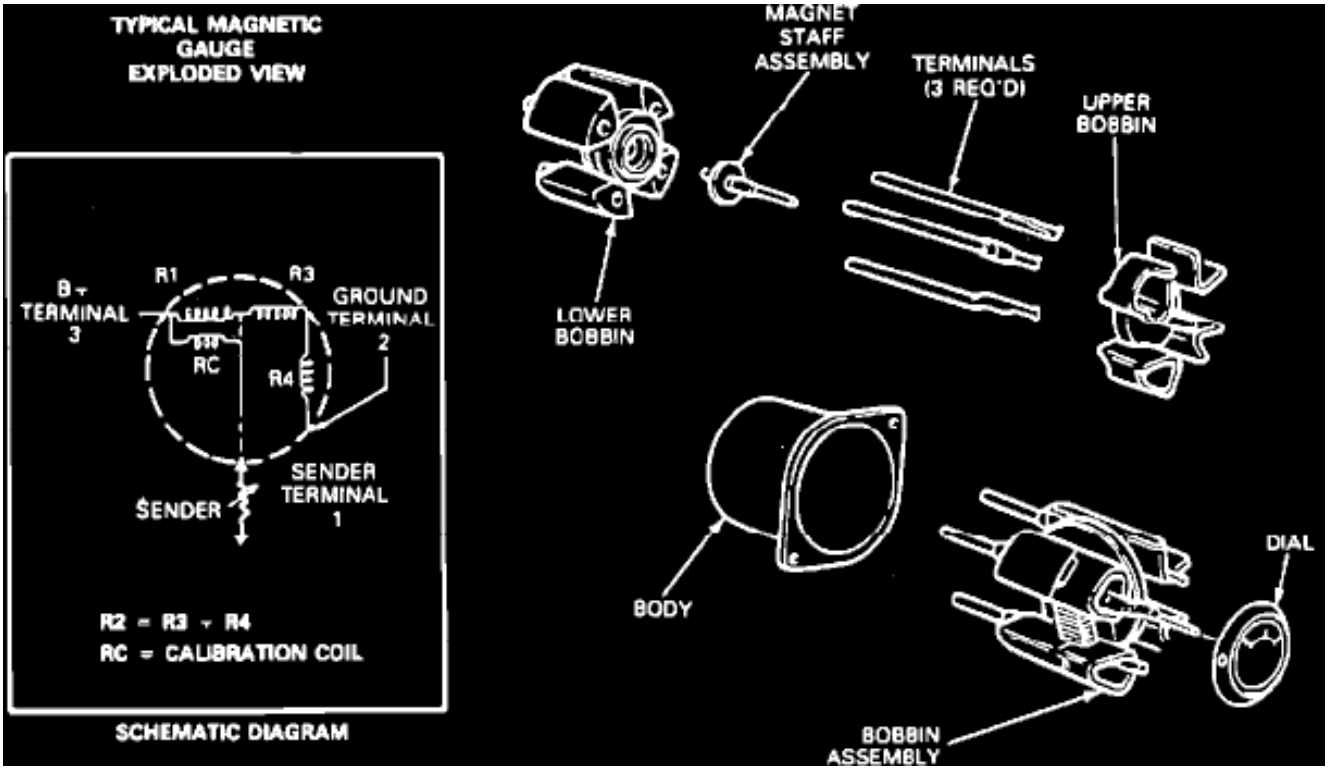
CONDITION

BASIC PART NO. CODE

10883 79

10884 79

OASIS CODES: 204000, 204200, 206000, 402000



Temperature Gauge: Description and Operation

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

This temperature indicating system consists of a sending unit, located on the cylinder head, electrical temperature gauge and an instrument voltage regulator. As engine temperature increases or decreases, the resistance of the sending unit changes, in turn controlling current flow to the gauge. When engine temperature is low, the resistance of the sending unit is high, restricting current flow to the gauge, in turn indicating low engine temperature. As engine temperature increases, the resistance of the ending unit decreases, permitting an increased current flow to the gauge, resulting in an increased temperature reading.

MAGNETIC GAUGE SYSTEM

Fig. 8 Magnetic Guage

The magnetic gauge movement consists of three primary coils, one of which is wound at a 90° angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet which is attached to a shaft and pointer rotates and aligns to this primary field resulting in pointer position. The bobbin/coil assembly is pressed into a metal housing which is attached to the instrument cluster, Fig. 8. These gauges require no adjustments, calibrations or maintenance. This gauge system does not use an IVR.

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	TEMPERATURE OR OIL GAUGE INOPERATIVE		
	• Check complaint.	Gauge pointer does not move ▶	GO to Step A2.
		Gauge pointer moves ▶	GO to Step B1.

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	VERIFY POWER TO CLUSTER		
	• With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test light to verify voltage at B+ terminal of cluster connector.	Other gauges and warning lamps operate correctly: voltage present at cluster ▶	GO to Step B1.
		Other gauges and warning lamps do not operate correctly: no voltage present at cluster ▶	SERVICE wiring to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TESTING SENDER CIRCUIT AT LOW		
	• Insert test box in sender circuit. Disconnect connector at sender and connect test box to cluster side of connector. Set box to LOW (73 ohms).	Temperature gauge reads around the C band ▶	GO to Step B2.
		Oil reads at or below L band ▶	GO to Step B3
		Pointer does not move ▶	GO to Step B4.
B2	TESTING TEMPERATURE SENDER CIRCUIT AT HIGH		
	• TEMPERATURE GAUGE • Set test box to HIGH (9.7 ohms).	Temperature gauge reads around the H grad ▶	REPLACE sender.
		Temperature gauge does not read around the H grad ▶	GO to Step B4.
B3	TESTING ON CABLE SENDER CIRCUIT AT HIGH		
	• OIL GAUGE • Set test box to 0 ohms (short circuit).	Oil gauge reads MID SCALE or slightly above ▶	REPLACE switch.
		Oil gauge does not read MID SCALE or slightly above ▶	GO to Step B4.
B4	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flexible circuit for shorts or open with ohmmeter.	Wiring and flex circuit OK ▶	REPLACE gauge. GO to A1.
		Wiring shorted or open. Flex circuit damaged ▶	REPAIR wiring / flex circuit. GO to A1.

Temperature Gauge: Pinpoint Tests

Fig. 11 Troubleshooting Chart

Fig. 11 Troubleshooting Chart

Fig. 12 Troubleshooting Chart

Temperature Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Temperature Gauge: Tools and Equipment

Tester tool No. 021-00055 or equivalent should be used to diagnose these type gauges.

Temperature Warning Lamp/Indicator: Description and Operation

A bimetal temperature switch located in the cylinder head controls operation of a temperature indicator light with a red lens. If engine cooling system is not functioning properly and coolant temperature exceeds a predetermined value, warning light will illuminate.

Temperature Warning Lamp/Indicator: Testing and Inspection

If the red light is not lit when engine is being cranked, check for a burned out bulb, open in light circuit, or a defective ignition switch. If red light is lit when engine is running, check wiring between light and switch for a ground, defective temperature switch, or overheated cooling system. As a test circuit to check whether the red bulb is functioning properly, a wire which is connected to the ground terminal of the ignition switch is tapped into its circuit. When the ignition is in ``Start'' (engine cranking) position, ground terminal is grounded inside the switch and the red bulb will be lit. When engine is started and the ignition switch is in the On position, test circuit is opened and bulb is then controlled by the temperature switch.

Thermostat: Technical Service Bulletins Cooling System - New System Diagnostics

Article No. 93-24-8

11/24/93

^ HESITATION - ROUGH IDLE - ENGINE COOLANT DOES NOT REACH NORMAL OPERATING TEMPERATURE - MEDIUM TRUCKS WITH 7.0L ENGINES

^ HESITATION/STALL DURING ACCELERATION OR DECELERATION

^ IDLE - ROUGH - ENGINE COOLANT DOES NOT REACH NORMAL OPERATING TEMPERATURE

^ HEATER/DEFROSTER - POOR HEATER OUTPUT - THERMOSTAT STUCK OPEN

^ COOLING SYSTEM - NEW DIAGNOSTICS FOR ENGINES THAT DO NOT REACH NORMAL OPERATING TEMPERATURE

FORD: 1983-94 ESCORT 1984-87 EXP 1984-94 CROWN VICTORIA, MUSTANG, TEMPO, THUNDERBIRD 1986-94 TAURUS

LINCOLN-MERCURY: 1984-86 CAPRI 1984-87 LYNX 1984-92 MARK VII 1984-94 CONTINENTAL, COUGAR, GRAND MARQUIS, TOPAZ, TOWN CAR 1986-94 SABLE 1988-89 TRACER 1991-94 CAPRI, TRACER

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1984-94 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1985-90 BRONCO II 1986-94 AEROSTAR 1988-94 F SUPER DUTY 1991-94 EXPLORER

This TSB article is being republished in its entirety to include 1994 model year vehicles.

ISSUE: Engine performance concerns such as hesitation or stall, rough idle, and/or poor fuel economy may be caused by the thermostat stuck in an open position or opening at a temperature lower than specified.

ACTION:

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE SOURCE	ACTION
• Engine fails to reach normal operating temperature	• Coolant level	• Check level in radiator and coolant recovery reservoir.
	• Leakage	• Check for leaks using pressure test.
• Low gauge reading	• Thermostat operation	• Check thermostat. Refer to "Thermostat Diagnosis" procedure.
	• Temperature gauge or sending unit	• Check gauge and gauge sender. Refer to Service Manual Section 13-01.
• Poor heater/defroster performance	• Coolant level	• Check level in radiator and coolant recovery reservoir.
	• Leakage	• Check for leaks using pressure test.
	• Thermostat operation	• Check Thermostat. Refer to "Thermostat Diagnosis" procedure.
	• Blend door operation	• Check blend door for binding and proper operation.
	• Mode door operation	• Check mode door for binding and proper operation.
	• Blower fan operation	• Check blower fan for proper operation and control.
	• Heater core plugged	• Flush cooling system.

Use the following "Cooling System Diagnosis" procedure to diagnose a cooling system that may not be reaching normal operating temperature. Follow the "Thermostat Diagnosis" procedure to determine if the thermostat may be at fault. Check the thermostat without removing it from the vehicle by using Rotunda Service Coolant Temperature Monitor Harness 007-00064.

A new cooling system diagnosis procedure has been developed for engines that do not reach normal operating temperature. A new thermostat diagnosis procedure also has been developed, using a new service coolant temperature monitor harness.

NOTE: THIS PROCEDURE WILL DIAGNOSE ONLY COOLING SYSTEMS THAT MAY NOT BE REACHING NORMAL OPERATING TEMPERATURE. IT WILL NOT DIAGNOSE A THERMOSTAT THAT CAUSES AN ENGINE OVERHEAT CONDITION.

NOTE: THE ESCORT/TRACER SPECIFIC APPLICATION FOR THIS ARTICLE IS AS FOLLOWS:

^ 1983-1990 Escort 1.9L and 1.6L

^ 1991-1994 Escort 1.9L

^ 1991-1994 Tracer 1.9L Only

THERMOSTAT DIAGNOSIS

NOTE: DISCONNECTING THE POWERTRAIN CONTROL MODULE (PCM) TO ATTACH A BREAKOUT BOX OR AN EEC IV MONITOR WILL ERASE THE ADAPTIVE LEARNING FROM MEMORY AND MAY "HIDE" A DRIVE CONCERN TEMPORARILY UNTIL THE ADAPTIVE LEARNING IS RE-LEARNED.

NOTE: THIS PROCEDURE IS MOST ACCURATE IF PERFORMED INDOORS AT LESS THAN 100~F (38~C) AMBIENT TEMPERATURE. THIS TEST MAY BE PERFORMED WITH OR WITHOUT THE HOOD OPEN AND WITH THE ENGINE WARM OR COLD.

CAUTION: ALWAYS VENT THE EXHAUST TO THE OUTSIDE WHEN PERFORMING THIS TEST.

1. Check the coolant level in the radiator and coolant recovery reservoir.

2. With the key in the "off" position, proceed as follows:

a. Remove the engine coolant temperature (ECT) sensor harness connector.

b. Attach Rotunda Service Coolant Temperature Monitor Harness 007-00064 as a jumper between the PCM and the ECT.

c. Attach Rotunda 73 Digital Multimeter 105-00051 or equivalent to the thermostat monitor harness. Voltage values (0-5vdc) may now be

VOLTAGES AND CORRESPONDING TEMPERATURES							
ECT (volts)	3.00	2.01	1.01	0.75	0.59	0.50	0.40
Coolant Temperature (°F)	71	109	159	180	195	206	221
Coolant Temperature (°C)	22	43	71	82	91	97	105

monitored while the sensor retains its connection to the wiring harness.

NOTE: A ROTUNDA NEW GENERATION STAR TESTER (NGS) 007-00500 OR THE ROTUNDA SERVICE BAY DIAGNOSTIC SYSTEM (SBDS) 001-00001 MAY BE USED TO MONITOR THE ECT ON VEHICLES EQUIPPED WITH DATA COMMUNICATIONS LINK (DCL). THE SBDS SEQUENCE TO USE FOR THE SCREEN IS "TOOLBOX - ELECTRONIC ENGINE CONTROL AND DCL - ITEM".

3. Vehicles equipped with electric engine cooling fan(s) must have a fan running during this test (high or low speed may be used). Two methods may be used to turn the fan(s) on:

a. Disconnect the A/C compressor clutch power supply and turn the climate control to A/C "ON". Or

b. Disconnect the power supply to the cooling fan and supply 12 volts direct to the fan connector from the battery.

NOTE: A GROUND MAY BE REQUIRED FOR SOME APPLICATIONS.

4. Place transmission in "park" or "neutral".

NOTE: RUNNING THIS TEST WITH THE VEHICLE IN GEAR OR WITH THE A/C COMPRESSOR CLUTCH ENGAGED (RUNNING) WILL CAUSE IMPROPER DIAGNOSIS

5. Start the engine and allow to idle throughout this test:

a. Allow engine to run for 2 minutes, then record ECT voltage.

b. From now on, record ECT voltage every 60 seconds.

c. When the ECT voltage trend changes direction or changes only slightly (0.03 volts or less) from the previous reading, record this as the thermostat opening voltage.

d. Use the "Voltage and Corresponding Temperature Chart" shown to obtain actual coolant temperatures.

6. If the opening voltage is GREATER than 0.75 volts (less than 18~ F/ 82~ C), or 0.85 volts (170~ F/ 77~ C) for 2.3L HSC engine only, replace the thermostat. Refer to the dealer Master Parts Catalog for correct thermostat usage.

7. If the thermostat opening voltage is LESS than 0.75 volts (greater than 180~ F/ 82~ C), or 0.85 volts (170~ F/ 77~ C) for 2.3L HSC engine only, the thermostat is good and should NOT be replaced. The "Cooling System Diagnosis Chart" should be referenced for further instructions.

NOTE: The 10~ F opening temperature difference for the 2.3L HSC engine is due to the ECT sensor location.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-14-4 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208000, 208100, 402000, 608000, 608400, 609000, 609400, 611000, 611500, 622000, 690000

Thermostat: Testing and Inspection

The thermostat should be replaced only after the following tests have been performed:

1. Heat Test

89° C (192° F) Thermostat

Immerse the removed thermostat in a 89°C (192°F) solution of antifreeze and water mixture. An 89°C (192°F) thermostat should open to 0.08 mm (0.0003 inch). When immersed in a 100° C (212° F) solution, the thermostat should open to 3.2 mm (1/8 inch).

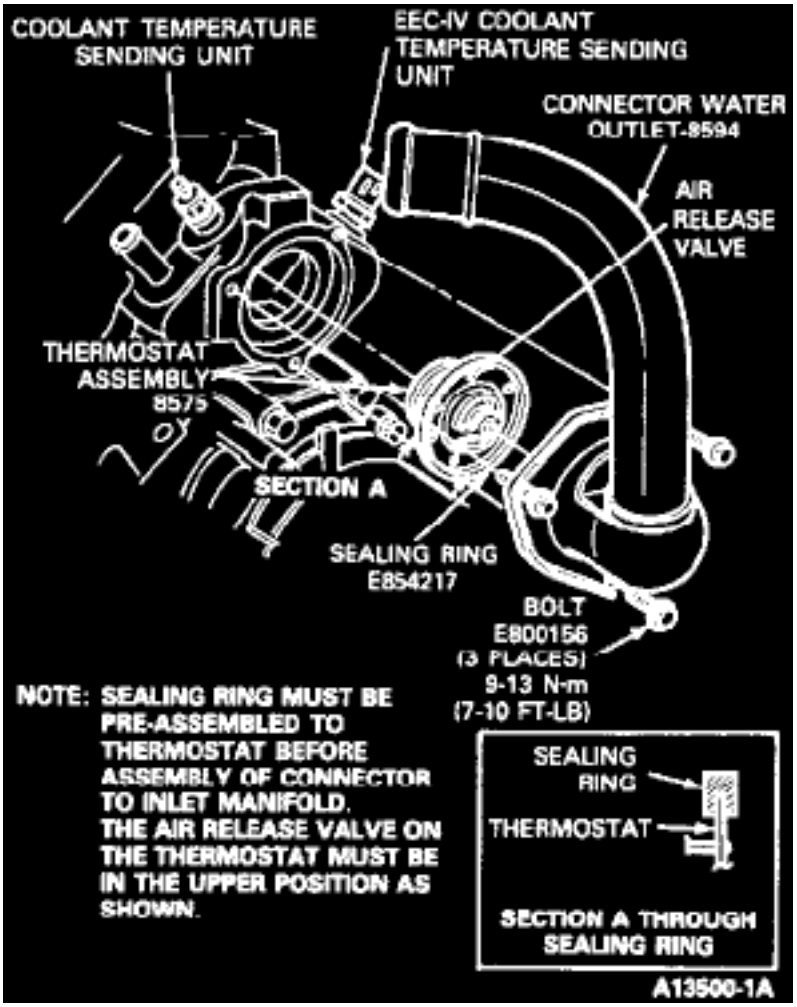
92° C (197° F) Thermostat

A 92°C (197°F) thermostat immersed in a 92°C (197°F) solution of antifreeze and water should open to O.O8 mm (0.0003 inch), when immersed in the 100° C (212° F) solution, the thermostat should open 3.2 mm (1/8 inch).

2. Visual Test

a. If heat is not available, the thermostat should be checked for leakage. This is done by holding the thermostat up to a lighted background.

Leakage of light around the thermostat valve (thermostat at room temperature) indicates that the thermostat should be replaced with an original equipment, approved thermostat. Some thermostats have a small leakage notch at one location on the perimeter of the thermostat valve which is considered normal.



Thermostat: Service and Repair

REMOVAL

1. Perform this operation on a cool engine to prevent injury from hot coolant. 2. Drain cooling system. 3. Disconnect negative battery terminal and set aside. 4. Remove air cleaner air duct assembly from throttle body and air cleaner. 5. Remove upper radiator hose from thermostat housing. 6. Remove three attaching bolts from housing. 7. Remove housing and thermostat.

INSTALLATION

1. Clean gasket mating surfaces with scraper or appropriate tool. Use care not to gouge aluminum components.

Thermostat And Housing

NOTE: Make sure the sealing ring is properly installed on the thermostat.

2. Install thermostat into housing making sure the air release valve is in the up position. 3. Install thermostat housing assembly and new gasket. Tighten attaching bolts to 9-13 Nm (7-10 ft lb). 4. Install upper radiator hose. Tighten clamp securely. 5. Fill and bleed cooling system with specified

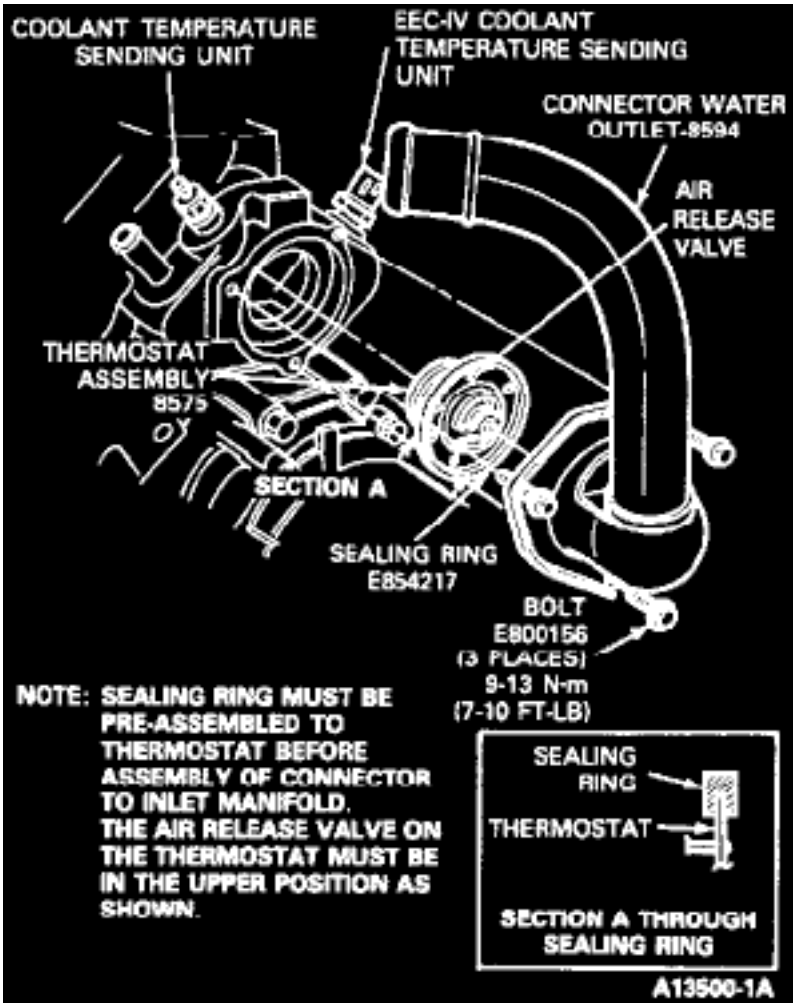
coolant and proper mixture. 6. Install air cleaner air duct assembly. Tighten clamps securely. 7. Connect negative ground cable.

WARNING: Do not stand in line with or near radiator fan when engine is running.

8. Run engine and check for coolant leaks.

Thermostat Housing: Specifications

Thermostat Housing Assembly Attaching Bolts ..... 9-13 Nm (7-10 ft lb)



Thermostat Housing: Service and Repair

REMOVAL

1. Perform this operation on a cool engine to prevent injury from hot coolant. 2. Drain cooling system. 3. Disconnect negative battery terminal and set aside. 4. Remove air cleaner air duct assembly from throttle body and air cleaner. 5. Remove upper radiator hose from thermostat housing. 6. Remove three attaching bolts from housing. 7. Remove housing and thermostat.

INSTALLATION

1. Clean gasket mating surfaces with scraper or appropriate tool. Use care not to gouge aluminum components.

Thermostat And Housing

NOTE: Make sure the sealing ring is properly installed on the thermostat.

2. Install thermostat into housing making sure the air release valve is in the up position. 3. Install thermostat housing assembly and new gasket. Tighten attaching bolts to 9-13 Nm (7-10 ft lb). 4. Install upper radiator hose. Tighten clamp securely. 5. Fill and bleed cooling system with specified

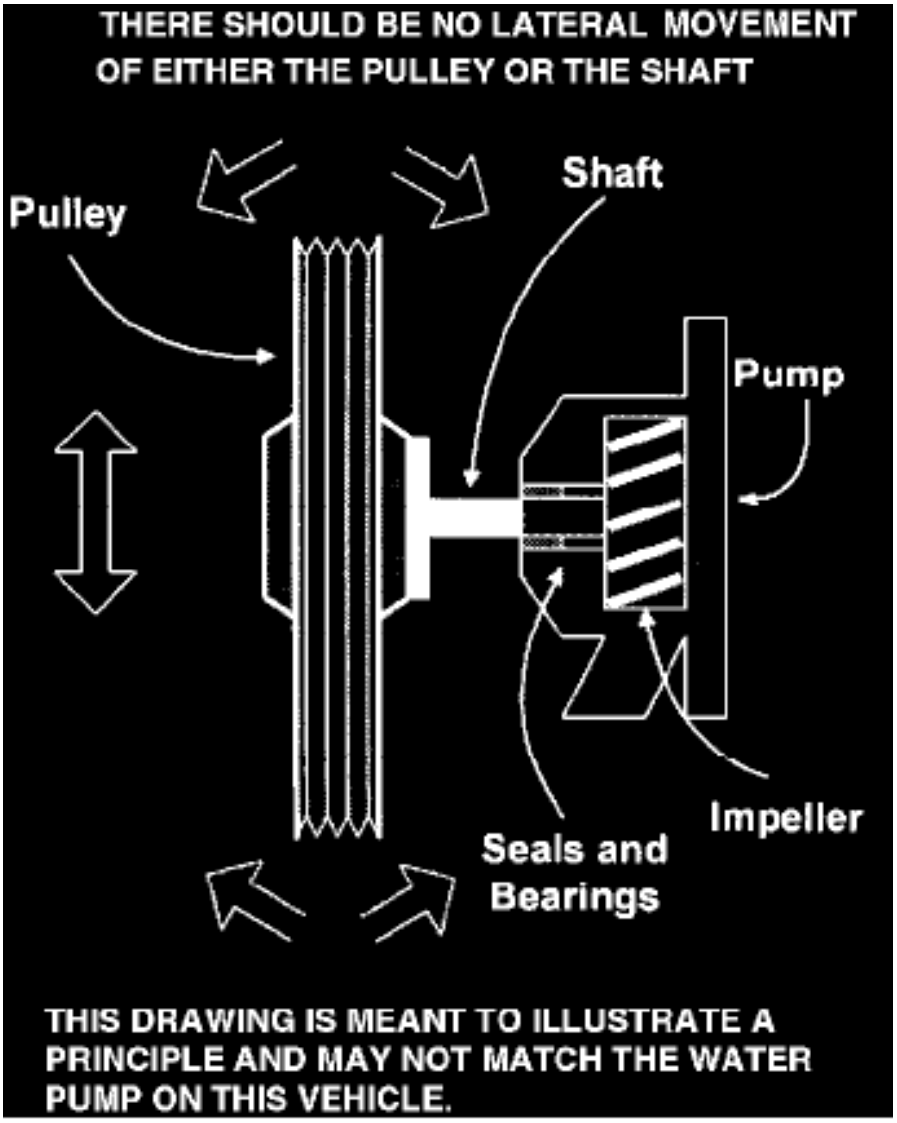
coolant and proper mixture. 6. Install air cleaner air duct assembly. Tighten clamps securely. 7. Connect negative ground cable.

WARNING: Do not stand in line with or near radiator fan when engine is running.

8. Run engine and check for coolant leaks.

Water Pump: Specifications

Water Pump Assembly Attaching Bolts ..... 8.5-12 Nm (6-9 ft lb) Water Pump Pulley Bolts .... 24-30 Nm (18-23 ft lb)


THERE SHOULD BE NO LATERAL MOVEMENT OF EITHER THE PULLEY OR THE SHAFT
Pulley
Shaft
Pump
Impeller
Seals and Bearings
THIS DRAWING IS MEANT TO ILLUSTRATE A PRINCIPLE AND MAY NOT MATCH THE WATER PUMP ON THIS VEHICLE.

Water Pump: Testing and Inspection Verifying Water Pump Problem

VERIFYING WATER PUMP PROBLEM

Check for Loose Water Pump Pulley

As the pump shaft seals and bearings wear with age the pulley/shaft may develop a wobble or lateral runout.

- With the engine off and the key removed from the ignition, attempt to move the pulley from side to side and back and forth. There should be no detectable movement. The pulley should turn smoothly, with no rough spots.

- The water pump should be replaced if any pulley wobble is detected. If the water pump is not replaced the pump shaft may eventually seize or break.

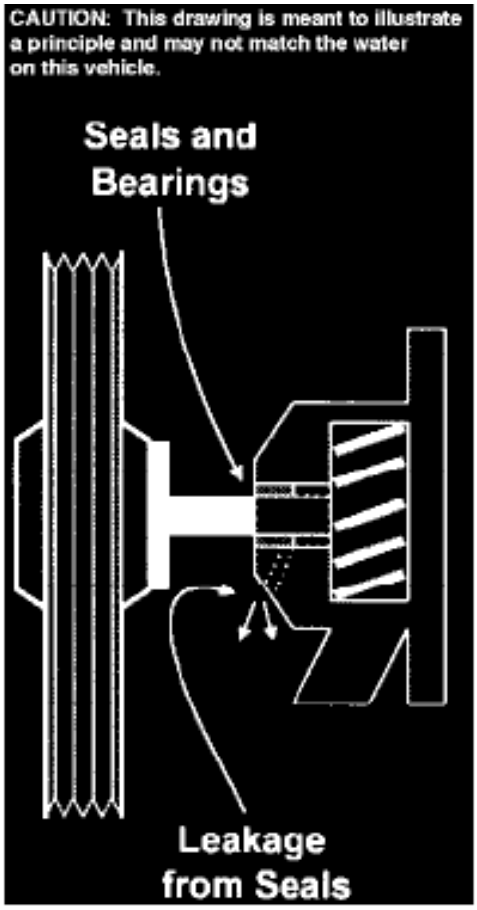
NOTE: Incorrect belt tension (too tight) may cause premature wear of the bearings and seals.

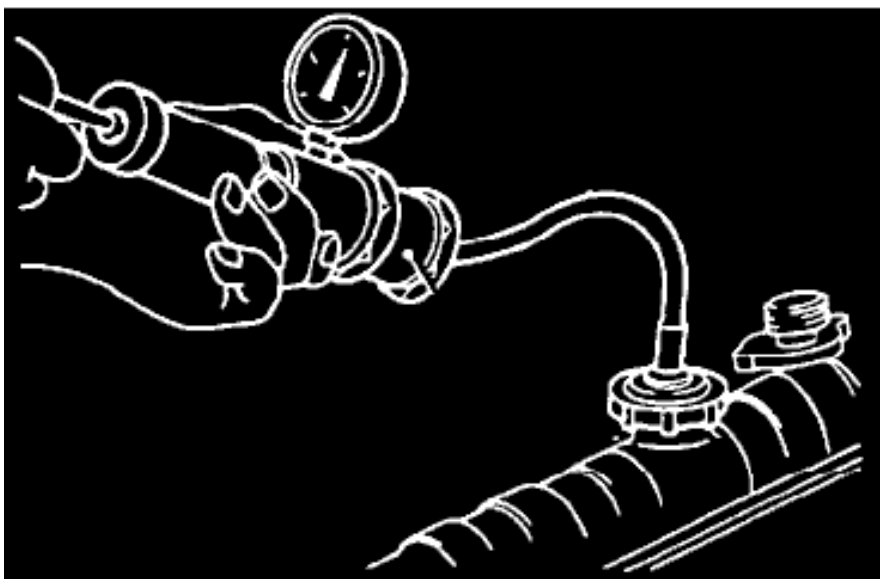
WARNING: Never remove a radiator cap while the engine is hot. Severe personal injury may result.

Inspect for Leakage

1. With the engine "OFF" and cold:

- Check coolant level and refill if necessary.


CAUTION: This drawing is meant to illustrate a principle and may not match the water on this vehicle.
Seals and Bearings
Leakage from Seals



- Inspect the water pump for leakage. Closely check the following areas: -

Inspection (weep) hole.

- Pump shaft.

- Gasket.

2. Pressurize the cooling system with a pressure tester and again check for leaks. Do not exceed the rated pressure of the radiator cap.

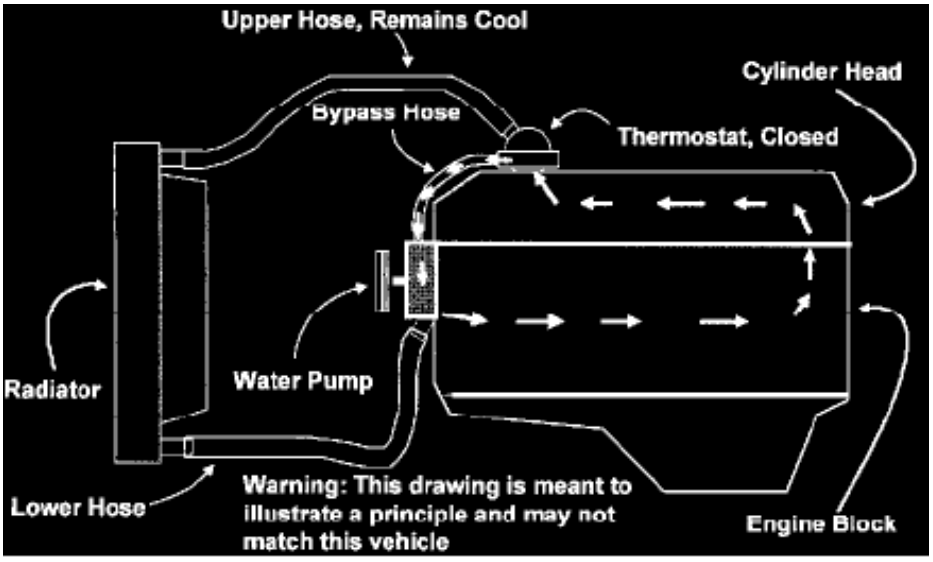
NOTE: If any leaks are found, verify that they are not originating from a component near or above the water pump (i.e. thermostat, loose radiator hoses, intake gasket, engine coolant temperature sensor)

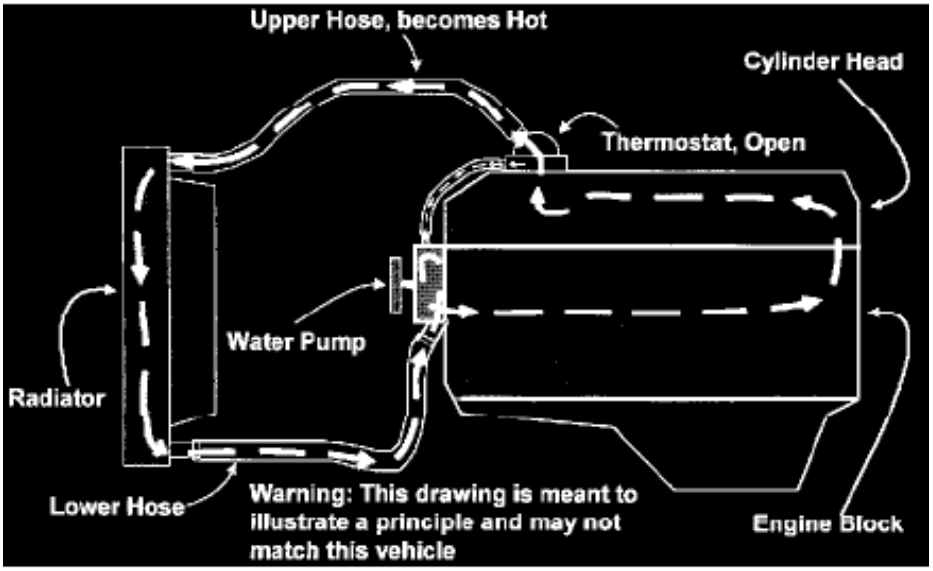
CAUTION: When finished, immediately re-install the radiator cap.

3. If no leaks are found, start and warm the engine until the thermostat opens. Stop the engine and check for fresh leakage around the water pump

shaft.

NOTE: Occasionally water pumps will only leak around the shaft seals while the shaft is rotating.


Upper Hose, Remains Cool
Cylinder Head
Bypass Hose
Thermostat, Closed
Radiator
Water Pump
Lower Hose
Warning: This drawing is meant to illustrate a principle and may not match this vehicle
Engine Block


Upper Hose, becomes Hot
Cylinder Head
Thermostat, Open
Water Pump
Radiator
Lower Hose
Warning: This drawing is meant to illustrate a principle and may not match this vehicle
Engine Block

Water Pump: Testing and Inspection After Repairs Operational Check

COOLING SYSTEM OPERATIONAL CHECK

IMPORTANT: Always verify the operation of the thermostat and cooling fan prior to driving the vehicle after a cooling system repair.

HOW

- With the cooling system filled with coolant and the radiator cap installed, start the engine and allow the coolant to warm up.

- The upper radiator hose should remain cool to the touch until the coolant within the engine block and head has reached the thermostat opening temperature.

-

The thermostat opening should be indicated by a rapid warm up of the upper radiator hose.

- If upper hose gradually warms up, the thermostat may be stuck open (assuming the engine is started cold)

- If the coolant temperature reaches the normal operating temperature (as indicated by the temperature gauge) before the upper hose becomes warm, the engine should be turned off, and the cooling system allowed to cool down. The thermostat may be stuck closed and should be removed and tested.

WARNING: Never remove a radiator cap while the engine is hot. Severe personal injury may result.

- After the cooling system has warmed up, turn off the engine, and verify the cooling fan clutch has engaged. -

The clutch should offer resistance when attempting to rotate the fan by hand.

- When the engine is cold the fan should spin freely on the clutch.

WHY

Thermostat Closed, Cold Engine - With the thermostat closed, coolant flow through the radiator is blocked forcing the coolant to re-circulate through the block and head. This allows for a rapid warm up. During this time there should be little or no coolant flow through the upper radiator hose.

Thermostat Open, Warm Engine - Once the coolant has reached normal operating temperature, the thermostat begins to open, allowing coolant flow through the upper hose and into the radiator. The thermostat will continue to regulate the amount of coolant flow to the radiator to maintain a "Minimum" operating temperature.

Water Pump: Testing and Inspection After Repairs Leak Check

AFTER REPAIRS LEAK CHECK

PURPOSE

Initially fill the cooling system and check for leaks prior to starting the engine and bleeding the system. Although the system will not be completely full, any leaks which are detected may be fixed before the engine and cooling system are hot.

NOTE: It is much easier to repair a leak on a cold engine than on a hot engine.

HOW

- Fill the cooling system until the radiator is full.

- Apply pressure to the system with a pressure tester.

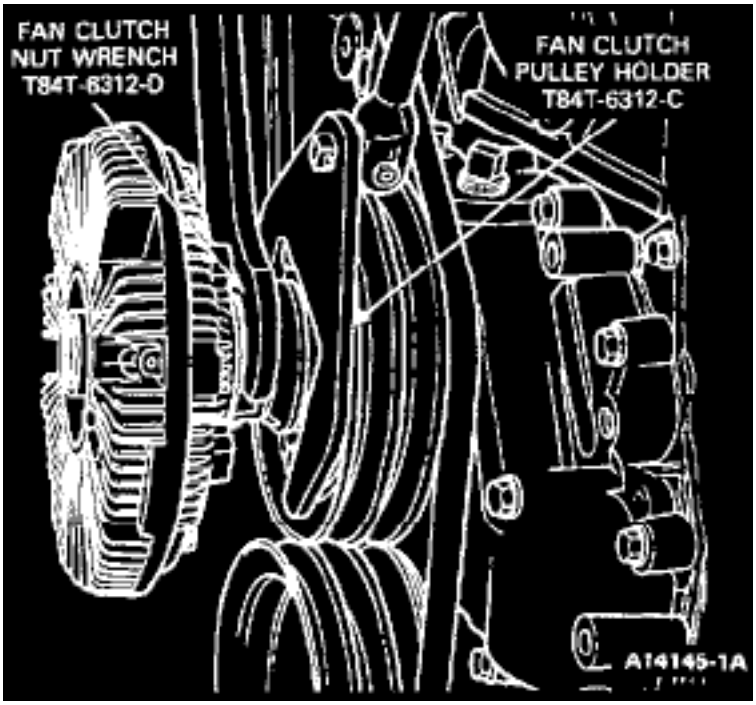
- Carefully check for leaks around: -

All hoses and clamps.

- Water pump sealing surfaces.

- Any cooling system component which was removed or replaced.

- If no leaks are detected continue with the fill and bleed procedure.



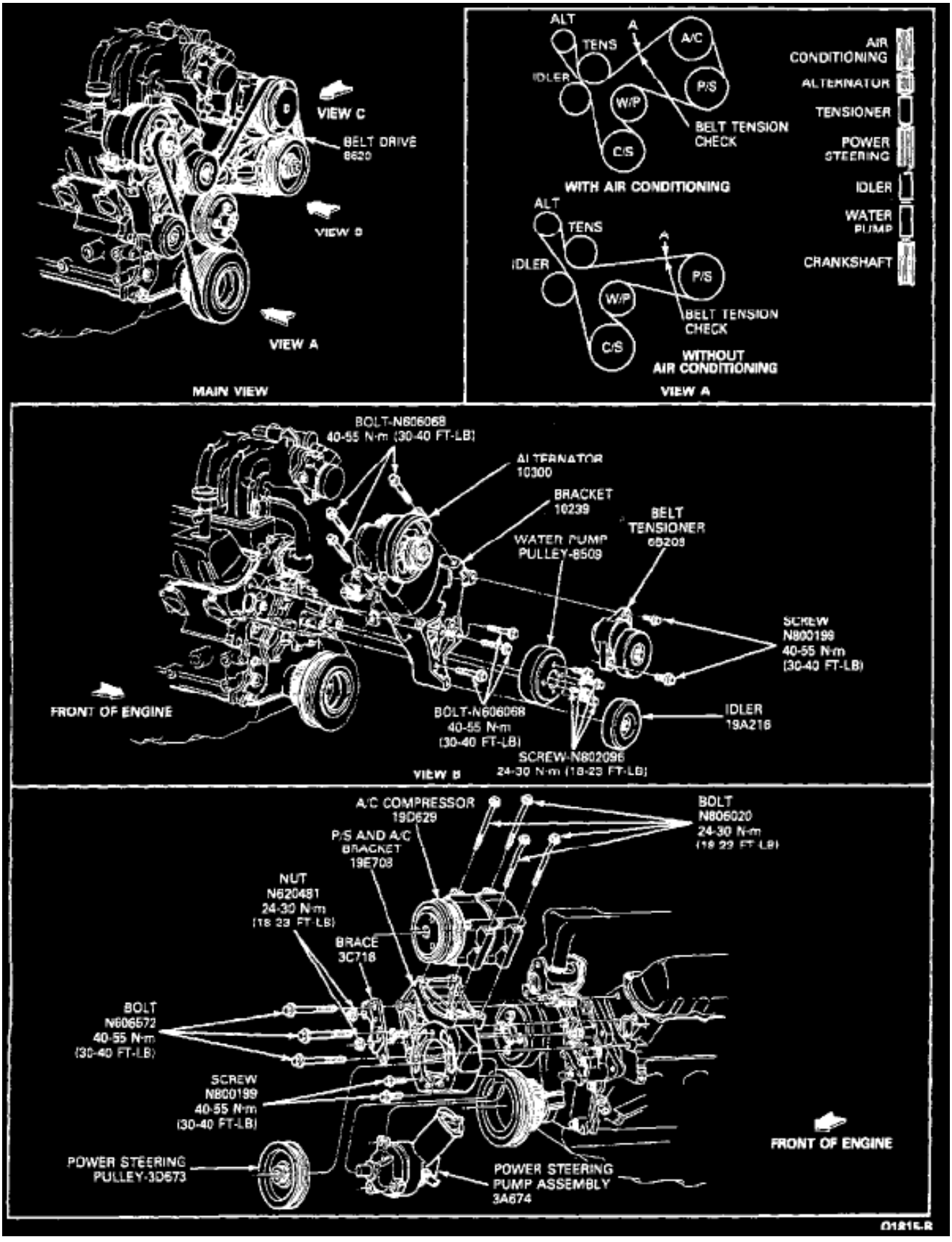
Water Pump: Service and Repair Removal

REMOVAL

1. Drain the coolant. Detach the radiator lower hose and the heater return hose from the water pump.

Fan Clutch Tools

2. Remove fan and clutch assembly using Fan Clutch Pulley Holder T84T-6312-C and Fan Clutch Nut Wrench T84T-6312-D or equivalents. 3. Loosen the alternator mounting bolts and remove the belt. Vehicles with A/C, remove alternator and bracket. 4. Remove the water pump pulley. 5. Remove the water pump assembly attaching bolts and remove water pump assembly.


VIEW C
BELT DRIVE
8620
VIEW B
VIEW A
MAIN VIEW
ALT
TENS
IDLER
A
A/C
P/S
W/P
C/S
BELT TENSION CHECK
WITH AIR CONDITIONING
WITHOUT AIR CONDITIONING
VIEW A
AIR CONDITIONING
ALTERNATOR
TENSIONER
POWER STEERING
IDLER
WATER PUMP
CRANKSHAFT
BOLT-N606068
40-55 N·m (30-40 FT-LB)
ALTERNATOR
10300
BRACKET
10239
BELT TENSIONER
8620B
WATER PUMP PULLEY-8509
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
FRONT OF ENGINE
BOLT-N606068
40-55 N·m
(30-40 FT-LB)
IDLER
19A216
SCREW-N802096
24-30 N·m (18-23 FT-LB)
VIEW B
A/C COMPRESSOR
19D629
P/S AND A/C BRACKET
19E708
BOLT
N606020
24-30 N·m
(18-23 FT-LB)
NUT
N620481
24-30 N·m
(18-23 FT-LB)
BRACE
3C718
BOLT
N606572
40-55 N·m
(30-40 FT-LB)
SCREW
N800199
40-55 N·m
(30-40 FT-LB)
POWER STEERING PULLEY-3D673
POWER STEERING PUMP ASSEMBLY
3A674
FRONT OF ENGINE
D1215-R

Water Pump: Service and Repair Installation

INSTALLATION

1. Remove all gasket material from the sealing surfaces on front cover and water pump assembly. Apply sealer to both sides of the new gasket and

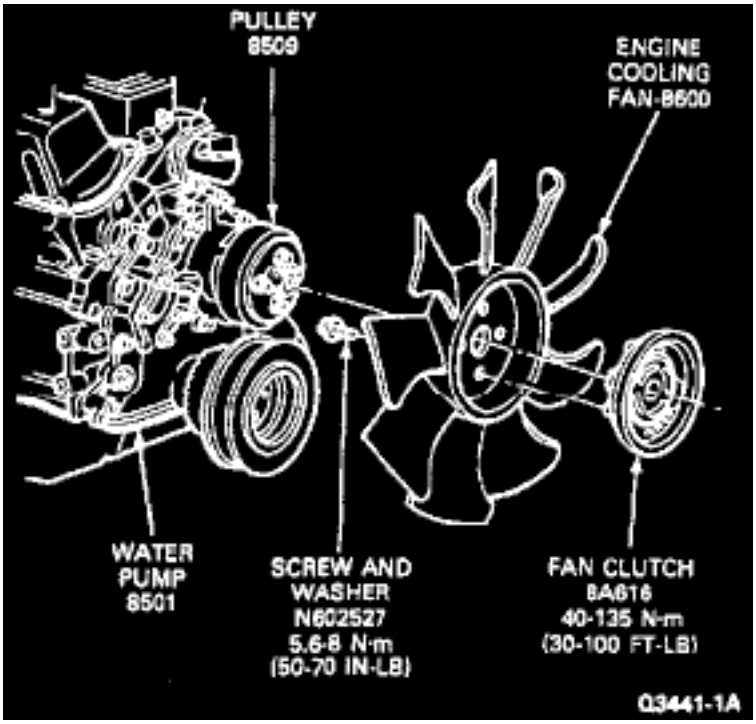
place the gasket on the water pump.

2. Position the water pump assembly to the front cover with two bolts finger-tight. Tighten all water pump assembly attaching bolts to 8.5-12 Nm

(6-9 ft lb).

Drive Belt Routing

3. Install water pump pulley. Tighten bolts to 24-30 Nm (18-23 ft lb). With A/C, install bracket and alternator. Install belt and adjust tension. 4. Connect both hoses to water pump and tighten hose clamps. Fill and bleed cooling system.



Fan And Clutch

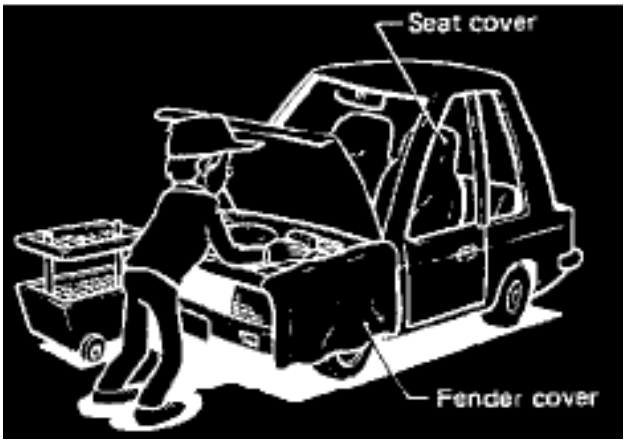
5. Install fan and clutch assembly using Fan Clutch Pulley Holder T84T-6312-C and Fan Clutch Nut Wrench T84T-6312-D or equivalents. Tighten

to 40-135 Nm (30-100 ft lb).

6. Start the engine and check for leaks.

T84T-6312-C

T84T-6312-D


Seat cover
Fender cover

Water Pump: Tools and Equipment

RECOMMENDED TOOLS

Fan Clutch Holding Tool

Fan Clutch Wrench

- Fan clutch wrenches, necessary for removing fan clutch: -

Clutch Holding Tool, T84T-6312-C

- Fan Clutch Nut Wrench, T84T-6312-D

- Drip pan - For draining coolant.

- Gasket scraper.

-

Torque Wrenches: -

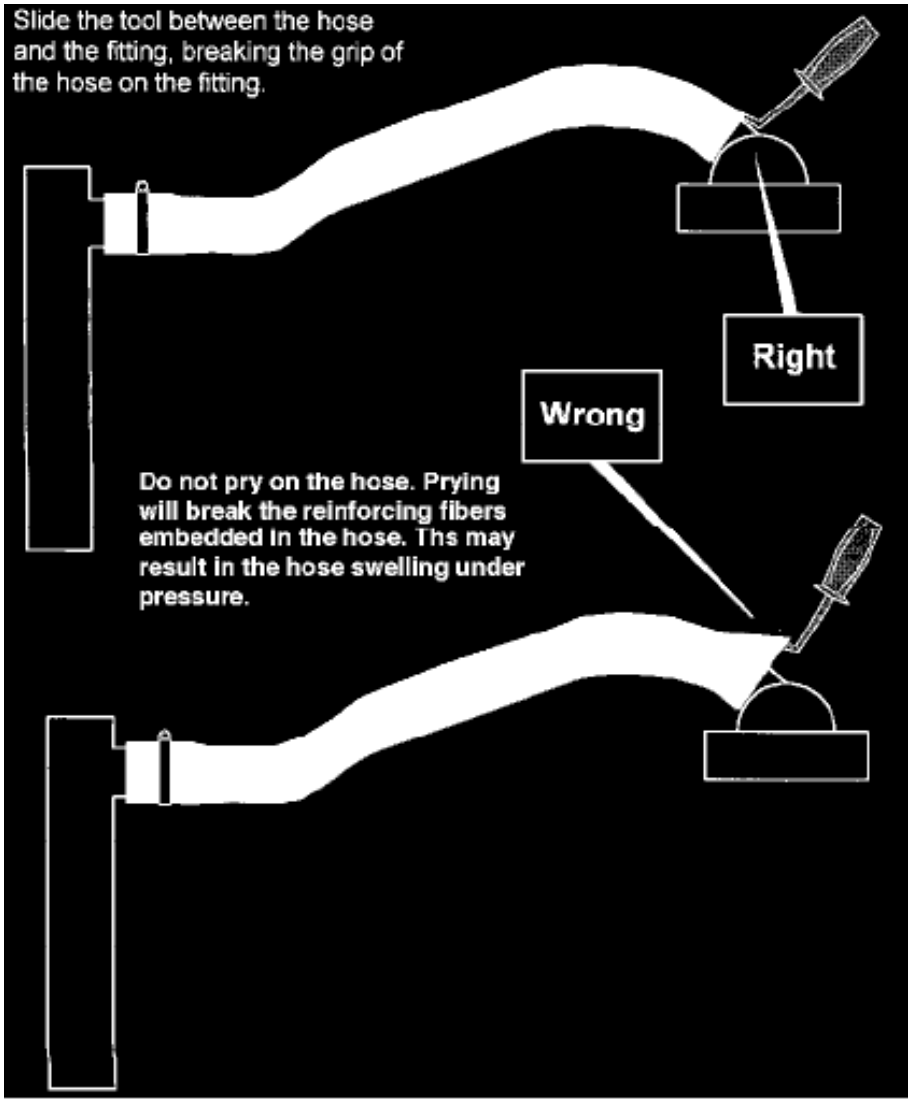
Low Range (0-50 ft-lb) for covers and brackets.

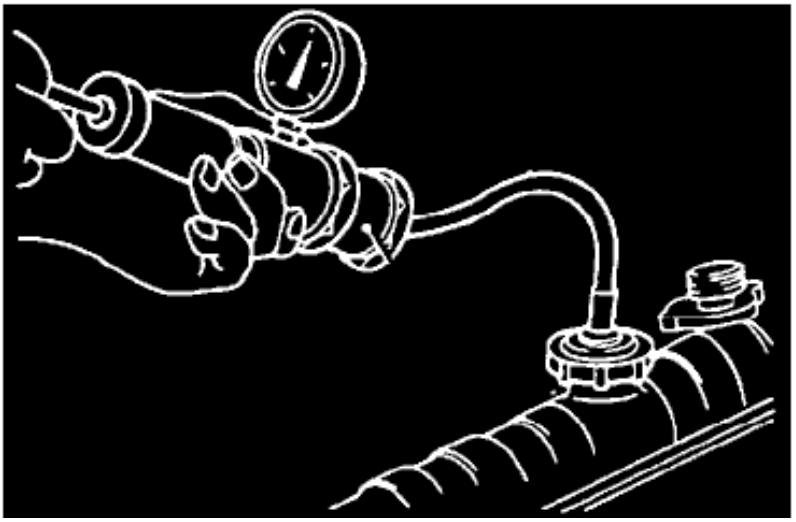
- High Range (0-150 ft-lb) for fan clutch.

- Full set of Metric sockets and wrenches.

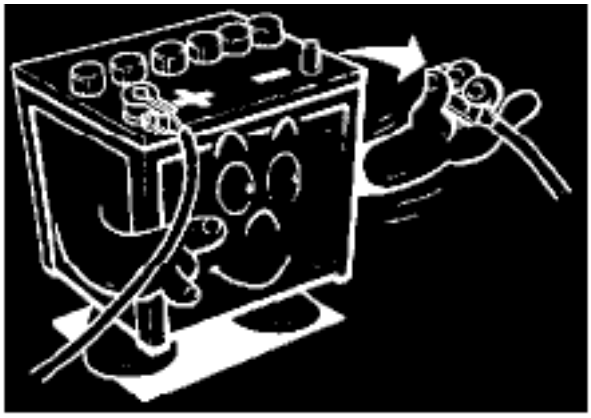
- Fender covers.

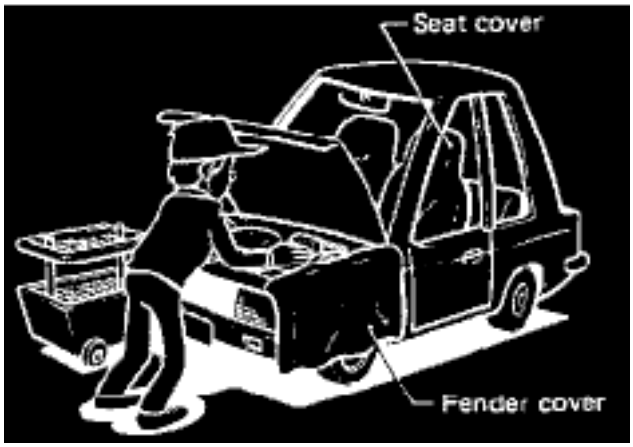
OPTIONAL


Slide the tool between the hose and the fitting, breaking the grip of the hose on the fitting.
Right
Wrong
Do not pry on the hose. Prying will break the reinforcing fibers embedded in the hose. Ths may result in the hose swelling under pressure.



- Radiator hose removal tool.
- Cooling system pressure tester.





Water Pump: Fundamentals and Basics Initial Preparations

INITIAL PREPARATIONS

Disconnect Battery

When working near or around the cooling fan or drive belts, accidentally engaging the starter or cooling fan can result in serious personal injury.

The negative battery terminal should be disconnected prior to commencing work and should not be reconnected until after the water pump is installed and the engine is ready to restart.

Fender Covers

Fender covers will prevent damage to the vehicles finish while performing the job.

NOTE: A fender cover folded over the radiator will prevent accidental damage to the radiator. The radiator can be easily damaged should a wrench slip off of a bolt while working on the water pump.

Coolant Drip Pan

Pre-position a drip pan under the vehicle to prevent any incidental spills.

Water Pump: Fundamentals and Basics Gasket Removal and Inspection

REMOVAL

- Remove all traces of the old gasket material. It only takes a very small amount of left over material to cause the new gasket to leak.

- Never reuse gaskets. After a gasket has been initially installed and removed it will no longer be able to compensate for the varying expansion rates of the water pump and block. An old gasket may seal initially but as the engine heats up cools down, the old gasket will be prone to leakage.

- When removing the gasket with a gasket scraper, be very careful not to gouge the sealing surface. Very small scratches in the sealing surface are likely to leak.

HINT: Always sharpen your gasket scraper prior to starting a job. A dull scraper is more likely to slip and gouge the sealing surface.

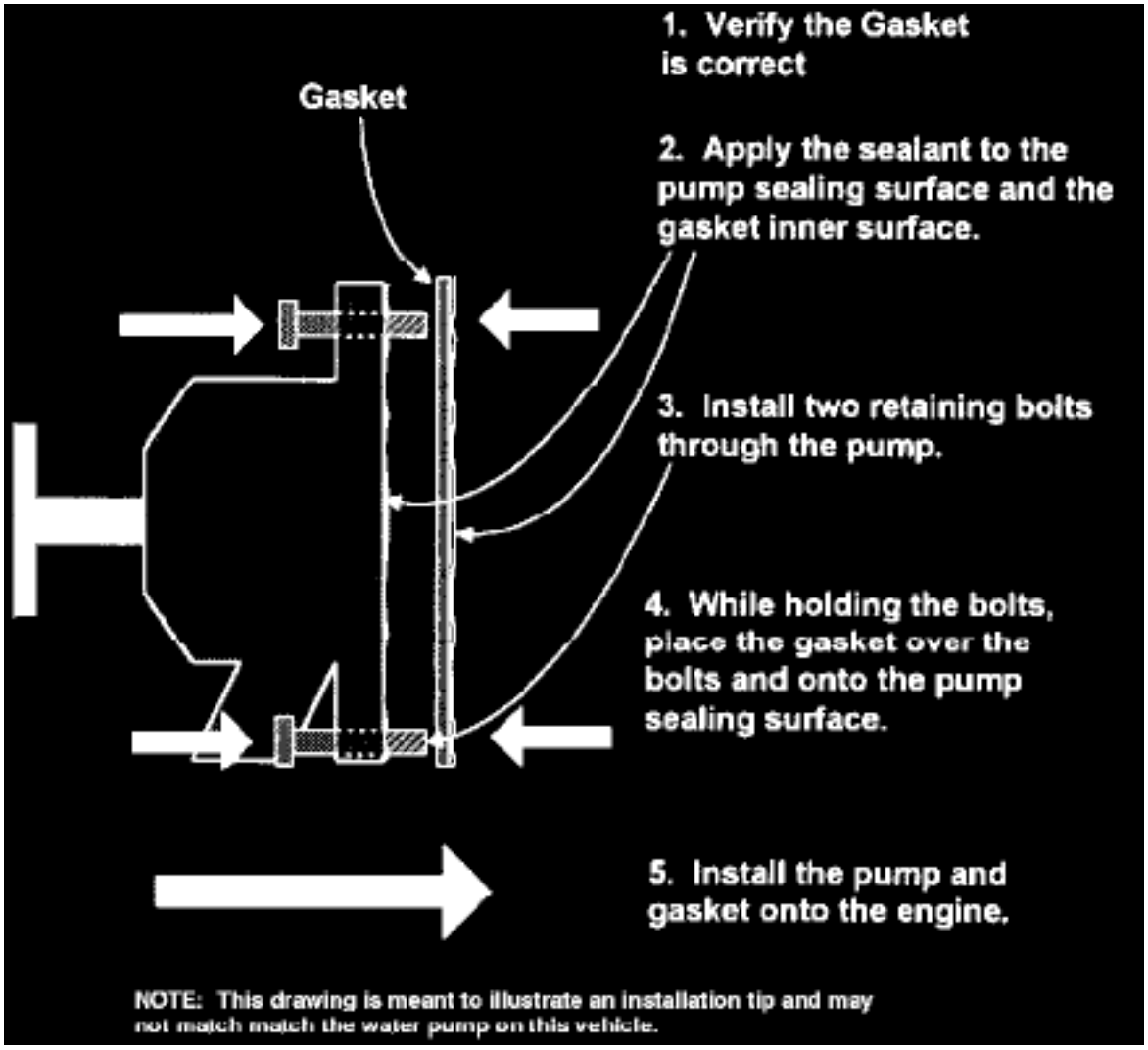
- If you are using a buffing wheel to clean the gasket surface, be very careful not to burn the surface.

CAUTION: Buffing wheels can rapidly remove metal from the sealing surface, be very careful and check your work frequently.

INSPECTION

- Verify the timing cover has not been damaged by the impeller. If a worn out water pump (shaft wobbles) is operated over a length of time the impeller (which also wobbles inside the pump) may wear into the timing cover. If the timing cover shows any signs of wear it should be replace.

- Verify the gasket sealing surfaces are free of all gasket material, dirt, gouges, and contaminants (such as coolant or oil).



Water Pump: Fundamentals and Basics Installation Tips and Hints

WATER PUMP INSTALLATION NOTES

- Compare the old pump to the new pump and verify: -

Shaft lengths match exactly.

- Retaining bolt holes match exactly.

-

Install the fan retaining studs into the shaft flange prior to installing the pump. The studs are much easier to install with the pump out of the vehicle.

- Prior to applying the sealant to the gasket and pump, practice installing the pump to the engine. If any problems are encountered they will be easier to solve without the silicone applied.

- Verify the retaining bolts and bolt holes have clean threads. Re-tap or chase the threads as necessary.

-

To simplify the gasket installation process and minimize errors, install the gasket as follows:

1. Verify the gasket is correct. 2. Apply the sealant to the pump sealing surface and the gasket inner surface. Apply only a light film of sealant to the sealing surfaces.

CAUTION: Excess sealant will squeeze out on the inside of the pump and may block the radiator or heater core coolant passages.

3. Install two retaining bolts through the pump.

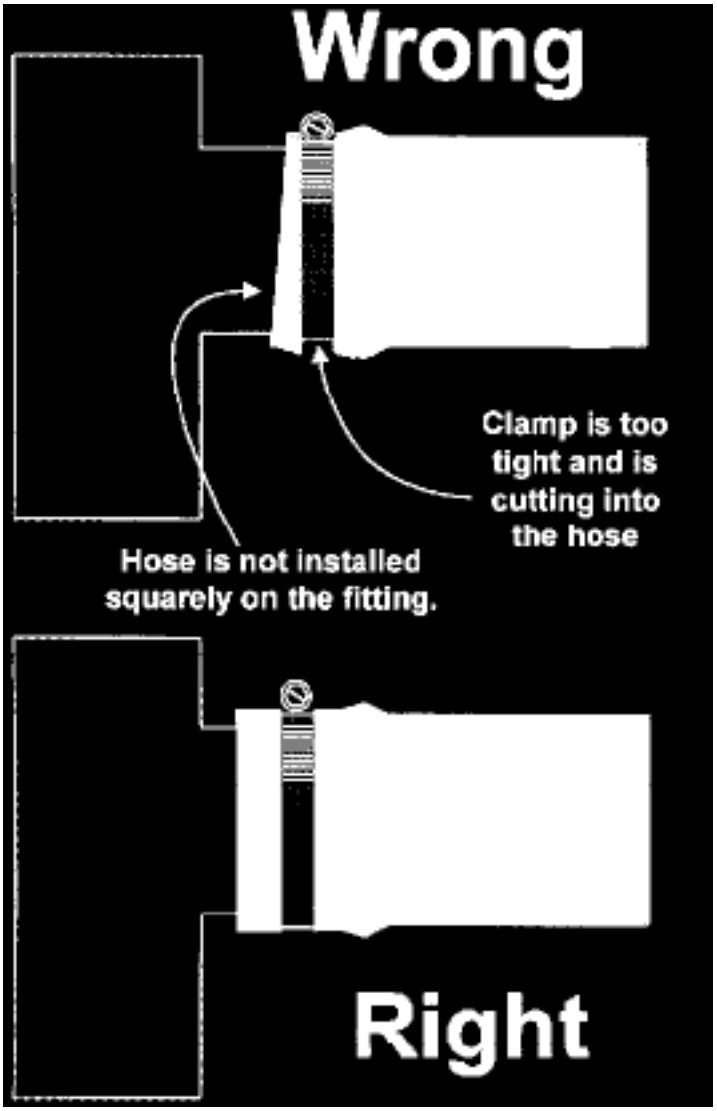
NOTE: This will help maintain the correct alignment of gasket in the next step.

4. While holding the bolts, place the gasket over the bolts and onto the pump sealing surface. 5. Install the pump and gasket onto the engine.

-

Do not over tighten the retaining bolts, use a torque wrench to properly tighten the bolts to the correct specification.

CAUTION: Water pump retaining bolts may be easily broken or stripped, do not tighten the retaining bolts with an air wrench or impact gun.



- When tightening hose clamps: -

Position the hose squarely on the fitting.

- Verify the hose clamp is clear of the retaining rim on the fitting. Do not over tighten the clamps.

- While working on the cooling system it is a good habit to clean the radiator and A/C condenser fins of bugs and dirt. This build up of debris can seriously reduce the cooling ability of the system.

Water Pump: Fundamentals and Basics Recommended Parts

RECOMMENDED PARTS

- New water pump and gasket.

- RTV sealant (for sealing water pump gasket).

- Engine Coolant: See: Specifications/Capacity Specifications

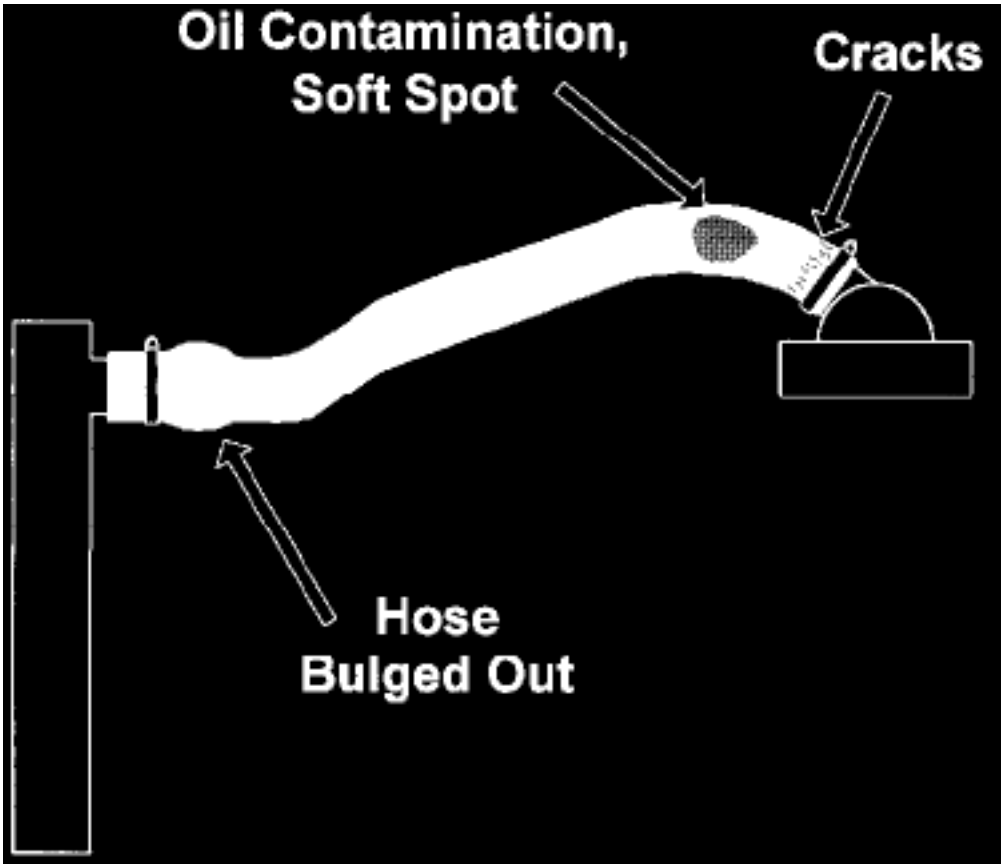
NOTE: For optimum performance, use 50/50 mixture of high quality ethylene glycol coolant and water.

OPTIONAL, PENDING INSPECTION

- Radiator hoses.

- Drive belts.

- Hose clamps.



Water Pump: Fundamentals and Basics Removal Tips and Hints

WATER PUMP REMOVAL TIPS AND HINTS

FROZEN AND BROKEN BOLTS

Frozen and broken bolts are often a major problem when removing water pumps. Coolant can seep into the bolt holes resulting in corrosion and frozen bolts. Prior to starting the job, spray all water pump retaining bolts with a penetrating oil.

Upon removal, any bolt or nut which shows signs of corrosion should be replaced. The threads of the associated bolt hole should be re-tapped or chased.

COOLANT HOSES

Inspect the hoses for the following: -

Cracks, especially near the hose clamps.

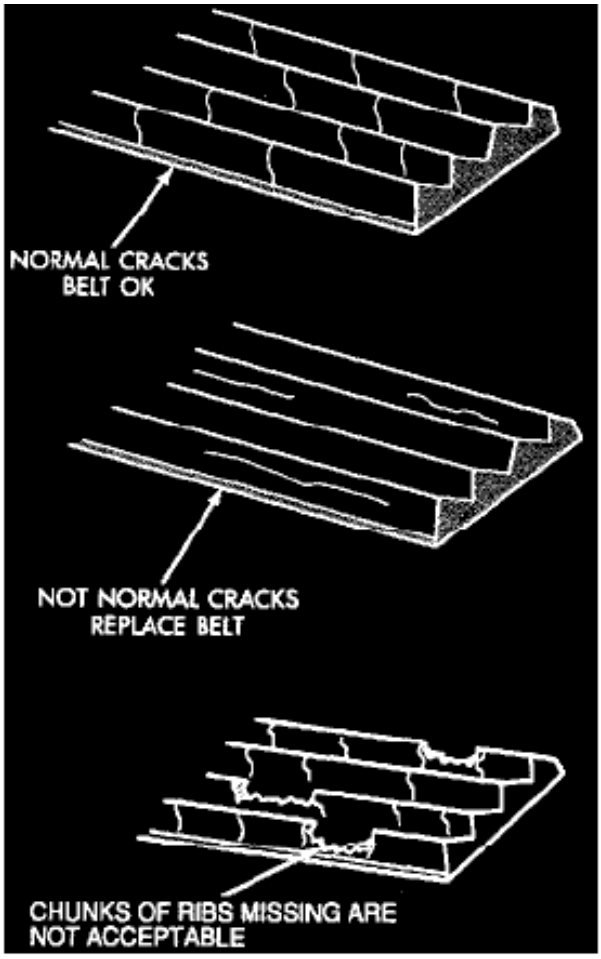
- Swelling, look for areas of the hose that appear unnaturally bulged outwards.

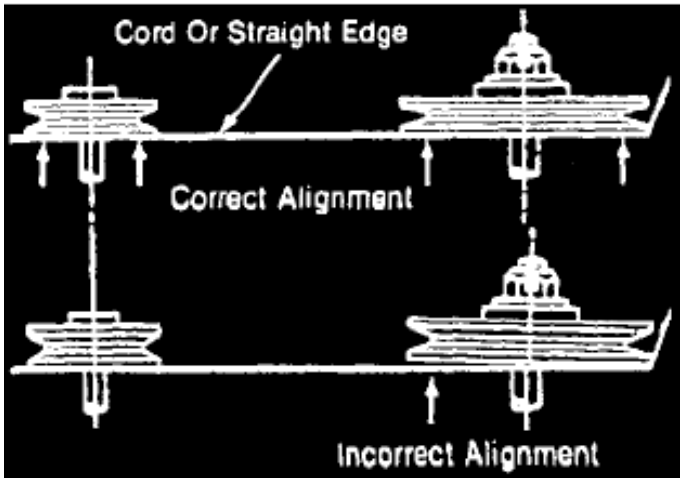
NOTE: This is often caused by improper removal techniques.

- Oil contamination and soft spots - Oil contamination breaks down the structure of the rubber and significantly weakens the hose.

NOTE: The oil leak should be fixed prior to replacing the hose.

- Hard or brittle hoses, as the hoses age the rubber looses its resiliency and becomes brittle. The hoses need to be able to flex to compensate for the movement of the engine.


NORMAL CRACKS
BELT OK
NOT NORMAL CRACKS
REPLACE BELT
CHUNKS OF RIBS MISSING ARE
NOT ACCEPTABLE


Cord Or Straight Edge
Correct Alignment
Incorrect Alignment

DRIVE BELTS

- Small cracks that run across that run across the ribbed surface of the belt from rib to rib , are considered normal, These are not reasons to replace the belt.

- If chunks of belt material are missing between the cracks, the belt should be replaced.

- Cracks running along the rib (not across) are not normal. Any belts with cracks running along the rib should be replaced.

- Replace the belt if it has excessive wear, frayed cords or severe glazing.

Drive Pulleys

- Verify the pulleys have no side to side wobble, and rotate freely. Replace if necessary.

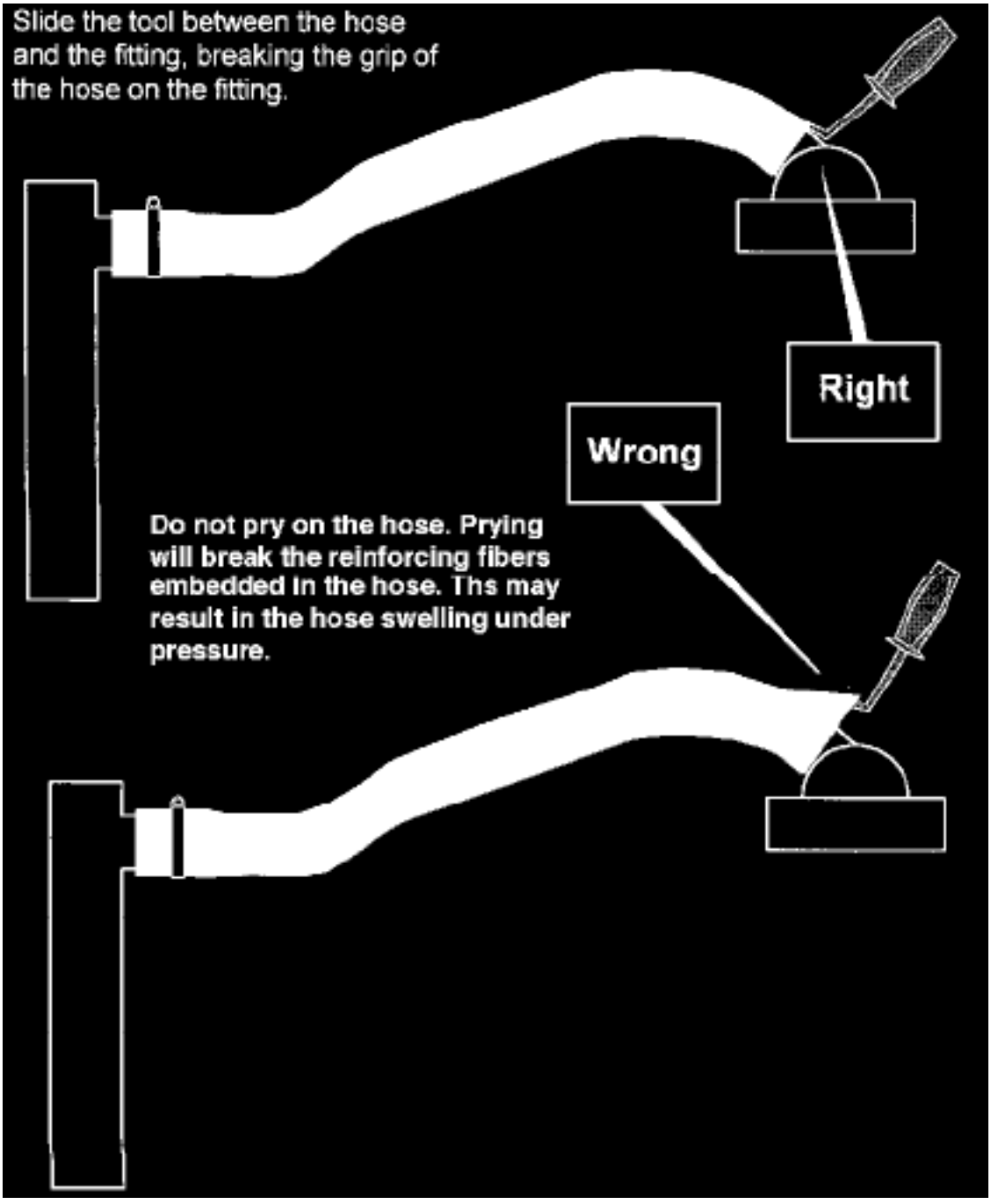
- Verify the pulleys are properly aligned. Adjust or replace as necessary.

Belt Removal

Do not attempt to bump the drive belts off with the starter. This practice can damage the belt, pulley, and technician. Removing the belt by relaxing the tension will allow you to correctly adjust the tension when installing the belt.

DRIP PAN

Prior to removing any hose or the water pump, place a large drip pan under the engine. Although the coolant may be drained from the radiator, there is still a large amount of residual coolant trapped in the hoses and water pump.



HOSE REMOVAL

- Prior to pulling the hose from the fitting, rotate/twist the hose on the fitting to break the grip of any corrosion present.

- If the hose is to be replaced, it may be quicker to cut hose from the fitting.

CAUTION: When cutting the hose be careful not to damage the fitting.

- A radiator hose removal tool may help free up stubborn hoses.

CAUTION: -

Do not use any device to pry the hose off of the fitting.

- If at any time a tearing or ripping sound is heard (though the hose appears fine) the hose should be replaced. The sound is coming from the internal reinforcing fibers embedded in the hose. Once the fibers have been broken the hose will be subject to swelling and rupture when pressure is applied.

WATER PUMP REMOVAL

After removing the retaining bolts the water pump may still be stuck to the engine. The original gasket sealant may cause the pump to firmly stick to engine. A few soft blows from a rubber mallet or block of wood will generally loosen the pump.

CAUTION: -

Verify that ALL of the retaining bolts are removed.

- Do not pry between the pump and the gasket. This may damage the pump sealing surface.

- Upon breaking the seal, a large amount of coolant trapped in the block will generally pour out from the water pump opening. Be sure to have a drip pan prepositioned.

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Catalytic Converter: Customer Interest Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART

APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED

AUTHORIZED MODIFICATIONS

THE FOLLOWING MODIFICATIONS HAVE BEEN MADE:

REPLACED PCM PER TSB 93-24-19.
USE 1992 POWERTRAIN CONTROL/
EMISSION DIAGNOSIS SERVICE
MANUAL.

THESE MODIFICATIONS HAVE BEEN APPROVED AS APPROPRIATE, BY EPA AND CARB.

DEALER NUMBER DATE:

CHANGE AUTHORITY:

FPS 8262 9/78 FORD MOTOR COMPANY PRINTED IN U.S.A.

PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
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1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Catalytic Converter: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

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ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

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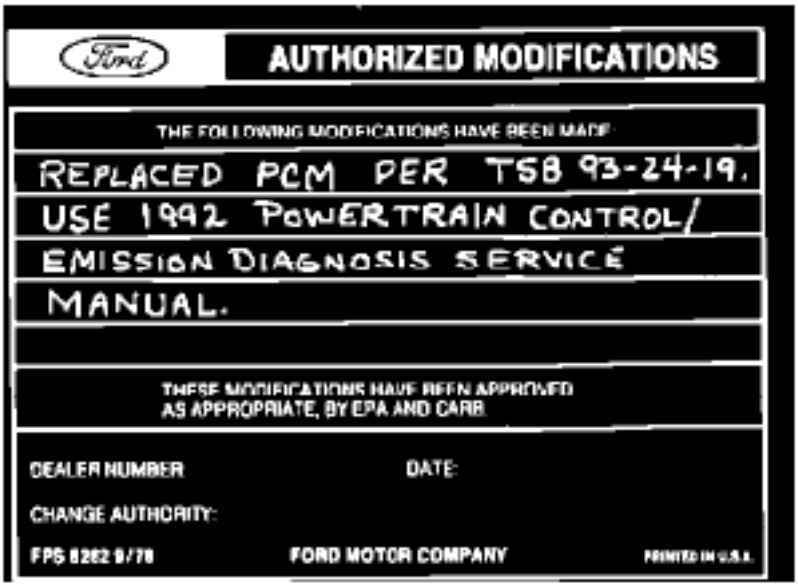
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

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Parts Block

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(includes Time To Retest) - All Vehicles

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Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

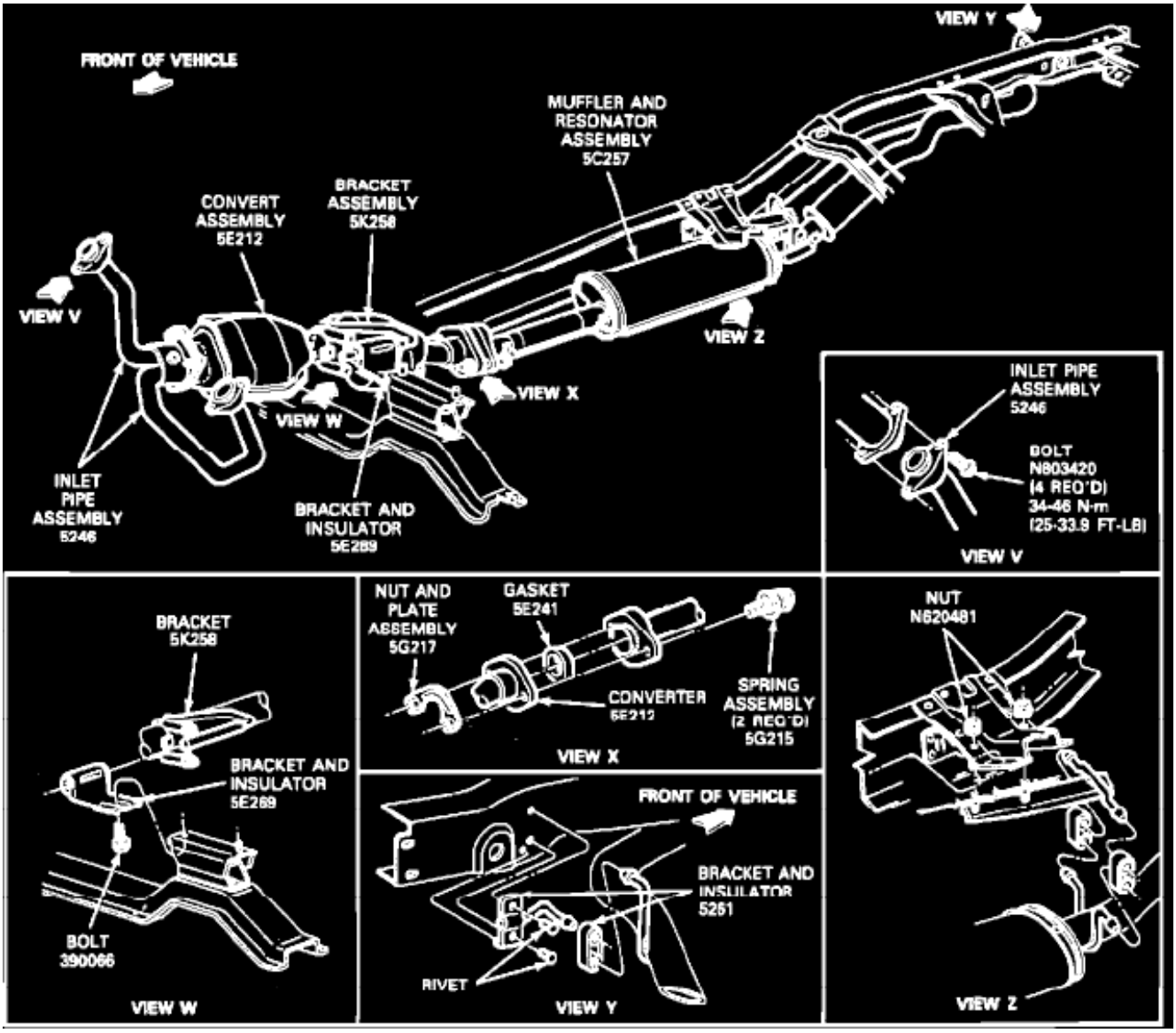
- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

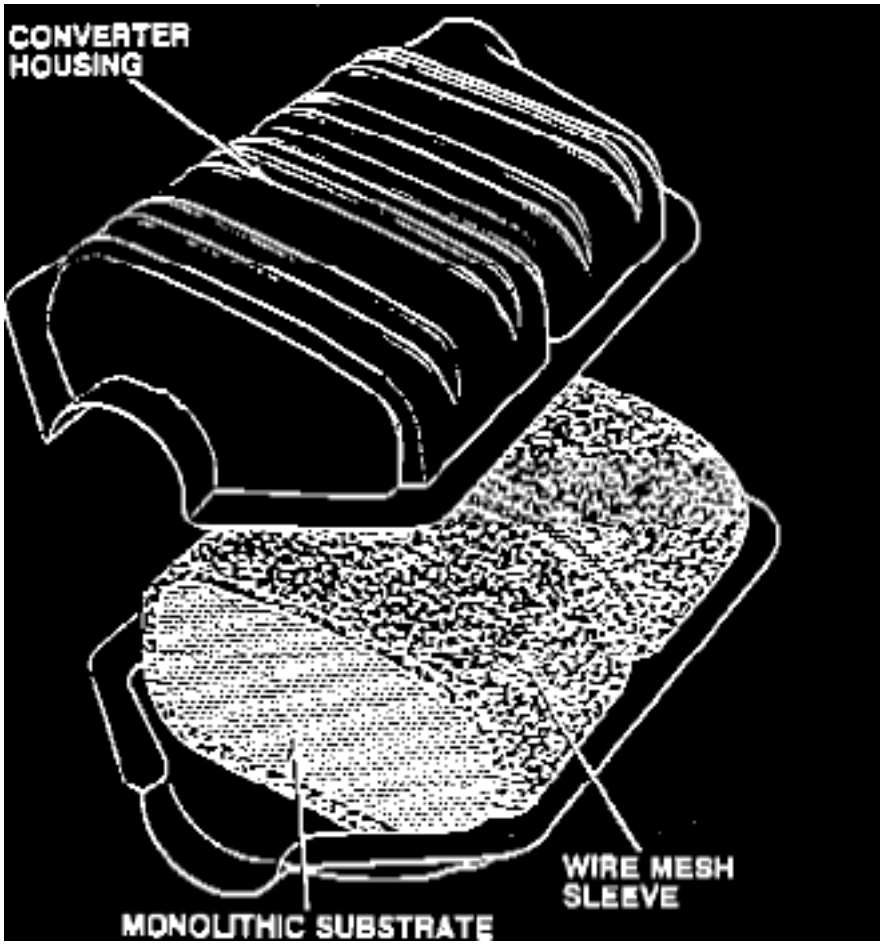
BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000



Exhaust System w/Catalytic Converter



Catalytic Converter: Description and Operation

The Catalytic Converter is mounted under the vehicles body within the exhaust system, and is designed to convert harmful exhaust gas pollutants, Carbon Monoxide (CO), Hydrocarbons (HC), and Oxides of Nitrogen (NOx) to harmless by-products of Nitrogen (N), Carbon Dioxide (CO2) and water vapor (H2O) through a catalytic chemical reaction.

Single Brick Catalytic Converter

Two types of converters in use today are the Conventional Oxidation Converter (COC) and Oxidation-Reduction Converter. Both consists of two stamped aluminum or stainless steel pieces welded together to form a round or oval housing.

Oval-type converters contain tiny pellets that are impregnated with the catalyzing element(s). Although this type of converter is known to create a fair amount of exhaust restriction, it is less expensive to manufacture and in some vehicle models contaminated pellets may be replaced. The round-type converter contains one or more ceramic monolithic honeycomb substrates. The substrate bricks or beds are impregnated with the catalyzing element(s), then covered by a wire mesh sleeve for insulation and protection from shock and severe jolts. A diffuser inside the shell allows the exhaust gases to flow uniformly over the entire area of the substrate.

THE OXIDATION REACTION

In order to change HC and CO into harmless materials, the catalytic elements (platinum and palladium) start an oxidation, or burning, reaction in the catalytic converter. Oxidation is the addition of oxygen to an element or compound. If there is not already enough oxygen in the exhaust, a secondary air supply system is incorporated into the vehicle's design for additional air injection. During the oxidation process, Oxygen (O2) mixes with the excess HC and CO to form H2O and CO2. During the oxidation reaction process, considerable heat (900~F to 1,600~F) is generated. Caution should be taken while working on or around the catalytic converter and other exhaust system components.

THE REDUCTION REACTION

Reduction is the opposite of oxidation, or the chemical removal of oxygen from a material. The reduction reaction changes NOx to harmless nitrogen (N) and (CO2) by chemically moving the oxygen from the NOx compound to the CO compound. The catalytic elements required for the reduction process are platinum and rhodium.

The Three-Way Catalytic Converter (TWC) is designed to reduce all three exhaust pollutants, but works best to reduce NOx when the CO level of the exhaust is between 0.8 and 1.5 percent. As the CO level increases or decreases from that percentage, the 3-way converters efficiency decreases. Exhaust gas first passes through the catalyst, where NOx is reduced to N2 and CO2; then through the catalyst where HC and CO are changed to H2O and CO2. The Light-Off Catalytic Converter (LOC) is a single bed oxidation-type converter, and is mounted to the exhaust manifold ahead of the main converter. The LOC primarily used in controlling HC and CO emissions during cold engine warm-up, while the main converter has not yet reached operating temperature. Heat from the exhaust manifold rapidly warms the LOC in order to start the Oxidation Process, which is then continued at the main converter. The Light-Off Catalytic Converter is also referred to as a Pre-Cat or a Mini-Cat by other vehicle manufacturers.

Catalytic Converter: Testing and Inspection

NOTE: A blocked or restricted exhaust system usually results in loss or lack of power or popping through the intake. Verify that this condition is not caused by ignition or timing problems, then proceed with diagnosis.

1. Visually inspect exhaust system for collapsed pipes, holes and cracks. Replace any damaged components.

2. Attach vacuum gauge to intake manifold vacuum source.

3. Connect a tachometer.

4. START engine and observe vacuum gauge needle.

5. Gradually increase the engine rpm to 2000 with the transmission in NEUTRAL. NOTE: The vacuum gauge reading may be normal when the engine is first started and idled. However, excessive restriction in the exhaust system will cause the vacuum gauge needle to drop to a low point even while the engine is idling.

6. Decrease rpm to idle speed. With the engine rpm at 2000, did manifold vacuum reach above 16 inches? If so, there is no restriction within the exhaust system. Refer to Diagnosis by Symptom/Lack of Power. If not, proceed to next step.

7. With vacuum gauge and tachometer still in place.

8. Gradually increase the engine rpm from base idle to 2000 rpm with the transmission in NEUTRAL.

9. While maintaining increased engine rpm, observe the RATE of speed of the vacuum gauge needle as it falls and rises. NOTE: a.

On a non-restricted system the needle will drop to zero and then quickly return to the normal setting without delay.

b. On a restricted system, as the engine rpm is increased to 2000 the vacuum gauge needle will slowly drop to zero and slowly rise to normal.

c. The rate of speed at which the vacuum gauge needle returns to the normal setting is much slower on a restricted system than on a non-restricted system.

10. Decrease engine rpm to base idle.

11. Was needle return rate much slower than that of a non-restricted system? If not, there is no restriction within the exhaust system. Refer to LACK OF POWER/DIAGNOSIS BY SYMPTOM. If so, proceed to next step.

12. Turn OFF engine.

13. Disconnect exhaust system at the muffler(s).

14. Repeat vacuum test.

15. Did manifold vacuum reach above 16". If so, replace muffler(s). If not, proceed to next step.

16. Turn OFF engine.

17. Disconnect exhaust system at catalytic converter(s).

18. Repeat vacuum test.

19. Did manifold vacuum reach above 16". If so, replace converter(s). If not, proceed to next step.

20. Turn OFF engine.

21. Disconnect exhaust system at exhaust manifold(s).

22. Repeat vacuum test.

23. Did manifold vacuum reach above 16". If so, restriction is located between exhaust manifold(s) and catalytic converter(s). If not, proceed to next step.

24. Remove the exhaust manifold(s) and inspect the ports for casting flash by dropping a length of chain into each port. NOTE: Do not use a wire or a lamp to check ports. The restriction may be large enough for the wire or light to pass through but small enough to cause excessive back pressure at high rpm.

25. Is a restriction present? If so, remove casting flash or replace exhaust manifold. If not, refer to LACK OF POWER/DIAGNOSIS BY SYMPTOM.

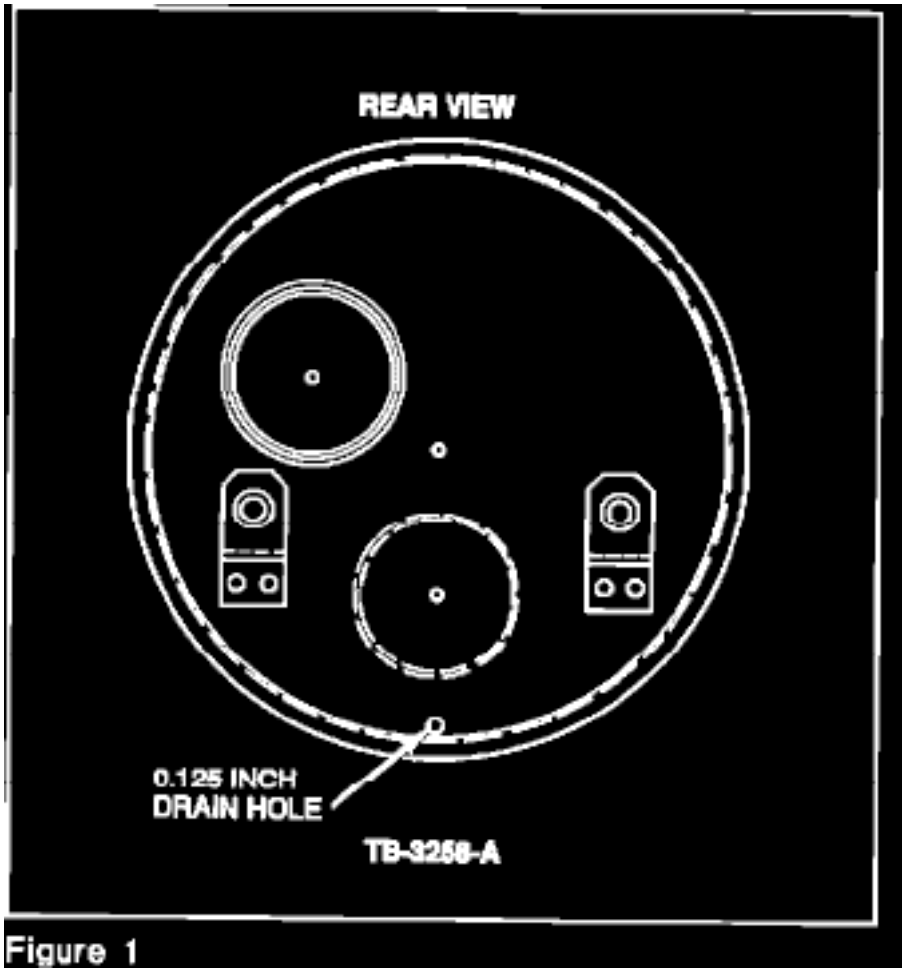


Figure 1

Muffler: Customer Interest Engine - Won't Start

Article No. 93-19-14

09/15/93

EXHAUST SYSTEM FREEZING - VEHICLE WILL NOT START - EXPLORER, RANGER

LIGHT TRUCK: 1991-92 EXPLORER, RANGER

ISSUE: Vehicle will not start due to frozen condensate in the exhaust system.

ACTION: Add a condensate drain hole similar to current production by drilling a 0.125" (3.2 mm) hole in the muffler head center just above the roll flange. Refer to the following procedure for service details.

Detailed Service Procedure:

1. Drill a 0.125" (3.2 mm) hole in the muffler rear head center just above the roll flange (see Figure 1).

WARNING: USE AIR TYPE DRILL ONLY TO AVOID POTENTIAL ELECTRICAL SHOCK HAZARD.

2. Heat the exhaust system to melt the condensate and allow the liquid to flow out of the exhaust system.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For 1991 Models

OPERATION DESCRIPTION TIME

931914A Drill Hole In Muffler, Melt 0.3 Hr.

Condensate With Heat Gun

DEALER CODING

BASIC PART NO. CONDITION CODE

5230 55

OASIS CODES: 403000, 603300

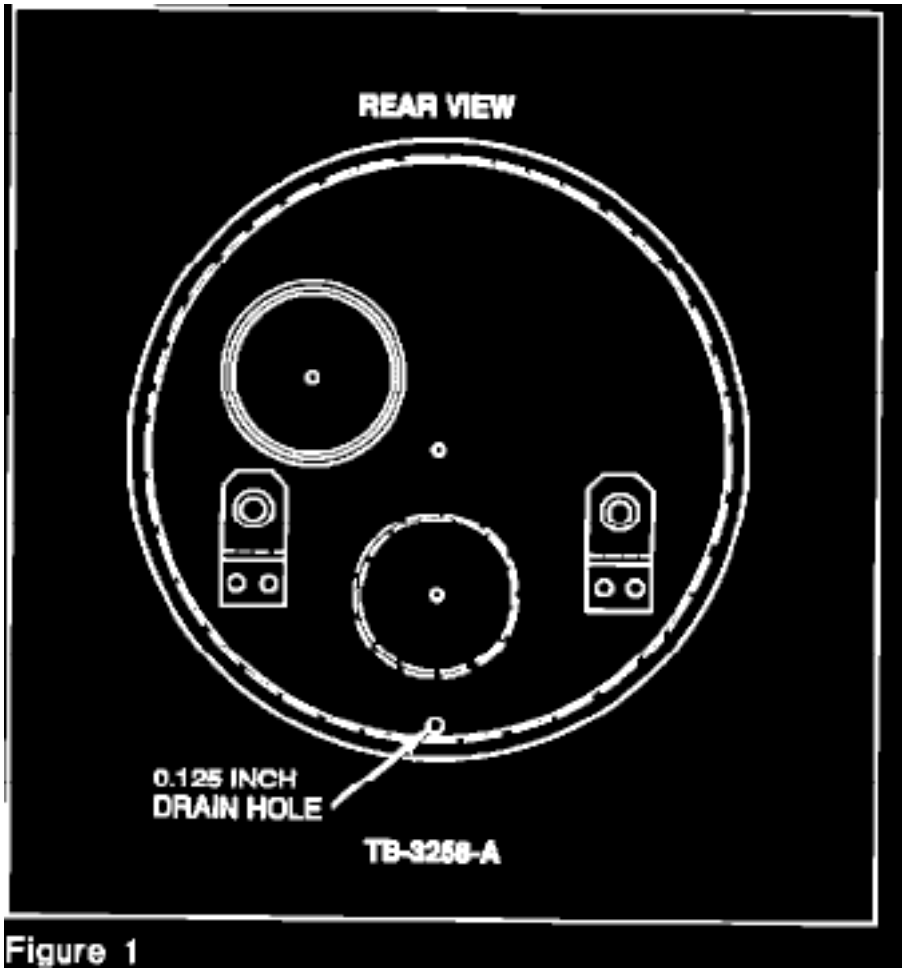


Figure 1

Muffler: All Technical Service Bulletins Engine - Won't Start

Article No. 93-19-14

09/15/93

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5230 55

OASIS CODES: 403000, 603300

EEC IV PROCESSOR REFERENCE CHART

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1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
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Engine Control Module: Customer Interest Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

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ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

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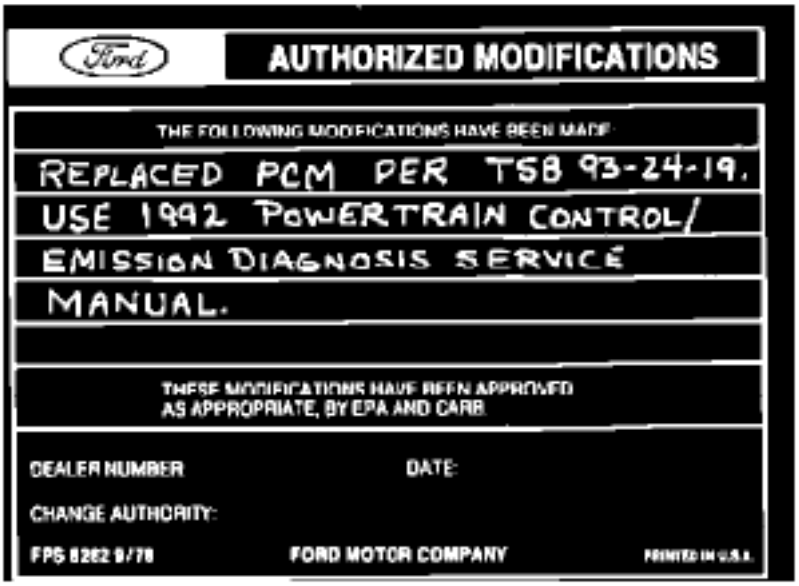

PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ 12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

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1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

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ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

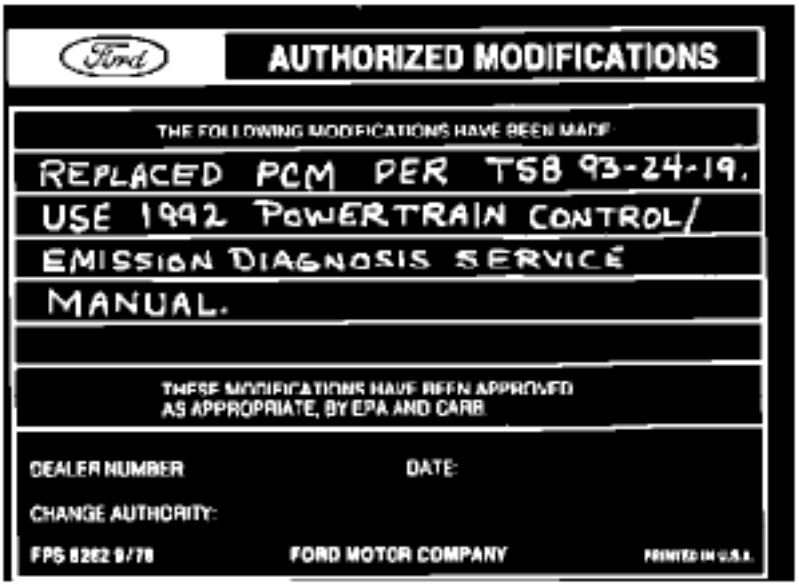
3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART

APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-6E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ 12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

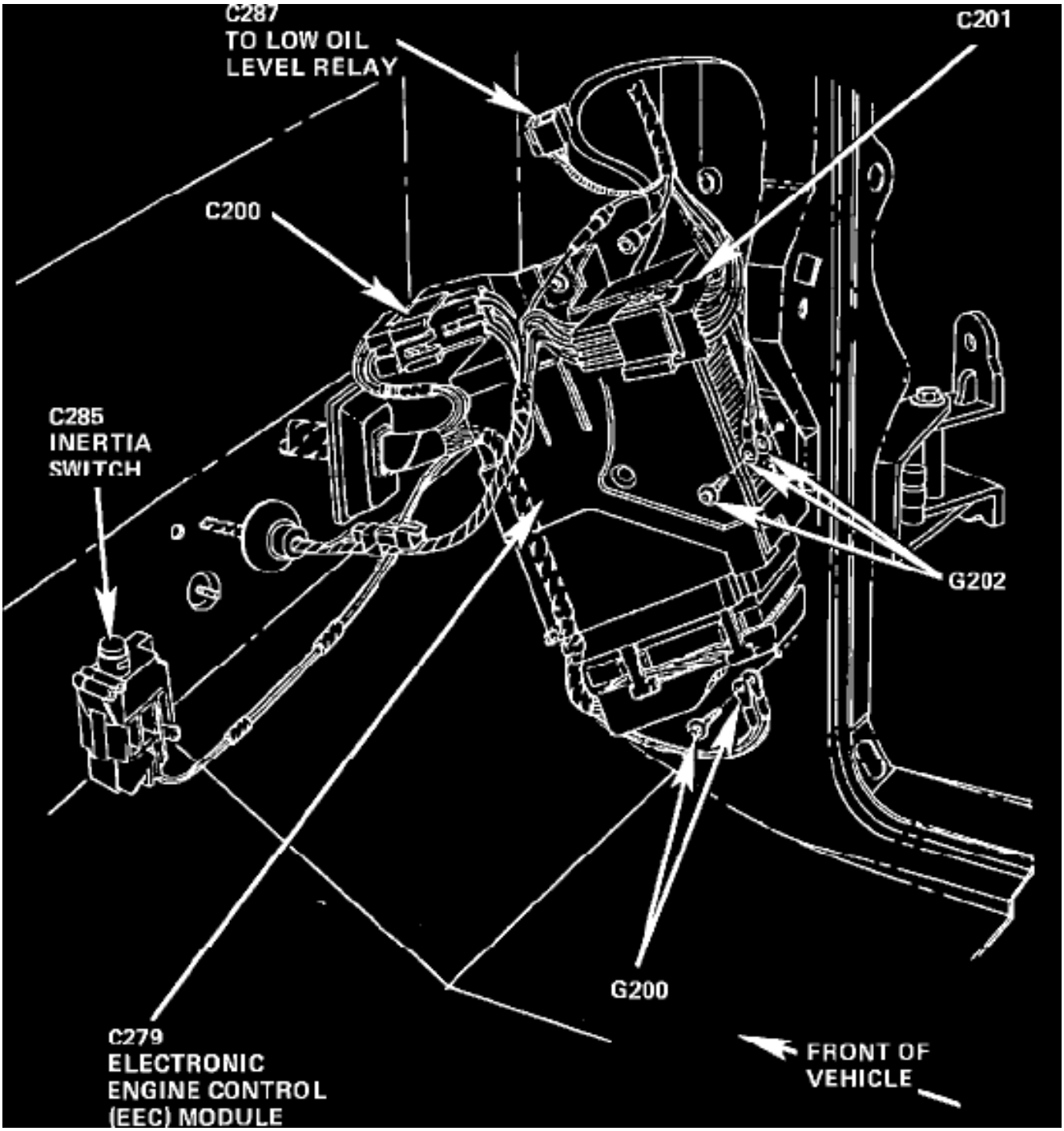
- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

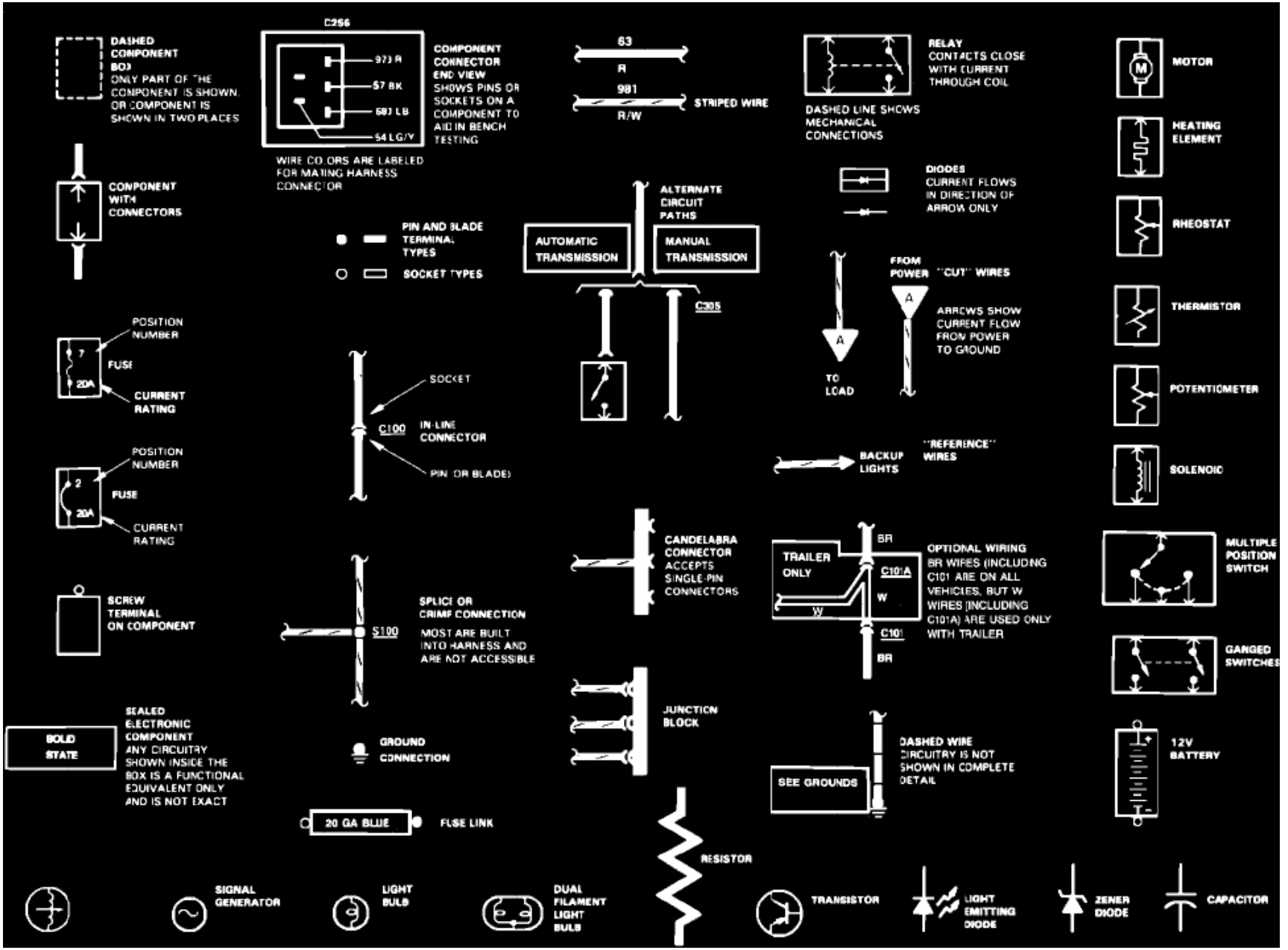
BASIC PART NO. CONDITION CODE

ODOR 08

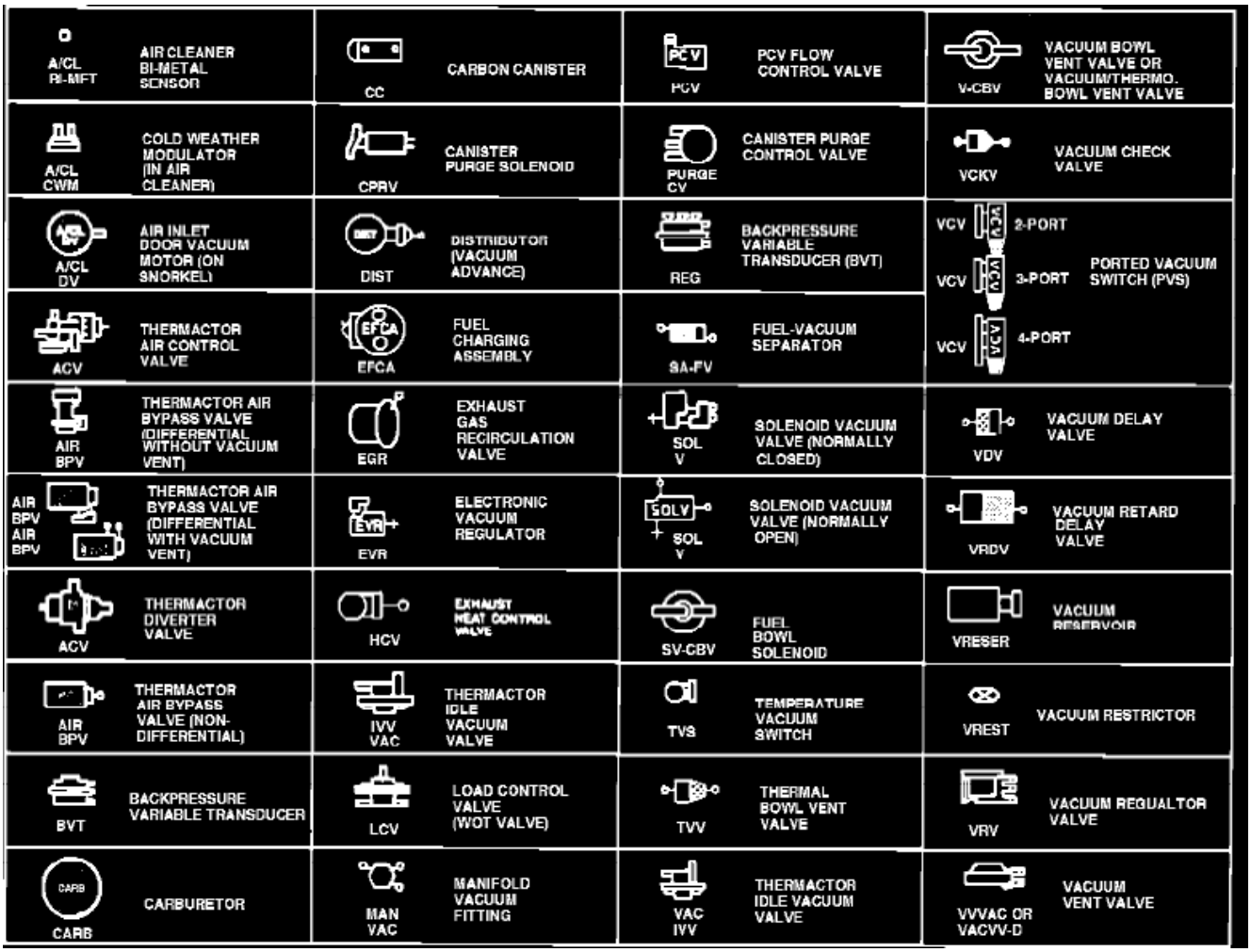
OASIS CODES: 403000, 623000



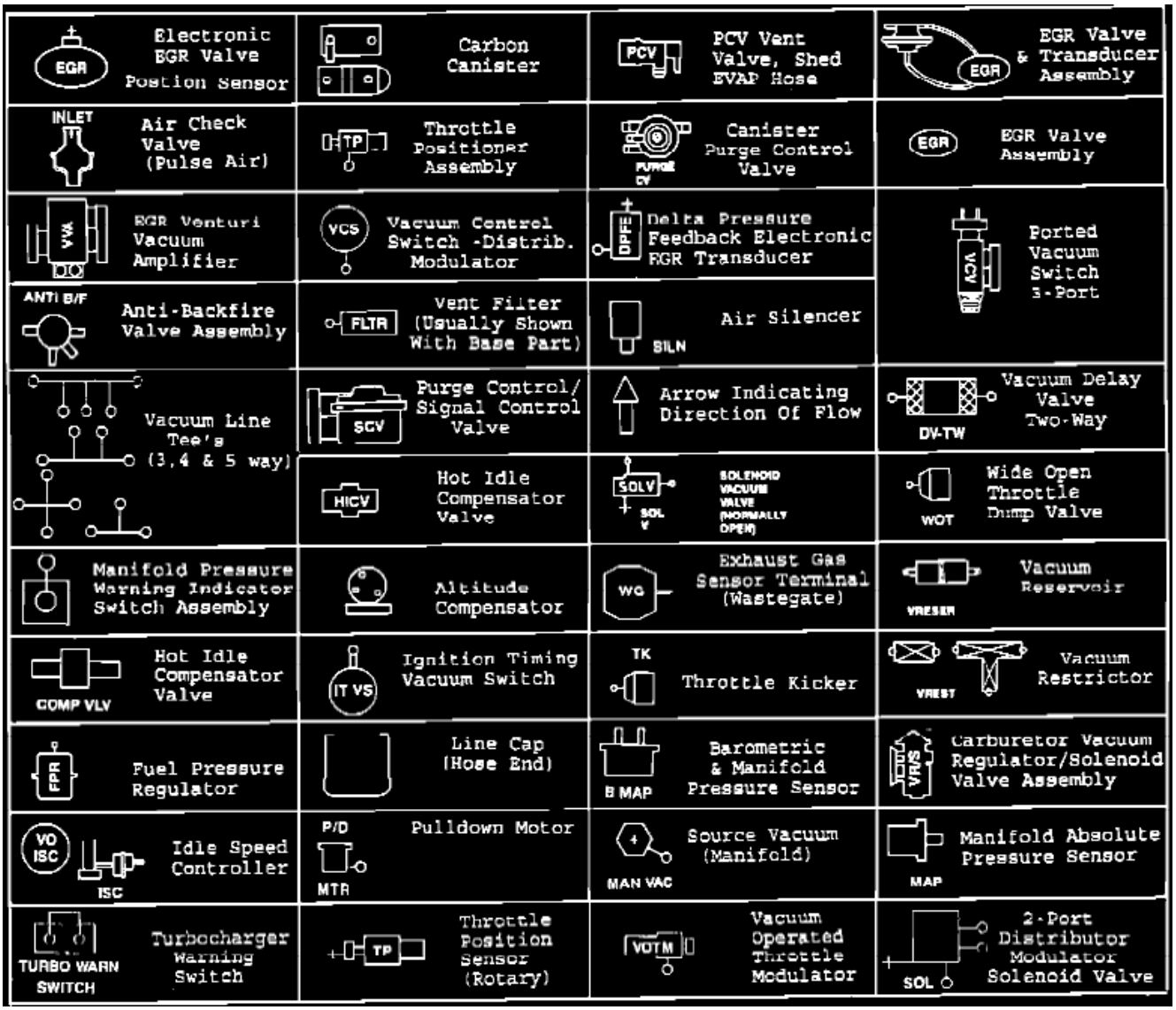
Engine Control Assembly (ECA)


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN, OR COMPONENT IS SHOWN IN TWO PLACES
C256
973 R
57 BK
581 LB
54 LG/Y
COMPONENT CONNECTOR END VIEW SHOWS PINS OR SOCKETS ON A COMPONENT TO AID IN BENCH TESTING
WIRE COLORS ARE LABELED FOR MATING HARNESS CONNECTOR
63
R
981
R/W
STRIPED WIRE
RELAY
CONTACTS CLOSE WITH CURRENT THROUGH COIL
DASHED LINE SHOWS MECHANICAL CONNECTIONS
MOTOR
HEATING ELEMENT
COMPONENT WITH CONNECTORS
PIN AND BLADE TERMINAL TYPES
SOCKET TYPES
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSMISSION
MANUAL TRANSMISSION
C305
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
RHEOSTAT
FROM POWER
"CUT" WIRES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
TO LOAD
THERMISTOR
POTENTIOMETER
POSITION NUMBER
FUSE
CURRENT RATING
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
BACKUP LIGHTS
"REFERENCE" WIRES
SOLENOID
POSITION NUMBER
FUSE
CURRENT RATING
CANDELABRA CONNECTOR ACCEPTS SINGLE-PIN CONNECTORS
TRAILER ONLY
BR
C101A
W
W
C101
BR
OPTIONAL WIRING
BR WIRES (INCLUDING C101 ARE ON ALL VEHICLES, BUT W WIRES (INCLUDING C101A) ARE USED ONLY WITH TRAILER
MULTIPLE POSITION SWITCH
SCREW TERMINAL ON COMPONENT
S100
SPLICE OR CRIMP CONNECTION
MOST ARE BUILT INTO HARNESS AND ARE NOT ACCESSIBLE
GANGED SWITCHES
JUNCTION BLOCK
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
SEE GROUNDS
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL
12V BATTERY
20 GA BLUE
FUSE LINK
RESISTOR
SIGNAL GENERATOR
LIGHT BULB
DUAL FILAMENT LIGHT BULB
TRANSISTOR
LIGHT EMITTING DIODE
ZENER DIODE
CAPACITOR

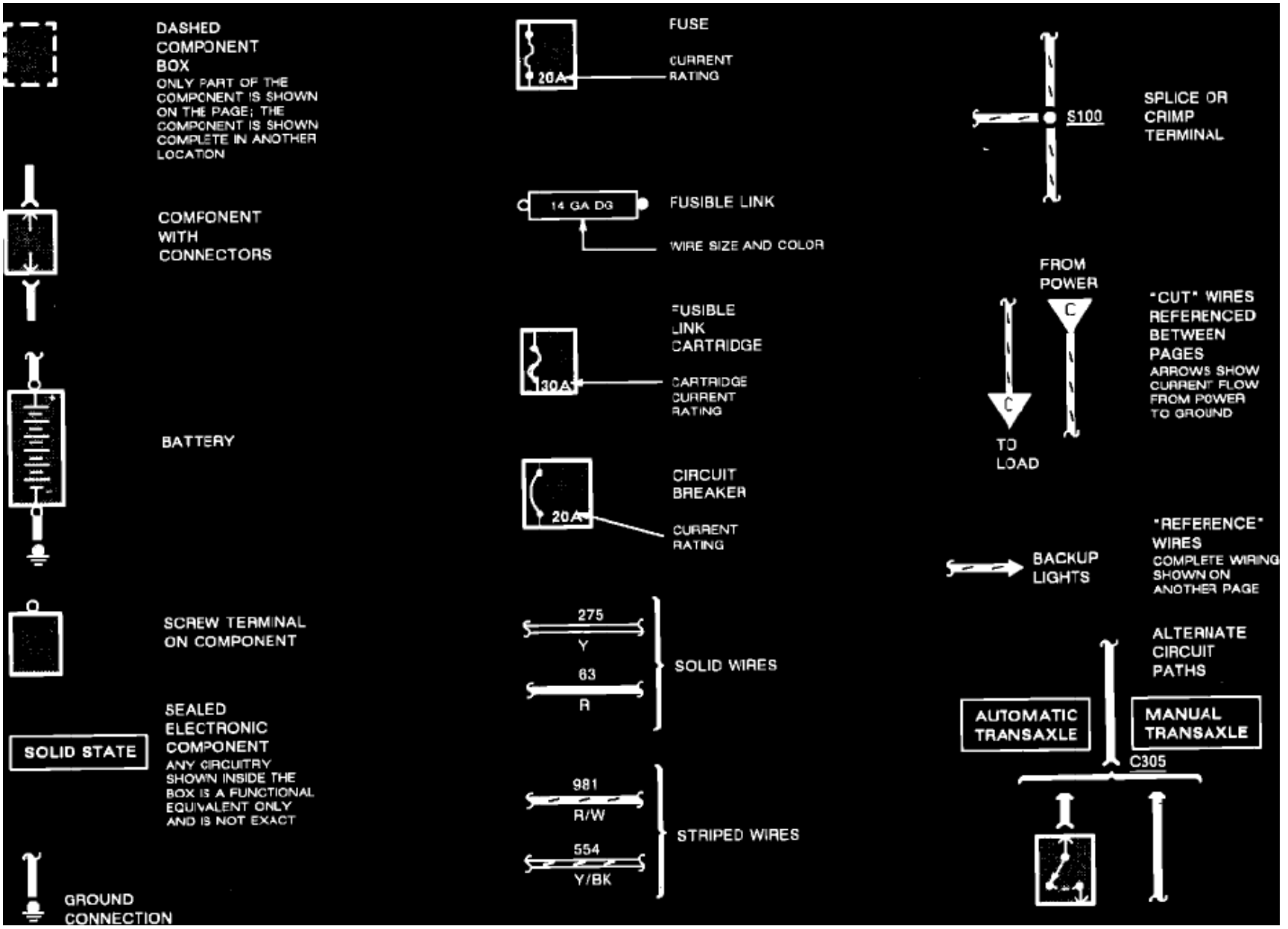
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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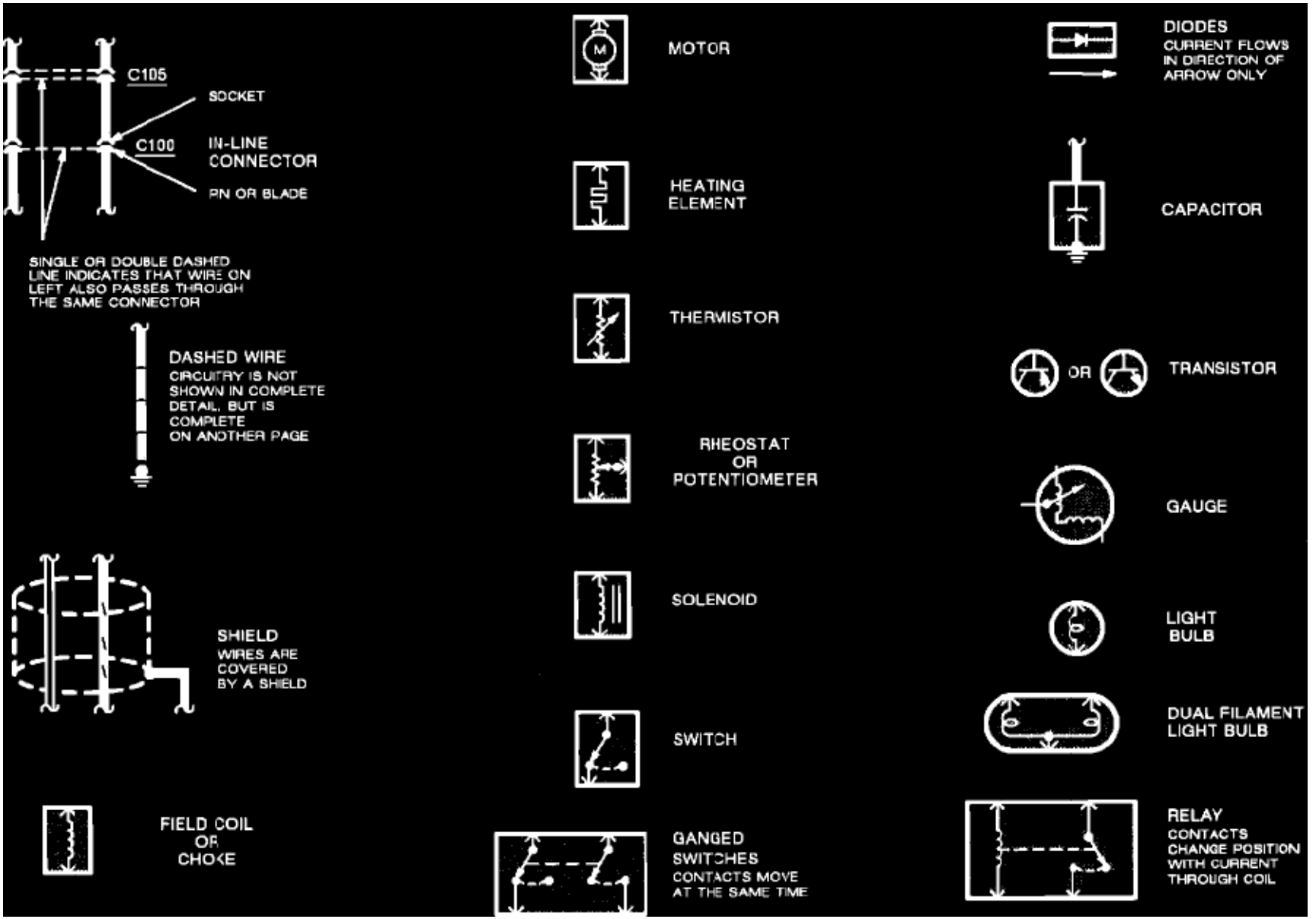
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

V: Violet

W: White

Y: Yellow

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (A/T only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
9	915	PK/LB	Data Communications Link (-)	DATA (-)
10	198	DG/O	A/C Cycling Switch	ACCS
14	967	LB/R	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Sensor Return	MAF RTN
16	259	O/R	Ignition Ground	IGN GND
17	656	PK/LG	Self-Test Output/Malfunction Indicator Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air) Solenoid	ISC
22	926	LB/O	Fuel Pump	FP
25	743	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
28	914	T/O	Data Communications Link (+)	DATA (+)
29	74	GY/LB	Heated Exhaust Gas Oxygen Sensor	HEGO
30	199	LB/Y	Clutch Interlock Switch (M/T Only)	CIS
30	199	LB/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge Solenoid	CANP
36	929	PK	Spark Angle Width	SAW
37	361	R	Vehicle Power	VPWR
40	570	BK/W	Power Ground	PWR GND
44	242	DG	Octane Adjust	OCT ADJ
45	358	LG/BK	Barometric Pressure Sensor	BP
46	350	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	99	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	237	O/Y	Shift Solenoid (A/T Only)	SS
53	480	P/Y	Clutch Converter Override (A/T Only)	CCO
54	331	PK/Y	WOT A/C Cut-Off	WAC
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 - Controls Engine Cylinder Numbers 1, 2, and 3)	INJ BANK 1
59	556	W	Injector (Bank 2 - Controls Engine Cylinder Numbers 4, 5, and 6)	INJ BANK 2
60	570	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.

ECA Connector Pin Identification

Engine Control Module: Description and Operation Electronic Control Assembly (ECA)

The Electronic Control Assembly (ECA) receives ignition ground and Profile Ignition Pickup (PIP) signals from the EDIS module then generates a Spark Angle Word (SAW) output signal based on fuel, air and other sensor information. An IDM signal is received from the EDIS module to determine if a failure mode should be recorded. For diagnosis and testing of the ECA refer to "COMPUTERIZED ENGINE CONTROLS".

Engine Control Module: Description and Operation Failure Mode Effects Management

PURPOSE

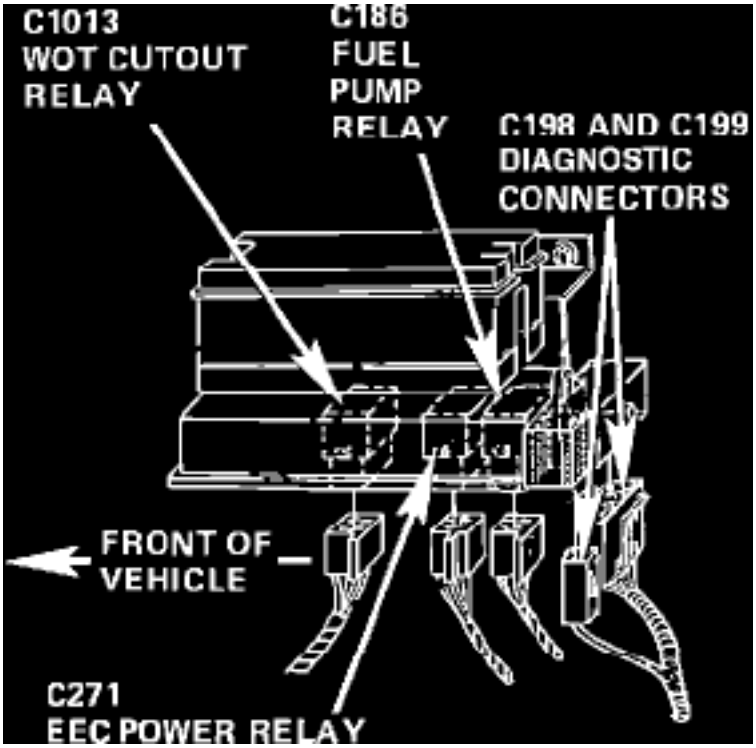
Operating mode that attempts to keep the vehicle driveable in the event of certain Electronic Engine Control (EEC) or ignition system failures.

Engine Control Module: Service and Repair

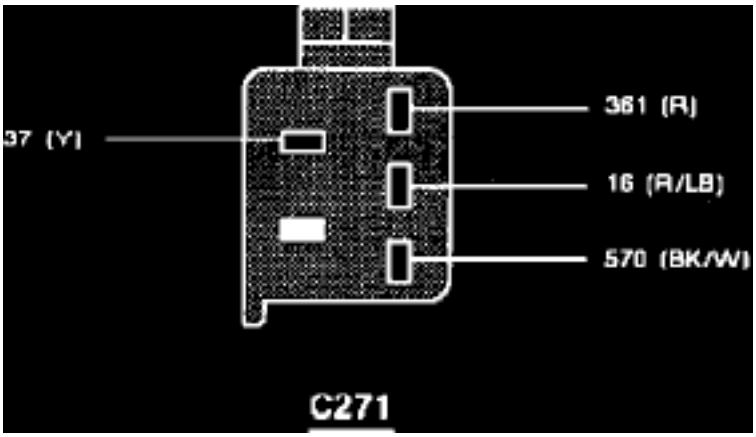
The processor stores data about vehicle operating conditions and uses this information to compensate for component tolerances. When an emission related component is replaced, Keep Alive Memory (KAM) should be cleared to erase the data stored by the processor from the original component.

1. With the ignition switch OFF, disconnect the negative battery cable for a minimum of five minutes, then reconnect the cable.

2. Operate the vehicle for a minimum of ten miles to allow the Engine Control Assembly (ECA) to relearn values for optimum driveability and performance. NOTE: Distance varies with vehicle application.



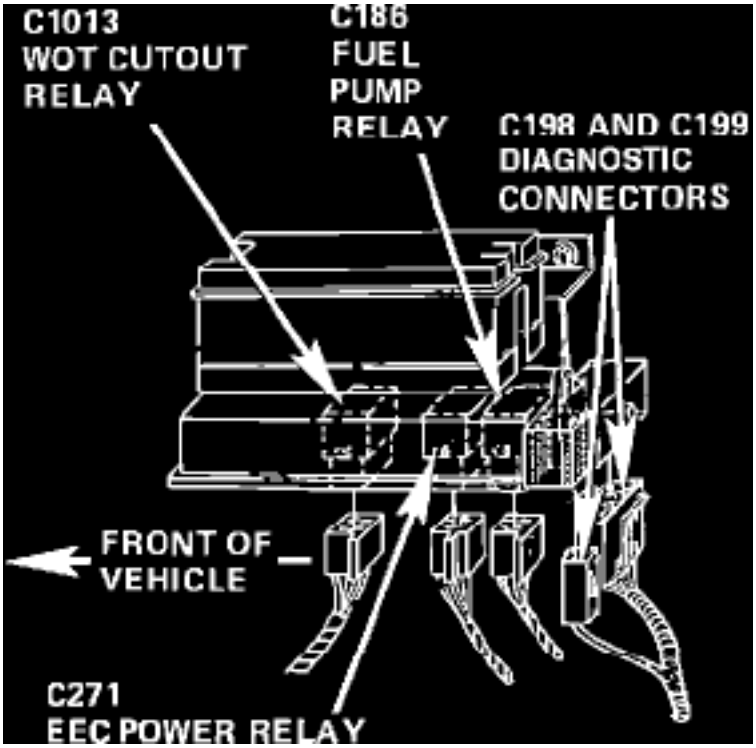
Relay And Diagnostic Connectors



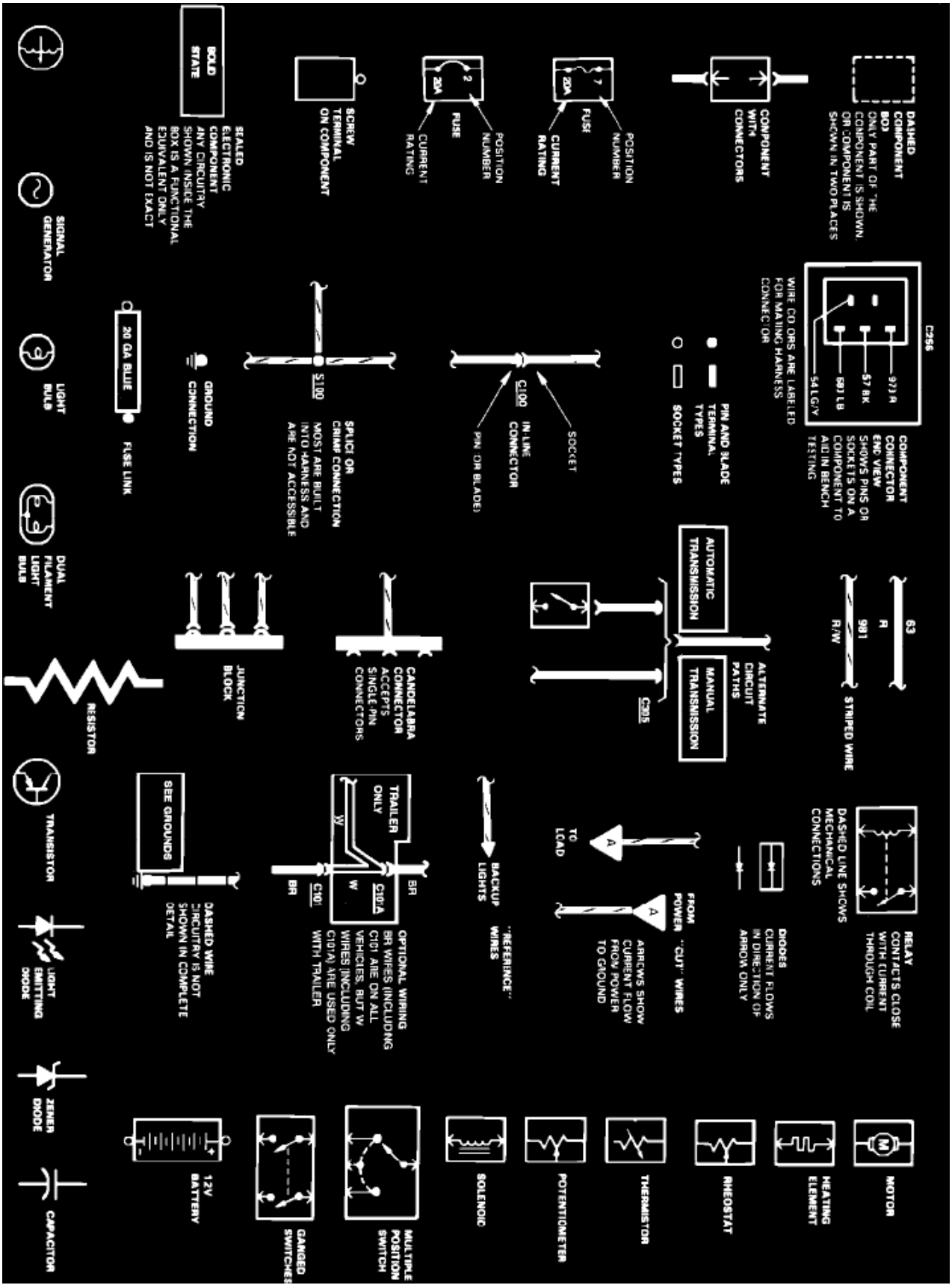
EEC-IV Power Relay Connector

Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.

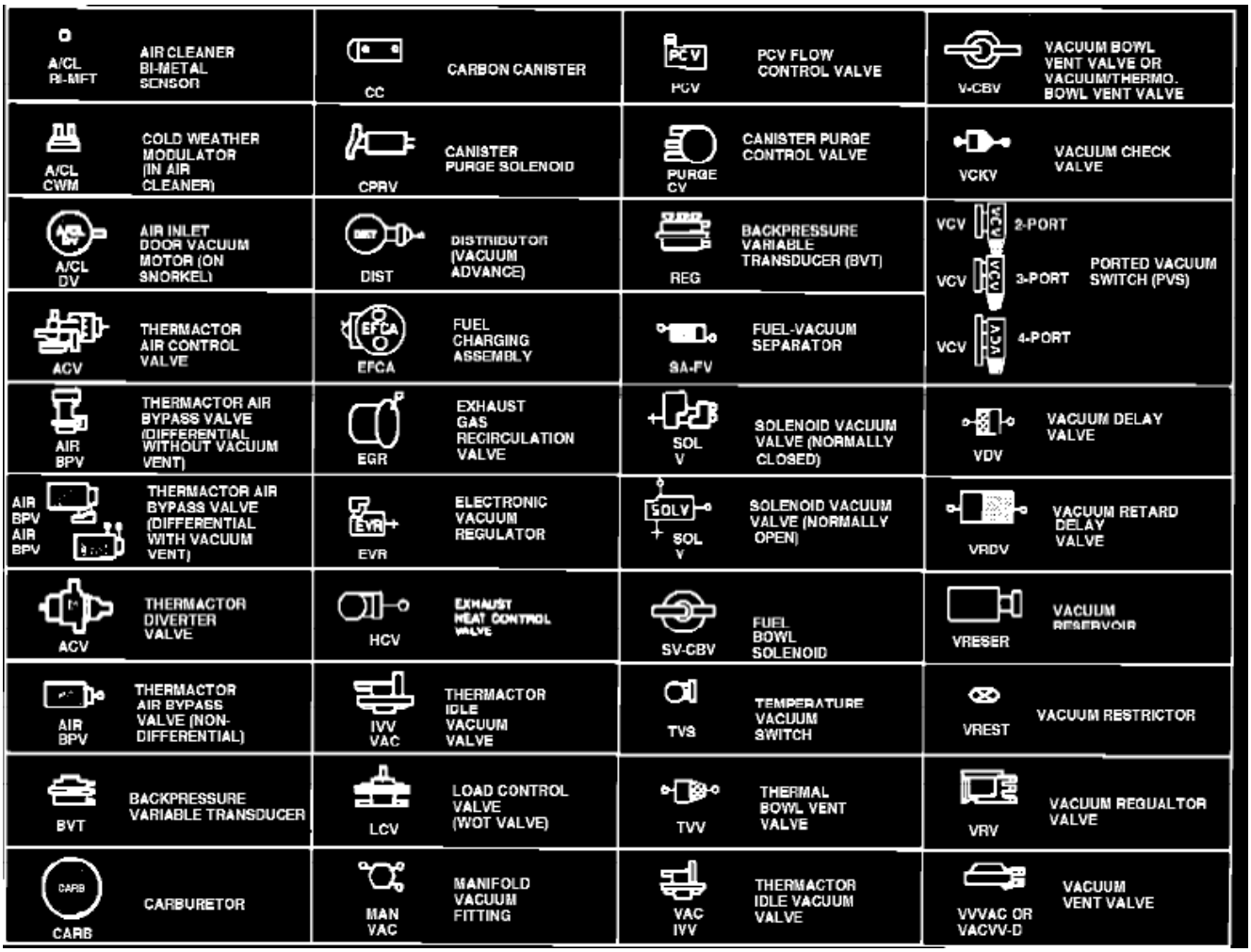


Relay And Diagnostic Connectors

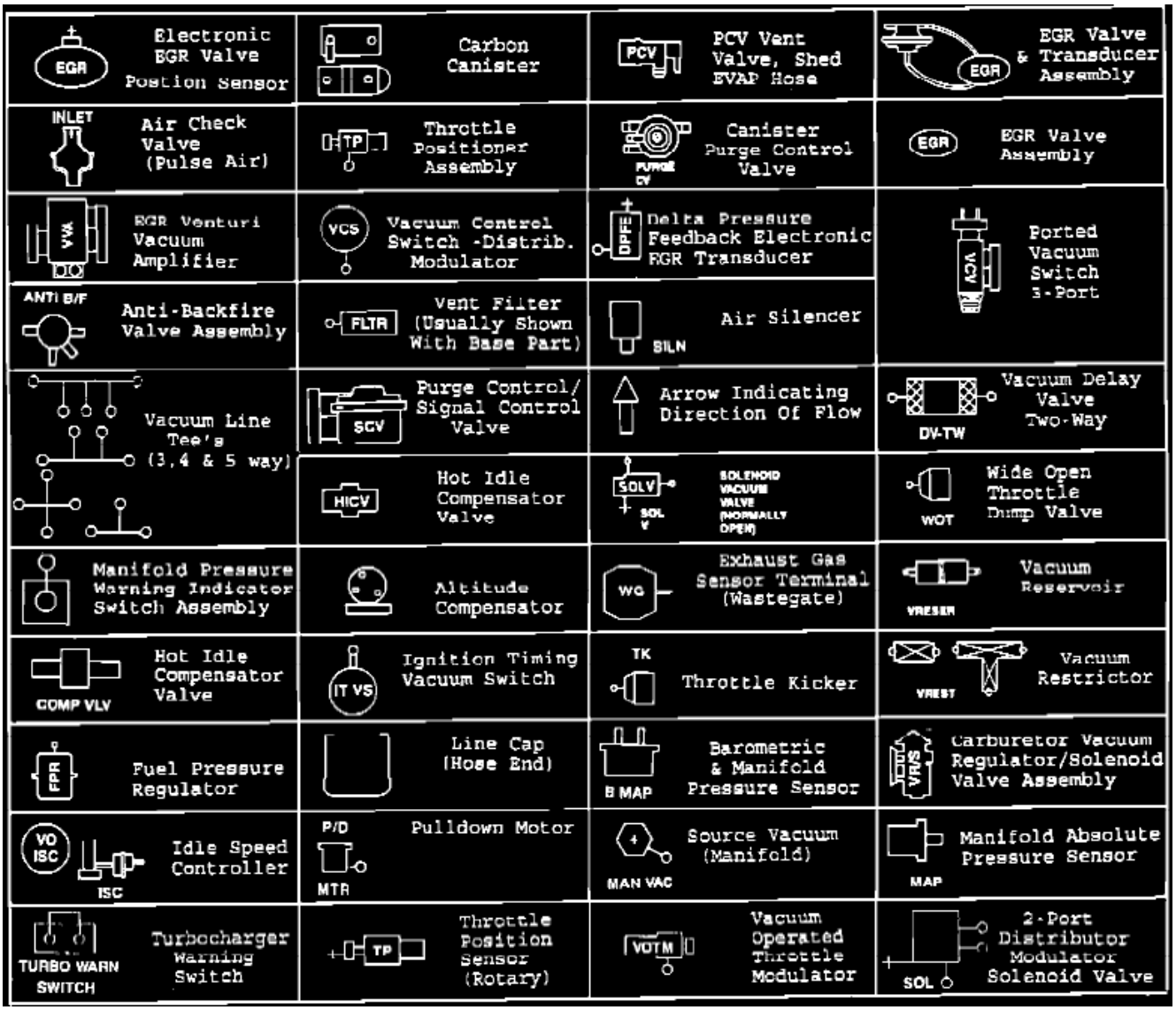


Fuel Pump Relay: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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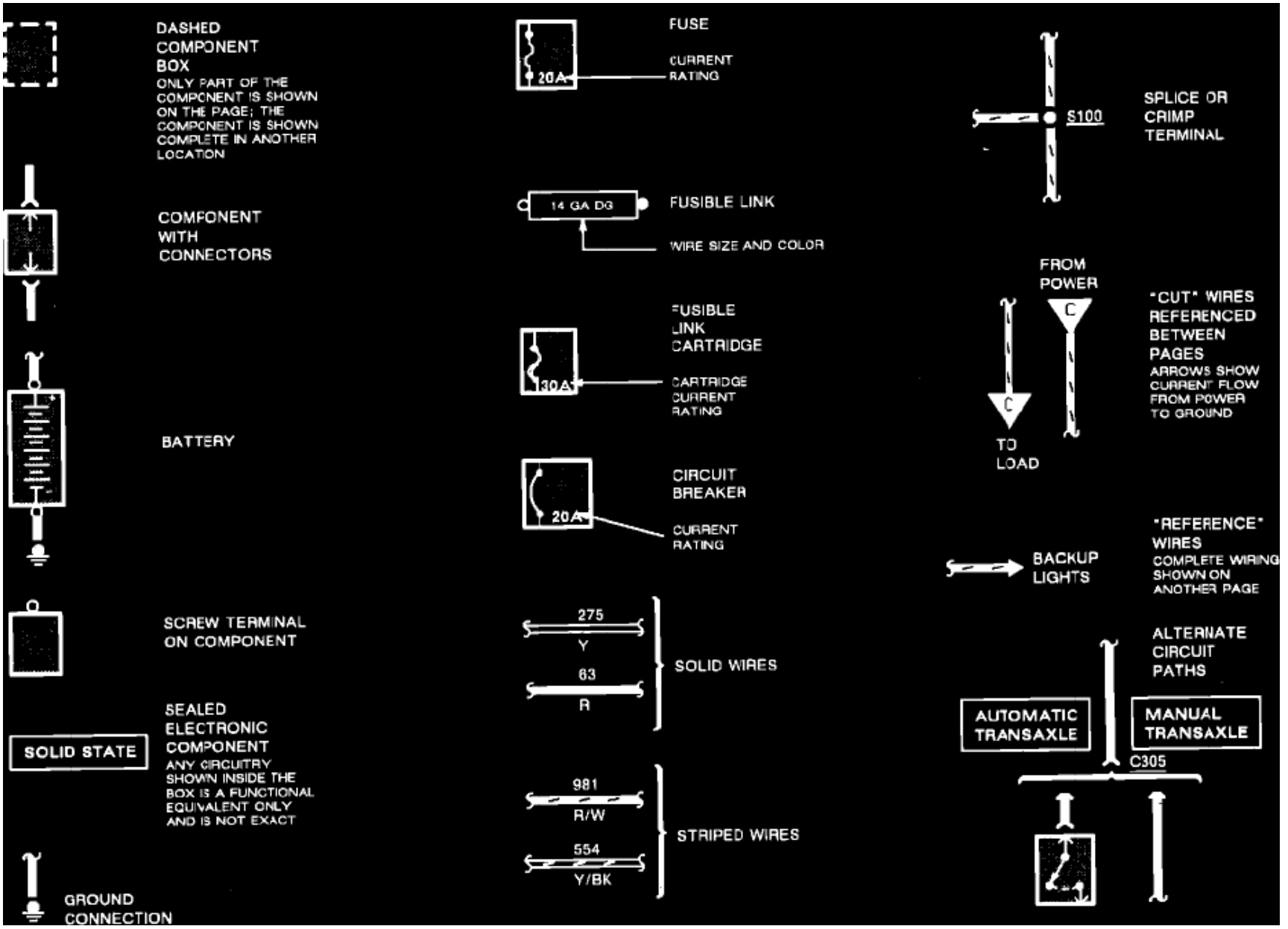
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BATTERY
SCREW TERMINAL ON COMPONENT
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FUSE
CURRENT RATING
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FUSIBLE LINK
WIRE SIZE AND COLOR
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R
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981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
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"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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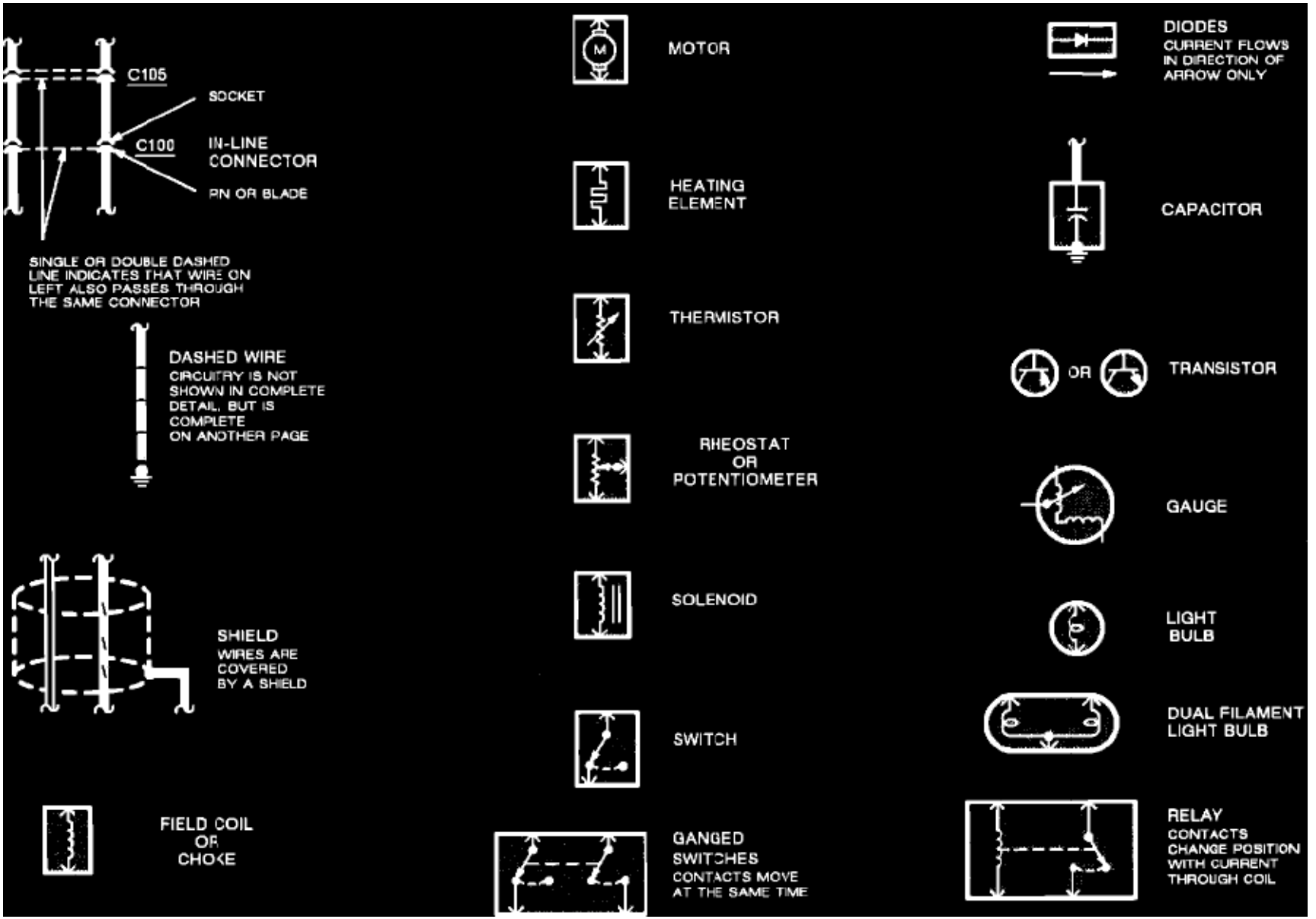
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

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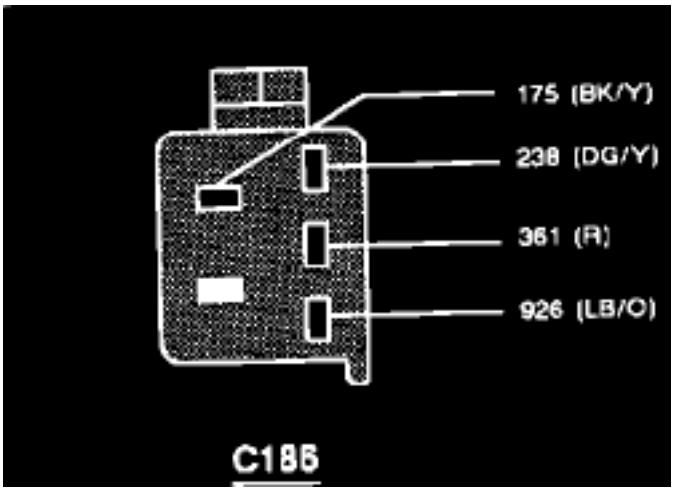
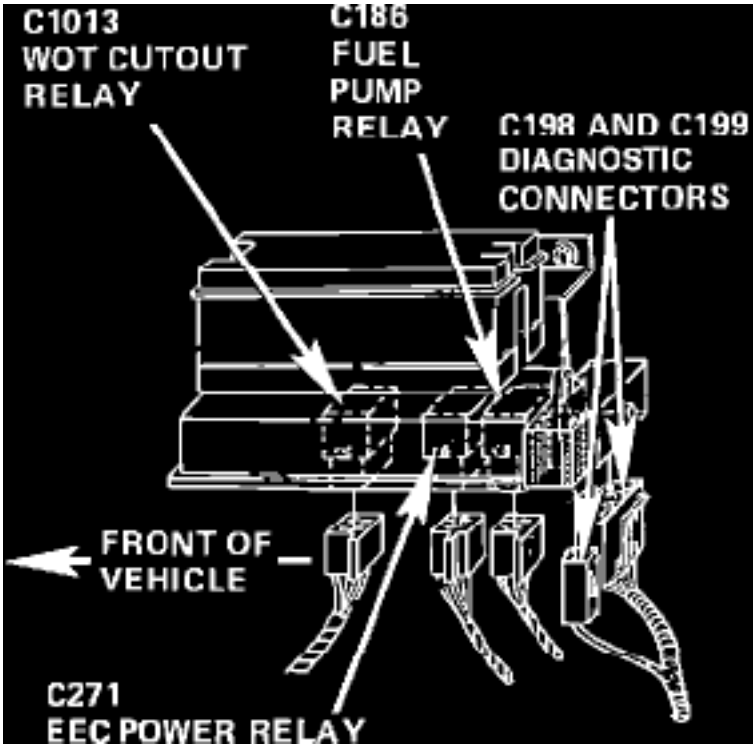


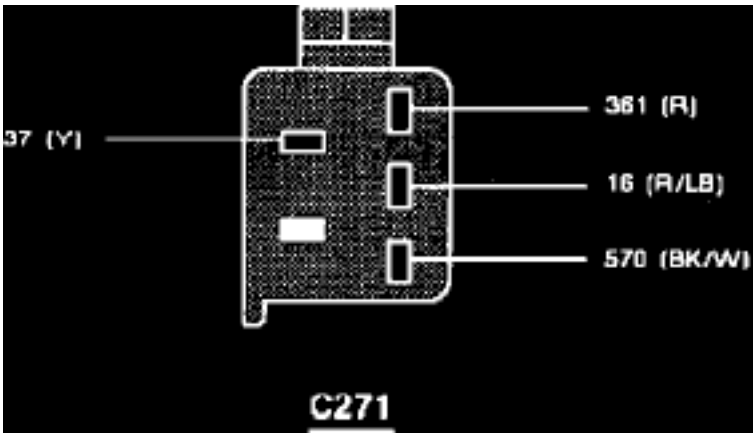
Fuel Pump Relay Connector

Fuel Pump Relay: Description and Operation

When the ignition switch is turned ON, the Electronic Engine Control (EEC) power relay is ENERGIZED, providing power to the fuel pump relay. Fuel pump power is provided through the fuel pump relay contacts and an inertia switch. If the ignition switch is not turned to the START position in approximately one second, a timer circuit in the Engine Control Assembly (ECA) will open the ground circuit to the fuel pump relay, causing the fuel pump relay contacts to OPEN. This action stops the power supply to the fuel pump. When the ignition switch is turned to the START position, the ECA closes the ground circuit to the fuel pump relay, resuming operation of the fuel pump. After the engine switch is returned to the ON position, power to the fuel pump is supplied through the fuel pump relay. The ECA monitors engine speed and OPENS the fuel pump relay ground circuit if the engine speed drops below 120 rpm.



Relay And Diagnostic Connectors



EEC-IV Power Relay Connector

Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.

Ignition Control Module: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: All Technical Service Bulletins Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

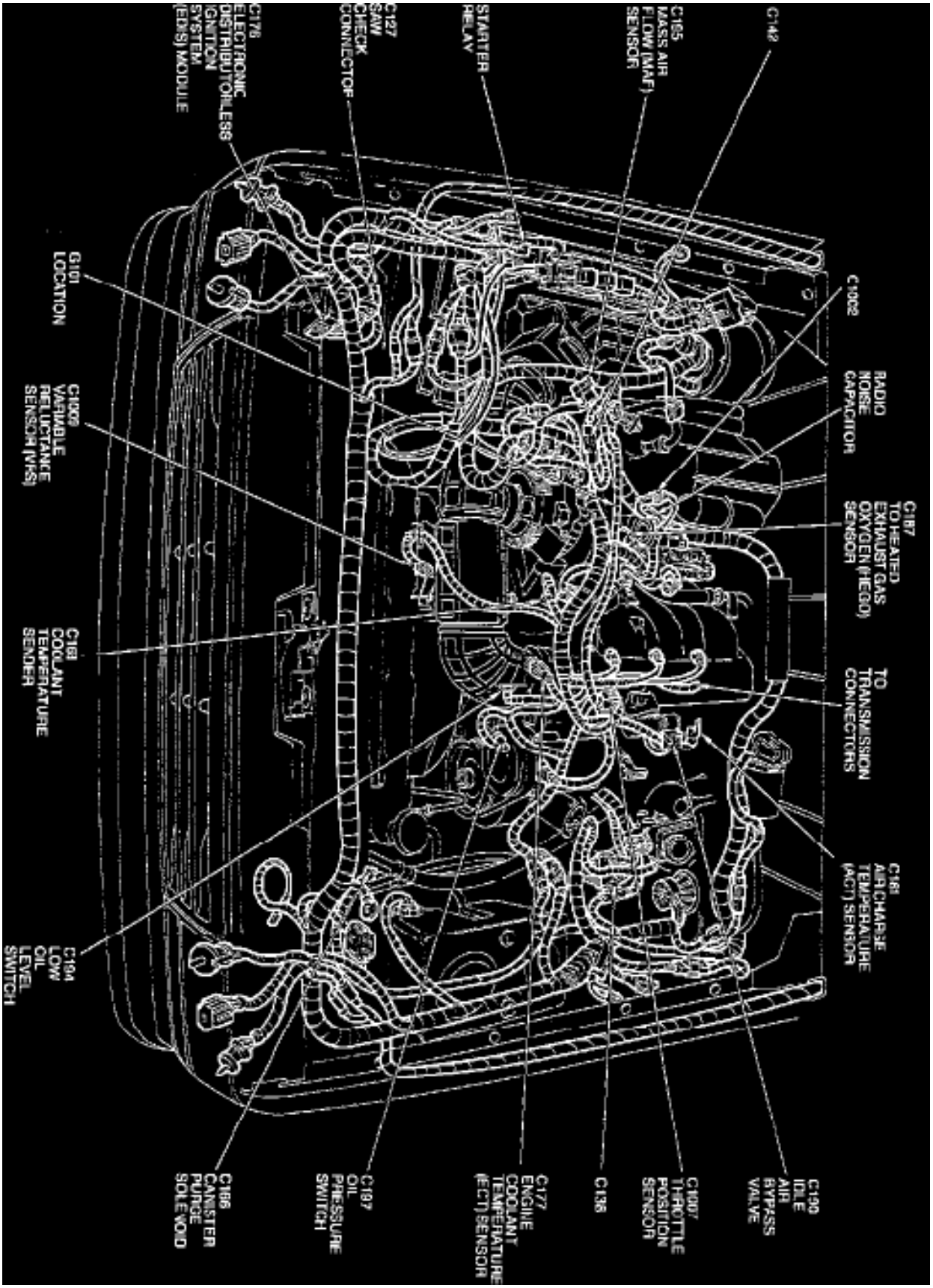
12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: Specifications

TORQUE VALUES:

Ignition Module Mounting Bolts ..... 22-31 lb.in. (2.5-3.5 Nm)

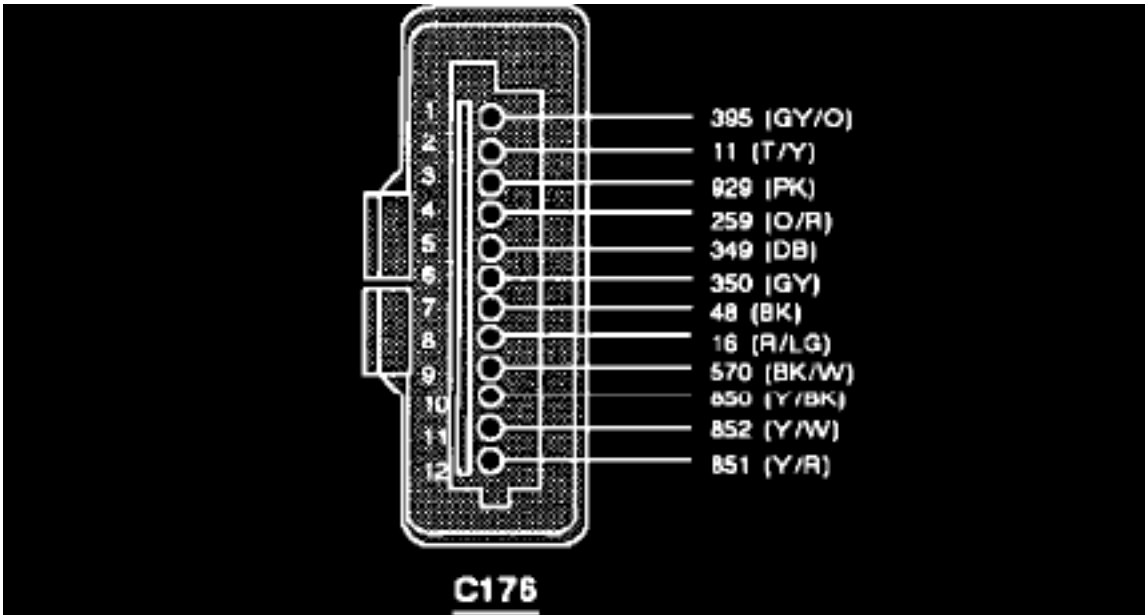

C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1008
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C161
COOLANT
TEMPERATURE
SENDER
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C190A
LOW
OIL
LEVEL
SWITCH
C190
IDLE
AIR
BYPASS
VALVE
C1007
THROTTLE
POSITION
SENSOR
C136
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C197
OIL
PRESSURE
SWITCH
C166
CANISTER
PURGE
SOLENOID

Ignition Control Module: Locations

Engine Compartment Components.

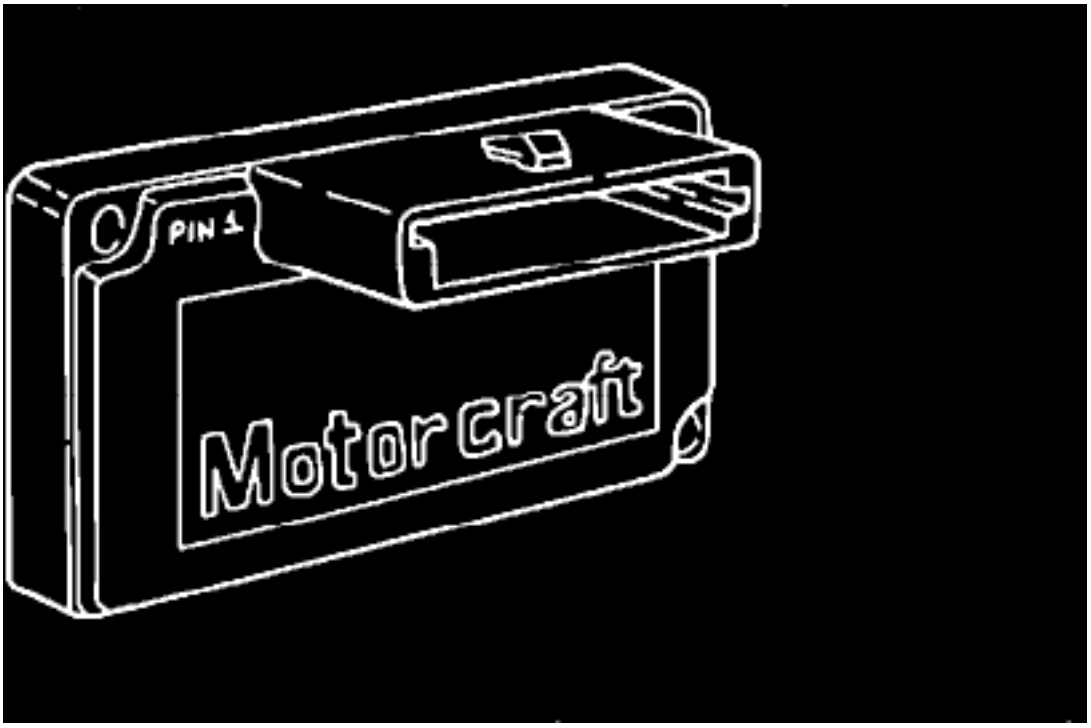
RH Front Corner Of Engine Compartment, Mounted On Upper Radiator Support

Applicable to: 4.0L/V6-244



PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	395 (GY/O)	Profile Ignition Pickup (PIP)
2	11 (T/Y)	Electronic Diagnostic Monitor (EDM)
3	929 (PK)	Spark Advance Word (SAW)
4	259 (O/R)	Ignition Ground To EEC Module
5	349 (DB)	Variable Reluctance Sensor (-)
6	350 (GY)	Variable Reluctance Sensor (+)
7	48 (BK)	VRS and EDIS Ignition Shield
8	16 (R/LG)	Power
9	570 (BK/W)	Power Ground
10	850 (Y/BK)	Drive for Ignition Coil "A"
11	852 (Y/W)	Drive for Ignition Coil "C"
12	851 (Y/R)	Drive for Ignition Coil "B"

Electronic Distributorless Ignition System (EDIS) Module Connector

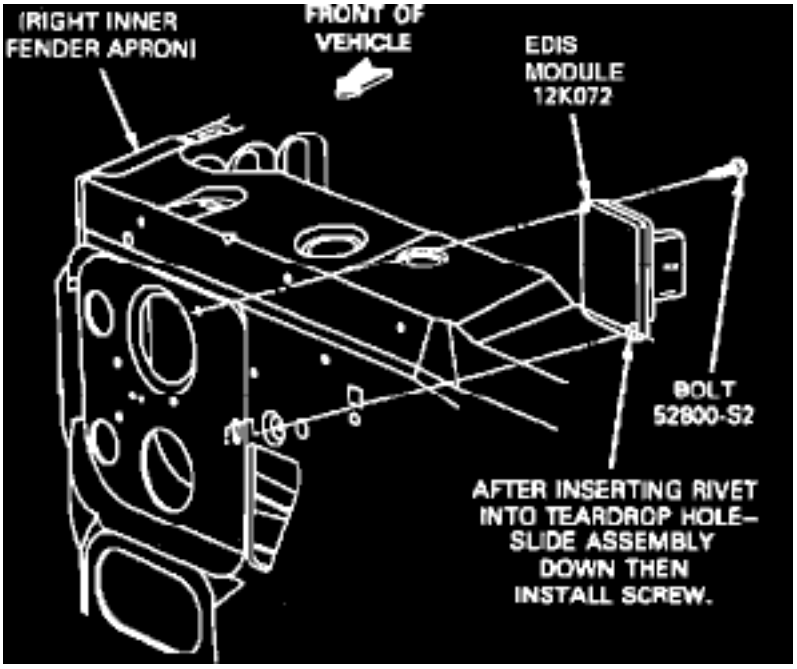


Ignition Control Module: Description and Operation

Module And Pin-Out

The EDIS module receives the Variable Reluctance Sensor (VRS) signal from the crankshaft sensor and the Spark Advance Word (SAW) signal from the EEC IV module. During normal operation, Profile Ignition Pickup (PIP) is sent to the EEC IV module from the EDIS module, providing base timing and RPM information. The VRS signal provides the EDIS module with the information required to synchronize the ignition coils for proper firing sequence. The Spark Angle Word (SAW) signal is a pulse width modulated signal and contains the optimum spark timing information. Spark angle is determined by the EDIS module using a zero excess dwell control routine.

PIN 1 PIP PIN 2 IDM (IGNITION DIAGNOSTIC MONITOR) PIN 3 SAW (SPARK ADVANCE WORD) PIN 4 IGN GRD (IGNITION GROUND) PIN 5 VRS- (VARIABLE RELUCTOR SENSOR NEGATIVE) PIN 6 VRS+ (VARIABLE RELUCTOR SENSOR POSITIVE) PIN 7 VRS SHIELD PIN 8 VBAT (IGNITION POWER TO COMPONENT) PIN 9 GND (BATTERY NEGATIVE) PIN 10 COIL 1 (CYL 1 and 5) PIN 11 COIL 2 (CYL 2 and 6) PIN 12 COIL 3 (CYL 3 and 4)



Ignition Control Module: Service and Repair

REMOVAL:

Ignition Module

1. Disconnect both battery cables, then remove the battery from the vehicle. 2. Disconnect the electrical connector from the ignition module.

NOTE: To disconnect the module connector, push on the connector where it says PUSH, then slide the connector from the module.

3. Remove the ignition module retaining bolt and remove the module by sliding the assembly up until it is released from the teardrop shaped hole in

the sheet metal.

INSTALLATION:

1. Place the module on the sheet metal so the retaining rivet passes through the hole, then slide the module down into position. Install the retaining

bolt. Torque to 22-31 in lb (2.2-3.5 Nm).

2. Connect the electrical connector to the module. 3. Install the battery and cables.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Sensors and Switches - Powertrain Management > Sensors and Switches - Computers and Control Systems > Mass Air Flow (MAF) Sensor <--> [Air Flow Meter/Sensor] > Component Information > Technical Service Bulletins > Customer Interest for Mass Air Flow (MAF) Sensor: > 98-23-10 > Nov > 98 > Engine - Lean Driveability Symptoms

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

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voltage at idle.

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^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

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15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
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NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

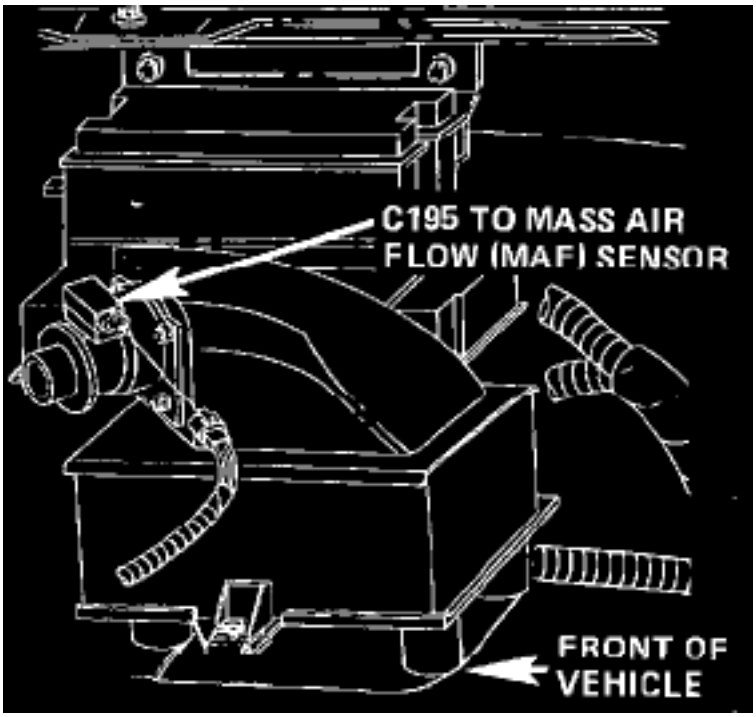
4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

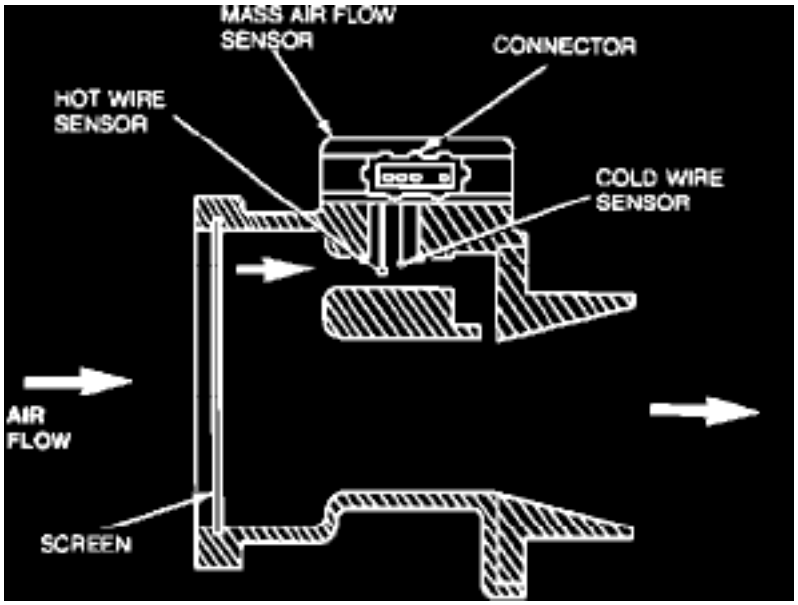
DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



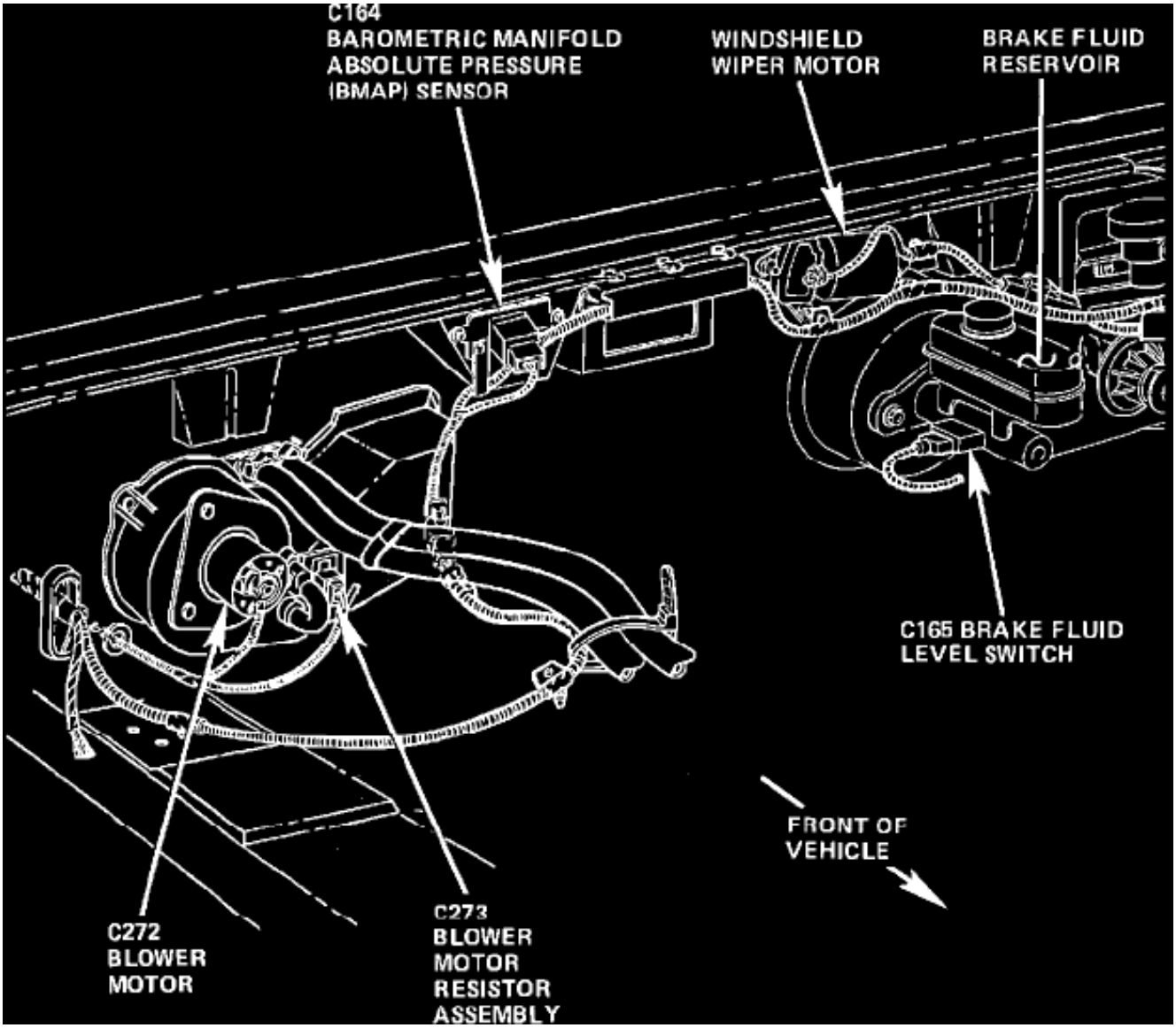
Mass Air Flow (MAF) Sensor



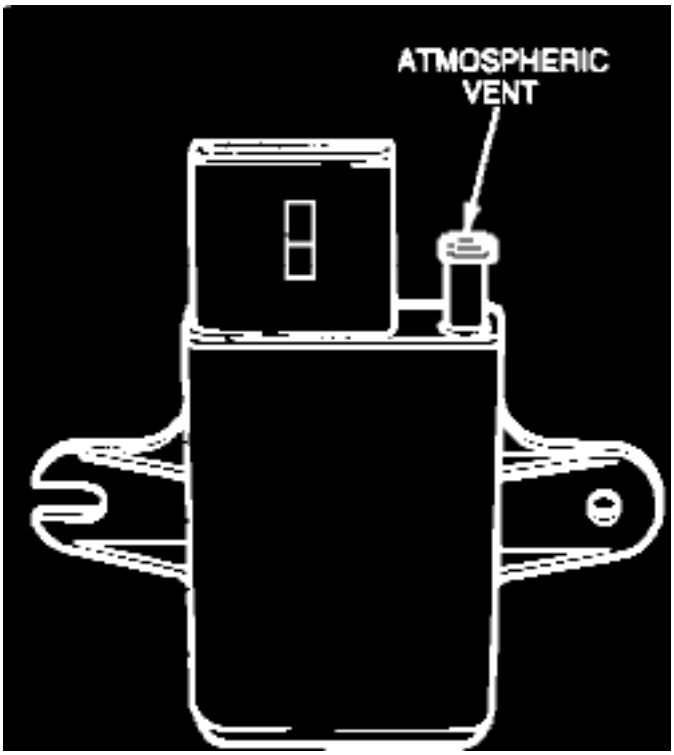
Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



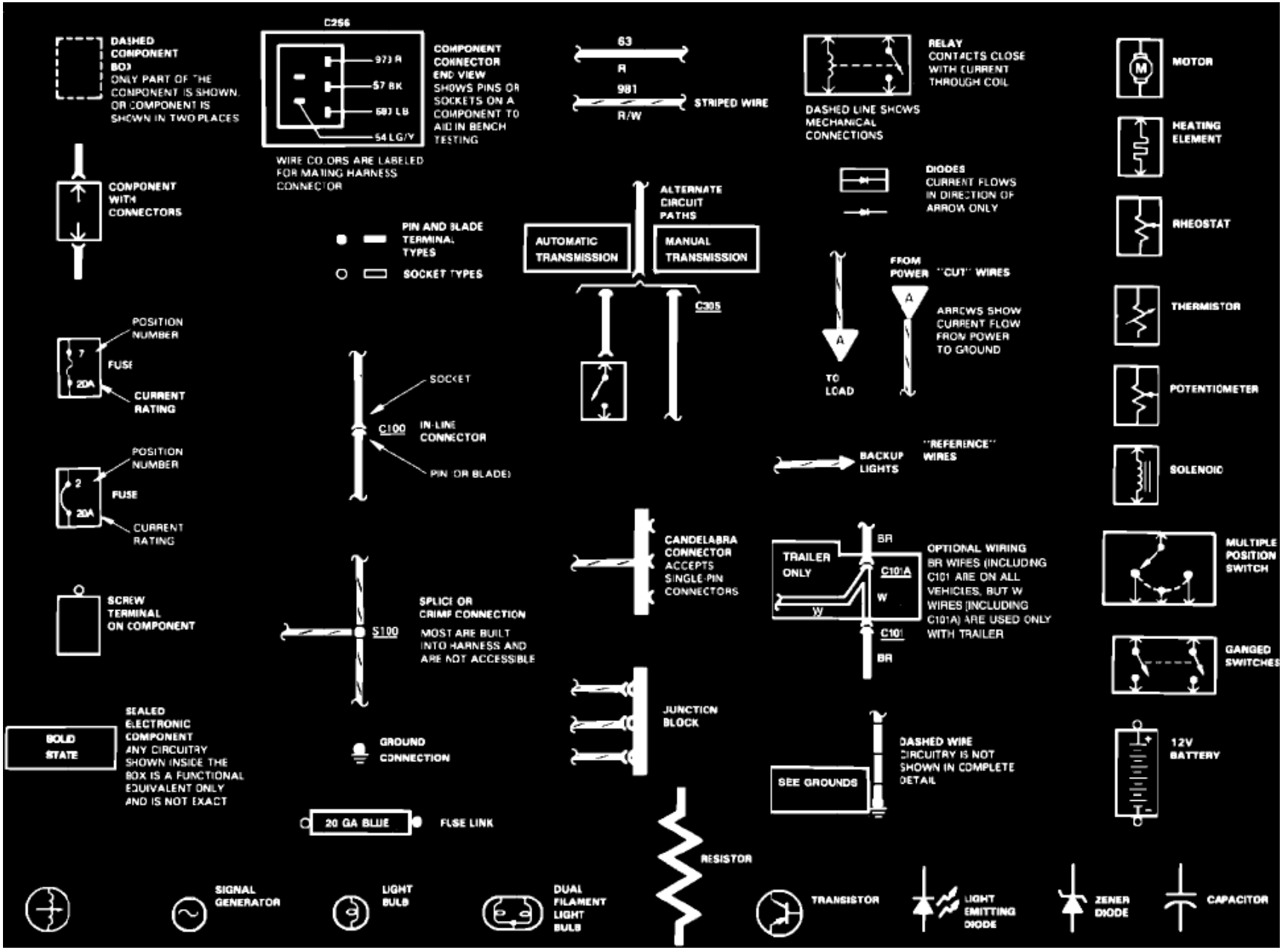
Barometric/manifold Absolute Pressure (BMAP) Sensor



Barometric Pressure Sensor: Description and Operation

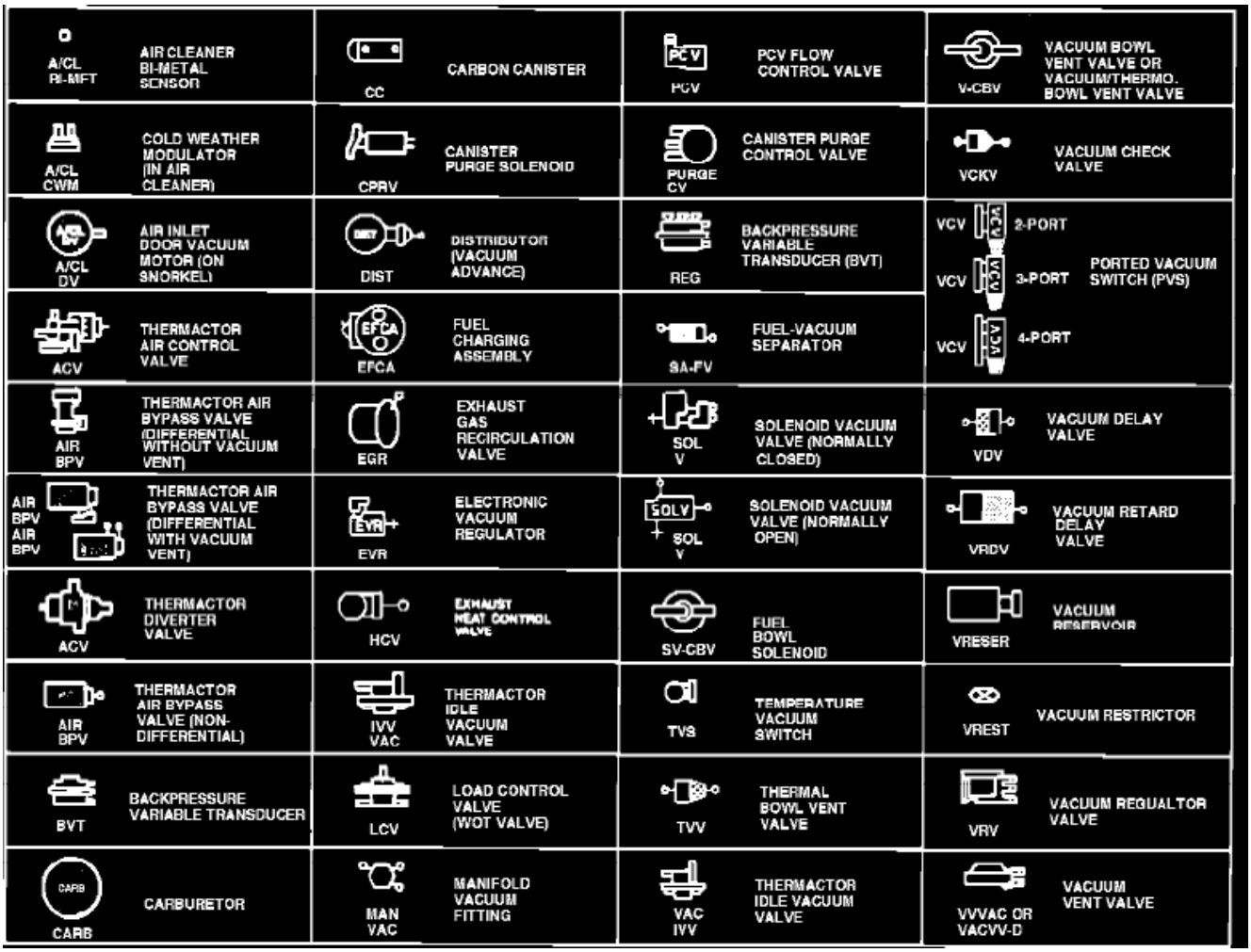
Barometric Pressure Sensor

The Barometric Pressure (BP) sensor is a frequency generating device that produces a varying signal depending on the amount of atmospheric (barometric) pressure. The Engine Control Assembly (ECA) monitors the frequency emitted from the BP sensor and converts the signal to atmospheric pressure. The ECA uses this reading to update the barometric pressure value stored in RAM memory. The ECA uses the input from the BP sensor to optimize the air/fuel ratio, ignition timing adjustment, and EGR flow control. The BP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

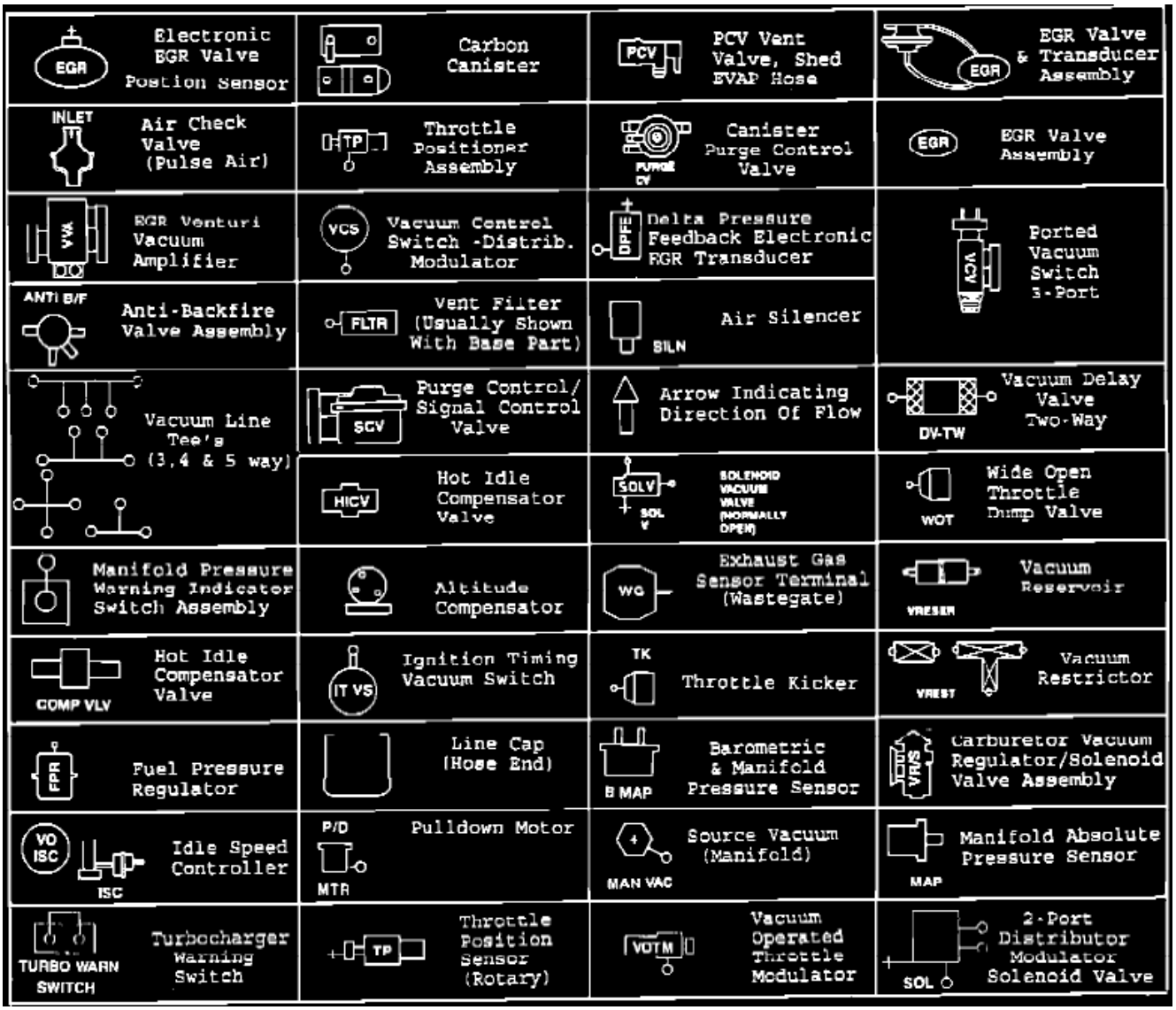


Camshaft Position Sensor: Diagram Information and Instructions

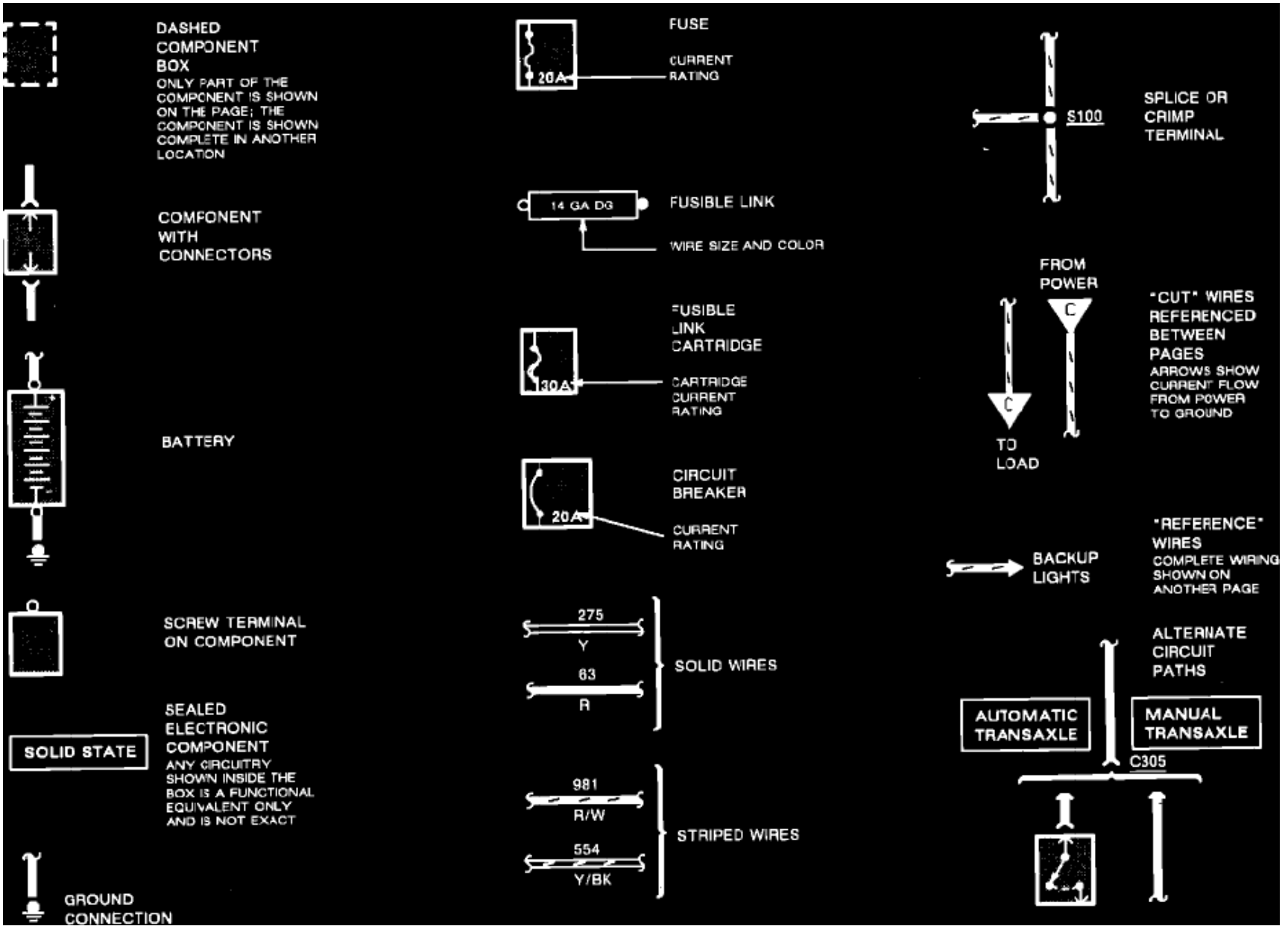
Symbol Identification

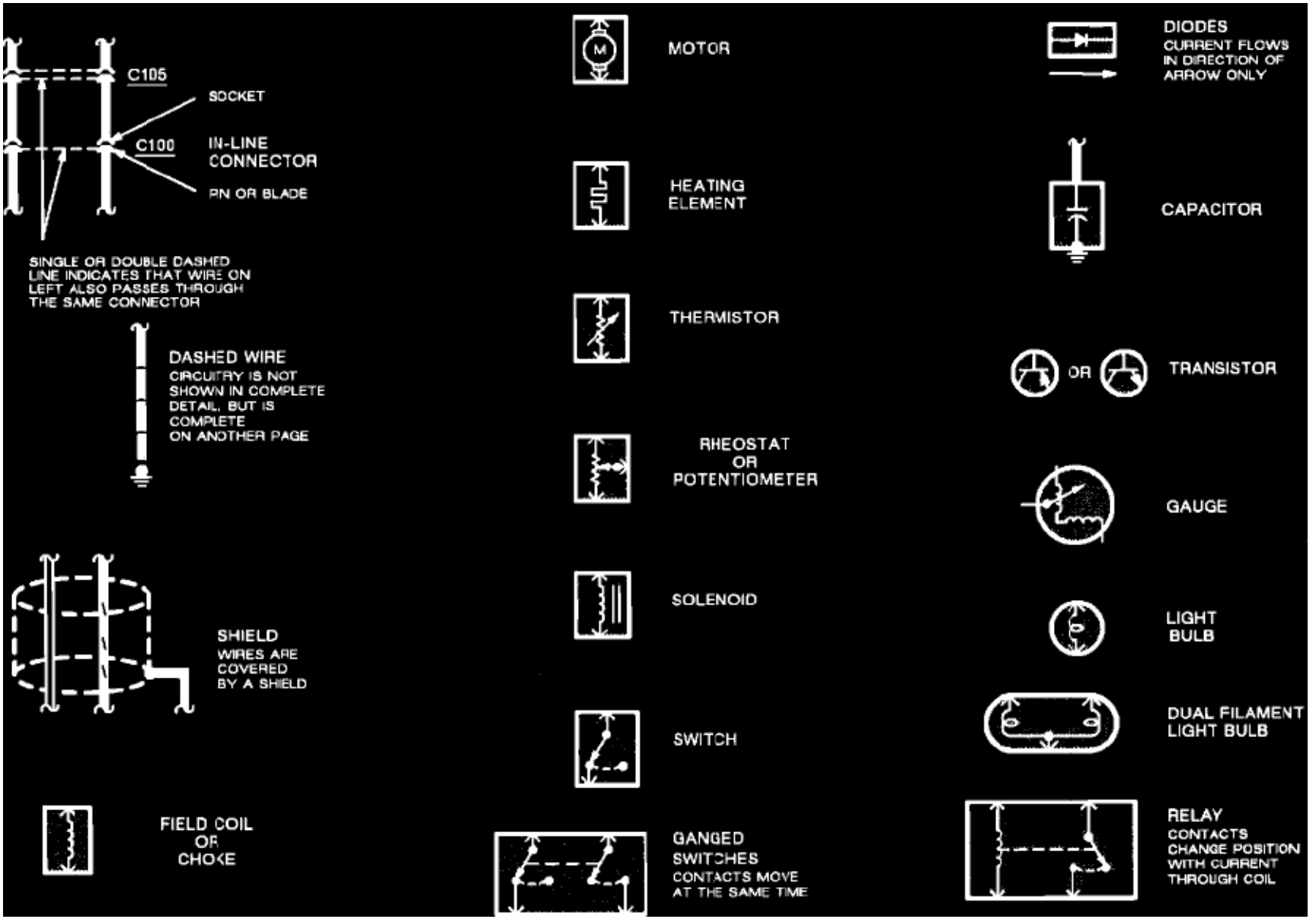


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

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W: White

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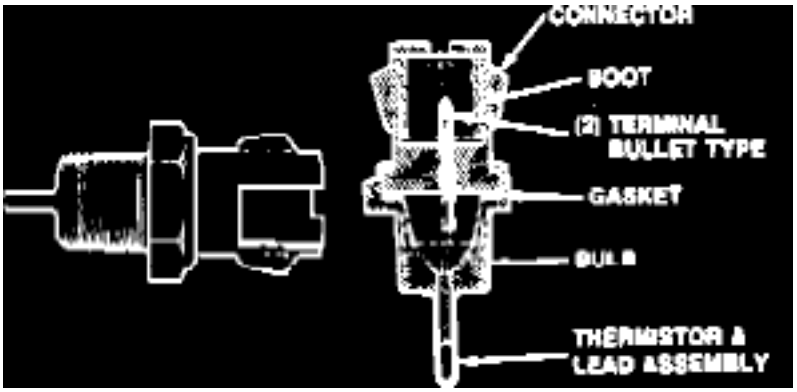


Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

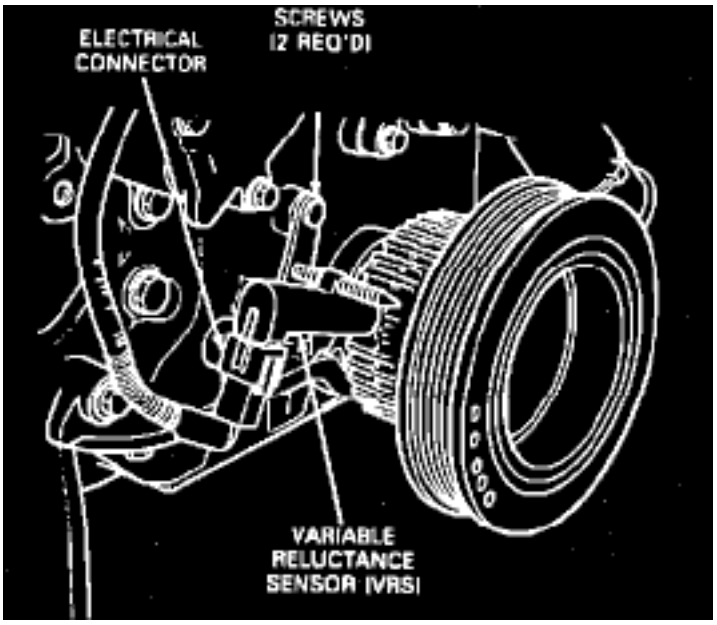
The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Crankshaft Position Sensor: Specifications

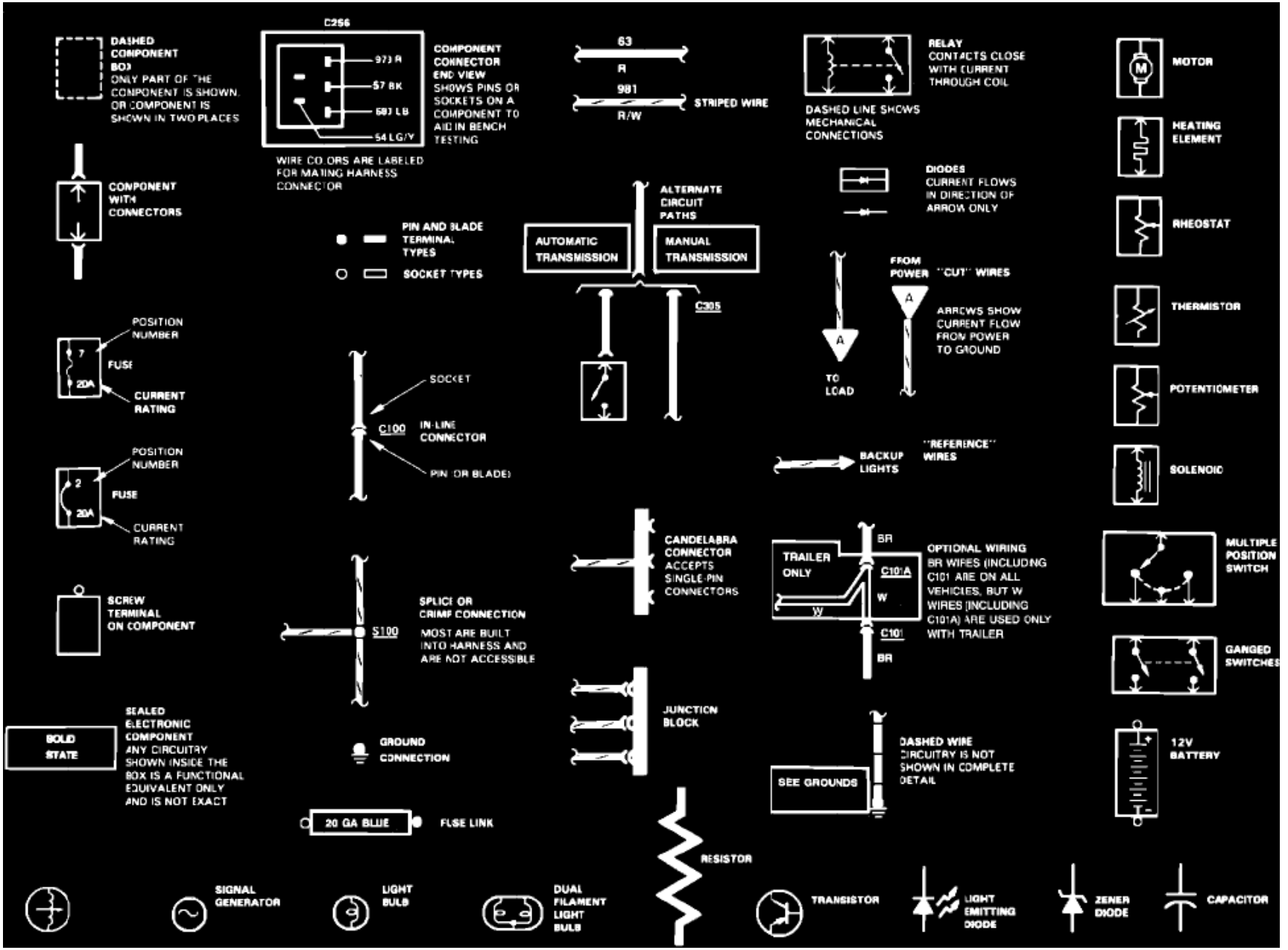
FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)

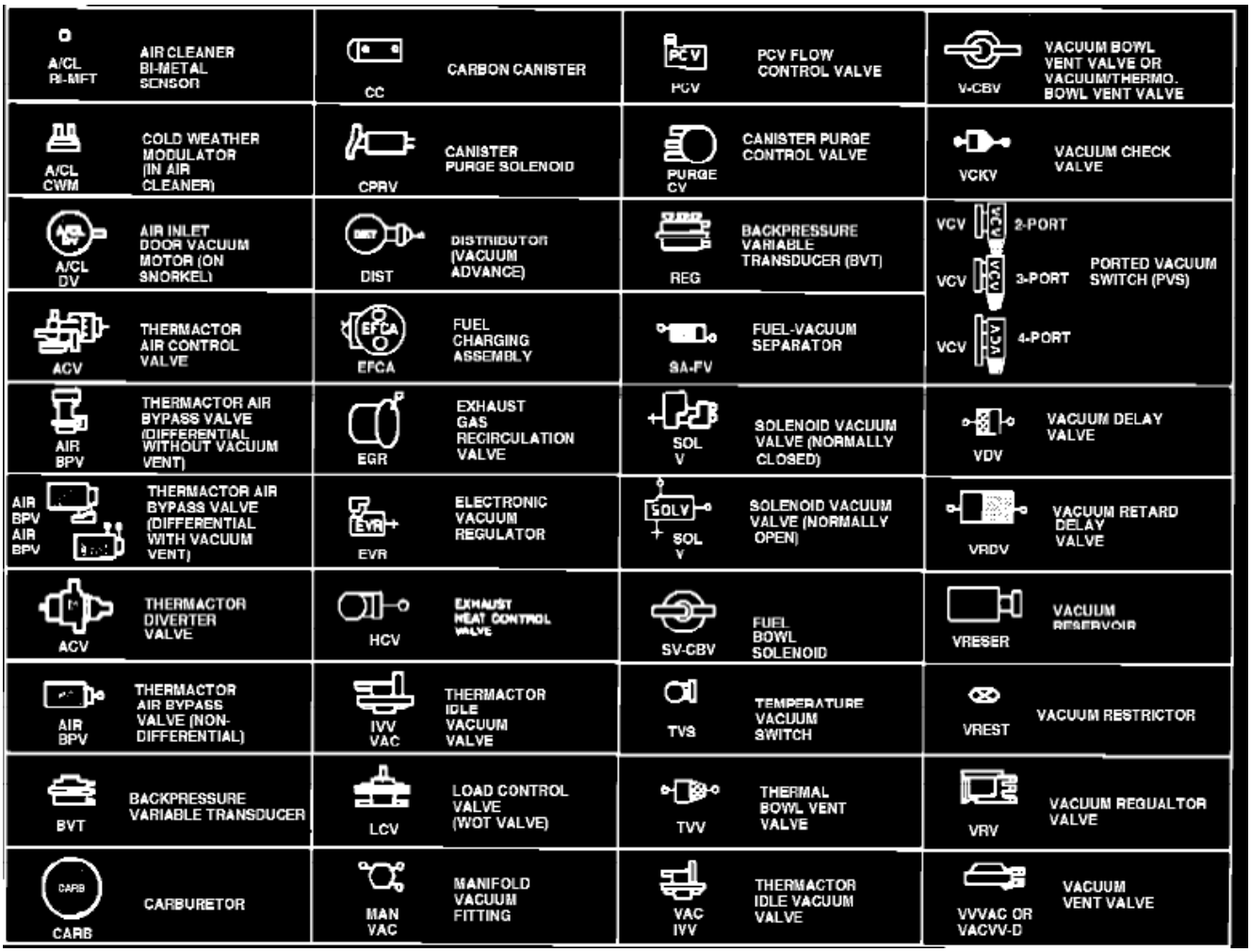


Variable Reluctance (Crankshaft Position) Sensor

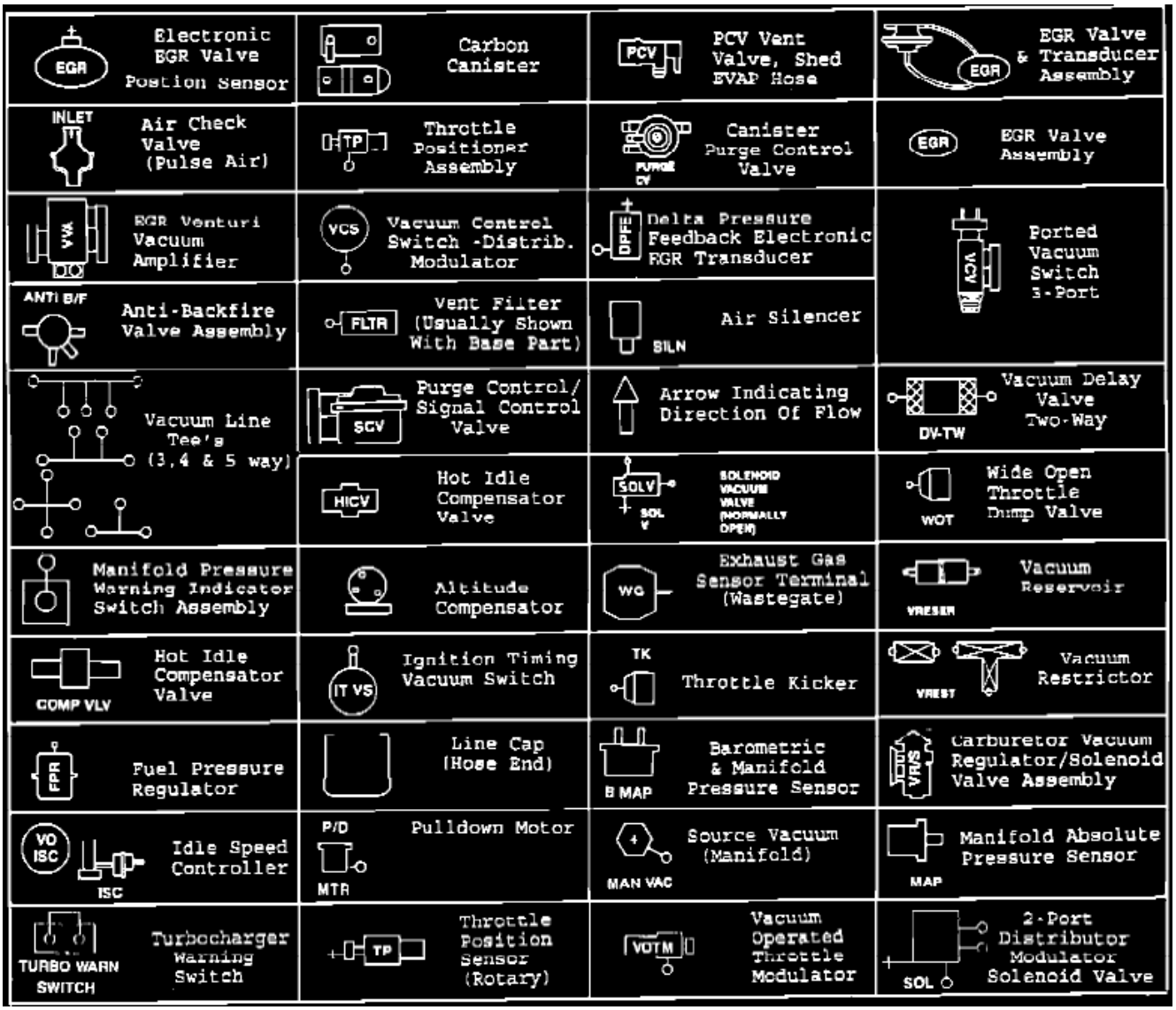


Crankshaft Position Sensor: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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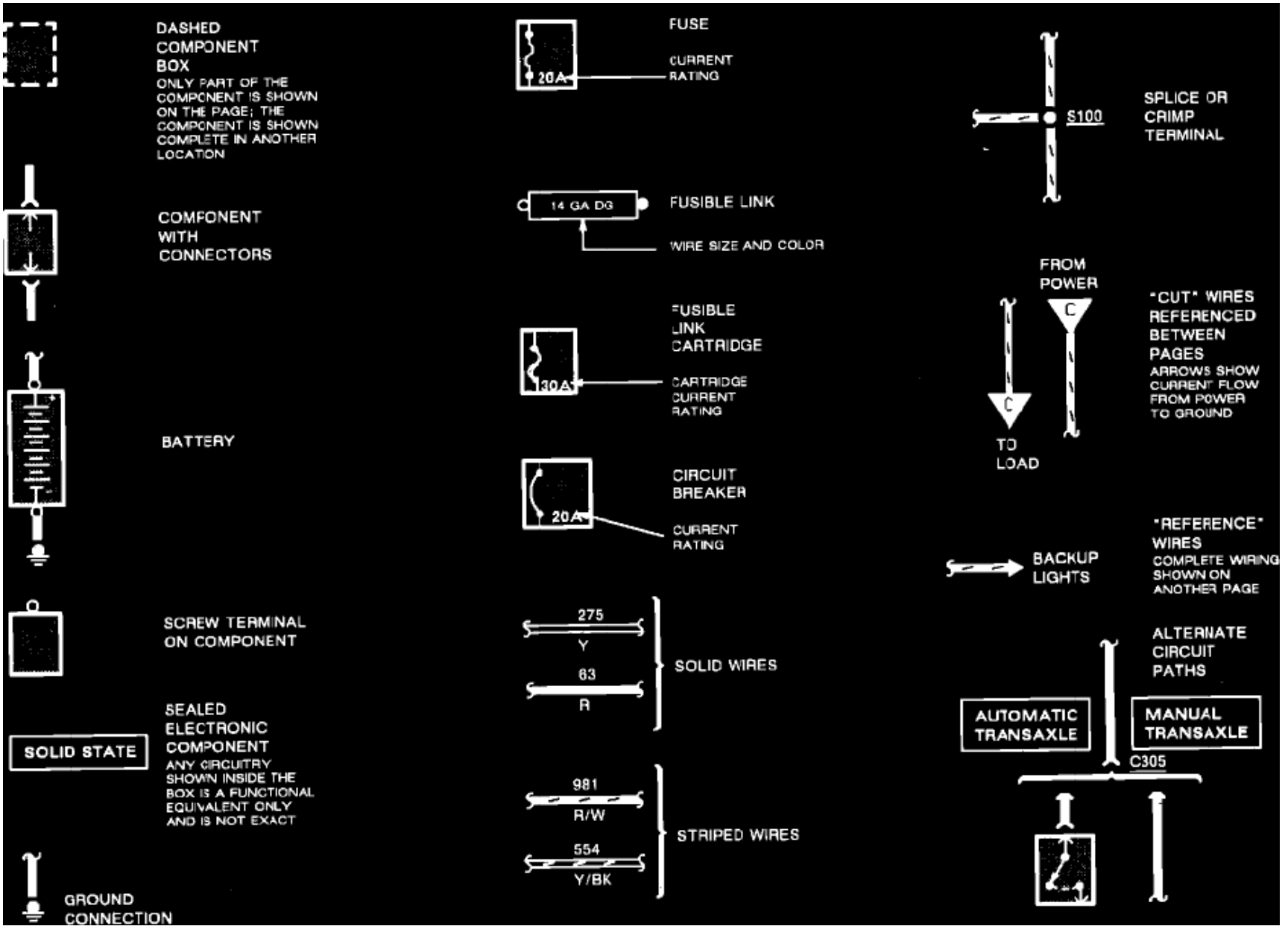
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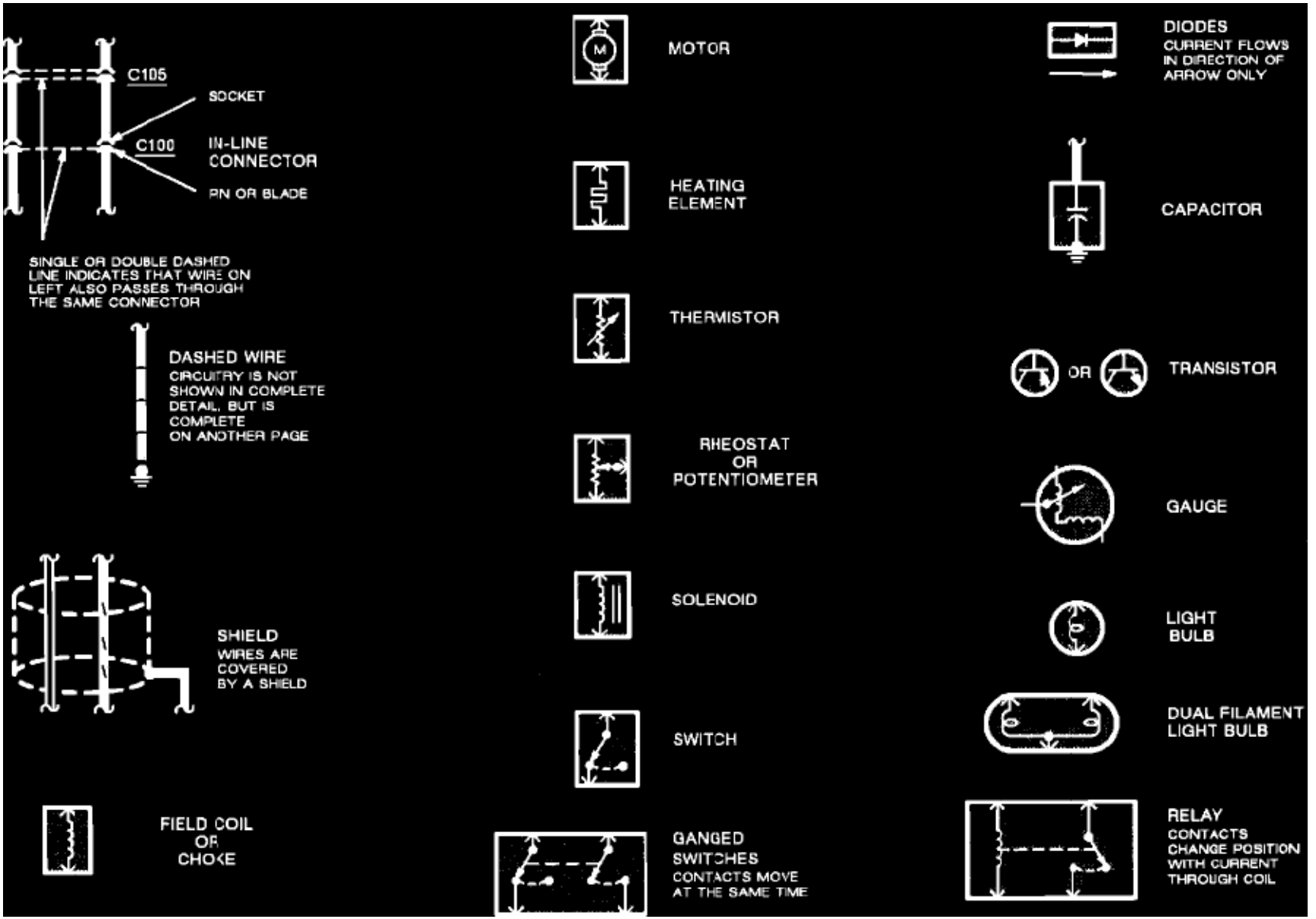

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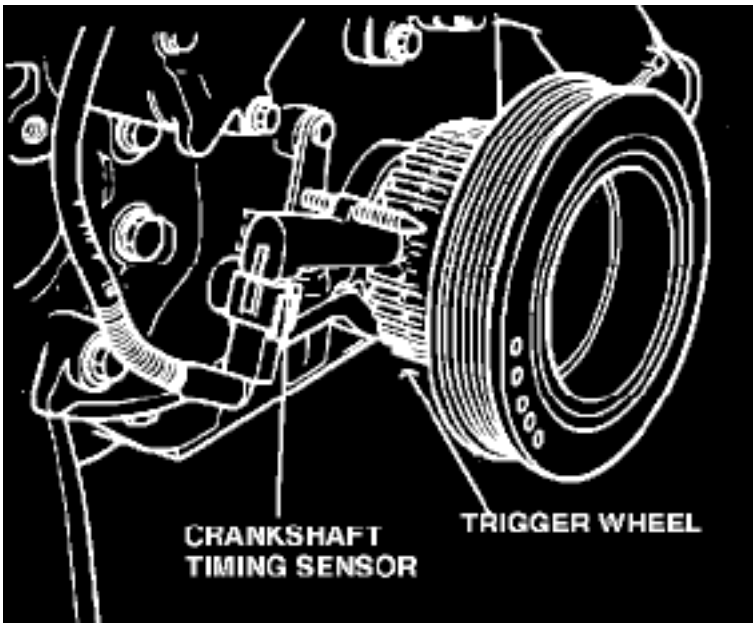
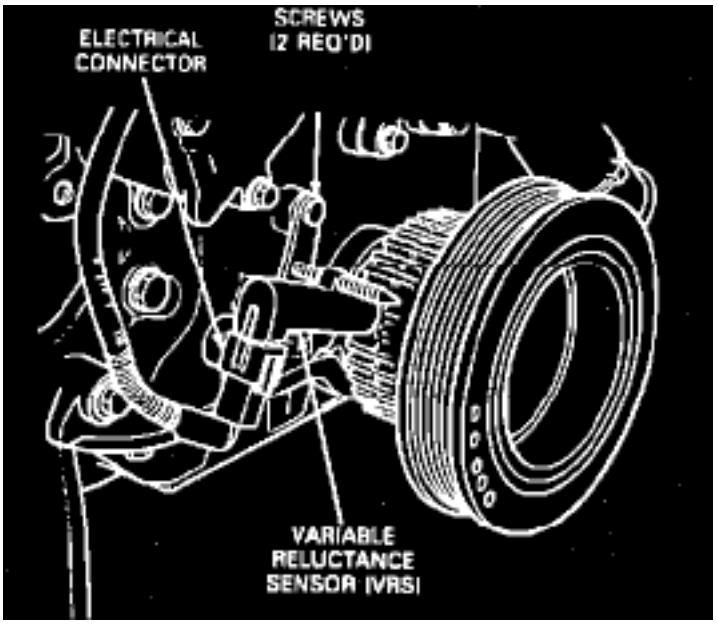


Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

INSTALLATION:

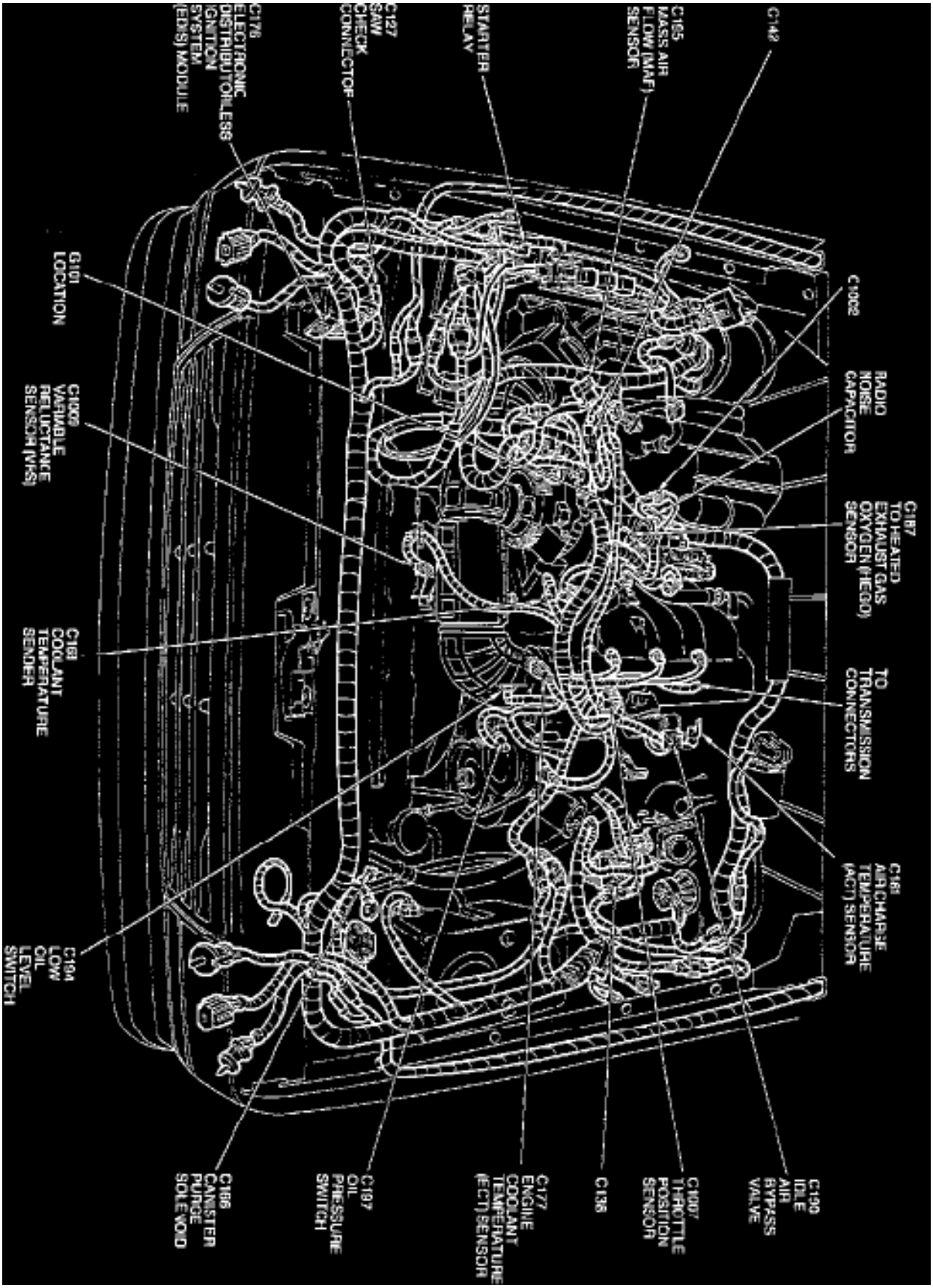
1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

4. Connect the negative battery cable.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Sensors and Switches - Powertrain Management > Sensors and Switches - Computers and Control Systems > Intake Air Temperature Sensor > Component Information > Locations

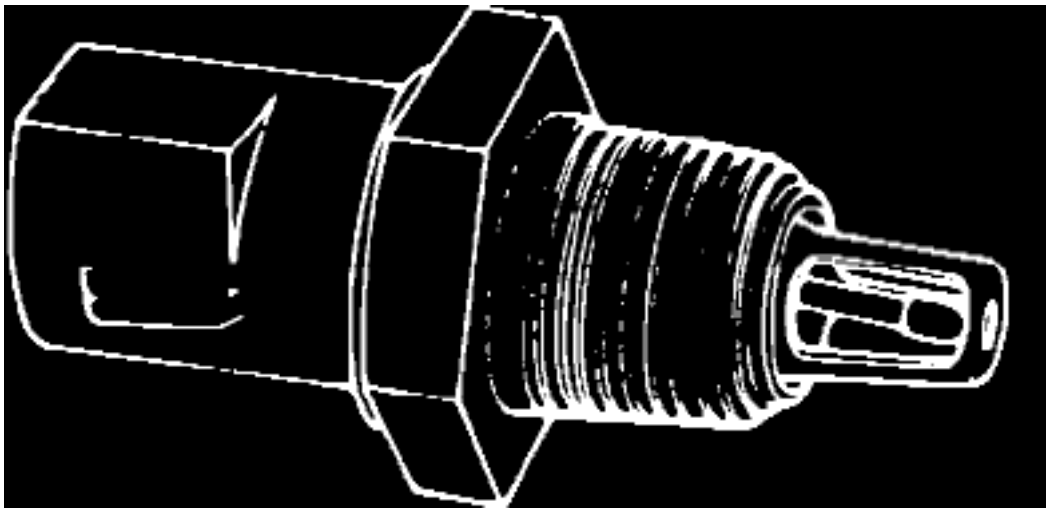


Intake Air Temperature Sensor: Locations

Engine Compartment Components.

Top LH Side Of Engine

Applicable to: 4.0L/V6-244



Intake Air Temperature Sensor: Description and Operation

Air Charge Temperature (ACT) Sensor

The Air Charge Temperature (ACT) sensor is threaded into the intake air passage with a sensing element extending into the air chamber. The ACT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) will also change. The ECA reads the varying sensor resistance and determines the air charge temperature, using this information to optimize the air/fuel mixture. The ACT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Technical Service Bulletins EGO Sensors - Silicone Contamination

Article No. 93-23-6

11/10/93

^ EGO SENSORS - SILICONE CONTAMINATION

^ ENGINE - SEALANTS, LOW VOLATILITY SILICONE REQUIRED

^ EXHAUST SYSTEM - SILICONE CONTAMINATION OF EXHAUST GAS OXYGEN (EGO) SENSORS

FORD: 1984-86 LTD 1984-88 EXP 1984-94 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-94 TAURUS 1988-93 FESTIVA 1989-94 PROBE 1994 ASPIRE

LINCOLN-MERCURY: 1984-86 CAPRI, MARQUIS 1984-87 LYNX 1984-92 MARK VII 1984-94 CONTINENTAL, COUGAR, GRAND MARQUIS, TOPAZ, TOWN CAR 1986-94 SABLE 1988-89 TRACER 1991-94 CAPRI, TRACER 1993-94 MARK VIII

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1983-94 RANGER 1984-90 BRONCO II 1984-94 BRONCO, ECONOLINE, F-150-350 SERIES 1986-94 AEROSTAR 1988-94 F-47, F-53 1991-94 EXPLORER 1993-94 VILLAGER

This TSB article is being republished in its entirety to update model applicability and to revise the part number of the Low Volatility Sealant.

ISSUE: EGO sensors can be contaminated if volatile types of silicone are used when servicing the engine. Volatile silicones can migrate throughout the system during the first one hundred hours of service. They are commonly found in liquid "silicone rubber" sealants and gasket material. These products are commonly sold in tubes and caulking-type cartridges.

ACTION: When service is performed on the engine, only use new low volatility silicone sealant (F1AZ-19662-A) where specified. Also replace the contaminated EGO sensor if required.

CAUTION: DO NOT SUBSTITUTE CONVENTIONAL SILICONE RUBBER SEALANTS WHEN LOW VOLATILITY SILICONE SEALANT IS SPECIFIED.

PART NUMBER PART NAME CLASS

F1AZ-19662-A Low Volatility RTV Sealant B

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 89-14-5

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 490000, 499000

Oxygen Sensor: Technical Service Bulletins Heated Exhaust Gas Oxygen Sensor - Application Chart

Article No. 94-16-9

08/10/94

EXHAUST - HEATED OXYGEN SENSOR (H02S) - APPLICATION CHART

FORD: 1991-94 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991-94 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1993-94 MARK VIII

LIGHT TRUCK: 1991-94 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F SUPER DUTY, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 F & B SERIES

ISSUE: Quick Reference Heated Oxygen Sensor (H02S) Application Charts have been developed to assist technicians and parts managers in correct parts usage.

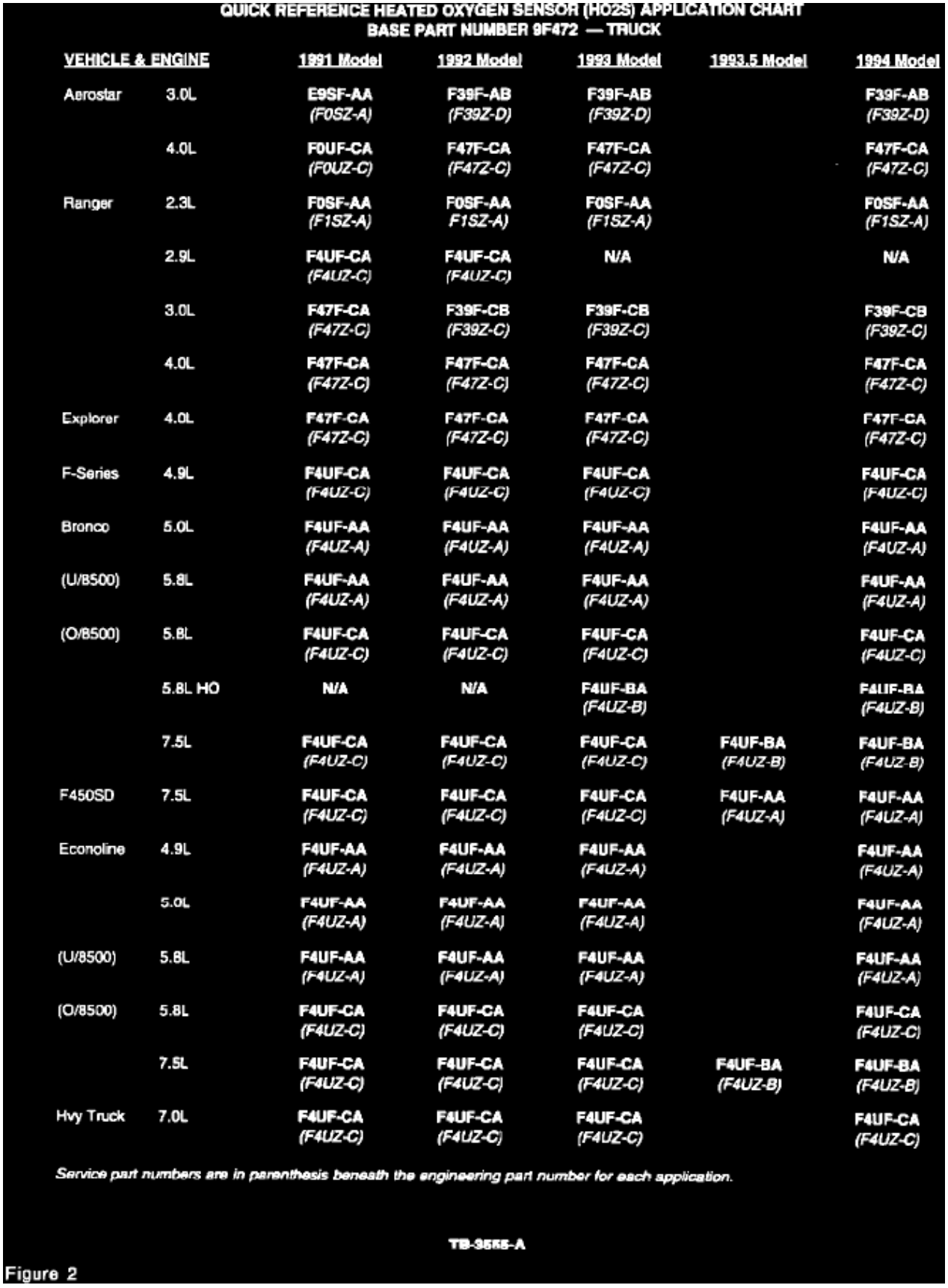
QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — CAR

VEHICLE & ENGINE		1991 Model	Qty	1992 Model	Qty	1993 Model	Qty	1994 Model	Qty
Escort	1.9L	E93F-AA *(F03Z-A)*	1	F09F-AA *(F09Z-A)*	1	F09F-AA *(F09Z-A)*	1	F0SF-AA *(F1SZ-A)*	1
Tempo/Topaz	2.3L	E9SF-BA *(F0SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1
	3.0L	N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
Taurus/Sable	2.5L	F0SF-AA *(F1SZ-A)*	1	N/A		N/A		N/A	
	3.0L	F0SF-AA *(F1SZ-A)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2
	3.8L	F4AF-AA *(F4AZ-A)*	2	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1
				# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1
	3.2L SHO	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
	3.0L SHO	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2
Mustang	2.3L DP	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	N/A	
	3.8L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
	5.0L HO+	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	F4SF-DA *(F4SZ-D)*	2
T/Bird/Cougar	3.8L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	3.8LSC	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	5.0L HO+	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A	
	4.6L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
Crown Vic/ Grand Marquis	4.6L;4BS	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2
	4.6L CAL	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-BA *(F4AZ-B)*	2
Continental	3.8L	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A/		N/A/	
	3.8L	N/A		@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1
		N/A		# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1
Town Car	4.6L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	N/A	
	4.6L LIMO	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L CAL	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L;4BS	N/A		N/A		N/A		F4AF-AA *(F4AZ-A)*	2
Mark VIII	4.6L 4V	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F4AF-AA *(F4AZ-A)*	2

NOTE: Boxed areas are recommended new parts for service (ITALICIZED numbers are service part numbers).
@ Engine control sensor located in rear manifold/exhaust pipe.
# Engine control sensor located in front manifold/exhaust pipe.

TB-3554-A

Figure 1



QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — TRUCK

VEHICLE & ENGINE		1991 Model	1992 Model	1993 Model	1993.5 Model	1994 Model
Aerostar	3.0L	E9SF-AA (F0SZ-A)	F39F-AB (F39Z-D)	F39F-AB (F39Z-D)		F39F-AB (F39Z-D)
	4.0L	F0UF-CA (F0UZ-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
Ranger	2.3L	F0SF-AA (F1SZ-A)	F0SF-AA F1SZ-A)	F0SF-AA (F1SZ-A)		F0SF-AA (F1SZ-A)
	2.9L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	N/A		N/A
	3.0L	F47F-CA (F47Z-C)	F39F-CB (F39Z-C)	F39F-CB (F39Z-C)		F39F-CB (F39Z-C)
	4.0L	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
Explorer	4.0L	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
F-Series	4.9L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
Bronco	5.0L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(U/B500)	5.8L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(O/B500)	5.8L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
	5.8L HO	N/A	N/A	F4UF-BA (F4UZ-B)		F4UF-BA (F4UZ-B)
	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-BA (F4UZ-B)	F4UF-BA (F4UZ-B)
F450SD	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)
Econoline	4.9L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
	5.0L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(U/8500)	5.8L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(O/8500)	5.8L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-BA (F4UZ-B)	F4UF-BA (F4UZ-B)
Hvy Truck	7.0L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)

Service part numbers are in parenthesis beneath the engineering part number for each application.

TB-3555-A

Figure 2

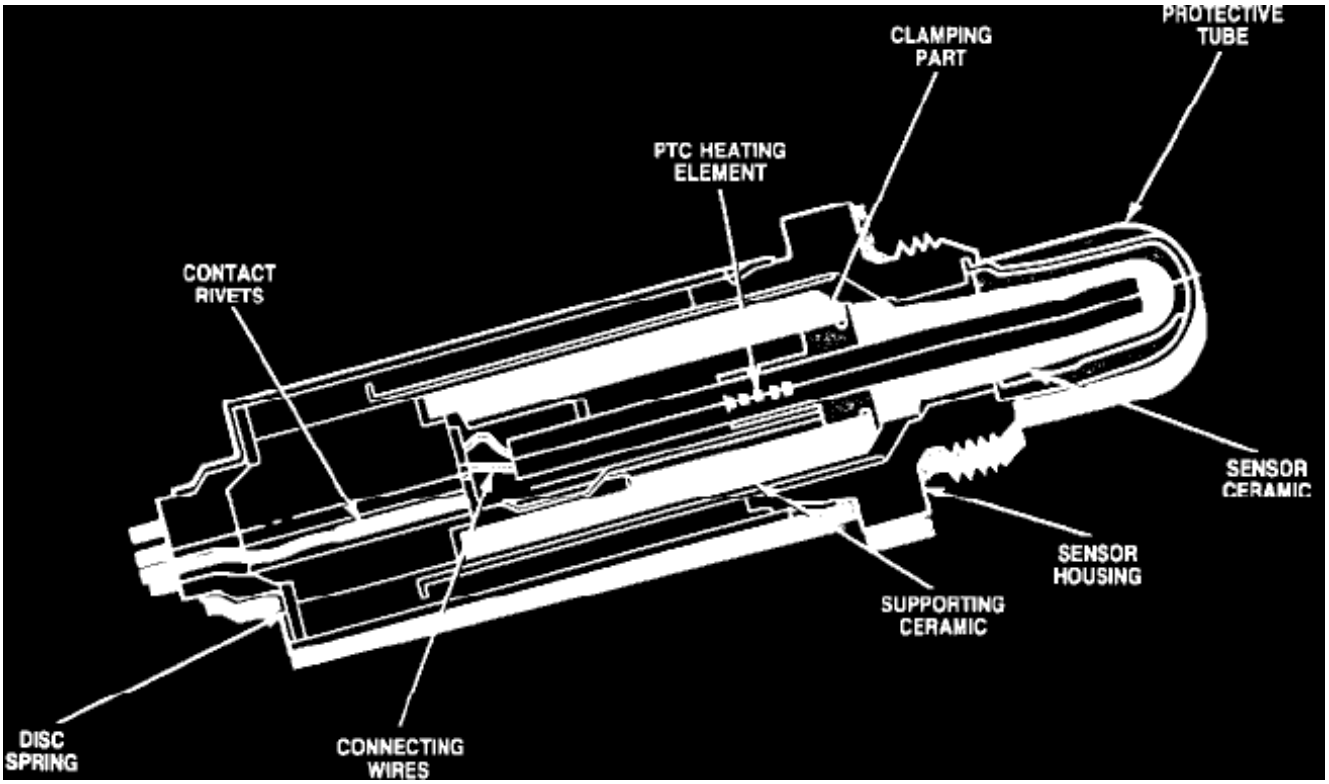
ACTION: Refer to the appropriate Quick Reference Heated Oxygen Sensor (HO2S) Application Chart for Passenger Car or Truck, Figures 1 and 2, to make sure that the correct service sensor is

installed. In some cases, new applications are shown.

PART NUMBER	PART NAME	CLASS
FOSZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-D	Heated Oxygen Sensor	A
FOUZ-9F472-C	Heated Oxygen Sensor	B
F47Z-9F472-C	Heated Oxygen Sensor	A
F1SZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-A	Heated Oxygen Sensor	A
F4UZ-9F472-B	Heated Oxygen Sensor	A
FO3Z-9F472-A	Heated Oxygen Sensor	B
FO9Z-9F472-A	Heated Oxygen Sensor	B
F1SZ-9F472-B	Heated Oxygen Sensor	B
F4AZ-9F472-A	Heated Oxygen Sensor	A
F4AZ-9F472-B	Heated Oxygen Sensor	A
F4ZZ-9F472-A	Heated Oxygen Sensor	A
F4SZ-9F472-D	Heated Oxygen Sensor	A
F4SZ-9F472-A	Heated Oxygen Sensor	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 623000



Oxygen Sensor: Description and Operation

Heated Oxygen Sensor

The Heated Exhaust Gas Oxygen (HEGO) sensor is threaded into the exhaust manifold with a sampling tip extending into the exhaust stream. The sensor is a zirconium dioxide ceramic thimble with platinum surface electrodes. The ceramic thimble is oxygen ion conductive and generates voltage due to the oxygen content difference between the atmosphere and the exhaust gas. The sensor will generate a voltage signal between 0 volts (lean condition) and 1.1 volts (rich condition). The ECU reads this signal to achieve an air/fuel ratio of 14.7:1 when operating in CLOSED LOOP. The HEGO sensor must operate above 600°F. To quickly heat up the sensor, a heating element is incorporated into the sensor. The HEGO sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Service and Repair

The oxygen sensor has a permanently attached wire and connector. This should not be removed, since the removal will affect proper operation of the oxygen sensor.

1. Disconnect electrical connector from oxygen sensor.

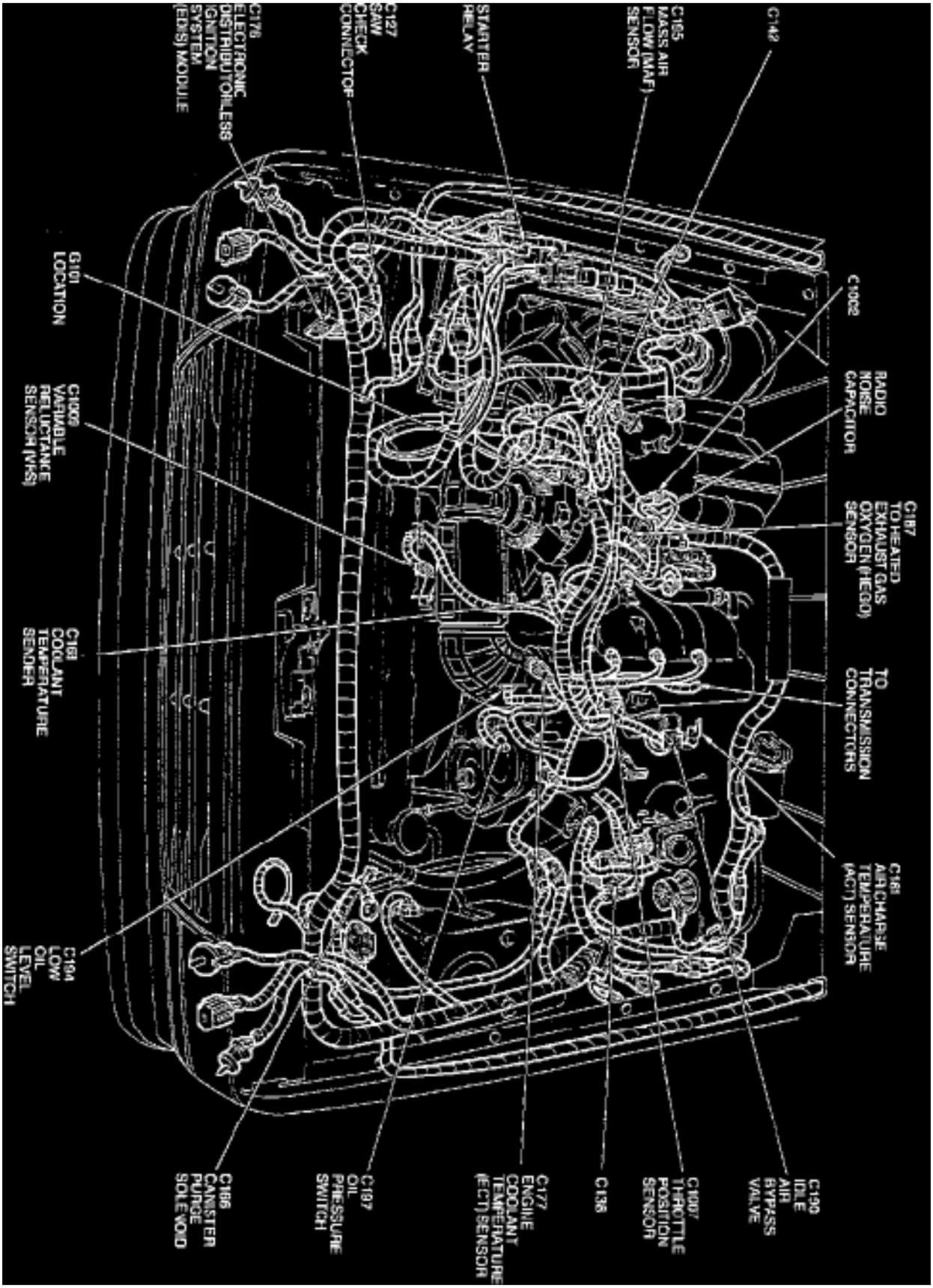
2. Using a suitable oxygen sensor wrench, carefully remove the sensor from exhaust manifold or pipe. The oxygen sensor may be difficult to remove when engine temperature is below 120°F. CAUTION: Excessive force may damage threads in exhaust manifold or pipe.

3. If a new sensor is being used, install the new sensor into the manifold or pipe.

4. If an old sensor is being reused, coat threads with anti-seize compound, then install the sensor into the manifold or pipe.

5. Torque the oxygen sensor to 30-36 lb. ft. (40-50 N-m), and reconnect the electrical connector.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Sensors and Switches - Powertrain Management > Sensors and Switches - Computers and Control Systems > Throttle Position Sensor > Component Information > Locations

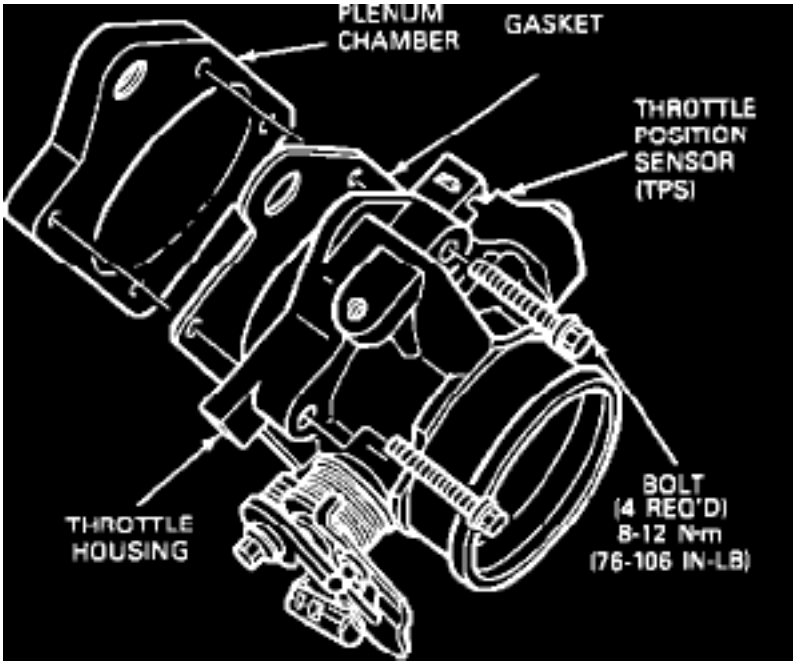


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



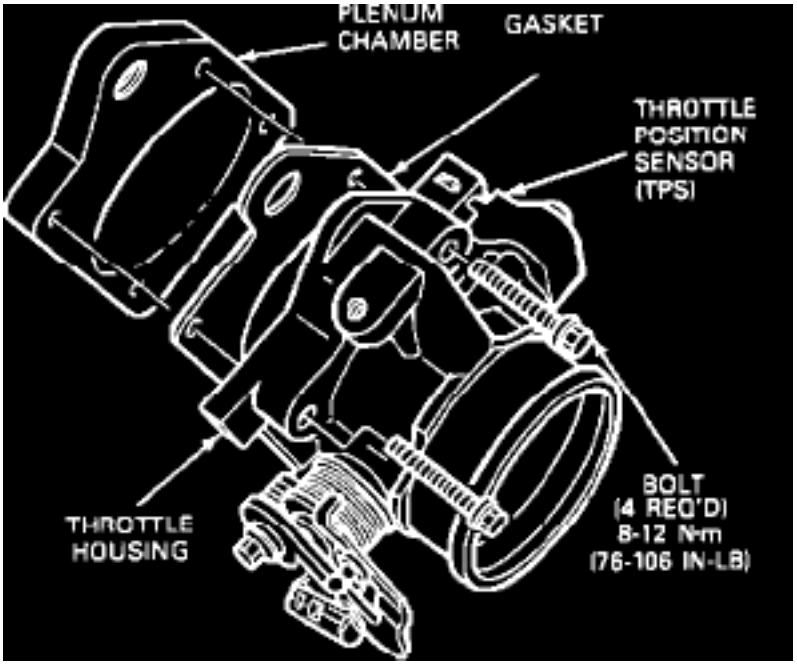
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

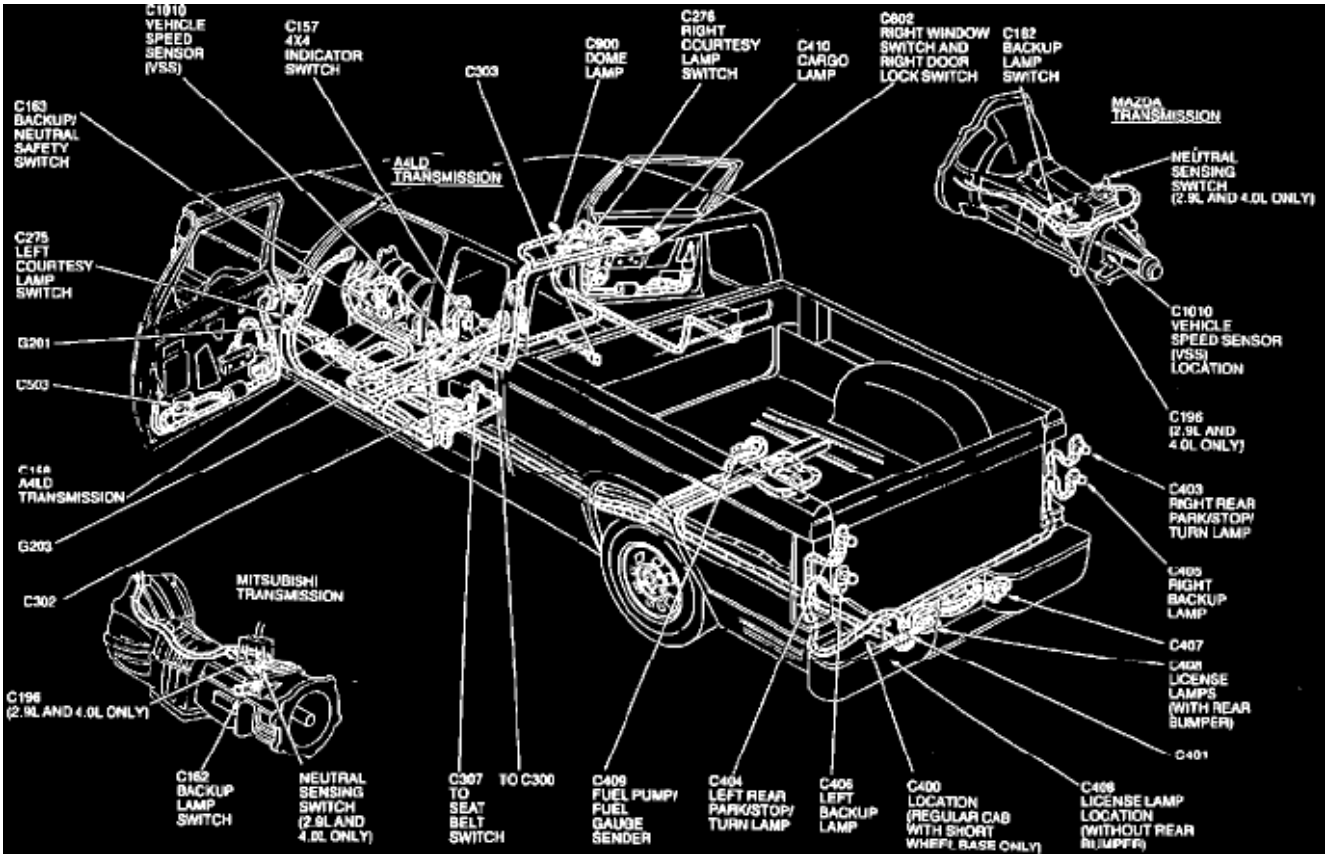
3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.



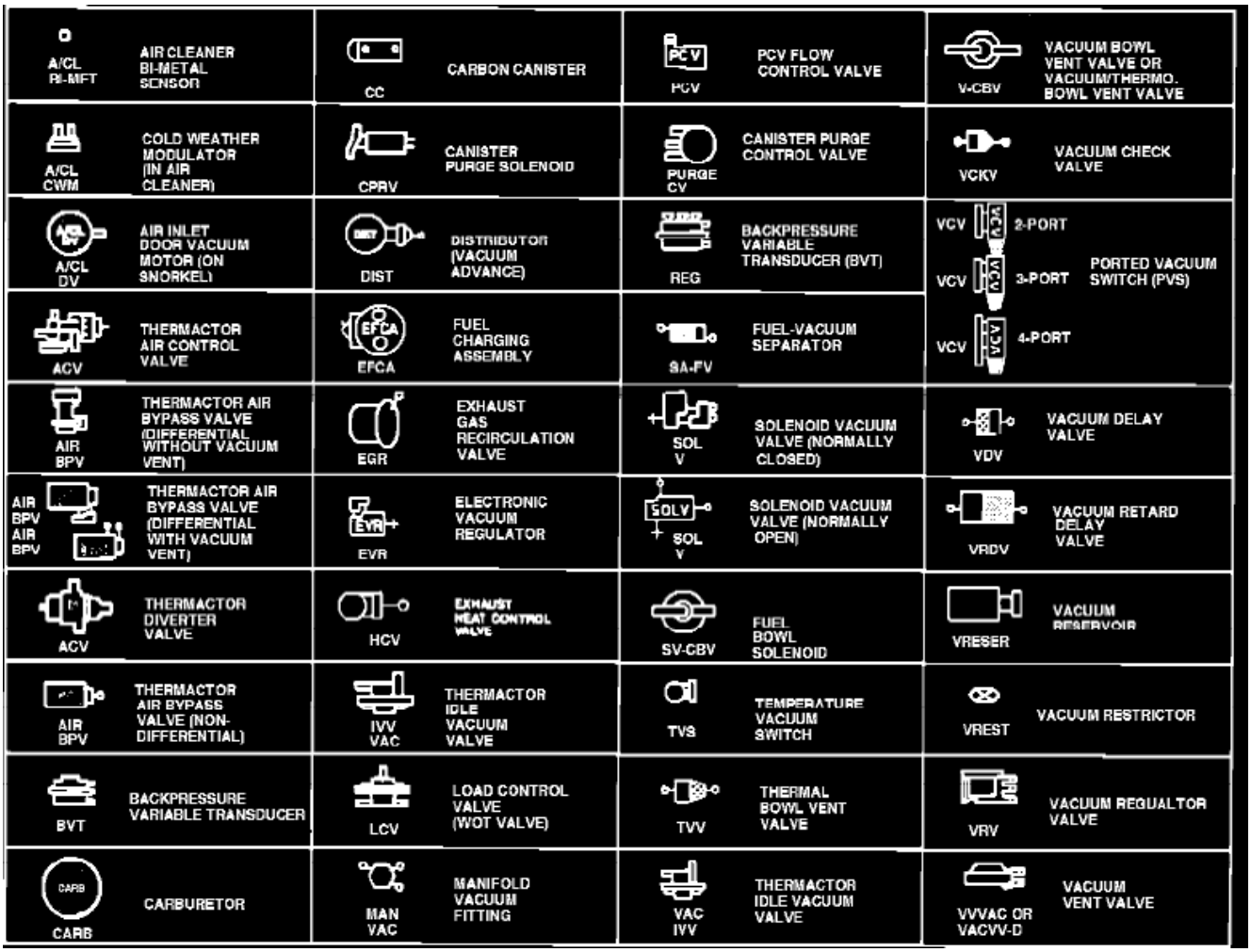
Vehicle Speed Sensor: Locations

Body Components

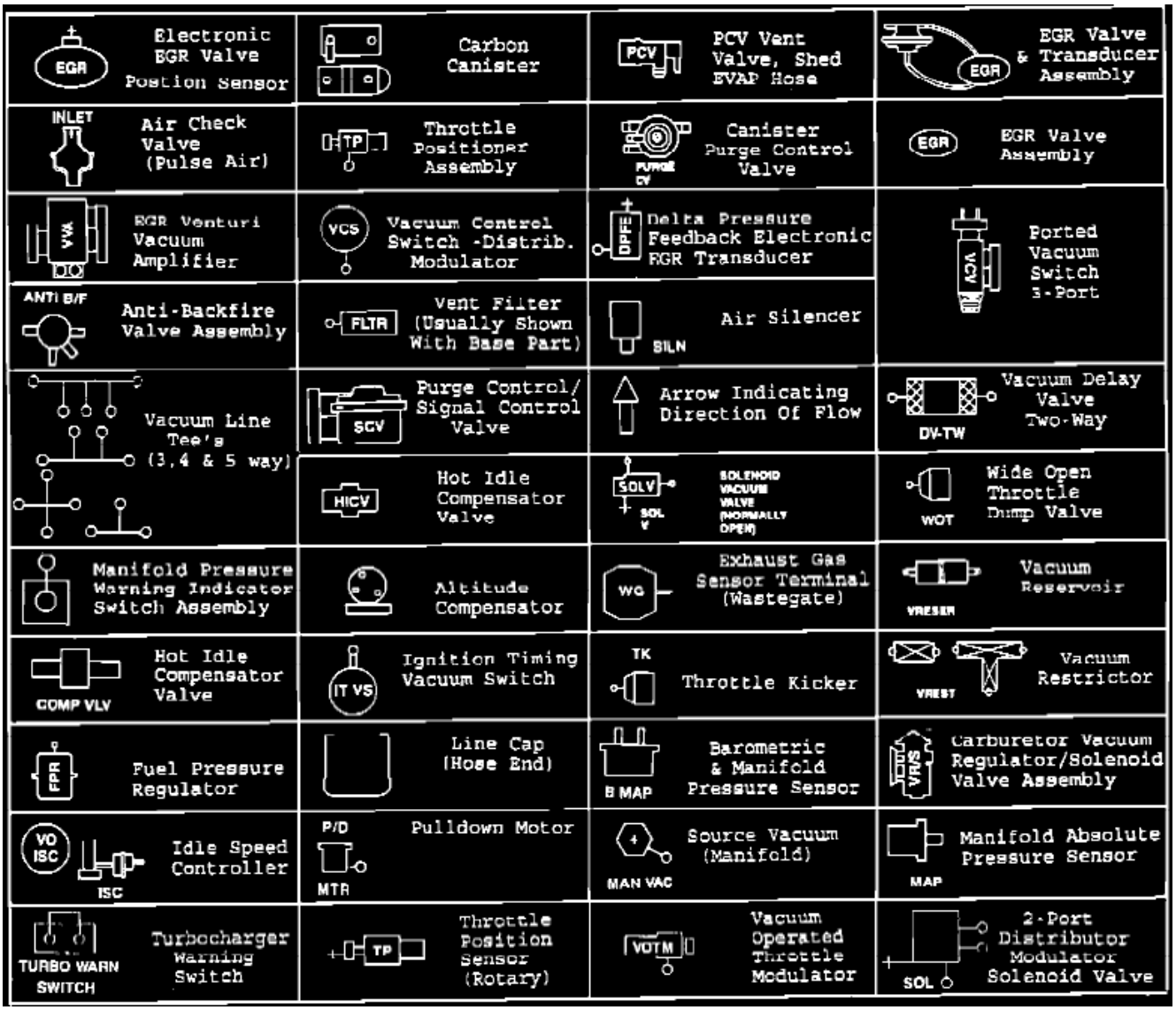
Top Of Transfer Case

Vehicle Speed Sensor: Diagram Information and Instructions

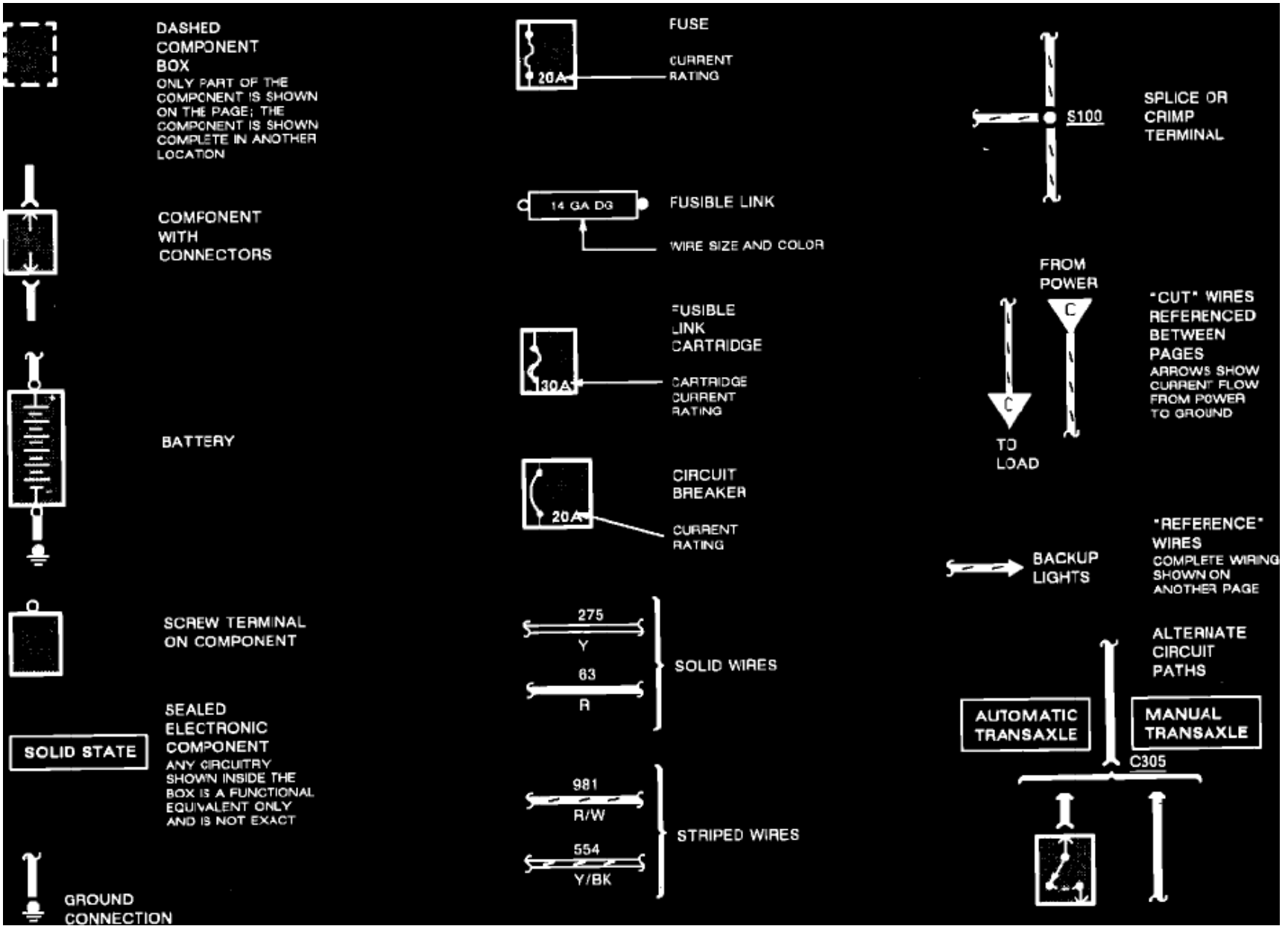
Symbol Identification

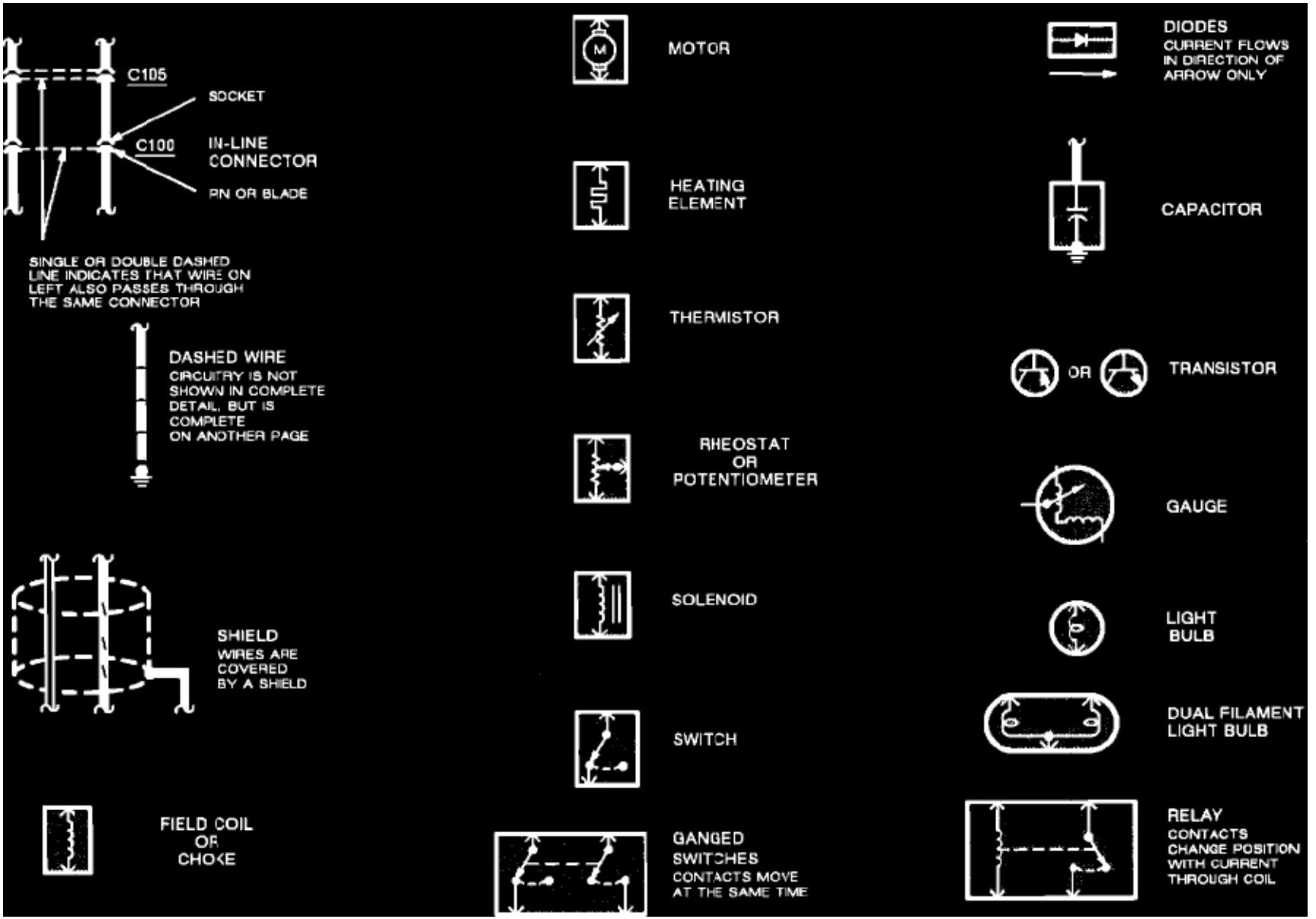


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

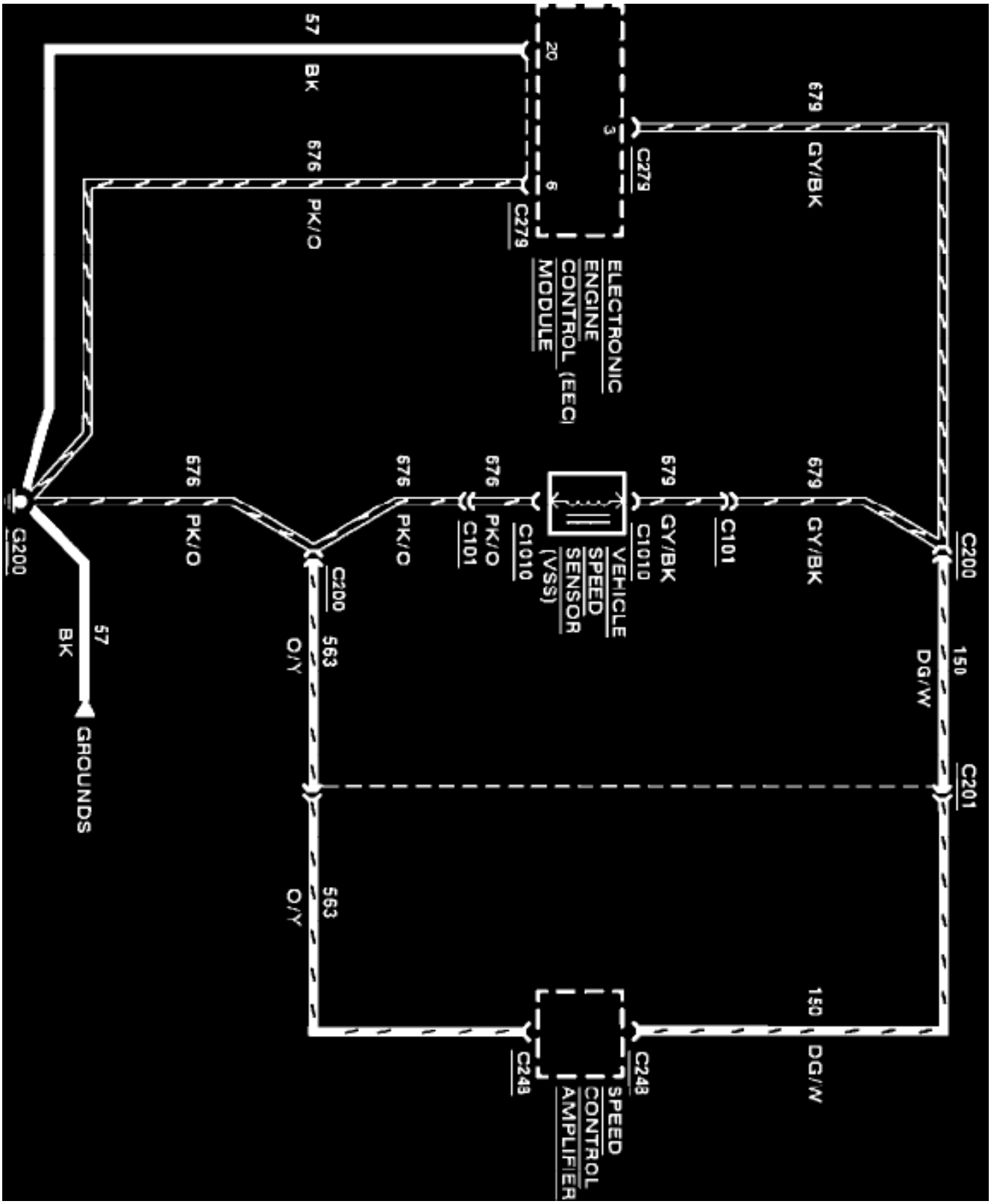
P: Purple

T: Tan

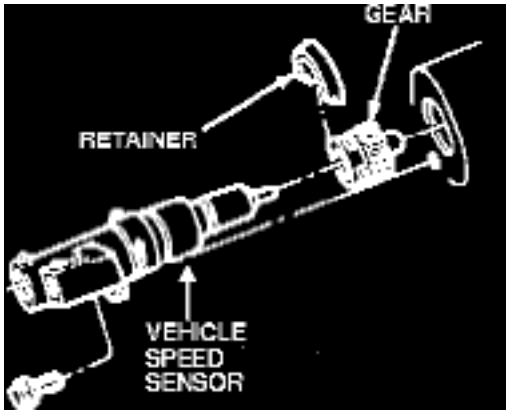
V: Violet

W: White

Y: Yellow



Vehicle Speed Sensor



Vehicle Speed Sensor: Description and Operation

Vehicle Speed Sensor

The Vehicle Speed Sensor (VSS) is a magnetic pulse generator driven by the transmission speedometer gear. The VSS produces 16 AC signals per revolution and sends this signal to the Engine Control Unit (ECA). The ECA converts this signal to a vehicle speed value and stores that value in RAM memory. The ECA uses this value to aid in controlling torque converter lock-up, coolant fan control, vehicle speed control, air/fuel ratio, and igniting timing.

Vehicle Speed Sensor: Service and Repair

1. Separate electrical connector leading to the amplifier assembly.

2. Disconnect upper and lower speedometer cables at the speed sensor. Remove speed sensor.

3. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Sensors and Switches - Powertrain Management > Sensors and Switches - Fuel Delivery and Air Induction > Mass Air Flow (MAF) Sensor <--> [Air Flow Meter/Sensor] > Component Information > Technical Service Bulletins > Customer Interest for Mass Air Flow (MAF) Sensor: > 98-23-10 > Nov > 98 > Engine - Lean Driveability Symptoms

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Sensors and Switches - Powertrain Management > Sensors and Switches - Fuel Delivery and Air Induction > Mass Air Flow (MAF) Sensor <--> [Air Flow Meter/Sensor] > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Mass Air Flow (MAF) Sensor: > 98-23-10 > Nov > 98 > Engine - Lean Driveability Symptoms

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

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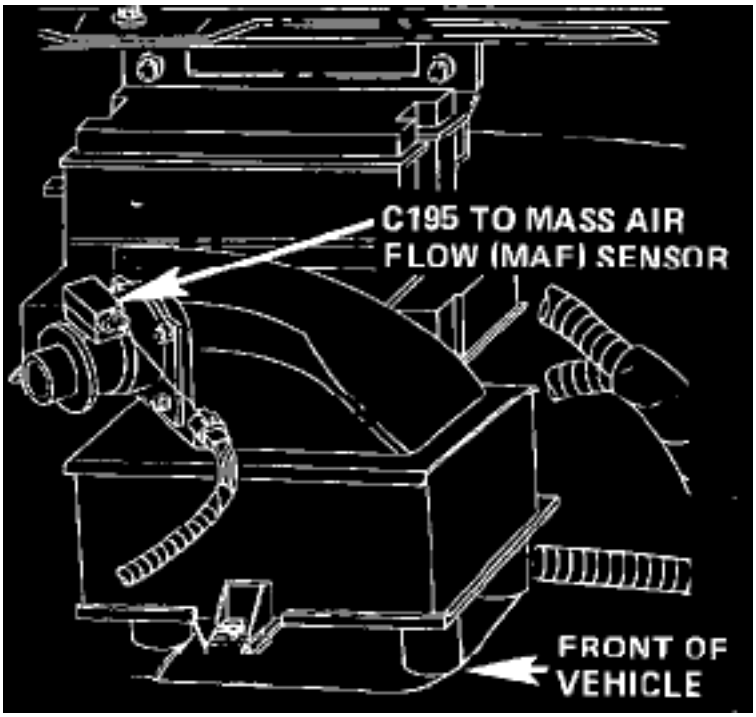
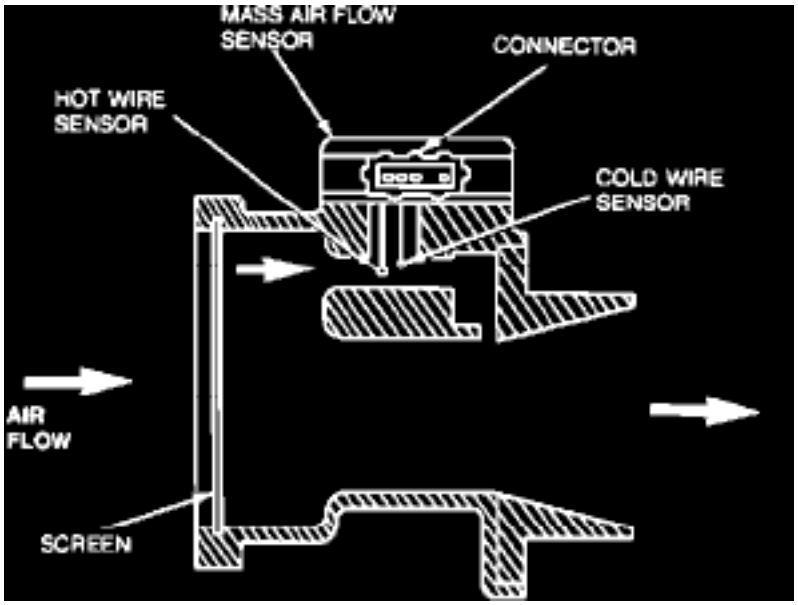


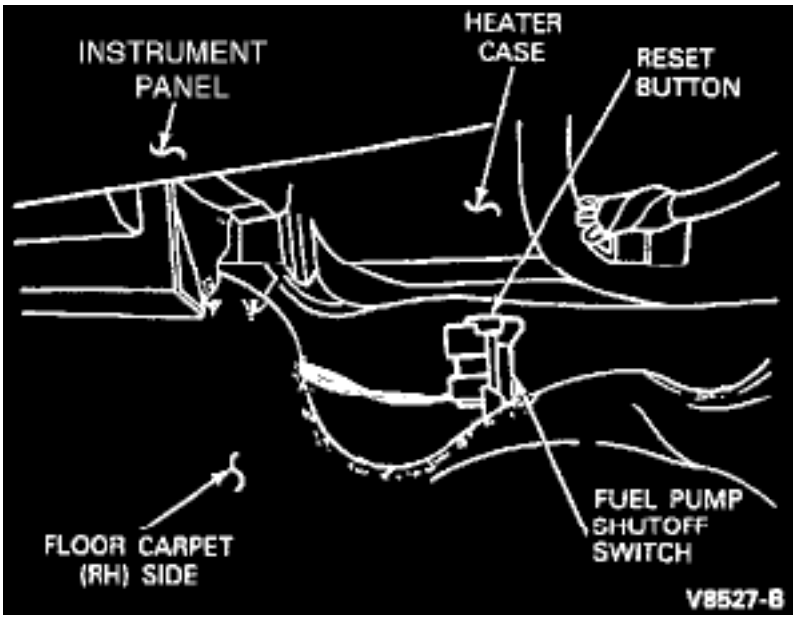
Mass Air Flow (MAF) Sensor



Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

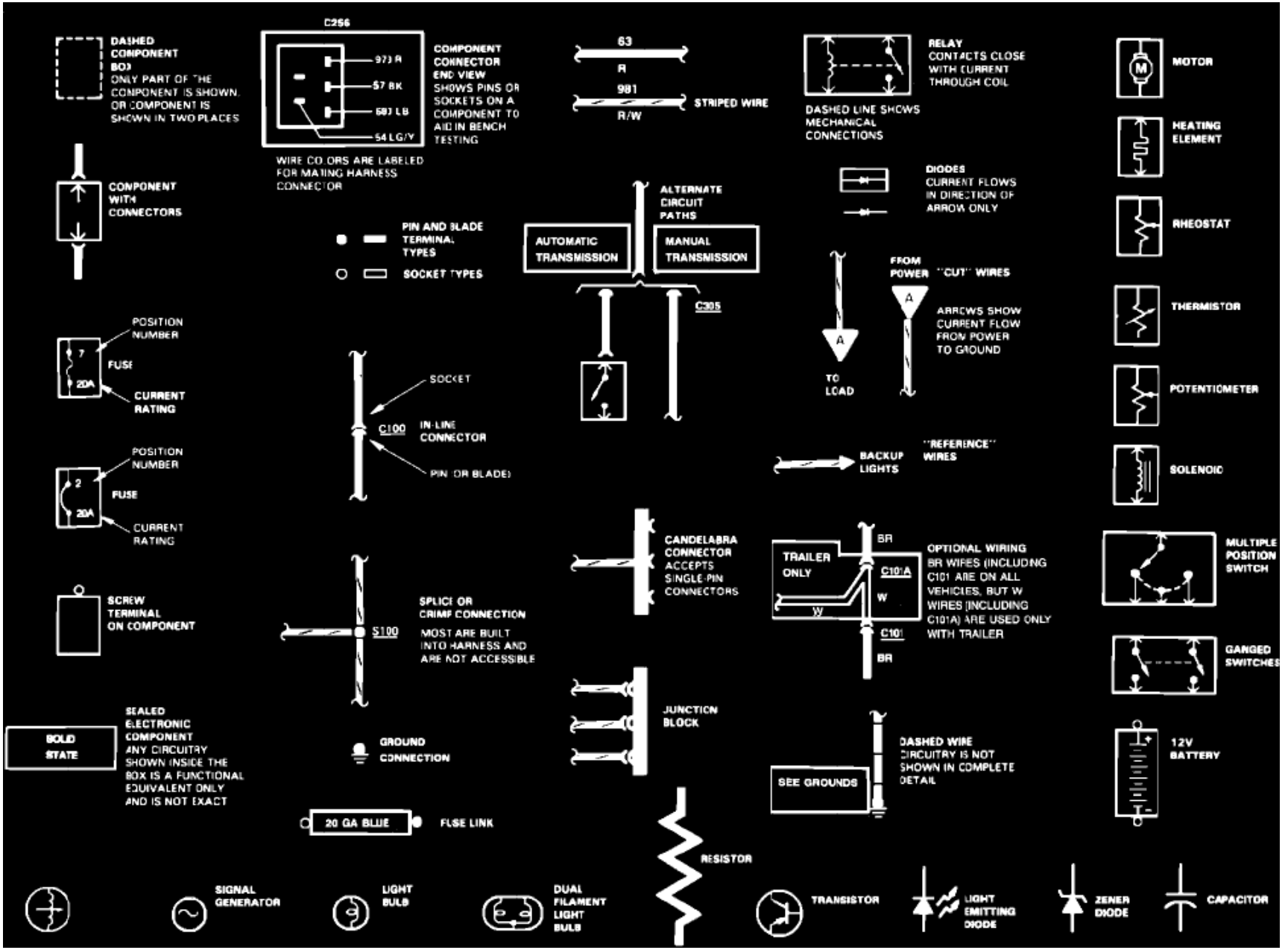
The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



Fuel Pump Inertia Switch: Locations

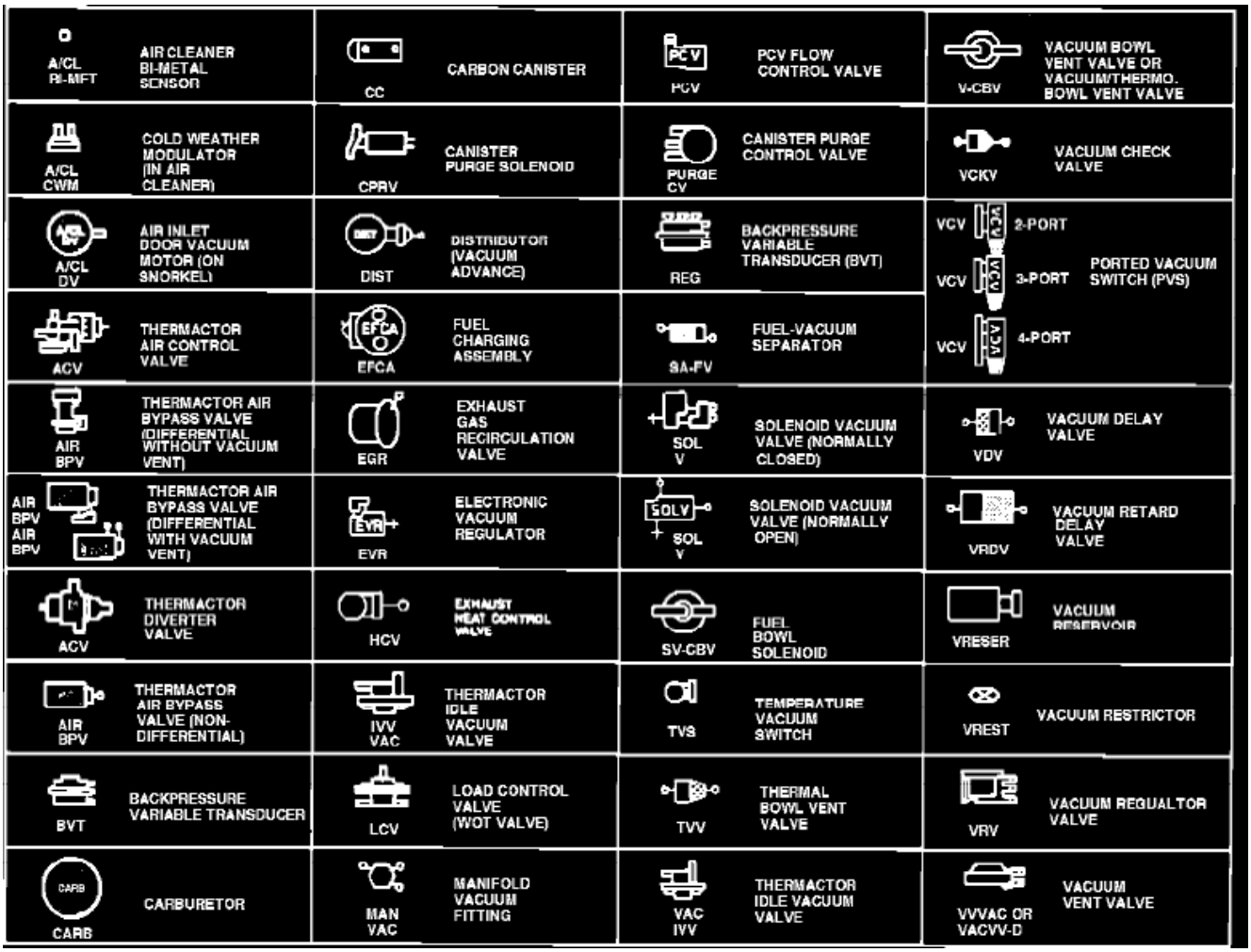
Inertia Switch

The inertia switch is located below the instrument panel, to the right of the transmission hump.

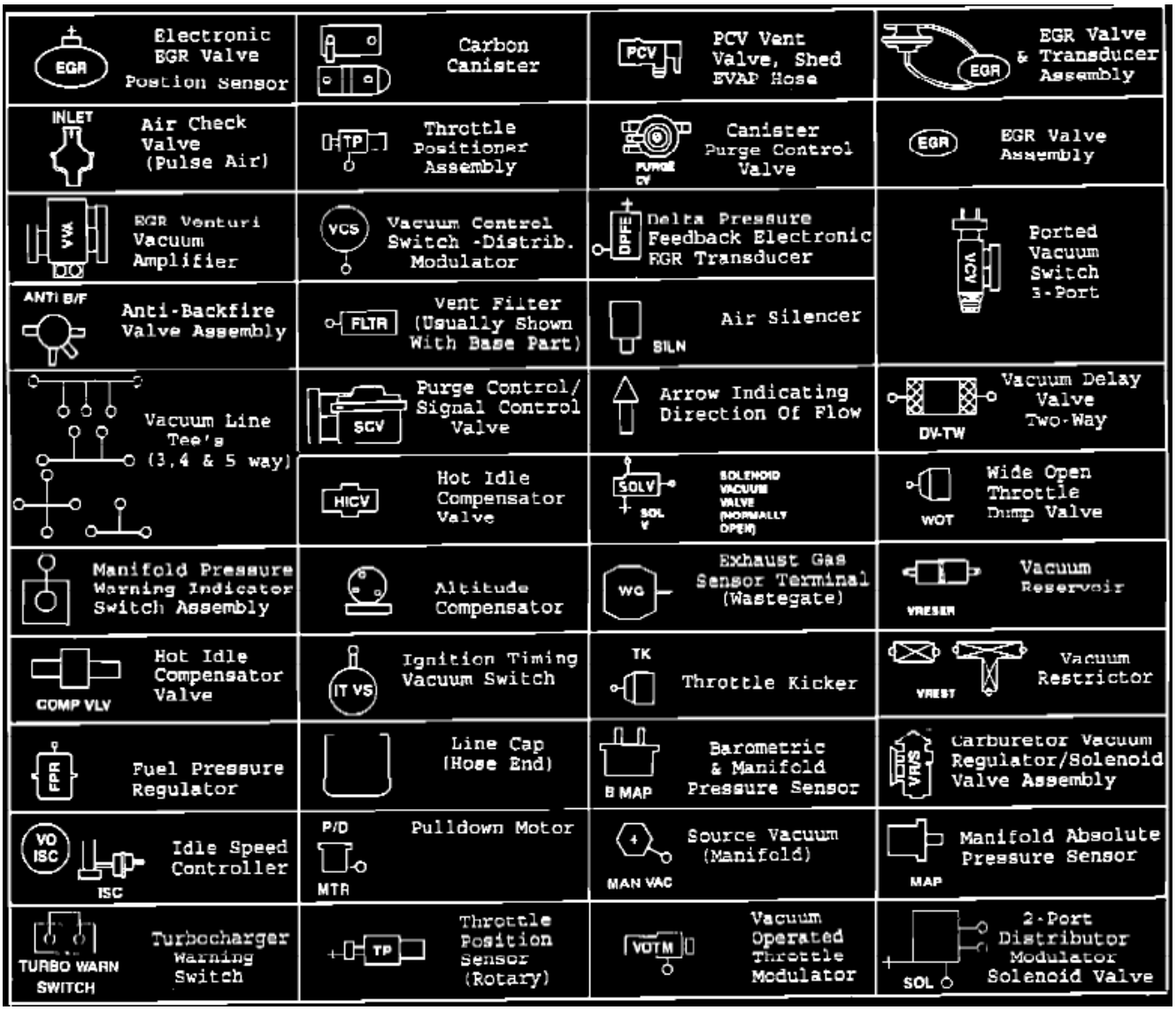


Fuel Pump Inertia Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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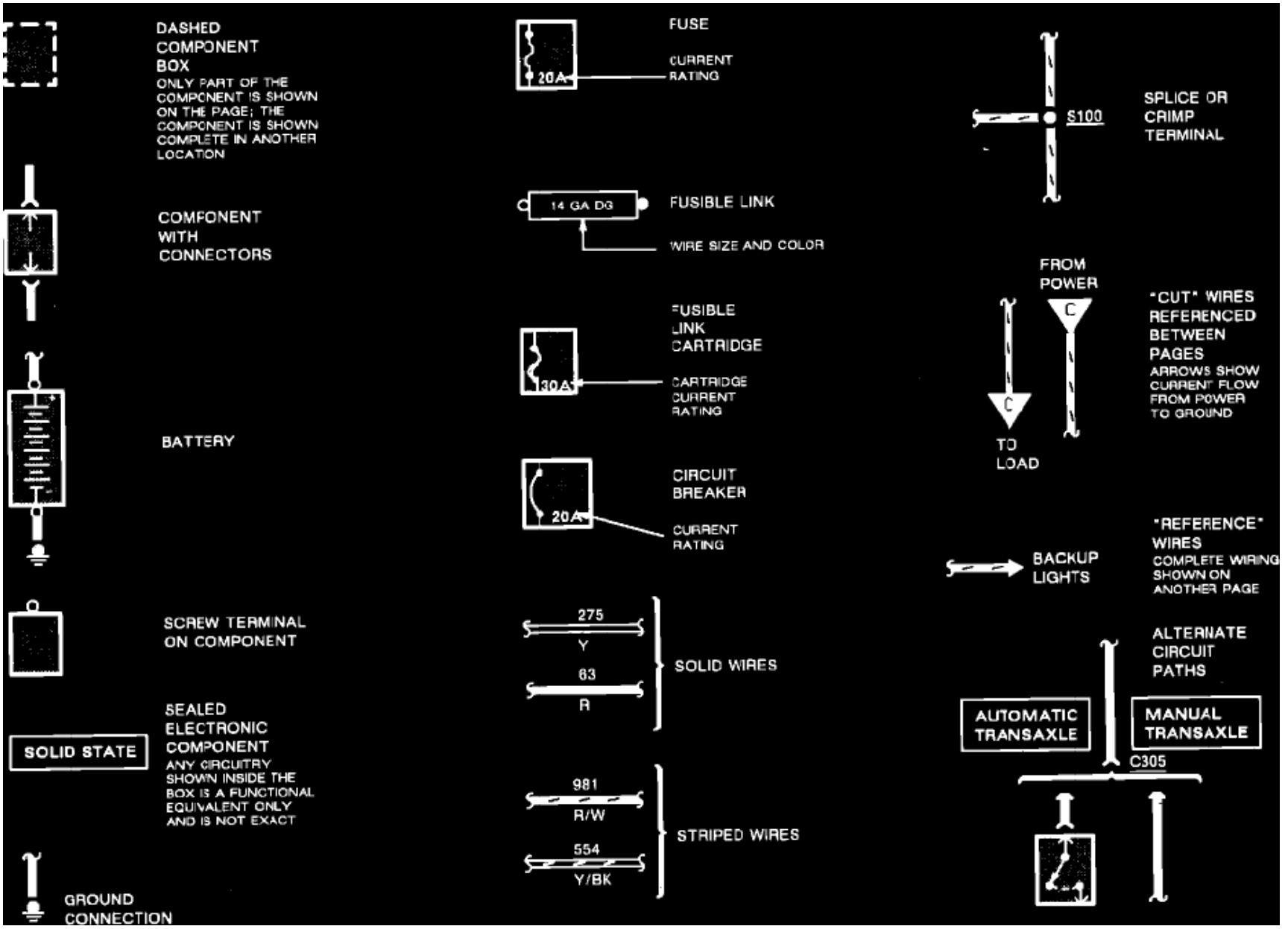
DASHED COMPONENT BOX
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ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
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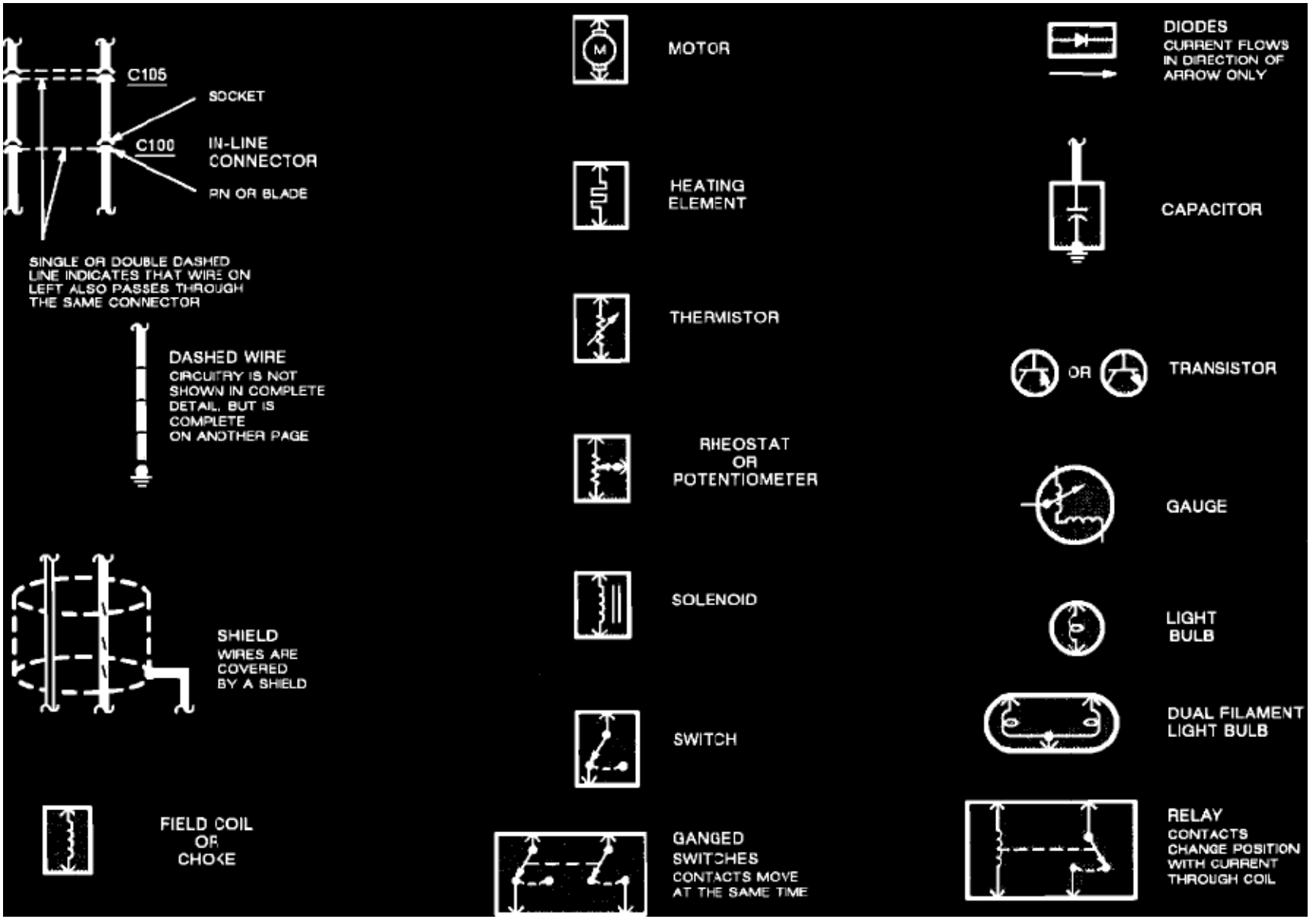
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

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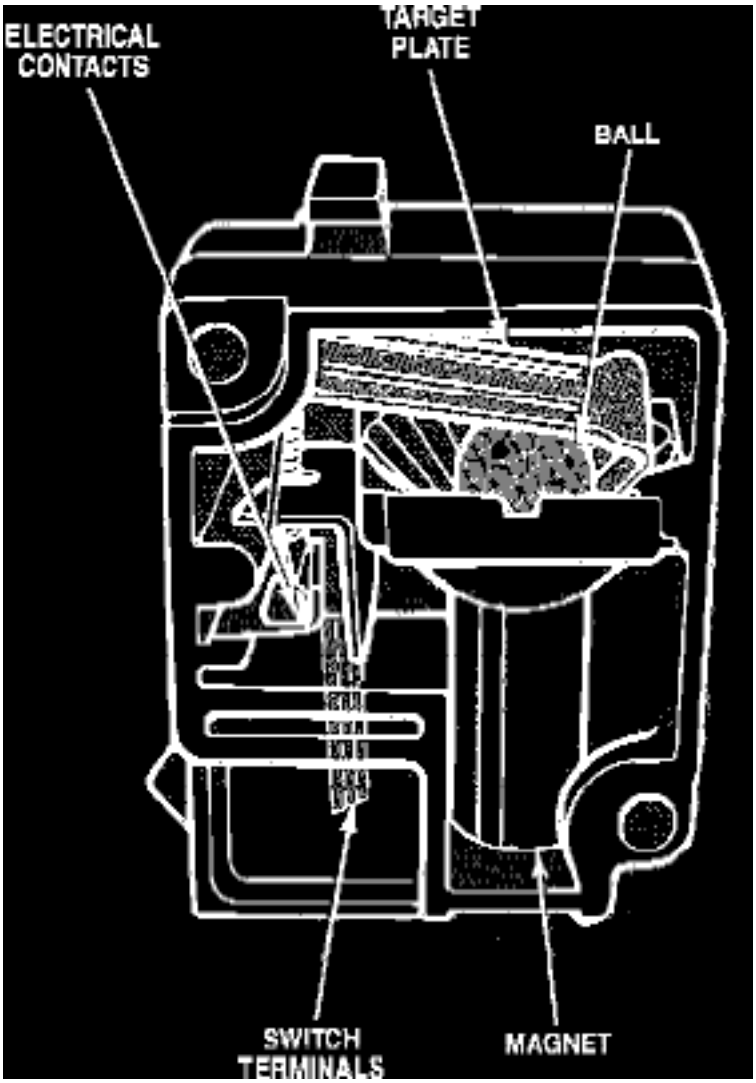


Fuel Pump Inertia Switch: Description and Operation

Typical Inertia Fuel Shut-Off Switch

The inertia switch is used to open the power circuit to the fuel pump, or the control circuit to the fuel pump relay, in case of an accident. The inertia switch must be manually reset by pushing the reset button located on top of the inertia switch.

Operation of the inertia switch is as follows:

A steel ball is held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate, which opens the electrical contacts.

Fuel Pump Inertia Switch: Service and Repair

TO RESET SWITCH 1.

Turn ignition switch to OFF.

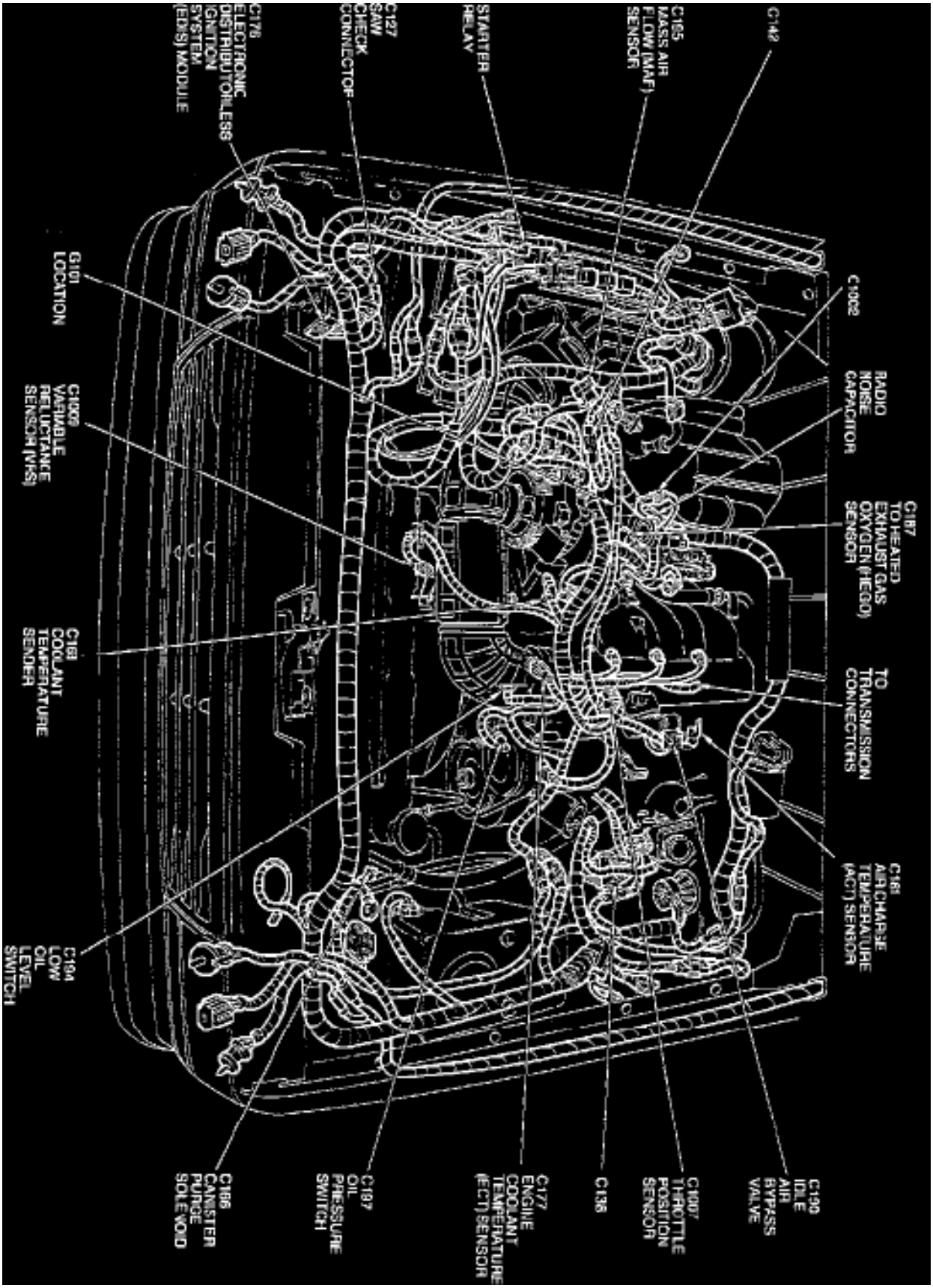
2. Check for leaking fuel in the engine compartment, fuel lines and tank(s).

3. If no fuel leak is apparent, reset the switch by pushing the reset button on the top of the switch.

4. Turn ignition switch to START for a few seconds, then to OFF.

5. Again, check for leaking fuel.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Sensors and Switches - Powertrain Management > Sensors and Switches - Fuel Delivery and Air Induction > Throttle Position Sensor > Component Information > Locations

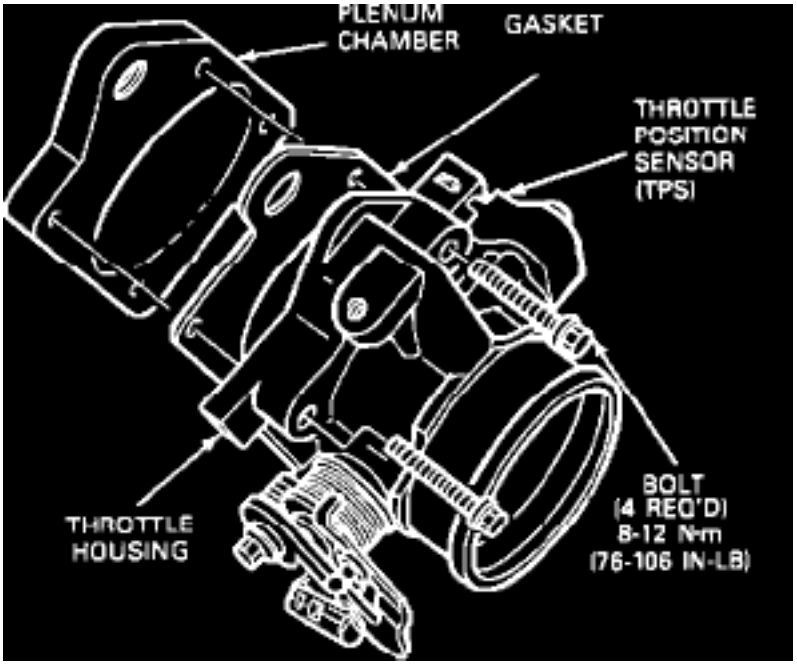


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



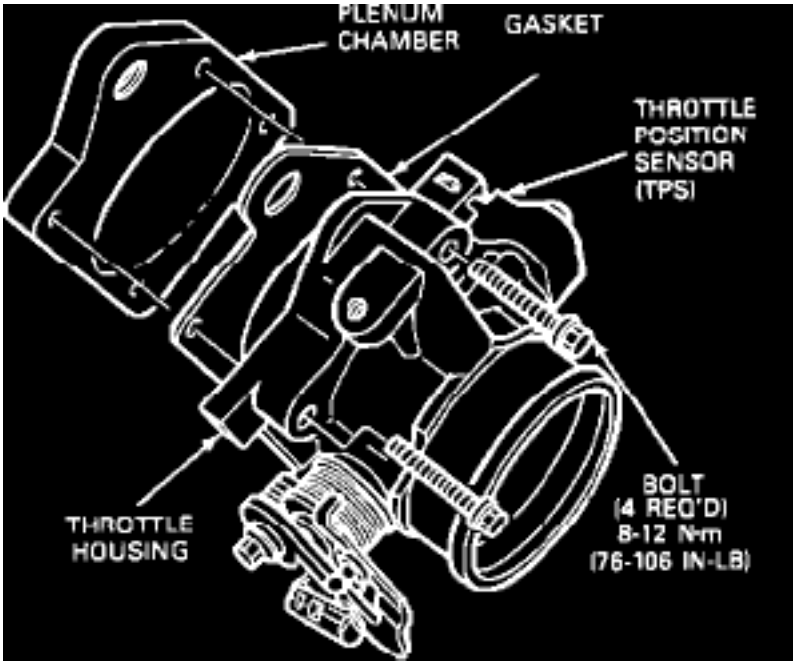
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

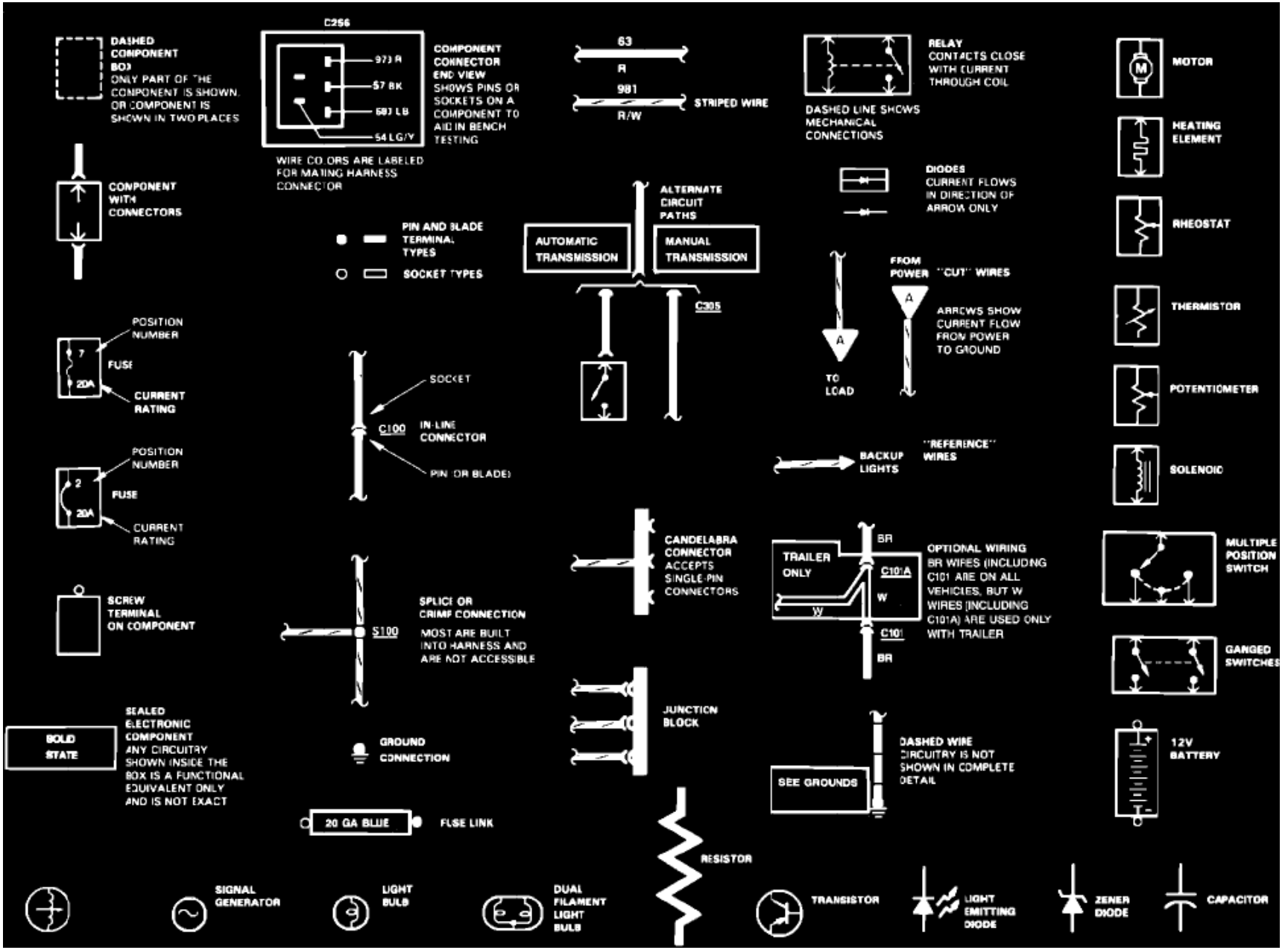
3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.



Camshaft Position Sensor: Diagram Information and Instructions

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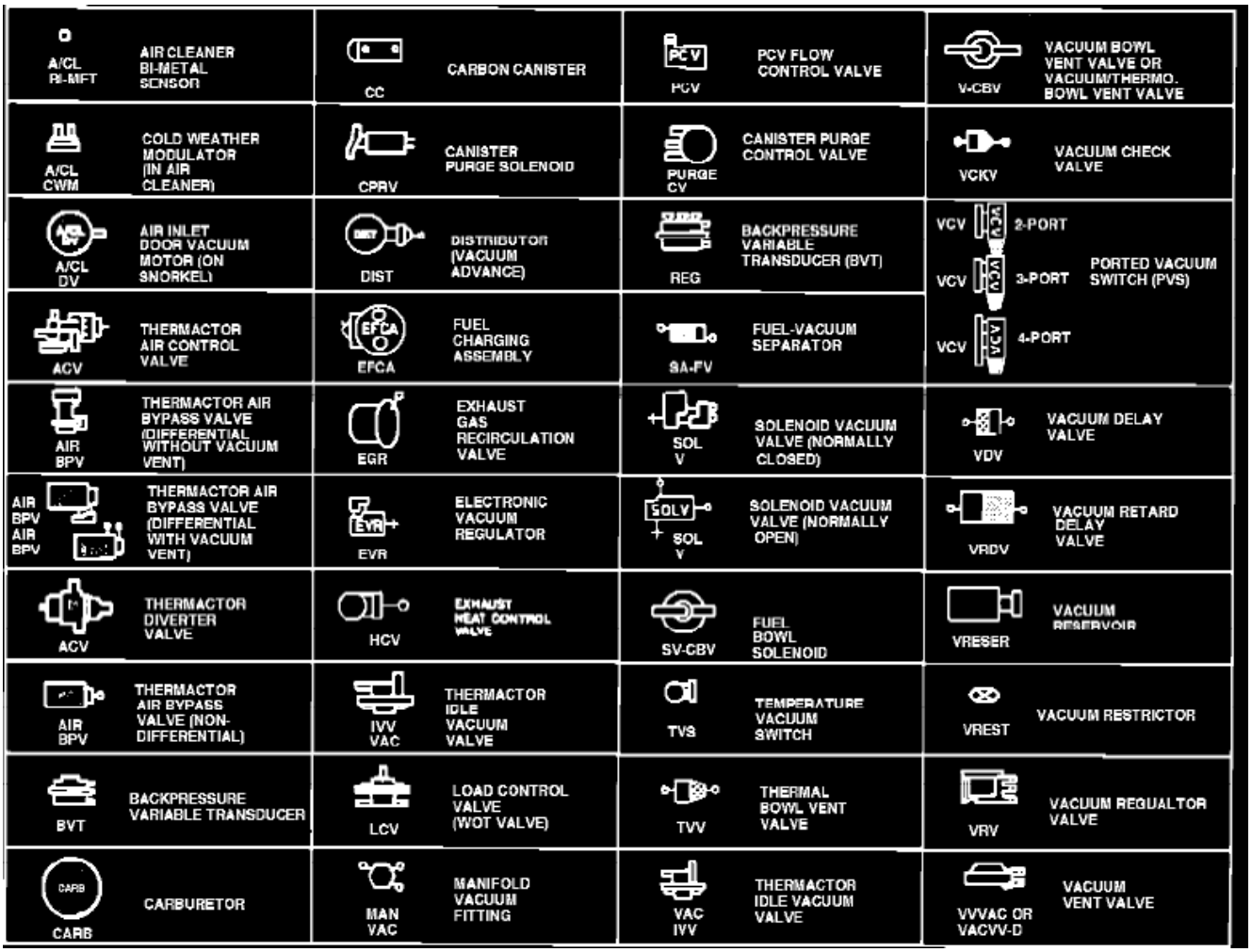

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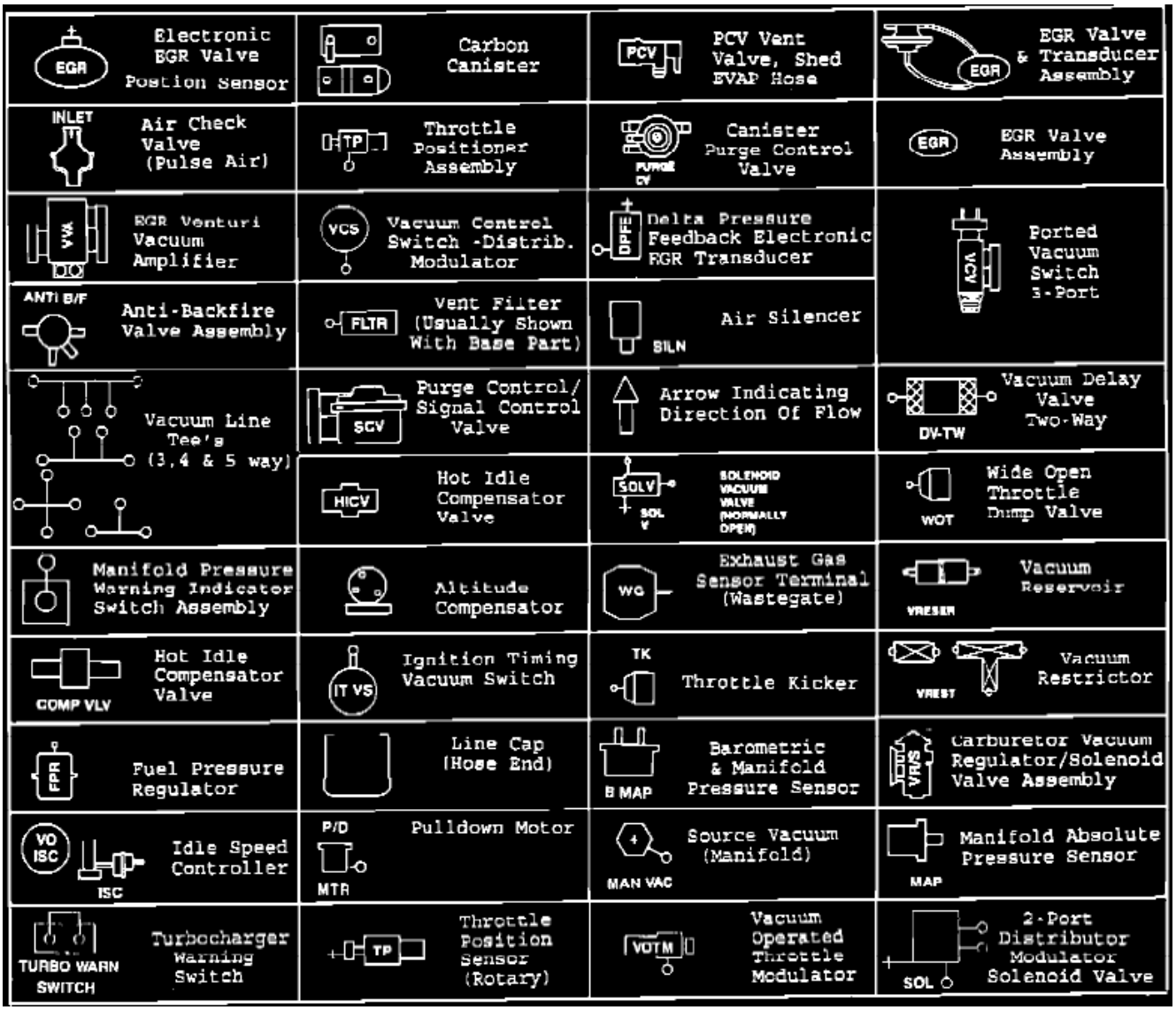

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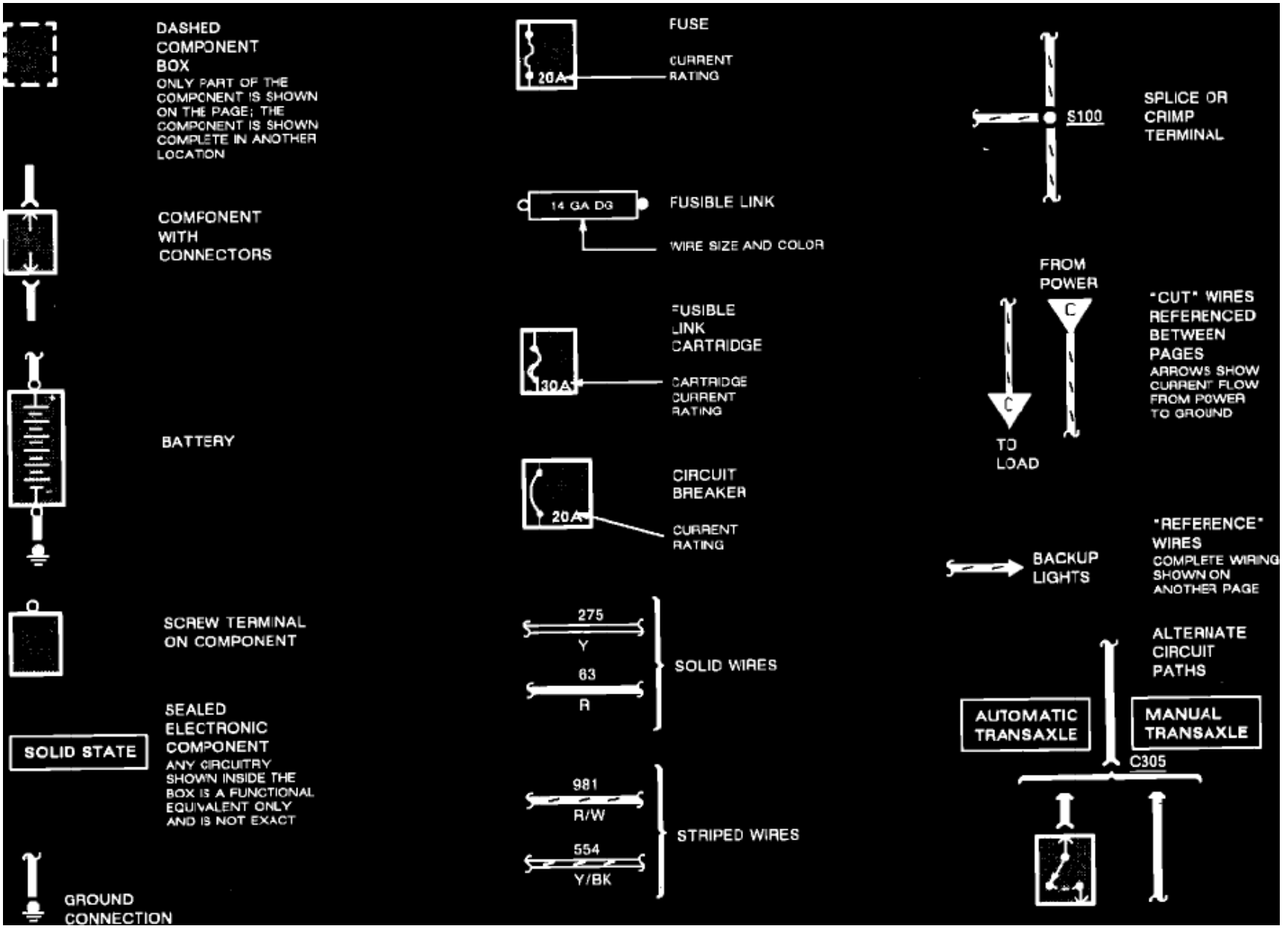
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Y
63
R
SOLID WIRES
981
R/W
554
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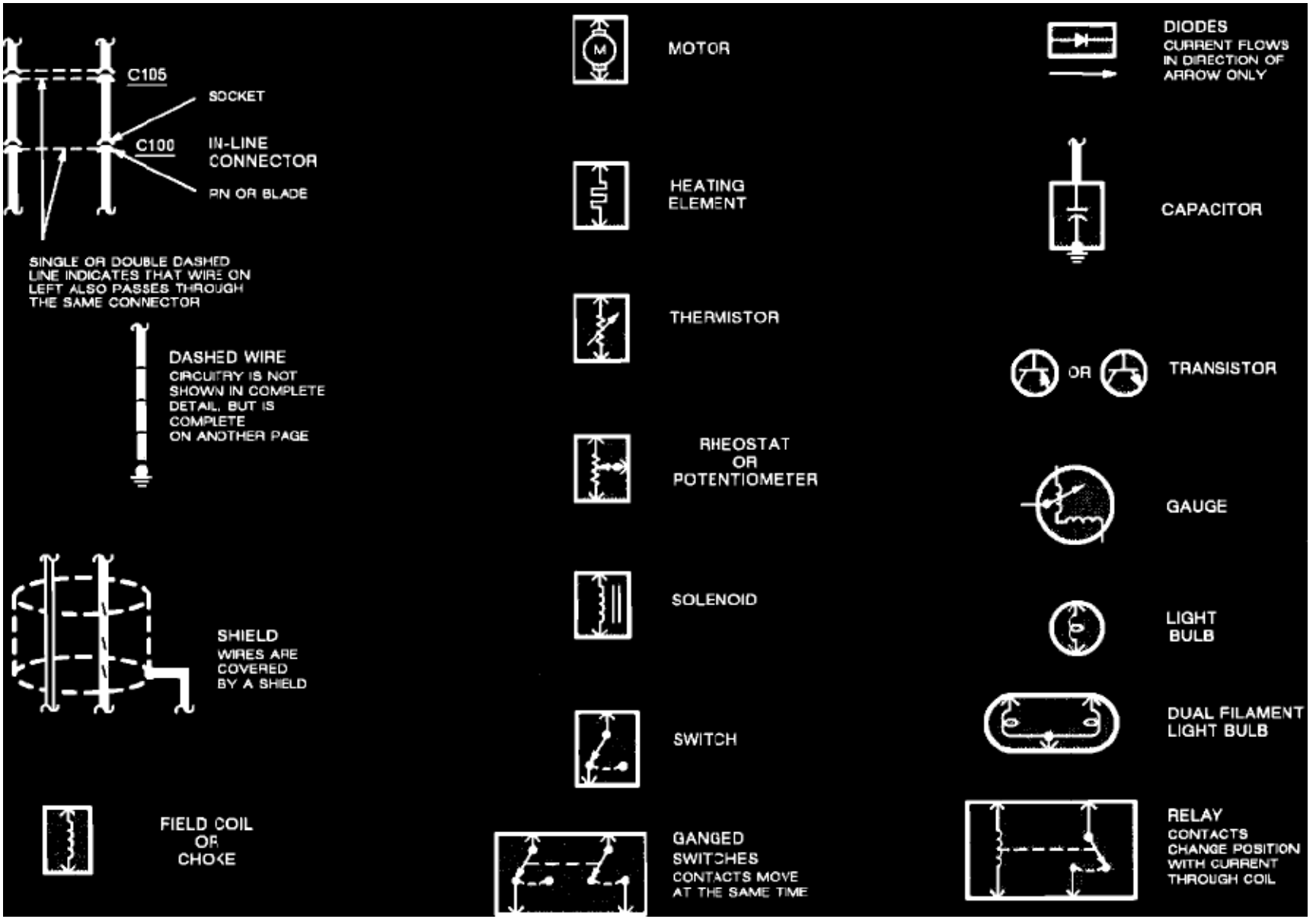

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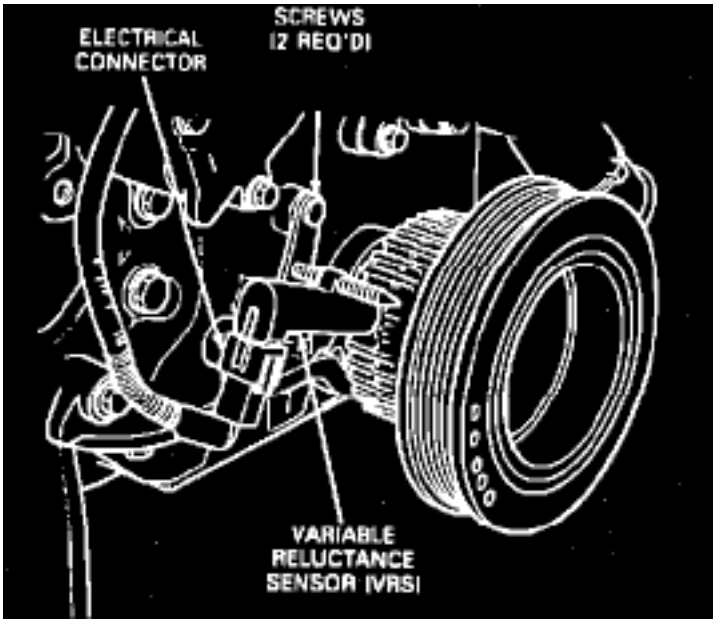
Y: Yellow

Crankshaft Position Sensor: Specifications

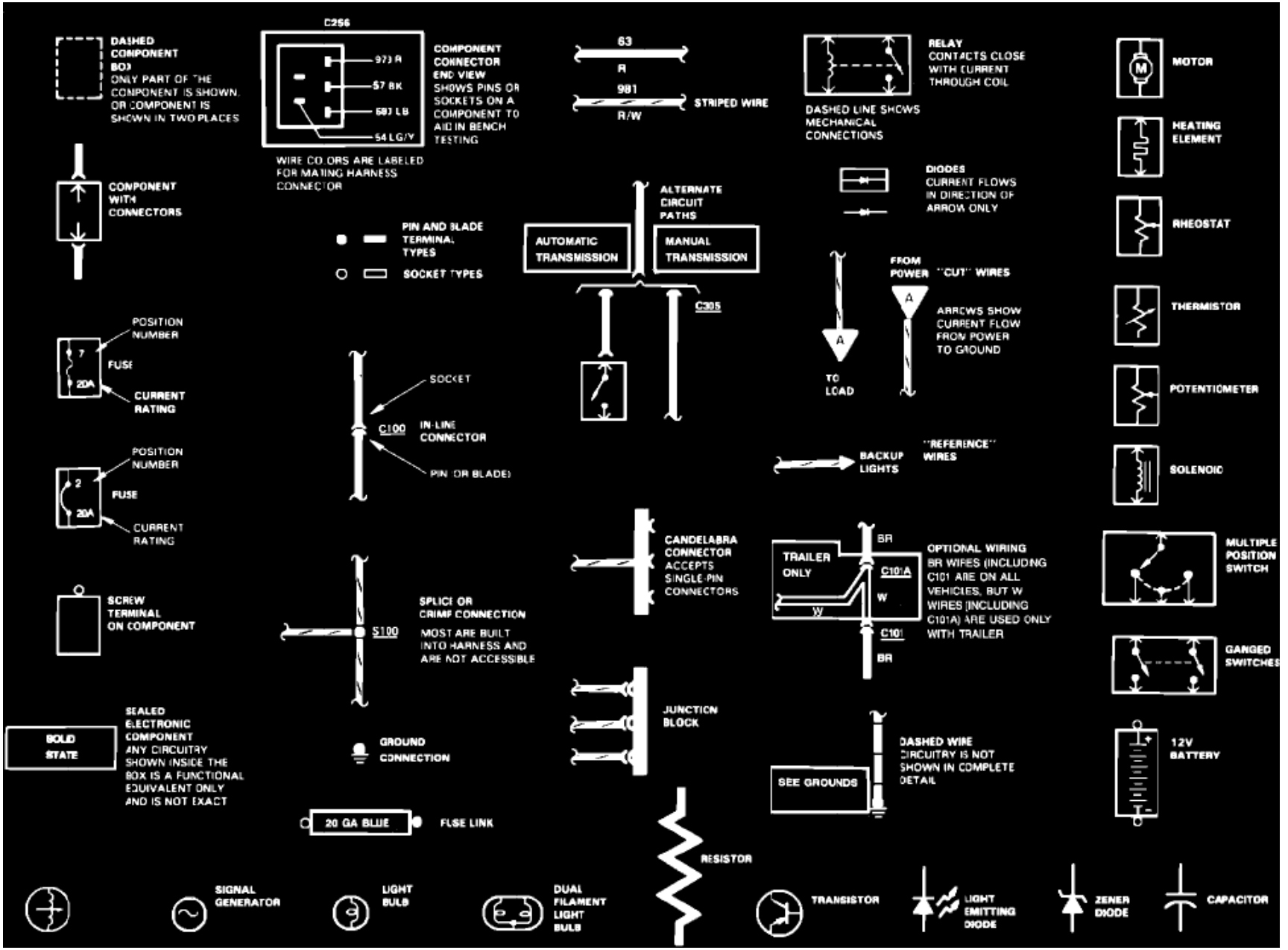
FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)

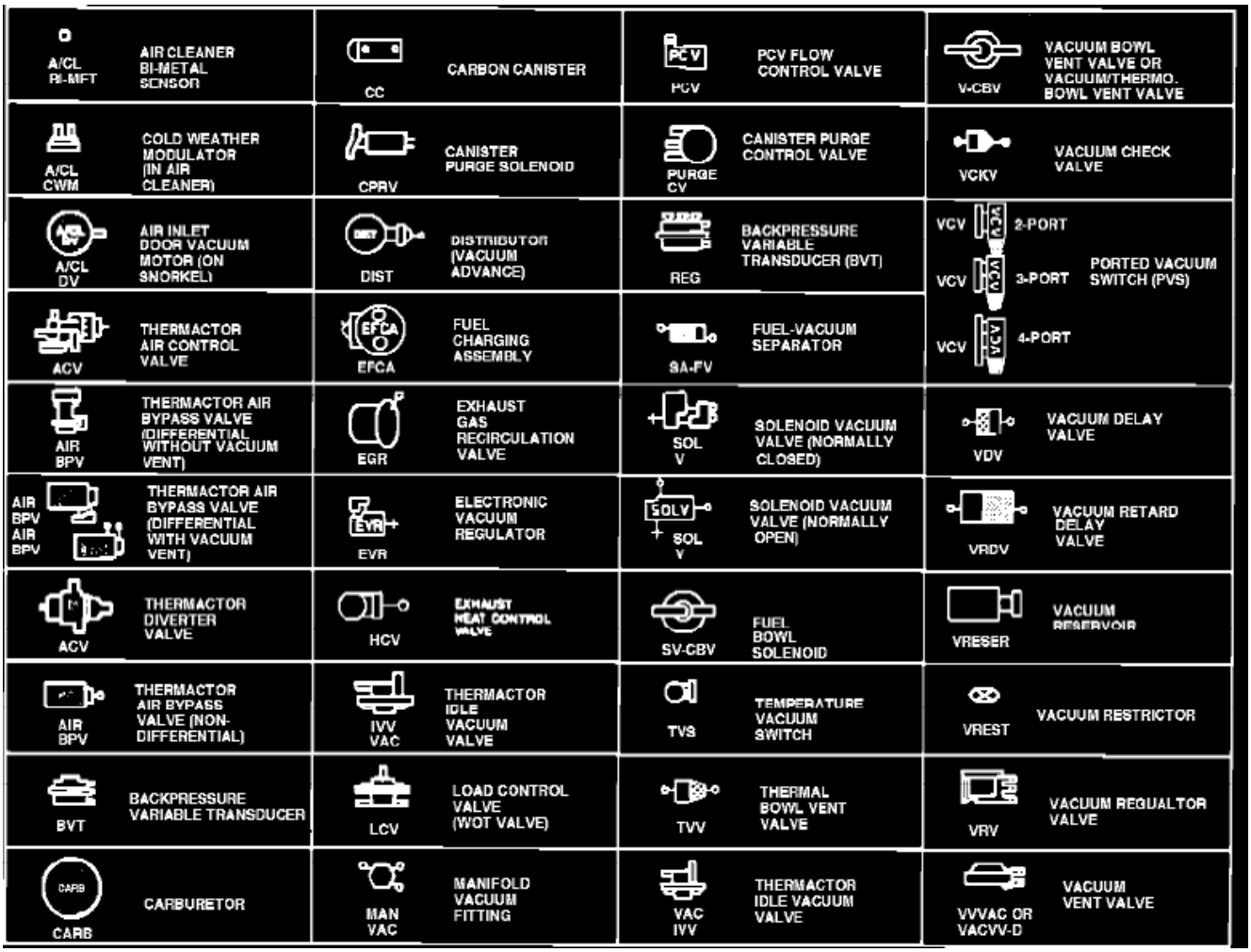


Variable Reluctance (Crankshaft Position) Sensor

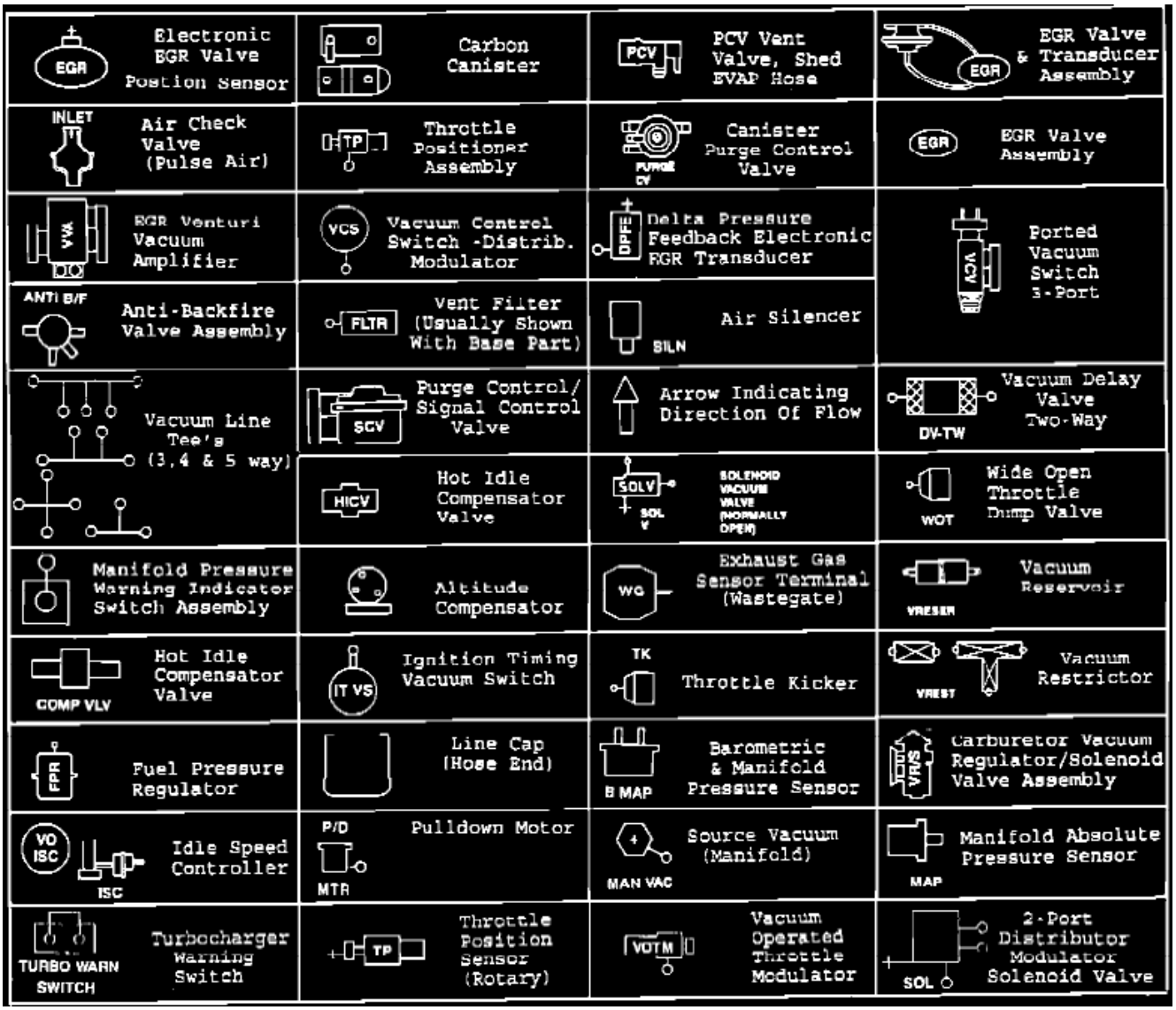


Crankshaft Position Sensor: Diagram Information and Instructions

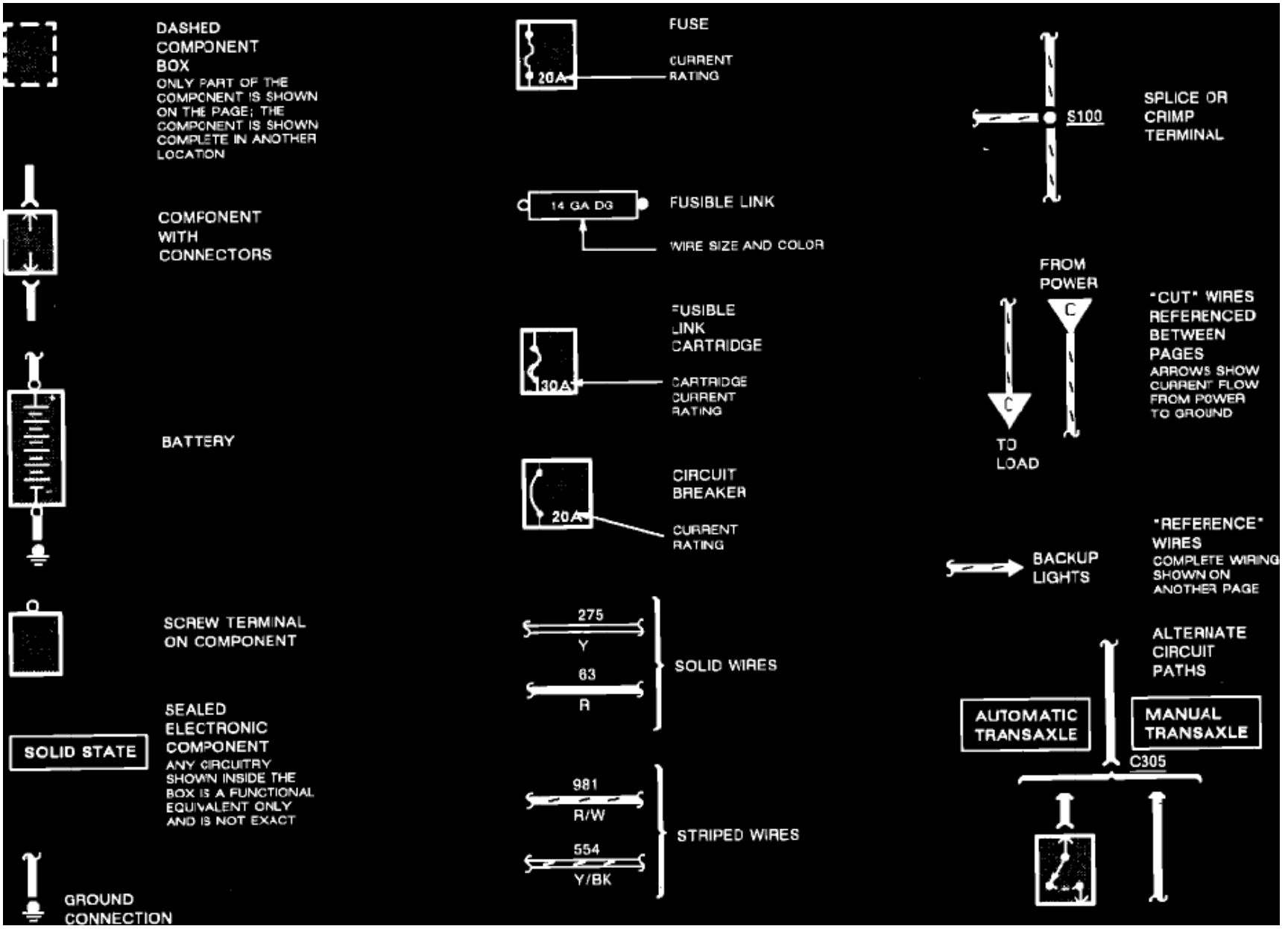
Symbol Identification

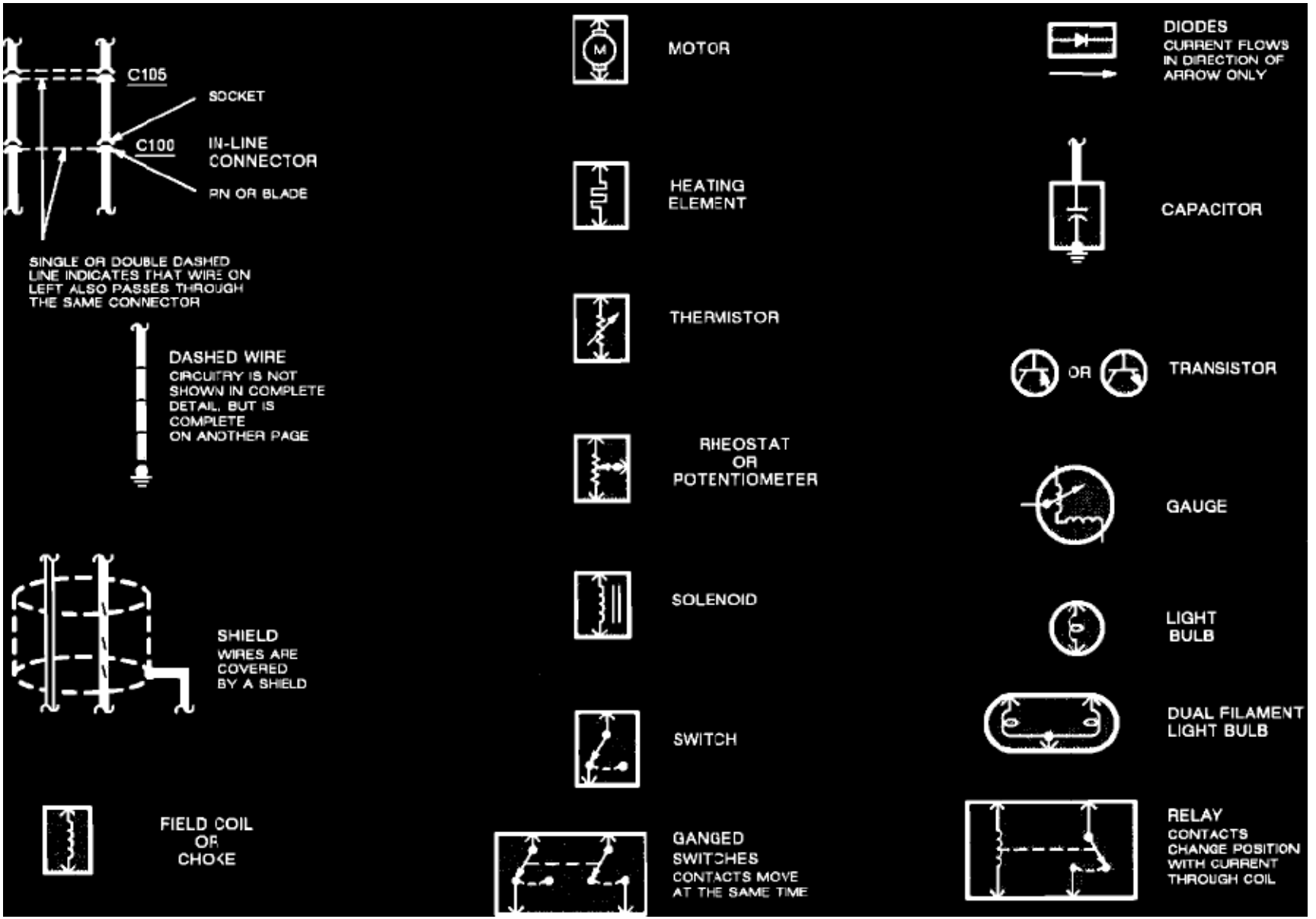


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

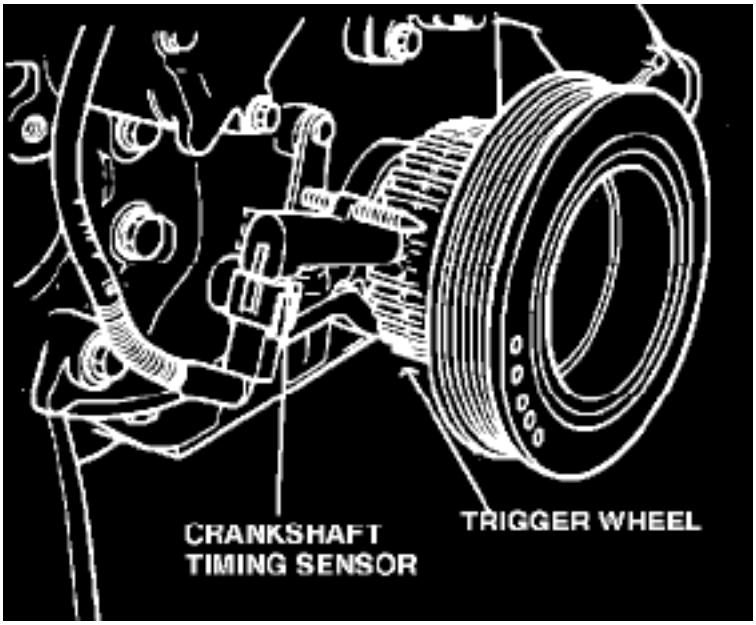
P: Purple

T: Tan

V: Violet

W: White

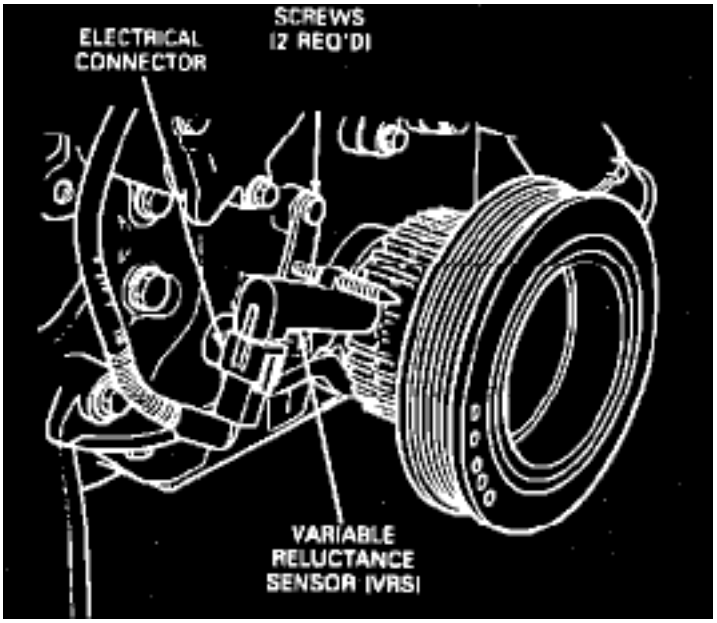
Y: Yellow



Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

INSTALLATION:

1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

4. Connect the negative battery cable.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

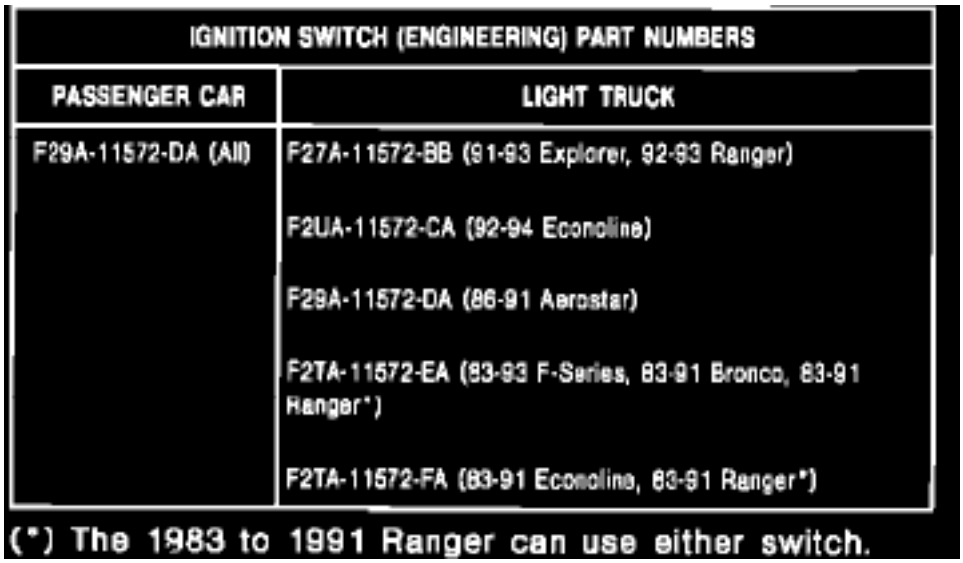
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

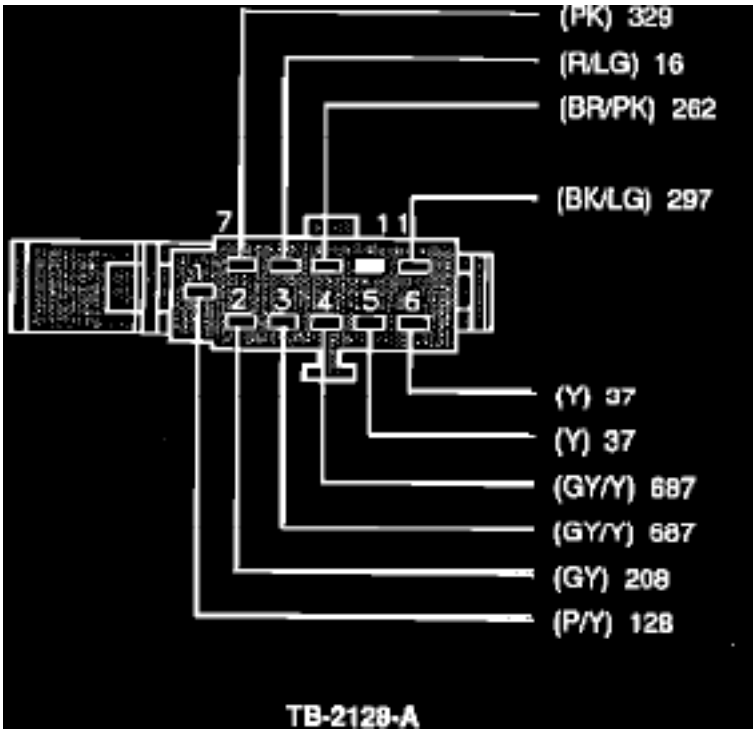
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: Customer Interest Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
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F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

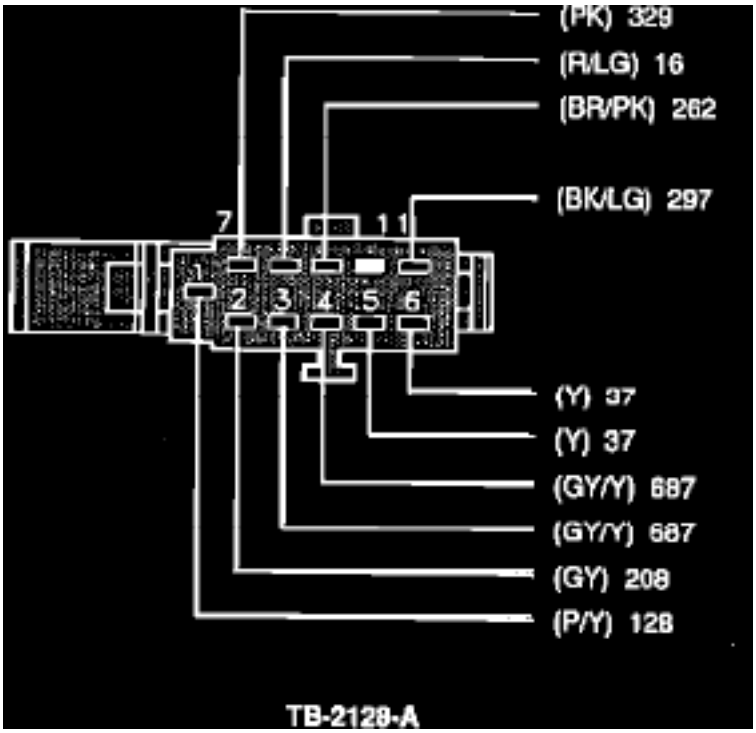
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

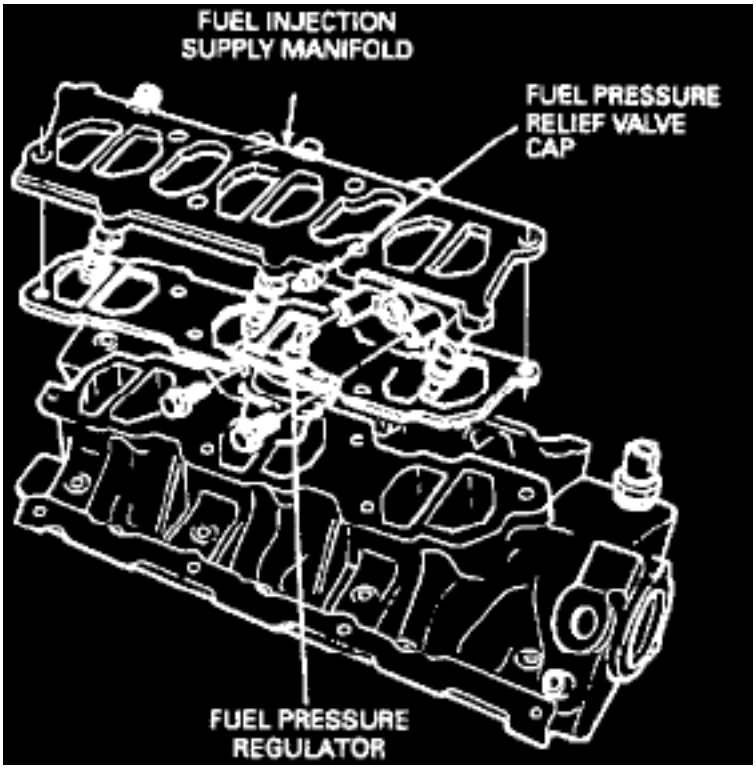
11572 44

OASIS CODES: 602300, 603300

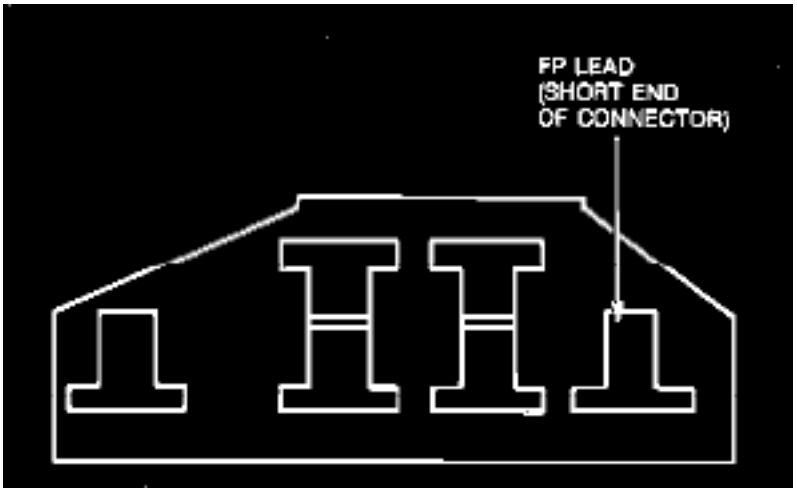
Fuel Pressure: Specifications

Key On Engine Off 35 - 45 psi

Key On Engine Running 30 - 40 psi



Fuel Injection Supply Manifold



Fuel Pressure: Testing and Inspection

STO Connector

STATIC PRESSURE TEST

1. Check for adequate fuel supply. 2. Turn key OFF 3. Install fuel pressure gauge to test port on fuel rail. 4. Install test lead to fuel pump lead of STO test connector. 5. Turn Key On Engine Off (KOEO). 6. Ground test lead to run fuel pump. 7. Check to determine if fuel pressure is within acceptable limits. Refer to SPECIFICATIONS.

a. If pressure is low but greater than 3 psi (indicates fuel pump is running but not enough pressure) check for:

^ Plugged fuel filter

^ Kinked fuel line

^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

^ Disconnect the fuel return line and note if fuel is being returned during this low pressure condition. If fuel is being returned, replace the fuel pressure regulator. Reconnect the fuel return line.

b. If pressure is less than 3 psi (pump not running) check for:

^ Defective fuse link

^ Inertia switch open

^ Wiring at fuel pump/tank connector loose or open

^ Fuel pump ground connection at chassis loose or defective

^ Improper fuel pump relay operation

If fuel supply and return lines are OK, and electrical supply and ground are OK, and fuel pressure is still low, replace fuel pump.

DYNAMIC PRESSURE TEST

1. Disconnect and plug the vacuum line to the pressure regulator.

2. Start engine and run at idle. Check to determine if fuel pressure is within acceptable limits.

a. If pressure is low check for:

^ Plugged fuel filter ^ Restricted fuel line ^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

3. Reconnect the vacuum line to the regulator.

If fuel supply and return lines are OK, and electrical supply and ground is OK, and fuel pressure is still low, replace fuel pump.

LEAKAGE TEST

1. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate operating pressure. 2. Remove ground from test lead and note pressure on gauge. Pressure should remain within 2 psi for 3 minutes after lead is ungrounded.

a. If pressure is not maintained check for leaking fuel

^ Lines ^ Connectors ^ Injectors

b. Disconnect fuel return line and plug engine side. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate

operating pressure. If pressure holds replace regulator and retest. Reconnect the fuel return line.

If pressure is not maintained replace fuel pump.

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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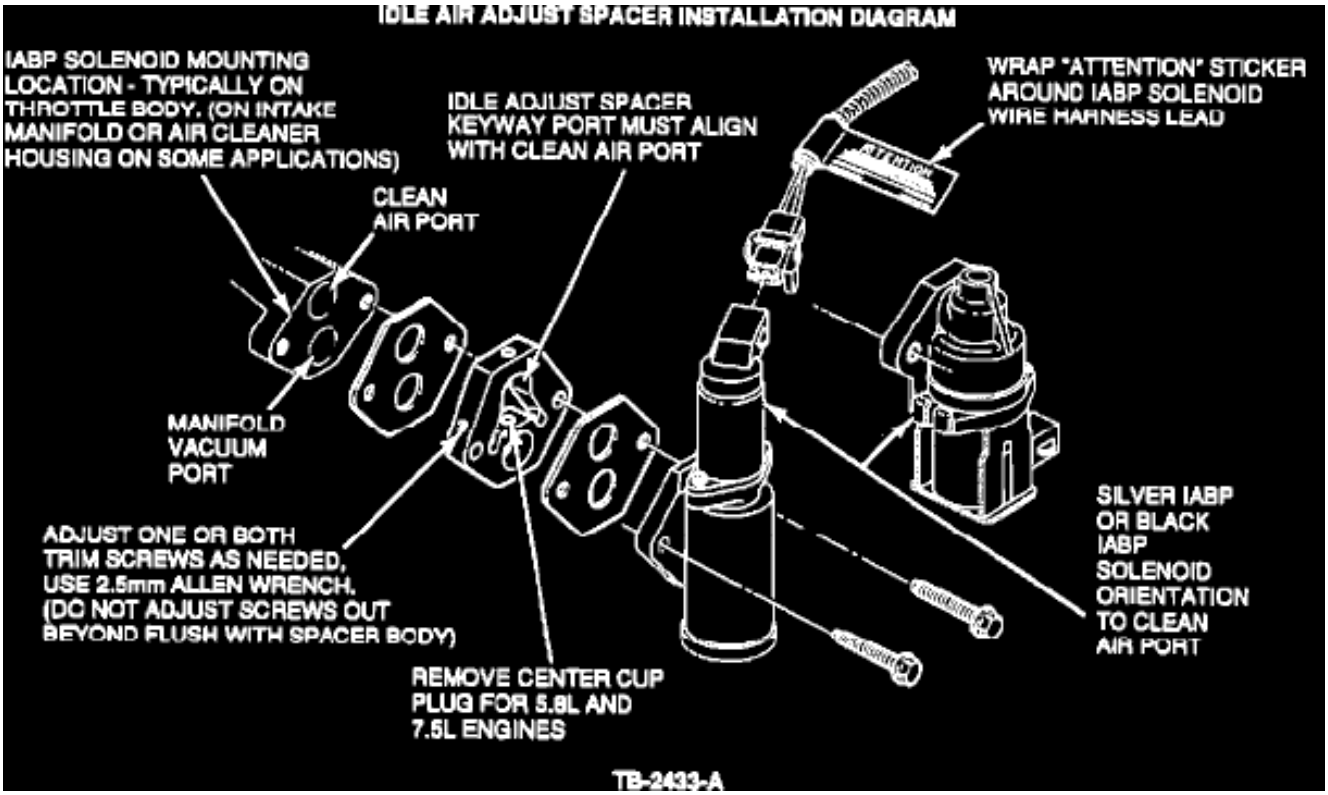
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

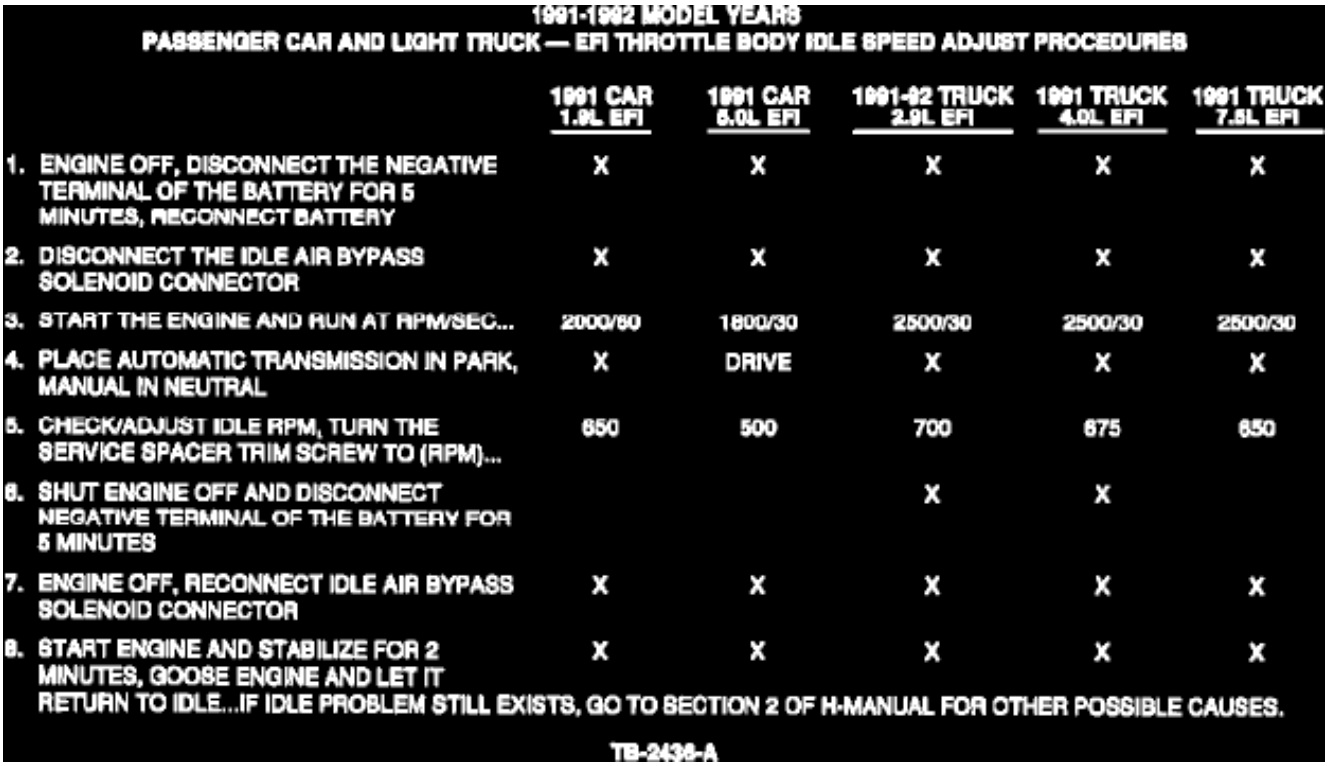
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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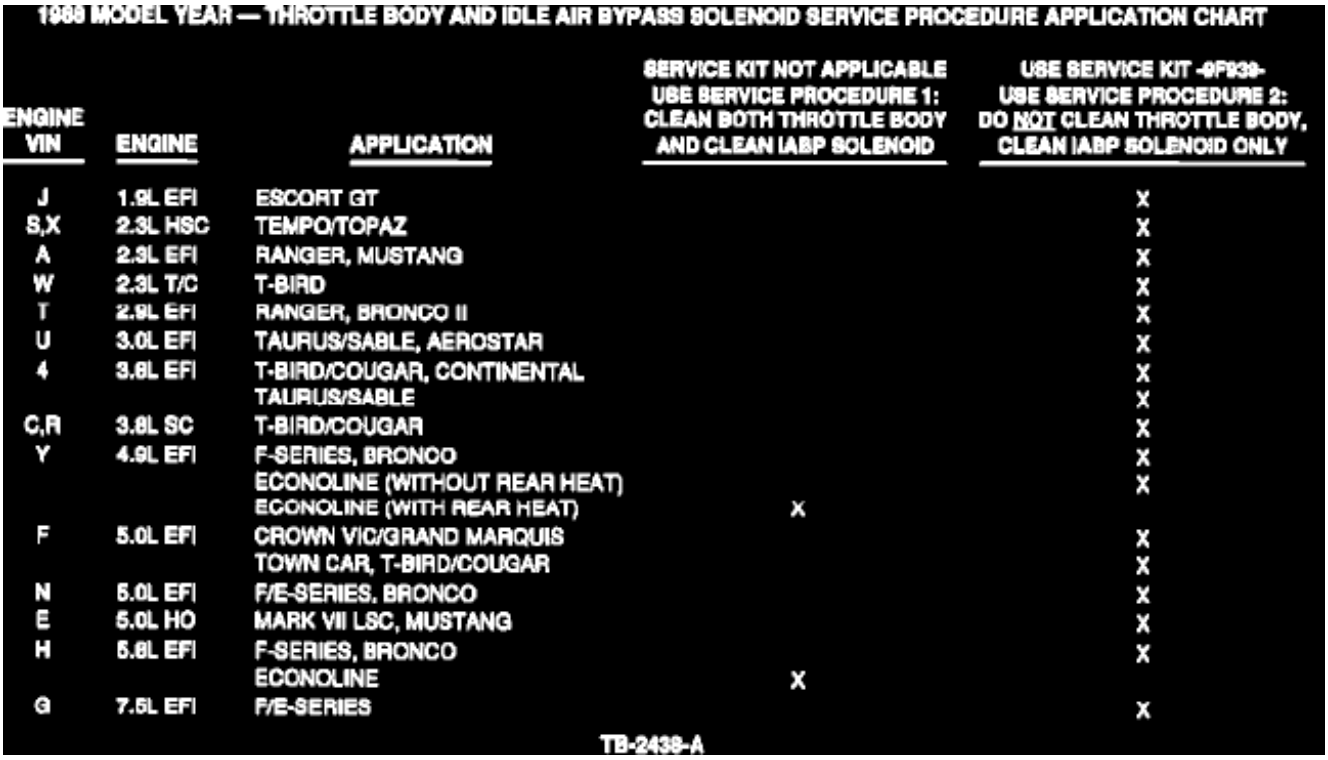
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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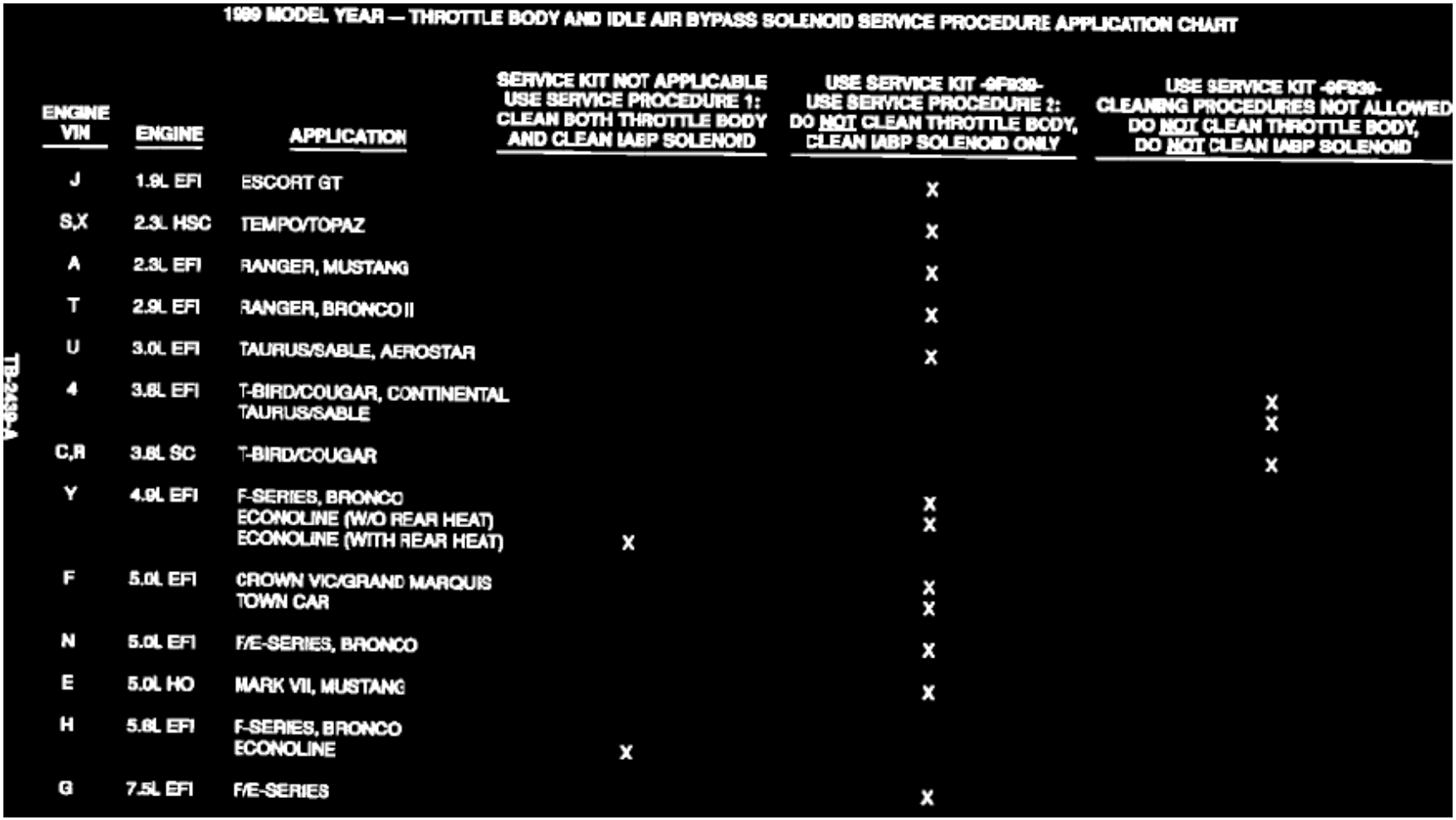
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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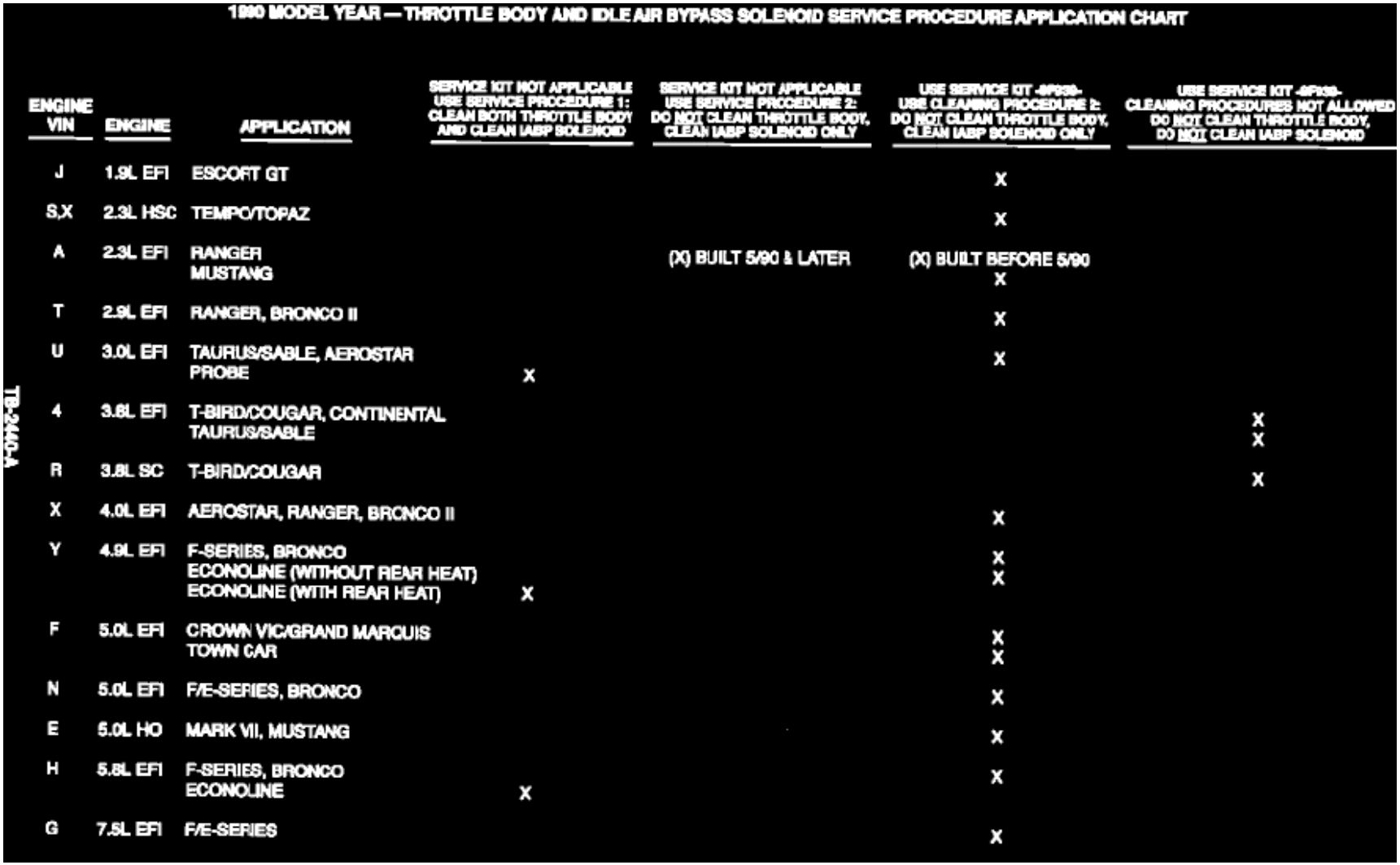
Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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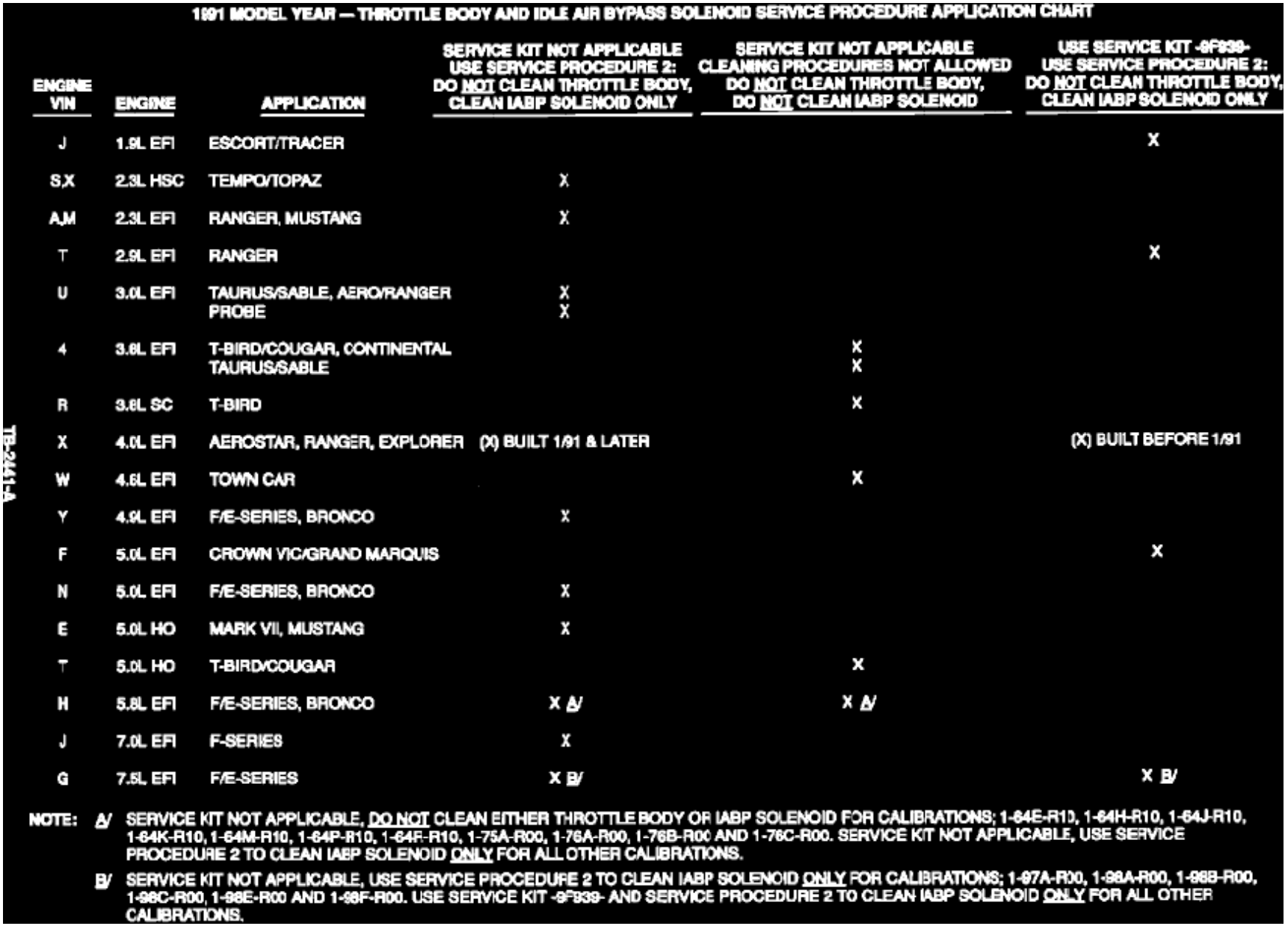
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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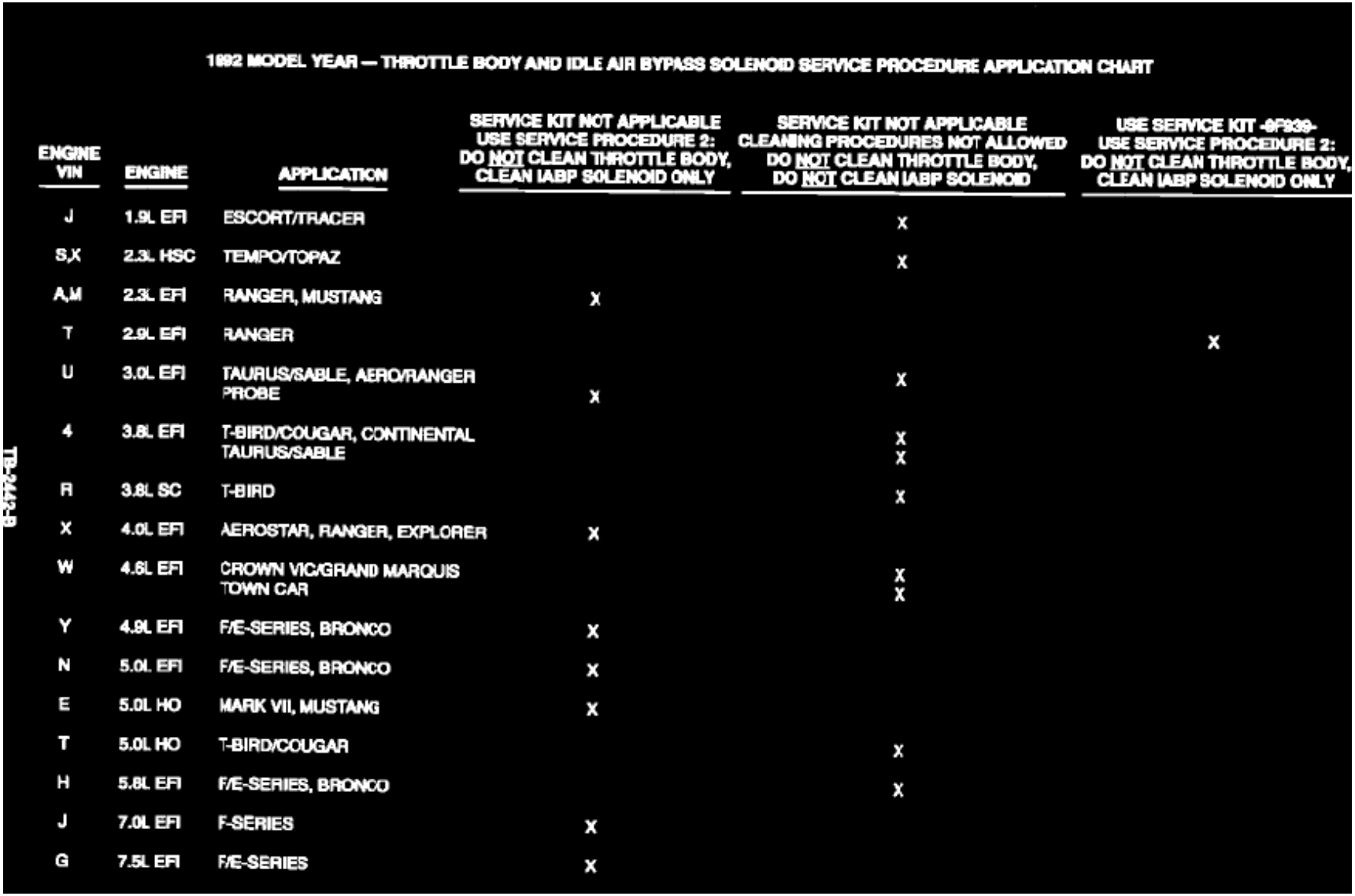
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TA-24428

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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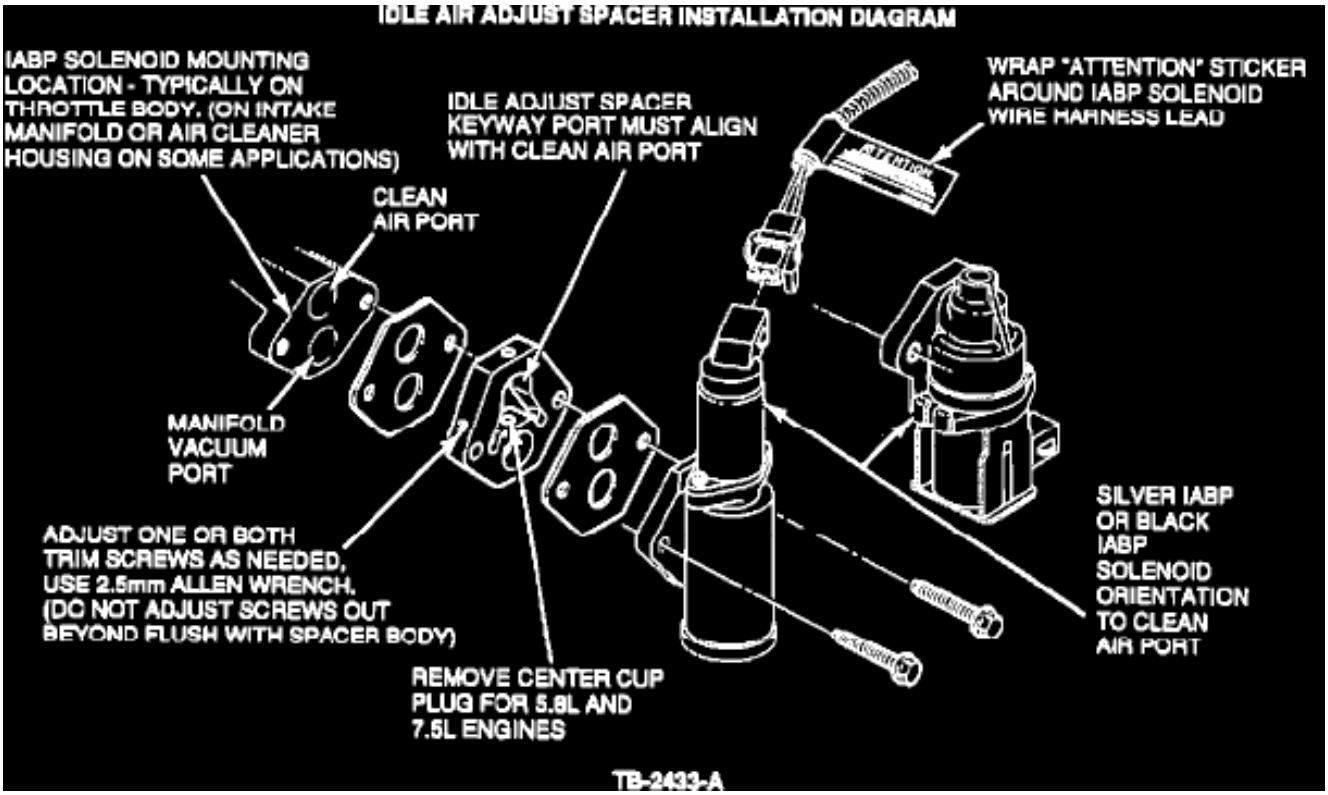
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

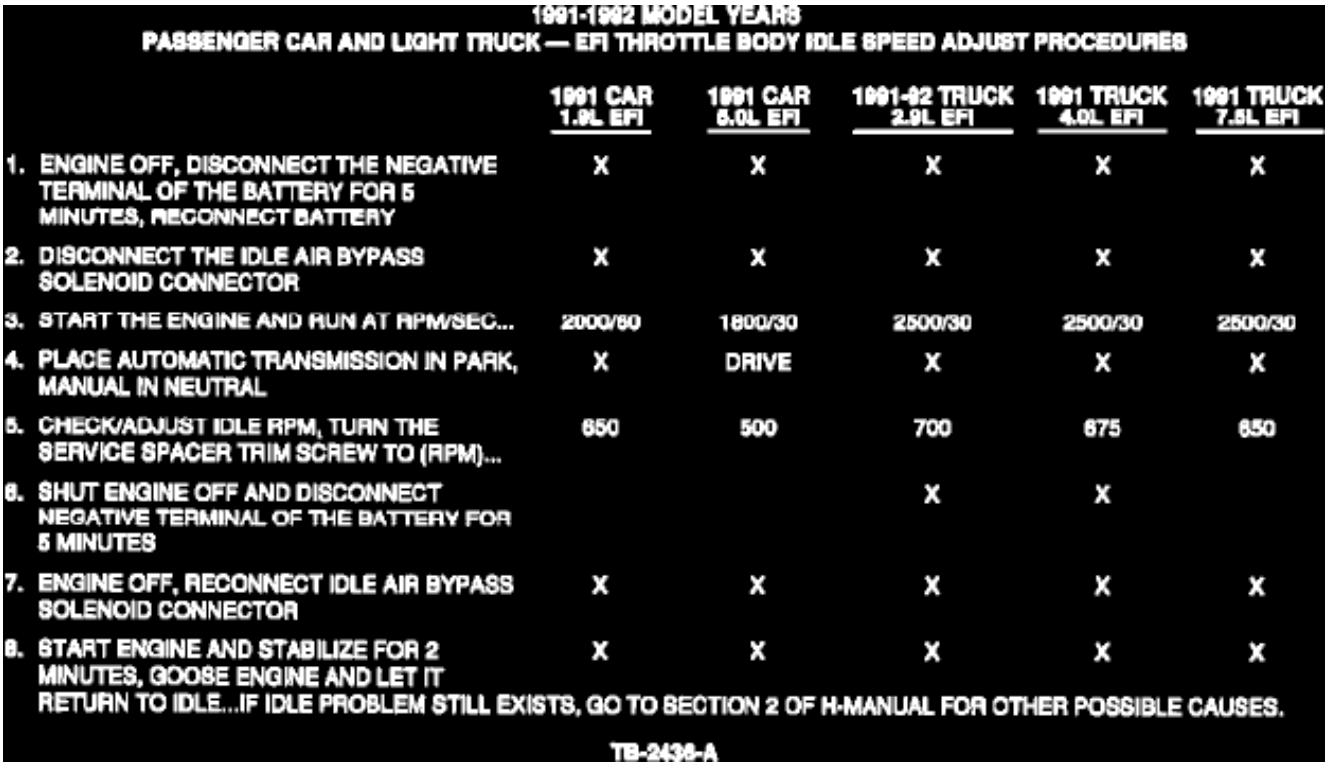
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

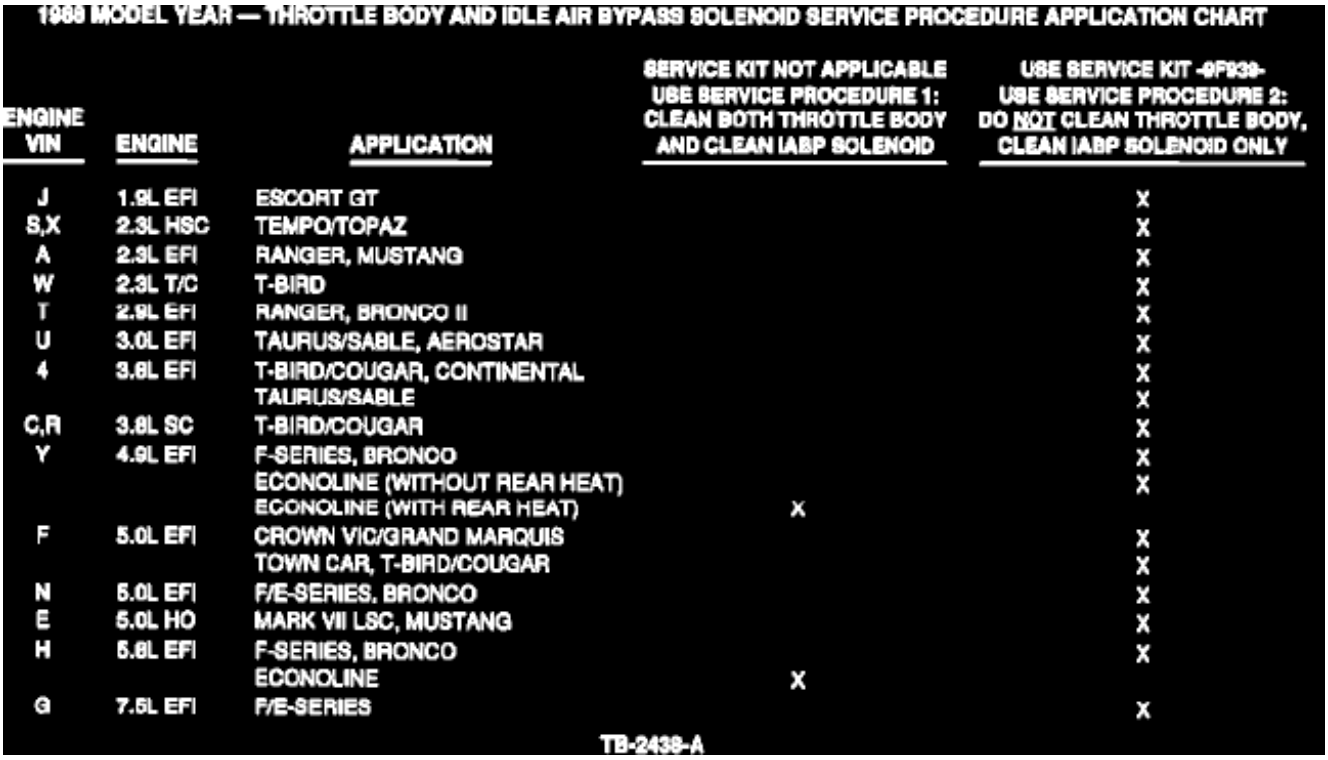
The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

TB-2437-A

Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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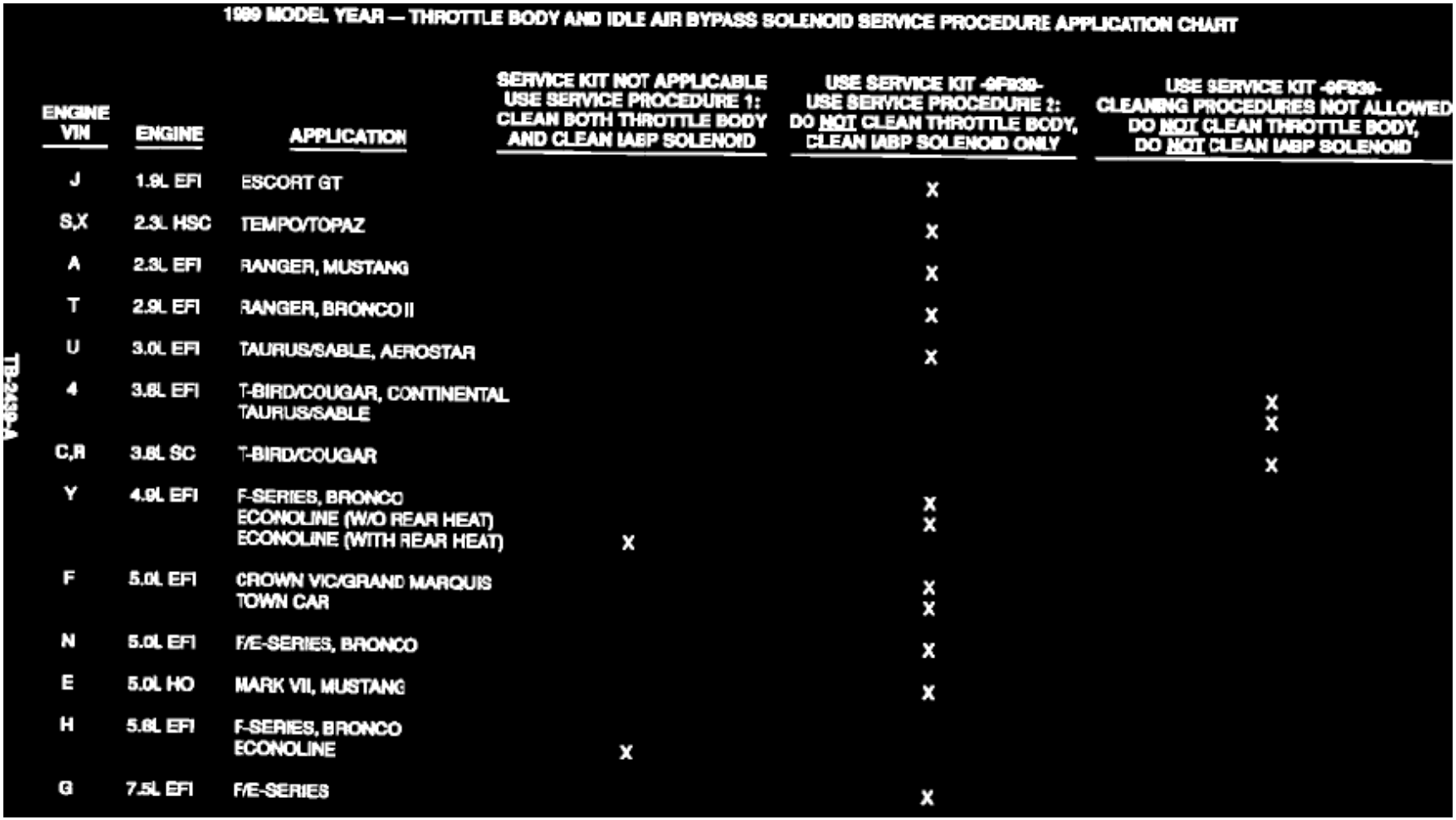
Figure 7

Figure 8

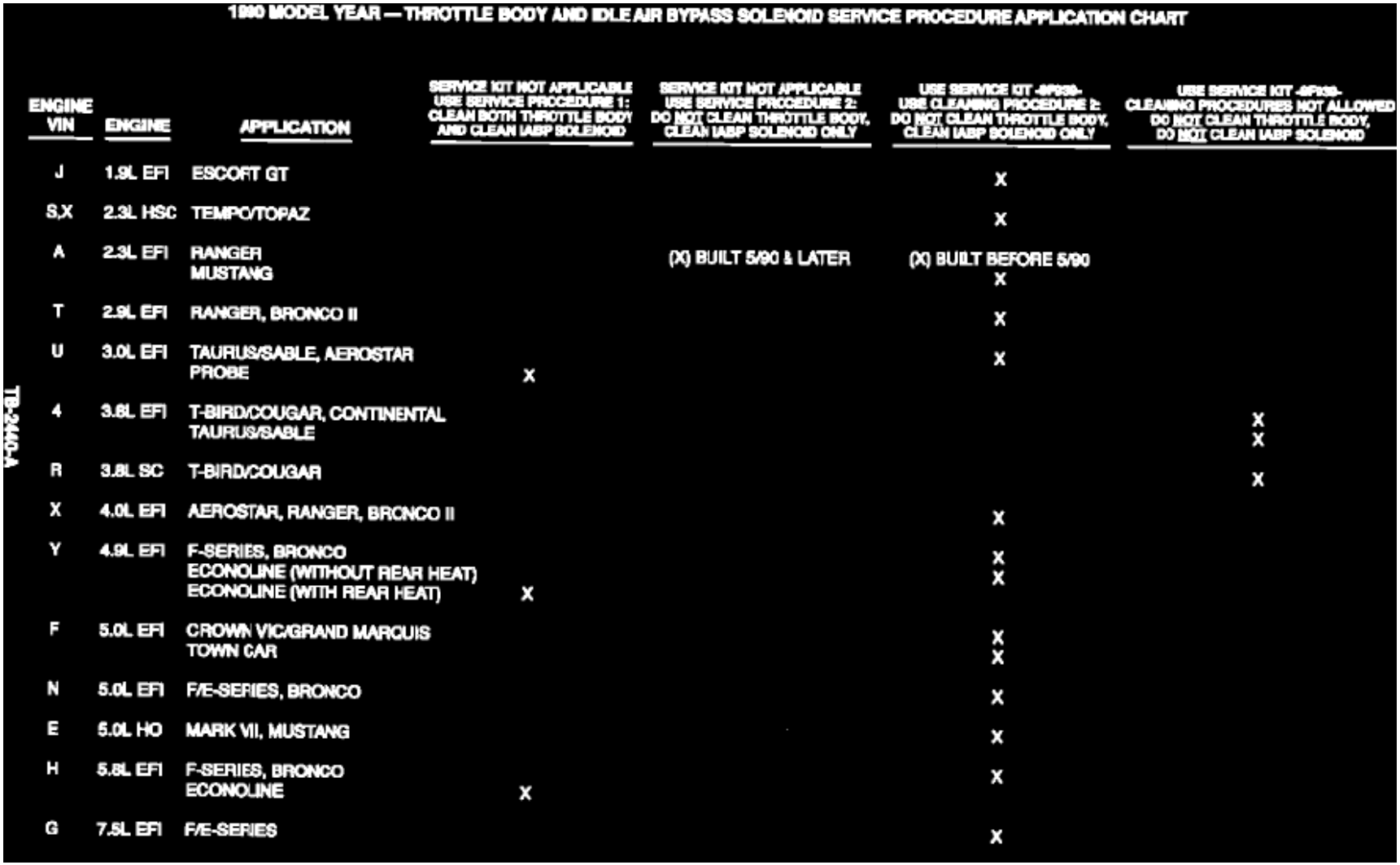


1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

TB-2439-A

Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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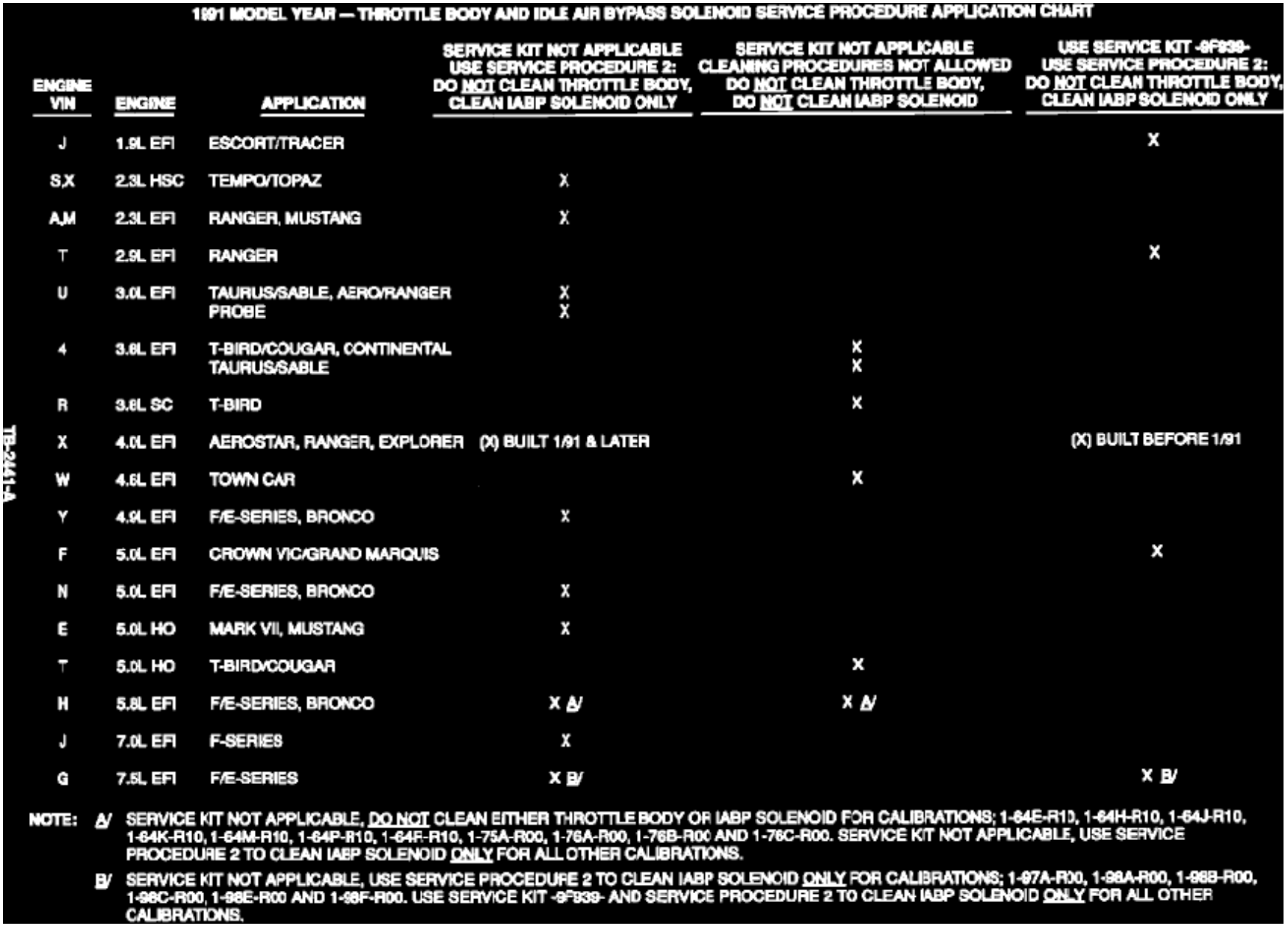
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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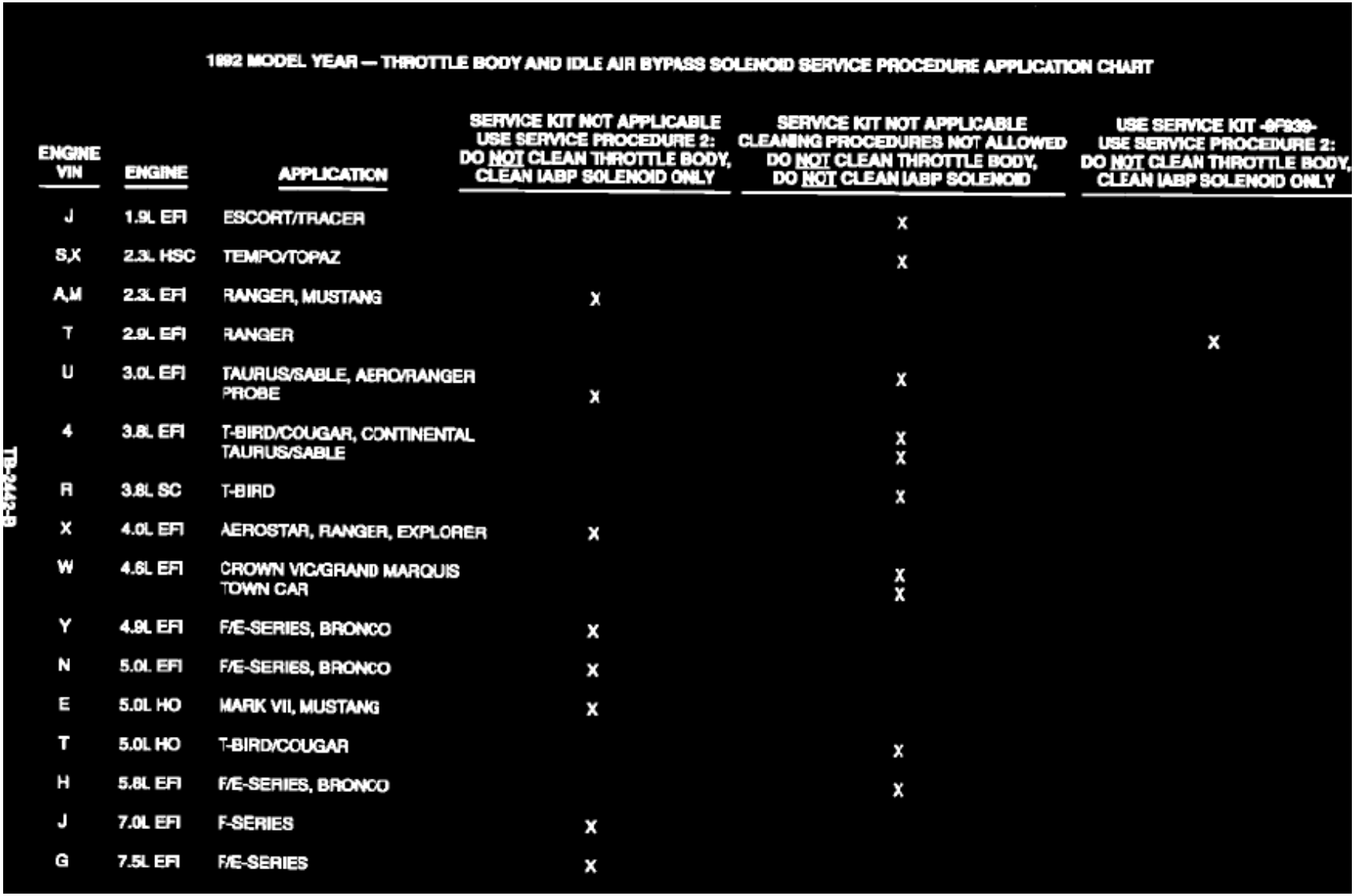
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Component Descriptions

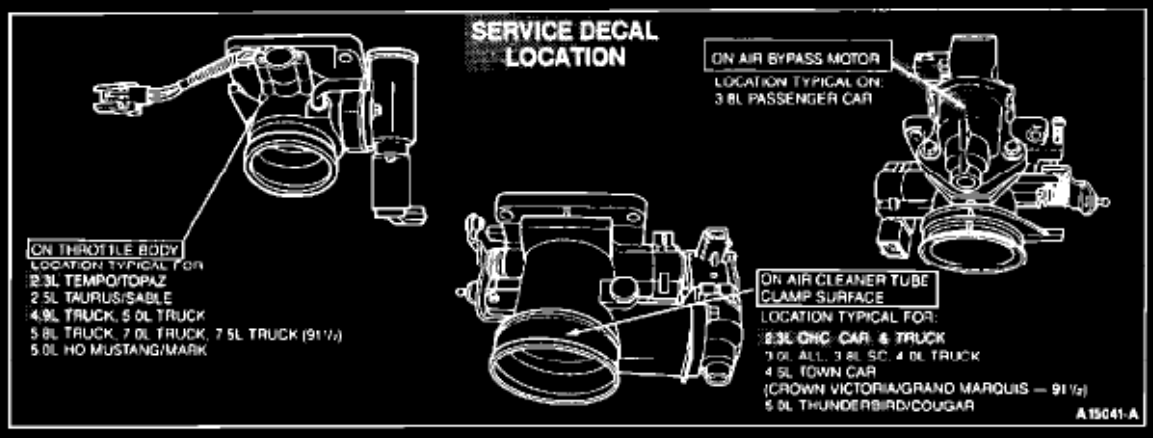


Figure 3

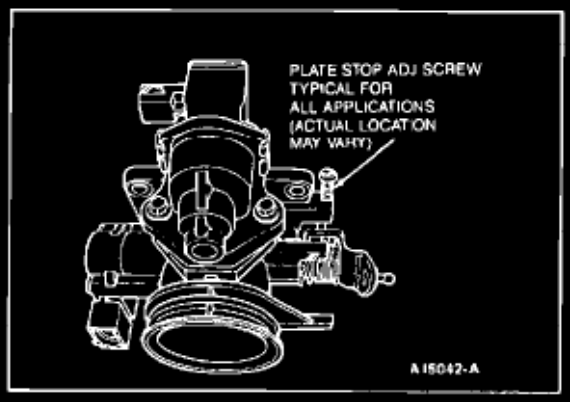


Figure 4

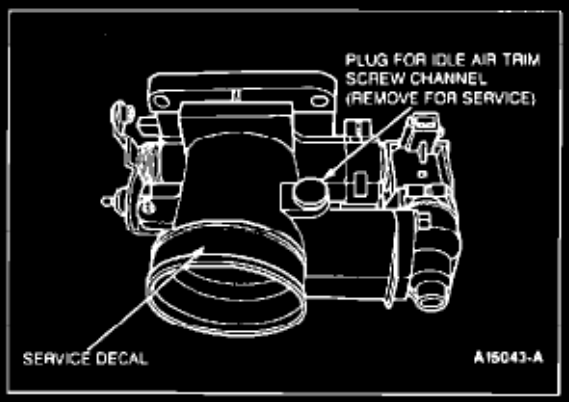


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

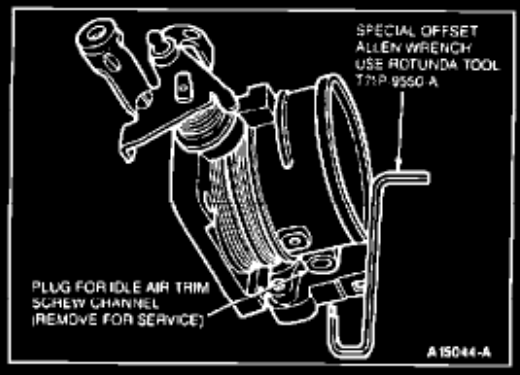
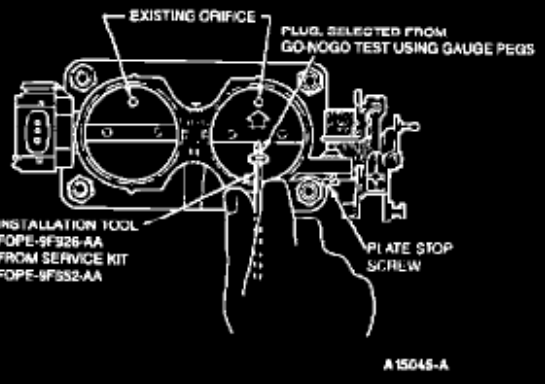


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT F-250 O-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Component Descriptions

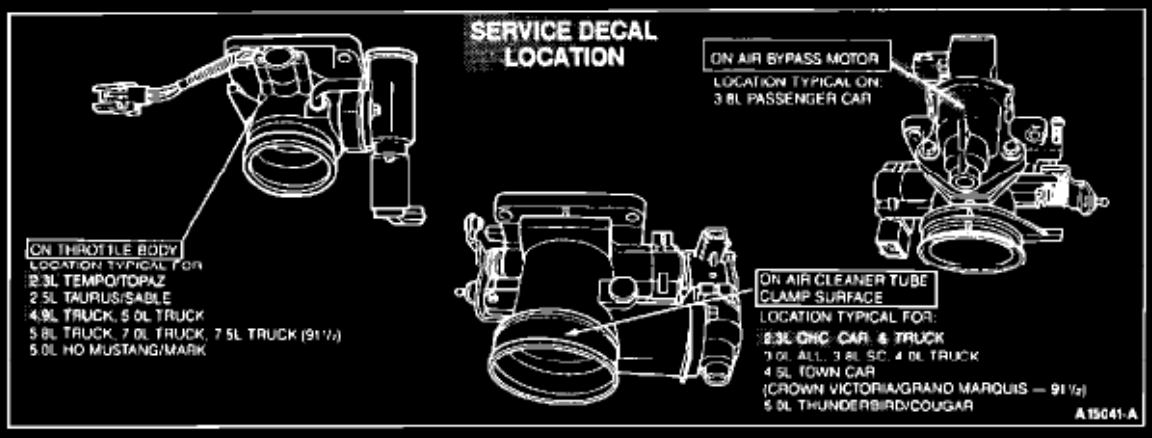


Figure 3

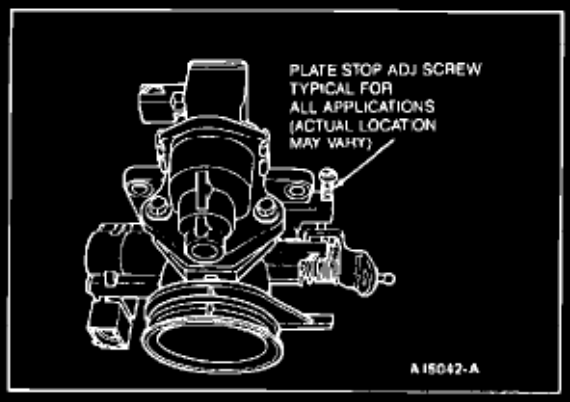


Figure 4

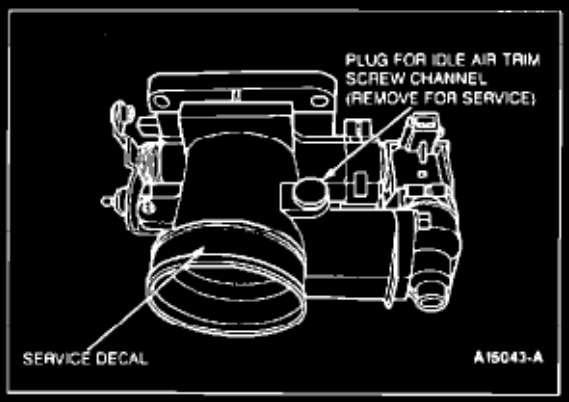


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

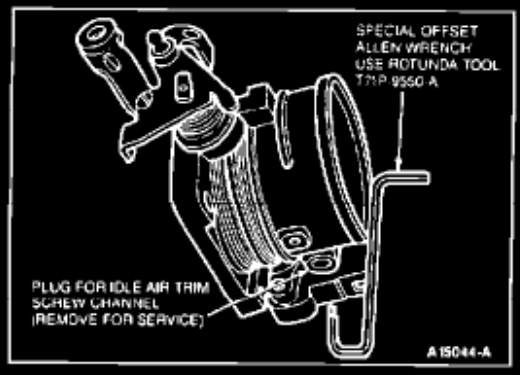
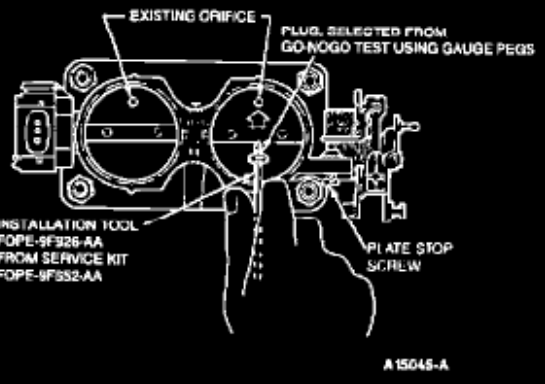


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off (reconnect idle speed control--air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Idle Speed: By Symptom

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

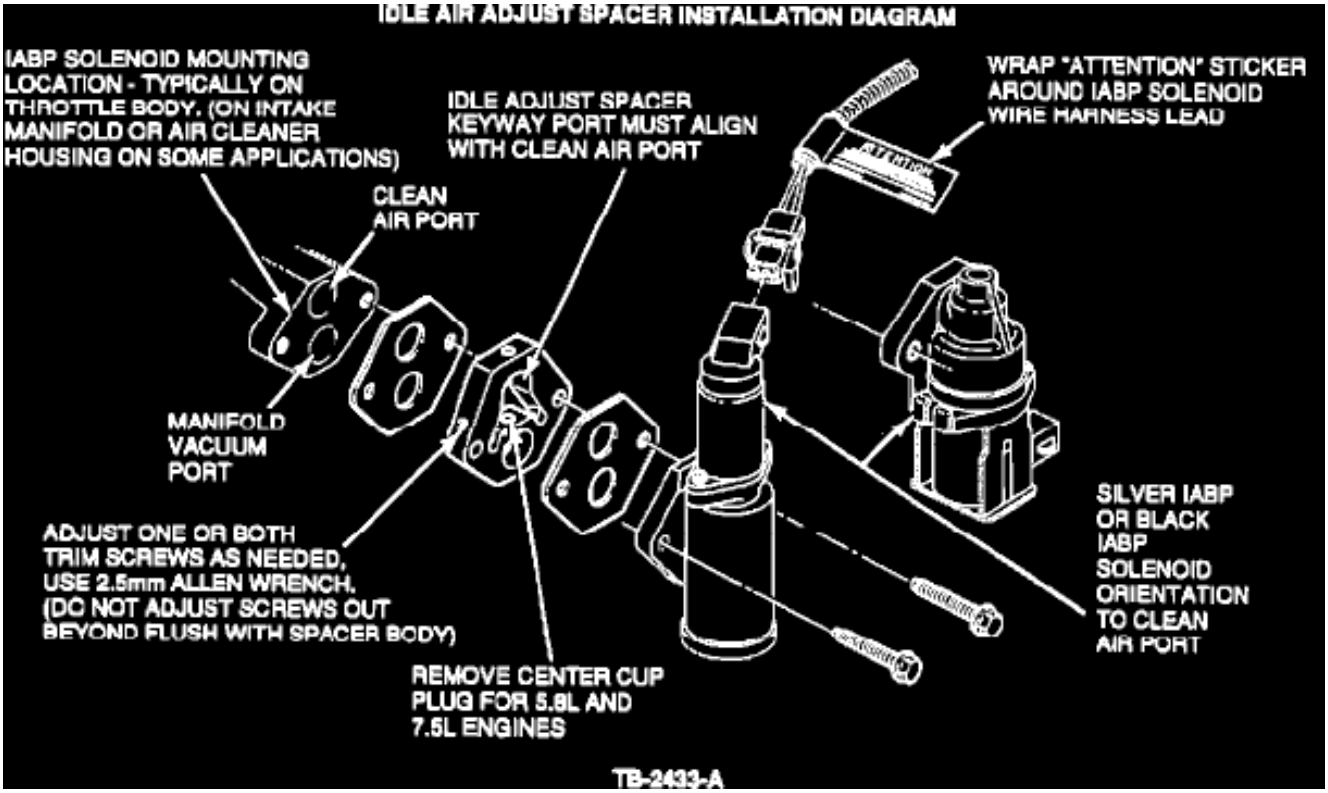
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

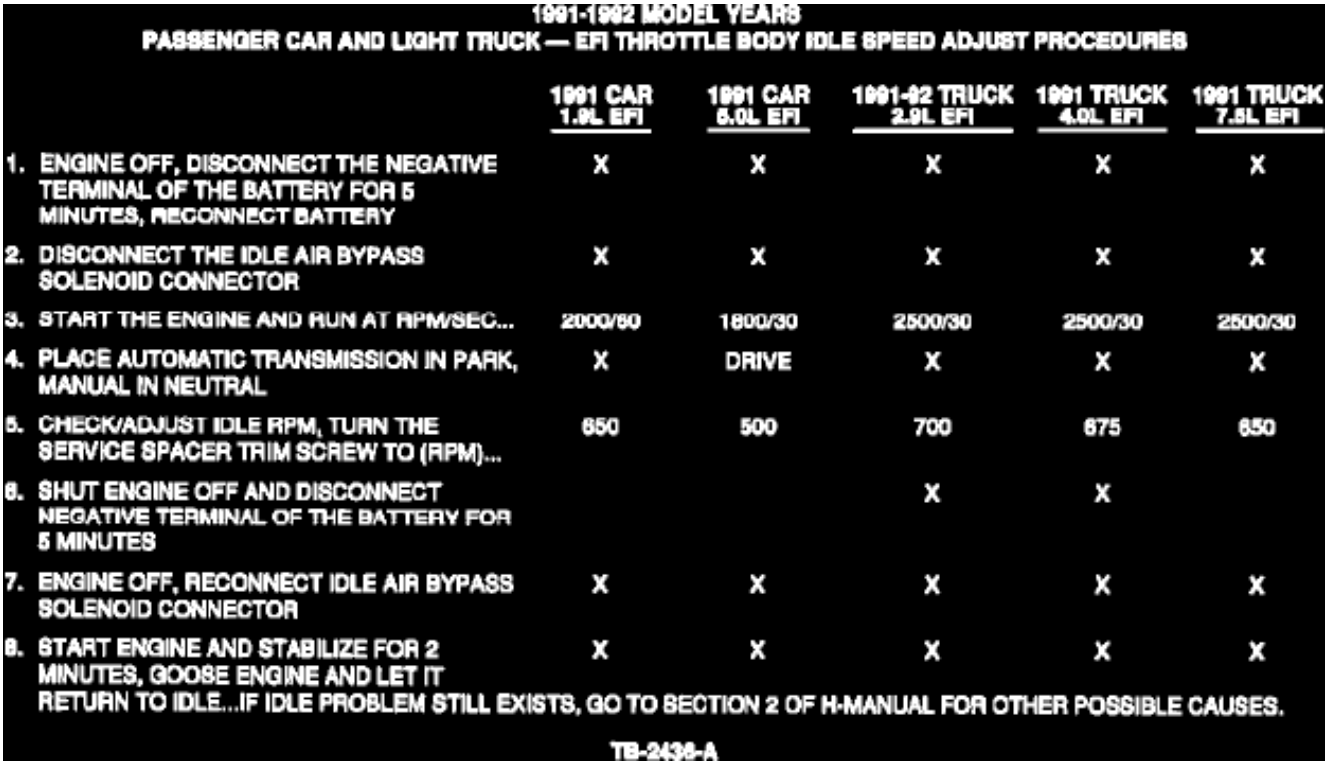
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1986 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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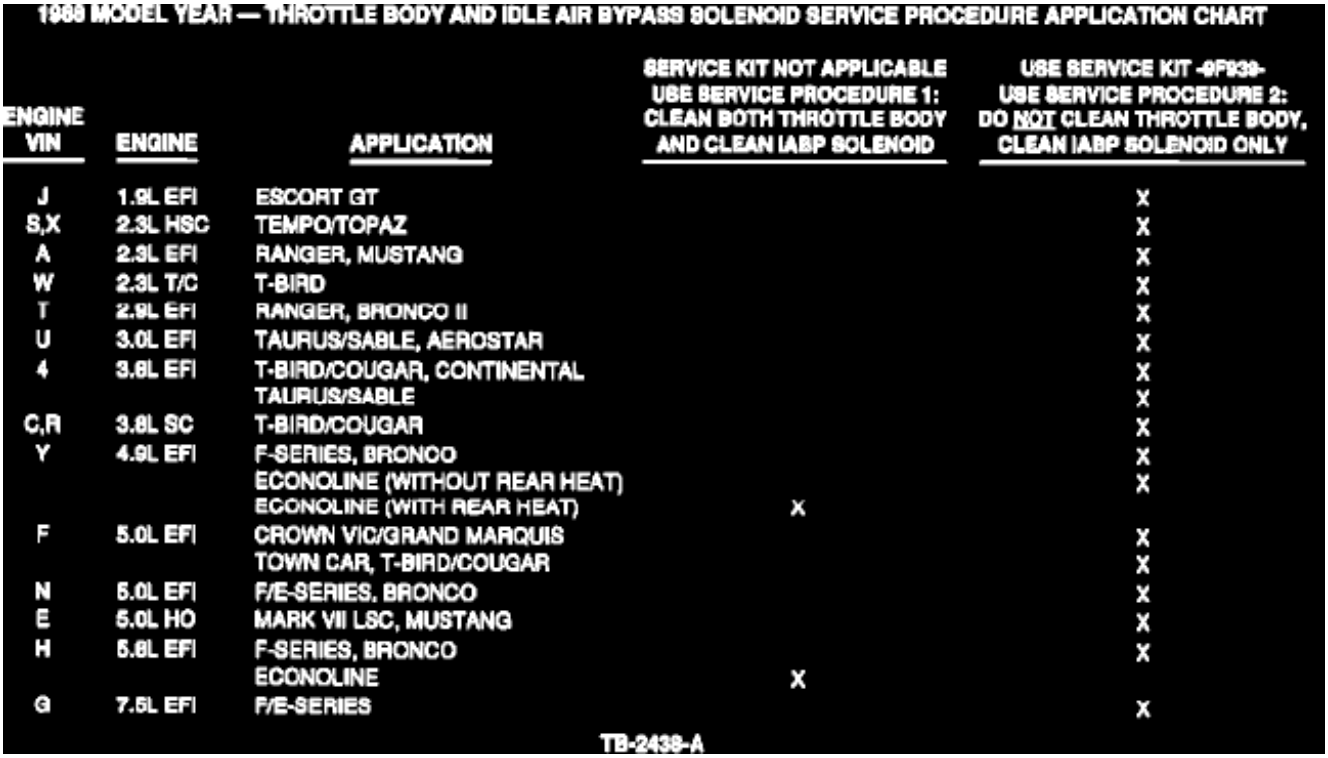
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT 4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT 4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT)		X	
		ECONOLINE (WITH REAR HEAT)	X	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

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Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2411-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART
ENGINE VIN
ENGINE
APPLICATION
SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
USE SERVICE KIT -9F936- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J 1.9L EFI ESCORT/TRACER X
S,X 2.3L HSC TEMPO/TOPAZ X
A,M 2.3L EFI RANGER, MUSTANG X
T 2.9L EFI RANGER X
U 3.0L EFI TAURUS/SABLE, AEROSTAR/RANGER PROBE X X
4 3.8L EFI T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE X X
R 3.8L SC T-BIRD X
X 4.0L EFI AEROSTAR, RANGER, EXPLORER X
W 4.6L EFI CROWN VIC/GRAND MARQUIS TOWN CAR X X
Y 4.9L EFI F/E-SERIES, BRONCO X
N 5.0L EFI F/E-SERIES, BRONCO X
E 5.0L HO MARK VII, MUSTANG X
T 5.0L HO T-BIRD/COUGAR X
H 5.8L EFI F/E-SERIES, BRONCO X
J 7.0L EFI F-SERIES X
G 7.5L EFI F/E-SERIES X
TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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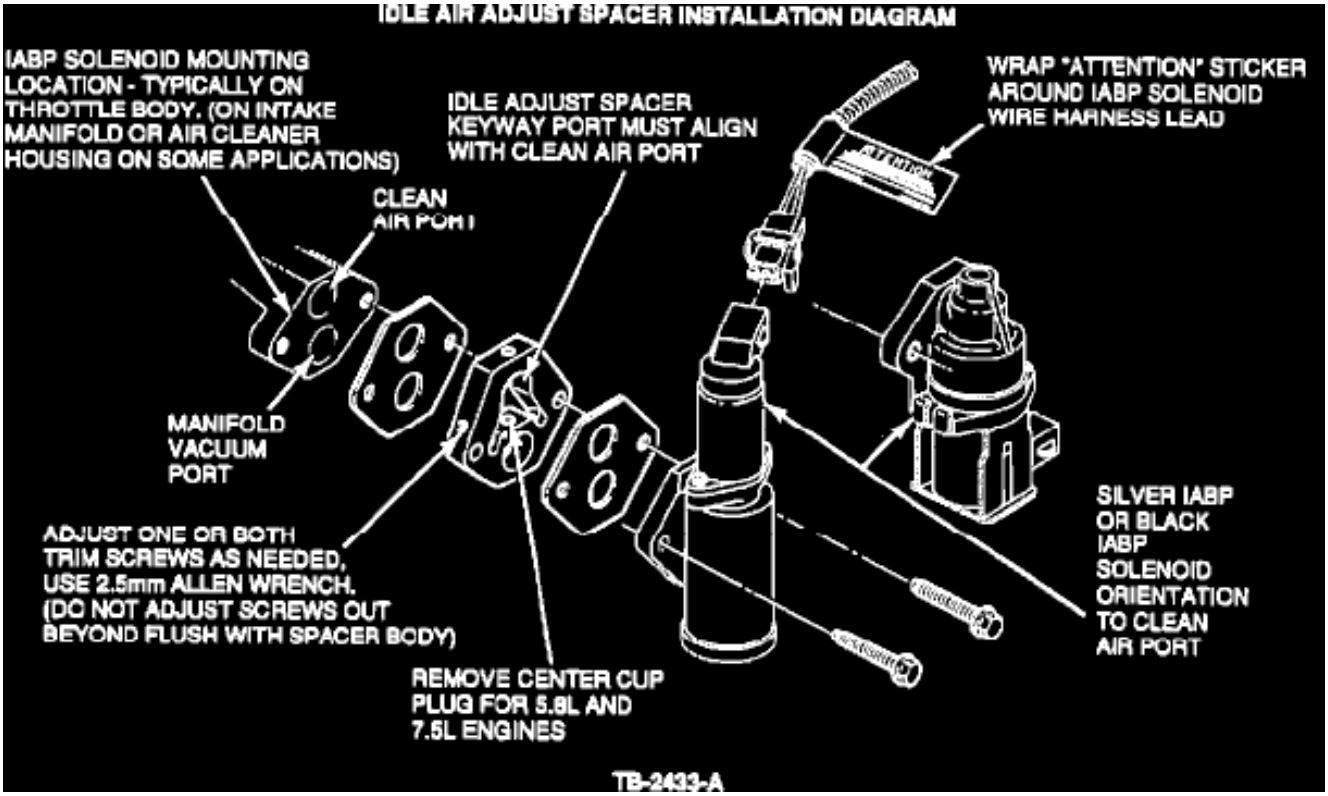
^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.



The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets

^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1986 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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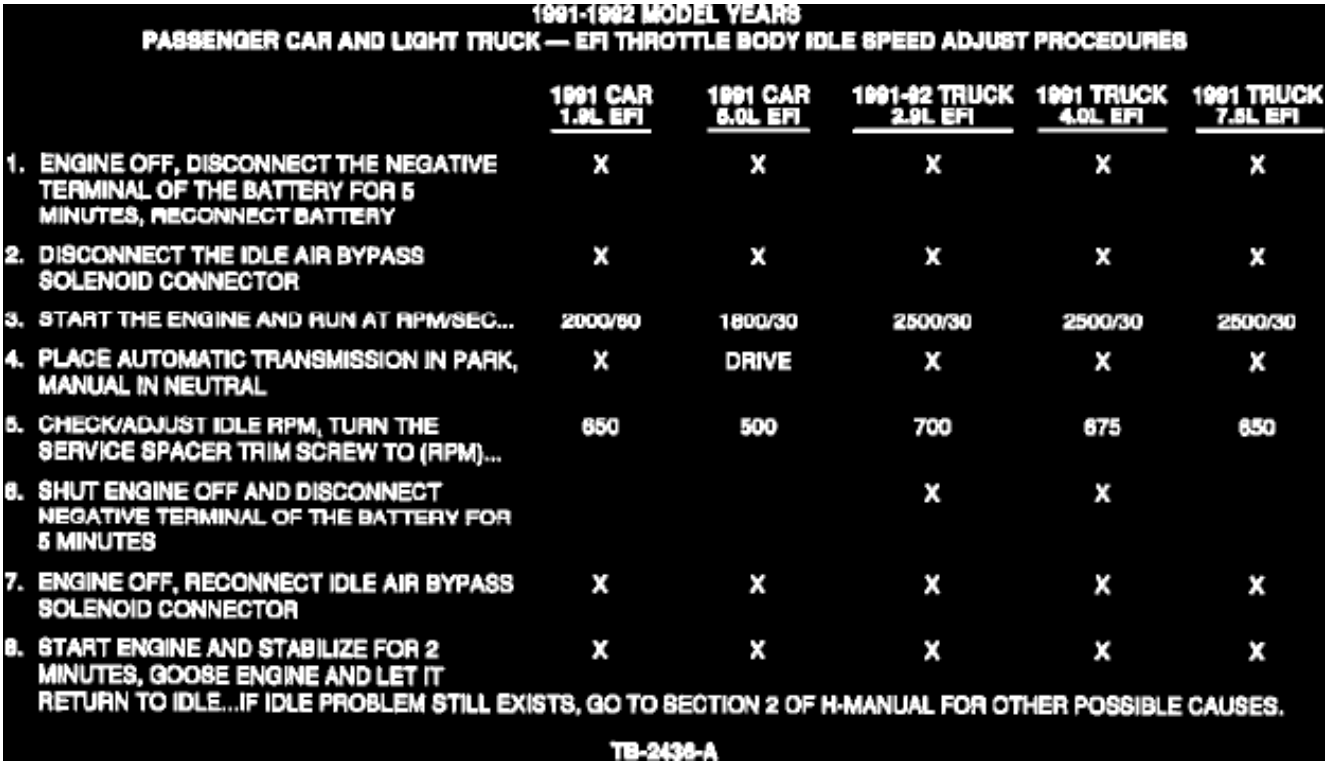
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO		X	
		ECONOLINE (W/O REAR HEAT)		X	
		ECONOLINE (WITH REAR HEAT)	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X	
				X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

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Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSS- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSS- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F836- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Idle Speed: Adjustments With 90TF-AA Throttle Body

*** UPDATED BY TSB 9111B4, 6/14/91; TSB 9025B2, 12/90

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5

Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-125 rpm.

RPM TOO LOW a.

Turn the plate stop screw to reach an idle speed of 675 +/- 25 rpm.

NOTE: During engine break-in reduce the idle rpm by 100 rpm. RPM TOO HIGH a.

Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6, if necessary.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

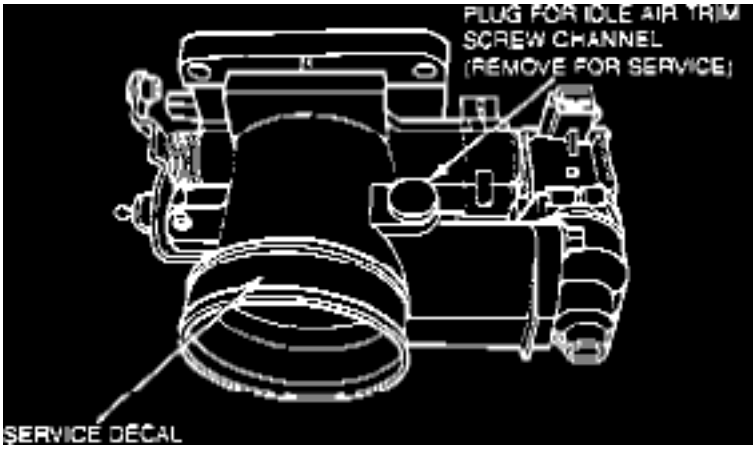
Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND

DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.



Idle Speed: Adjustments With 91TF-AA Throttle Body

*** UPDATED BY TSB 91-11B-4 6/14/91

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed. The idle speed setting procedure has been revised considerably to reflect the expanded application of the Self-Test idle speed options and because the throttle body incorporates an orifice in the throttle plate to control idle airflow as part of the sludge tolerant design.

Air Trim Screw Channel Cover

Throttle bodies with sludge tolerant design (introduced 1991 1/2 model vehicles) are clearly identified with a Yellow/Black decal. This decal warns that the throttle plate stop screw must not be adjusted counterclockwise (backed off), as this will not reduce the engine speed but may cause the throttle plate to stick in the bore. Backing out the screw may be required if the throttle body has been previously serviced (a plug in the throttle plate orifice may be present) or the plate stop screw tampered with (TPS Self-Test output out of range). The decal also warns that the throttle body must NOT be cleaned inside the bore, as this cleaning will impair the sensitive coating. The sludge accumulation will not affect the idle air flow. The cleaning procedure for the ISC-BPA still applies.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

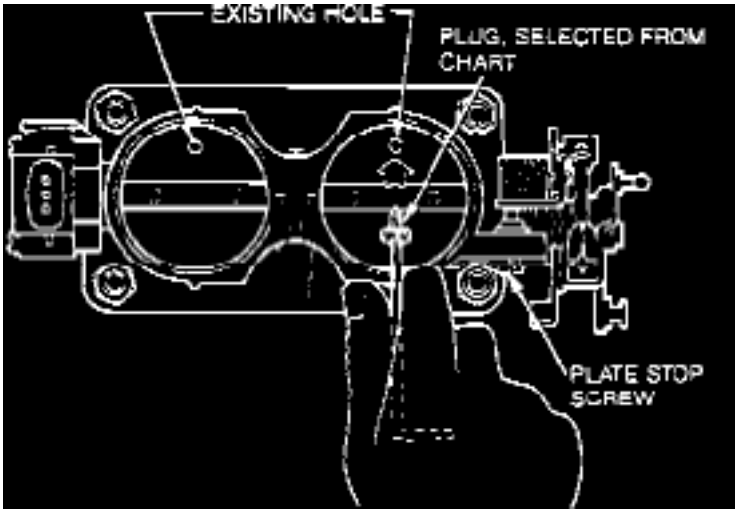
STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5



Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-120 rpm.

Throttle Plate Orifice Plug

NOTE: A plug in the throttle body orifice will decrease idle rpm. Where as an orifice without a plug will increase idle rpm. Orifice plugs and installation tools are available in service kit # FOPZ-9F652-A.

RPM TOO LOW a.

Do not clean the throttle body, check for the plate orifice plug. ^

If there is no plug, turn the screw clockwise to the desired rpm.

^ If there is a plug from previous service, remove the plug, and adjust the screw in either direction as required. NOTE: Screw must be in contact with the lever pad after adjustment.

RPM TOO HIGH a.

Turn the engine OFF.

b. Disconnect air cleaner hose.

c. Temporarily block the orifice in the throttle plate with tape. If the orifice already has a plug from previous service proceed to Step (e).

d. RESTART the engine, and check the idle speed, using a tachometer. NOTE: On vehicles with Mass Air Flow Sensors, reconnect the air intake duct hose before checking rpm. If the engine stalls, crack open the plate stop screw, but DO NOT over adjust.

e. If rpm continues to be fast, perform KOEO Self-Test. ^

If TPS output code is within range, remove tape from throttle plate, and check for other possible causes.

^ If TPS output is out of range, adjust screw for proper TPS code. Lever must be in contact with the screw.

^ If rpm is still fast, terminate this procedure, then check for other possible causes.

f. If rpm drops to 675 or lower, or engine stalls, turn the engine OFF, disconnect the air cleaner hose, and remove tape from throttle plate.

g. Install the plug with proper color code depending on throttle plate orifice size.

h. Reconnect the air cleaner hose. START the engine, and check the idle rpm using a tachometer. Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved. NOTE: Do not turn the plate stop screw counterclockwise. This may cause the throttle plate to stick at idle.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

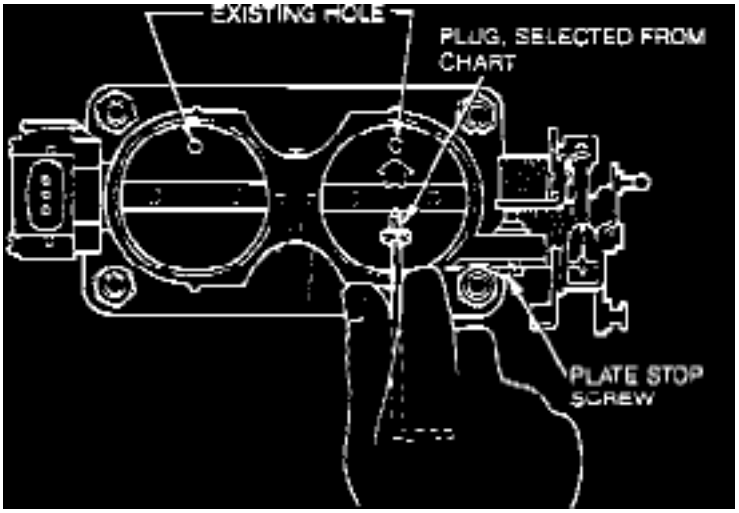
START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.

PROCEDURES FOR PLUG INSTALLATION

STEP 1

Remove air inlet tube(s) from throttle body.



Throttle Plate Orifice Plug

STEP 2

Select the proper color plug by using the Go/No-Go gauge pegs, included in the service kit (FOPZ-9F652-A).

STEP 3

Starting with the largest diameter gauge peg, attempt to insert through the throttle plate orifice.

STEP 4

If the gauge peg goes through the orifice, use the corresponding color plug. If the gauge peg does not go through, proceed with the next smaller gauge peg for Go/No-Go Test. NOTE: It is important that the largest Go/No-Go combination is used to determine the proper plug size.

STEP 5

If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe plate clean and then return to Step 3 to determine the proper plug size.

STEP 6

Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.

STEP 7

Open and snap closed the throttle several times to verify proper plug retention.

STEP 8

Reconnect the air inlet tube(s).

STEP 9

Reset idle rpm per engine requirement using the throttle plate stop screw.

Air Cleaner Fresh Air Duct/Hose: Technical Service Bulletins Engine - Water Entry Through Air Intake System

Article No. 94-3-8

02/09/94

^ AIR INTAKE - 2.9L, 3.0L, 4.0L EFI ENGINES - WATER ENTRY THROUGH AIR INTAKE SYSTEM

^ ENGINE - 2.9L, 3.0L, 4.0L EFI - POSSIBLE INTERNAL DAMAGE FROM WATER ENTRY THROUGH AIR INTAKE SYSTEM

LIGHT TRUCK: 1986-90 BRONCO II 1986-94 RANGER 1991-94 EXPLORER

This article is being republished in its entirety to add 1993-94 4.0L Ranger, 1993-94 3.0L Ranger and 1993-94 4.0L Explorer vehicles.

ISSUE: Reports have been received of internal engine damage caused by water entering the engine through the air intake system. This condition may occur when the vehicle is driven in normal wet conditions, such as water splash/spray from other vehicles, or when driven through shallow water. Improvements were made to the EFI engine air intake systems that have greatly reduced the number of reported incidences.

ACTION: Dealers should be assured that warranty repairs will be covered unless there Is evidence of owner misuse. This warranty repair policy will remain effective unless you are notified that a waterproof air intake system has been released.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-21-10 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

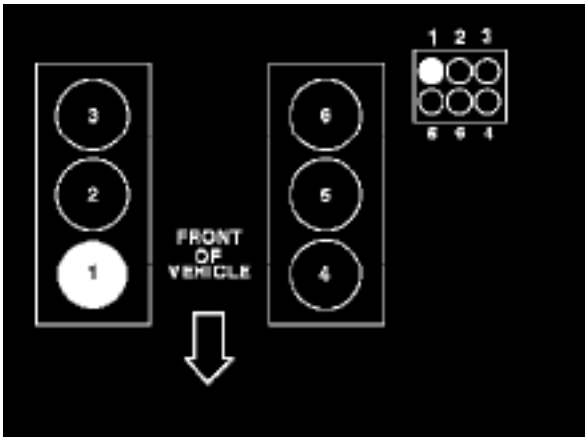
3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.



Firing Order: Specifications

V6 Firing Order: 1 4 2 5 3 6

Octane Adjust Shorting Bar - Revised Procedures

Article No. 91-11B-6

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1989 - PAGE 17-289 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGE 17-329 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGE 5-22 - EEC-IV QUICK TEST STEP 12.0 - CAR DIAGNOSIS BY SYMPTOM CHART REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 6-305 THROUGH 6-307 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

FORD: 1989-91 TAURUS, THUNDERBIRD 1991 ESCORT, MUSTANG

LINCOLN-MERCURY: 1989-90 COUGAR 1991 TRACER

LIGHT TRUCK: 1989-91 RANGER 1991 AEROSTAR, EXPLORER

ISSUE: Additional information regarding removal of the Octane Adjust Shorting Bar is required to assure compliance with Federal (EPA) Emission Standards. The following Manuals are affected on the pages indicated:

^ 1989 Engine/Emissions Diagnosis Page 17-289

^ 1990 Engine/Emissions Diagnosis Page 17-329

^ 1991 Engine/Emissions Diagnosis Page 5-22 and Pages 6-305 through 307

ACTION: Refer to the pages in this TSB article for the additional information.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 690000

Octane Adjust	Pinpoint Test	KP

Note

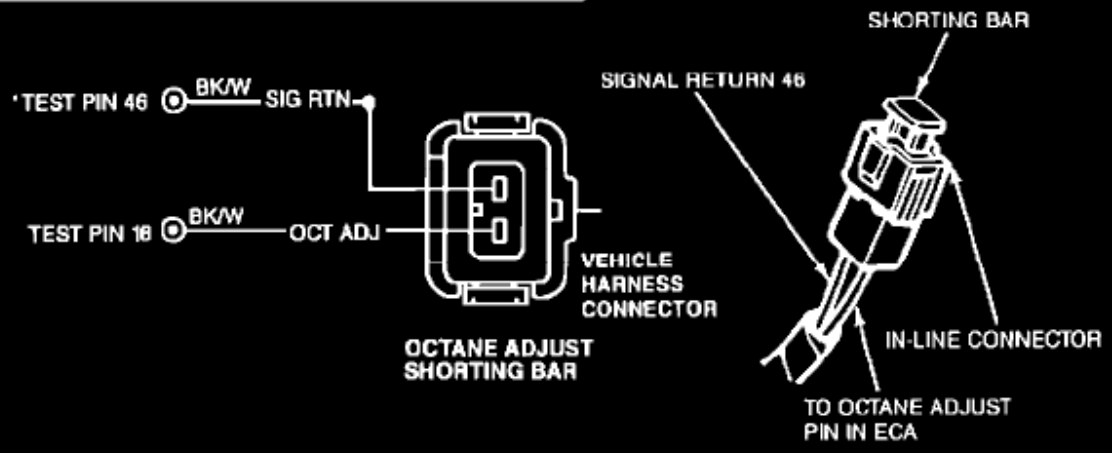
You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: Signal Return, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



OCTANE ADJUST SHORTING BAR LOCATIONS

APPLICATION	LOCATION
2.3L EFI Truck	Passenger side of fender apron, taped to the self-test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to self-test connector.

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9686-D

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

Octane Adjust

Pinpoint Test **KP**

Octane Adjust Shorting Bar Locations

Application	Location
1.9L MA SEFI	Near EEC-IV power relay, fuel pump relay and processor in passenger compartment.
2.3L EFI Truck	Passenger side of fender apron, taped to the Self-Test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to Self-Test connector.
4.0L MA EFI Aerostar	Driver side, engine cowl near windshield wiper motor take-out (alongside MAP take-out).
4.0L MA EFI Ranger/ Bronco II	Passenger side of fender apron, taped to the Self-Test connector.

Test Pin 18 (44 and 43) OCT ADJ

Application	Wire Color
2.3L EFI Truck 3.0L SEFI SHO 3.8L SEFI SC	DK/W
4.0L Aerostar	O
4.0L Ranger	W/R
1.9L MA SEFI	GR/W

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

NOTE: Use a higher octane grade of fuel to address the spark knock concern. **DO NOT** remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

EEC-IV QUICK TEST STEP: Diagnosis By Symptom — 12.0

12.0 CAR DIAGNOSIS BY SYMPTOM CHART

Symptom	Pinpoint Test Step Direction												
	1.9L MA SEFI	2.3L OHC EFI	2.3L HSC EFI	2.5L AXODE SEFI	3.0L EFI PROBE	3.0L AXODE SEFI	3.0L SHO SEFI	3.8L AXODE SEFI	3.8L RWD SEFI	3.8L SC SEFI	4.6L 2V SEFI	5.0L SEFI	5.0L MA SEFI
Stumble after hot restart	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21
Fuel pump runs with engine off	—	—	—	X14	X14	X14	X14	X14	—	—	J22	J22	
Gasoline fumes under hood	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Black Exhaust Smoke	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Spark knock	KP5	KP5	—	—	DG1 or SEC. 11	—	KP5	—	—	KP5	KP5	—	—
Cooling fan does not operate Low speed cooling fan does not operate High speed cooling fan does not operate	KF10	X18	—	X18	X18	X18	X18	X18	—	X18	—	—	—
Low speed cooling fan always on	KF25	X35	—	X35	X35	X35	X35	X35	—	X35	—	—	—
High speed cooling fan always on	KF25	—	—	X40	X40	X40	x40	—	X40	X40	—	—	—

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

NOTE: The Octane Adjust shorting bar is similar in shape to the SPOUT in-line connector and on some applications the PSPS circuit will also have a shorting bar connector. **DO NOT** remove the shorting bar unless you have been directed by an application specific Technical Service Bulletin (TSB).

Test Pin 18, 29 or 44 — OCT ADJ

Application	Wire Color
1.9L Escort/Tracer	GR/W
Car: 2.3L Mustang Truck: 2.3L Ranger 4.0L Explorer	DG
3.0L SHO	PK
3.8L SC	BK/W
4.0L Ranger	O
4.6L MA SEFI	W/R

Test Pin 46 — SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
3.8L SC SEFI	BK/W
All Others	GY/R

DELETION

Revised 5/91

Octane Adjust

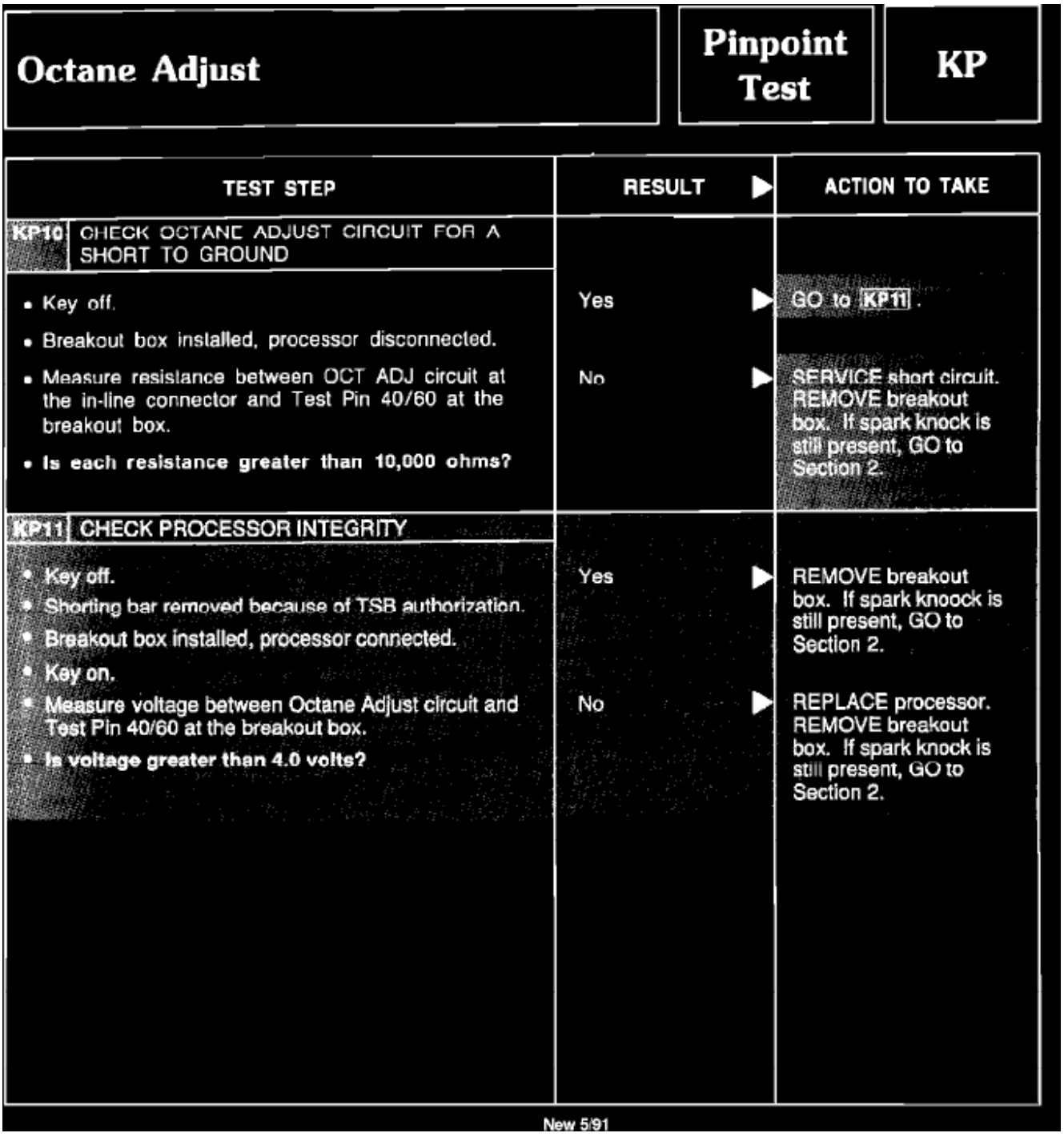
Pinpoint Test **KP**

TEST STEP	RESULT ▶	ACTION TO TAKE
KP1 VISUALLY INSPECT OCTANE ADJUST IN-LINE CONNECTOR SERVICE CODE 57/341		
Service Code 57/341 indicates Octane Adjust shorting bar is not in or the OCT ADJ circuit is open. • Key off. • Visually inspect Octane Adjust in-line connector. • **Is the shorting bar removed?**	Yes ▶ No ▶	GO to KP2. GO to KP4.
KP2 CHECK FOR MODIFICATION DECAL		
• Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	Testing complete. If vehicle has spark knock concern, GO to Section 2. GO to KP3.
KP3 CHECK FOR SERVICE CODE 57/341		
• Replace Octane Adjust shorting bar. • Key off. • Activate self-test. • **Is service code 57/341 present?**	Yes ▶ No ▶	GO to KP4. Testing complete. EEC system OK.
KP4 CHECK CONTINUITY OF OCTANE ADJUST CIRCUIT		
NOTE: There should be continuity from OCT ADJ circuit thru the in-line connector and shorting bar to SIG RTN circuit. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 46 and OCT ADJ Test Pin at the breakout box (see schematic for appropriate OCT ADJ circuit test pin). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE open OCT ADJ circuit or shorting bar or SIG RTN circuit. REMOVE breakout box. RERUN Quick Test.

Octane Adjust

Pinpoint Test **KP**

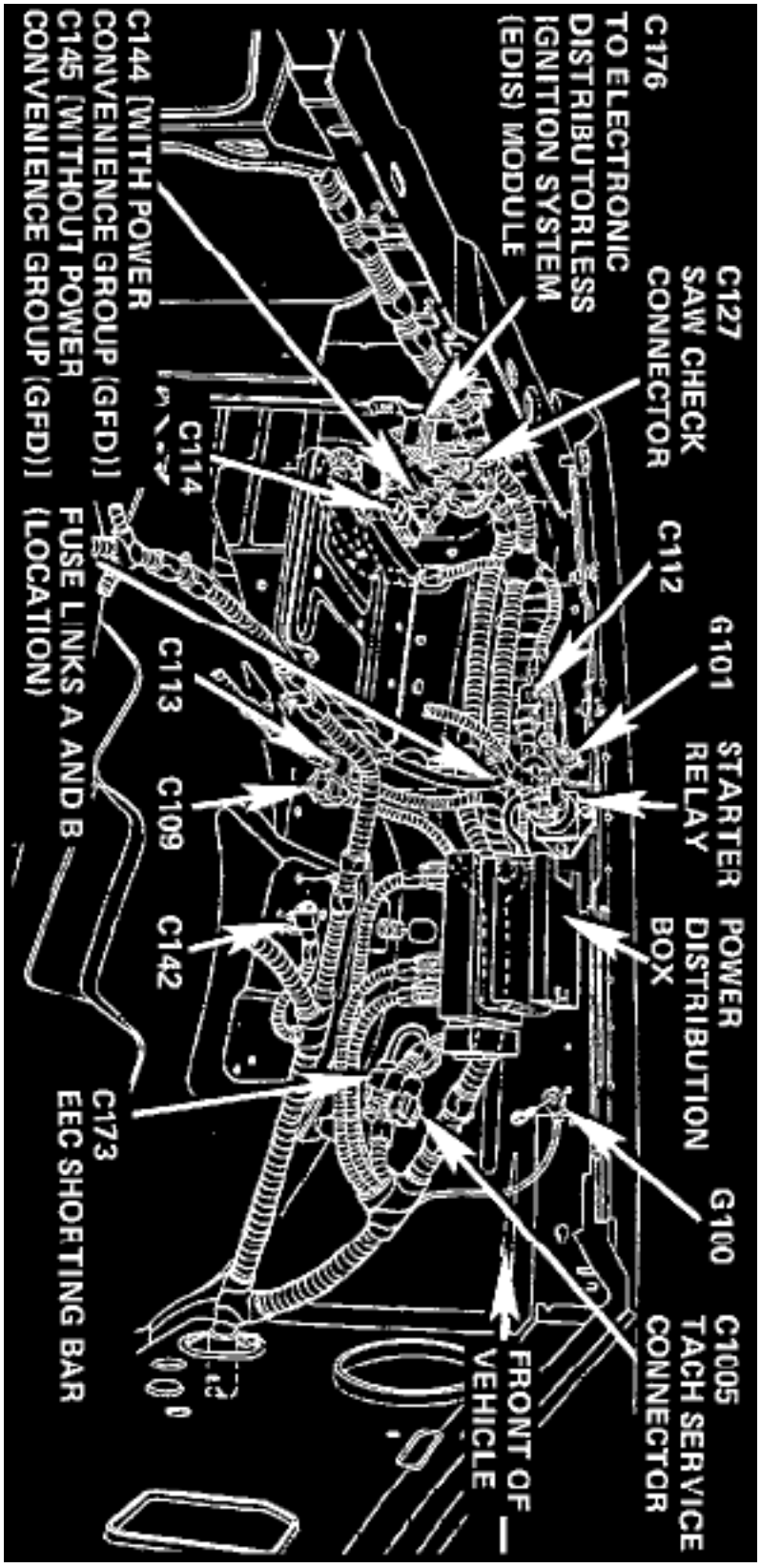
TEST STEP	RESULT	ACTION TO TAKE
KP5 CHECK FOR SERVICE CODE 11 • Start engine and idle vehicle at operating temperature. • Key off. • Activate self-test. • Key on, engine off. • **Is service code 11 or 111 present?**	Yes ▶ No ▶	GO to KP6. **For service code 57/341:** GO to KP1. **For all other codes:** RETURN to Quick Test.
KP6 VERIFY IN-LINE CONNECTOR SHORTING BAR IS INSTALLED • Key off. • Visually inspect Octane Adjust in-line connector. • **Is shorting bar installed?**	Yes ▶ No ▶	GO to KP8. GO to KP7.
KP7 CHECK FOR MODIFICATION DECAL • Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	GO to KP10. REPLACE shorting bar. GO to Section 2 to address spark knock concern.
KP8 CHECK FOR TSB • Is there a Technical Service Bulletin (TSB) authorizing the removal of the Octane Adjust shorting bar?	Yes ▶ No ▶	GO to KP9. GO to Section 2 to address spark knock concern.
KP9 REMOVE SHORTING BAR • Remove shorting bar only if there is a TSB authorization. • Drive vehicle to verify spark knock. • **Is spark knock present?**	Yes ▶ No ▶	GO to KP10. Testing complete. EEC system OK.



Octane Adjust | **Pinpoint Test** | **KP**

TEST STEP	RESULT ▶	ACTION TO TAKE
KP10 CHECK OCTANE ADJUST CIRCUIT FOR A SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • Measure resistance between OCT ADJ circuit at the in-line connector and Test Pin 40/60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	GO to KP11.
	No ▶	SERVICE short circuit. REMOVE breakout box. If spark knock is still present, GO to Section 2.
KP11 CHECK PROCESSOR INTEGRITY • Key off. • Shorting bar removed because of TSB authorization. • Breakout box installed, processor connected. • Key on. • Measure voltage between Octane Adjust circuit and Test Pin 40/60 at the breakout box. • **Is voltage greater than 4.0 volts?**	Yes ▶	REMOVE breakout box. If spark knoock is still present, GO to Section 2.
	No ▶	REPLACE processor. REMOVE breakout box. If spark knock is still present, GO to Section 2.

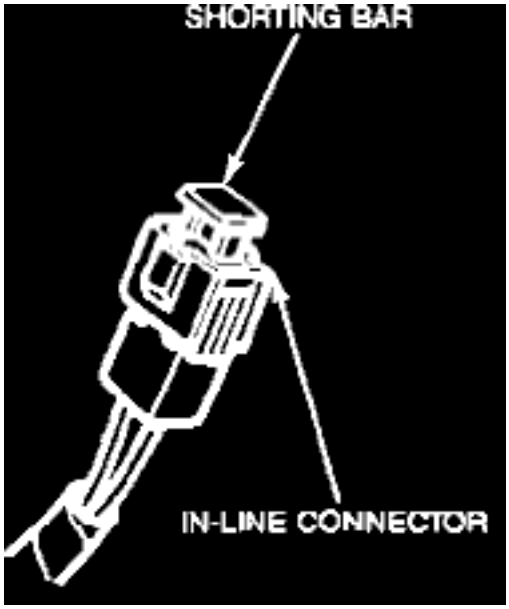
New 5/91


C127
SAW CHECK
CONNECTOR
C176
TO ELECTRONIC
DISTRIBUTORLESS
IGNITION SYSTEM
(EDIS) MODULE
C112
G101
STARTER
RELAY
POWER
DISTRIBUTION
BOX
G100
C1005
TACH SERVICE
CONNECTOR
C114
C113
C109
C142
C144 [WITH POWER
CONVENIENCE GROUP (GFD)]
C145 [WITHOUT POWER
CONVENIENCE GROUP (GFD)]
FUSE LINKS A AND B
(LOCATION)
C173
EEC SHIFTING BAR
FRONT OF
VEHICLE

Ignition Timing Connector: Locations

Component Location

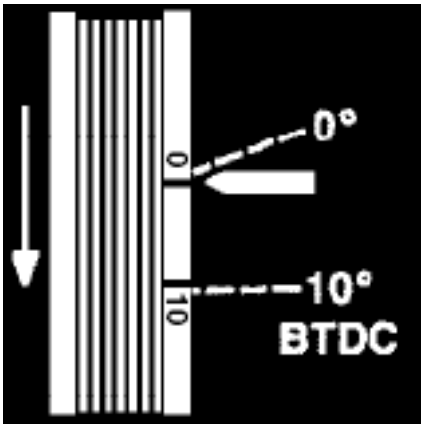
The SPOUT connector (SAW check connector C127) is located at the RH front of the engine compartment in front of the battery.



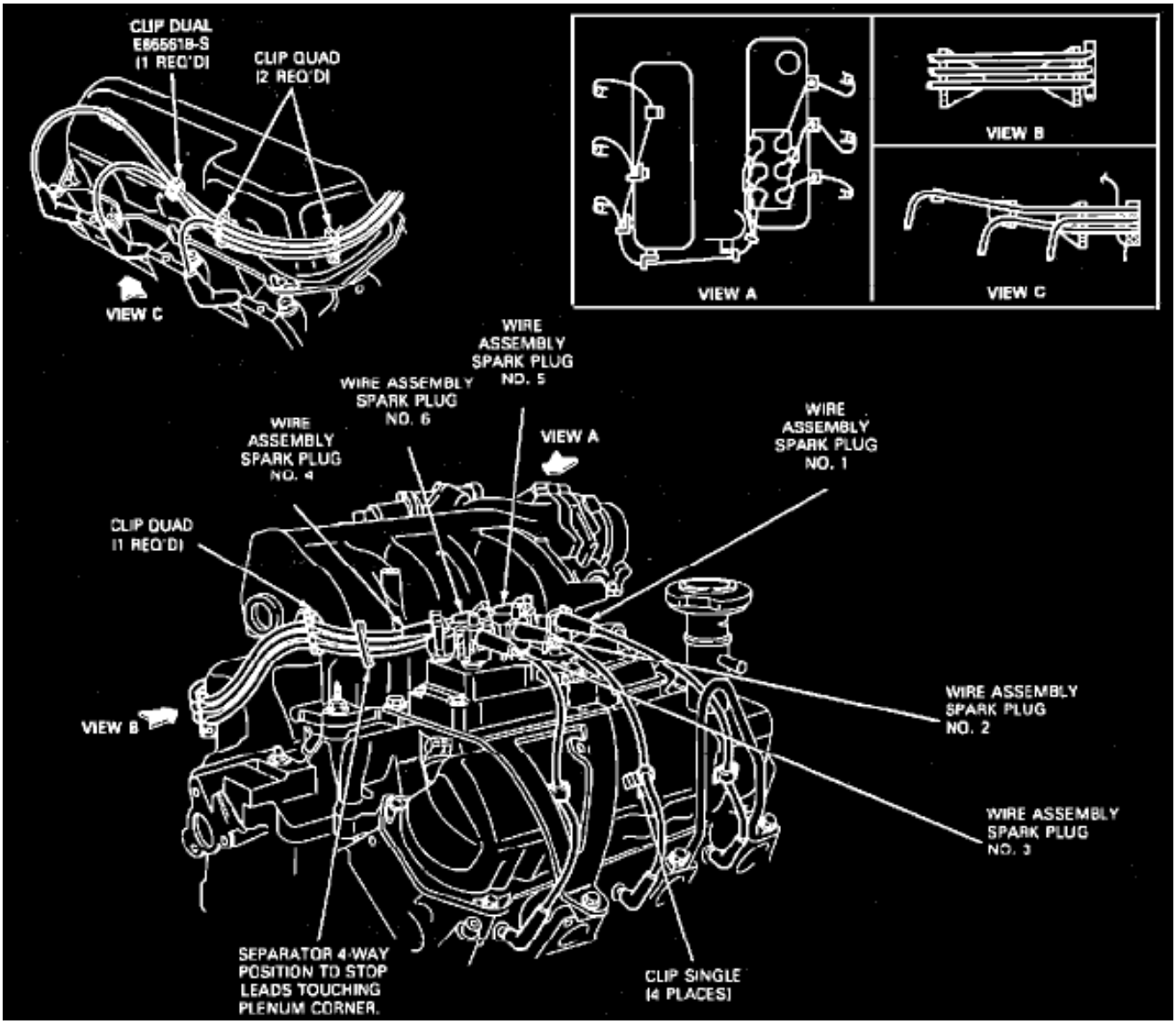
Ignition Timing Connector: Description and Operation

In-line Connector With Shorting Bar

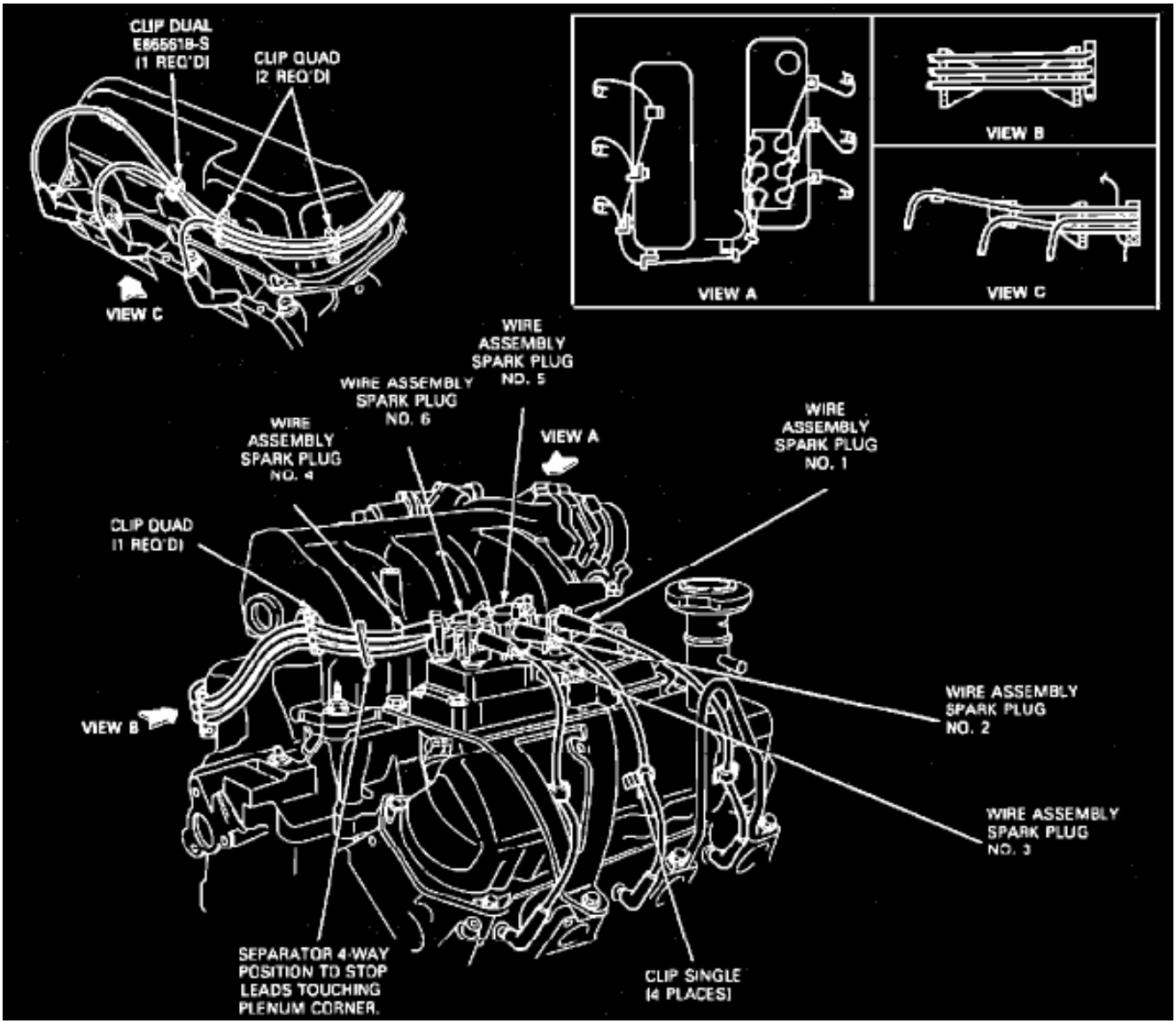
The octane adjustment switch is used to retard the ignition timing three to four degrees. When the switch jumper is INSTALLED, the timing is normal. With the jumper REMOVED, the timing is retarded. This is done to allow for optimum spark advance for effective combustion of the air/fuel mixture.



Timing Marks



Spark Plug Wire Assembly



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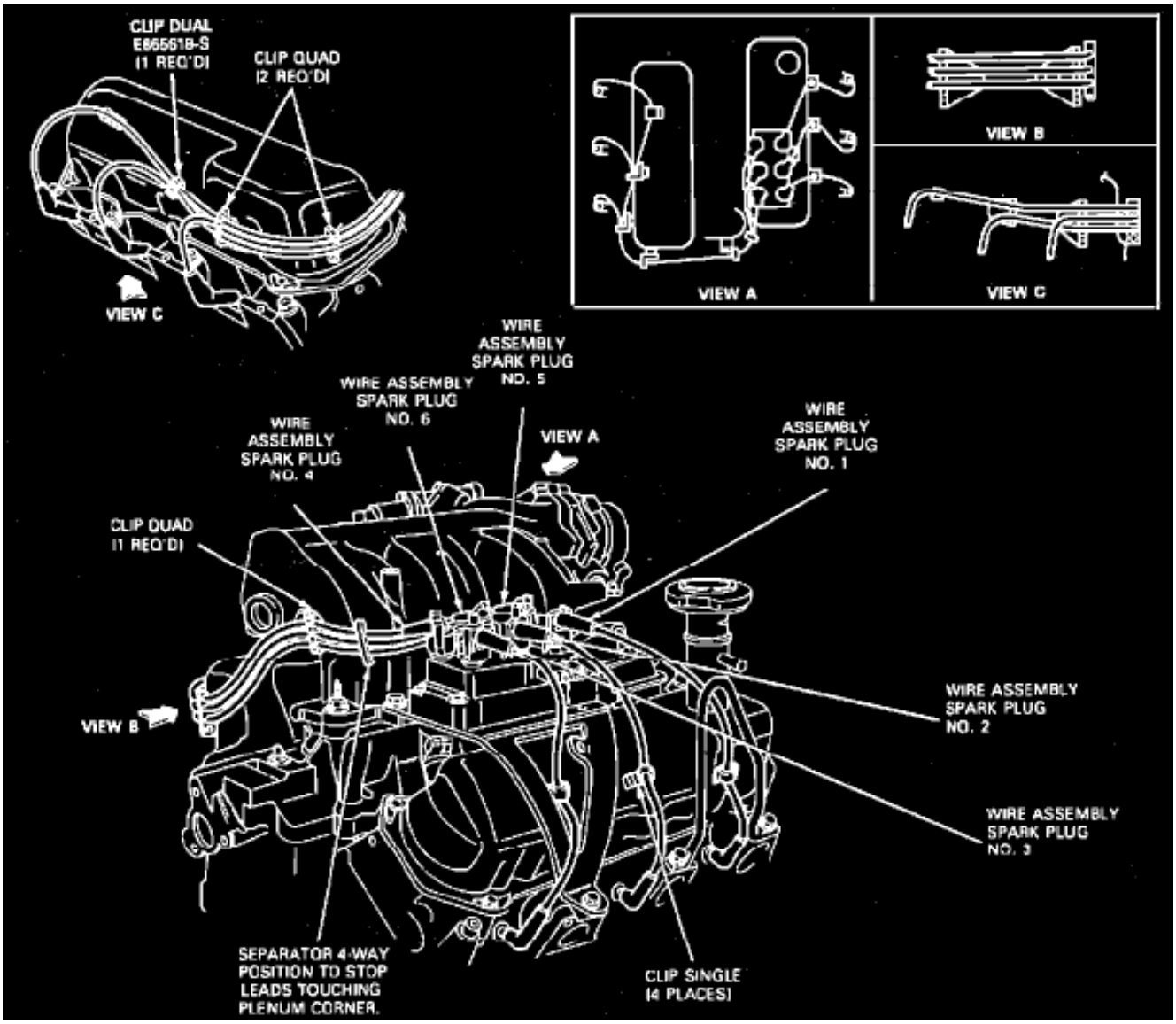

Ignition Cable: Service and Repair

Spark Plug Wire Assembly

Removal:

1. When removing spark plug wires from the spark plugs, use the spark plug wire remover T74P-6666-A or equivalent. Grasp and twist the boot back and forth on the plug insulator to free the boot.

2. Use the special tool or equivalent to pull the boot from the plug. Do not pull on the wire directly, as it may become separated from the connector inside the boot.

3. To remove the wires from the coil pack, squeeze the locking tabs of the coil wire retainer and remove using a twisting and pulling motion. Do not pull on the wire.

INSTALLATION:

CAUTION: Proper installation of spark plug wires is critical to vehicle operation. If one spark plug wire is not properly installed on the spark plug or ignition coil, both spark plugs connected to that coil may not fire under load.

1. Whenever a high tension wire is removed for any reason from a spark plug or ignition coil, or a new high tension wire is installed, Silicone Dielectric Compound D7AZ-19A331-A or equivalent must be applied to the boot prior to installation. Using a small tool, coat the entire interior surface of the boot.

2. Install each wire on the proper ignition coil terminal. The terminal cylinder numbers are identified on the ignition coil pack. Ensure that both coil boot retainer locking tabs have engaged.

3. Remove the wire retaining brackets from the old wiring set and install the brackets on the new wires in the same position. Install the wires and retaining brackets on the engine.

4. Connect the wires to the proper Spark plugs.

Spark Plug: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Article No. 92-3-8

01/29/92

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OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Spark Plug: Specifications Spark Plug Gap

SPARK PLUG

Electrode Gap ..... 0.052-0.056 in (1.3-1.4 mm)

Spark Plug: Specifications Tightening Torque

SPARK PLUG

Tightening Torque ..... 10-16 ft lb (14-22 Nm)

Compression Check: Specifications

Compression Pressure .....
PSI of lowest cylinder must be within 75% of highest

Valve Clearance: Locations

Valve Arrangement (Front To Rear)

.....

L.H. I-E-I-E-I-E Valve Arrangement (Front To Rear)

.....

R.H. E-I-E-I-E-I

Valve Clearance: Adjustments

The hydraulic roller tappets have non-adjustable rocker arms. The tappets are not adjustable, and if found to be excessively worn or noisy, should be tested and replaced.

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE			
Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

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One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

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^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

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^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

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^ 181, 189 (Fuel system lean, Bank 1 or 2)

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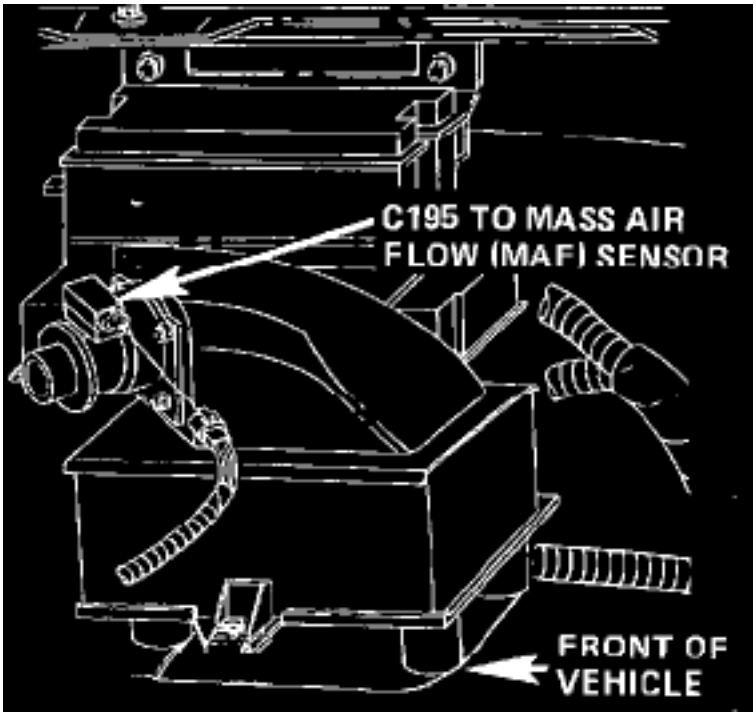
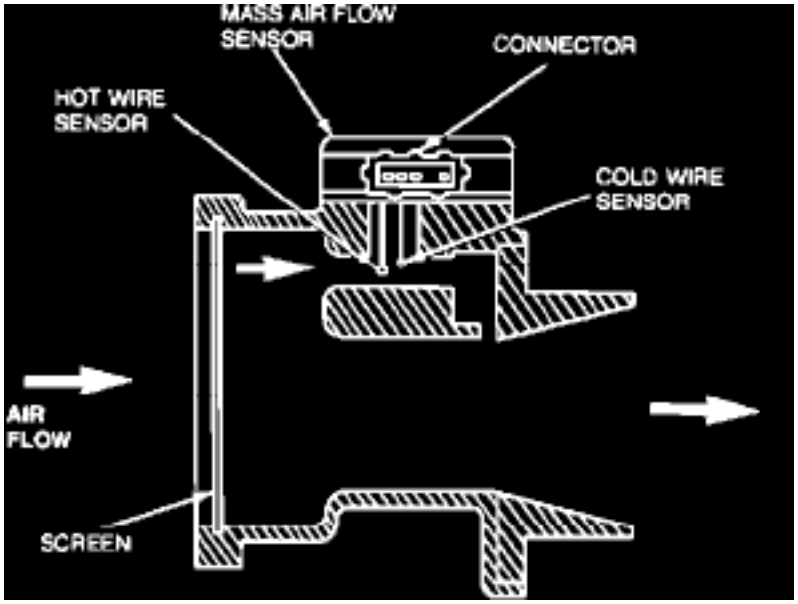
After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



Mass Air Flow (MAF) Sensor

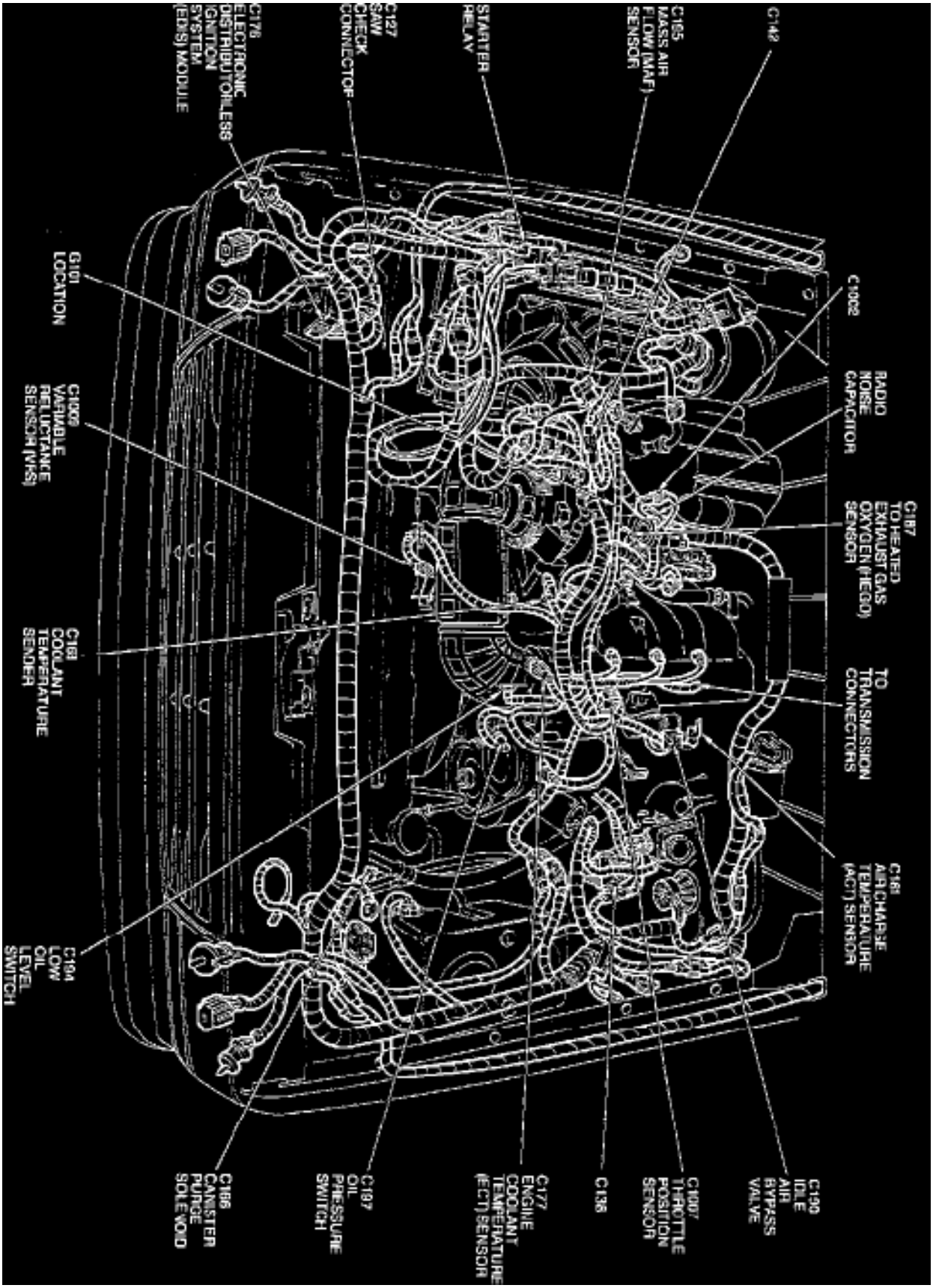


Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Intake Air Temperature Sensor > Component Information > Locations

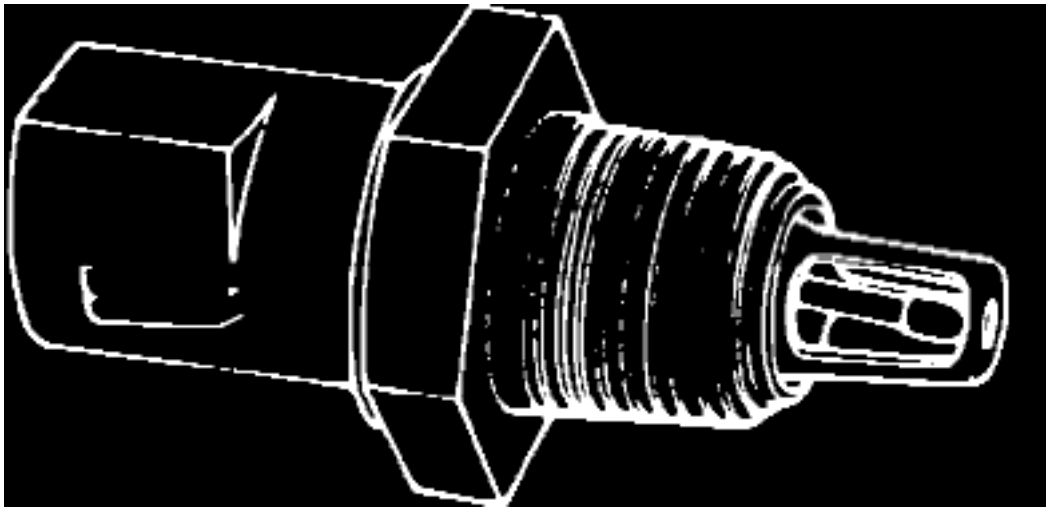


Intake Air Temperature Sensor: Locations

Engine Compartment Components.

Top LH Side Of Engine

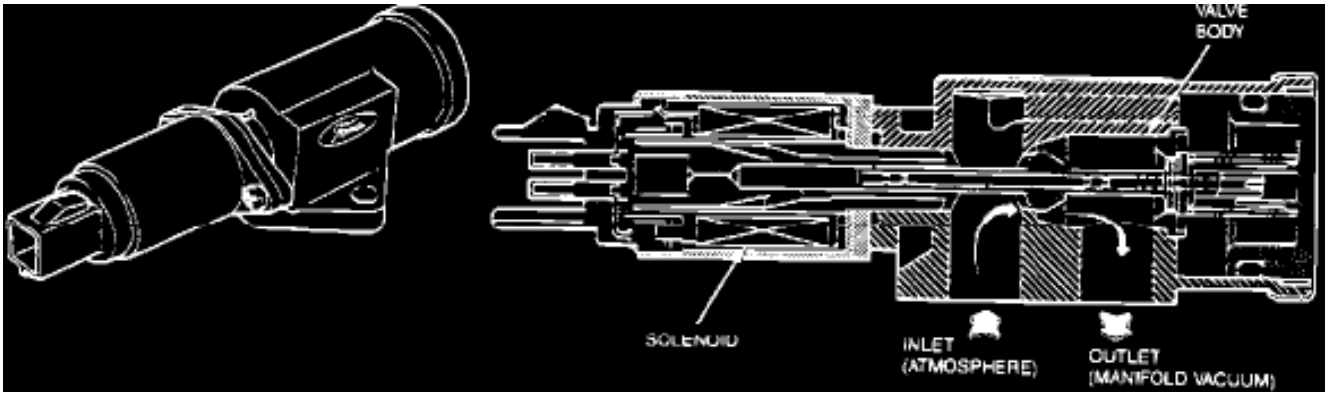
Applicable to: 4.0L/V6-244



Intake Air Temperature Sensor: Description and Operation

Air Charge Temperature (ACT) Sensor

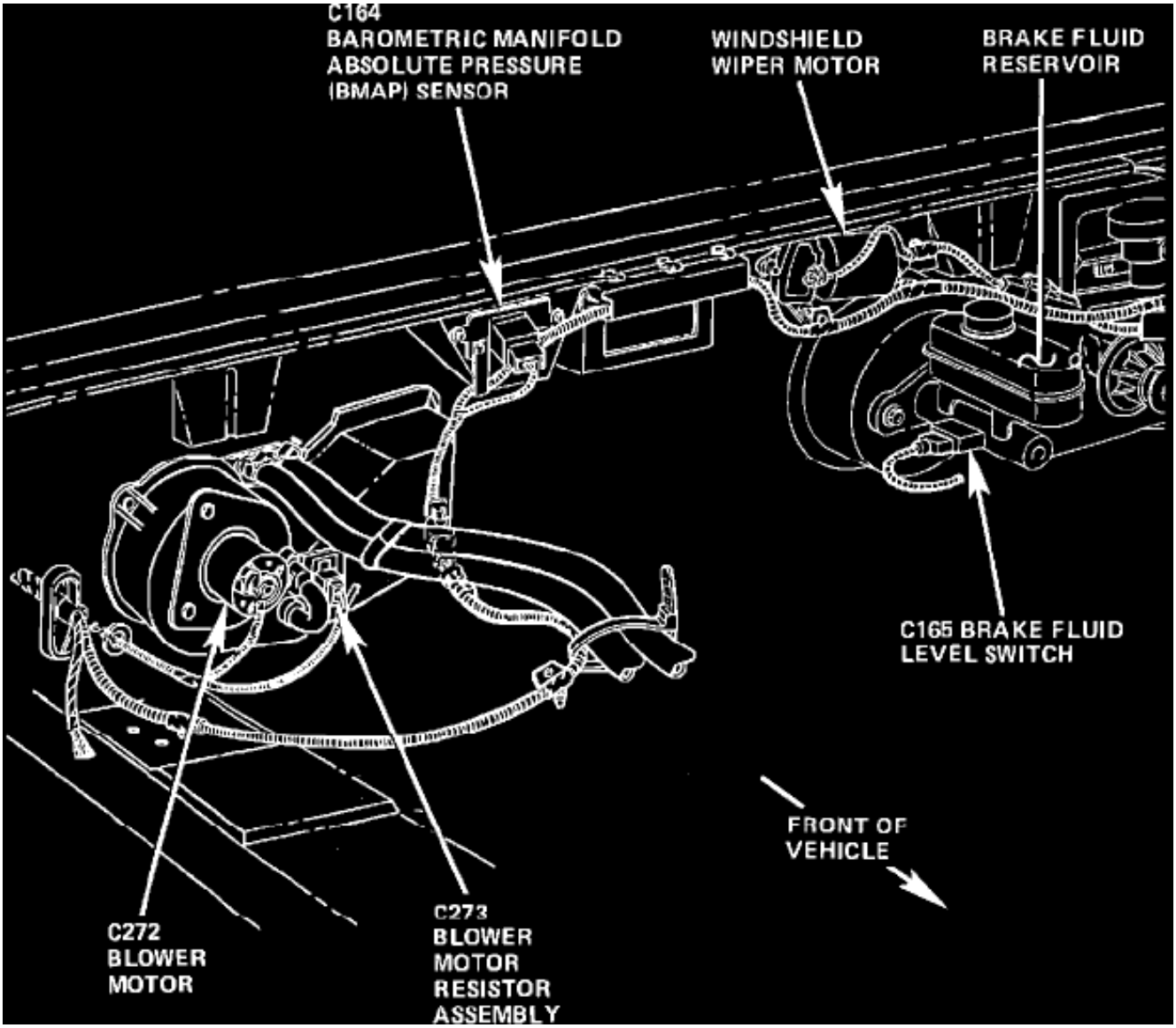
The Air Charge Temperature (ACT) sensor is threaded into the intake air passage with a sensing element extending into the air chamber. The ACT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) will also change. The ECA reads the varying sensor resistance and determines the air charge temperature, using this information to optimize the air/fuel mixture. The ACT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.



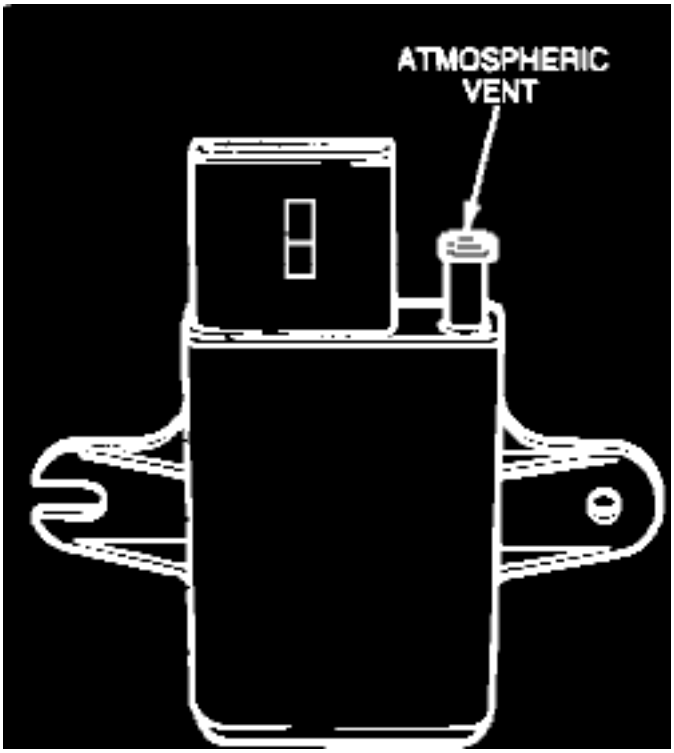
Auxiliary Air Valve (Idle Speed): Description and Operation

Idle Air Bypass Valve

The Idle Speed Control Bypass Air (ISC-BPA) valve is used to control engine idle speed and is operated by the Engine Control Assembly (ECA). This valve allows air to pass around the throttle plates to control cold engine fast idle, no touch start, over temperature idle boost and engine idle load correction.



Barometric/manifold Absolute Pressure (BMAP) Sensor

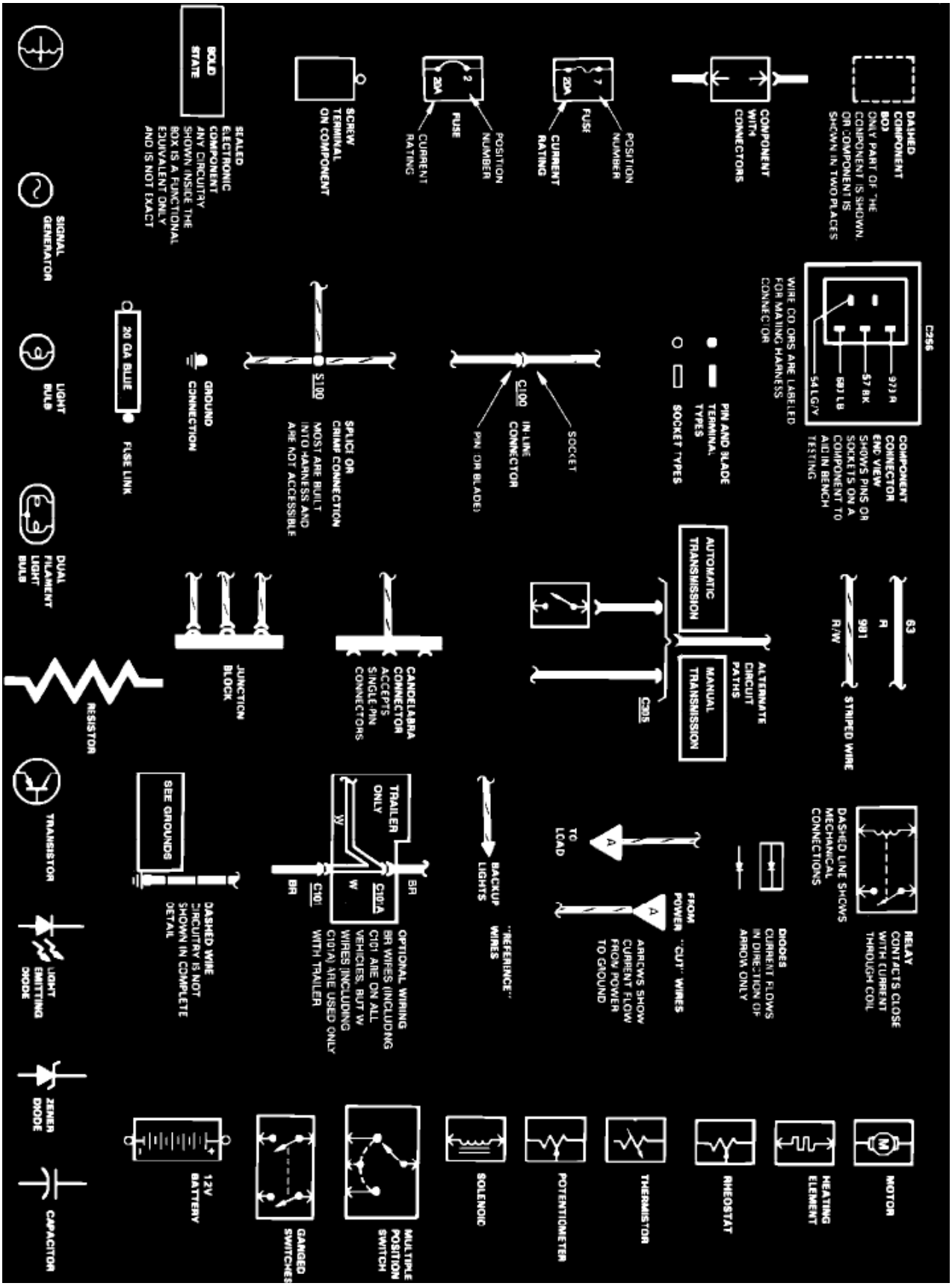


Barometric Pressure Sensor: Description and Operation

Barometric Pressure Sensor

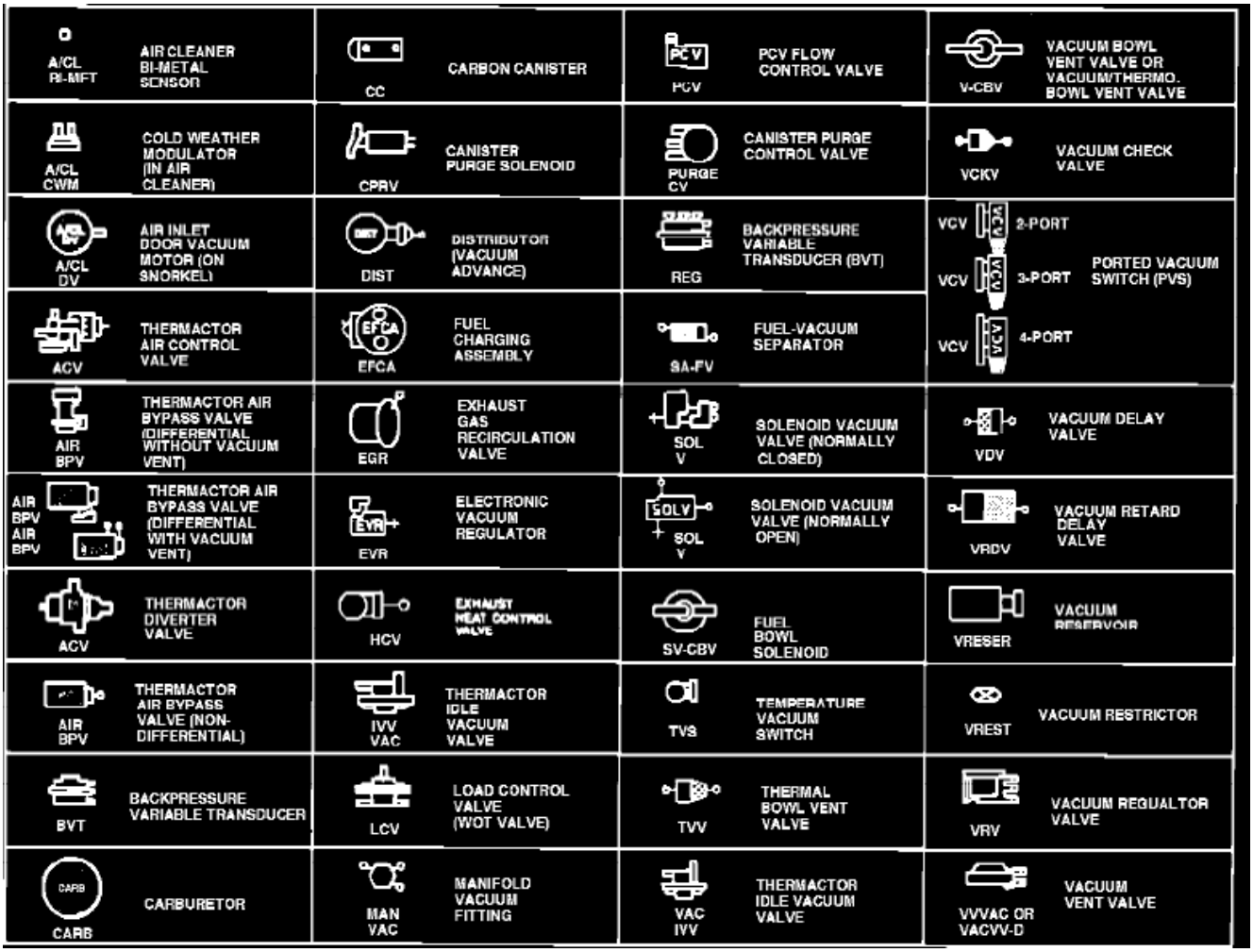
The Barometric Pressure (BP) sensor is a frequency generating device that produces a varying signal depending on the amount of atmospheric (barometric) pressure. The Engine Control Assembly (ECA) monitors the frequency emitted from the BP sensor and converts the signal to atmospheric pressure. The ECA uses this reading to update the barometric pressure value stored in RAM memory. The ECA uses the input from the BP sensor to optimize the air/fuel ratio, ignition timing adjustment, and EGR flow control. The BP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Camshaft Position Sensor > Component Information > Diagrams > Diagram Information and Instructions

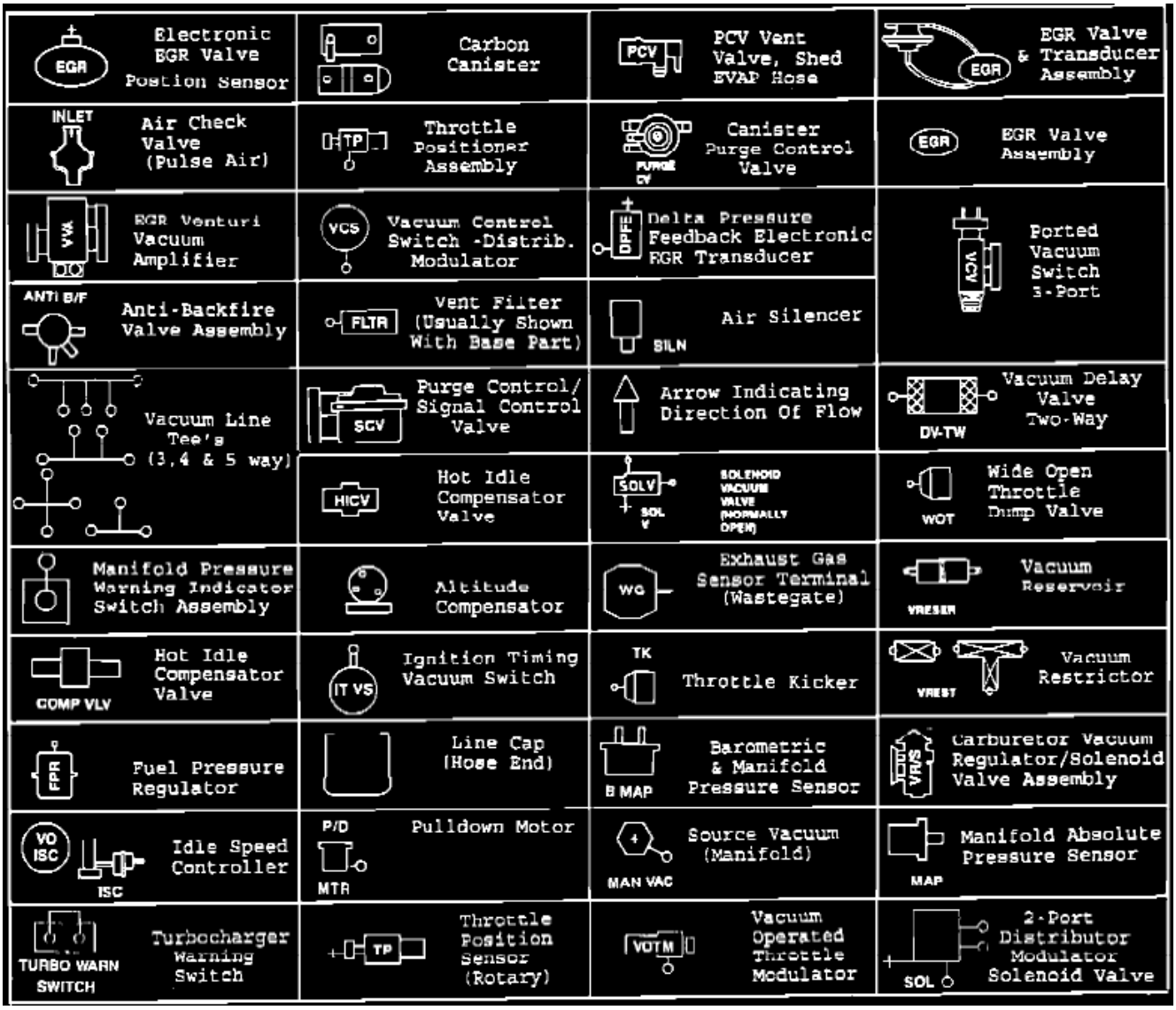


Camshaft Position Sensor: Diagram Information and Instructions

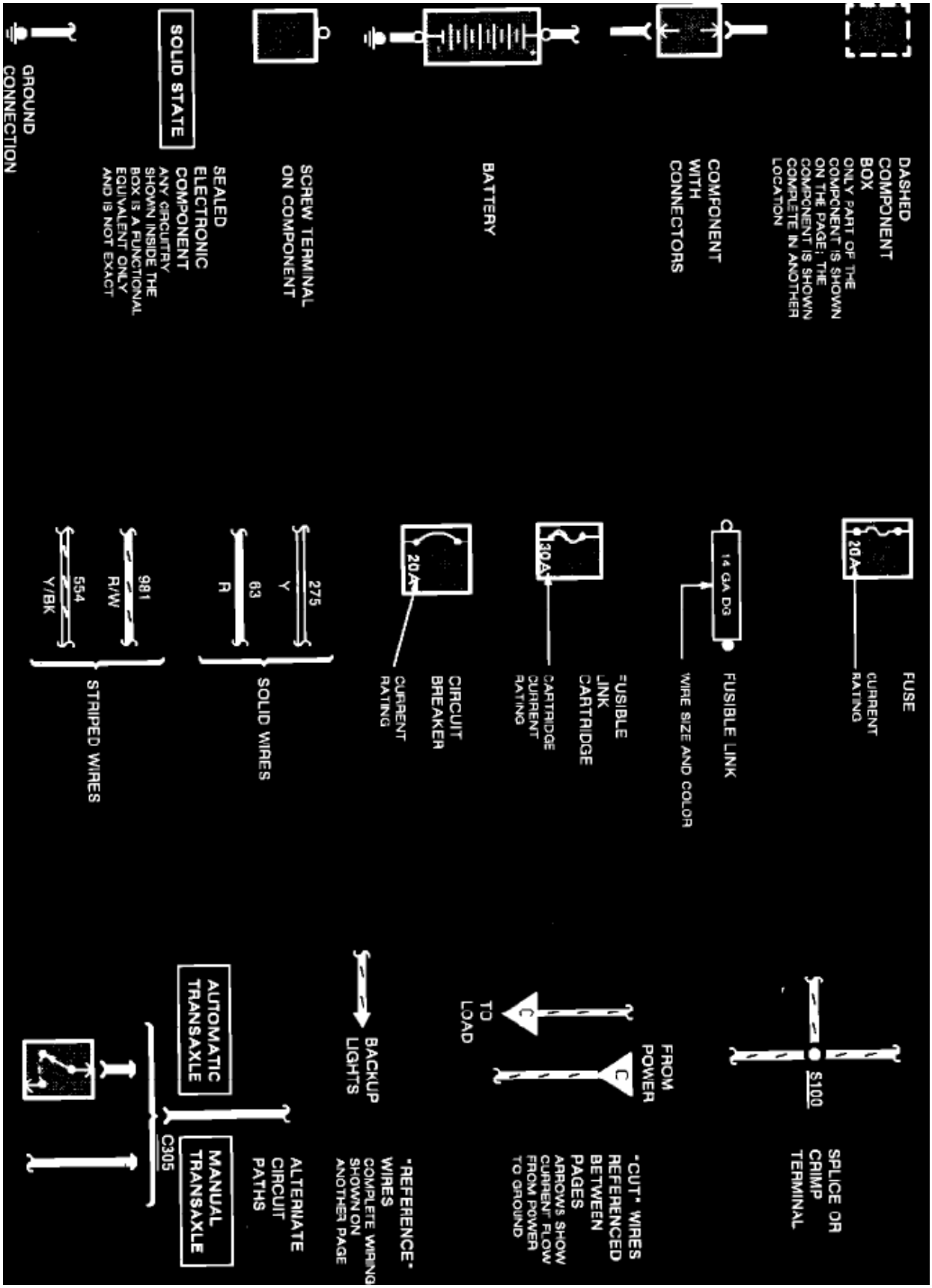
Symbol Identification



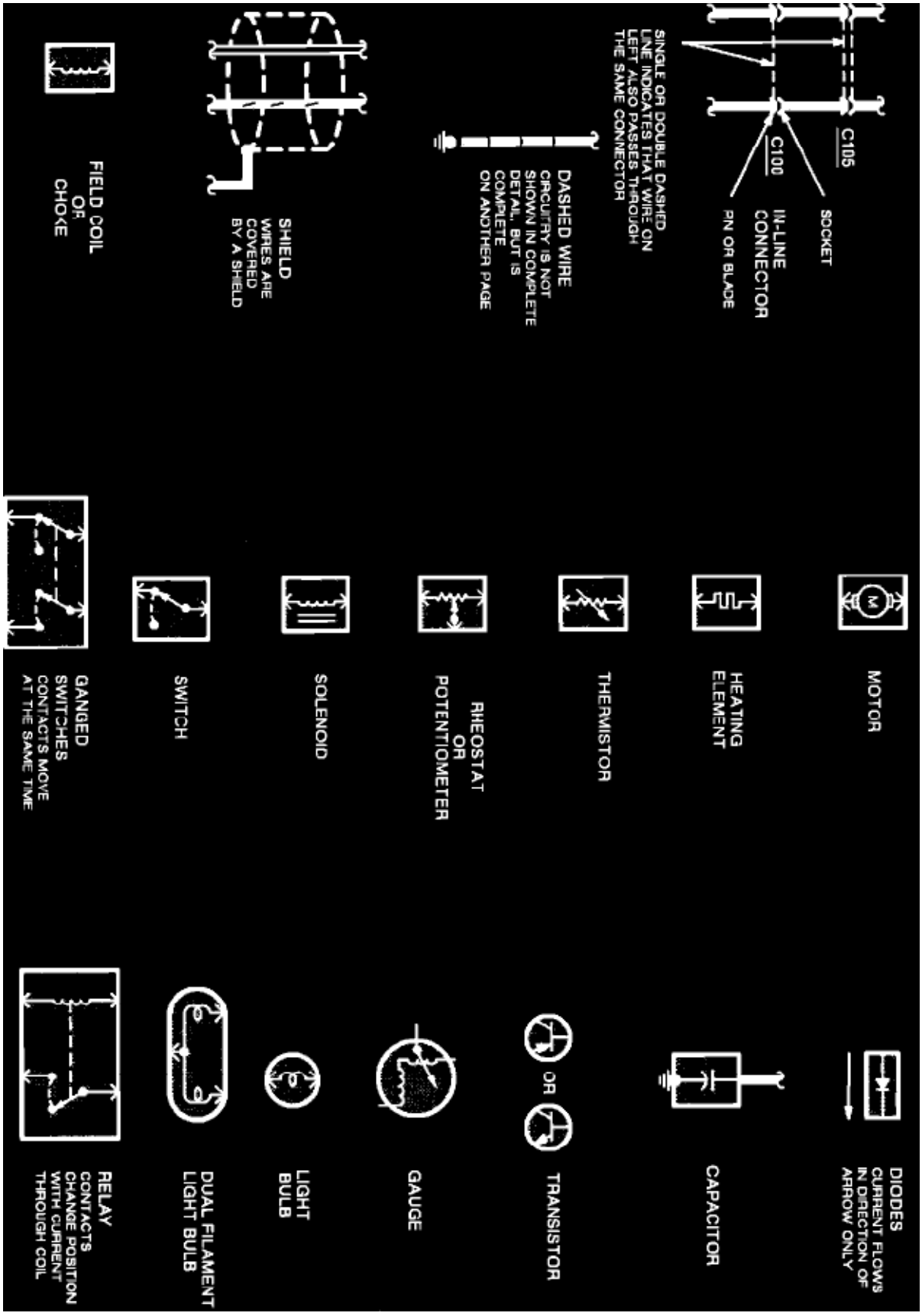
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
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SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
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DUAL FILAMENT LIGHT BULB
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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

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P: Purple

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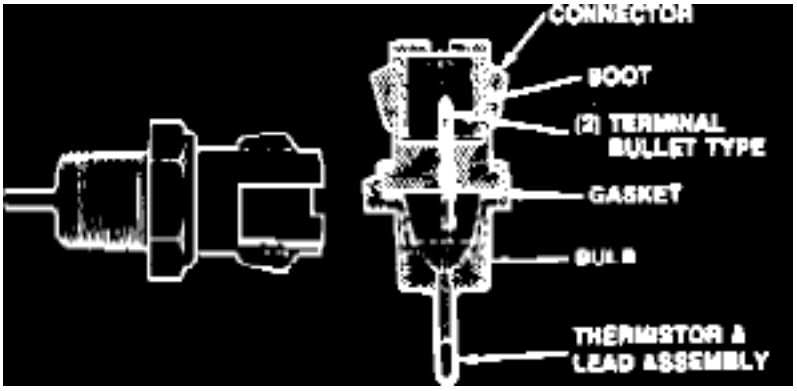


Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

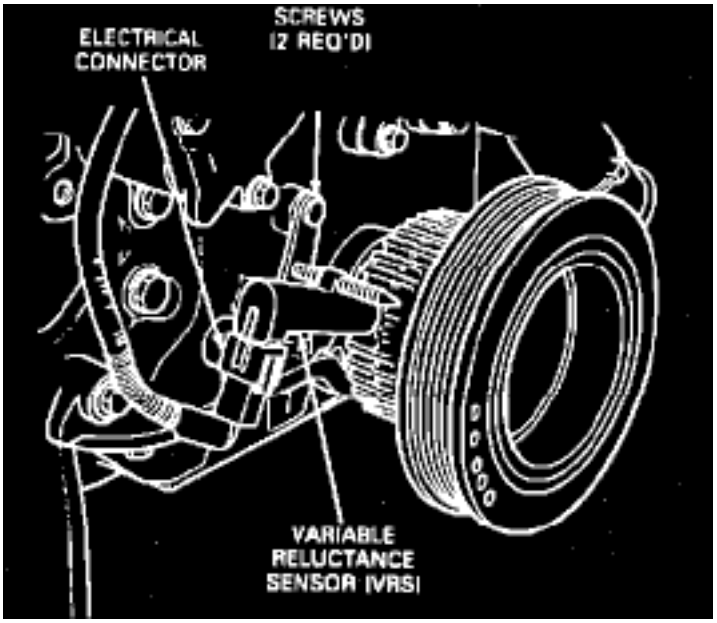
The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Crankshaft Position Sensor: Specifications

FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

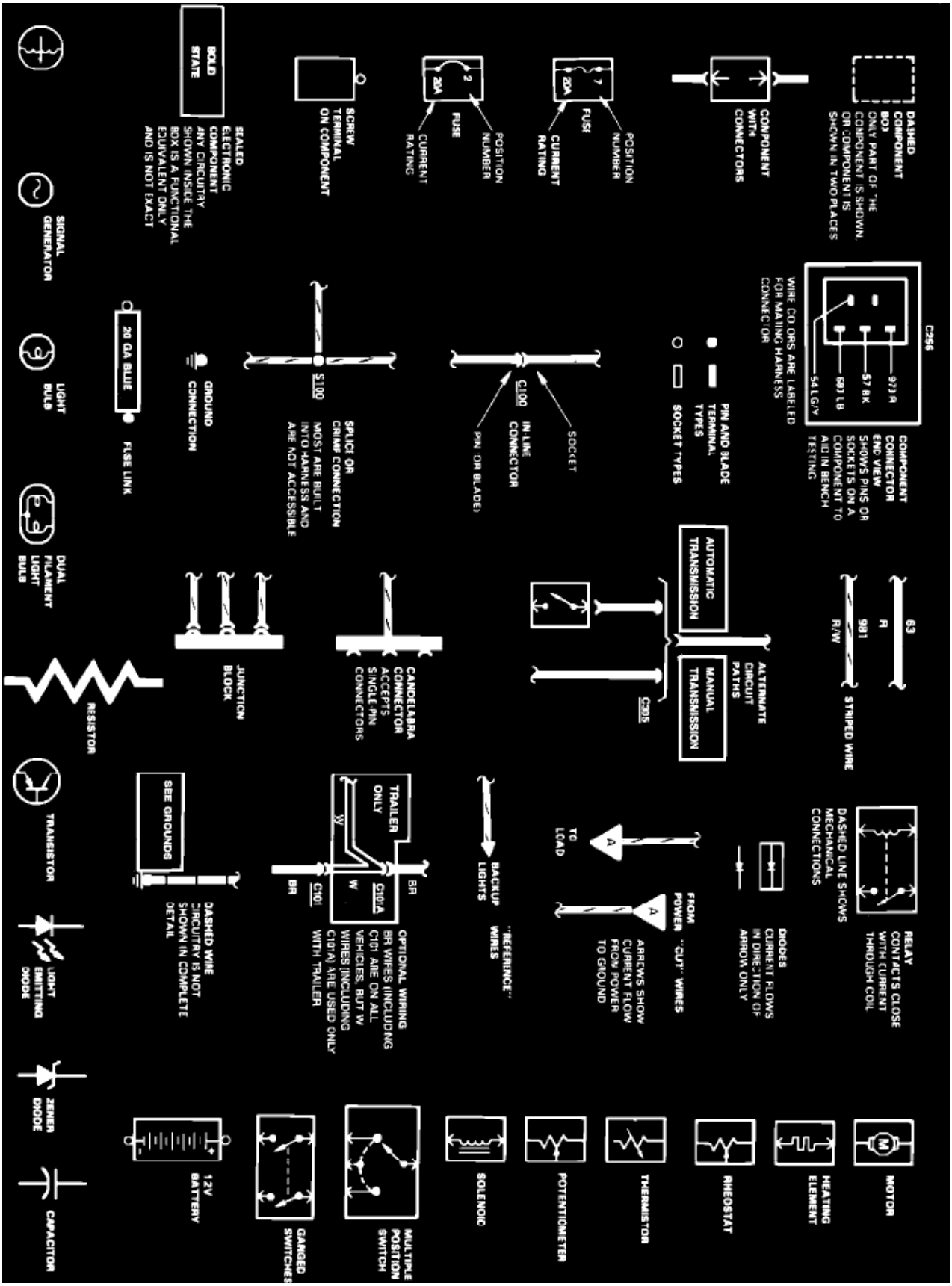
TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)



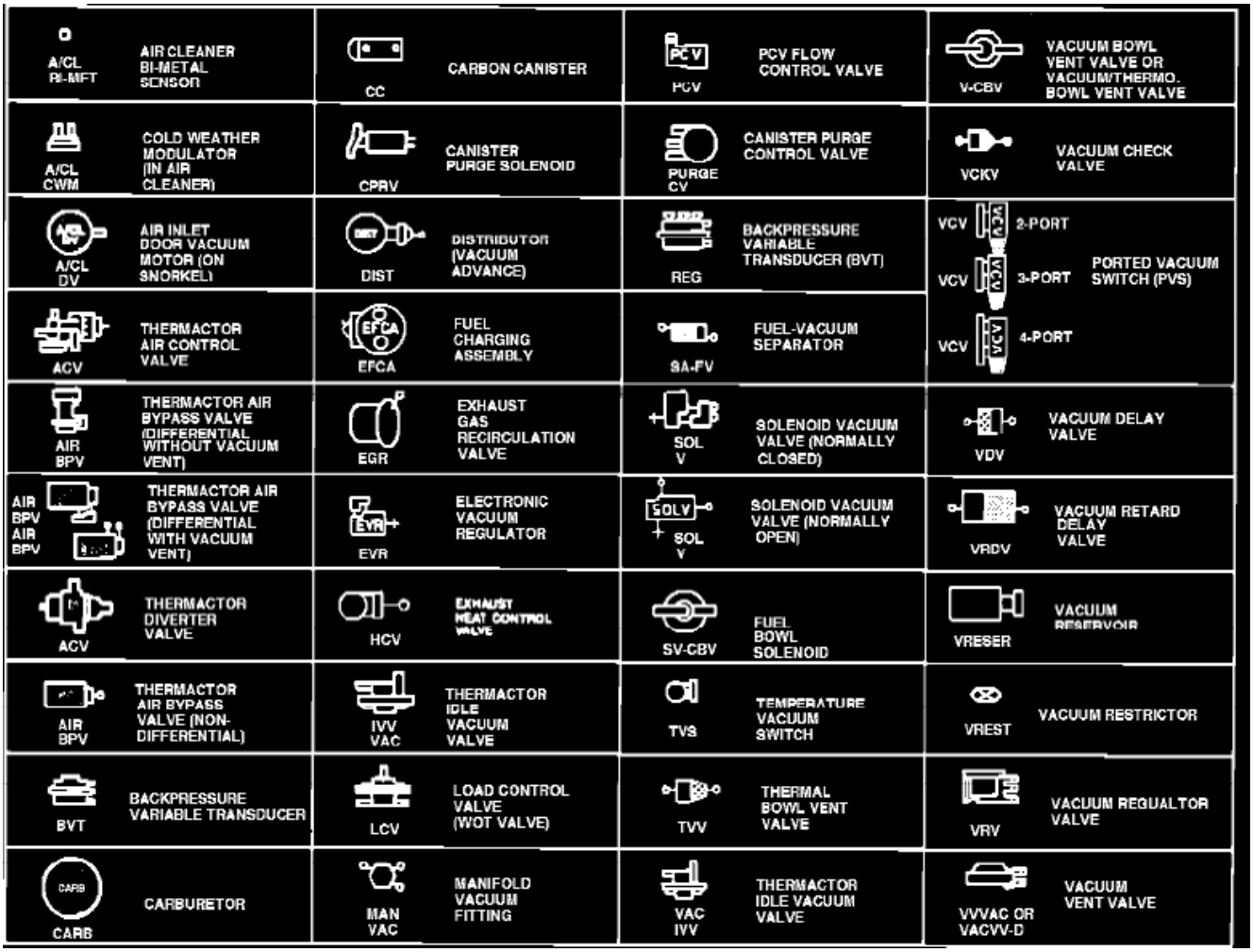
Variable Reluctance (Crankshaft Position) Sensor

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Crankshaft Position Sensor > Component Information > Diagrams > Diagram Information and Instructions

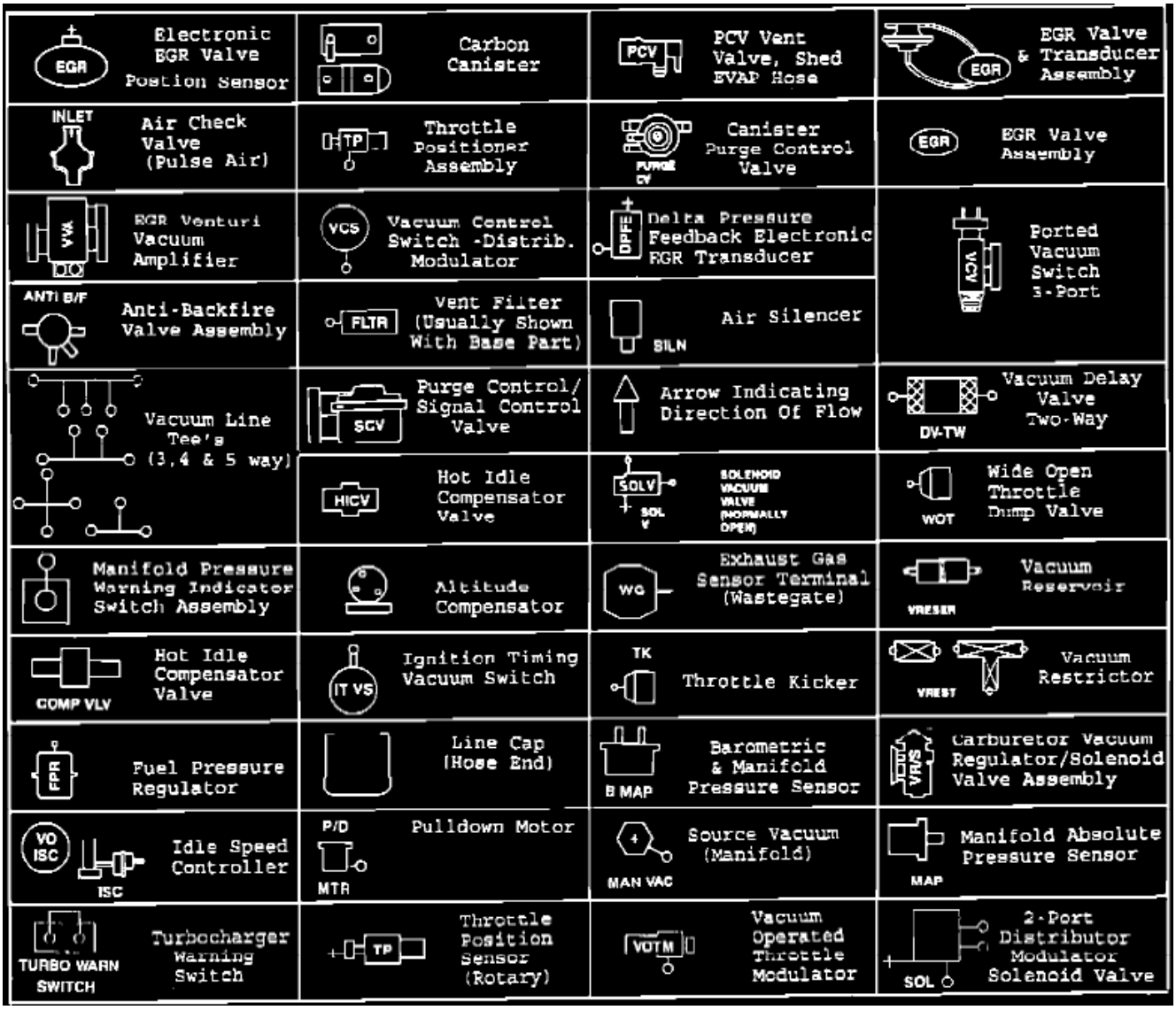


Crankshaft Position Sensor: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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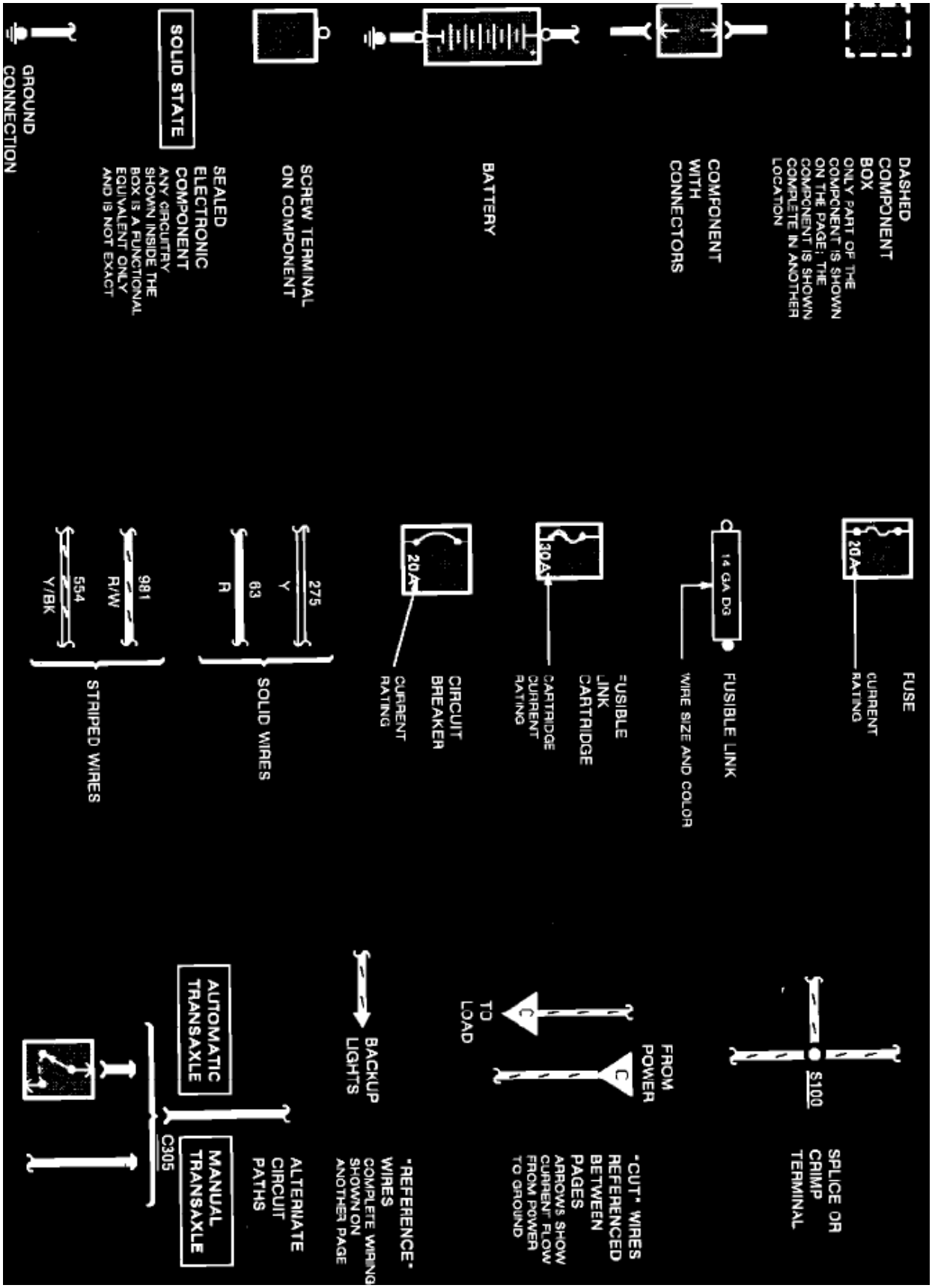
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GROUND CONNECTION
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CURRENT RATING
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14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
"CUT" WIRES REFERENCED BETWEEN PAGES
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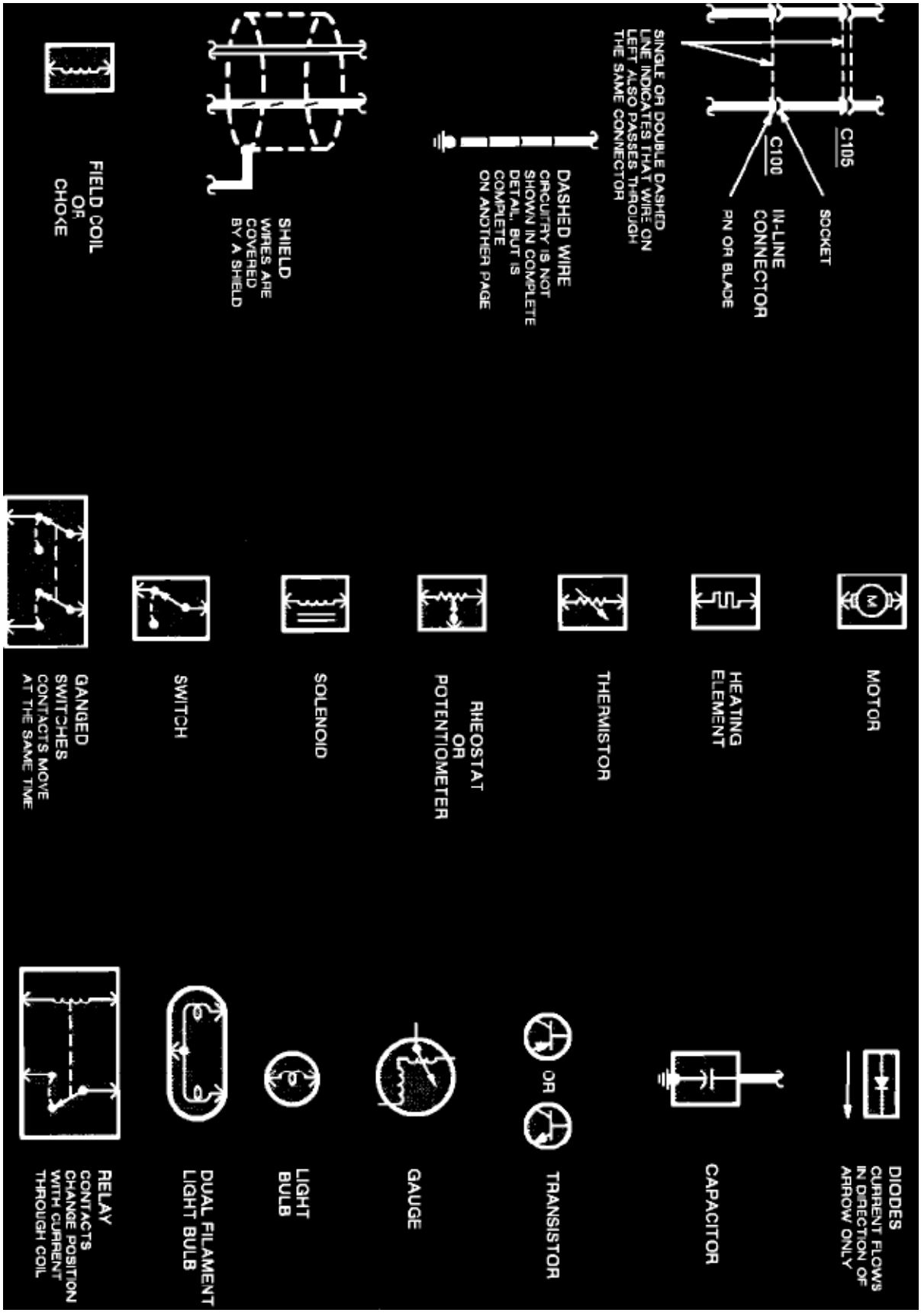
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
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SOLENOID
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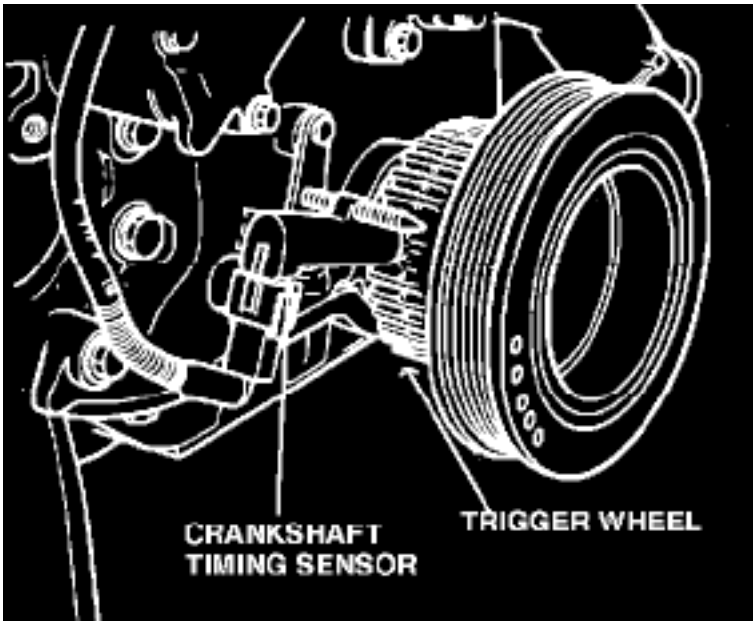
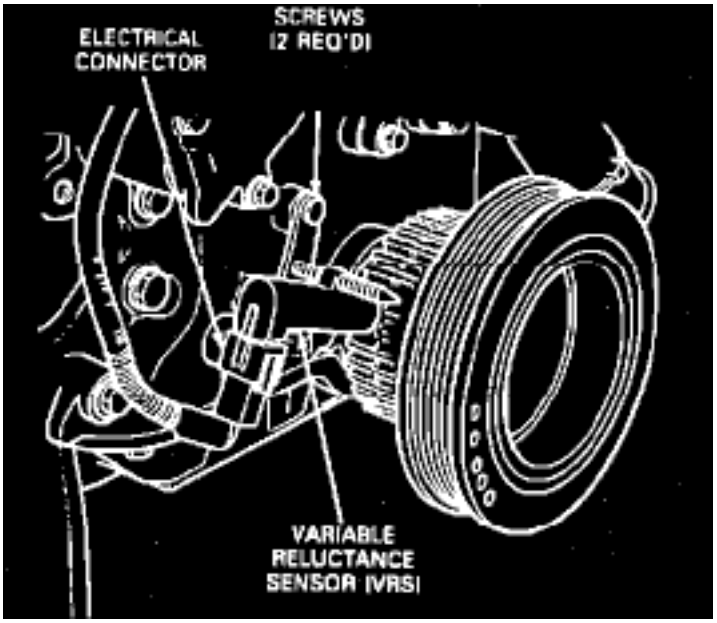


Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

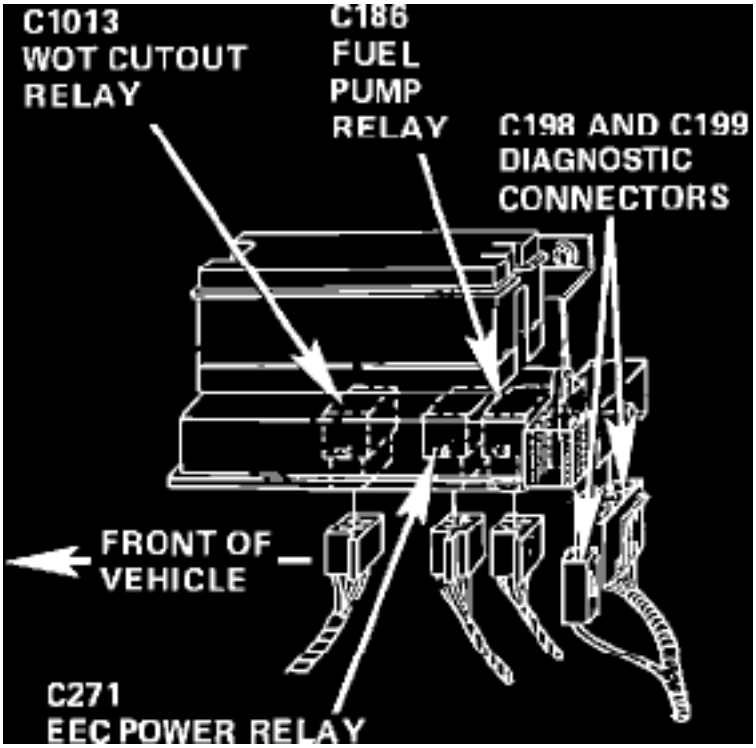
INSTALLATION:

1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

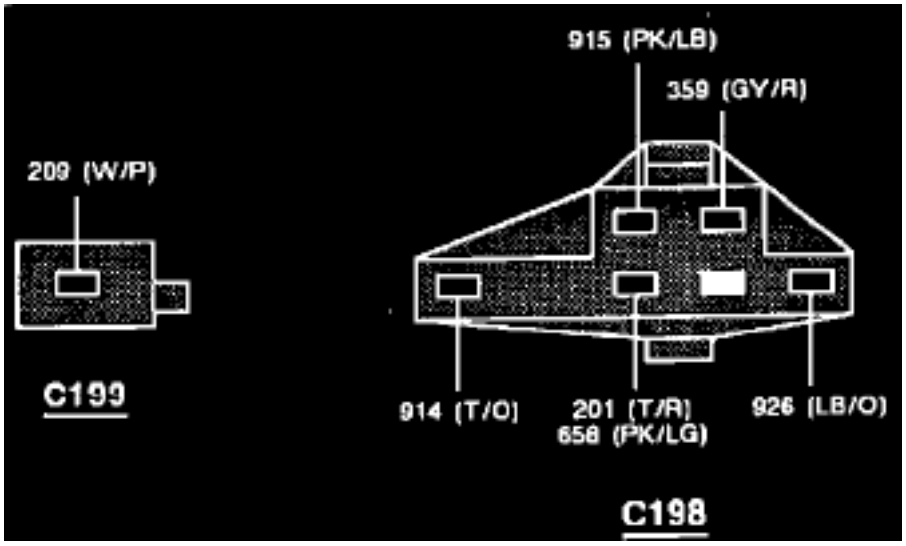
2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

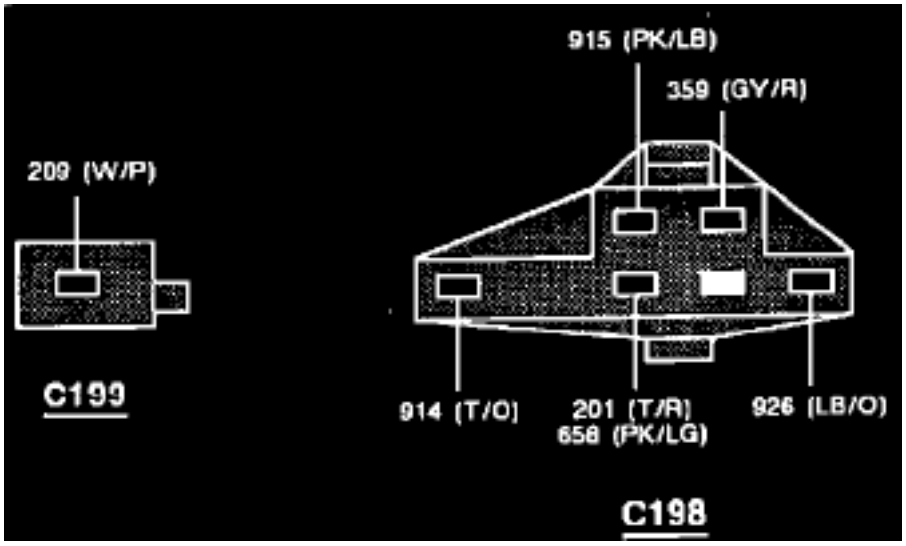
4. Connect the negative battery cable.



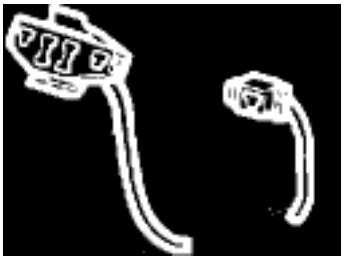
Relay And Diagnostic Connectors



Diagnostic Connector



Diagnostic Connector



Diagnostic Mode Switch/Connector: Description and Operation

Diagnostic Connector

The diagnostic connector is used to access the diagnostic mode of the Engine Control Assembly (ECA).

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: Customer Interest Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

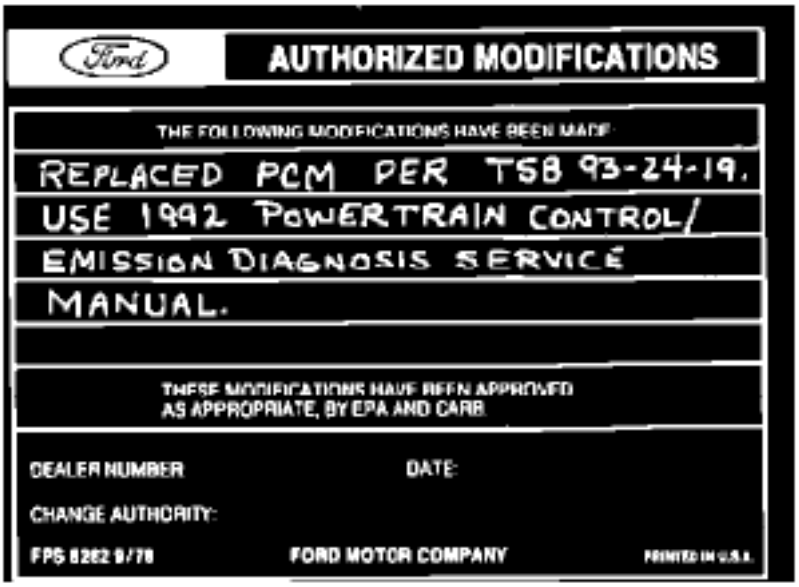
3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART

APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

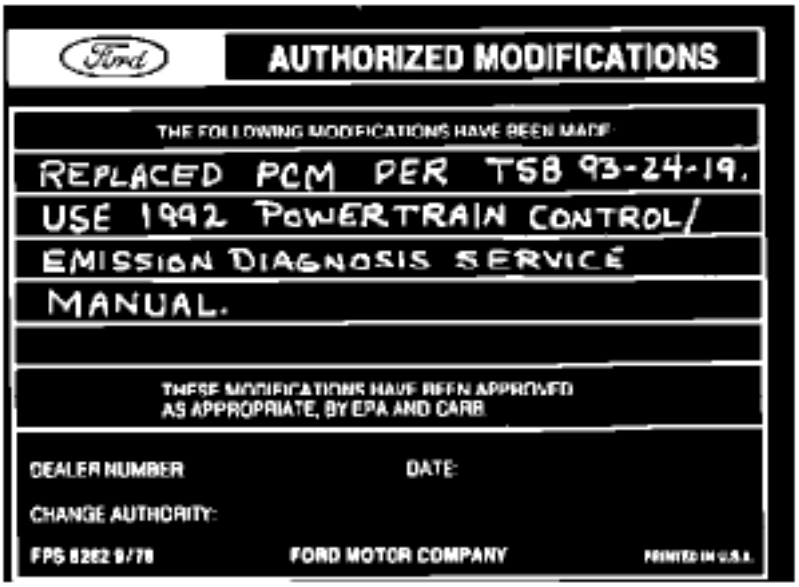
b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART		
APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

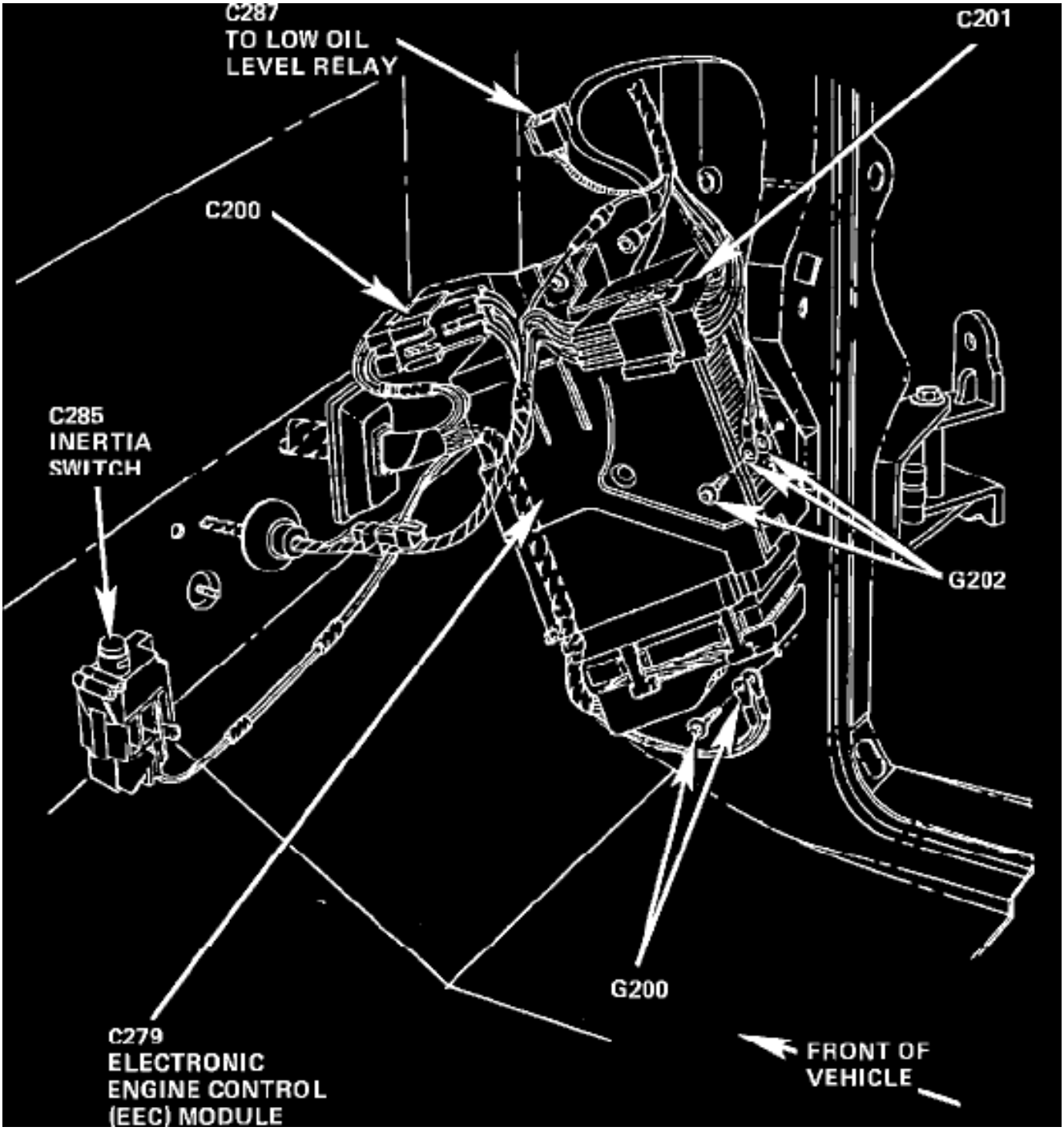
- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

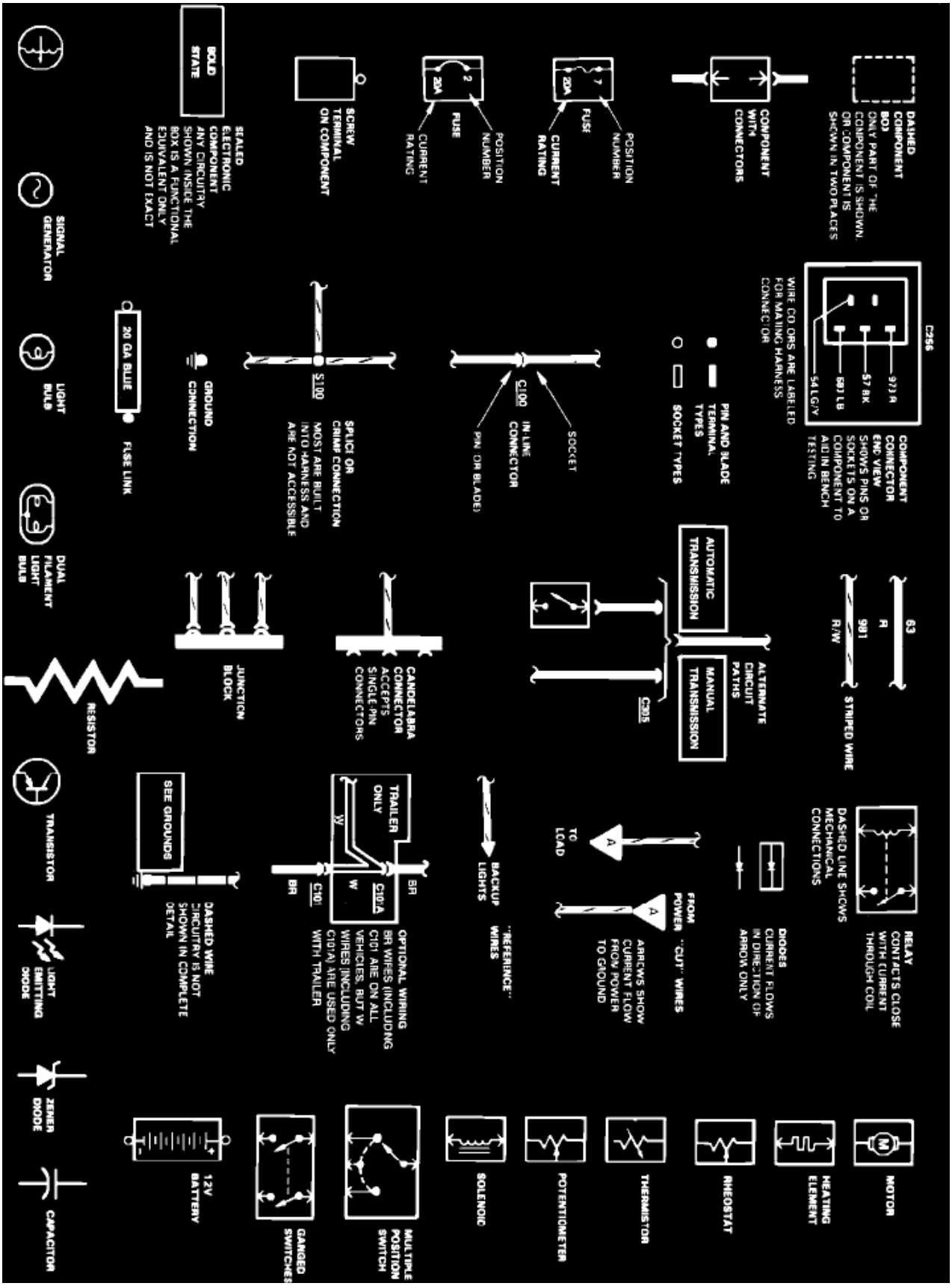
ODOR 08

OASIS CODES: 403000, 623000



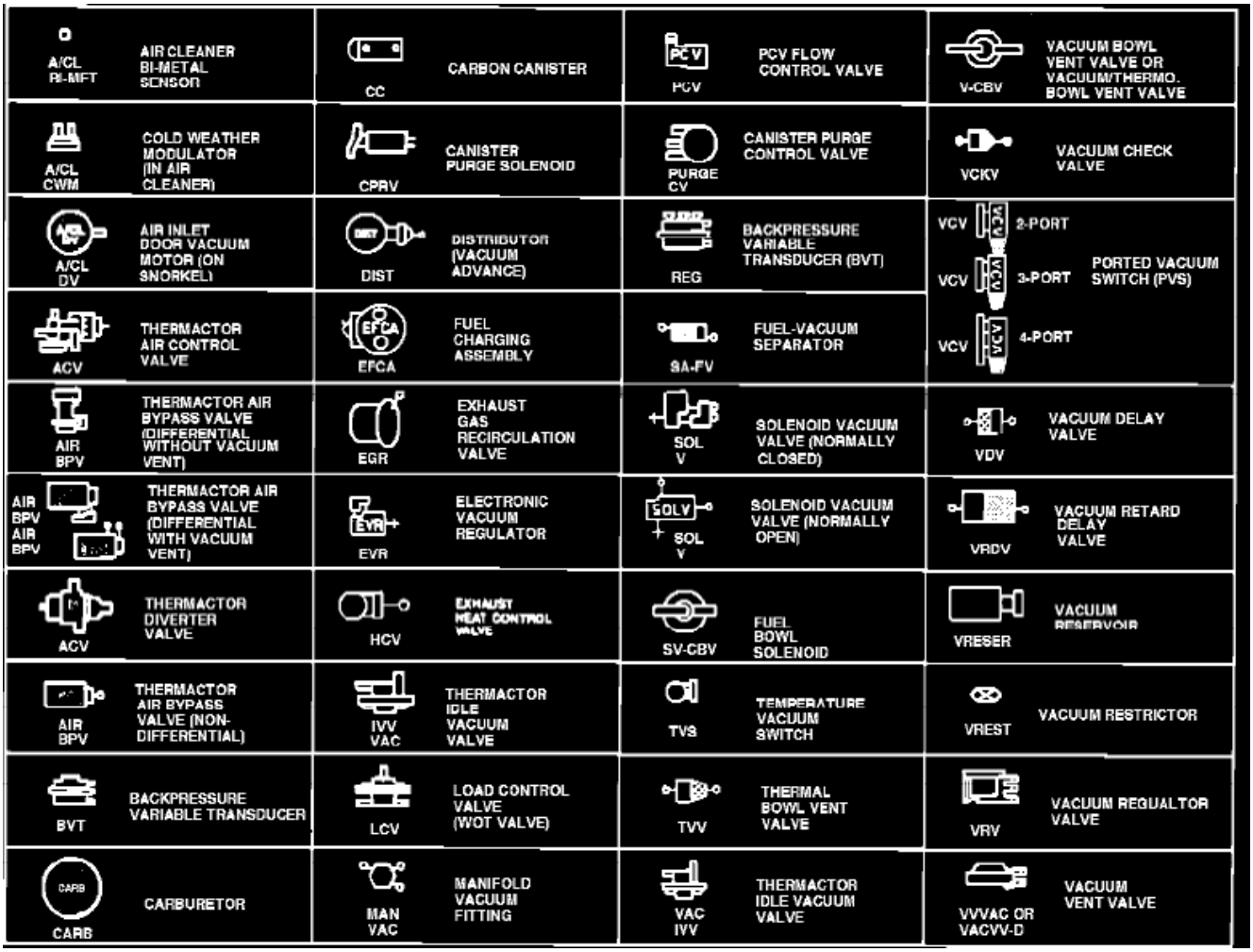
Engine Control Assembly (ECA)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Engine Control Module > Component Information > Diagrams > Diagram Information and Instructions

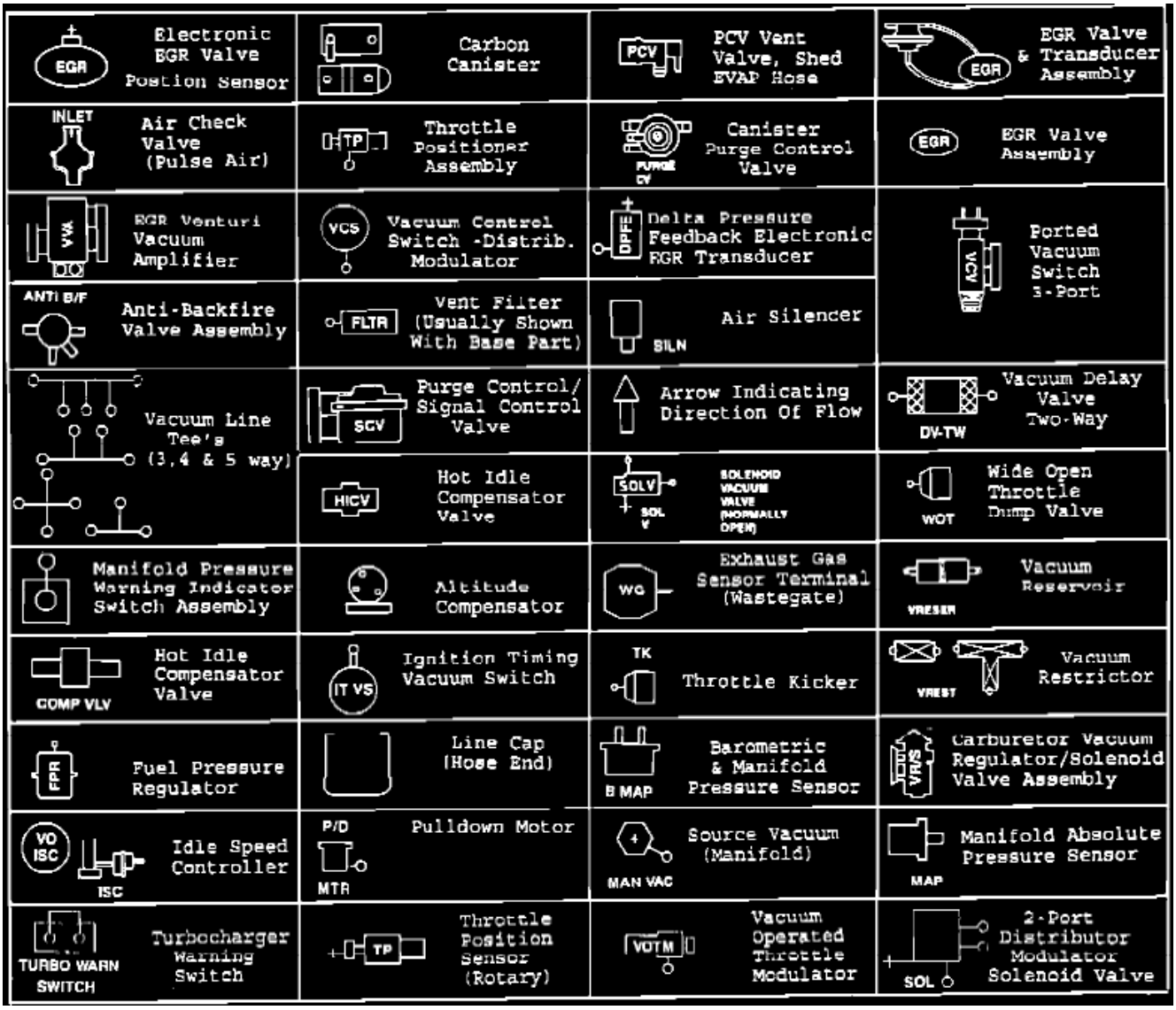


Engine Control Module: Diagram Information and Instructions

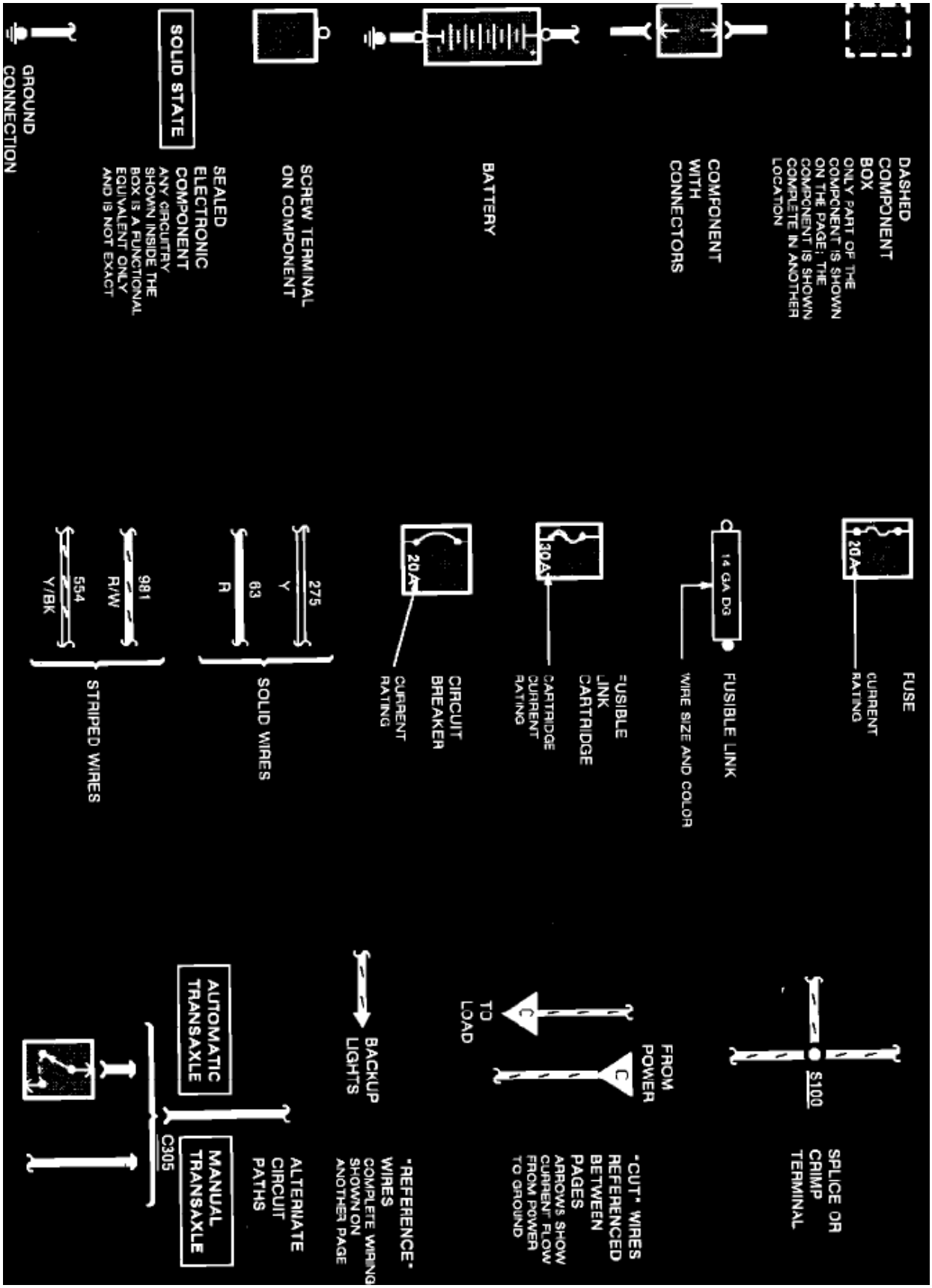
Symbol Identification



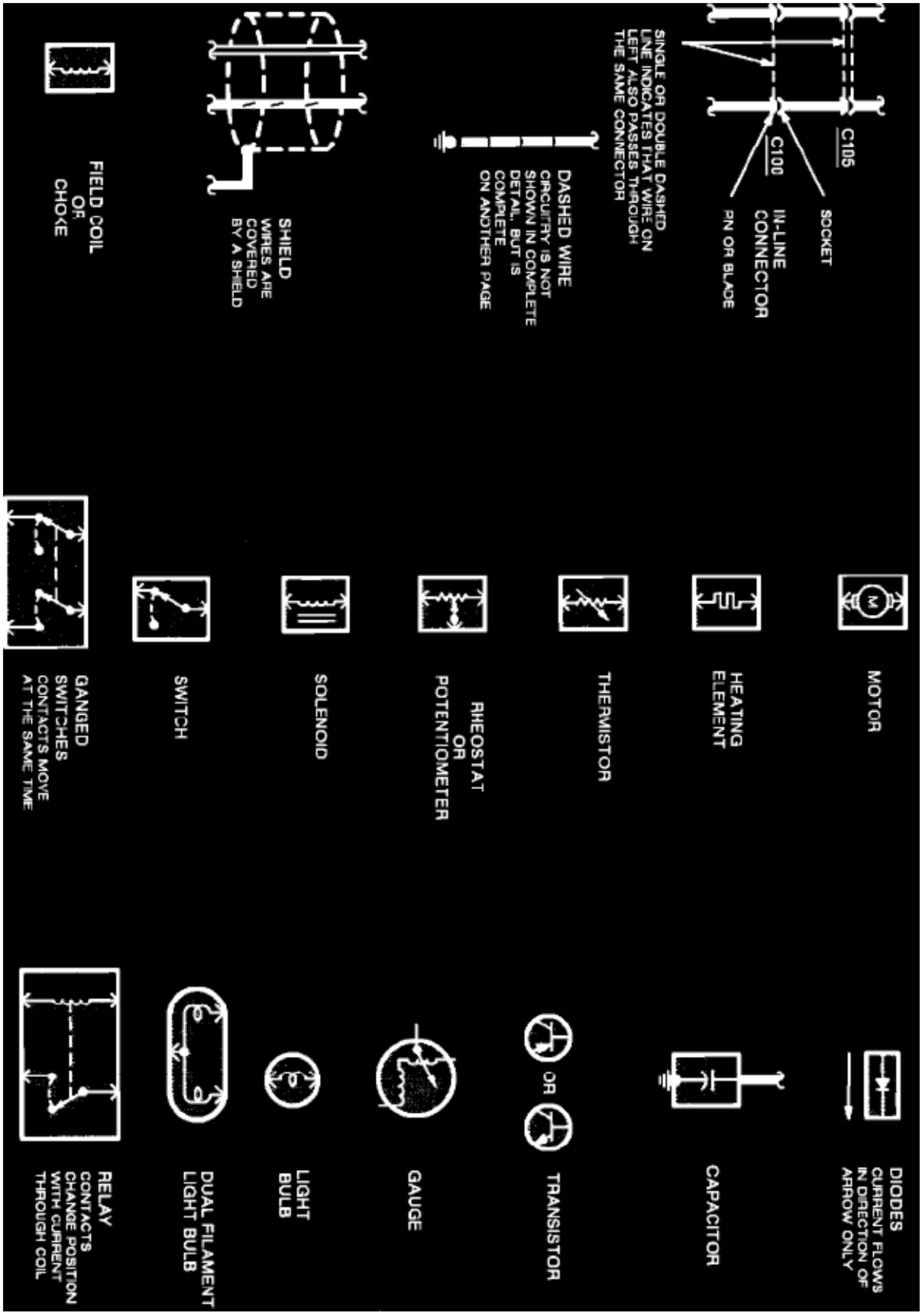
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

T: Tan

V: Violet

W: White

Y: Yellow

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (A/T only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
9	915	PK/LB	Data Communications Link (-)	DATA (-)
10	198	DG/O	A/C Cycling Switch	ACCS
14	967	LB/R	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Sensor Return	MAF RTN
16	259	O/R	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output/Malfunction Indicator Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air) Solenoid	ISC
22	926	LB/O	Fuel Pump	FP
25	743	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
28	914	T/O	Data Communications Link (+)	DATA (+)
29	74	GY/LB	Heated Exhaust Gas Oxygen Sensor	HEGO
30	199	LB/Y	Clutch Interlock Switch (M/T Only)	CIS
30	199	LB/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge Solenoid	CANP
36	929	PK	Spark Angle Width	SAW
37	361	R	Vehicle Power	VPWR
40	570	BK/W	Power Ground	PWR GND
44	242	DG	Octane Adjust	OCT ADJ
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	99	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	237	O/Y	Shift Solenoid (A/T Only)	SS
53	480	P/Y	Clutch Converter Override (A/T Only)	CCO
54	331	PK/Y	WOT A/C Cut-Off	WAC
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 - Controls Engine Cylinder Numbers 1, 2, and 3)	INJ BANK 1
59	556	W	Injector (Bank 2 - Controls Engine Cylinder Numbers 4, 5, and 6)	INJ BANK 2
60	570	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.

ECA Connector Pin Identification

Engine Control Module: Description and Operation Electronic Control Assembly (ECA)

The Electronic Control Assembly (ECA) receives ignition ground and Profile Ignition Pickup (PIP) signals from the EDIS module then generates a Spark Angle Word (SAW) output signal based on fuel, air and other sensor information. An IDM signal is received from the EDIS module to determine if a failure mode should be recorded. For diagnosis and testing of the ECA refer to "COMPUTERIZED ENGINE CONTROLS".

Engine Control Module: Description and Operation Failure Mode Effects Management

PURPOSE

Operating mode that attempts to keep the vehicle driveable in the event of certain Electronic Engine Control (EEC) or ignition system failures.

Engine Control Module: Service and Repair

The processor stores data about vehicle operating conditions and uses this information to compensate for component tolerances. When an emission related component is replaced, Keep Alive Memory (KAM) should be cleared to erase the data stored by the processor from the original component.

1. With the ignition switch OFF, disconnect the negative battery cable for a minimum of five minutes, then reconnect the cable.

2. Operate the vehicle for a minimum of ten miles to allow the Engine Control Assembly (ECA) to relearn values for optimum driveability and performance. NOTE: Distance varies with vehicle application.

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

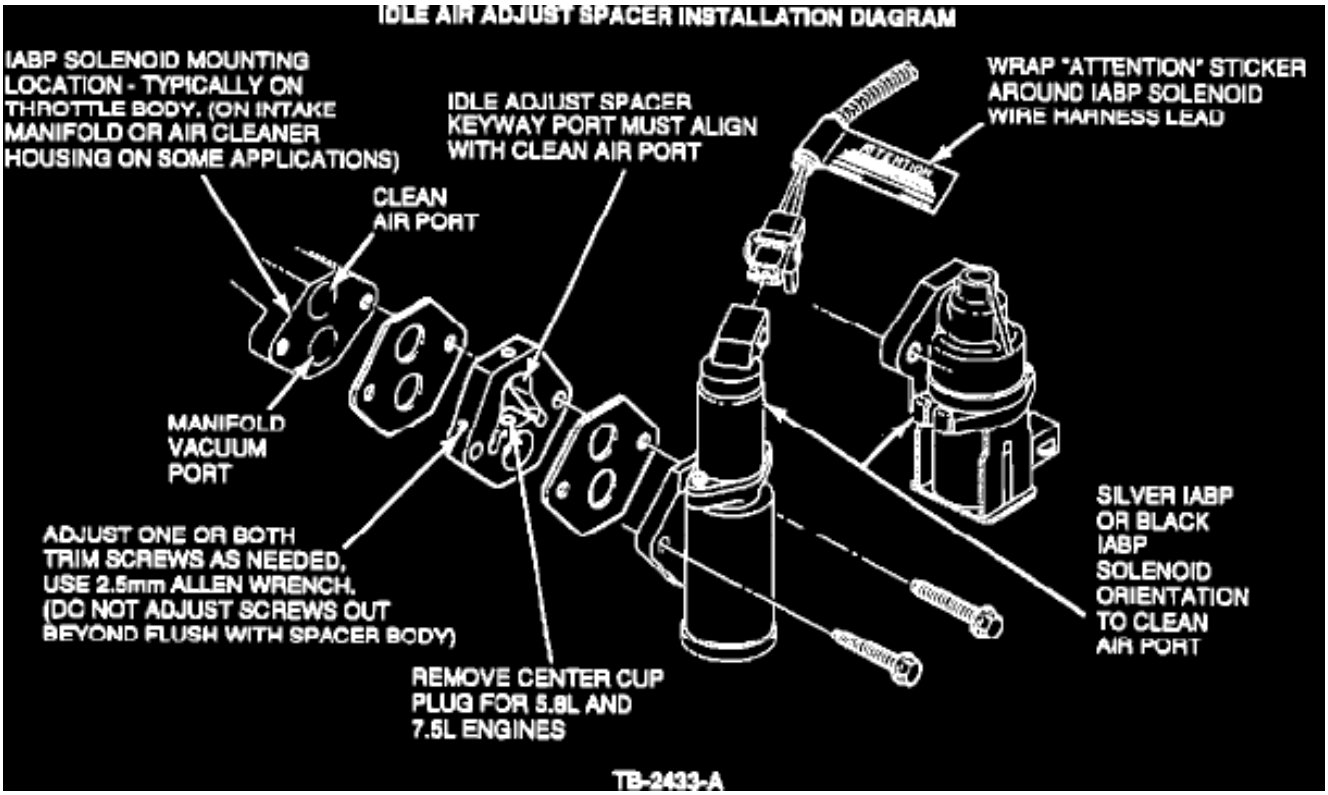
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

TB-2434-A

Figure 3

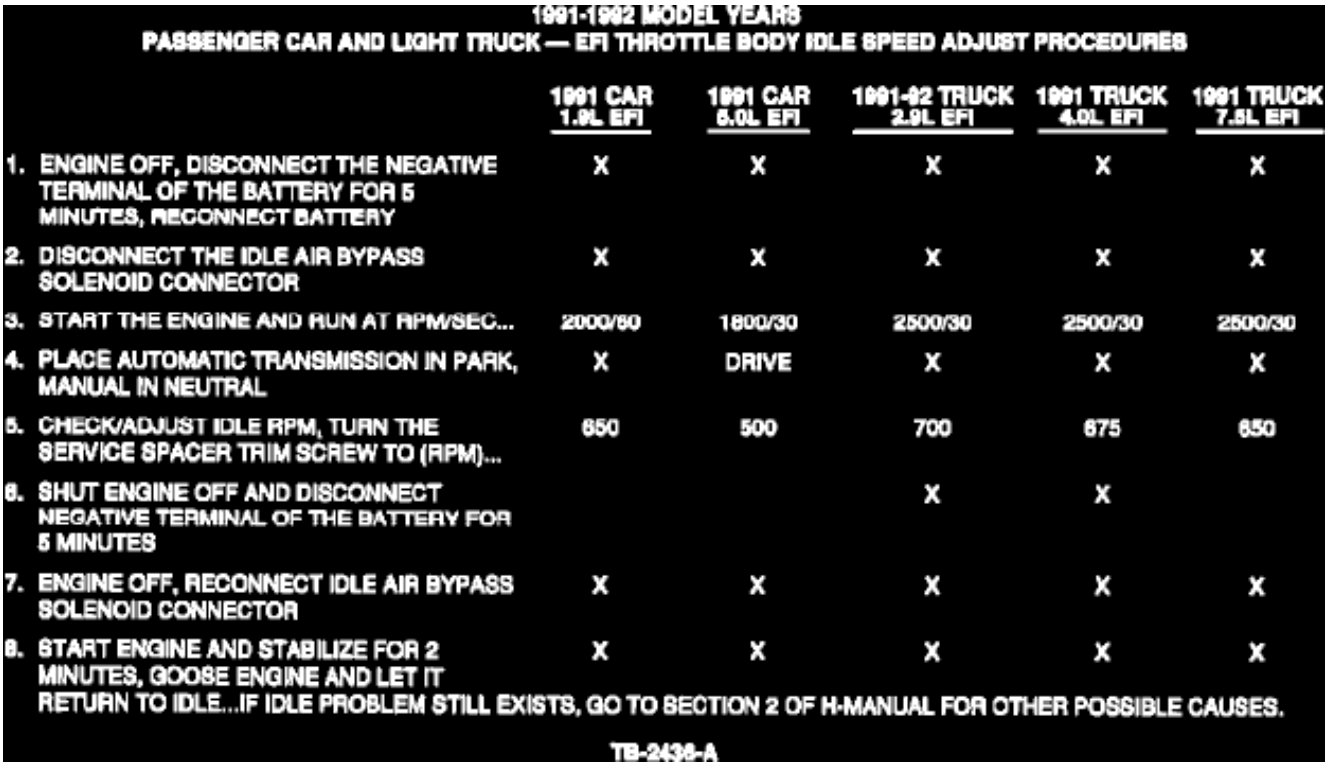
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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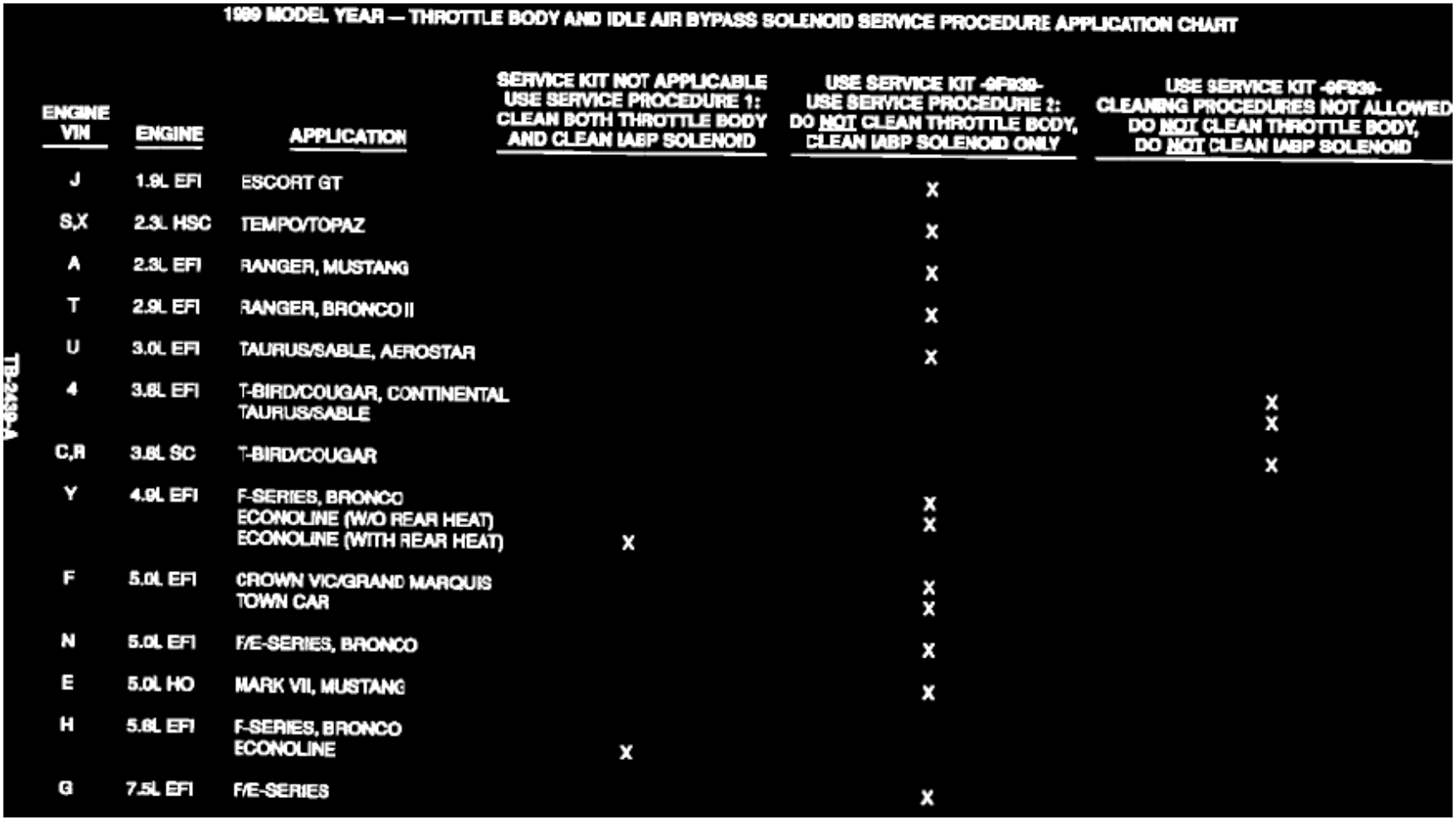
Figure 7

Figure 8

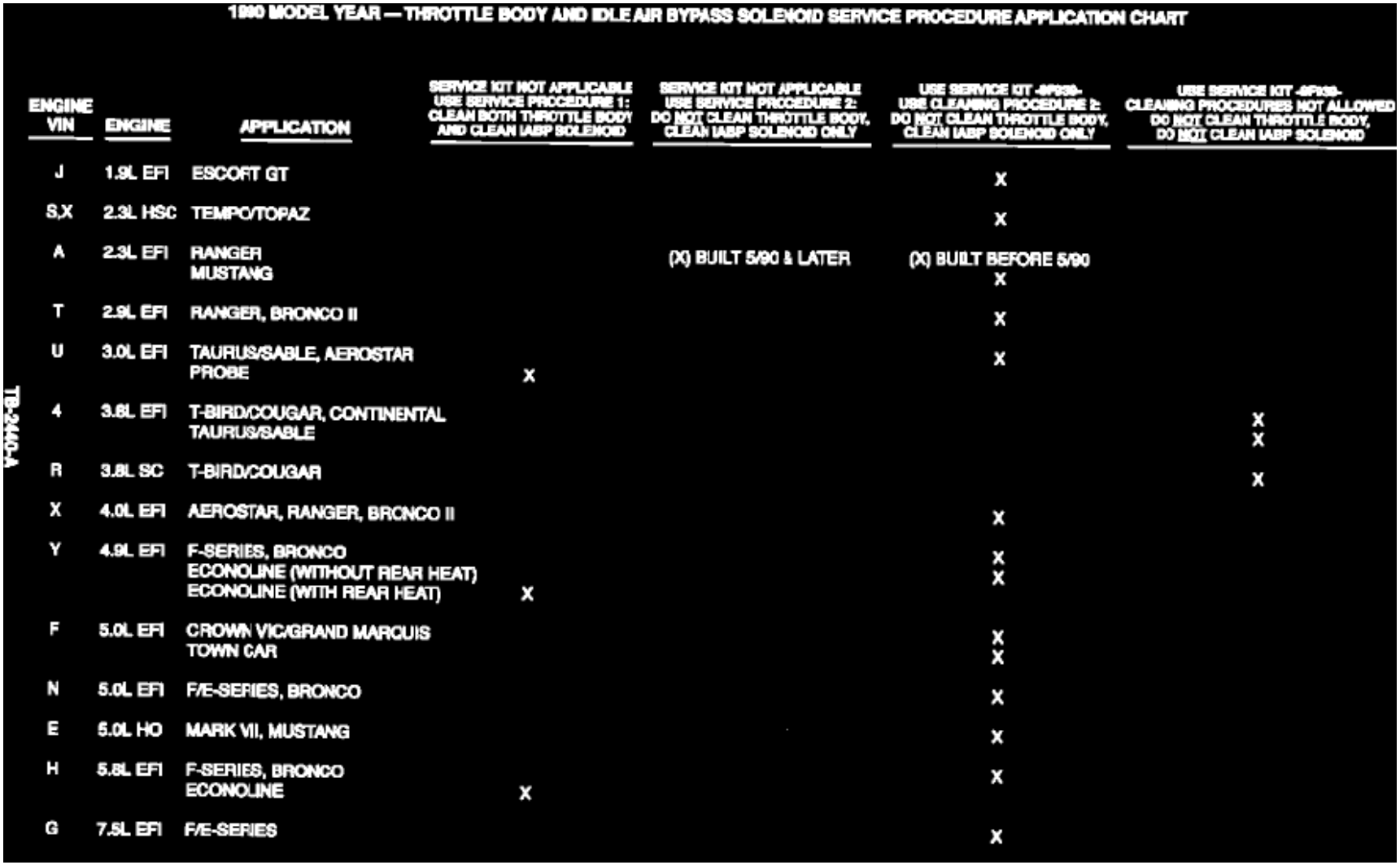


1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

TB-2439-A

Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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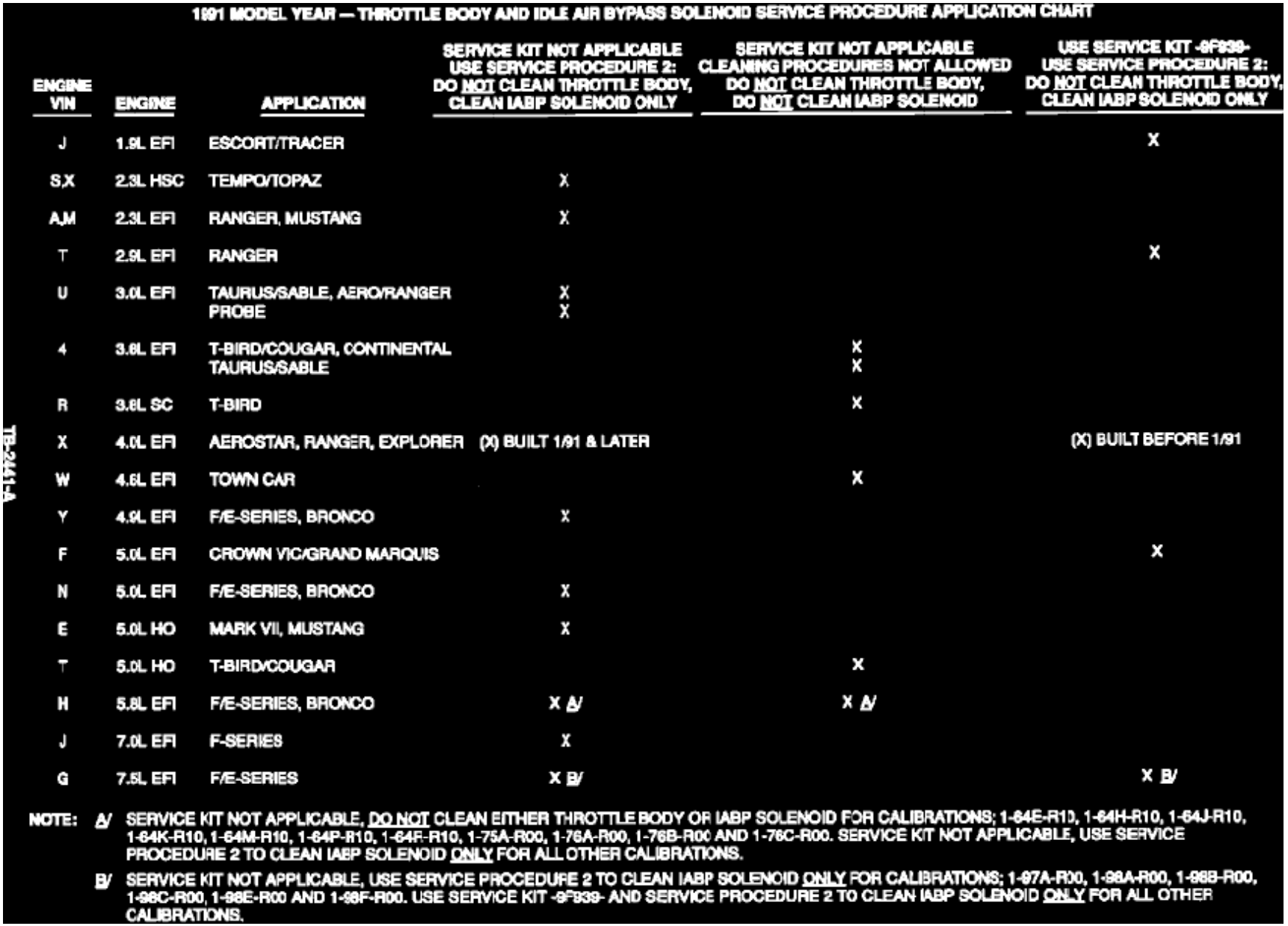
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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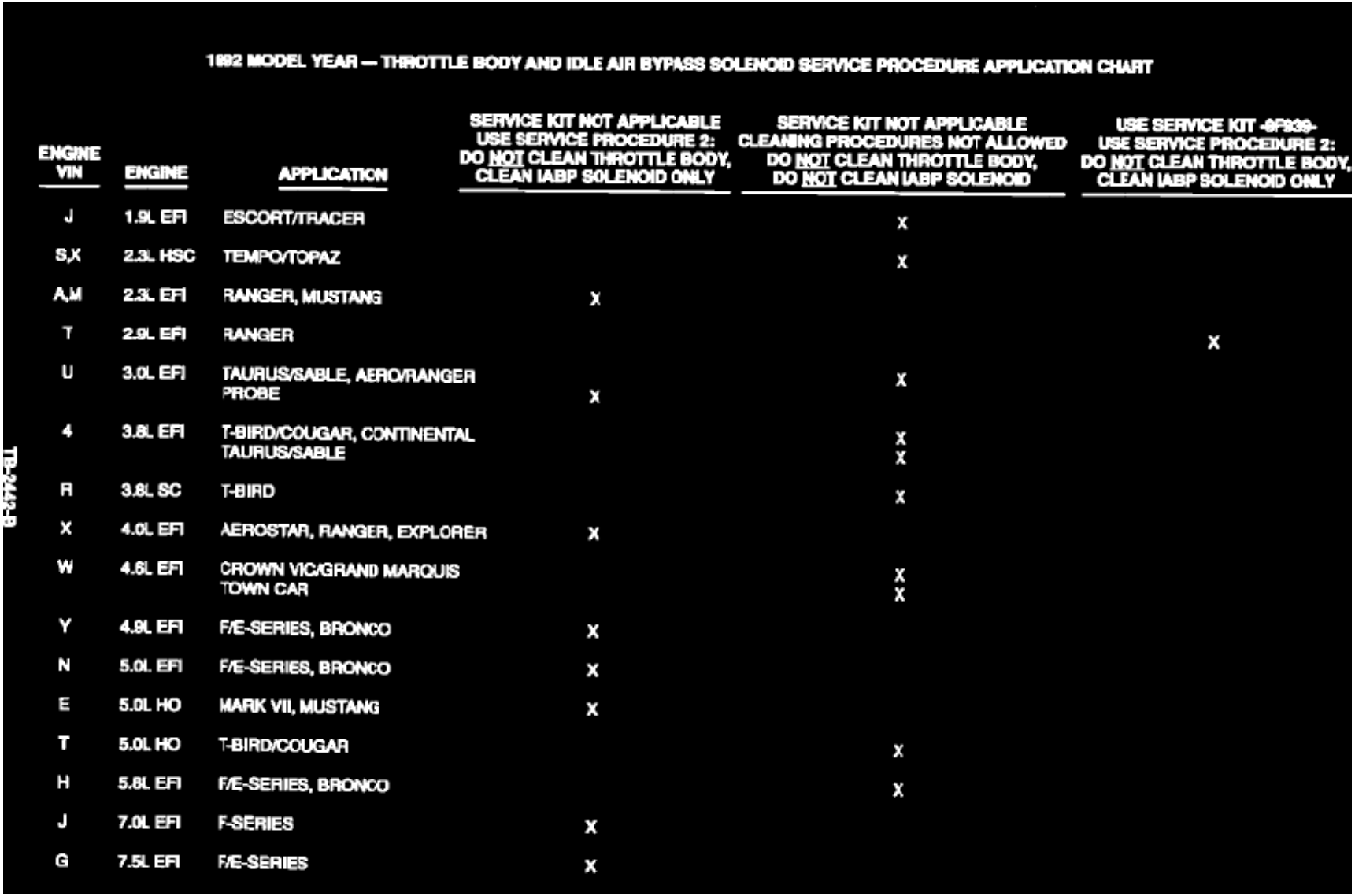
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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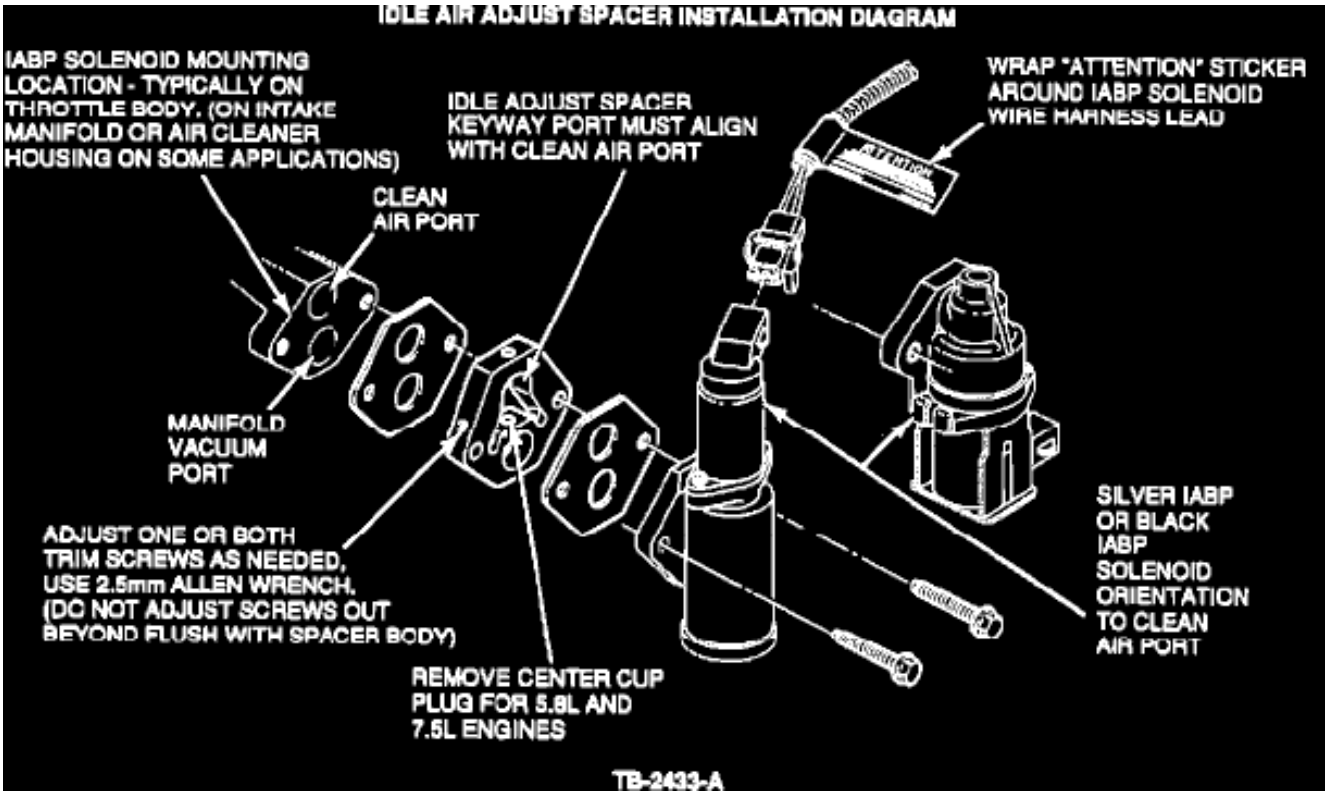
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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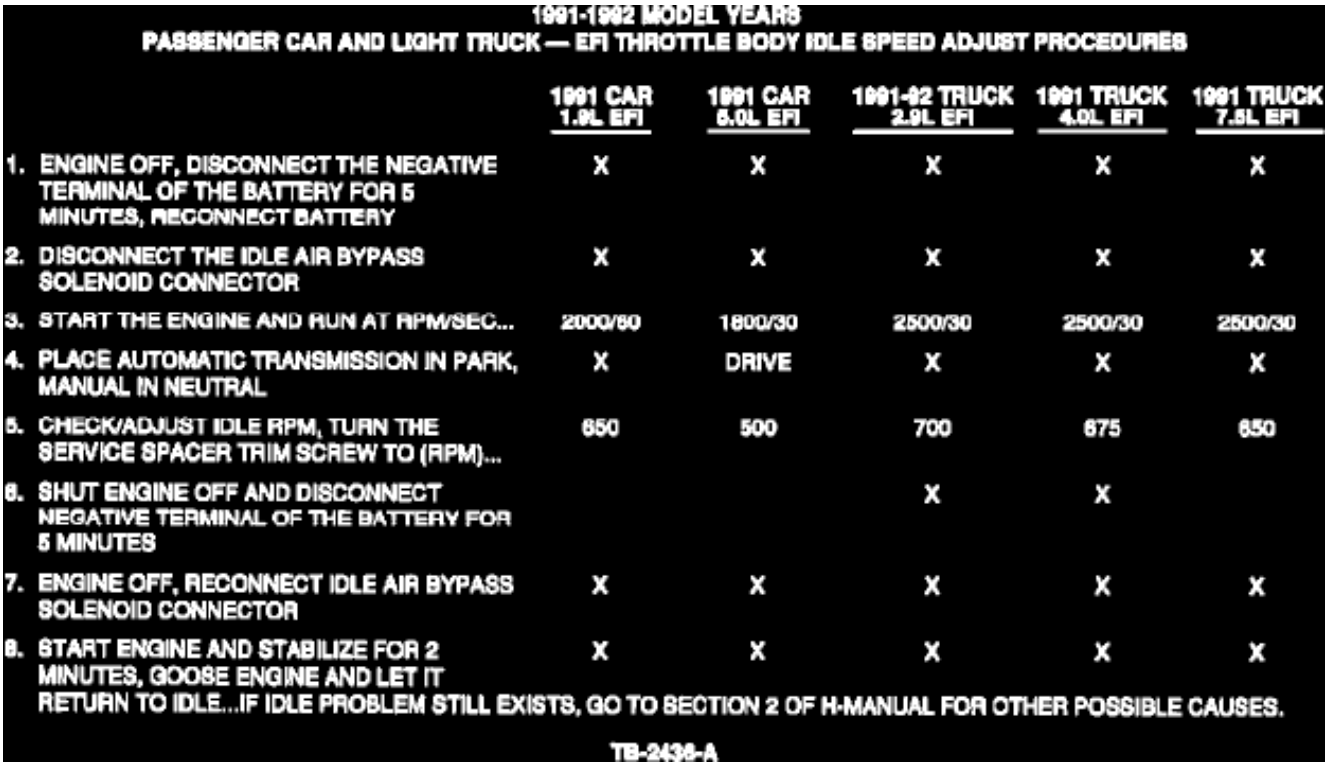
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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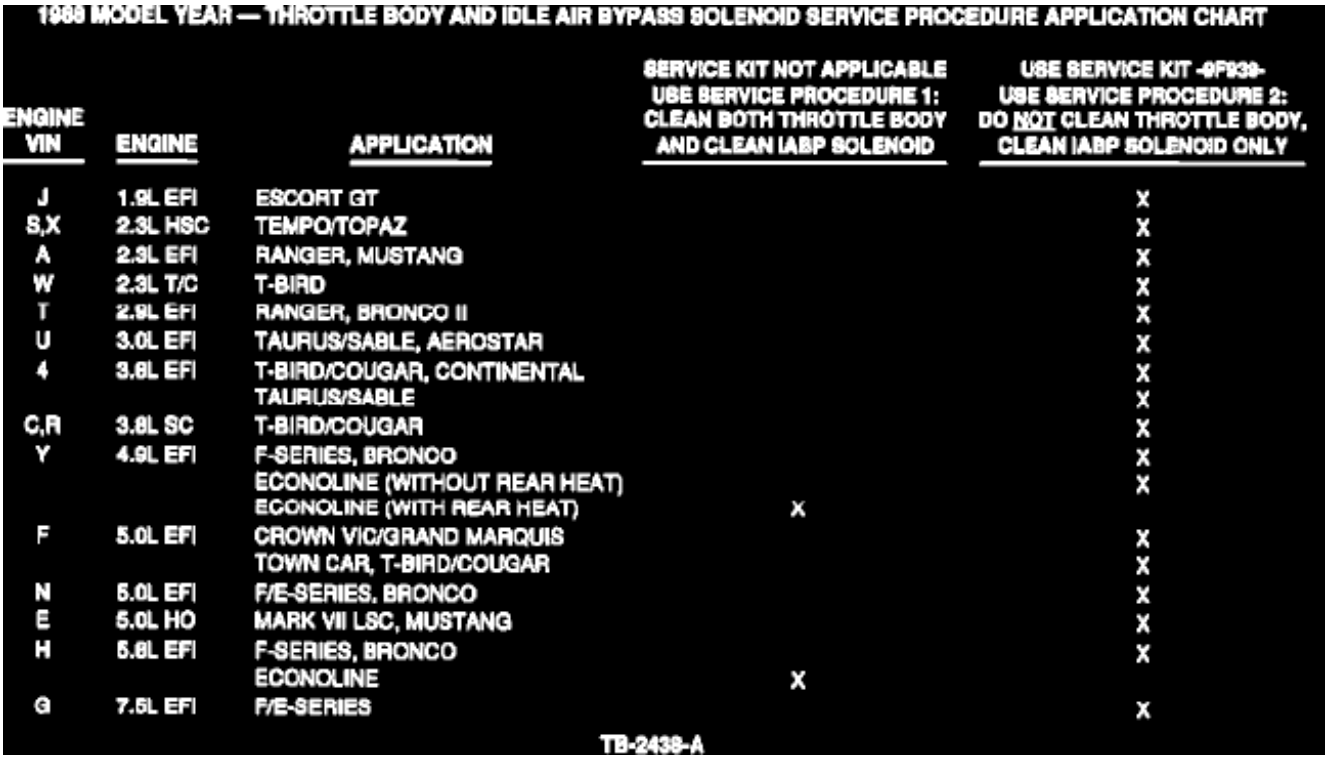
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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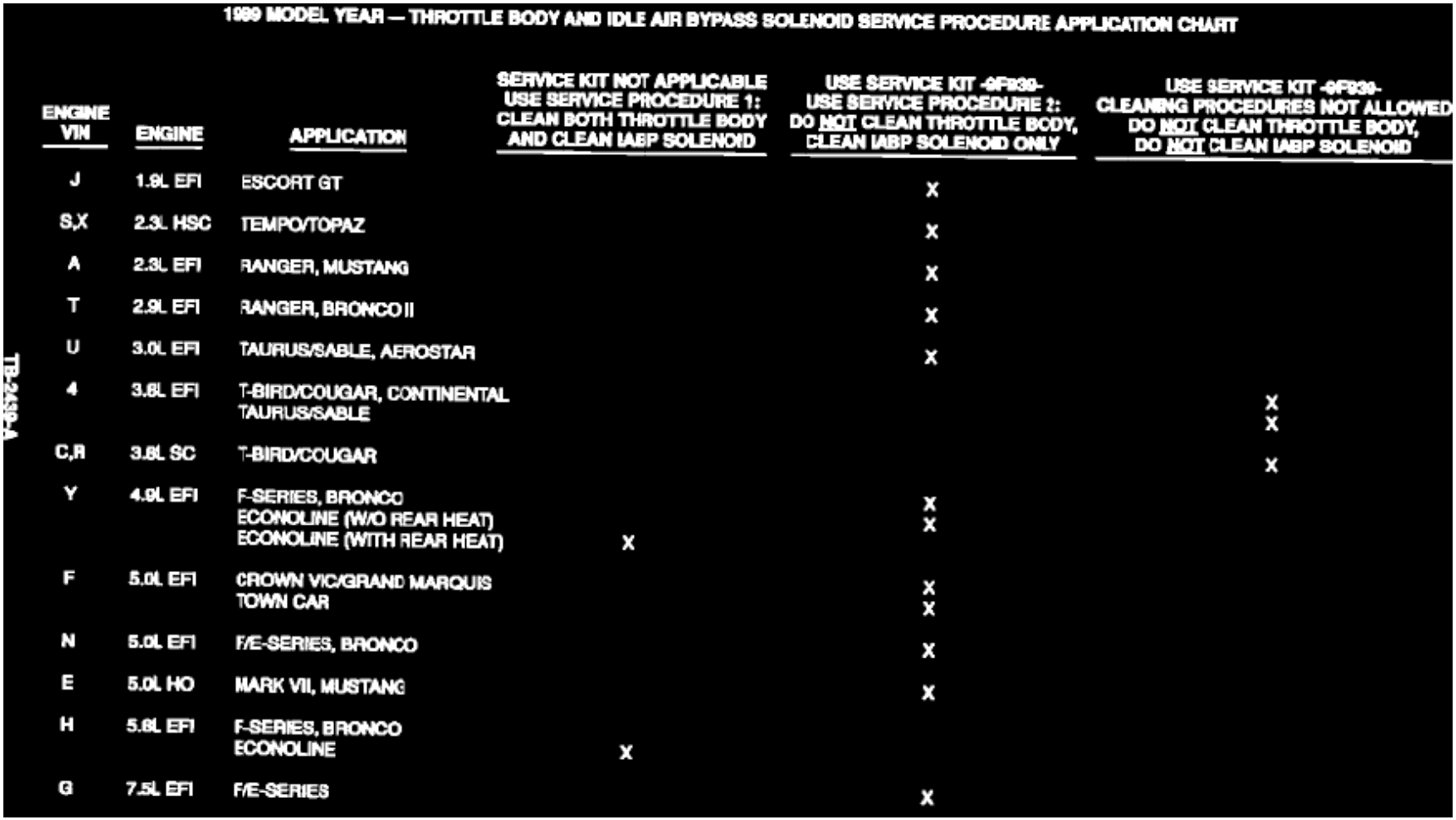
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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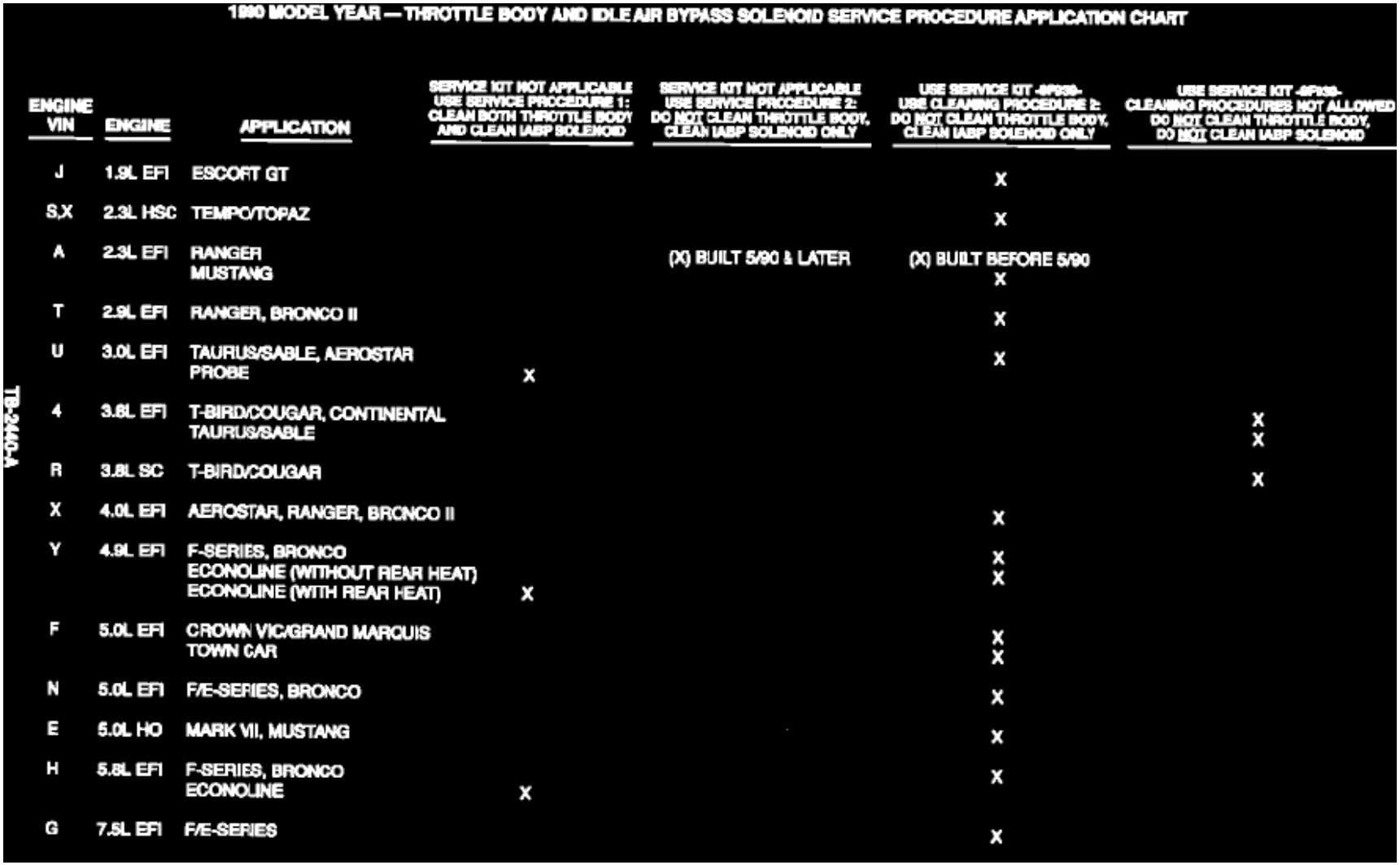
Figure 9

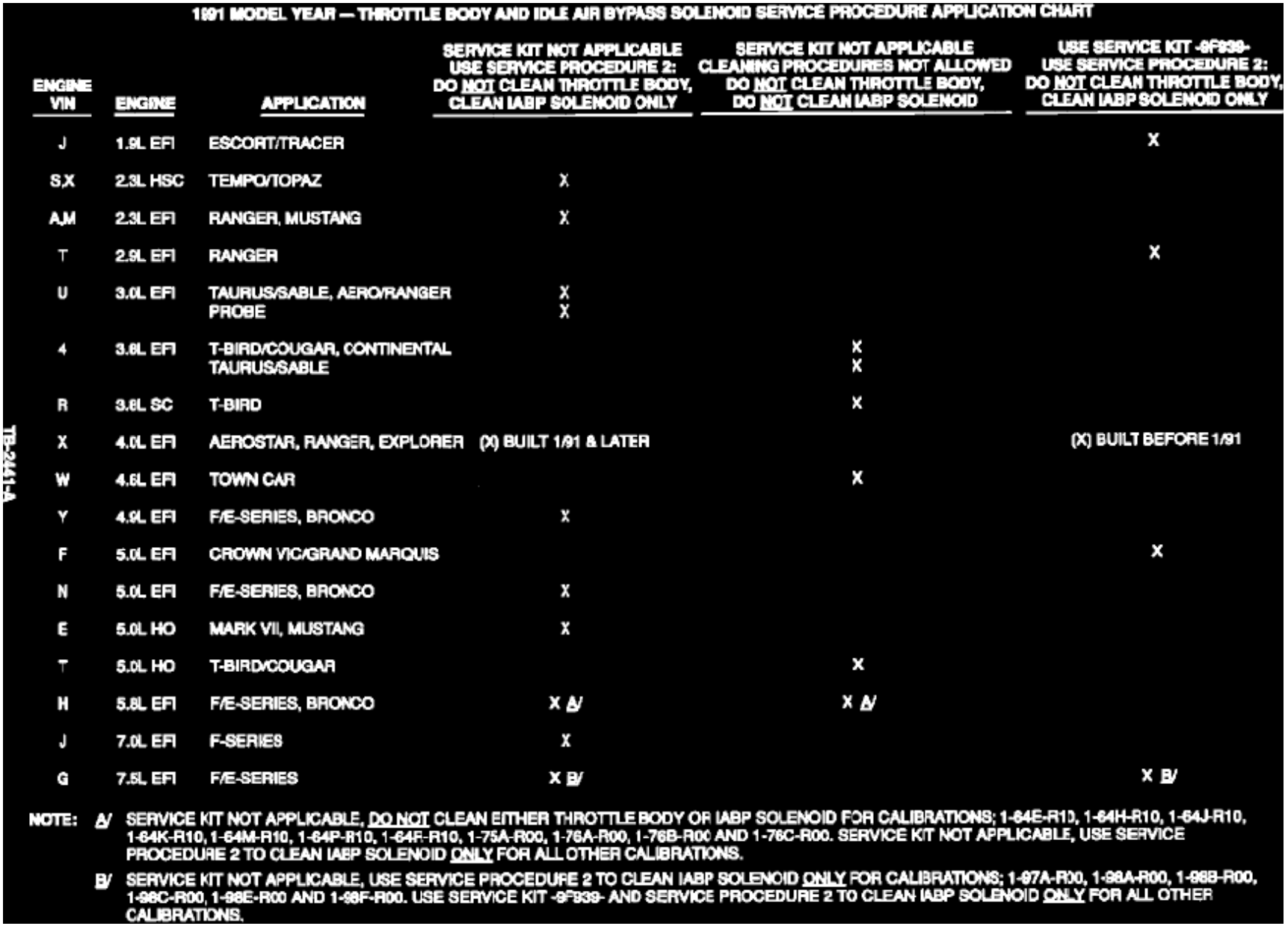


1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

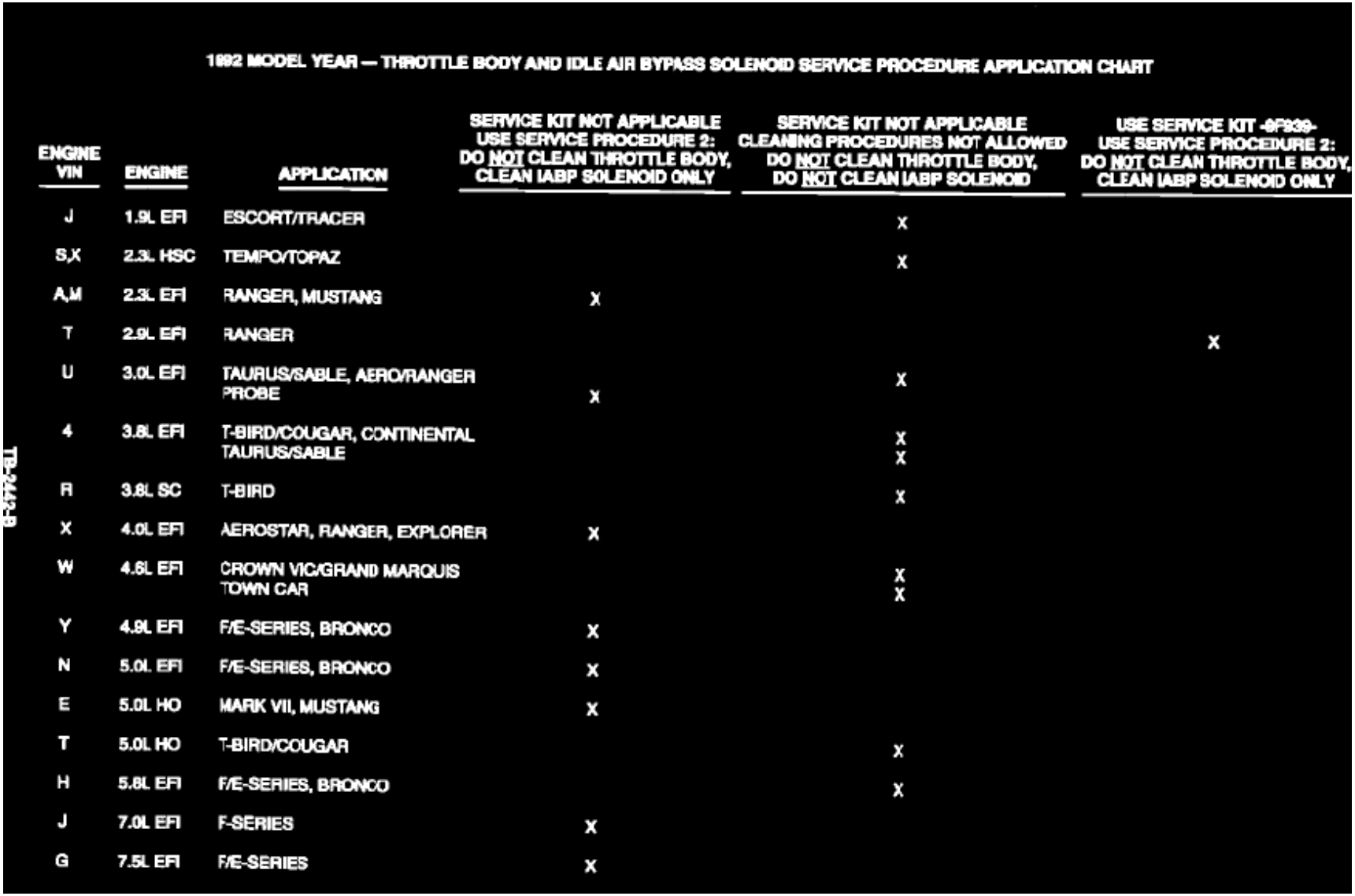
ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TA-24428

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

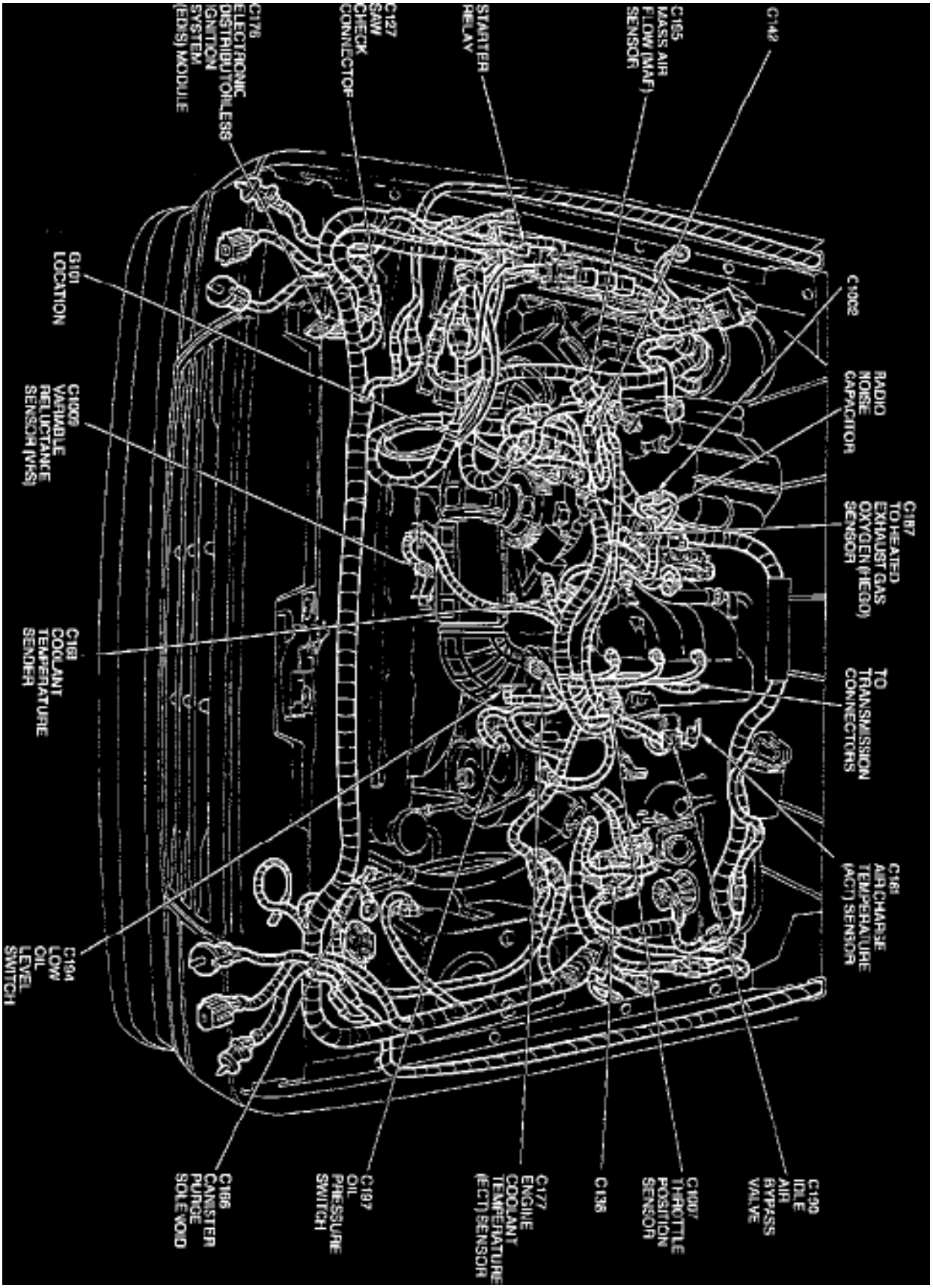
Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

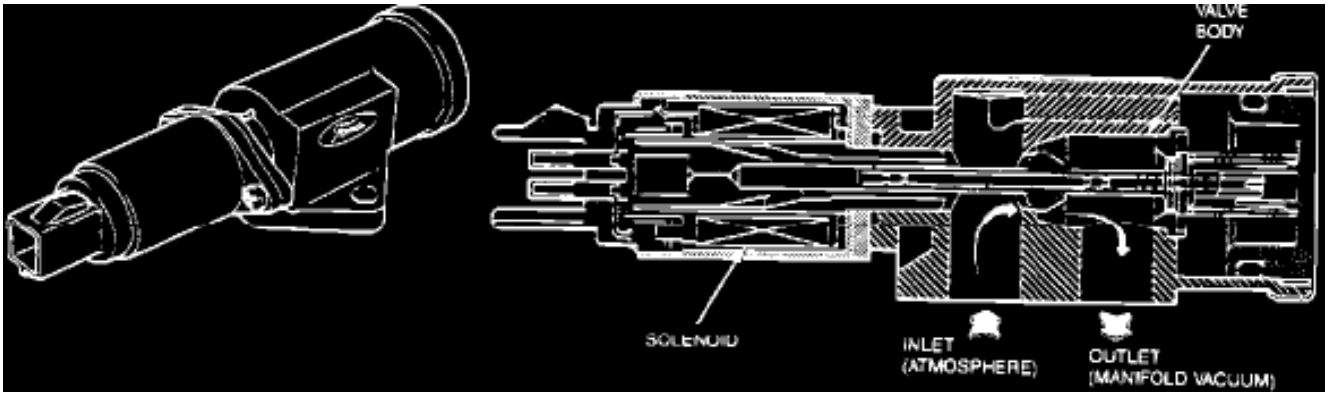

C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1909
VARIABLE
RELUCTANCE
SENSOR (VRS)
C168
COOLANT
TEMPERATURE
SENDER
C190A
LOW
OIL
LEVEL
SWITCH
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C166
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C190
IDLE
AIR
BYPASS
VALVE
C1007
THROTTLE
POSITION
SENSOR
C136
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C197
OIL
PRESSURE
SWITCH
C186
CANISTER
PURGE
SOLENOID

Idle Speed/Throttle Actuator - Electronic: Locations

Engine Compartment Components.

Top LH Side Of Engine

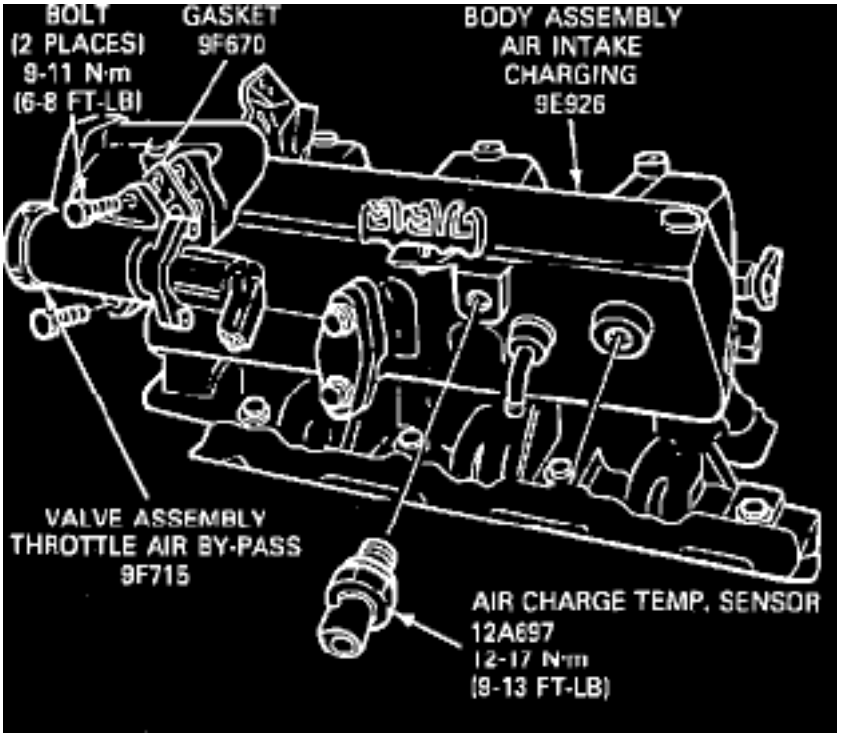
Applicable to: 4.0L/V6-244



Idle Speed/Throttle Actuator - Electronic: Description and Operation

Idle Air Bypass Valve

The Idle Speed Control Bypass Air (ISC-BPA) valve is used to control engine idle speed and is operated by the Engine Control Assembly (ECA). This valve allows air to pass around the throttle plates to control cold engine fast idle, no touch start, over temperature idle boost and engine idle load correction.



Idle Speed/Throttle Actuator - Electronic: Service and Repair

Intake Manifold

1. Disconnect the Idle Speed Control By-Pass Air (ISC-BPA) valve assembly connector from the wiring harness.

2. Remove the two ISC-BPA retaining bolts.

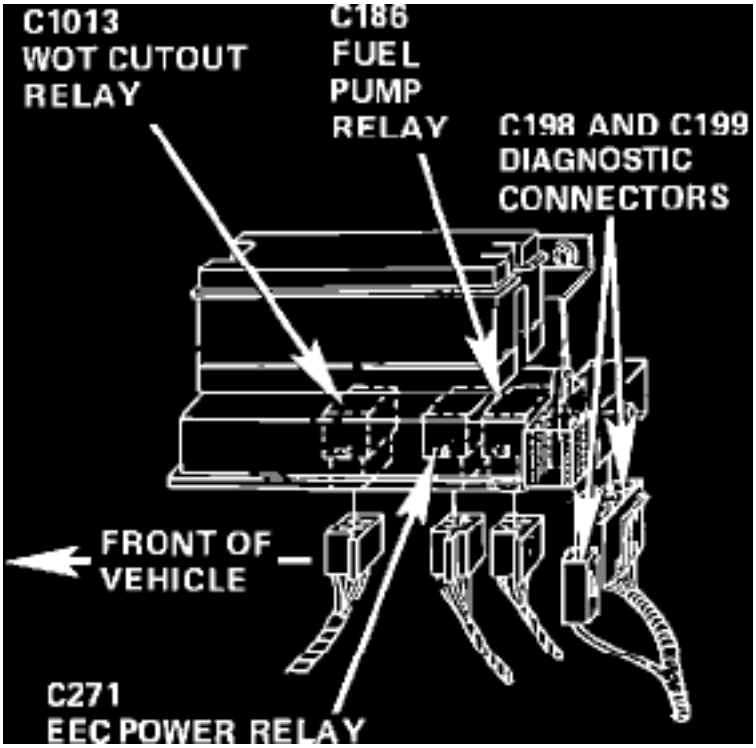
3. Remove the ISC-BPA valve and gasket.

4. Clean the gasket mating surfaces. NOTE: If scraping is necessary, use care not to damage ISC-BPA valve or throttle body gasket surfaces, or drop material into the throttle body.

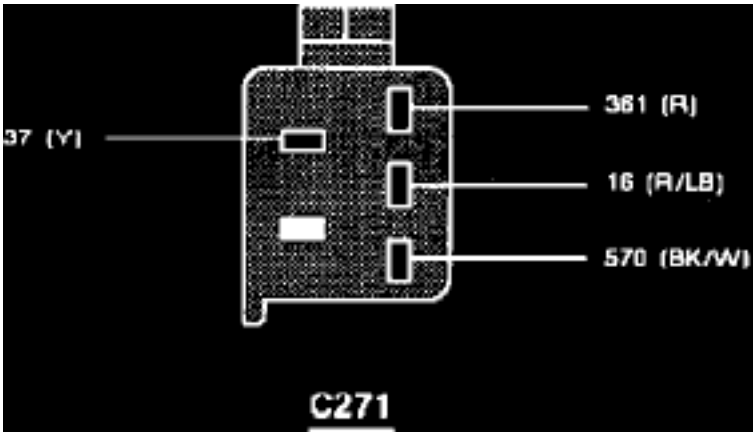
5. Install the gasket and ISC-BPA valve on the throttle body.

6. Install the retaining screws, torquing them to 72-96 lb. in. (9-11 N-m).

7. Connect the electrical connection for the ISC-BPA valve.



Relay And Diagnostic Connectors



EEC-IV Power Relay Connector

Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.

Malfunction Indicator Lamp: Technical Service Bulletins Connector, DIS Ignition Revised

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Malfunction Indicator Lamp: Locations

The Malfunction Indicator Light (MIL) is located on the instrument cluster. The MIL will show CHECK ENGINE when illuminated.

Malfunction Indicator Lamp: Description and Operation

The Malfunction Indicator Light (MIL) is mounted in the dash and reads CHECK ENGINE or SERVICE SOON. The MIL will ILLUMINATE when the engine is operating in Failure Mode Effects Management (FMEM). The light will stay ON as long as there is a fault in the system. The MIL can also be used to retrieve fault codes from the Electronic Engine Control (EEC) system when the self test mode is entered.

Oxygen Sensor: Technical Service Bulletins EGO Sensors - Silicone Contamination

Article No. 93-23-6

11/10/93

^ EGO SENSORS - SILICONE CONTAMINATION

^ ENGINE - SEALANTS, LOW VOLATILITY SILICONE REQUIRED

^ EXHAUST SYSTEM - SILICONE CONTAMINATION OF EXHAUST GAS OXYGEN (EGO) SENSORS

FORD: 1984-86 LTD 1984-88 EXP 1984-94 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-94 TAURUS 1988-93 FESTIVA 1989-94 PROBE 1994 ASPIRE

LINCOLN-MERCURY: 1984-86 CAPRI, MARQUIS 1984-87 LYNX 1984-92 MARK VII 1984-94 CONTINENTAL, COUGAR, GRAND MARQUIS, TOPAZ, TOWN CAR 1986-94 SABLE 1988-89 TRACER 1991-94 CAPRI, TRACER 1993-94 MARK VIII

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1983-94 RANGER 1984-90 BRONCO II 1984-94 BRONCO, ECONOLINE, F-150-350 SERIES 1986-94 AEROSTAR 1988-94 F-47, F-53 1991-94 EXPLORER 1993-94 VILLAGER

This TSB article is being republished in its entirety to update model applicability and to revise the part number of the Low Volatility Sealant.

ISSUE: EGO sensors can be contaminated if volatile types of silicone are used when servicing the engine. Volatile silicones can migrate throughout the system during the first one hundred hours of service. They are commonly found in liquid "silicone rubber" sealants and gasket material. These products are commonly sold in tubes and caulking-type cartridges.

ACTION: When service is performed on the engine, only use new low volatility silicone sealant (F1AZ-19662-A) where specified. Also replace the contaminated EGO sensor if required.

CAUTION: DO NOT SUBSTITUTE CONVENTIONAL SILICONE RUBBER SEALANTS WHEN LOW VOLATILITY SILICONE SEALANT IS SPECIFIED.

PART NUMBER PART NAME CLASS

F1AZ-19662-A Low Volatility RTV Sealant B

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 89-14-5

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 490000, 499000

Oxygen Sensor: Technical Service Bulletins Heated Exhaust Gas Oxygen Sensor - Application Chart

Article No. 94-16-9

08/10/94

EXHAUST - HEATED OXYGEN SENSOR (H02S) - APPLICATION CHART

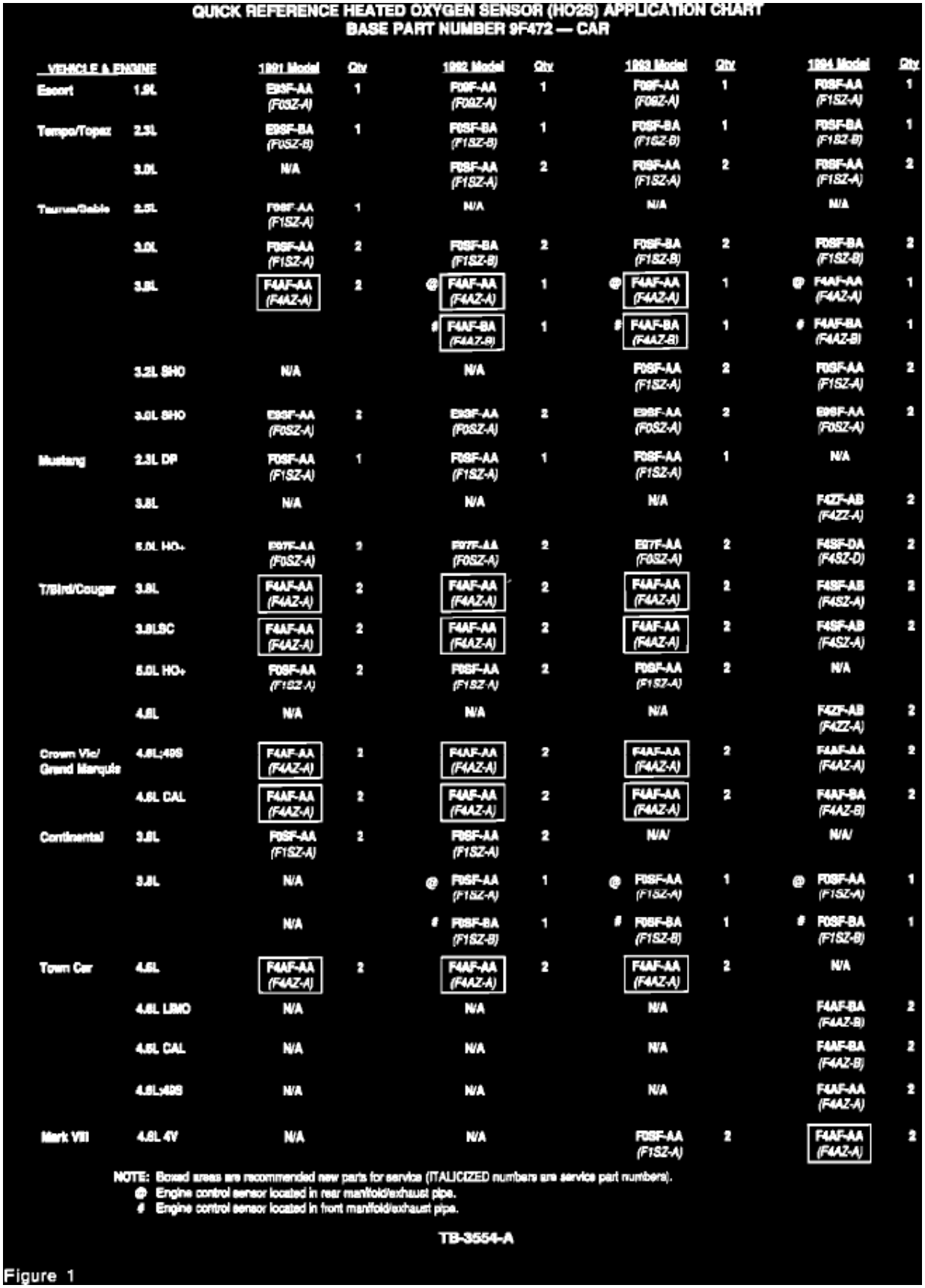
FORD: 1991-94 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991-94 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1993-94 MARK VIII

LIGHT TRUCK: 1991-94 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F SUPER DUTY, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 F & B SERIES

ISSUE: Quick Reference Heated Oxygen Sensor (H02S) Application Charts have been developed to assist technicians and parts managers in correct parts usage.



QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — CAR

VEHICLE & ENGINE		1991 Model	Qty	1992 Model	Qty	1993 Model	Qty	1994 Model	Qty
Escort	1.9L	E93F-AA *(F0SZ-A)*	1	F0SF-AA *(F0SZ-A)*	1	F0SF-AA *(F0SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1
Tempo/Topaz	2.3L	E93F-BA *(F0SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1
	3.0L	N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
Taurus/Sable	2.5L	F0SF-AA *(F1SZ-A)*	1	N/A		N/A		N/A	
	3.0L	F0SF-AA *(F1SZ-A)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2
	3.8L	F4AF-AA *(F4AZ-A)*	2	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1
				# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1
	3.2L SHO	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
	3.0L SHO	E93F-AA *(F0SZ-A)*	2	E93F-AA *(F0SZ-A)*	2	E93F-AA *(F0SZ-A)*	2	E93F-AA *(F0SZ-A)*	2
Mustang	2.3L DP	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	N/A	
	3.8L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
	5.0L HO+	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	F4SF-DA *(F4SZ-D)*	2
T/Bird/Cougar	3.8L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	3.8LSC	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	5.0L HO+	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A	
	4.6L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
Crown Vic/ Grand Marquis	4.6L;4BS	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2
	4.6L CAL	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-BA *(F4AZ-B)*	2
Continental	3.8L	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A/		N/A/	
	3.8L	N/A		@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1
		N/A		# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1
Town Car	4.6L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	N/A	
	4.6L LIMO	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L CAL	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L;4BS	N/A		N/A		N/A		F4AF-AA *(F4AZ-A)*	2
Mark VIII	4.6L 4V	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F4AF-AA *(F4AZ-A)*	2

NOTE: Boxed areas are recommended new parts for service (ITALICIZED numbers are service part numbers).
@ Engine control sensor located in rear manifold/exhaust pipe.
# Engine control sensor located in front manifold/exhaust pipe.

TB-3554-A

Figure 1

QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — TRUCK

VEHICLE & ENGINE		1991 Model	1992 Model	1993 Model	1993.5 Model	1994 Model
Aerostar	3.0L	E9SF-AA *(F0SZ-A)*	F39F-AB *(F39Z-D)*	F39F-AB *(F39Z-D)*		F39F-AB *(F39Z-D)*
	4.0L	F0UF-CA *(F0UZ-C)*	F47F-CA *(F47Z-C)*	F47F-CA *(F47Z-C)*		F47F-CA *(F47Z-C)*
Ranger	2.3L	F0SF-AA *(F1SZ-A)*	F0SF-AA *F1SZ-A)*	F0SF-AA *(F1SZ-A)*		F0SF-AA *(F1SZ-A)*
	2.9L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	N/A		N/A
	3.0L	F47F-CA *(F47Z-C)*	F39F-CB *(F39Z-C)*	F39F-CB *(F39Z-C)*		F39F-CB *(F39Z-C)*
	4.0L	F47F-CA *(F47Z-C)*	F47F-CA *(F47Z-C)*	F47F-CA *(F47Z-C)*		F47F-CA *(F47Z-C)*
Explorer	4.0L	F47F-CA *(F47Z-C)*	F47F-CA *(F47Z-C)*	F47F-CA *(F47Z-C)*		F47F-CA *(F47Z-C)*
F-Series	4.9L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*		F4UF-CA *(F4UZ-C)*
Bronco	5.0L	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*		F4UF-AA *(F4UZ-A)*
(U/B500)	5.8L	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*		F4UF-AA *(F4UZ-A)*
(O/B500)	5.8L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*		F4UF-CA *(F4UZ-C)*
	5.8L HO	N/A	N/A	F4UF-BA *(F4UZ-B)*		F4UF-BA *(F4UZ-B)*
	7.5L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-BA *(F4UZ-B)*	F4UF-BA *(F4UZ-B)*
F450SD	7.5L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*
Econoline	4.9L	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*		F4UF-AA *(F4UZ-A)*
	5.0L	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*		F4UF-AA *(F4UZ-A)*
(U/8500)	5.8L	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*	F4UF-AA *(F4UZ-A)*		F4UF-AA *(F4UZ-A)*
(O/8500)	5.8L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*		F4UF-CA *(F4UZ-C)*
	7.5L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-BA *(F4UZ-B)*	F4UF-BA *(F4UZ-B)*
Hvy Truck	7.0L	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*	F4UF-CA *(F4UZ-C)*		F4UF-CA *(F4UZ-C)*

Service part numbers are in parenthesis beneath the engineering part number for each application.

TB-9555-A

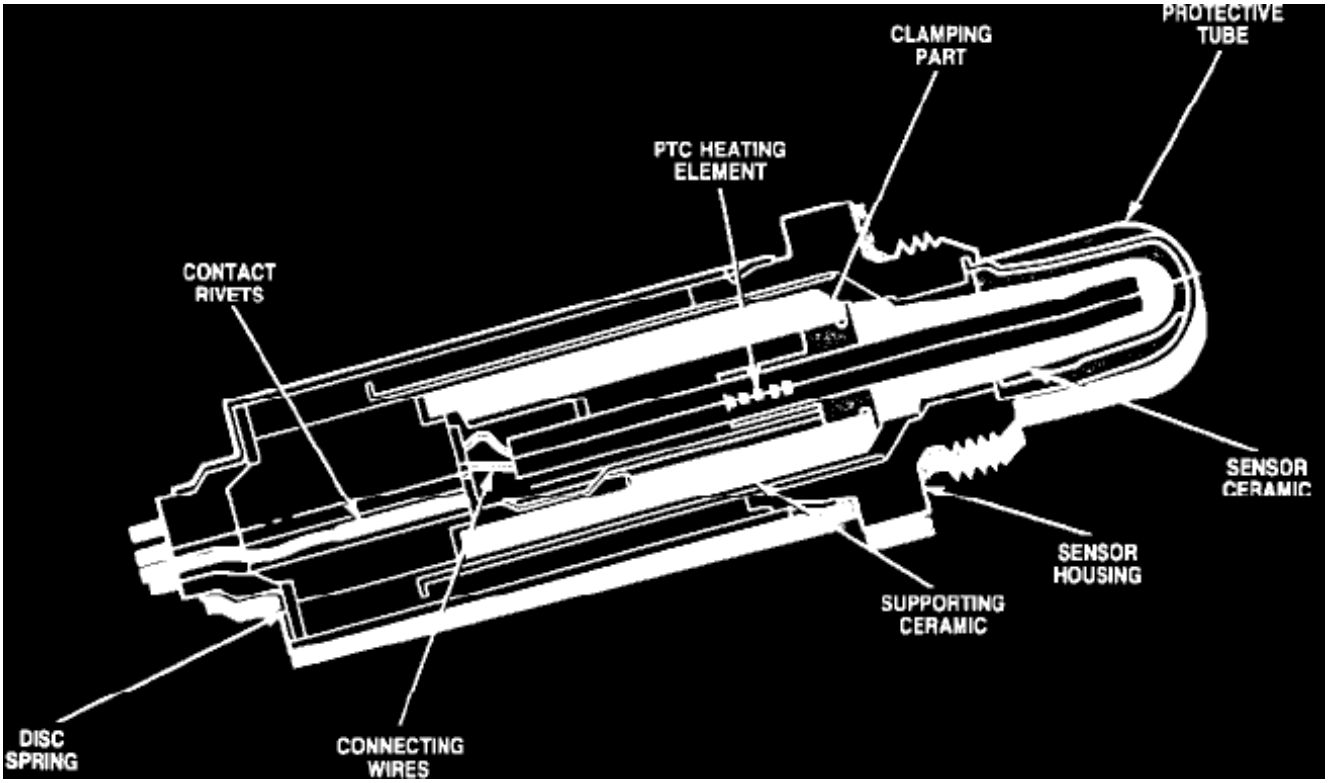
Figure 2

ACTION: Refer to the appropriate Quick Reference Heated Oxygen Sensor (HO2S) Application Chart for Passenger Car or Truck, Figures 1 and 2, to make sure that the correct service sensor is installed. In some cases, new applications are shown.

PART NUMBER	PART NAME	CLASS
F0SZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-D	Heated Oxygen Sensor	A
F0UZ-9F472-C	Heated Oxygen Sensor	B
F47Z-9F472-C	Heated Oxygen Sensor	A
F1SZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-A	Heated Oxygen Sensor	A
F4UZ-9F472-B	Heated Oxygen Sensor	A
F03Z-9F472-A	Heated Oxygen Sensor	B
F09Z-9F472-A	Heated Oxygen Sensor	B
F1SZ-9F472-B	Heated Oxygen Sensor	B
F4AZ-9F472-A	Heated Oxygen Sensor	A
F4AZ-9F472-B	Heated Oxygen Sensor	A
F4ZZ-9F472-A	Heated Oxygen Sensor	A
F4SZ-9F472-D	Heated Oxygen Sensor	A
F4SZ-9F472-A	Heated Oxygen Sensor	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 623000



Oxygen Sensor: Description and Operation

Heated Oxygen Sensor

The Heated Exhaust Gas Oxygen (HEGO) sensor is threaded into the exhaust manifold with a sampling tip extending into the exhaust stream. The sensor is a zirconium dioxide ceramic thimble with platinum surface electrodes. The ceramic thimble is oxygen ion conductive and generates voltage due to the oxygen content difference between the atmosphere and the exhaust gas. The sensor will generate a voltage signal between 0 volts (lean condition) and 1.1 volts (rich condition). The ECU reads this signal to achieve an air/fuel ratio of 14.7:1 when operating in CLOSED LOOP. The HEGO sensor must operate above 600°F. To quickly heat up the sensor, a heating element is incorporated into the sensor. The HEGO sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Service and Repair

The oxygen sensor has a permanently attached wire and connector. This should not be removed, since the removal will affect proper operation of the oxygen sensor.

1. Disconnect electrical connector from oxygen sensor.

2. Using a suitable oxygen sensor wrench, carefully remove the sensor from exhaust manifold or pipe. The oxygen sensor may be difficult to remove when engine temperature is below 120°F. CAUTION: Excessive force may damage threads in exhaust manifold or pipe.

3. If a new sensor is being used, install the new sensor into the manifold or pipe.

4. If an old sensor is being reused, coat threads with anti-seize compound, then install the sensor into the manifold or pipe.

5. Torque the oxygen sensor to 30-36 lb. ft. (40-50 N-m), and reconnect the electrical connector.

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: Customer Interest Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

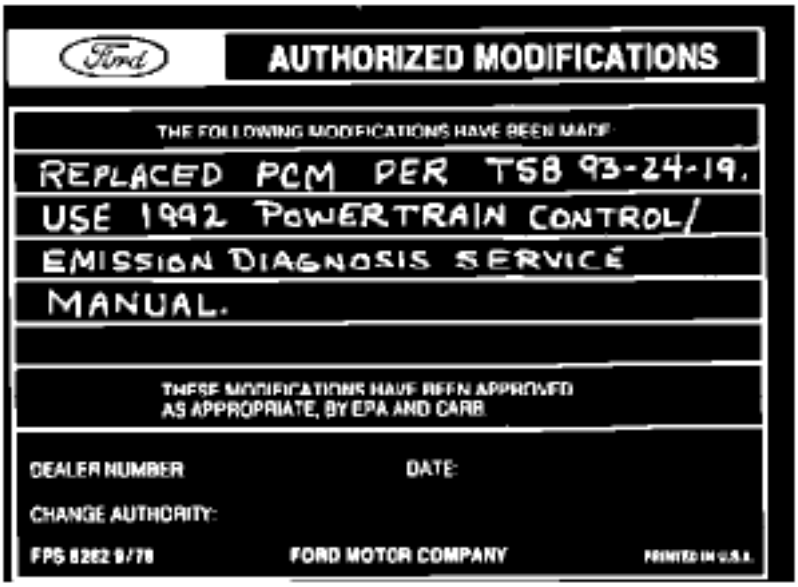
b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART		
APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Engine Control Module: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

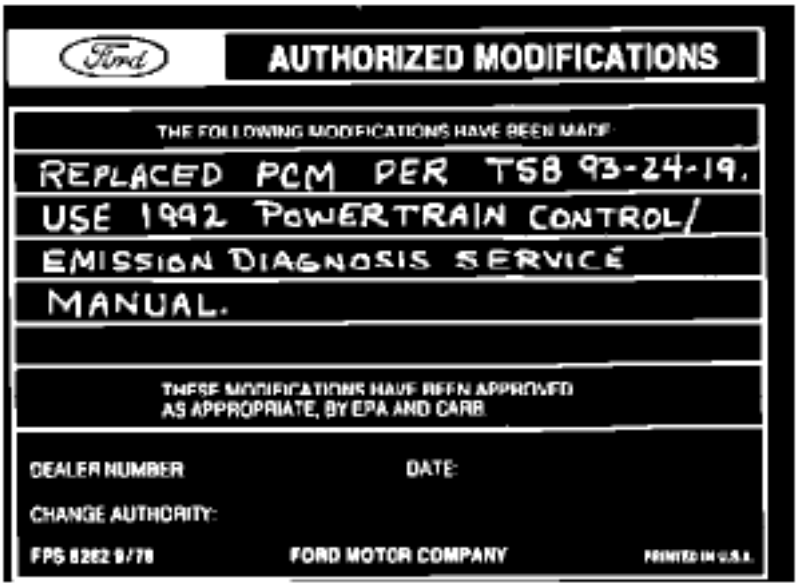
3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART

APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

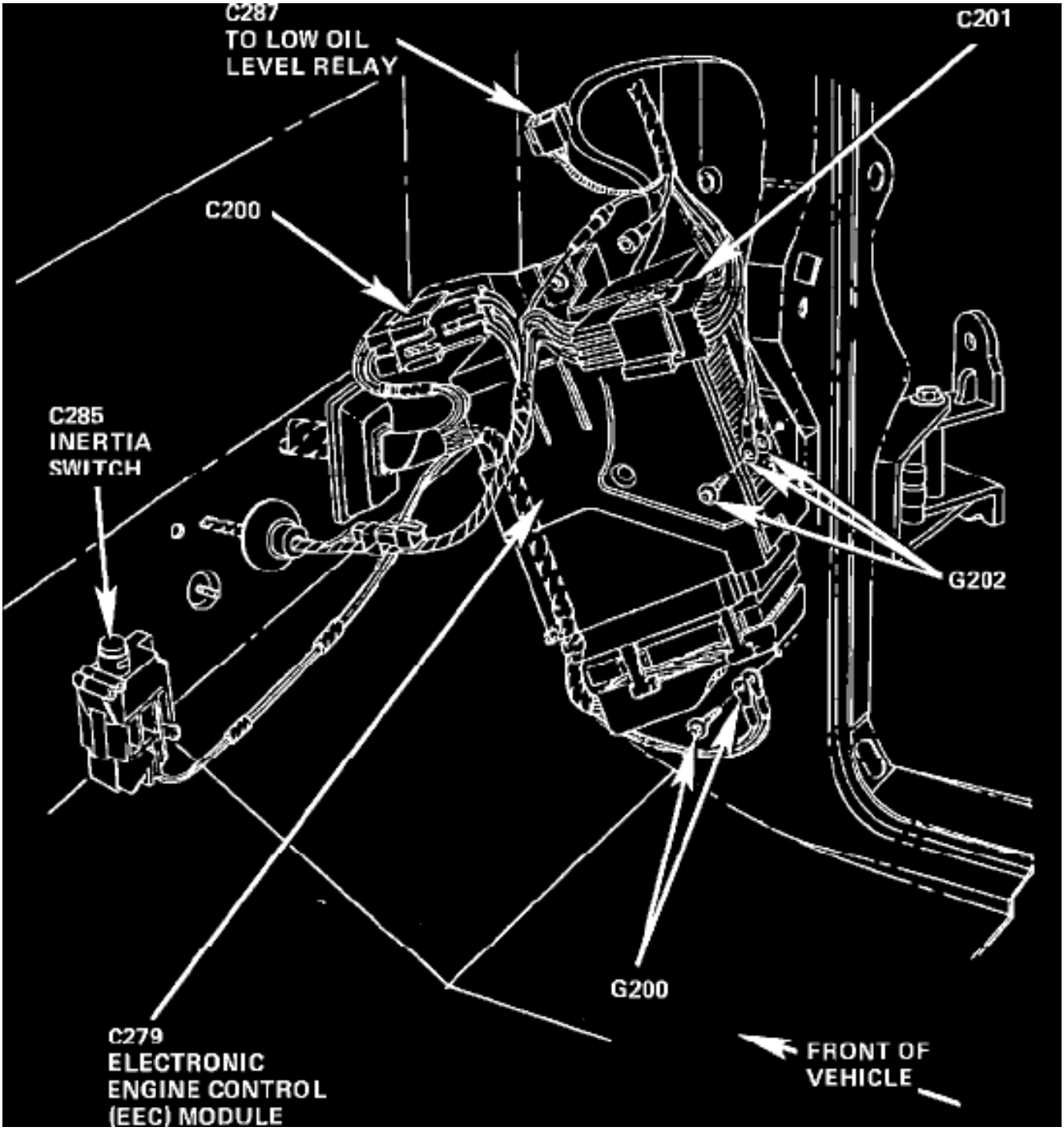
- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

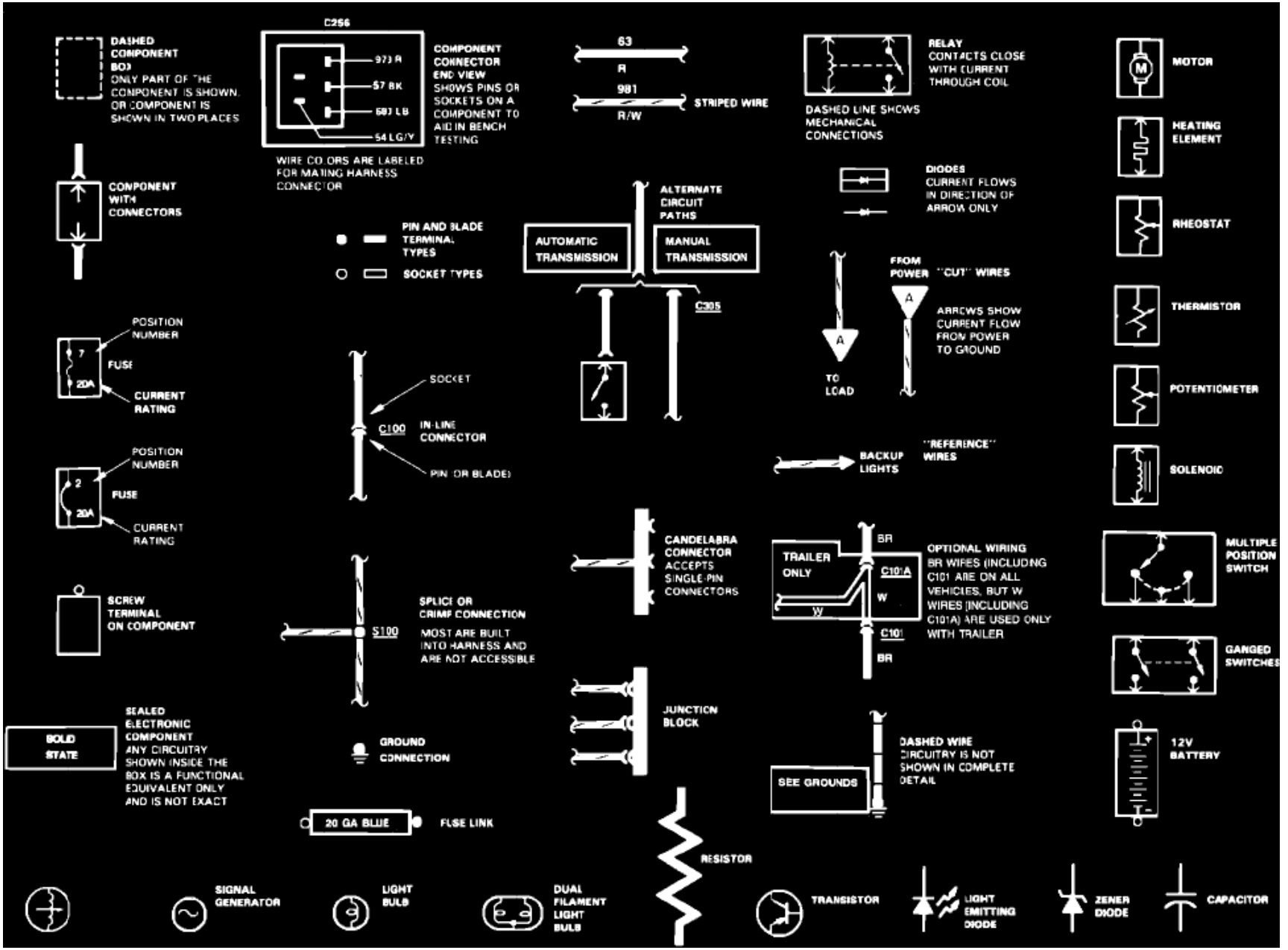
BASIC PART NO. CONDITION CODE

ODOR 08

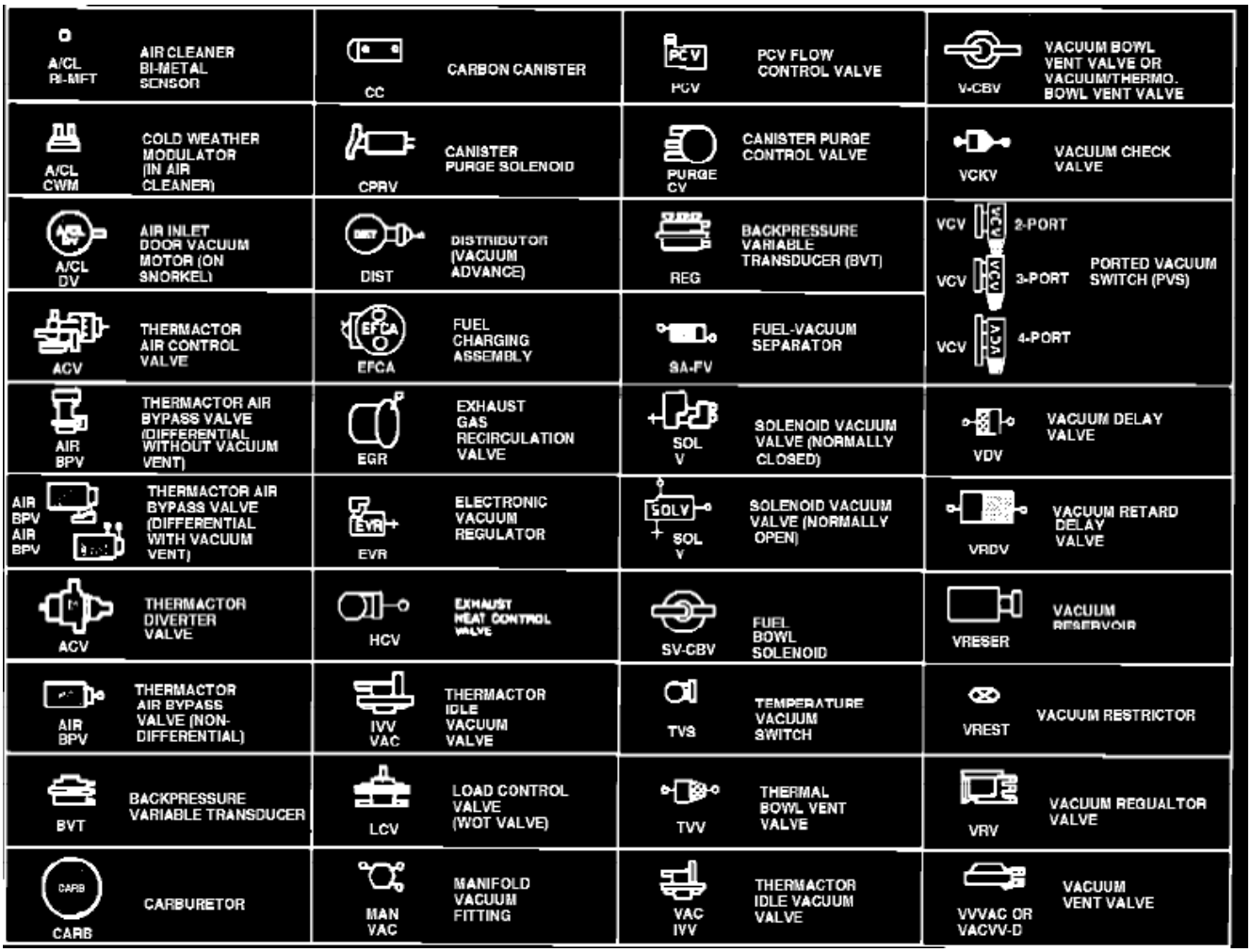
OASIS CODES: 403000, 623000



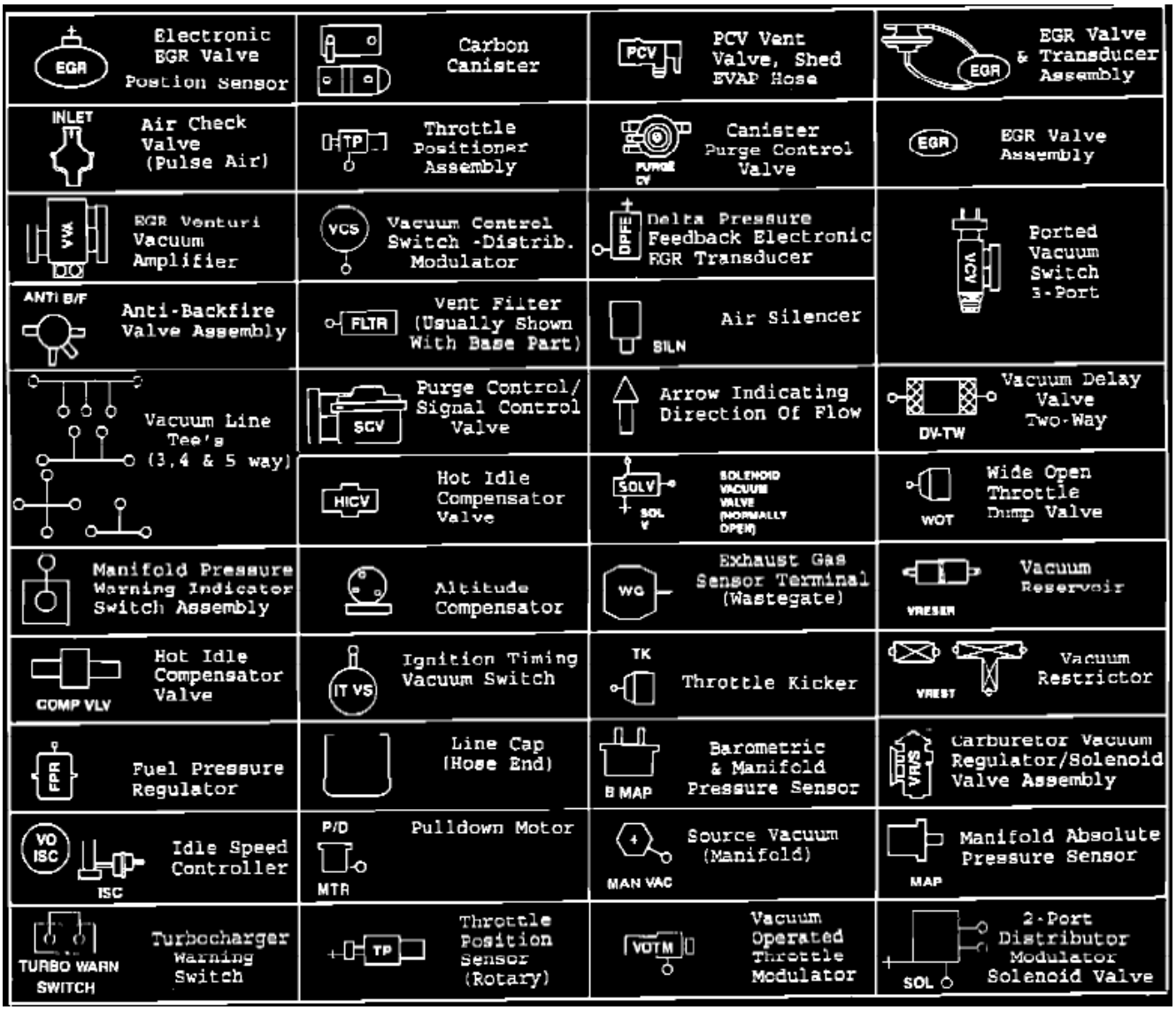
Engine Control Assembly (ECA)


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN, OR COMPONENT IS SHOWN IN TWO PLACES
C256
973 R
57 BK
581 LB
54 LG/Y
COMPONENT CONNECTOR END VIEW SHOWS PINS OR SOCKETS ON A COMPONENT TO AID IN BENCH TESTING
WIRE COLORS ARE LABELED FOR MATING HARNESS CONNECTOR
63
R
981
R/W
STRIPED WIRE
RELAY
CONTACTS CLOSE WITH CURRENT THROUGH COIL
DASHED LINE SHOWS MECHANICAL CONNECTIONS
MOTOR
HEATING ELEMENT
COMPONENT WITH CONNECTORS
PIN AND BLADE TERMINAL TYPES
SOCKET TYPES
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSMISSION
MANUAL TRANSMISSION
C305
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
RHEOSTAT
FROM POWER
"CUT" WIRES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
TO LOAD
THERMISTOR
POTENTIOMETER
POSITION NUMBER
FUSE
CURRENT RATING
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
BACKUP LIGHTS
"REFERENCE" WIRES
SOLENOID
POSITION NUMBER
FUSE
CURRENT RATING
CANDELABRA CONNECTOR ACCEPTS SINGLE-PIN CONNECTORS
TRAILER ONLY
BR
C101A
W
W
C101
BR
OPTIONAL WIRING
BR WIRES (INCLUDING C101 ARE ON ALL VEHICLES, BUT W WIRES (INCLUDING C101A) ARE USED ONLY WITH TRAILER
MULTIPLE POSITION SWITCH
SCREW TERMINAL ON COMPONENT
S100
SPLICE OR CRIMP CONNECTION
MOST ARE BUILT INTO HARNESS AND ARE NOT ACCESSIBLE
GANGED SWITCHES
JUNCTION BLOCK
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
SEE GROUNDS
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL
12V BATTERY
20 GA BLUE
FUSE LINK
RESISTOR
SIGNAL GENERATOR
LIGHT BULB
DUAL FILAMENT LIGHT BULB
TRANSISTOR
LIGHT EMITTING DIODE
ZENER DIODE
CAPACITOR

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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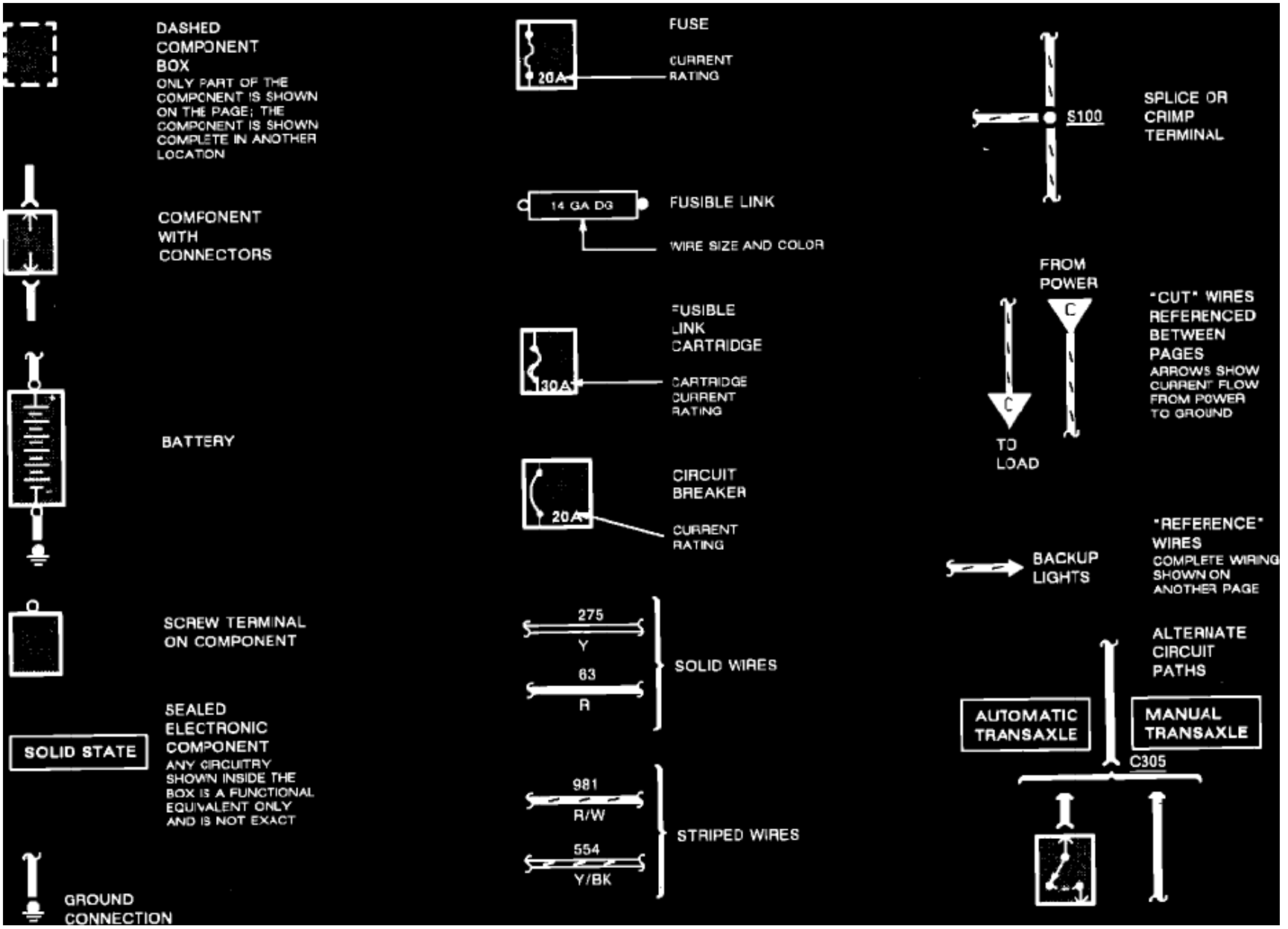
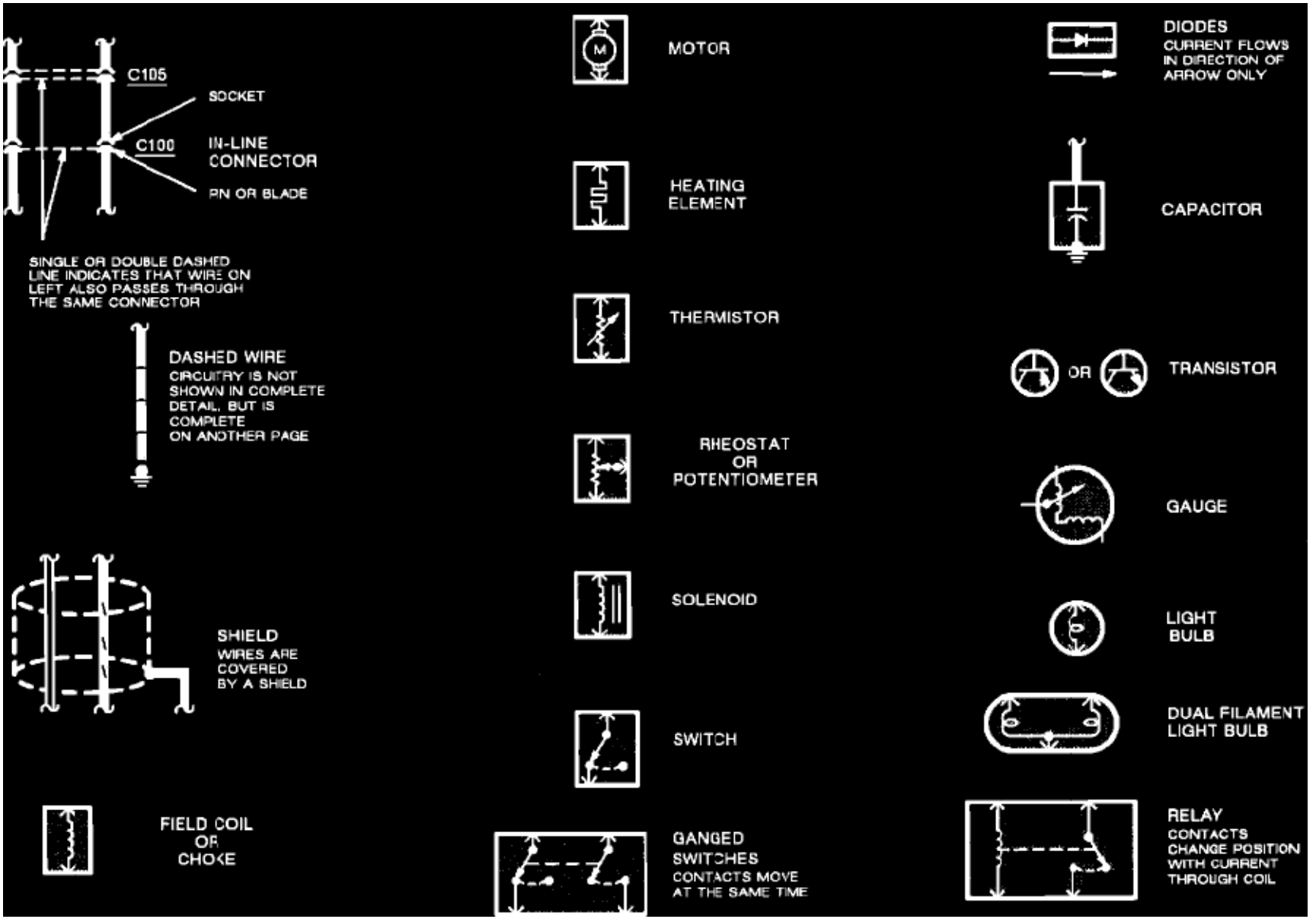

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

V: Violet

W: White

Y: Yellow

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (A/T only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
9	915	PK/LB	Data Communications Link (-)	DATA (-)
10	198	DG/O	A/C Cycling Switch	ACCS
14	967	LB/R	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Sensor Return	MAF RTN
16	259	O/R	Ignition Ground	IGN GND
17	656	PK/LG	Self-Test Output/Malfunction Indicator Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air) Solenoid	ISC
22	926	LB/O	Fuel Pump	FP
25	743	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
28	914	T/O	Data Communications Link (+)	DATA (+)
29	74	GY/LB	Heated Exhaust Gas Oxygen Sensor	HEGO
30	199	LB/Y	Clutch Interlock Switch (M/T Only)	CIS
30	199	LB/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge Solenoid	CANP
36	929	PK	Spark Angle Width	SAW
37	361	R	Vehicle Power	VPWR
40	570	BK/W	Power Ground	PWR GND
44	242	DG	Octane Adjust	OCT ADJ
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	99	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	237	O/Y	Shift Solenoid (A/T Only)	SS
53	480	P/Y	Clutch Converter Override (A/T Only)	CCO
54	331	PK/Y	WOT A/C Cut-Off	WAC
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 - Controls Engine Cylinder Numbers 1, 2, and 3)	INJ BANK 1
59	556	W	Injector (Bank 2 - Controls Engine Cylinder Numbers 4, 5, and 6)	INJ BANK 2
60	570	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.

ECA Connector Pin Identification

Engine Control Module: Description and Operation Electronic Control Assembly (ECA)

The Electronic Control Assembly (ECA) receives ignition ground and Profile Ignition Pickup (PIP) signals from the EDIS module then generates a Spark Angle Word (SAW) output signal based on fuel, air and other sensor information. An IDM signal is received from the EDIS module to determine if a failure mode should be recorded. For diagnosis and testing of the ECA refer to "COMPUTERIZED ENGINE CONTROLS".

Engine Control Module: Description and Operation Failure Mode Effects Management

PURPOSE

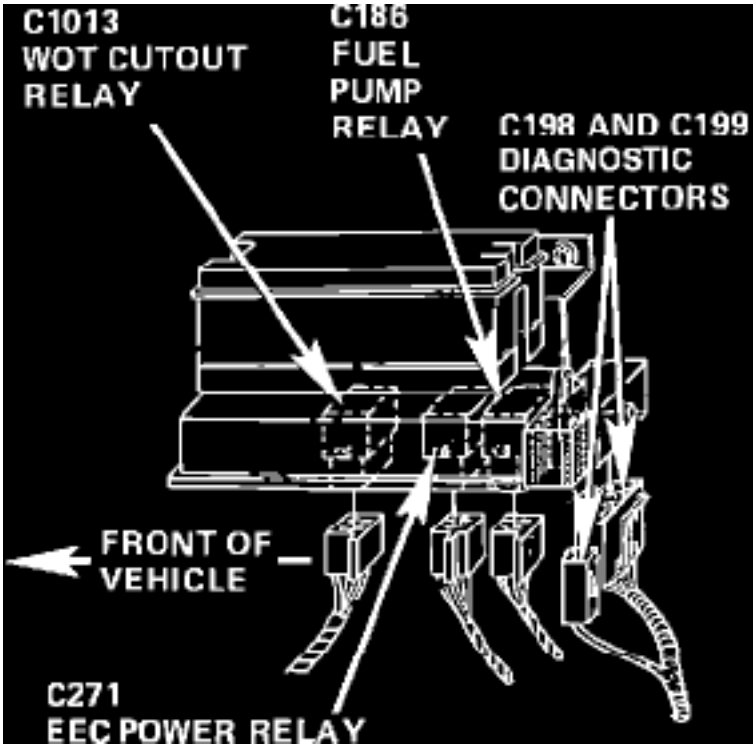
Operating mode that attempts to keep the vehicle driveable in the event of certain Electronic Engine Control (EEC) or ignition system failures.

Engine Control Module: Service and Repair

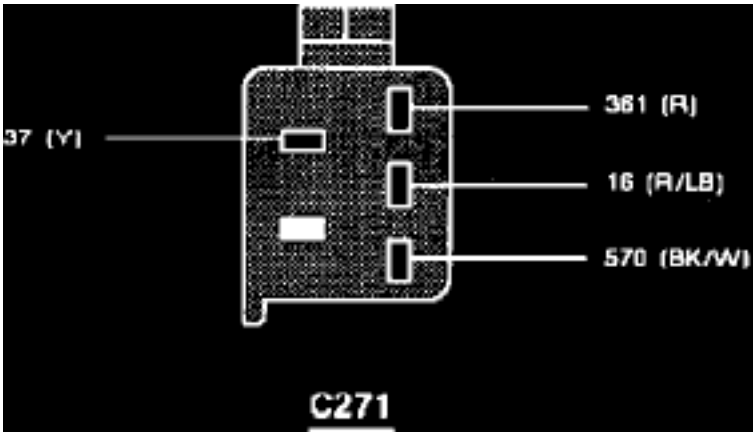
The processor stores data about vehicle operating conditions and uses this information to compensate for component tolerances. When an emission related component is replaced, Keep Alive Memory (KAM) should be cleared to erase the data stored by the processor from the original component.

1. With the ignition switch OFF, disconnect the negative battery cable for a minimum of five minutes, then reconnect the cable.

2. Operate the vehicle for a minimum of ten miles to allow the Engine Control Assembly (ECA) to relearn values for optimum driveability and performance. NOTE: Distance varies with vehicle application.



Relay And Diagnostic Connectors



EEC-IV Power Relay Connector

Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE			
Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

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^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

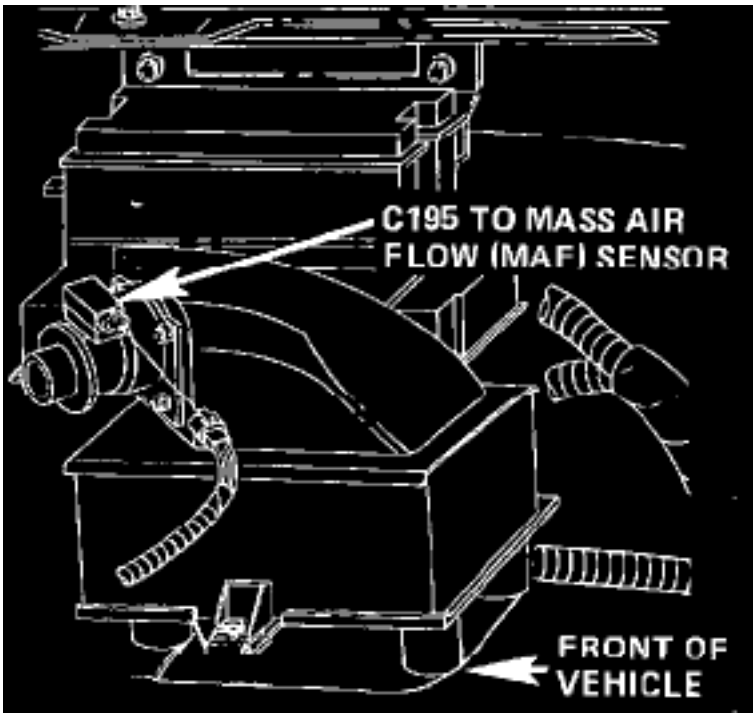
4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

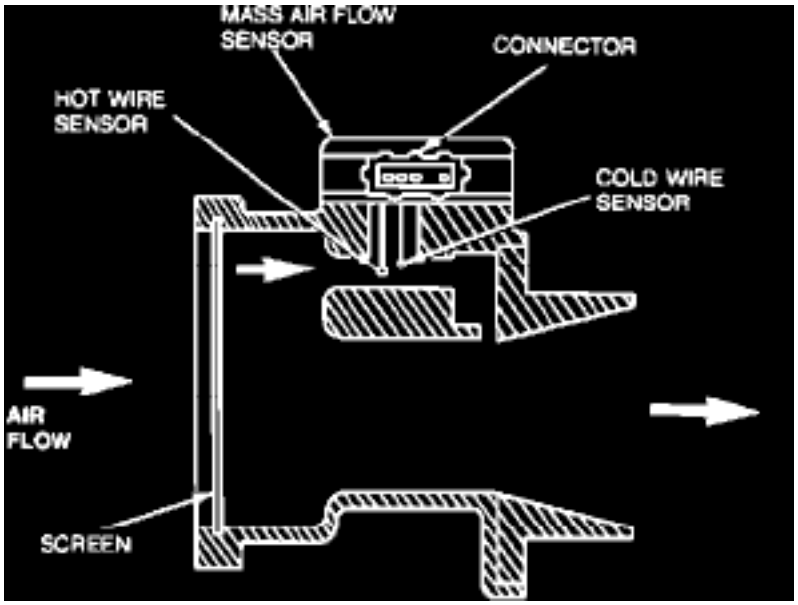
DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



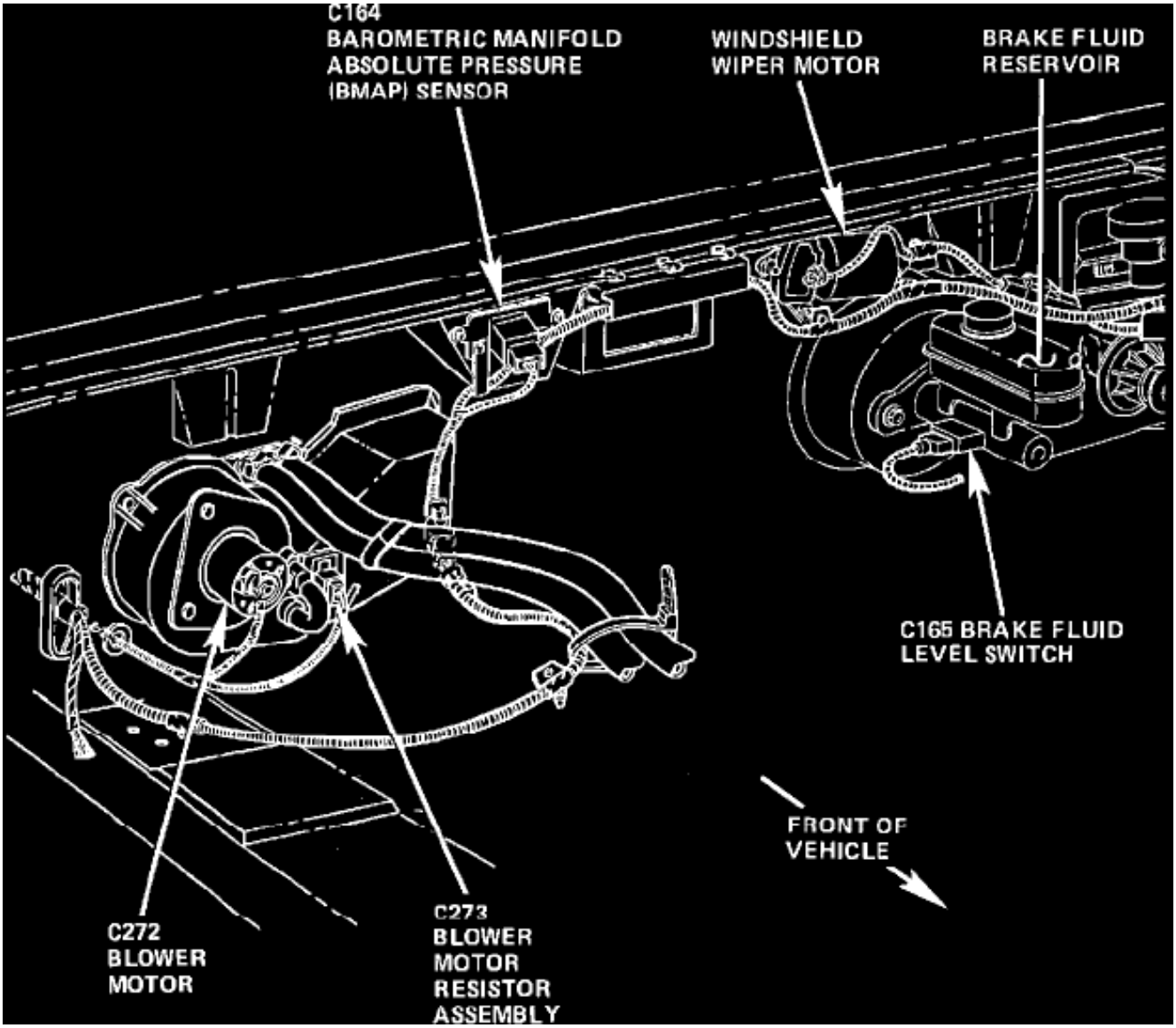
Mass Air Flow (MAF) Sensor



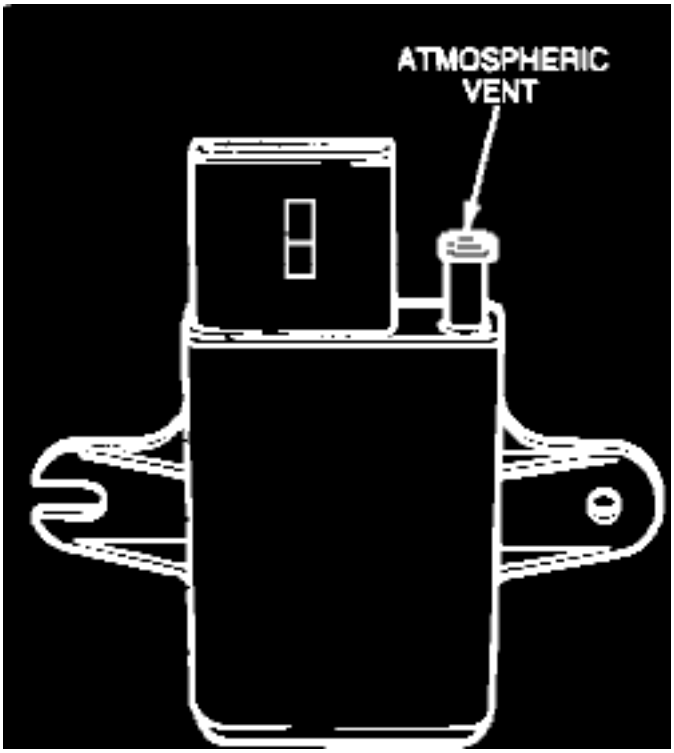
Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



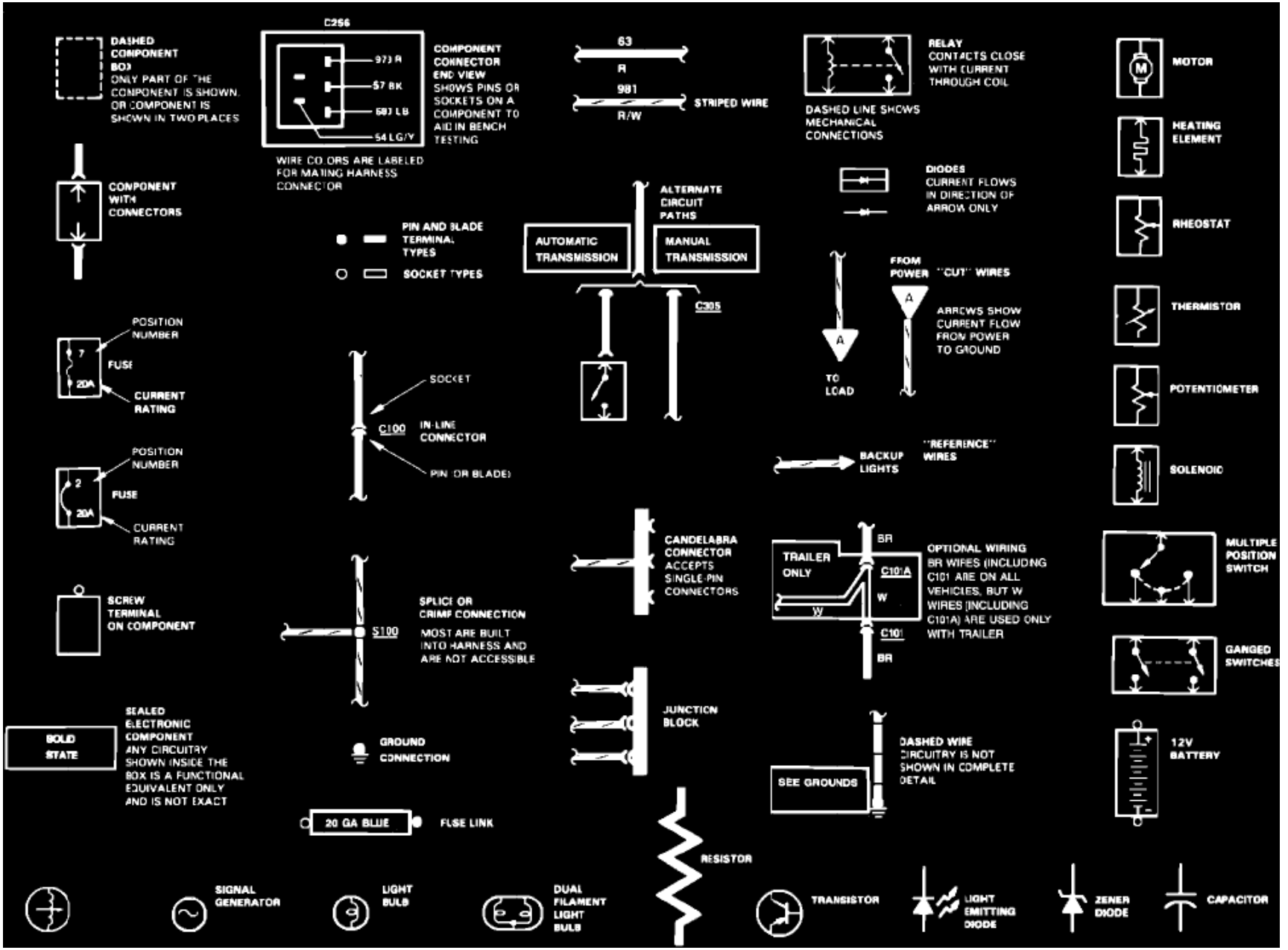
Barometric/manifold Absolute Pressure (BMAP) Sensor



Barometric Pressure Sensor: Description and Operation

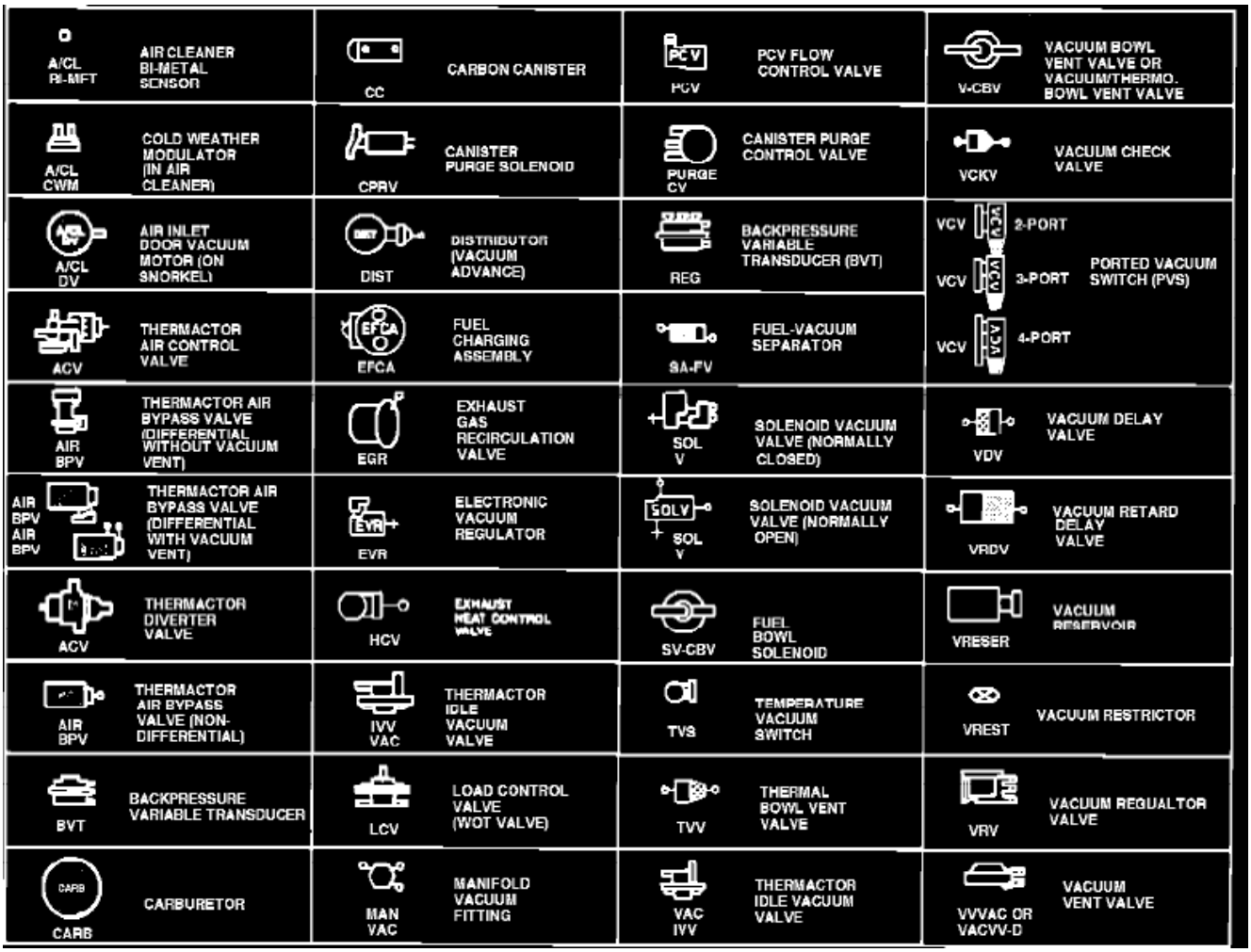
Barometric Pressure Sensor

The Barometric Pressure (BP) sensor is a frequency generating device that produces a varying signal depending on the amount of atmospheric (barometric) pressure. The Engine Control Assembly (ECA) monitors the frequency emitted from the BP sensor and converts the signal to atmospheric pressure. The ECA uses this reading to update the barometric pressure value stored in RAM memory. The ECA uses the input from the BP sensor to optimize the air/fuel ratio, ignition timing adjustment, and EGR flow control. The BP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

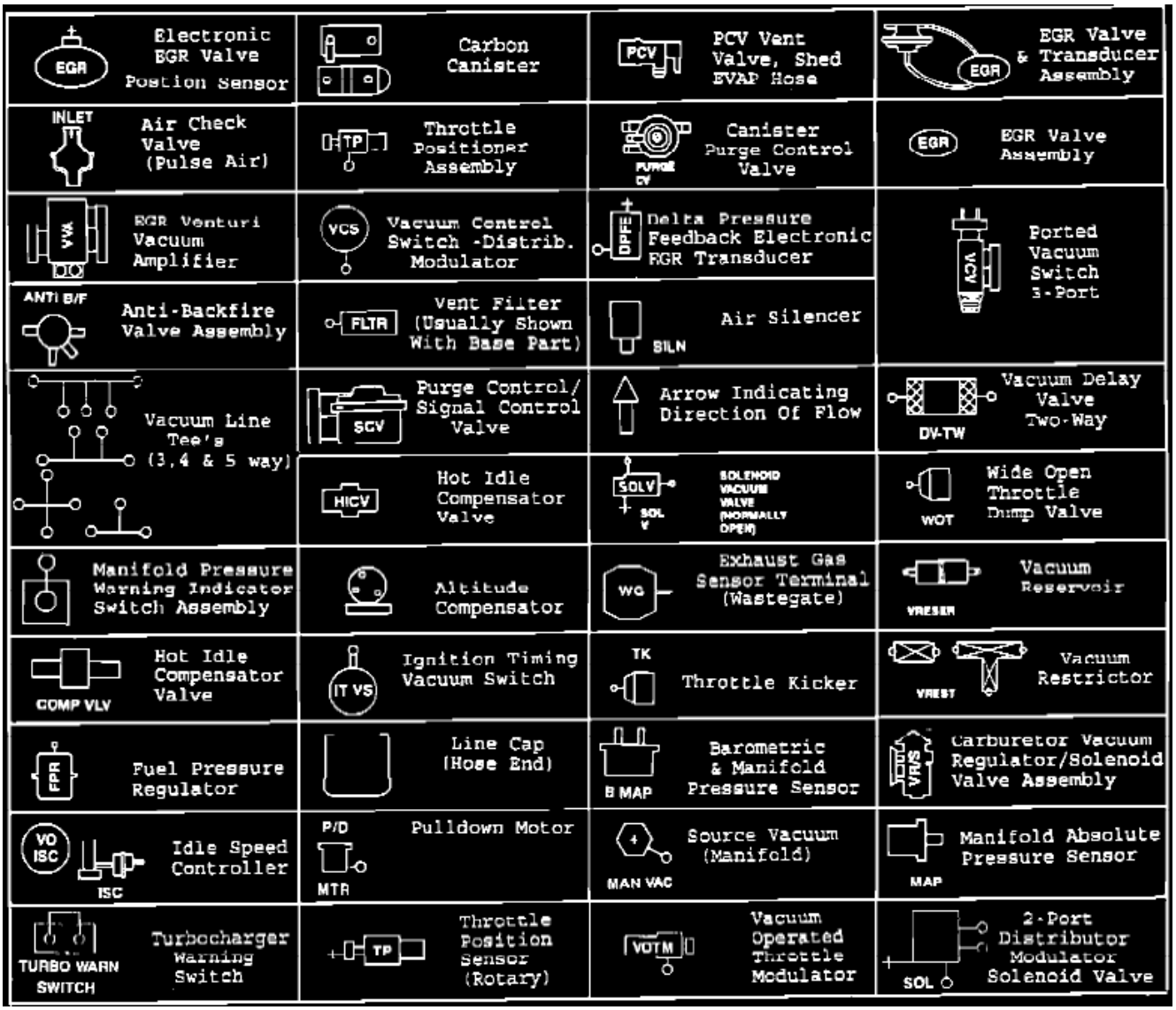


Camshaft Position Sensor: Diagram Information and Instructions

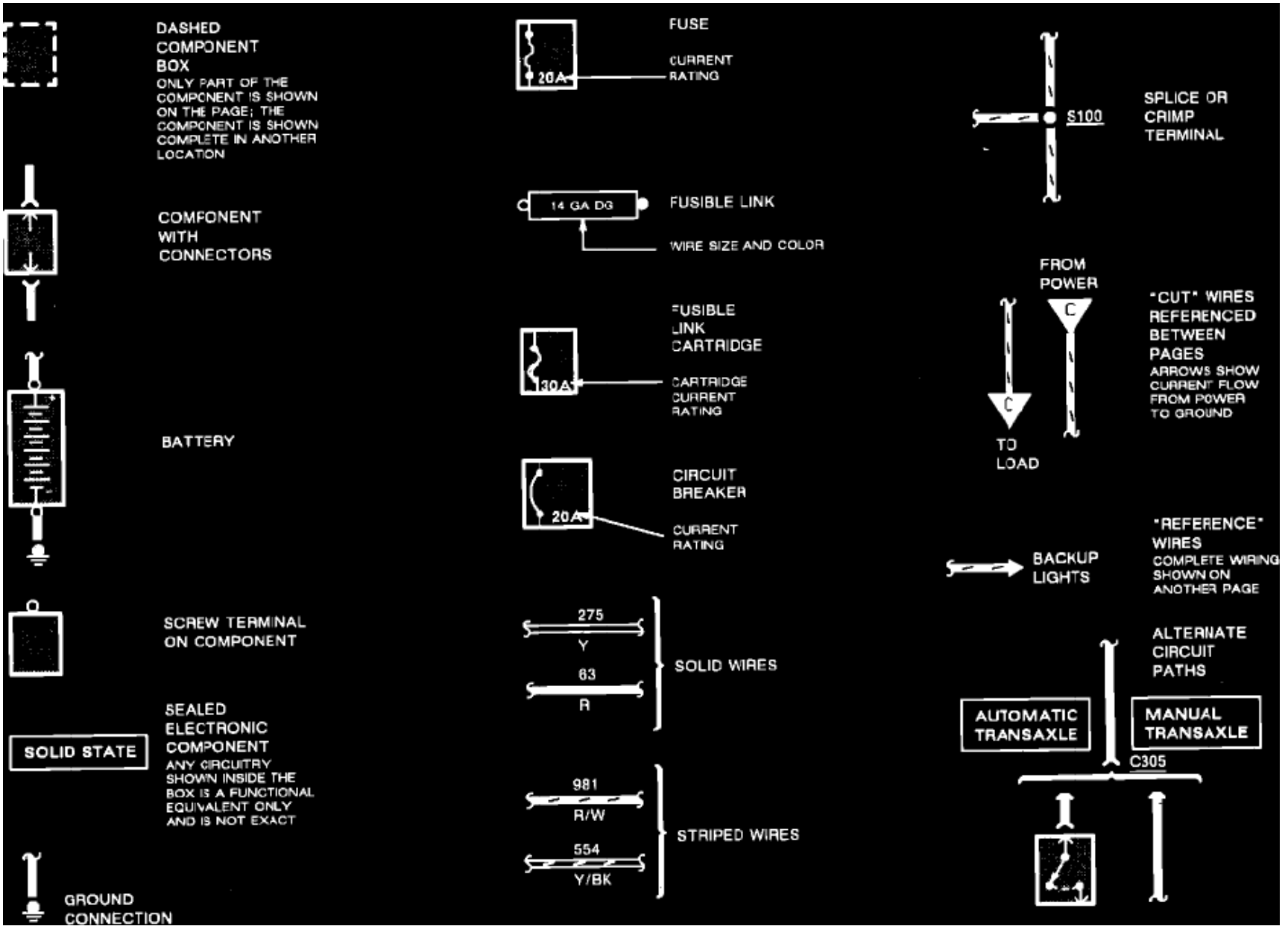
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
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SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
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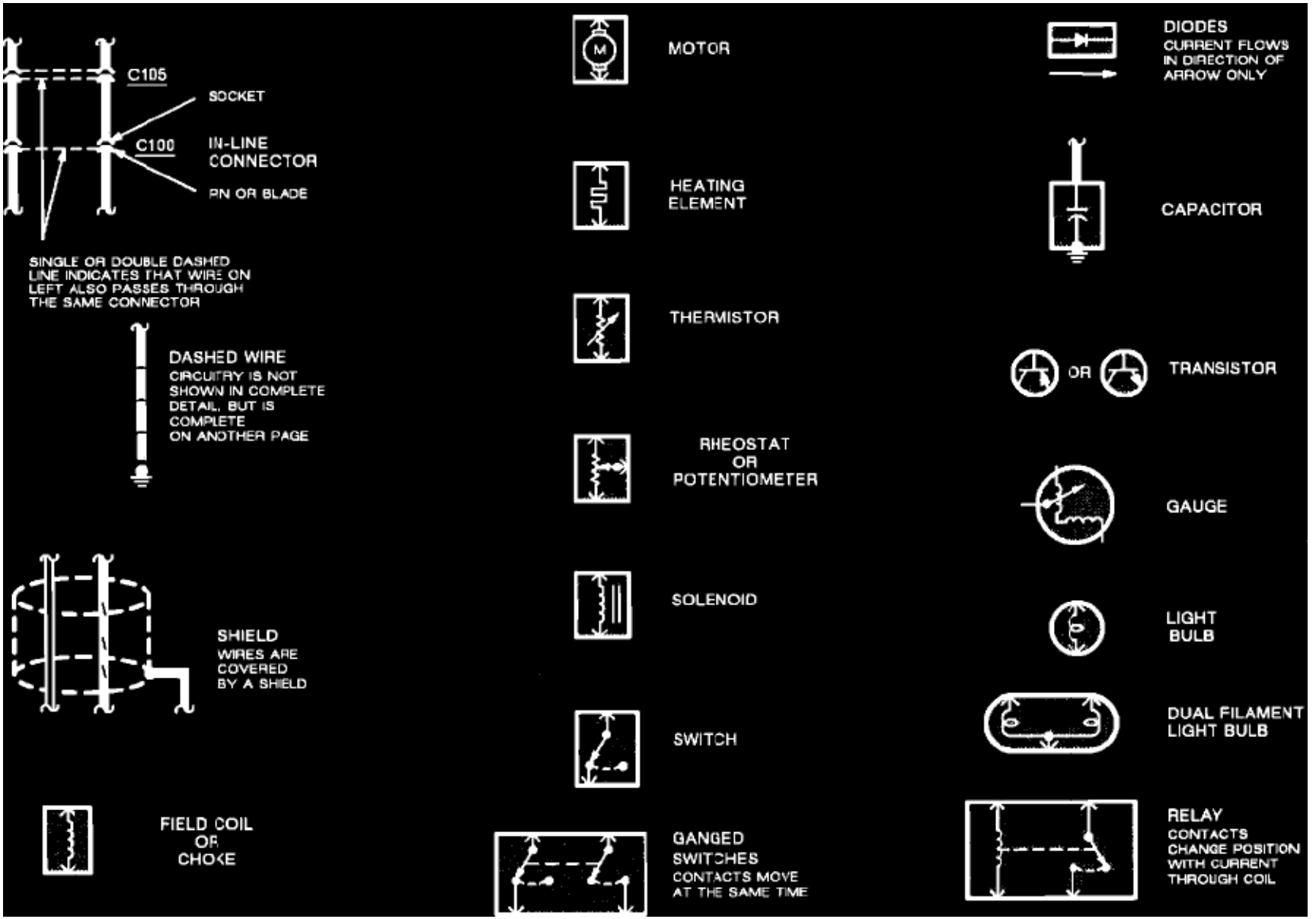
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

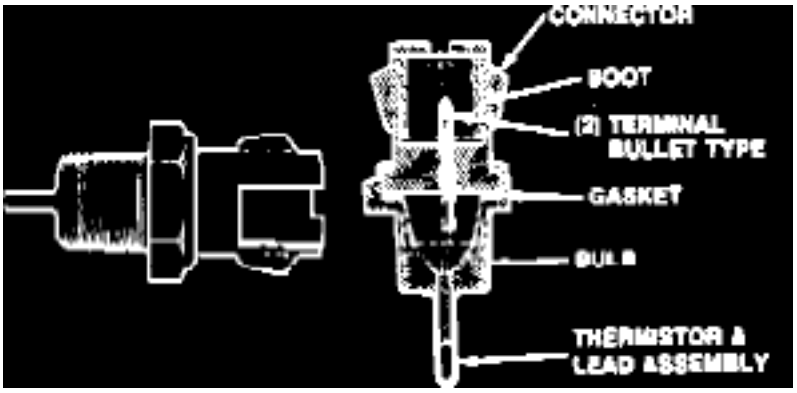
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Coolant Temperature Sensor/Switch (For Computer): Description and Operation

Engine Coolant Temperature Sensor

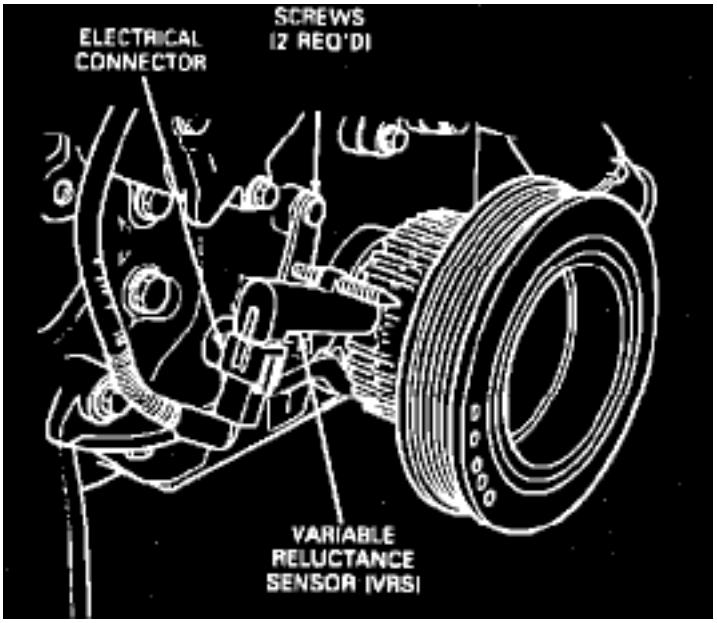
The Engine Coolant Temperature (ECT) sensor is threaded into a coolant passage with the sensing bulb extending into the coolant. The ECT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) also changes. The ECA reads the varying sensor resistance and determines the engine operating temperature, using this information to optimize the air/fuel mixture and ignition timing. The ECT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Crankshaft Position Sensor: Specifications

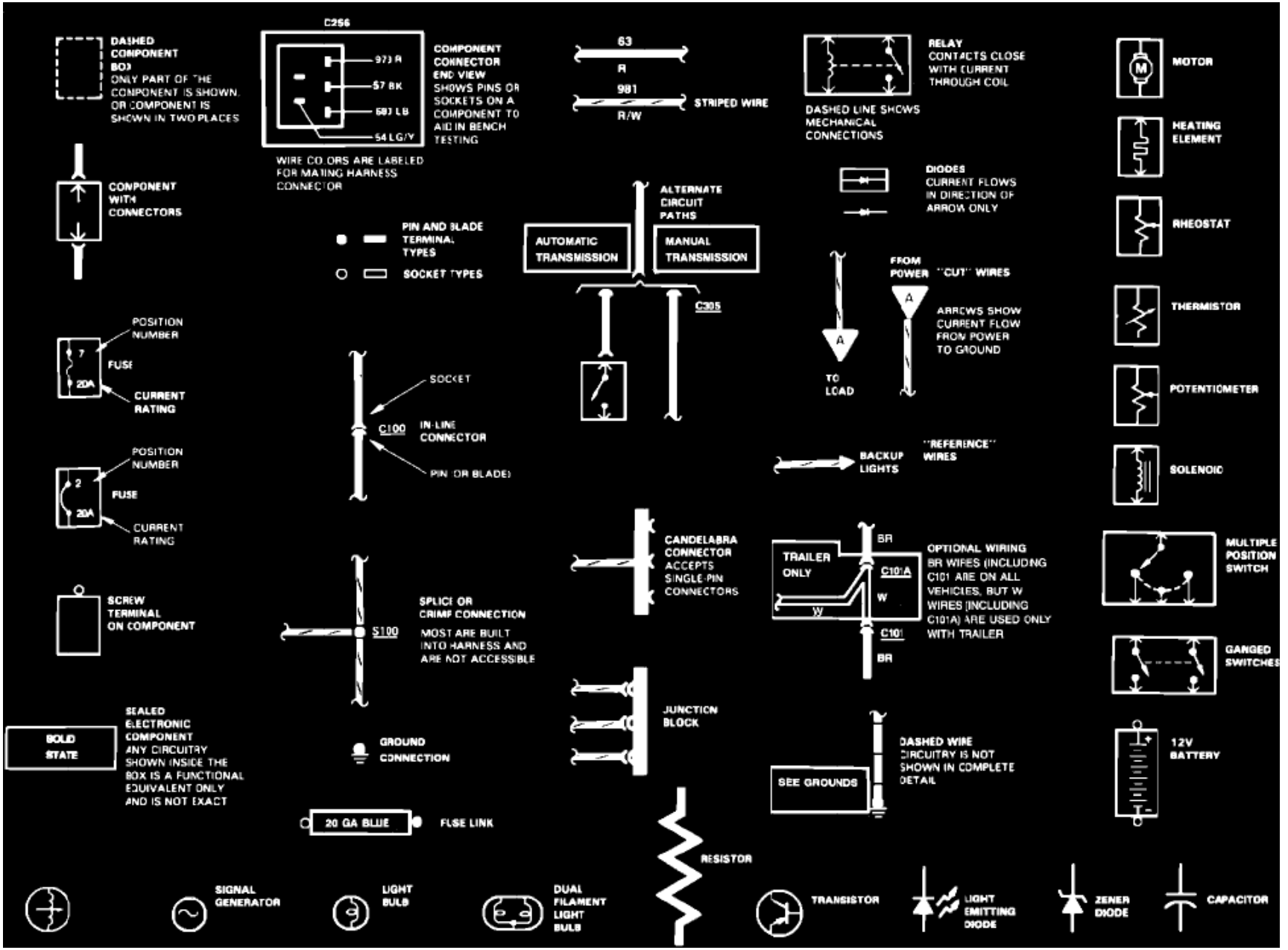
FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)

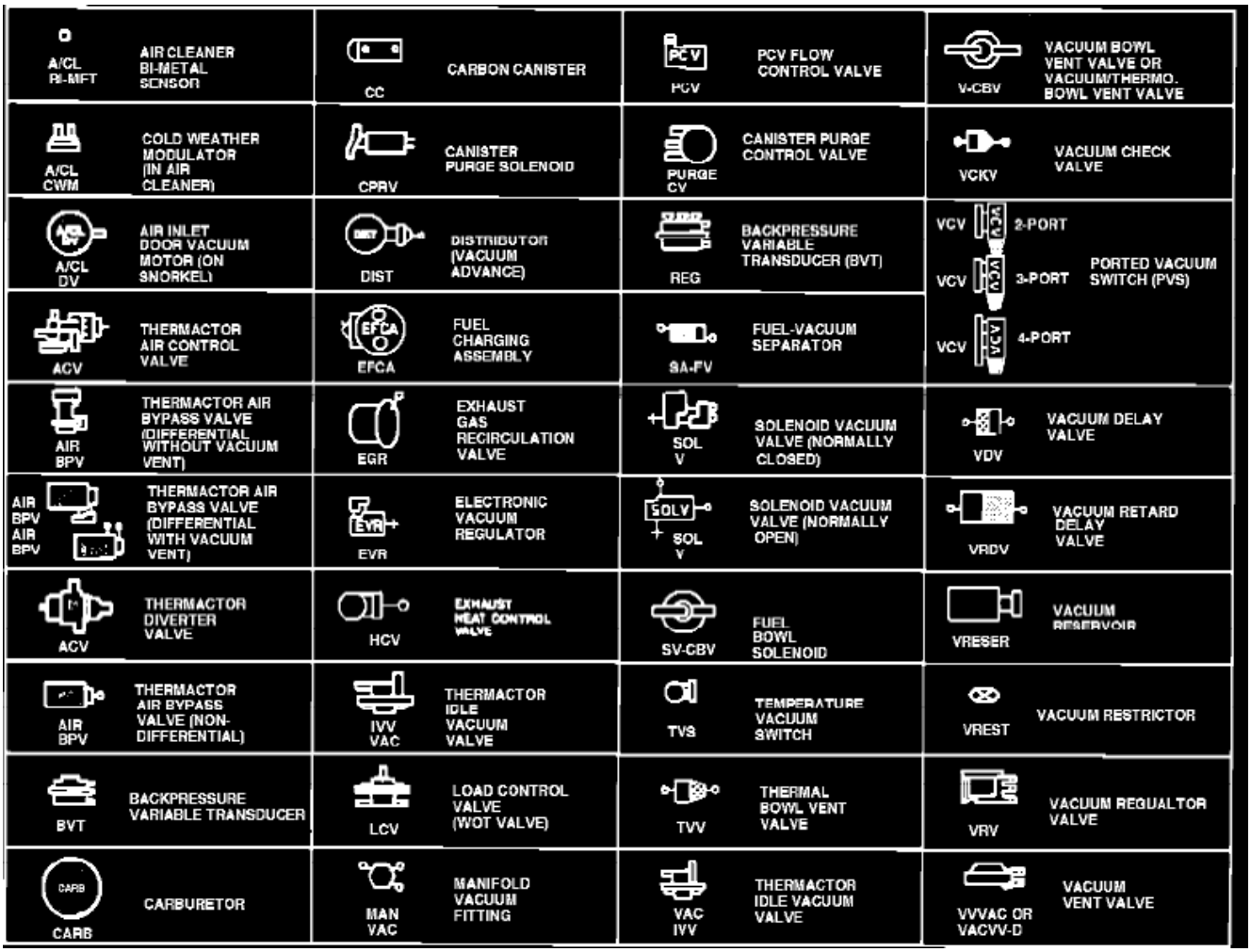


Variable Reluctance (Crankshaft Position) Sensor

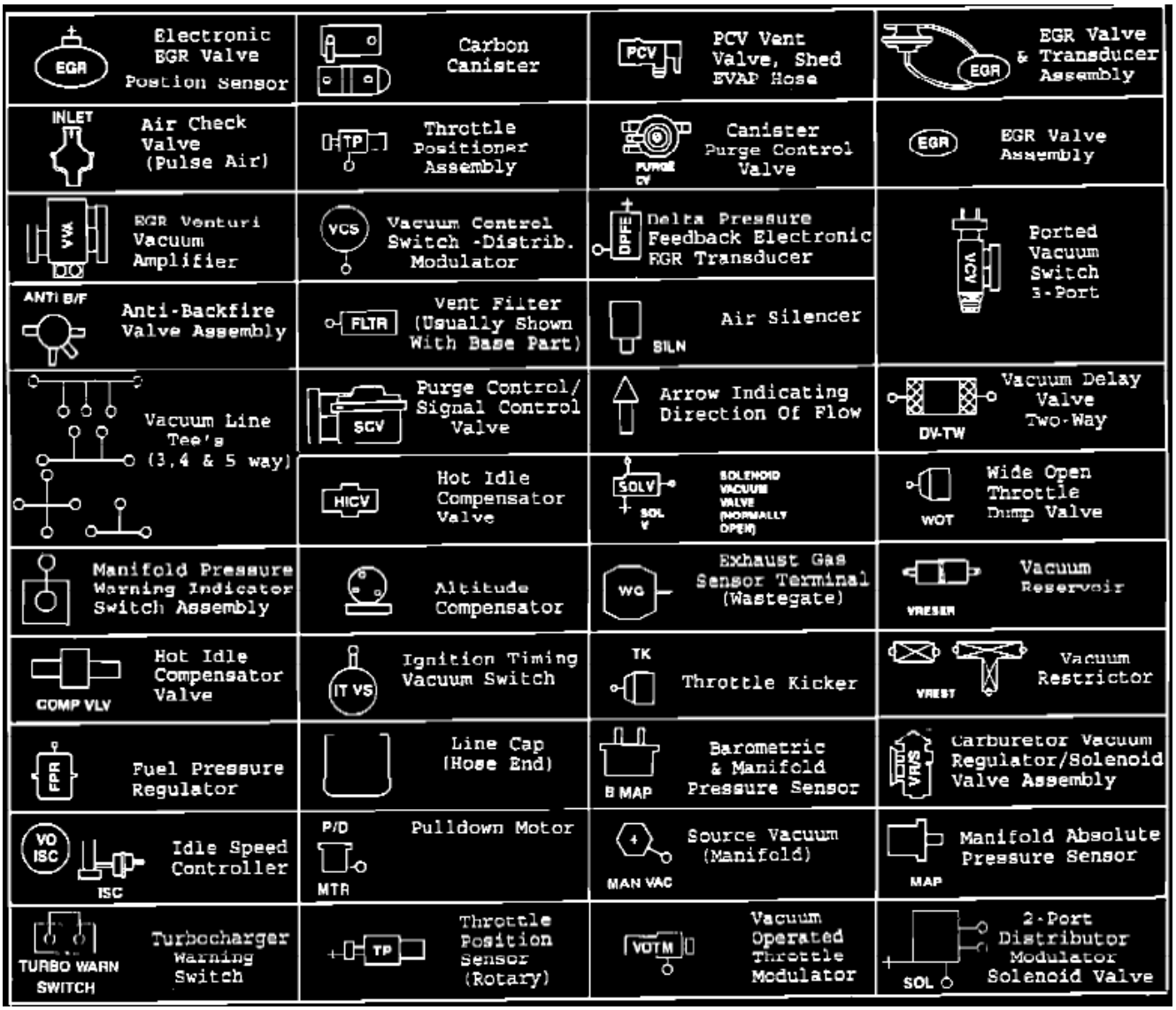


Crankshaft Position Sensor: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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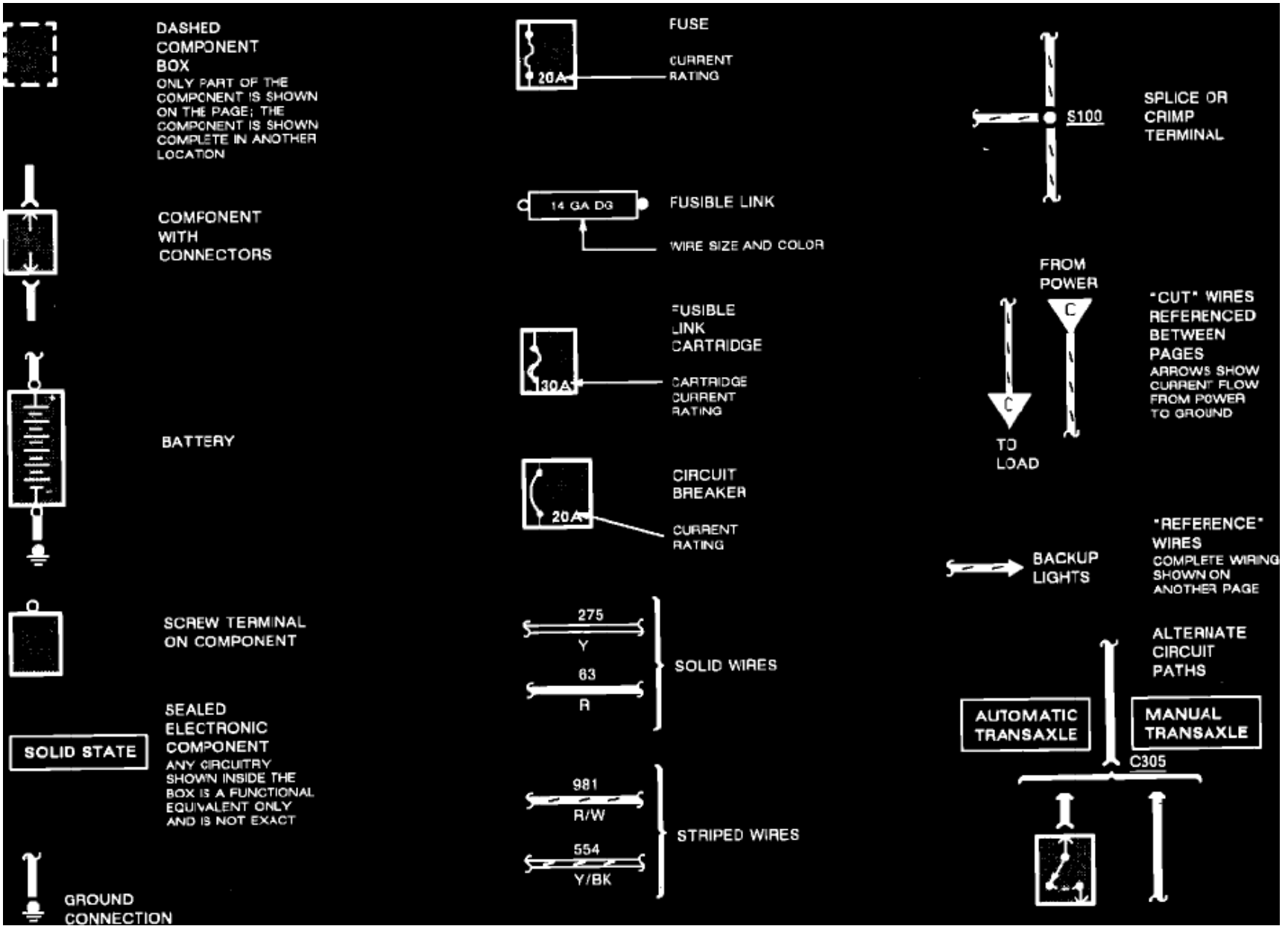
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CARTRIDGE CURRENT RATING
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CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
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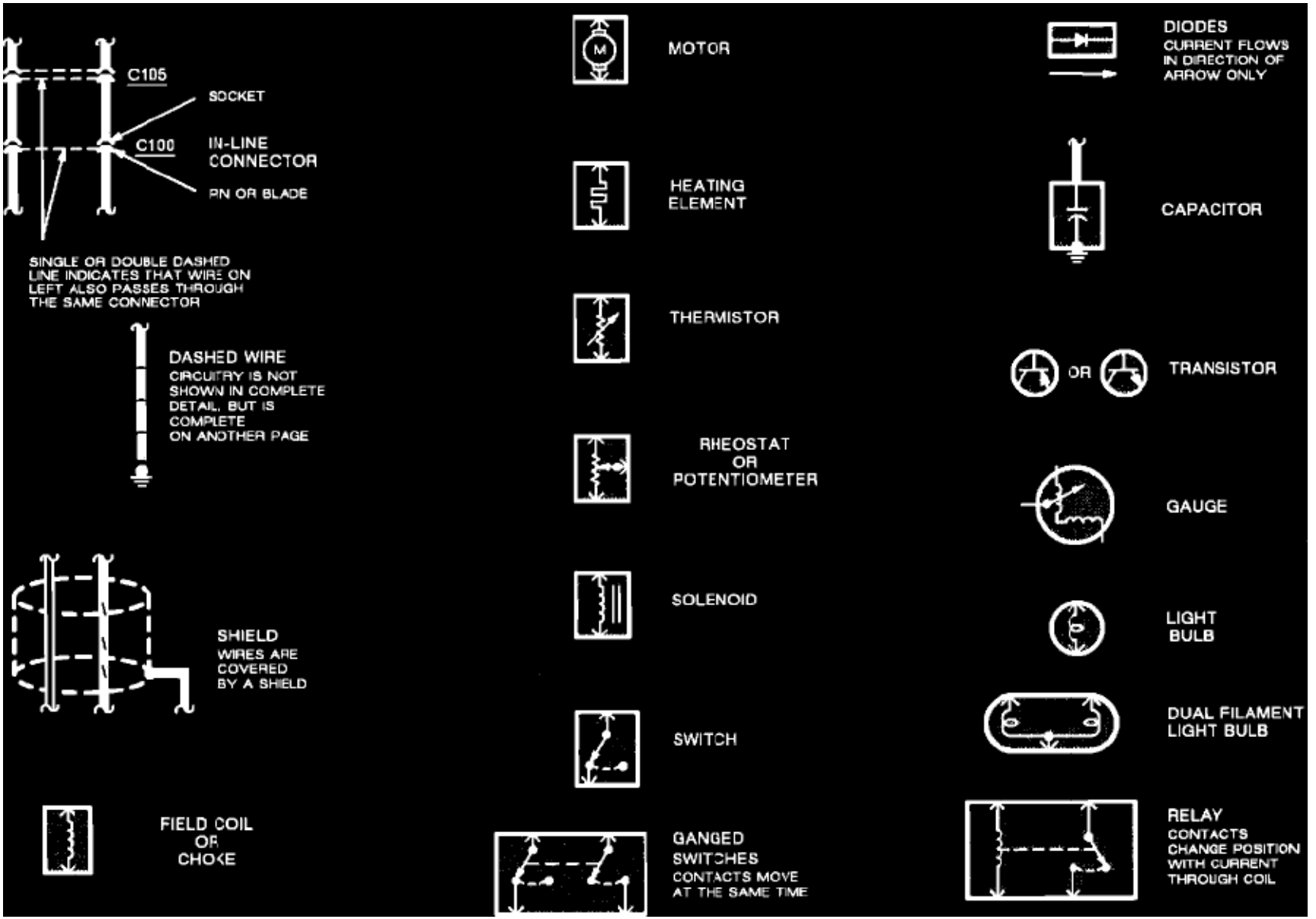

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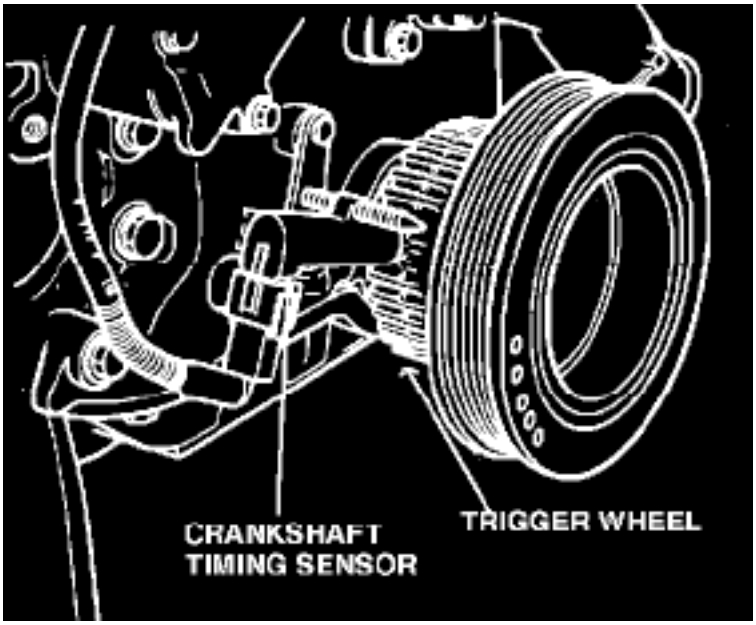
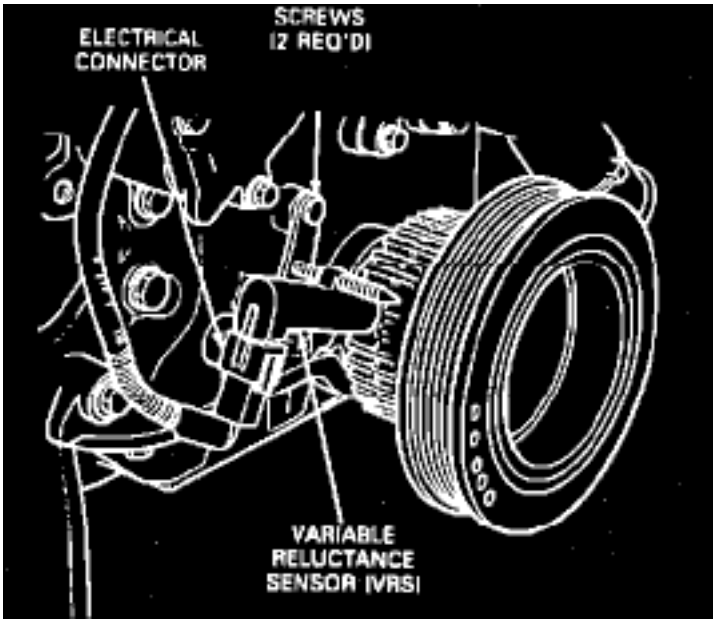


Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

INSTALLATION:

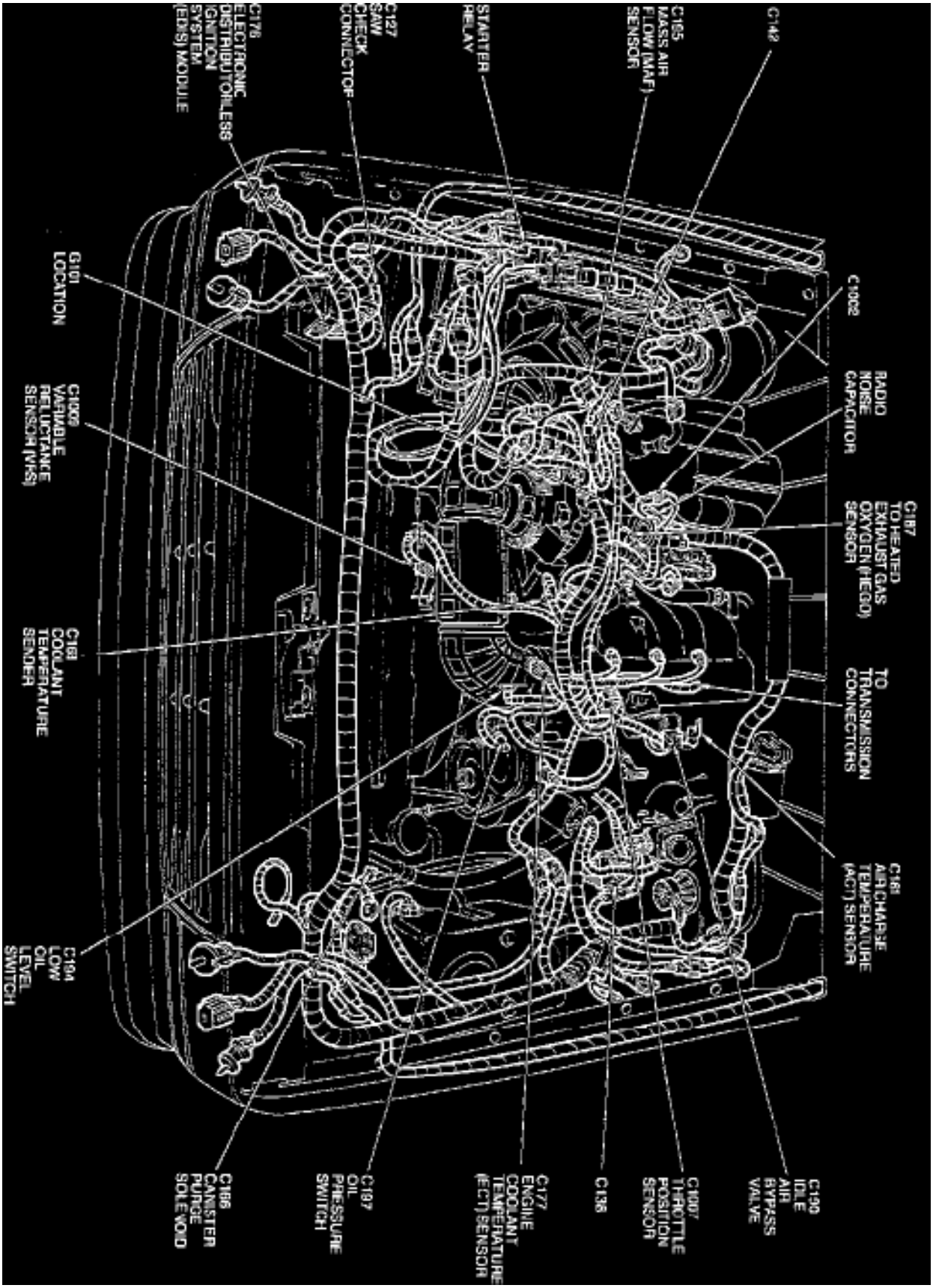
1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

4. Connect the negative battery cable.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Sensors and Switches - Computers and Control Systems > Intake Air Temperature Sensor > Component Information > Locations

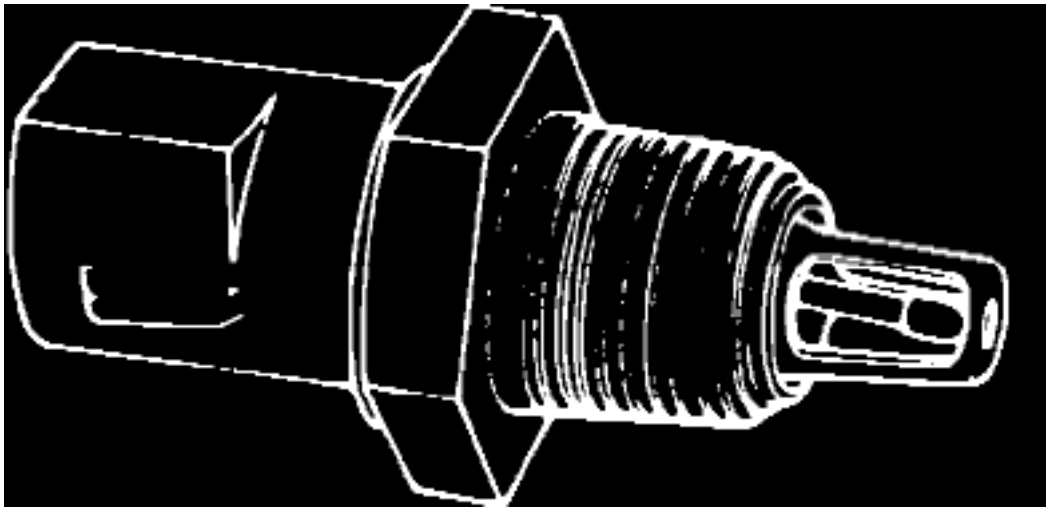


Intake Air Temperature Sensor: Locations

Engine Compartment Components.

Top LH Side Of Engine

Applicable to: 4.0L/V6-244



Intake Air Temperature Sensor: Description and Operation

Air Charge Temperature (ACT) Sensor

The Air Charge Temperature (ACT) sensor is threaded into the intake air passage with a sensing element extending into the air chamber. The ACT sensor is a negative temperature coefficient sensor, meaning that as the temperature of the sensor increases, the resistance will decrease. As the resistance value changes, the signal sensed by the Engine Control Assembly (ECA) will also change. The ECA reads the varying sensor resistance and determines the air charge temperature, using this information to optimize the air/fuel mixture. The ACT sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Technical Service Bulletins EGO Sensors - Silicone Contamination

Article No. 93-23-6

11/10/93

^ EGO SENSORS - SILICONE CONTAMINATION

^ ENGINE - SEALANTS, LOW VOLATILITY SILICONE REQUIRED

^ EXHAUST SYSTEM - SILICONE CONTAMINATION OF EXHAUST GAS OXYGEN (EGO) SENSORS

FORD: 1984-86 LTD 1984-88 EXP 1984-94 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-94 TAURUS 1988-93 FESTIVA 1989-94 PROBE 1994 ASPIRE

LINCOLN-MERCURY: 1984-86 CAPRI, MARQUIS 1984-87 LYNX 1984-92 MARK VII 1984-94 CONTINENTAL, COUGAR, GRAND MARQUIS, TOPAZ, TOWN CAR 1986-94 SABLE 1988-89 TRACER 1991-94 CAPRI, TRACER 1993-94 MARK VIII

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1983-94 RANGER 1984-90 BRONCO II 1984-94 BRONCO, ECONOLINE, F-150-350 SERIES 1986-94 AEROSTAR 1988-94 F-47, F-53 1991-94 EXPLORER 1993-94 VILLAGER

This TSB article is being republished in its entirety to update model applicability and to revise the part number of the Low Volatility Sealant.

ISSUE: EGO sensors can be contaminated if volatile types of silicone are used when servicing the engine. Volatile silicones can migrate throughout the system during the first one hundred hours of service. They are commonly found in liquid "silicone rubber" sealants and gasket material. These products are commonly sold in tubes and caulking-type cartridges.

ACTION: When service is performed on the engine, only use new low volatility silicone sealant (F1AZ-19662-A) where specified. Also replace the contaminated EGO sensor if required.

CAUTION: DO NOT SUBSTITUTE CONVENTIONAL SILICONE RUBBER SEALANTS WHEN LOW VOLATILITY SILICONE SEALANT IS SPECIFIED.

PART NUMBER PART NAME CLASS

F1AZ-19662-A Low Volatility RTV Sealant B

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 89-14-5

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 490000, 499000

Oxygen Sensor: Technical Service Bulletins Heated Exhaust Gas Oxygen Sensor - Application Chart

Article No. 94-16-9

08/10/94

EXHAUST - HEATED OXYGEN SENSOR (H02S) - APPLICATION CHART

FORD: 1991-94 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991-94 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1993-94 MARK VIII

LIGHT TRUCK: 1991-94 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F SUPER DUTY, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 F & B SERIES

ISSUE: Quick Reference Heated Oxygen Sensor (H02S) Application Charts have been developed to assist technicians and parts managers in correct parts usage.

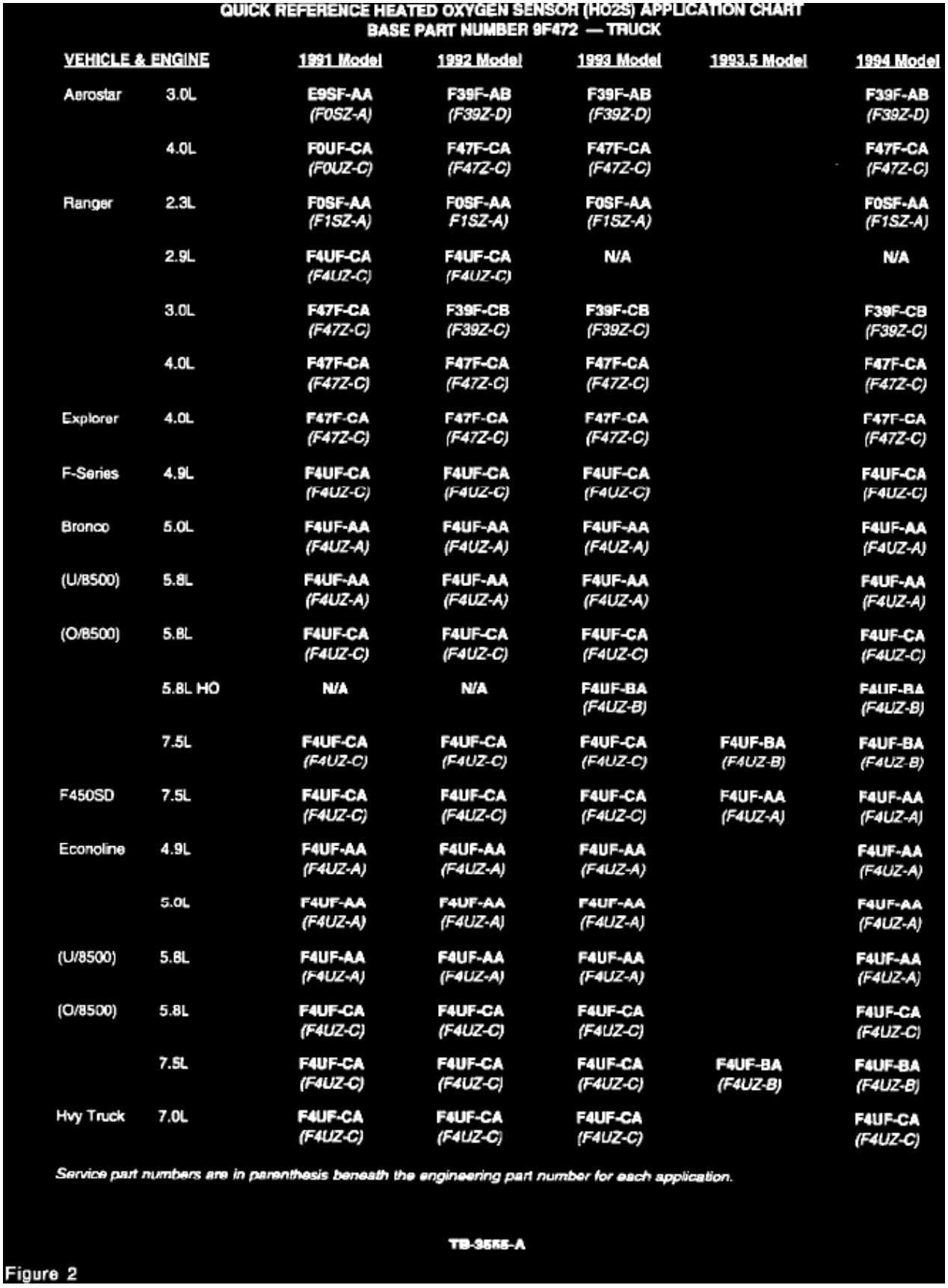
QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — CAR

VEHICLE & ENGINE		1991 Model	Qty	1992 Model	Qty	1993 Model	Qty	1994 Model	Qty
Escort	1.9L	E93F-AA *(F03Z-A)*	1	F09F-AA *(F09Z-A)*	1	F09F-AA *(F09Z-A)*	1	F0SF-AA *(F1SZ-A)*	1
Tempo/Topaz	2.3L	E9SF-BA *(F0SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1	F0SF-BA *(F1SZ-B)*	1
	3.0L	N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
Taurus/Sable	2.5L	F0SF-AA *(F1SZ-A)*	1	N/A		N/A		N/A	
	3.0L	F0SF-AA *(F1SZ-A)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2	F0SF-BA *(F1SZ-B)*	2
	3.8L	F4AF-AA *(F4AZ-A)*	2	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1	@ F4AF-AA *(F4AZ-A)*	1
				# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1	# F4AF-BA *(F4AZ-B)*	1
	3.2L SHO	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2
	3.0L SHO	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2	E9SF-AA *(F0SZ-A)*	2
Mustang	2.3L DP	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	F0SF-AA *(F1SZ-A)*	1	N/A	
	3.8L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
	5.0L HO+	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	E97F-AA *(F0SZ-A)*	2	F4SF-DA *(F4SZ-D)*	2
T/Bird/Cougar	3.8L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	3.8LSC	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4SF-AB *(F4SZ-A)*	2
	5.0L HO+	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A	
	4.6L	N/A		N/A		N/A		F4ZF-AB *(F4ZZ-A)*	2
Crown Vic/ Grand Marquis	4.6L;4BS	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2
	4.6L CAL	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-BA *(F4AZ-B)*	2
Continental	3.8L	F0SF-AA *(F1SZ-A)*	2	F0SF-AA *(F1SZ-A)*	2	N/A/		N/A/	
	3.8L	N/A		@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1	@ F0SF-AA *(F1SZ-A)*	1
		N/A		# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1	# F0SF-BA *(F1SZ-B)*	1
Town Car	4.6L	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	F4AF-AA *(F4AZ-A)*	2	N/A	
	4.6L LIMO	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L CAL	N/A		N/A		N/A		F4AF-BA *(F4AZ-B)*	2
	4.6L;4BS	N/A		N/A		N/A		F4AF-AA *(F4AZ-A)*	2
Mark VIII	4.6L 4V	N/A		N/A		F0SF-AA *(F1SZ-A)*	2	F4AF-AA *(F4AZ-A)*	2

NOTE: Boxed areas are recommended new parts for service (ITALICIZED numbers are service part numbers).
@ Engine control sensor located in rear manifold/exhaust pipe.
# Engine control sensor located in front manifold/exhaust pipe.

TB-3554-A

Figure 1



QUICK REFERENCE HEATED OXYGEN SENSOR (HO2S) APPLICATION CHART
BASE PART NUMBER 9F472 — TRUCK

VEHICLE & ENGINE		1991 Model	1992 Model	1993 Model	1993.5 Model	1994 Model
Aerostar	3.0L	E9SF-AA (F0SZ-A)	F39F-AB (F39Z-D)	F39F-AB (F39Z-D)		F39F-AB (F39Z-D)
	4.0L	F0UF-CA (F0UZ-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
Ranger	2.3L	F0SF-AA (F1SZ-A)	F0SF-AA F1SZ-A)	F0SF-AA (F1SZ-A)		F0SF-AA (F1SZ-A)
	2.9L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	N/A		N/A
	3.0L	F47F-CA (F47Z-C)	F39F-CB (F39Z-C)	F39F-CB (F39Z-C)		F39F-CB (F39Z-C)
	4.0L	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
Explorer	4.0L	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)	F47F-CA (F47Z-C)		F47F-CA (F47Z-C)
F-Series	4.9L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
Bronco	5.0L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(U/B500)	5.8L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(O/B500)	5.8L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
	5.8L HO	N/A	N/A	F4UF-BA (F4UZ-B)		F4UF-BA (F4UZ-B)
	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-BA (F4UZ-B)	F4UF-BA (F4UZ-B)
F450SD	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)
Econoline	4.9L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
	5.0L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(U/8500)	5.8L	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)	F4UF-AA (F4UZ-A)		F4UF-AA (F4UZ-A)
(O/8500)	5.8L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)
	7.5L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-BA (F4UZ-B)	F4UF-BA (F4UZ-B)
Hvy Truck	7.0L	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)	F4UF-CA (F4UZ-C)		F4UF-CA (F4UZ-C)

Service part numbers are in parenthesis beneath the engineering part number for each application.

TB-3555-A

Figure 2

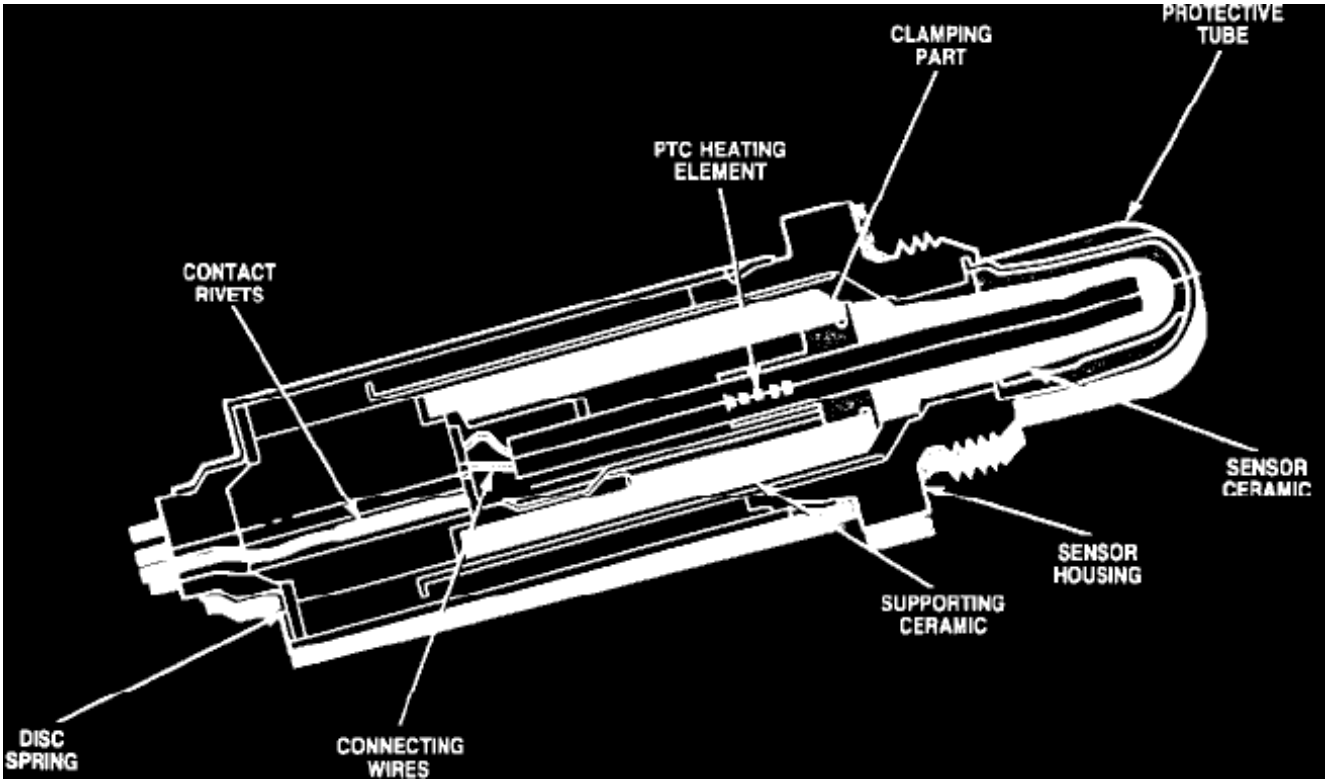
ACTION: Refer to the appropriate Quick Reference Heated Oxygen Sensor (HO2S) Application Chart for Passenger Car or Truck, Figures 1 and 2, to make sure that the correct service sensor is

installed. In some cases, new applications are shown.

PART NUMBER	PART NAME	CLASS
FOSZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-D	Heated Oxygen Sensor	A
FOUZ-9F472-C	Heated Oxygen Sensor	B
F47Z-9F472-C	Heated Oxygen Sensor	A
F1SZ-9F472-A	Heated Oxygen Sensor	B
F39Z-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-C	Heated Oxygen Sensor	A
F4UZ-9F472-A	Heated Oxygen Sensor	A
F4UZ-9F472-B	Heated Oxygen Sensor	A
FO3Z-9F472-A	Heated Oxygen Sensor	B
FO9Z-9F472-A	Heated Oxygen Sensor	B
F1SZ-9F472-B	Heated Oxygen Sensor	B
F4AZ-9F472-A	Heated Oxygen Sensor	A
F4AZ-9F472-B	Heated Oxygen Sensor	A
F4ZZ-9F472-A	Heated Oxygen Sensor	A
F4SZ-9F472-D	Heated Oxygen Sensor	A
F4SZ-9F472-A	Heated Oxygen Sensor	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 403000, 623000



Oxygen Sensor: Description and Operation

Heated Oxygen Sensor

The Heated Exhaust Gas Oxygen (HEGO) sensor is threaded into the exhaust manifold with a sampling tip extending into the exhaust stream. The sensor is a zirconium dioxide ceramic thimble with platinum surface electrodes. The ceramic thimble is oxygen ion conductive and generates voltage due to the oxygen content difference between the atmosphere and the exhaust gas. The sensor will generate a voltage signal between 0 volts (lean condition) and 1.1 volts (rich condition). The ECU reads this signal to achieve an air/fuel ratio of 14.7:1 when operating in CLOSED LOOP. The HEGO sensor must operate above 600°F. To quickly heat up the sensor, a heating element is incorporated into the sensor. The HEGO sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Oxygen Sensor: Service and Repair

The oxygen sensor has a permanently attached wire and connector. This should not be removed, since the removal will affect proper operation of the oxygen sensor.

1. Disconnect electrical connector from oxygen sensor.

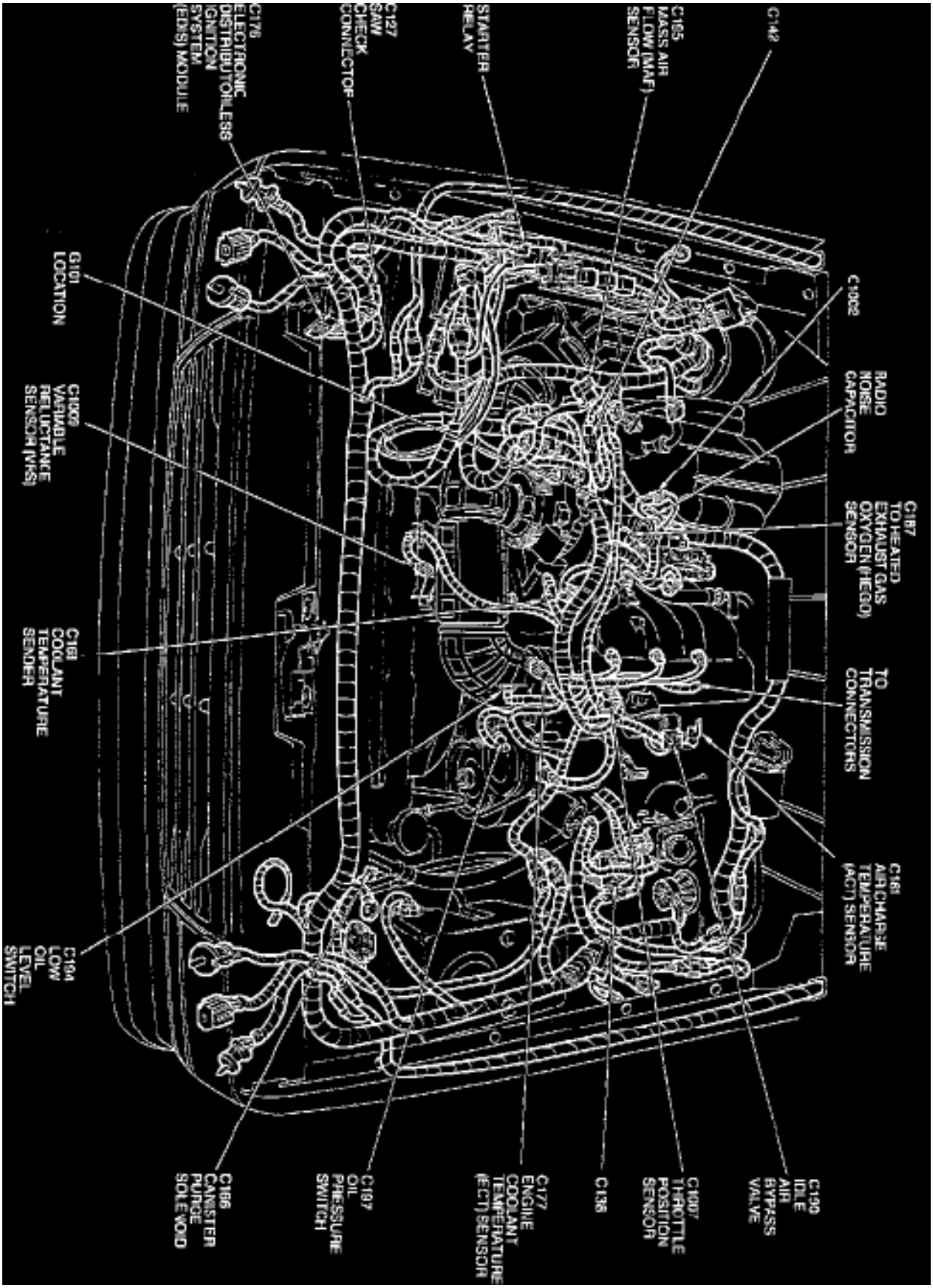
2. Using a suitable oxygen sensor wrench, carefully remove the sensor from exhaust manifold or pipe. The oxygen sensor may be difficult to remove when engine temperature is below 120°F. CAUTION: Excessive force may damage threads in exhaust manifold or pipe.

3. If a new sensor is being used, install the new sensor into the manifold or pipe.

4. If an old sensor is being reused, coat threads with anti-seize compound, then install the sensor into the manifold or pipe.

5. Torque the oxygen sensor to 30-36 lb. ft. (40-50 N-m), and reconnect the electrical connector.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Sensors and Switches - Computers and Control Systems > Throttle Position Sensor > Component Information > Locations

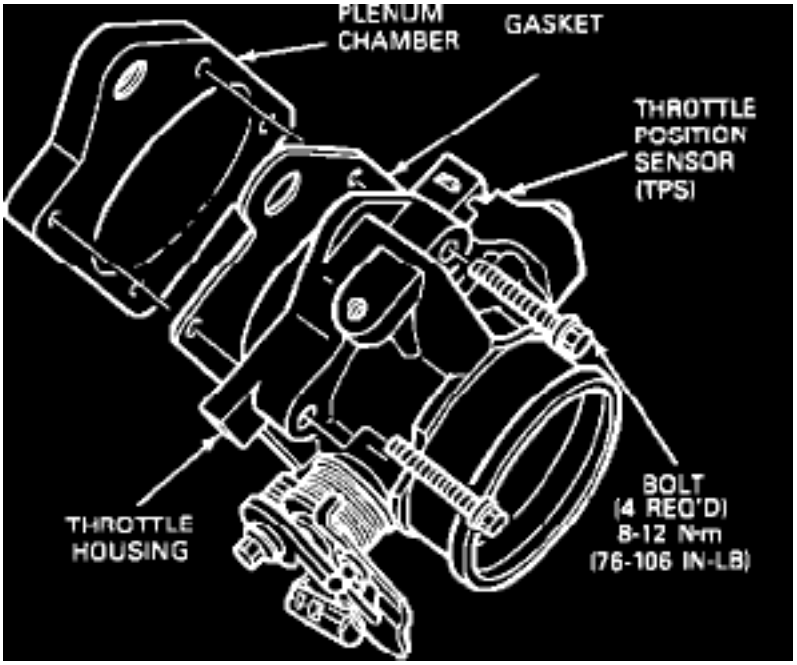


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



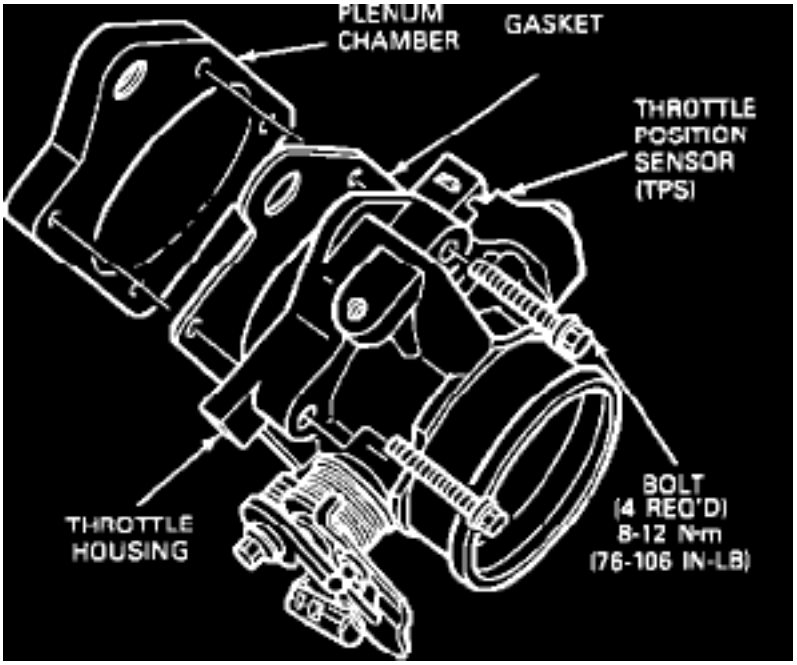
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

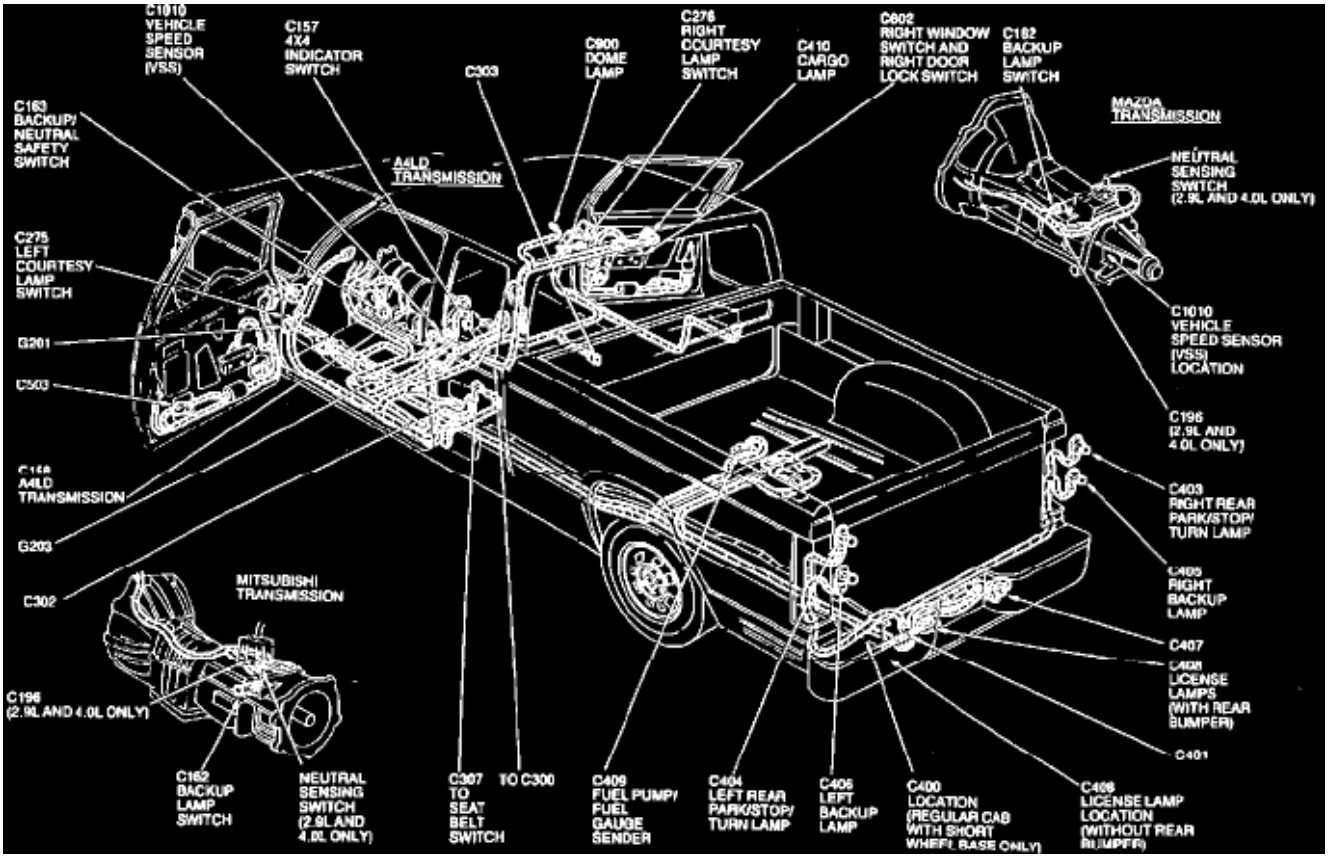
3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.



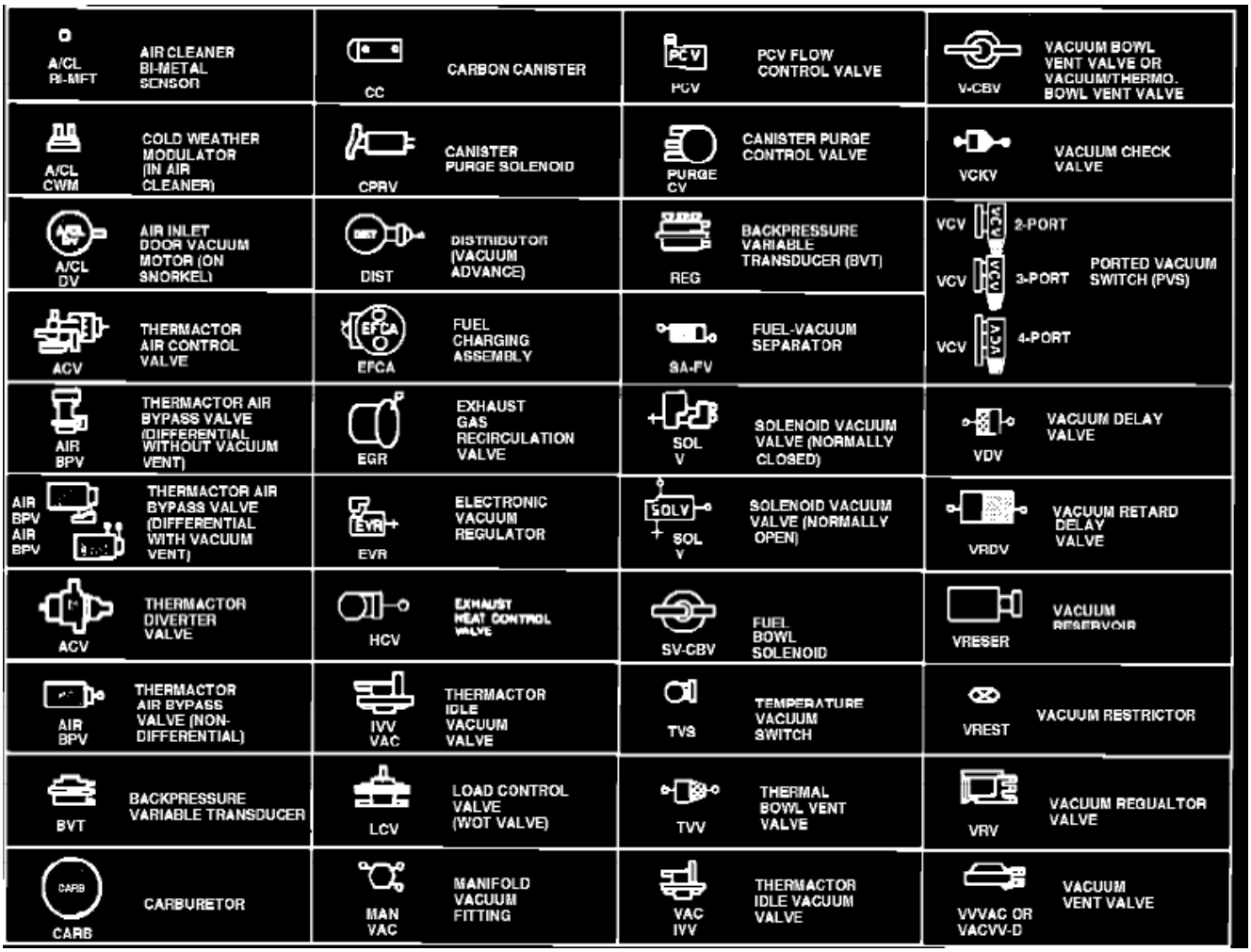
Vehicle Speed Sensor: Locations

Body Components

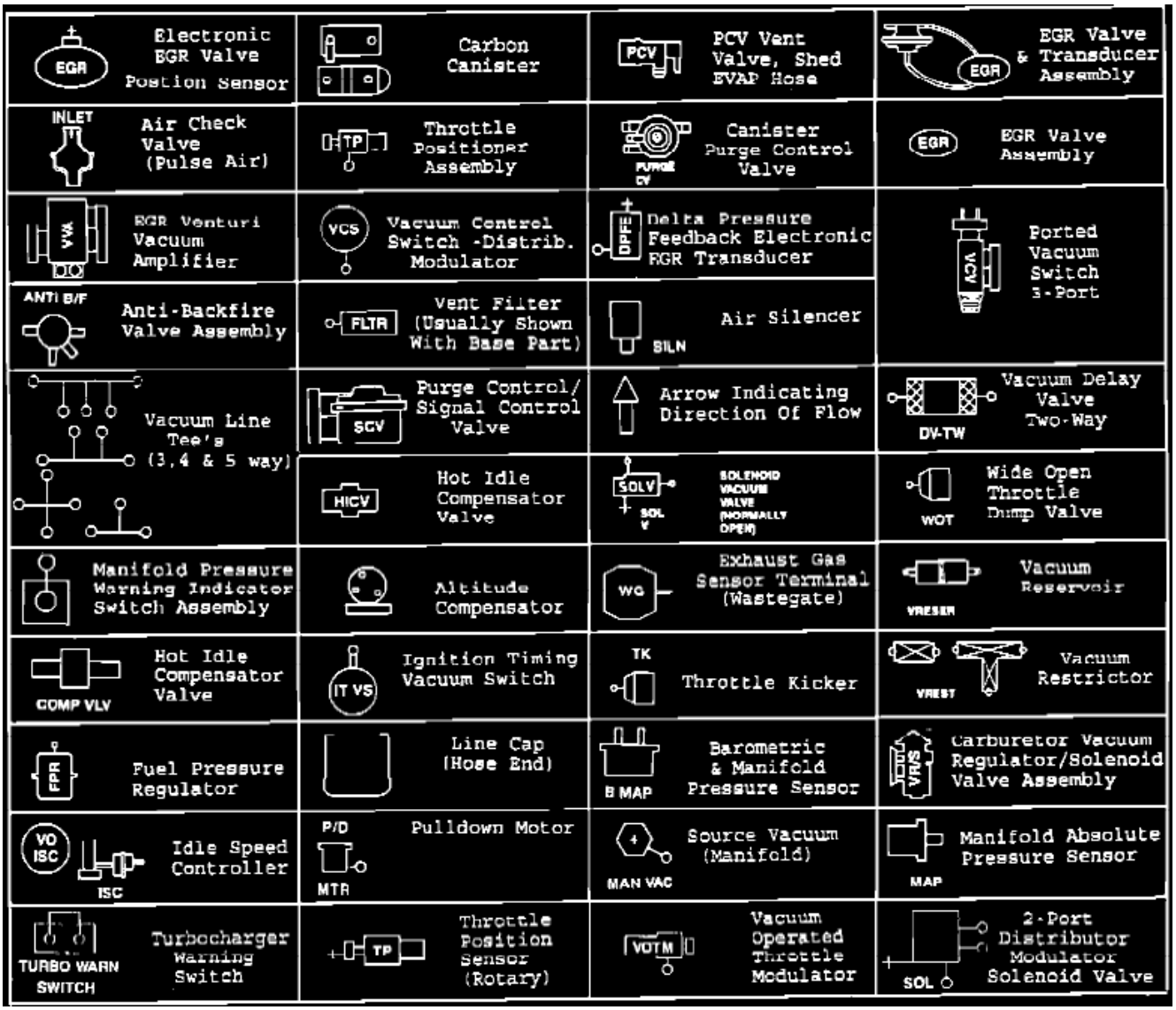
Top Of Transfer Case

Vehicle Speed Sensor: Diagram Information and Instructions

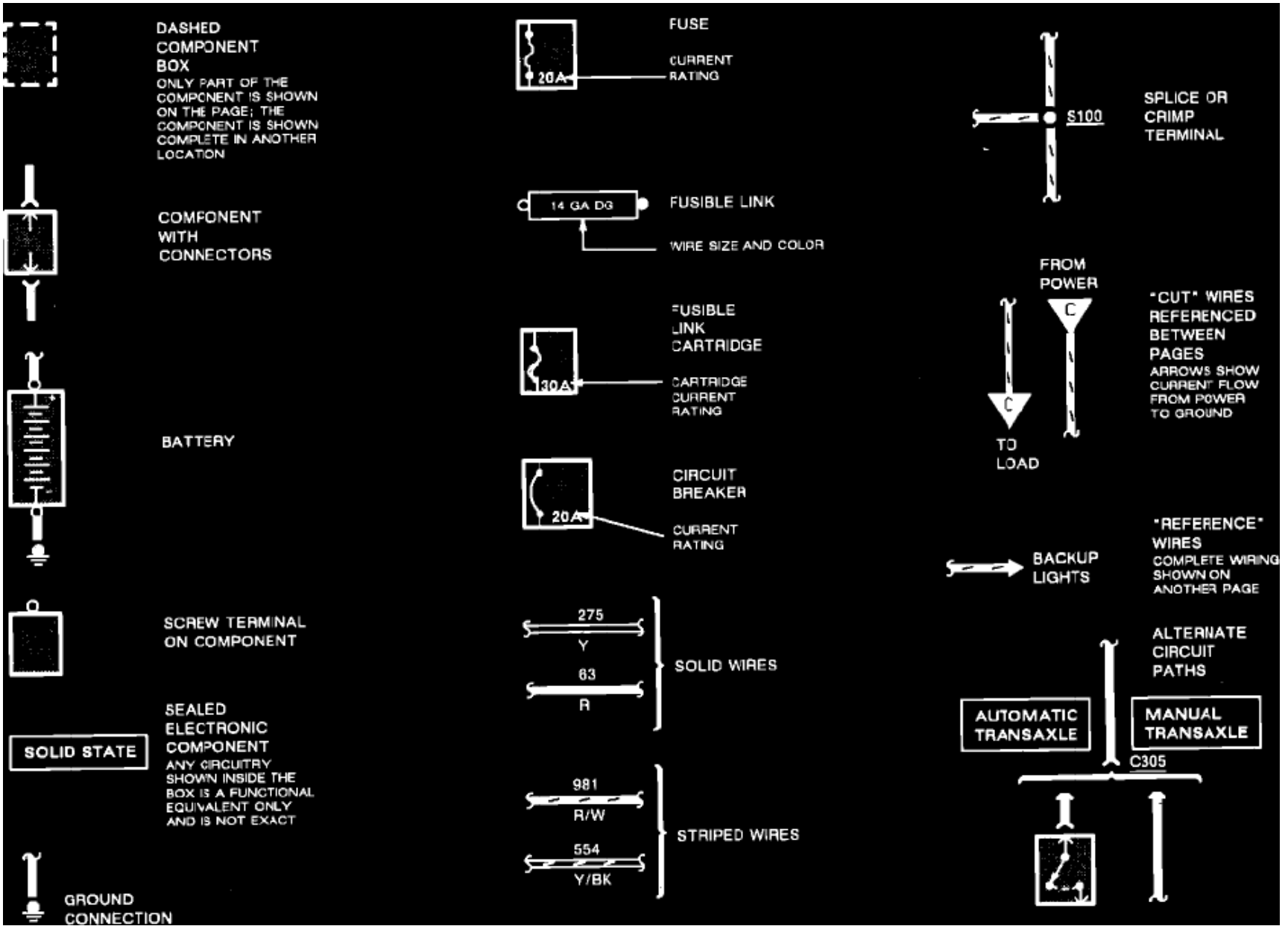
Symbol Identification

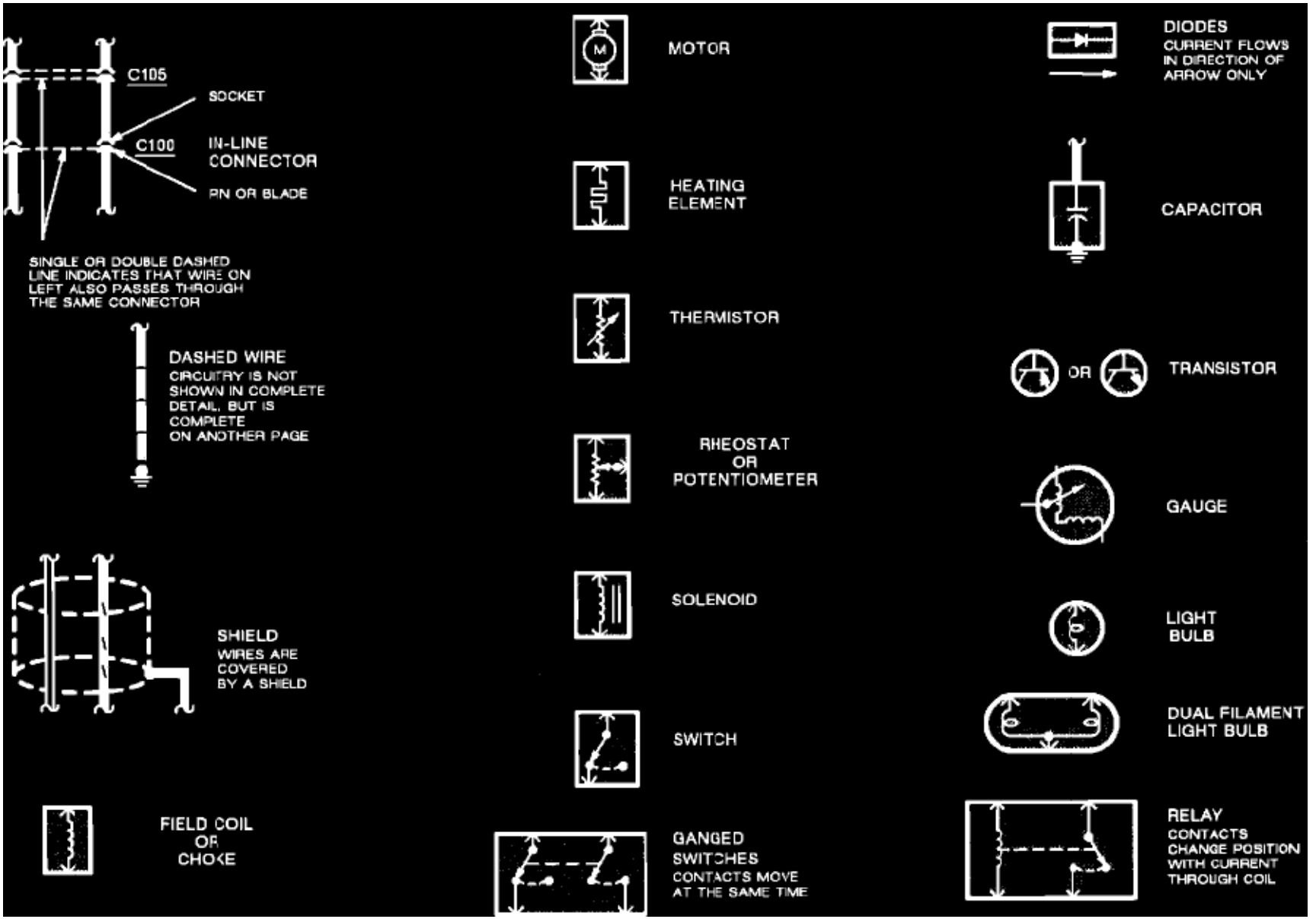


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

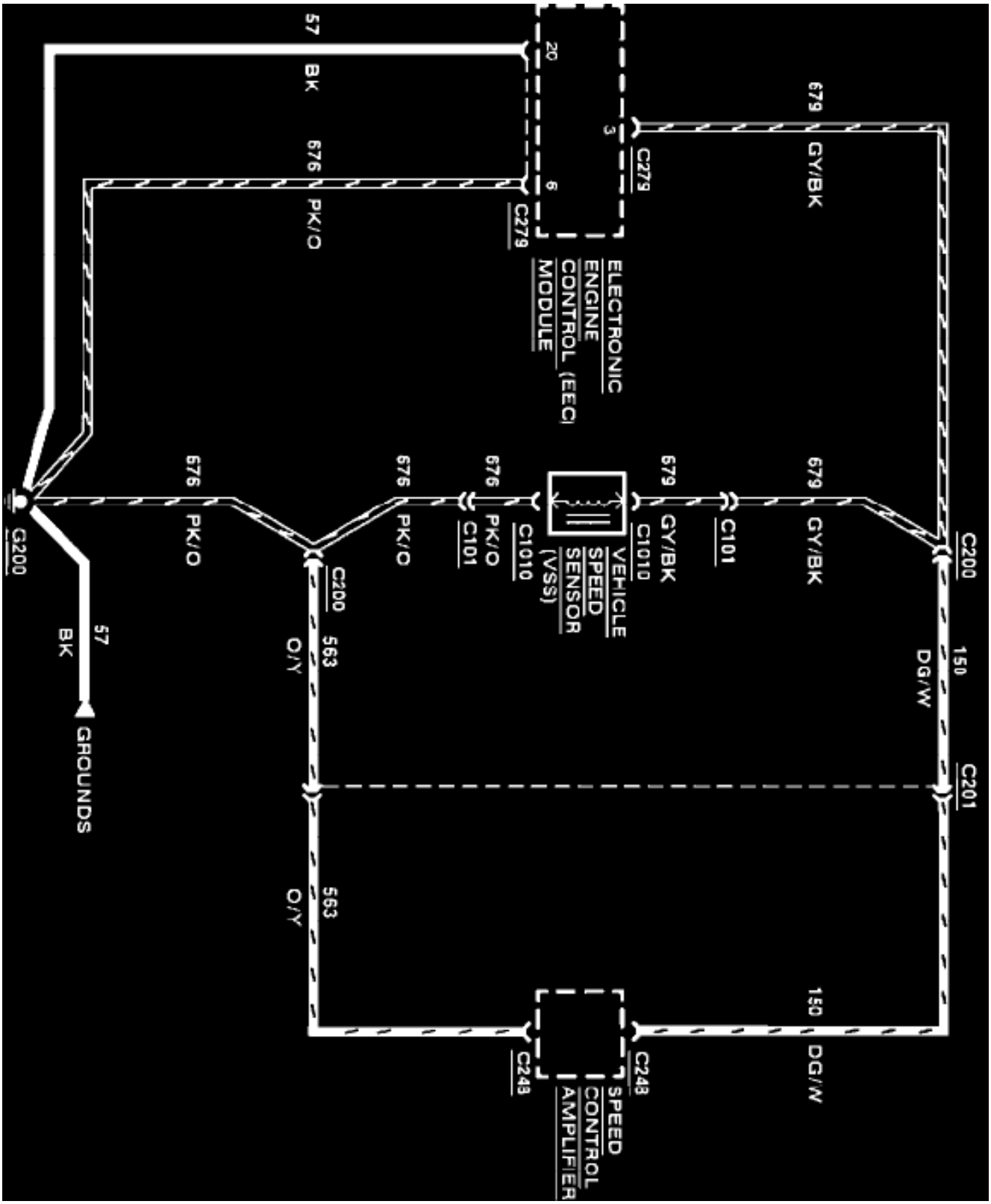
P: Purple

T: Tan

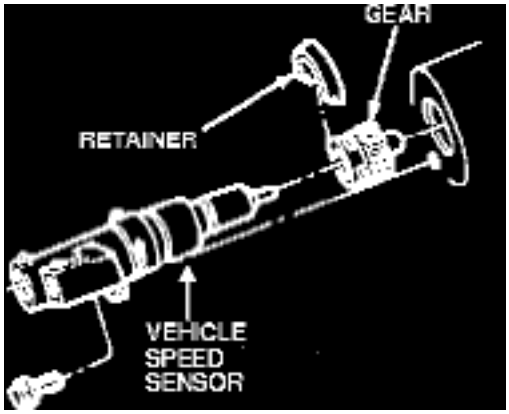
V: Violet

W: White

Y: Yellow



Vehicle Speed Sensor



Vehicle Speed Sensor: Description and Operation

Vehicle Speed Sensor

The Vehicle Speed Sensor (VSS) is a magnetic pulse generator driven by the transmission speedometer gear. The VSS produces 16 AC signals per revolution and sends this signal to the Engine Control Unit (ECA). The ECA converts this signal to a vehicle speed value and stores that value in RAM memory. The ECA uses this value to aid in controlling torque converter lock-up, coolant fan control, vehicle speed control, air/fuel ratio, and igniting timing.

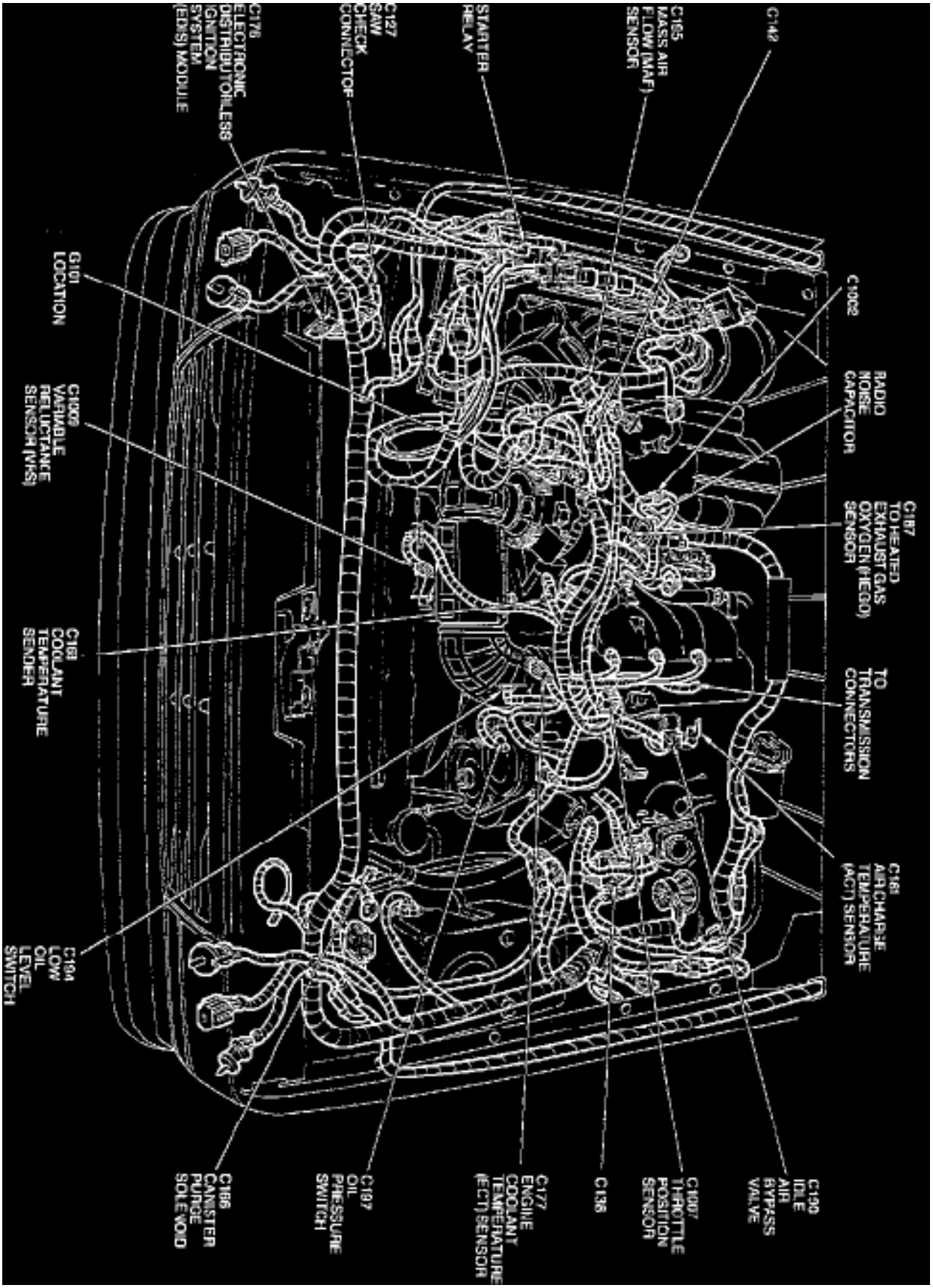
Vehicle Speed Sensor: Service and Repair

1. Separate electrical connector leading to the amplifier assembly.

2. Disconnect upper and lower speedometer cables at the speed sensor. Remove speed sensor.

3. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Throttle Position Sensor > Component Information > Locations

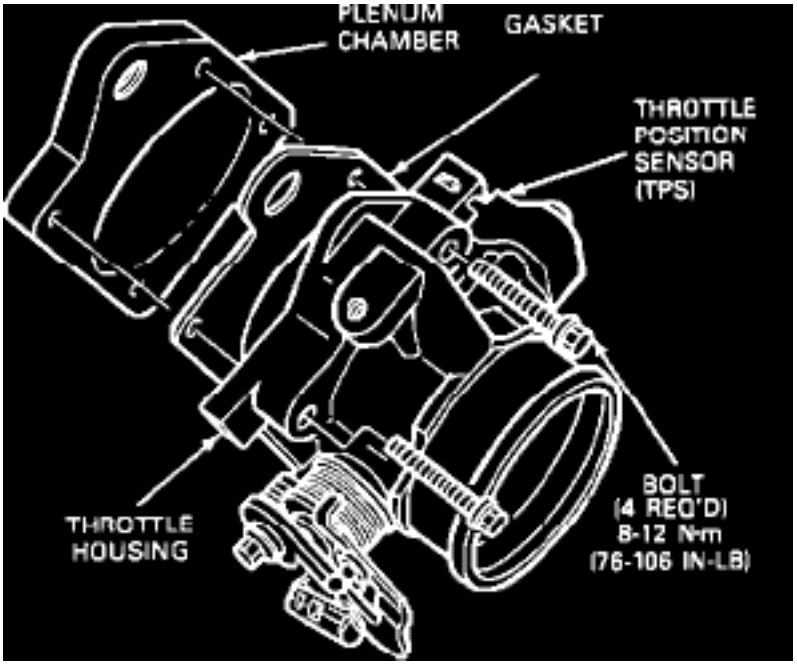


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



Throttle Position Sensor: Description and Operation

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Throttle Position Sensor: Adjustments

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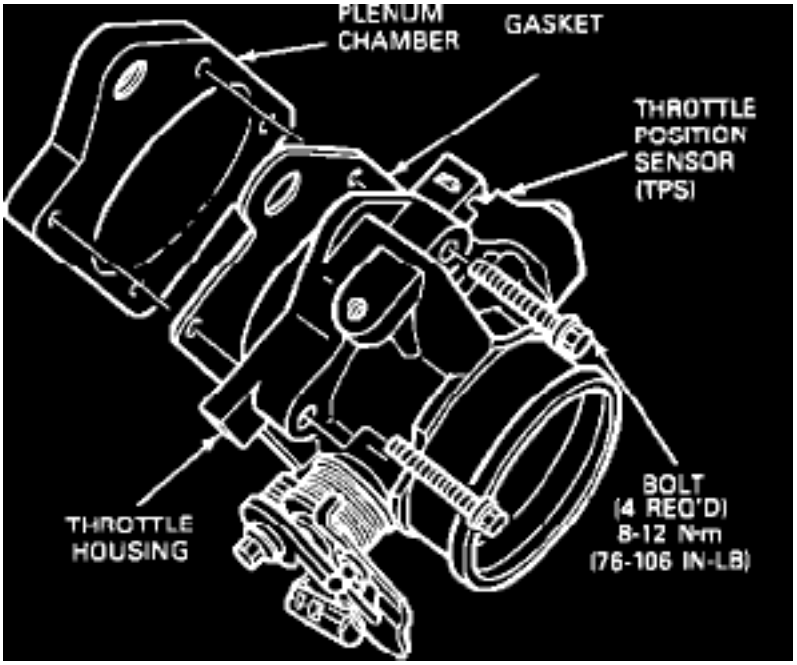

Throttle Position Sensor: Service and Repair

Throttle Body Assembly

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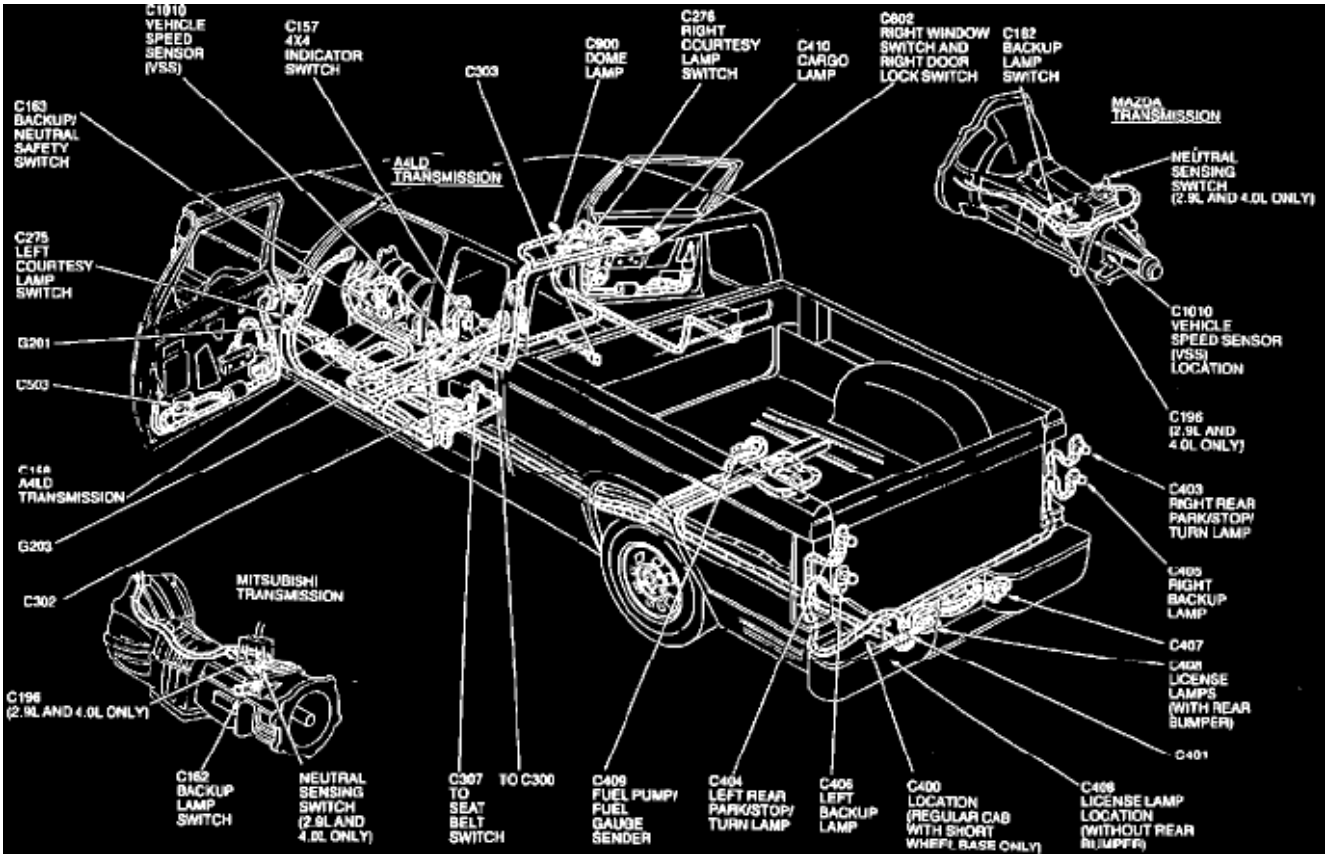
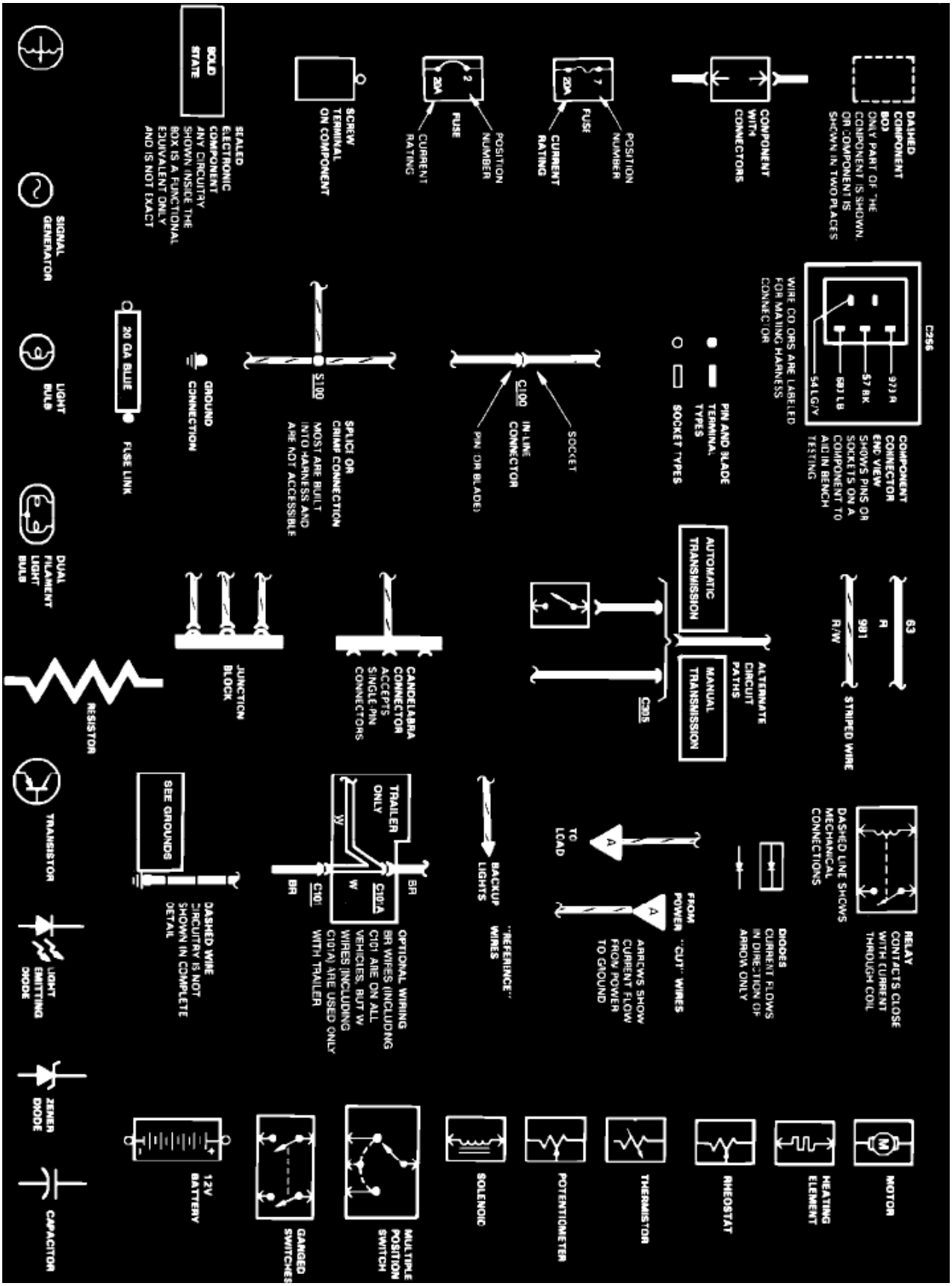


Vehicle Speed Sensor: Locations

Body Components

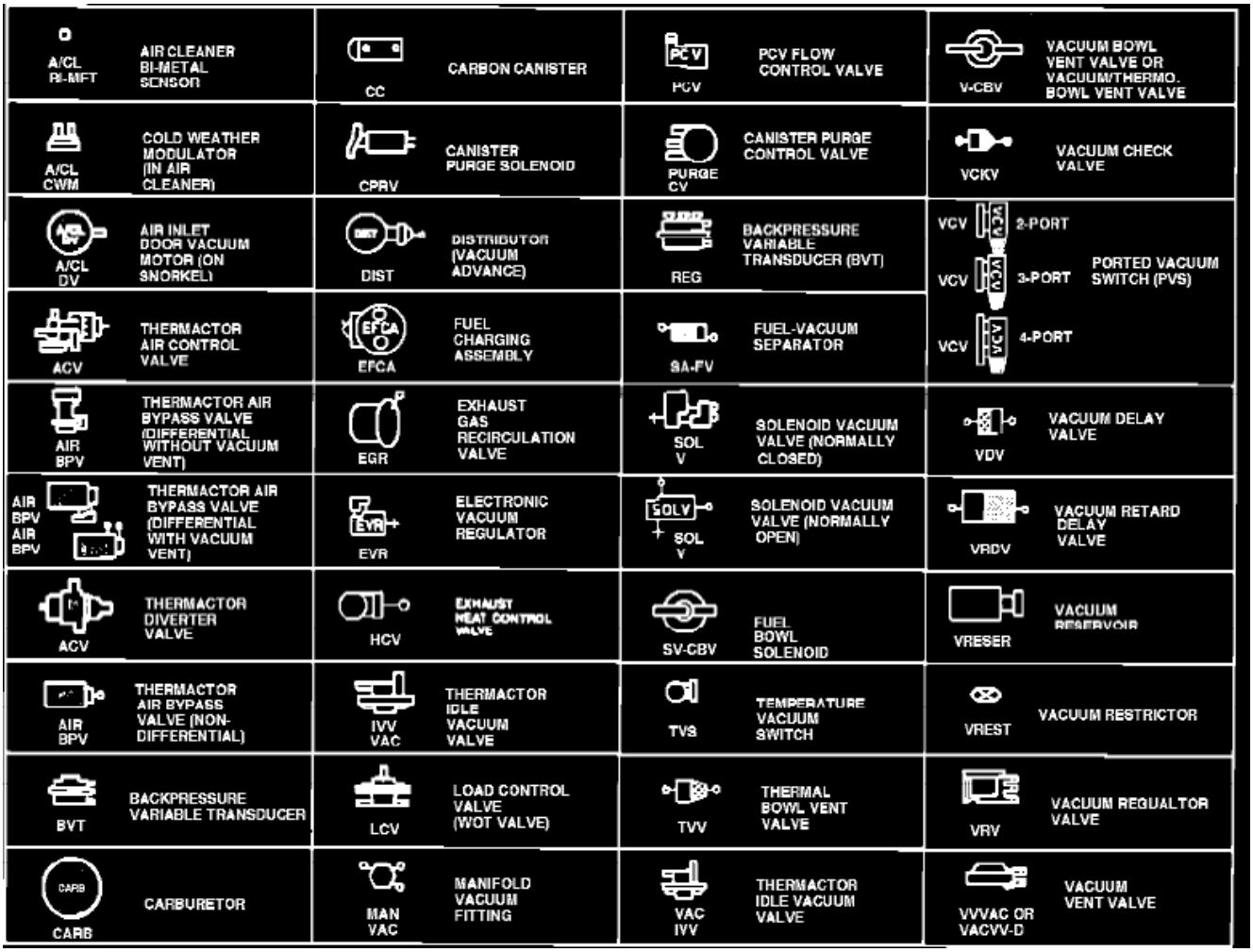
Top Of Transfer Case

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Computers and Control Systems > Vehicle Speed Sensor > Component Information > Diagrams > Diagram Information and Instructions

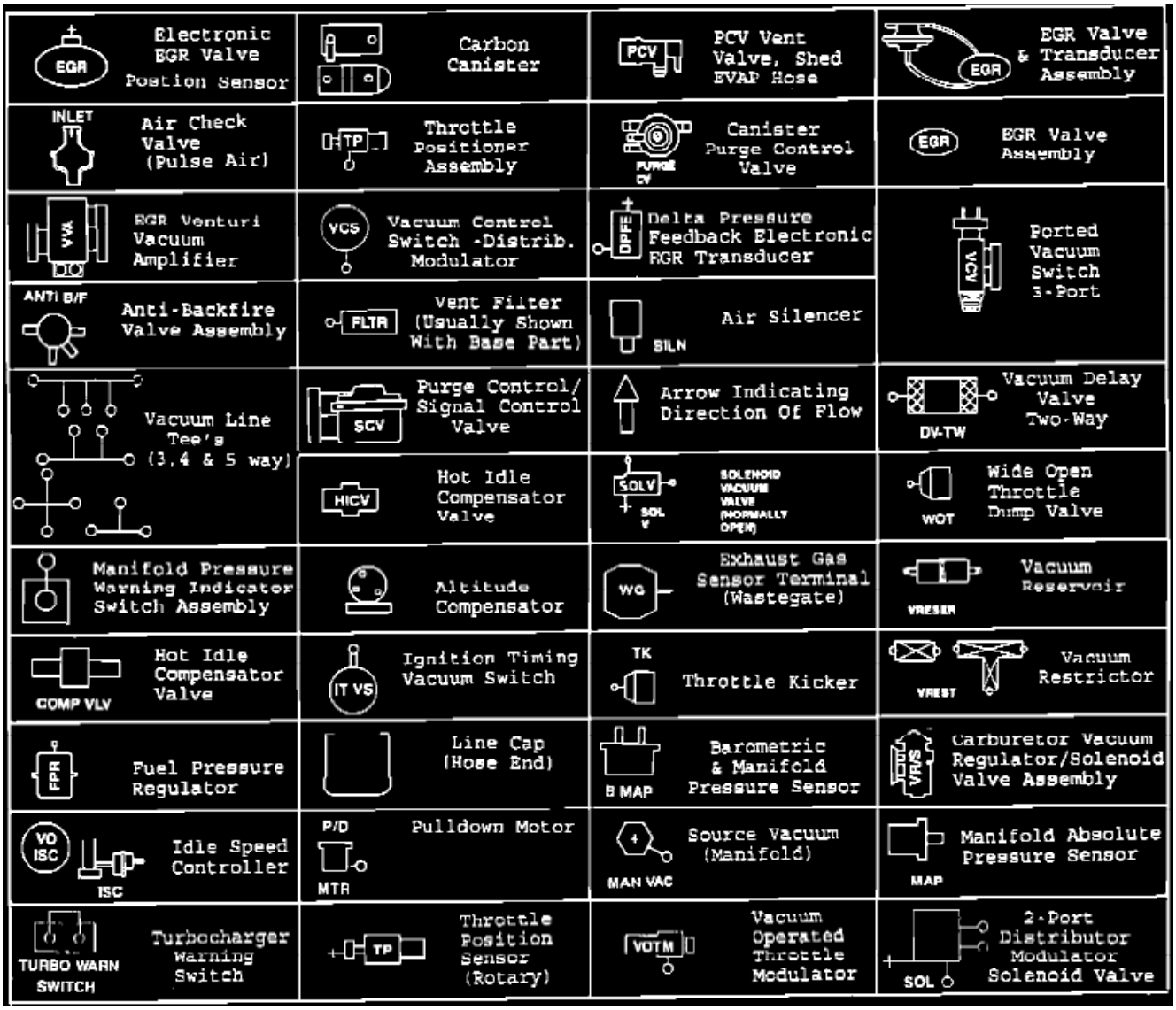


Vehicle Speed Sensor: Diagram Information and Instructions

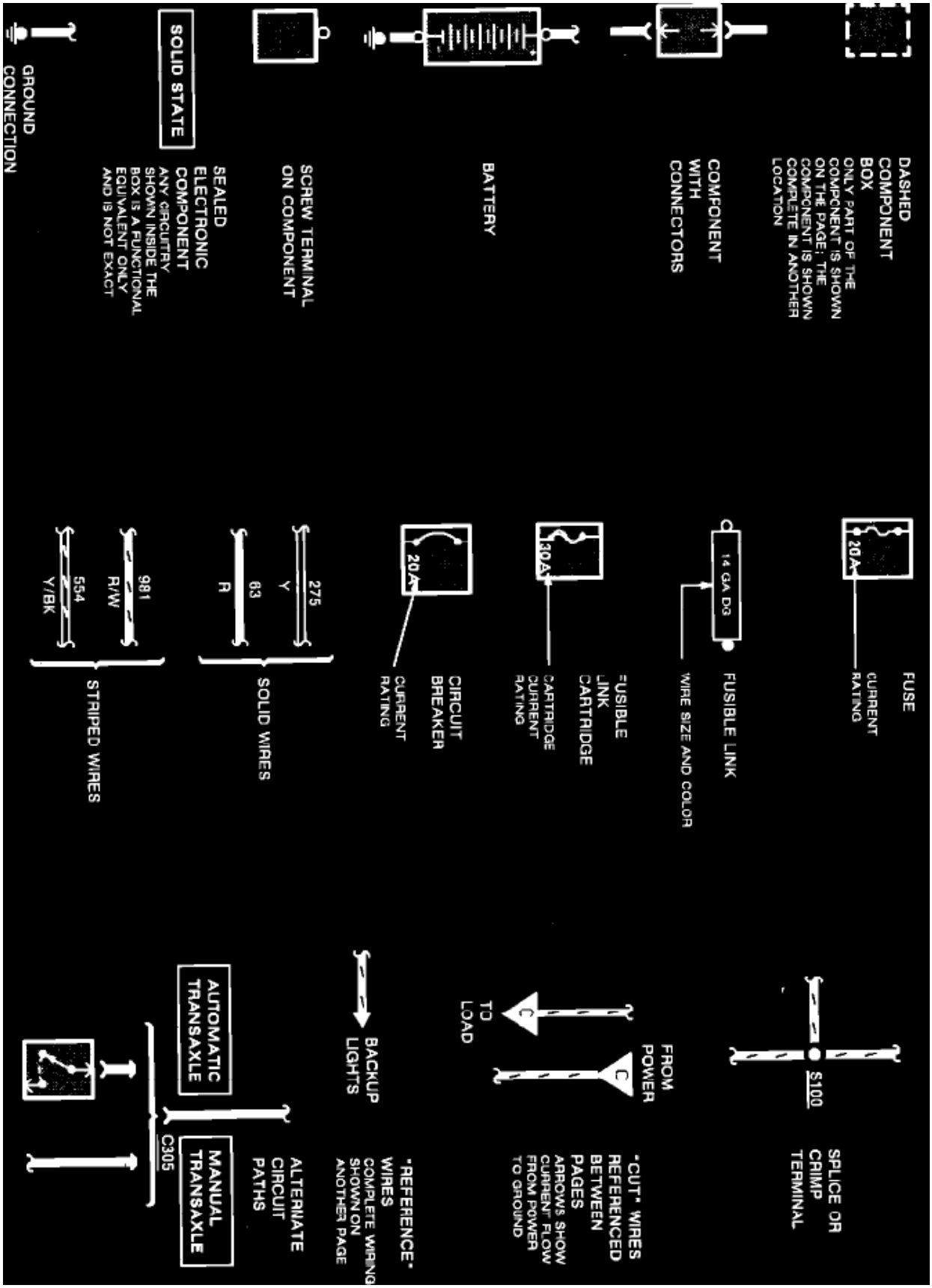
Symbol Identification



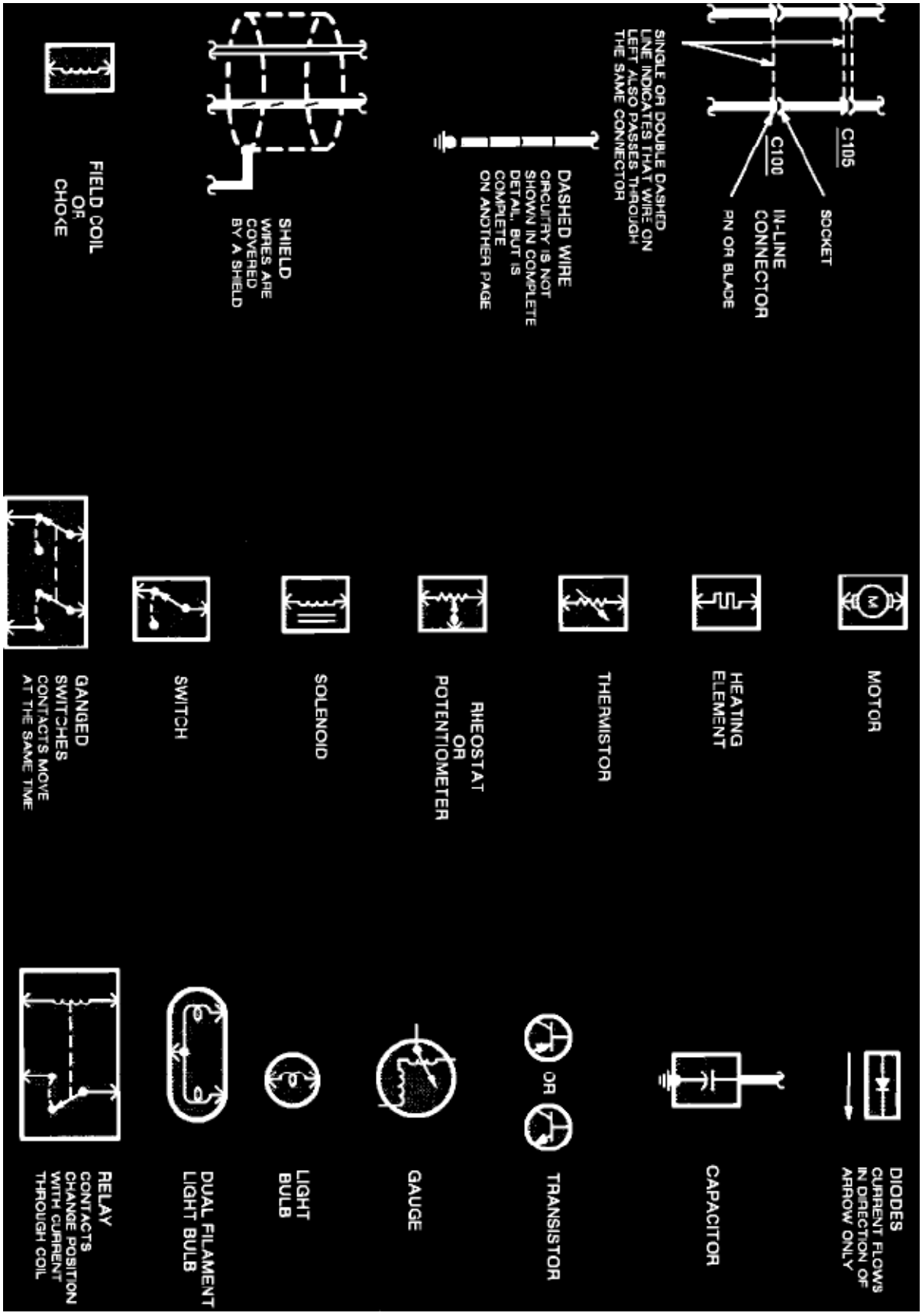
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
TRANSISTOR
OR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

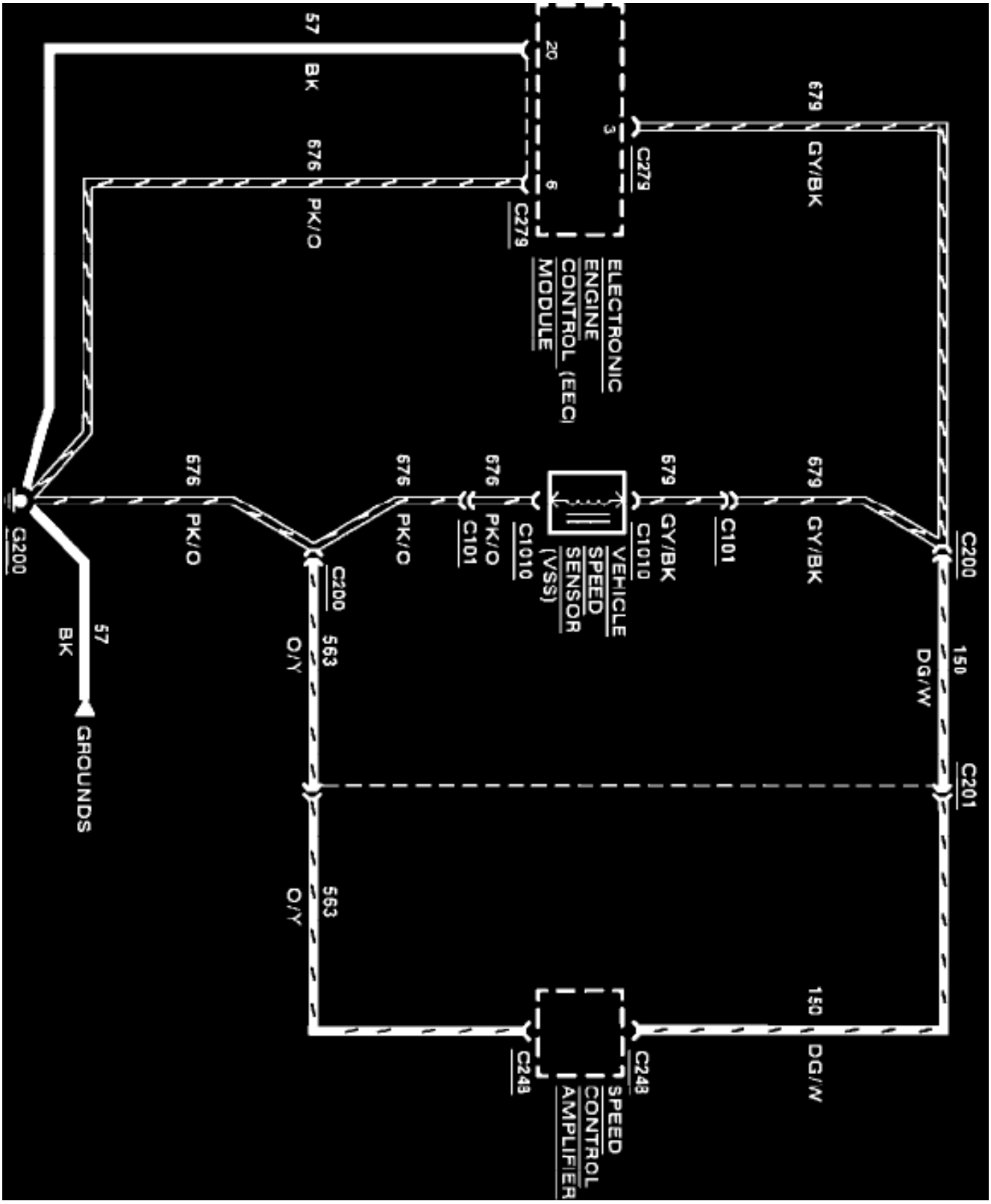
P: Purple

T: Tan

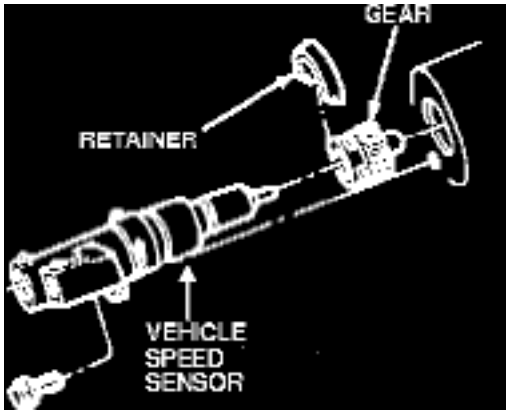
V: Violet

W: White

Y: Yellow



Vehicle Speed Sensor



Vehicle Speed Sensor: Description and Operation

Vehicle Speed Sensor

The Vehicle Speed Sensor (VSS) is a magnetic pulse generator driven by the transmission speedometer gear. The VSS produces 16 AC signals per revolution and sends this signal to the Engine Control Unit (ECA). The ECA converts this signal to a vehicle speed value and stores that value in RAM memory. The ECA uses this value to aid in controlling torque converter lock-up, coolant fan control, vehicle speed control, air/fuel ratio, and igniting timing.

Vehicle Speed Sensor: Service and Repair

1. Separate electrical connector leading to the amplifier assembly.

2. Disconnect upper and lower speedometer cables at the speed sensor. Remove speed sensor.

3. Reverse procedure to install.

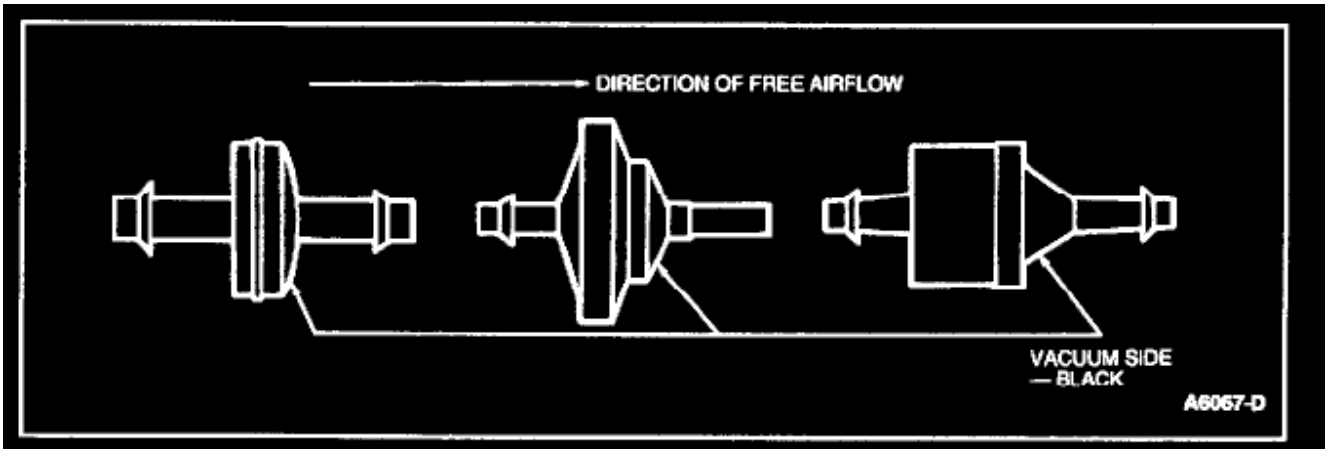
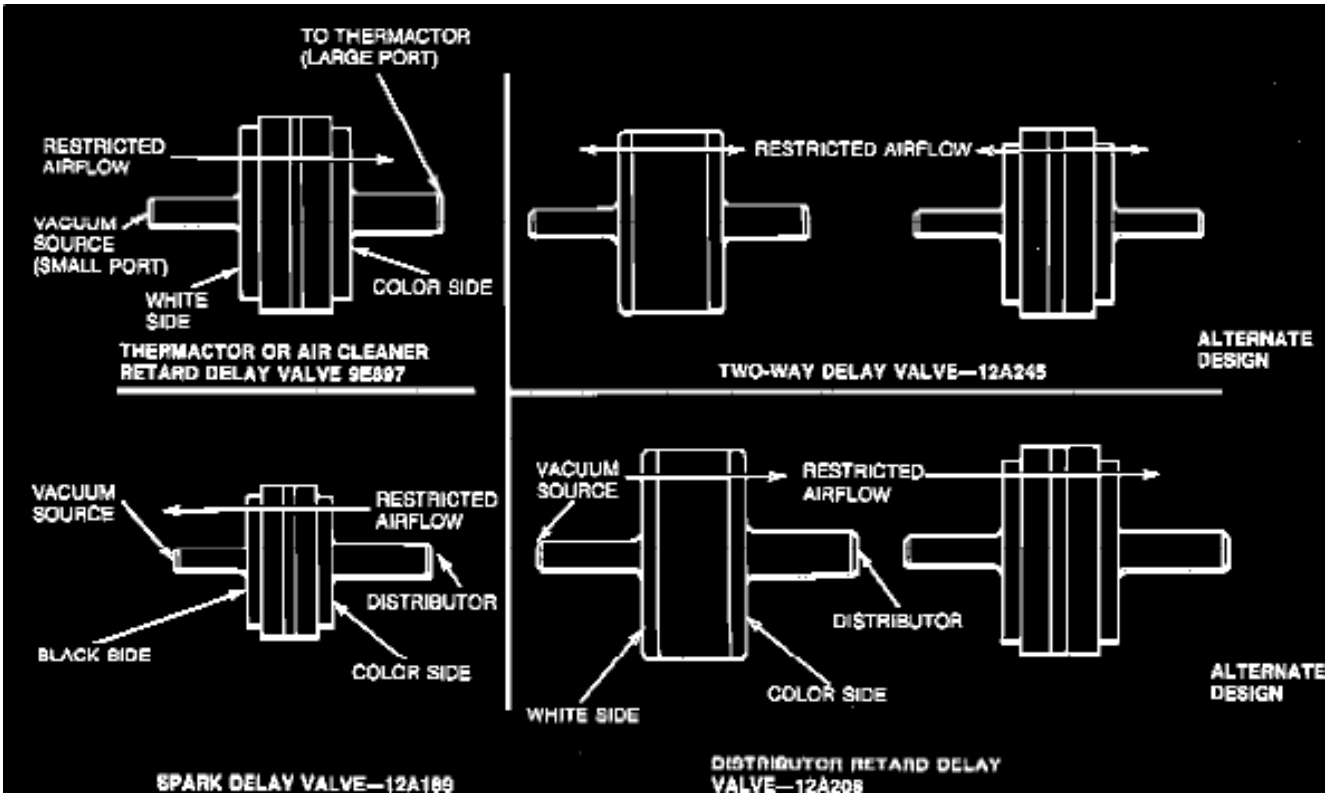


Figure 125: Vacuum Check Valve

Vacuum Check Valve: Description and Operation

Vacuum Check Valve

The Vacuum Check Valve allows vacuum to be applied in one direction only. The check valve is designed maintain a steady vacuum application to a component or within a vacuum line. This helps to reduce any rapid fluctuations and/or sudden drops in the vacuum signal, due to engine load or acceleration. When vacuum is applied to one side of the check valve, it should hold. When applied to the other side of the check valve, vacuum should not be drawn allowing free airflow.



Vacuum Delay Valve: Description and Operation

The Vacuum Delay Valve (VDV) is usually located within the vacuum hose routing or harness assembly. These valves are designed to decrease the rate at which vacuum is applied to or released from a component.

Types Of Vacuum Delay Valves

There are three basic types of Delay Valves

VACUUM DELAY VALVE (VDV) - Delays the application of vacuum to a vacuum-operated component.

VACUUM RETARD DELAY VALVE (VRDV) - Delays the loss of a vacuum signal to a component when source vacuum decreases suddenly. May be used to delay the release of vacuum from any diaphragm as a momentary trap for vacuum.

TWO-WAY DELAY VALVE (DV-TW) - Delays vacuum equally in either direction. This valve is commonly used in Evaporative Emission Controls and can be inserted in the vacuum line in either direction.

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Catalytic Converter: Customer Interest Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

WARNING: THIS MODIFICATION IS AUTHORIZED ONLY FOR THE LISTED ENGINE. PERFORMING THIS MODIFICATION ON OTHER ENGINE CALIBRATIONS IS UNAUTHORIZED AND COULD CREATE LIABILITY UNDER APPLICABLE FEDERAL OR LOCAL LAWS.

ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

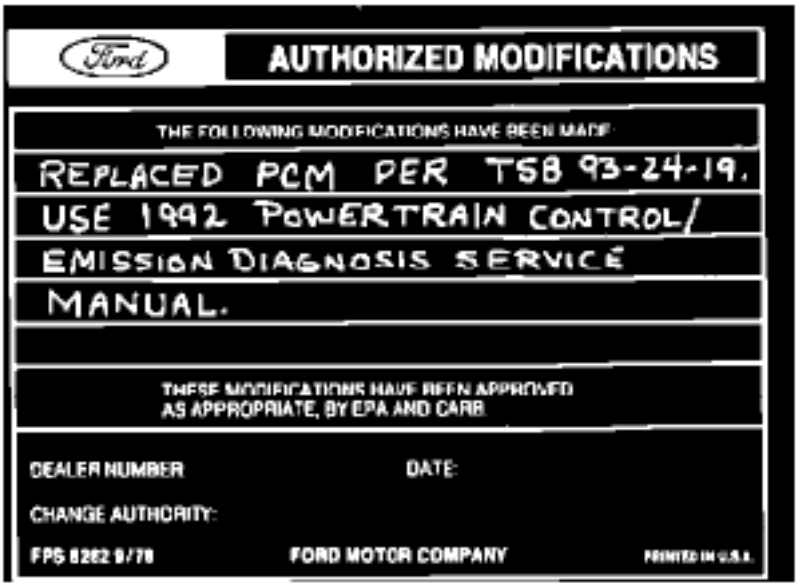
b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART		
APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
1990 Ranger/1991 Explorer	F07A-5F250-AC	F37A-5E212-ED
1991-1992 Ranger/Explorer	F17A-5E212-EE	F37A-5E212-ED
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ-12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000

EEC IV PROCESSOR REFERENCE CHART		
APPLICATION	OLD AND NEW CALIBRATION	NEW PROCESSOR
1991 Explorers, All w A/T	0-58A-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58A-R10	F2PZ-12A650-YA
1991 Explorers, All w A/T	1-58P-R10	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58A-R00	F2PZ-12A650-YA
1992 Explorers, All w A/T	2-58P-R00	F2PZ-12A650-YA
1991 Explorers, All w A/T	0-58B-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	0-58R-R00	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58B-R10	F2PZ-12A650-ZA
1991 Explorers, All w A/T	1-58R-R10	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58B-R00	F2PZ-12A650-ZA
1992 Explorers, All w A/T	2-58R-R00	F2PZ-12A650-ZA

Catalytic Converter: All Technical Service Bulletins Exhaust System - Sulfur Odor

Article No. 93-24-19

11/24/93

EXHAUST - 4.0L - SULFUR ODOR

LIGHT TRUCK: 1990-93 RANGER 1991-93 EXPLORER

This TSB article is being republished in its entirety to correct the model application.

CALIBRATION: 0-58A-R00, 0-58P-R00, 1-58A-R10, 1-58P-R10, 2-58A-R00, 2-58P-R00, 0-58B-R00, 0-58R-R00, 1-58B-R10, 1-58R-R10, 2-58B-R00, 2-58R-R00

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ISSUE: An objectionable exhaust sulfur odor may be experienced during various driving conditions. This may be caused by the operating strategy of the EEC IV processor or by the catalytic converter, depending on the particular application.

ACTION: Use the following procedure to determine if a new EEC IV processor or a new catalytic converter is required. Vehicles previously serviced by TSB 93-3-17 may already have had the processor changed.

1. Perform the diagnostic procedure in the 1993 Powertrain Control/Emissions Diagnosis Service Manual, Page 2A-73. Service as required.

2. If the vehicle is a 1991-1992 Explorer with automatic transmission and the sulfur odor still exists:

a. Verify the processor part number. If not already updated, install a new EEC IV processor. Refer to the EEC IV Processor Application Chart contained in this TSB article for correct parts usage.

NOTE: THE BAP SENSOR IS NOT REQUIRED WITH THE NEW POWERTRAIN CONTROL MODULE BUT MAY REMAIN CONNECTED WITHOUT INTERFERENCE.

b. For 1991 models only, in addition to the standard entries on the Authorized Modifications Decal, write in the following instructions: "USE 1992 POWERTRAIN CONTROL/EMISSION DIAGNOSIS SERVICE MANUAL".

3. If the vehicle is:

a. a 1991-1992 Explorer with manual transmission,

b. a 1993 California Ranger/Explorer (automatic or manual transmission), or

CATALYTIC CONVERTER REFERENCE CHART

APPLICATION	CONVERTER ENGINEERING P/N (ORIG)	CONVERTER ENGINEERING P/N (NEW)
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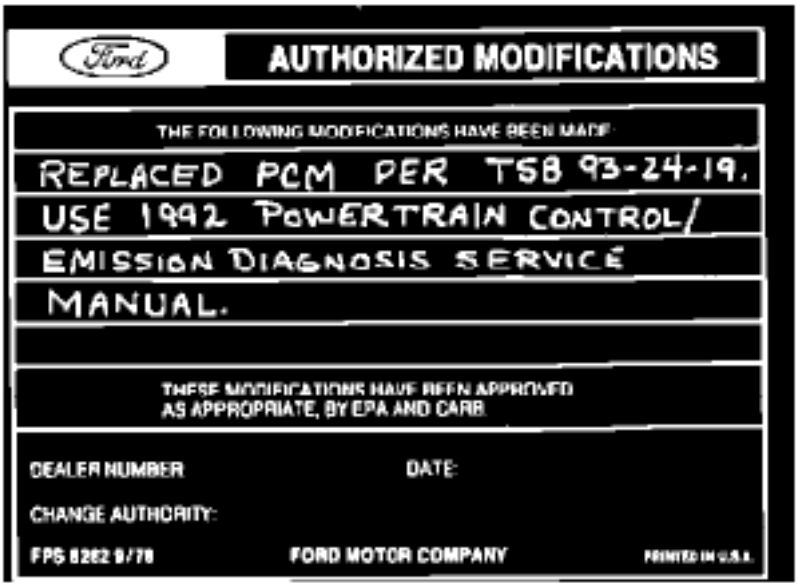
1993 Ranger/Explorer (CA)	F37A-5E212-HC	F37A-5E212-ED



PART NUMBER	PART NAME	CLASS
F2PZ-12A650-YA	EEC IV Processor	B
F2PZ 12A650-ZA	EEC IV Processor	B
F37Z-5E212-C	Catalytic Converter Assembly	C

c. a 1990-1992 Ranger (automatic or manual transmission), and if a sulfur smell exists after the vehicle has accumulated 2000 or more miles of service, install a new catalytic converter. Refer to

the Catalytic Converter Reference Chart shown. Do NOT replace the EEC IV Processor in these vehicles.

Obtain an Authorized Modifications Decal and list the date, dealer number, and summary of alterations performed. Select a prominent place adjacent to the Vehicle Emission Control Information Decal suitable for installing the Authorized Modifications Decal. Clean the area, install the decal, and cover it with a clear plastic decal shield.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-22-18 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Models, Basic Warranty Coverage For 1990/91 Models And Emissions Warranty Coverage For All Model Years

OPERATION DESCRIPTION TIME

932419A Perform EEC IV Diagnosis 0.5 Hr.

(includes Time To Retest) - All Vehicles

932419B Replace PCM - 1991-92 0.3 Hr.

Explorer equipped with A4LD Automatic Transmission

932419C Replace Catalytic Converter 1.0 Hr.

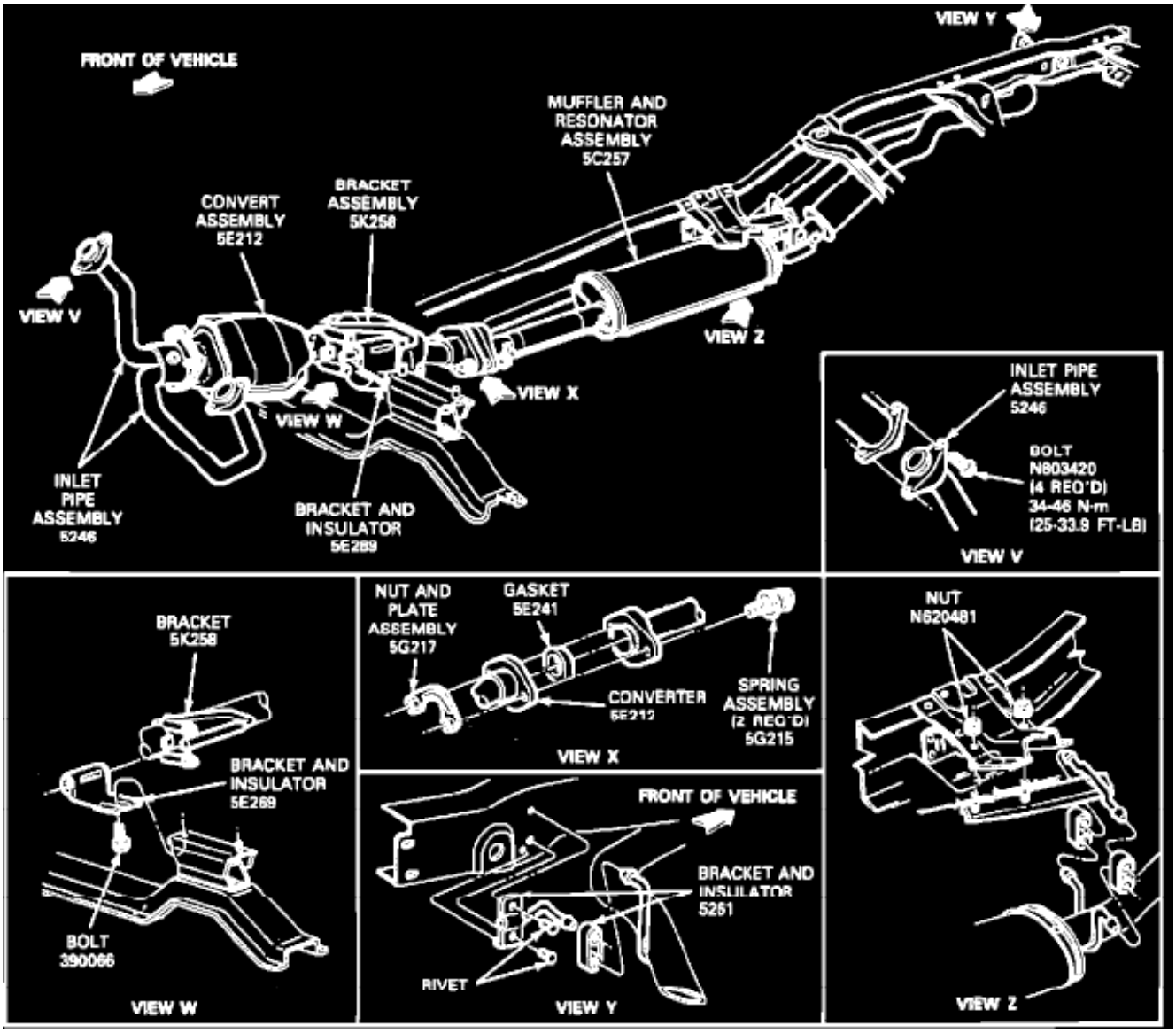
- 1991-92 Explorer (Manual Transmission), 1990-92 Ranger (Automatic or Manual Transmission), 1993 Ranger or Explorer with California Emissions (Automatic or Manual Transmission)

DEALER CODING

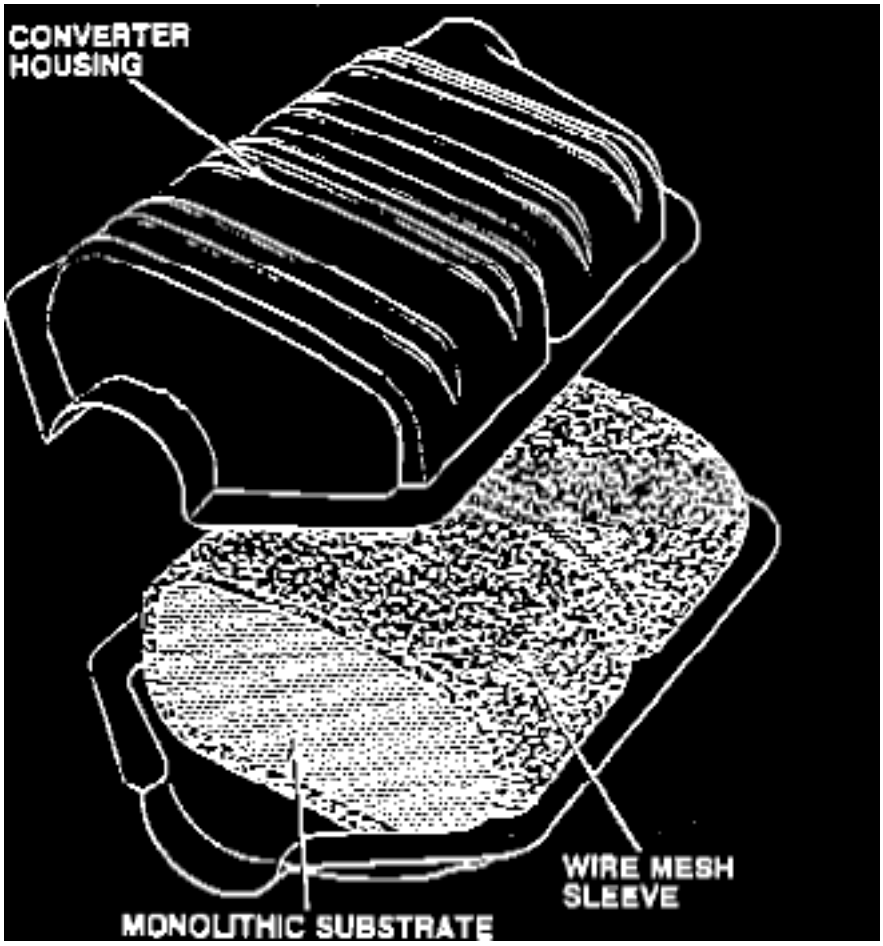
BASIC PART NO. CONDITION CODE

ODOR 08

OASIS CODES: 403000, 623000



Exhaust System w/Catalytic Converter



Catalytic Converter: Description and Operation

The Catalytic Converter is mounted under the vehicles body within the exhaust system, and is designed to convert harmful exhaust gas pollutants, Carbon Monoxide (CO), Hydrocarbons (HC), and Oxides of Nitrogen (NOx) to harmless by-products of Nitrogen (N), Carbon Dioxide (CO2) and water vapor (H2O) through a catalytic chemical reaction.

Single Brick Catalytic Converter

Two types of converters in use today are the Conventional Oxidation Converter (COC) and Oxidation-Reduction Converter. Both consists of two stamped aluminum or stainless steel pieces welded together to form a round or oval housing.

Oval-type converters contain tiny pellets that are impregnated with the catalyzing element(s). Although this type of converter is known to create a fair amount of exhaust restriction, it is less expensive to manufacture and in some vehicle models contaminated pellets may be replaced. The round-type converter contains one or more ceramic monolithic honeycomb substrates. The substrate bricks or beds are impregnated with the catalyzing element(s), then covered by a wire mesh sleeve for insulation and protection from shock and severe jolts. A diffuser inside the shell allows the exhaust gases to flow uniformly over the entire area of the substrate.

THE OXIDATION REACTION

In order to change HC and CO into harmless materials, the catalytic elements (platinum and palladium) start an oxidation, or burning, reaction in the catalytic converter. Oxidation is the addition of oxygen to an element or compound. If there is not already enough oxygen in the exhaust, a secondary air supply system is incorporated into the vehicle's design for additional air injection. During the oxidation process, Oxygen (O2) mixes with the excess HC and CO to form H2O and CO2. During the oxidation reaction process, considerable heat (900~F to 1,600~F) is generated. Caution should be taken while working on or around the catalytic converter and other exhaust system components.

THE REDUCTION REACTION

Reduction is the opposite of oxidation, or the chemical removal of oxygen from a material. The reduction reaction changes NOx to harmless nitrogen (N) and (CO2) by chemically moving the oxygen from the NOx compound to the CO compound. The catalytic elements required for the reduction process are platinum and rhodium.

The Three-Way Catalytic Converter (TWC) is designed to reduce all three exhaust pollutants, but works best to reduce NOx when the CO level of the exhaust is between 0.8 and 1.5 percent. As the CO level increases or decreases from that percentage, the 3-way converters efficiency decreases. Exhaust gas first passes through the catalyst, where NOx is reduced to N2 and CO2; then through the catalyst where HC and CO are changed to H2O and CO2. The Light-Off Catalytic Converter (LOC) is a single bed oxidation-type converter, and is mounted to the exhaust manifold ahead of the main converter. The LOC primarily used in controlling HC and CO emissions during cold engine warm-up, while the main converter has not yet reached operating temperature. Heat from the exhaust manifold rapidly warms the LOC in order to start the Oxidation Process, which is then continued at the main converter. The Light-Off Catalytic Converter is also referred to as a Pre-Cat or a Mini-Cat by other vehicle manufacturers.

Catalytic Converter: Testing and Inspection

NOTE: A blocked or restricted exhaust system usually results in loss or lack of power or popping through the intake. Verify that this condition is not caused by ignition or timing problems, then proceed with diagnosis.

1. Visually inspect exhaust system for collapsed pipes, holes and cracks. Replace any damaged components.

2. Attach vacuum gauge to intake manifold vacuum source.

3. Connect a tachometer.

4. START engine and observe vacuum gauge needle.

5. Gradually increase the engine rpm to 2000 with the transmission in NEUTRAL. NOTE: The vacuum gauge reading may be normal when the engine is first started and idled. However, excessive restriction in the exhaust system will cause the vacuum gauge needle to drop to a low point even while the engine is idling.

6. Decrease rpm to idle speed. With the engine rpm at 2000, did manifold vacuum reach above 16 inches? If so, there is no restriction within the exhaust system. Refer to Diagnosis by Symptom/Lack of Power. If not, proceed to next step.

7. With vacuum gauge and tachometer still in place.

8. Gradually increase the engine rpm from base idle to 2000 rpm with the transmission in NEUTRAL.

9. While maintaining increased engine rpm, observe the RATE of speed of the vacuum gauge needle as it falls and rises. NOTE: a.

On a non-restricted system the needle will drop to zero and then quickly return to the normal setting without delay.

b. On a restricted system, as the engine rpm is increased to 2000 the vacuum gauge needle will slowly drop to zero and slowly rise to normal.

c. The rate of speed at which the vacuum gauge needle returns to the normal setting is much slower on a restricted system than on a non-restricted system.

10. Decrease engine rpm to base idle.

11. Was needle return rate much slower than that of a non-restricted system? If not, there is no restriction within the exhaust system. Refer to LACK OF POWER/DIAGNOSIS BY SYMPTOM. If so, proceed to next step.

12. Turn OFF engine.

13. Disconnect exhaust system at the muffler(s).

14. Repeat vacuum test.

15. Did manifold vacuum reach above 16". If so, replace muffler(s). If not, proceed to next step.

16. Turn OFF engine.

17. Disconnect exhaust system at catalytic converter(s).

18. Repeat vacuum test.

19. Did manifold vacuum reach above 16". If so, replace converter(s). If not, proceed to next step.

20. Turn OFF engine.

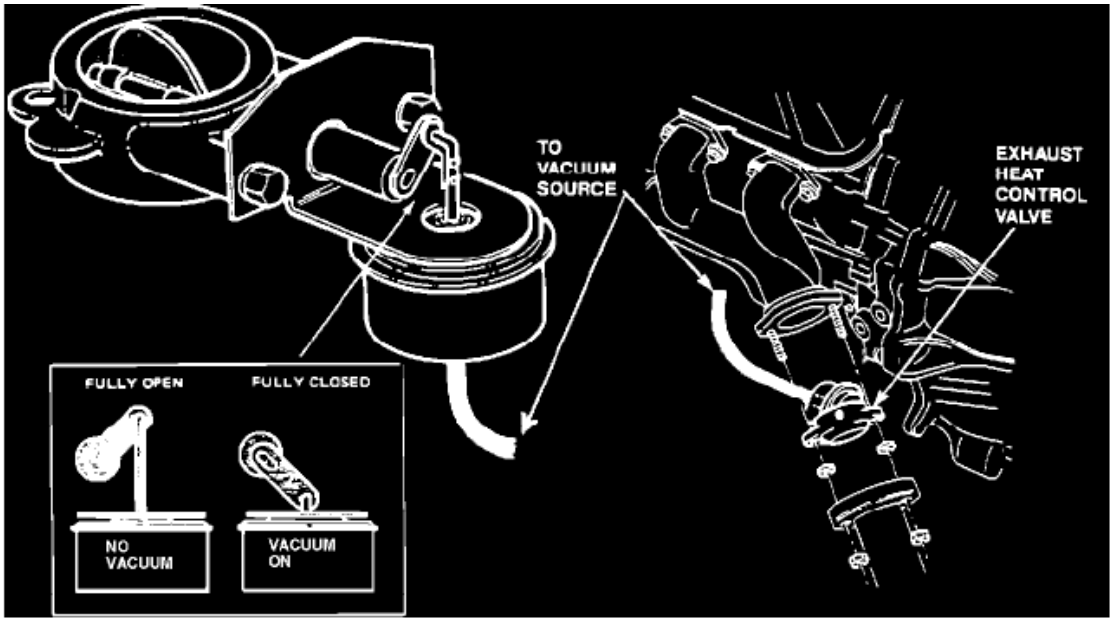
21. Disconnect exhaust system at exhaust manifold(s).

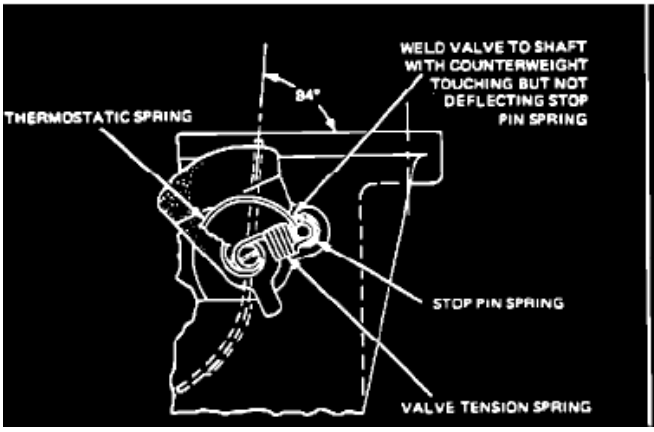
22. Repeat vacuum test.

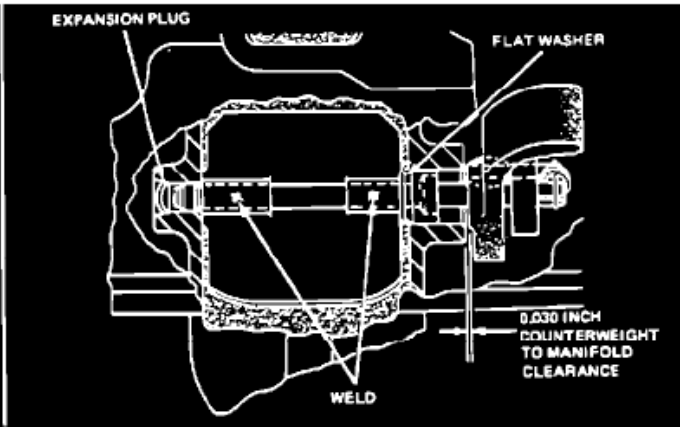
23. Did manifold vacuum reach above 16". If so, restriction is located between exhaust manifold(s) and catalytic converter(s). If not, proceed to next step.

24. Remove the exhaust manifold(s) and inspect the ports for casting flash by dropping a length of chain into each port. NOTE: Do not use a wire or a lamp to check ports. The restriction may be large enough for the wire or light to pass through but small enough to cause excessive back pressure at high rpm.

25. Is a restriction present? If so, remove casting flash or replace exhaust manifold. If not, refer to LACK OF POWER/DIAGNOSIS BY SYMPTOM.







Exhaust Heat Control Valve: Testing and Inspection

VACUUM OPERATED HEAT CONTROL VALVE

Vacuum Operated Heat Control Valve

1. Connect a hand vacuum pump to the vacuum motor of the Heat Control Valve.

2. Apply and trap 10-15" vacuum (33.77-67.54 kPa).

3. The valve must close and lose no more than 2" vacuum (6.75 kPa) in 60 seconds.

4. When vacuum is released, the valve must open. If results differ from above, replace the HCV.

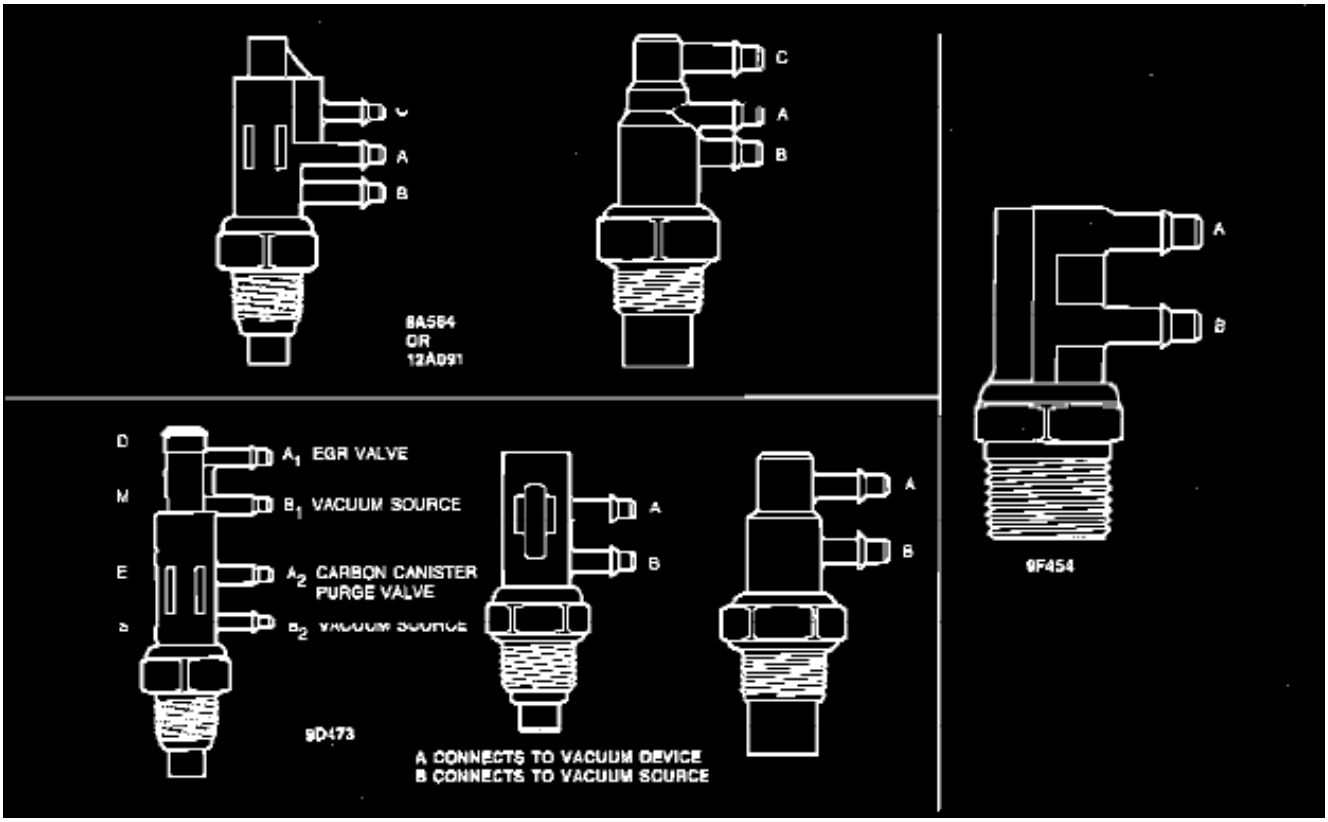
BIMETAL HEAT CONTROL VALVE

Bi-metal Spring Heat Control Valve

1. Visually inspect the heat control valve for any abnormal conditions.

2. Check the valve and thermostatic spring operation by manually rotating the valve shaft. Valve must move freely and return to the closed position when the spring is cold.

3. Lubricate the valve and shaft with graphite lubricant or equivalent.



Thermal Vacuum Valve: Description and Operation Vacuum Control Valve

Vacuum Control Valves are designed to operate according to engine coolant temperature and are usually threaded into the engine block or manifold. Based on the wax pellet sensing bulb principle and theory, the Vacuum Control Valve directs and supplies vacuum to other emission control components. The Bimetal principle is used with the 2-port (9F454) VCV.

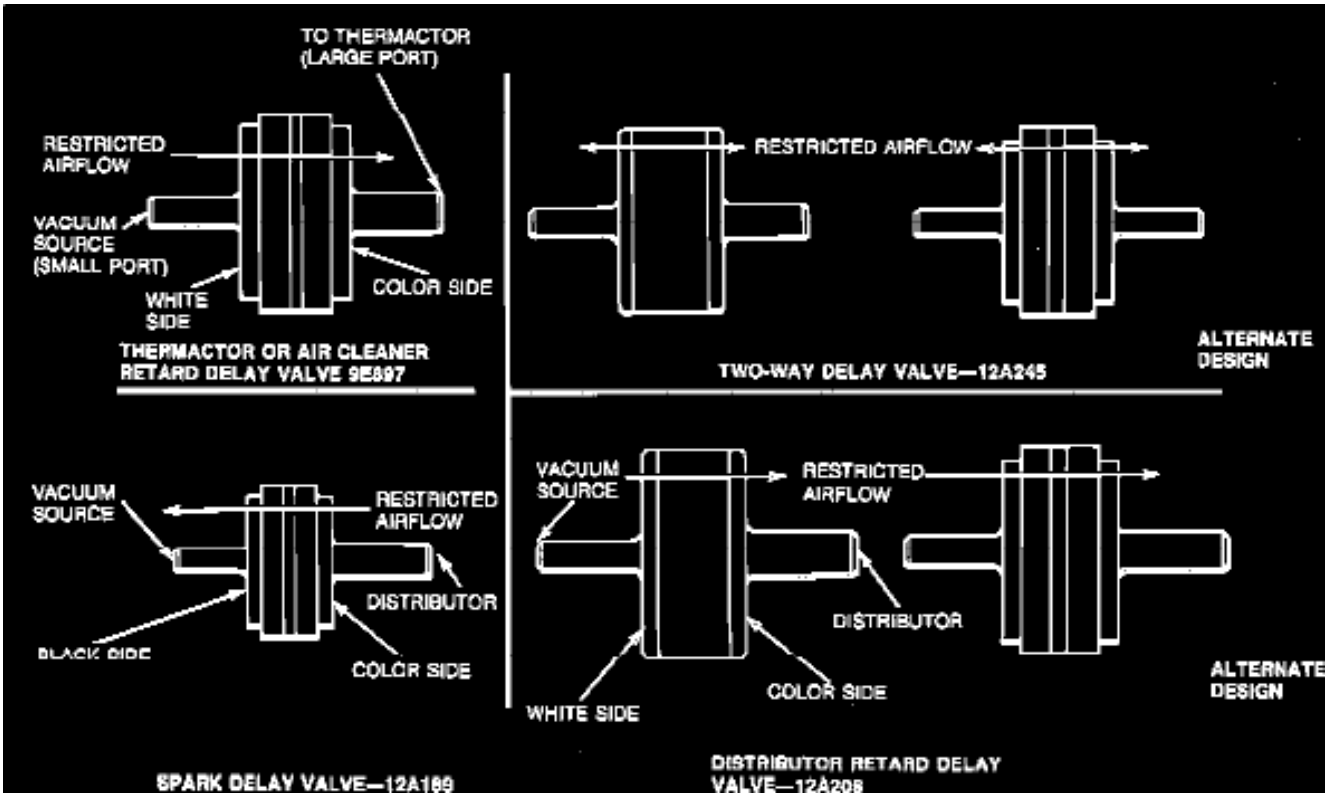
2-, 3-, and 4-Port Vacuum Valves

The 2-port VCV opens to supply vacuum at a pre-determined engine coolant temperature calibration.

The 4-port VCV operates the same as the 2-port. Vacuum is supplied to two different components that are calibrated for the same temperature.

The 3-port VCV directs vacuum from the center port to the upper port during cold engine operation. After the engine reaches operating temperature, the upper port closes and the lower is opened.

For example during cold engine warm-up, vacuum from the center port passes through the upper port to be applied to the Heat Control Valve. After engine warm-up, the upper port closes, the lower port opens, and vacuum passes through to be applied to the purge control device. Vacuum is controlled by a normally closed vacuum solenoid.



Thermal Vacuum Valve: Description and Operation Vacuum Delay Valves

The Vacuum Delay Valve (VDV) is usually located within the vacuum hose routing or harness assembly. These valves are designed to decrease the rate at which vacuum is applied to or released from a component.

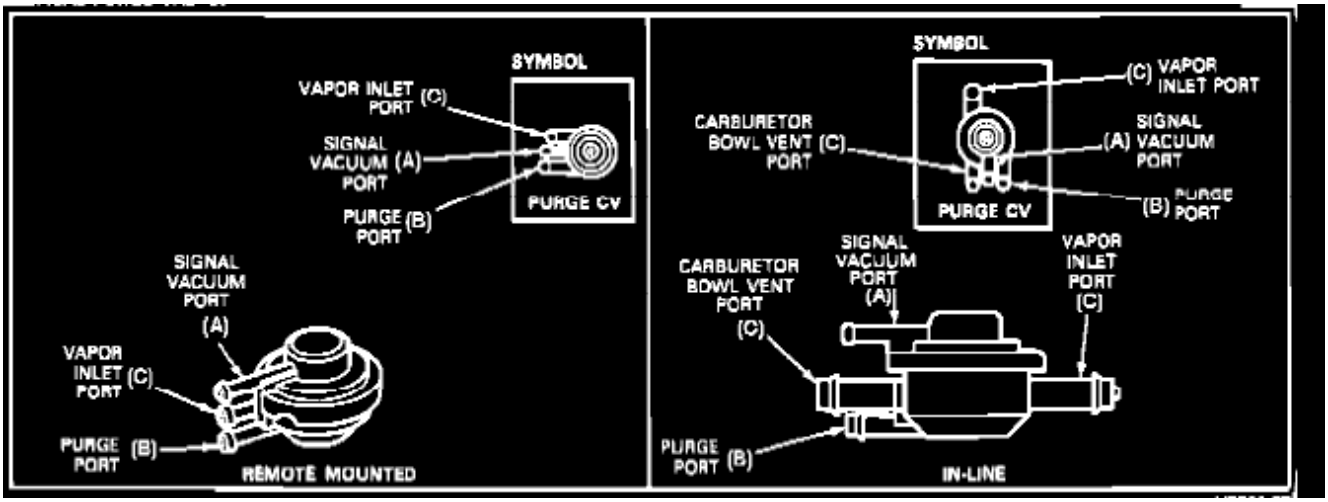
Types Of Vacuum Delay Valves

There are three basic types of Delay Valves

VACUUM DELAY VALVE (VDV) - Delays the application of vacuum to a vacuum-operated component.

VACUUM RETARD DELAY VALVE (VRDV) - Delays the loss of a vacuum signal to a component when source vacuum decreases suddenly. May be used to delay the release of vacuum from any diaphragm as a momentary trap for vacuum.

TWO-WAY DELAY VALVE (DV-TW) - Delays vacuum equally in either direction. This valve is commonly used in Evaporative Emission Controls and can be inserted in the vacuum line in either direction.



Canister Purge Control Valve: Testing and Inspection

Vacuum Operated Purge Control Valve

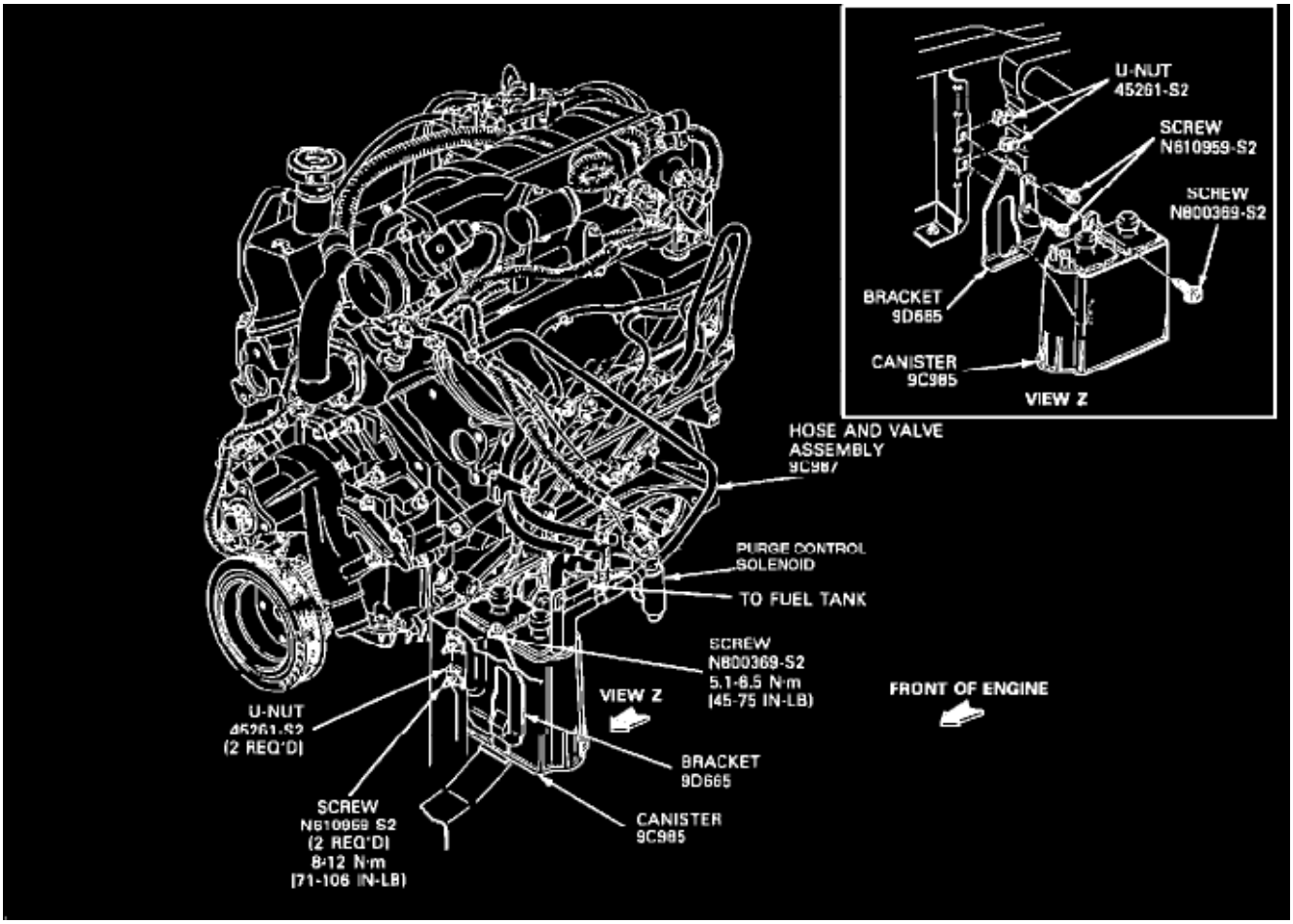
CAUTION: DO NOT apply vacuum to Port C of the purge control valve. Doing so may dislodge the internal diaphragm causing permanent damage.

1. Vacuum applied to Port A only, should not pass through. If flow occurs, replace valve.

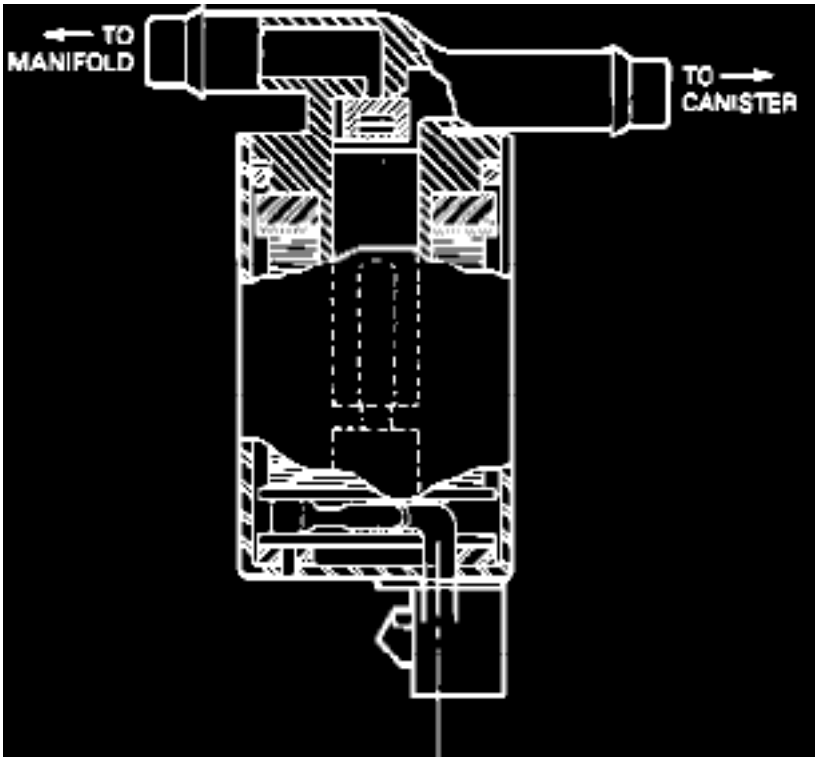
2. Vacuum applied to Port B only, should not pass through. If flow occurs, replace valve. NOTE: Slight flow should be indicated with the following valves: E5VE-9B963-AA, E4VE-9B963-AA, and E77E-9B963-AA.

3. After applying and maintaining a vacuum of 16" to Port A, apply vacuum to Port B with a second hand vacuum pump. Vacuum to Port B should pass through.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Emission Control Systems > Evaporative Emissions System > Canister Purge Solenoid > Component Information > Locations



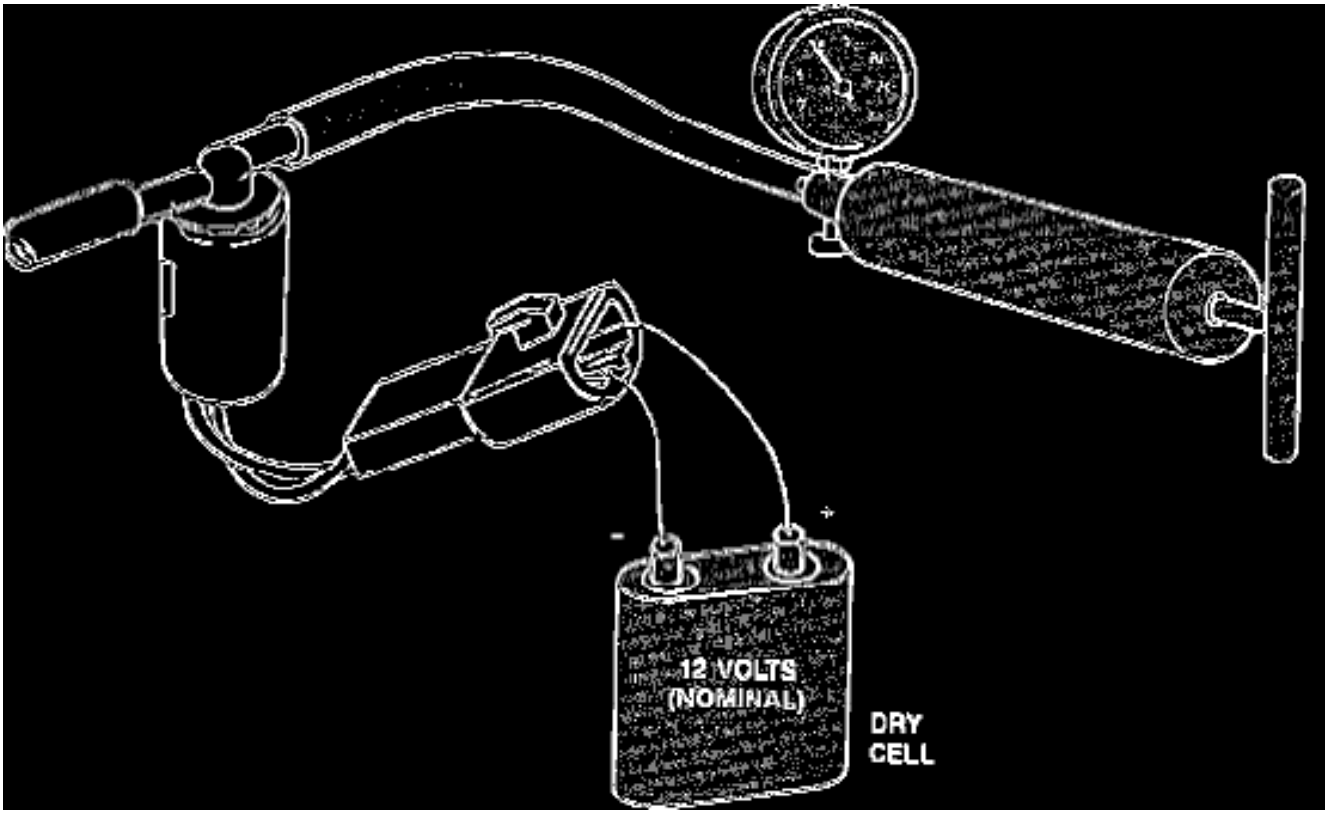
EVAP Components For Canister Purge



Canister Purge Solenoid: Description and Operation

Canister Purge Solenoid

Canister purging is regulated by a Purge Control Solenoid Valve, which is electronically controlled by the EEC-IV Module. The normally closed solenoid valve is located within the vapor line between the charcoal canister and the throttle body vacuum fitting. The solenoid valve is designed to block fuel vapors from entering the intake manifold, while the engine is not running, and allows precise control of canister purging. In order to calculate the timing and duration that the canister is purged, the EEC-IV Module monitors engine speed, load, and temperature until conditions are favorable. When the solenoid valve is opened, manifold vacuum is applied to the canister, and the fuel vapors are drawn into the induction system to be consumed. As the fuel vapors are being purged, fresh air is drawn into the charcoal canister from under the fresh air inlet cap, located on top of the canister.



Canister Purge Solenoid: Testing and Inspection

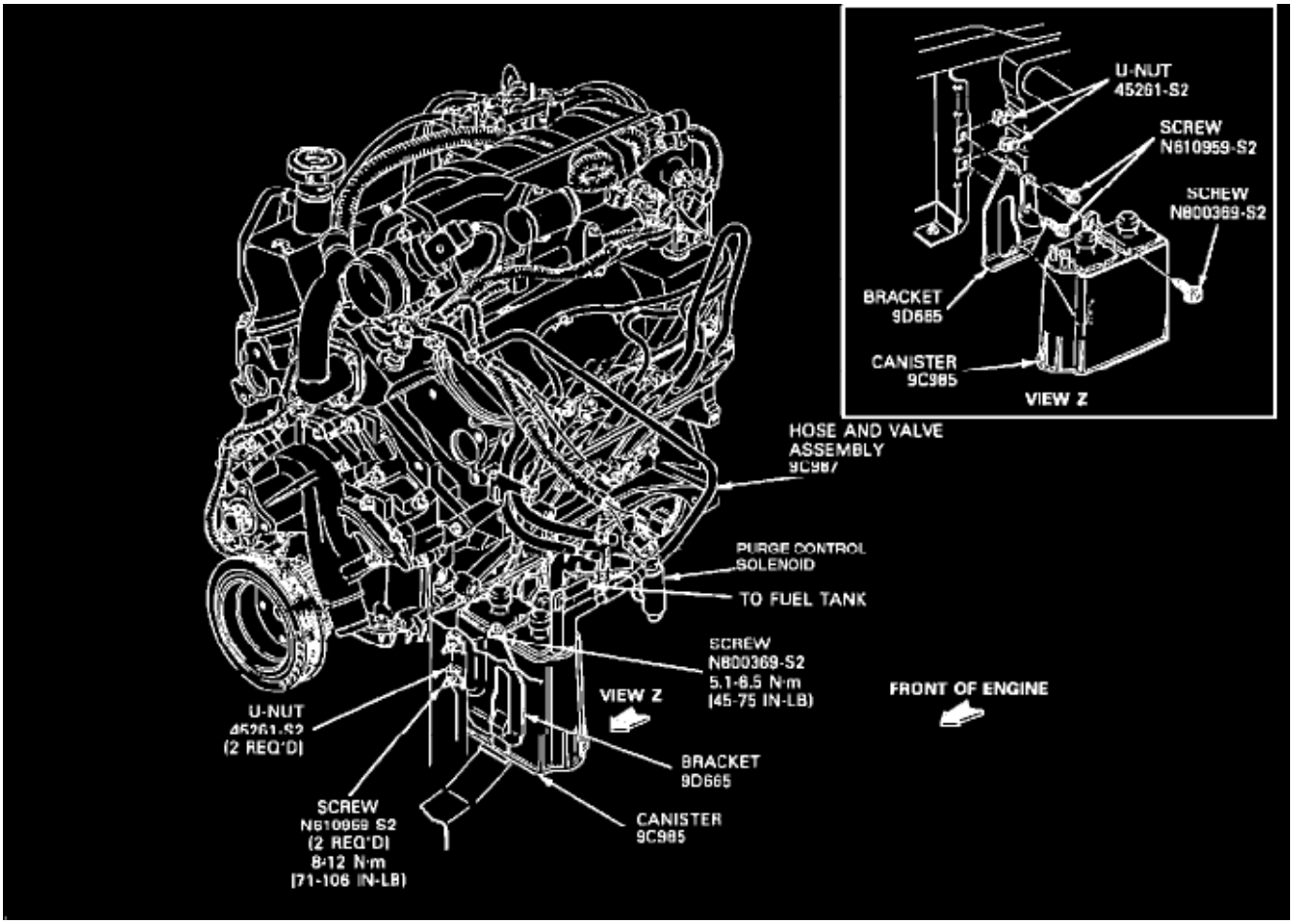
Testing The Purge Solenoid

1. Disconnect the electrical connector at the canister purge solenoid.

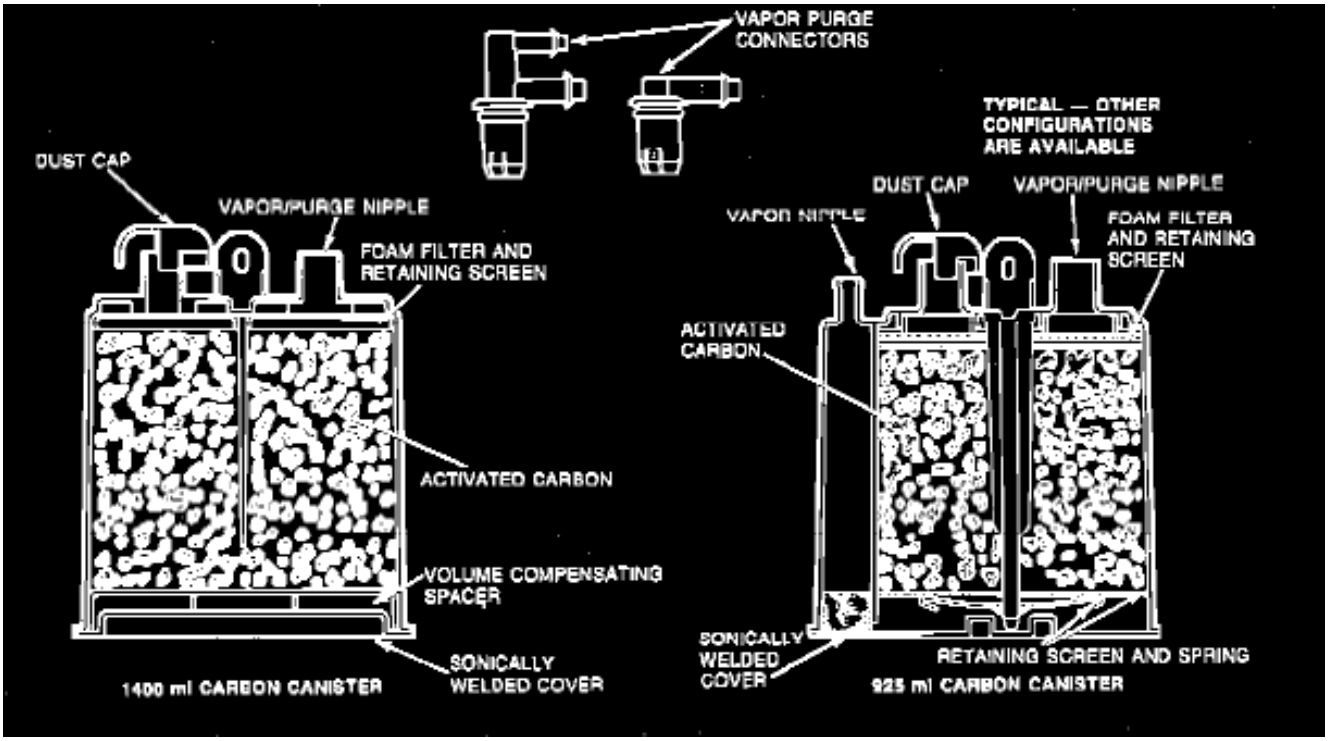
2. Connect a vacuum pump to the source vacuum nipple of the solenoid, and apply 5" vacuum. Vacuum should NOT leak. If it does, replace the solenoid.

3. Connect jumper wires to the electrical terminals of the solenoid.

4. While applying vacuum to the source vacuum nipple, energize the solenoid by connecting jumper wires from a 12 volt battery to the electrical terminals of the solenoid. The valve should open, allowing vacuum to pass through. If it does not, replace the solenoid.



EVAP Components For Canister Purge

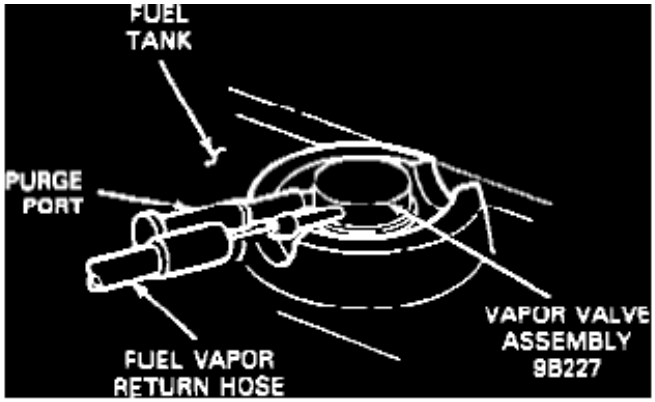


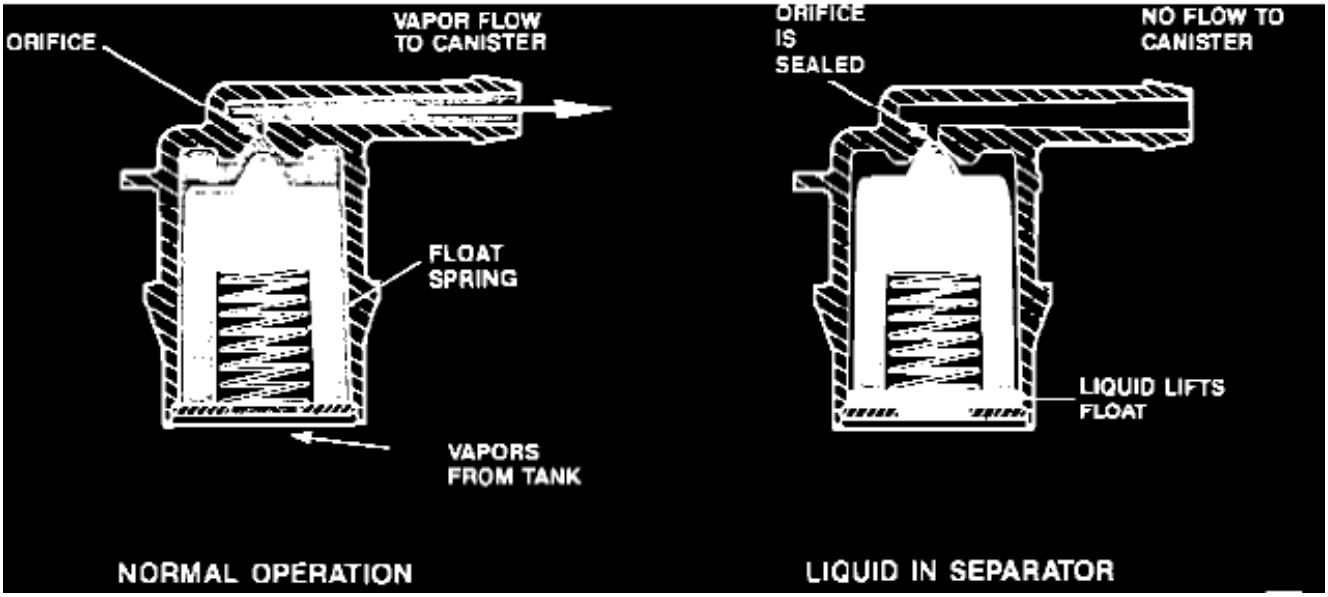
Charcoal Canister: Description and Operation

Carbon Canisters, Typical

The Charcoal Canister is normally located within the engine compartment, or along the frame rail, and is filled with activated charcoal granules. Activated charcoal is used as a vapor trap because of its great surface area, holding up to one-third its own weight in fuel vapors. Each gram of activated charcoal has a surface area of 1,100 square meters, or more than a quarter acre.

The canister is connected to the fuel tank by a vapor hose with an in-line metering-type vapor valve. Another vacuum/vapor hose connects the canister to the intake manifold. This second hose may contain an in-line purge control valve or solenoid. The charcoal canister receives and stores fuel vapors, when the engine is OFF or when the vapors are not being routed directly to the induction system, while the engine is running. During purge conditions, as manifold vacuum is applied to the canister, fresh air enters the Evaporative Emission System through the fuel filler caps vents. The fresh air passes over the charcoal in the canister allowing the stored fuel vapors to pass into the induction system for burning.





Liquid Vapor Separator: Description and Operation

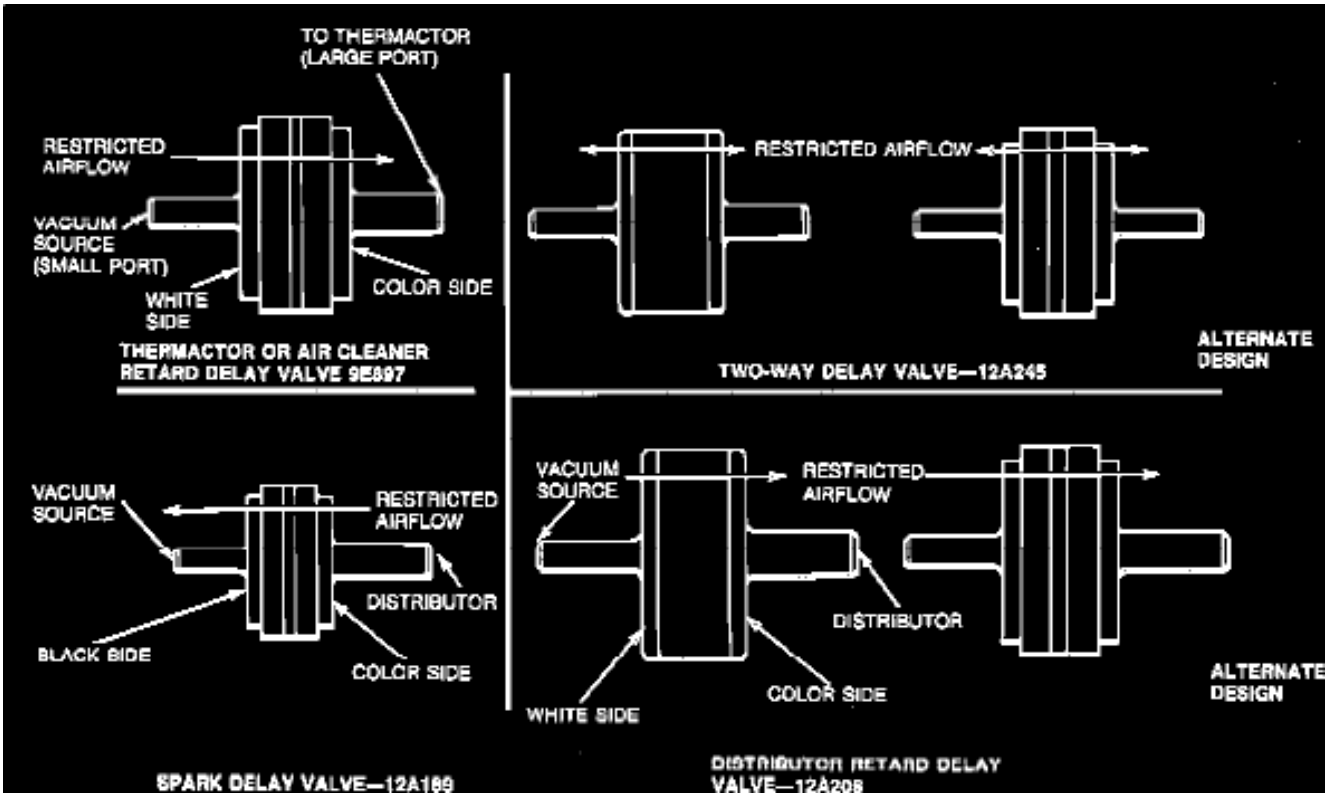
Fuel Tank Vapor Vent Valve

The Fuel Tank Vapor Valve is mounted in the top of the fuel tank and permits fuel vapors to be vented to the charcoal canister, while restricting liquid fuel. A rubber grommet provides a tight seal around the valve in order to provide a sealed fuel system.

Fuel Tank Fuel/Vapor Separator Operation

As fuel vapors are generated, they enter the valve from the bottom, rise upward past the float, and out through a single vapor line. If liquid fuel should enter the valve assembly, the float will rise upward and close the orifice. As the fuel is drained back into the fuel tank, the spring attached to the underside of the valve pulls the float downward, exposing the orifice. If the fuel vapor line to the canister becomes kinked or plugged, causing extreme pressures to build inside the fuel tank, the

vapor valves purge port opens to provide pressure relief. NOTE: In the event of vehicle roll-over, the float closes off the valve, preventing fuel from escaping and saturating the charcoal canister.



Vacuum Delay Valve: Description and Operation

The Vacuum Delay Valve (VDV) is usually located within the vacuum hose routing or harness assembly. These valves are designed to decrease the rate at which vacuum is applied to or released from a component.

Types Of Vacuum Delay Valves

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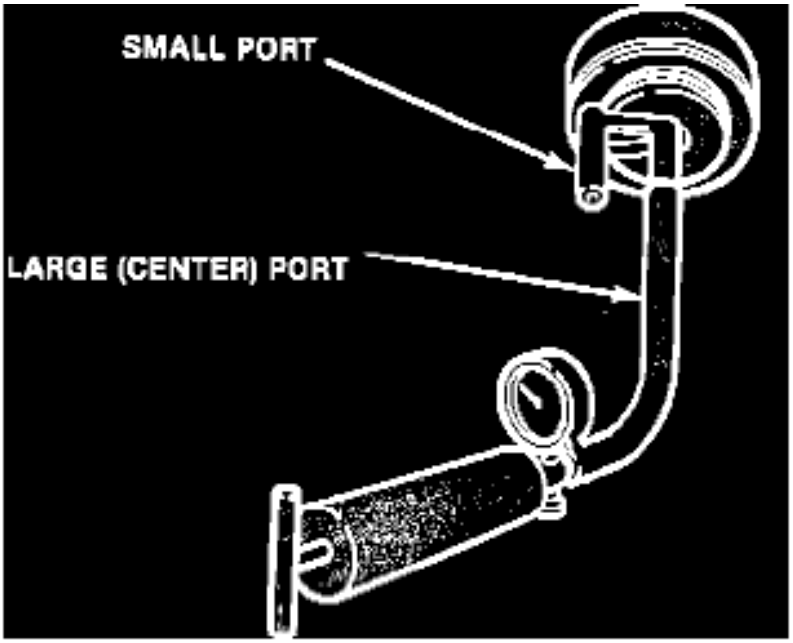
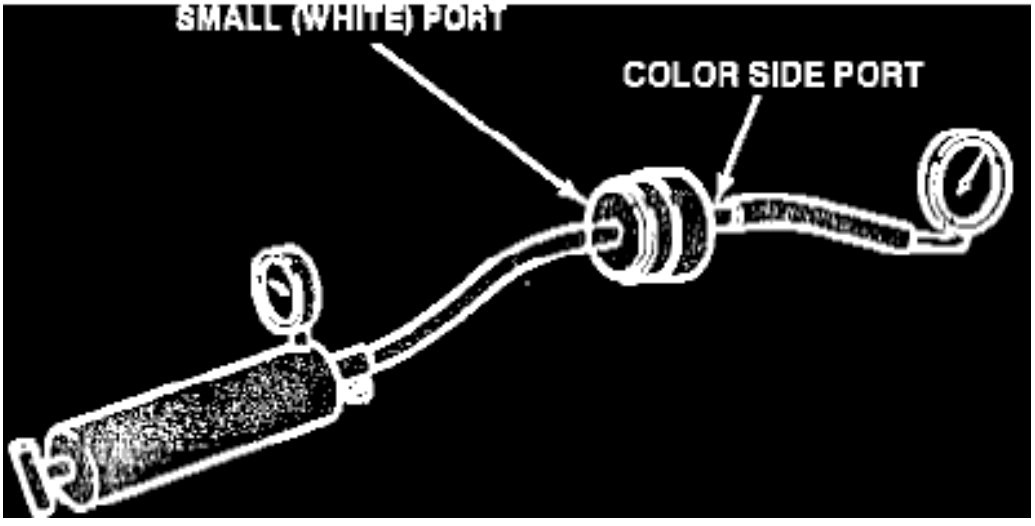

SMALL PORT
LARGE (CENTER) PORT


SMALL (WHITE) PORT
COLOR SIDE PORT

Vacuum Delay Valve: Testing and Inspection

Cold Weather Modulator Test

1. Attach a vacuum pump the large center port of the CWM (Cold Weather Modulator/Retard Delay Valve).

2. Cool the CWM, apply vacuum. Vacuum must hold.

3. Warm the CWM, apply vacuum. Vacuum must be released.

VACUUM RETARD DELAY VALVE (VRDV) TEST

Retard Delay Valve Test

1. Attach a vacuum pump to the small (white) port of the valve.

2. Attach a vacuum gauge to the large (colored) port of the valve.

3. Apply 10" vacuum and hold.

4. Verify gauge reads 10" vacuum, then release vacuum from pump to valve.

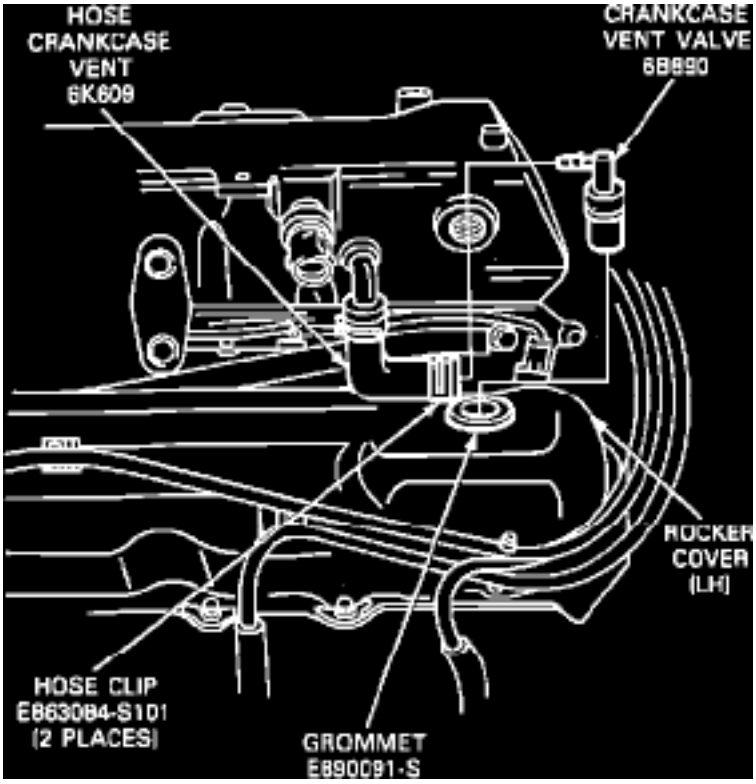
5. Count the seconds it takes the vacuum to drop from 8" to 0" of vacuum. Replace the sensor if it fails, according to the chart below.

Color Code Delay Time

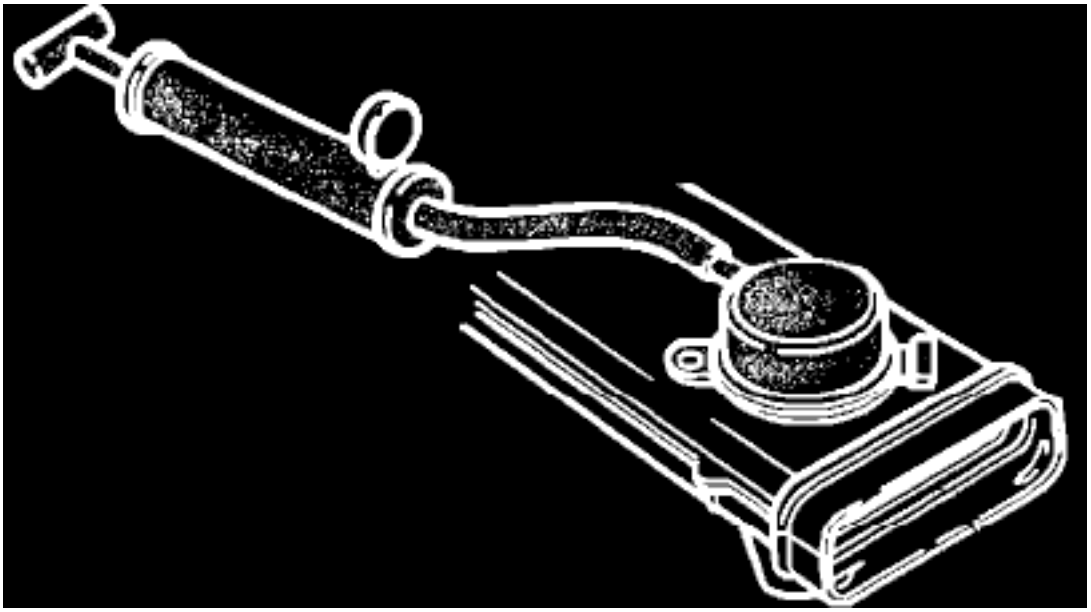
Red 15-28 seconds

Blue 9-20 seconds

Pink 4-12 seconds



PCV Valve And Hose Connections

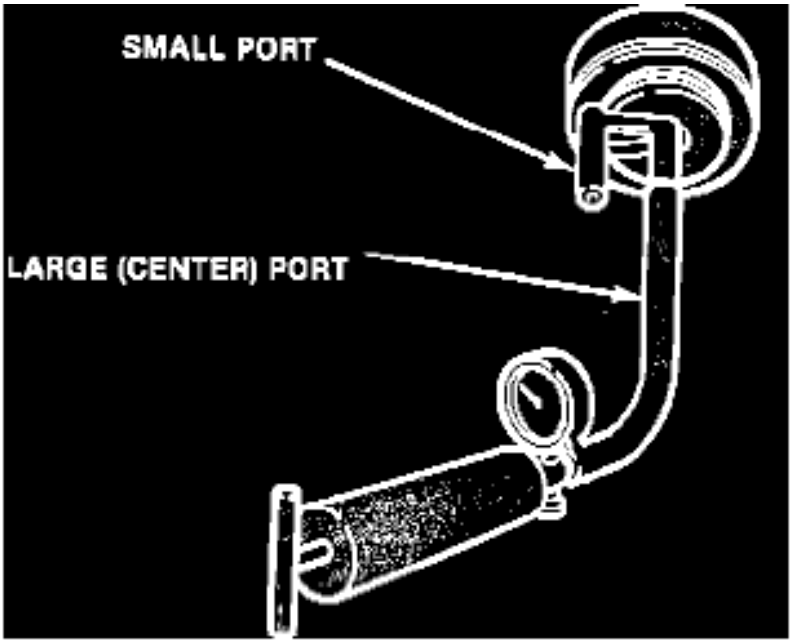


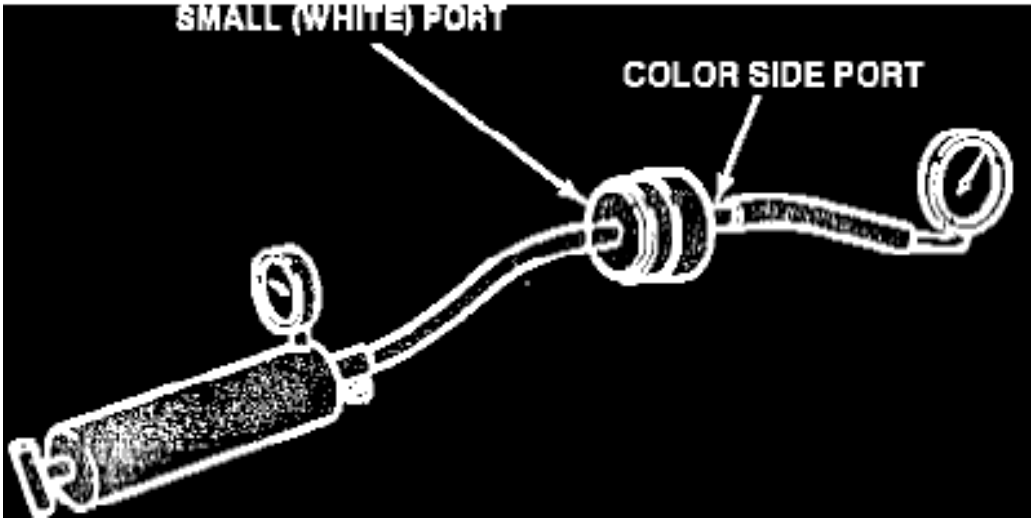
Thermostatic Air Cleaner Vacuum Motor: Testing and Inspection

Air Door Vacuum Motor Test

1. Verify that the air door is in the closed to heated air position and that the vacuum motor stem and the air door are connected, by looking up into the snorkel.

2. Remove vacuum hose from motor, connect a vacuum pump, and apply 10-15" vacuum. Air door should be in the open to heated air position and must remain so for two minutes with vacuum trapped. When vacuum is released the door should move to the closed to heated air position.


SMALL PORT
LARGE (CENTER) PORT


SMALL (WHITE) PORT
COLOR SIDE PORT

Thermostatic Air Cleaner Vacuum Switch: Testing and Inspection

Cold Weather Modulator Test

1. Attach a vacuum pump the large center port of the CWM (Cold Weather Modulator/Retard Delay Valve).

2. Cool the CWM, apply vacuum. Vacuum must hold.

3. Warm the CWM, apply vacuum. Vacuum must be released.

VACUUM RETARD DELAY VALVE (VRDV) TEST

Retard Delay Valve Test

1. Attach a vacuum pump to the small (white) port of the valve.

2. Attach a vacuum gauge to the large (colored) port of the valve.

3. Apply 10" vacuum and hold.

4. Verify gauge reads 10" vacuum, then release vacuum from pump to valve.

5. Count the seconds it takes the vacuum to drop from 8" to 0" of vacuum. Replace the sensor if it fails, according to the chart below.

Color Code Delay Time

Red 15-28 seconds

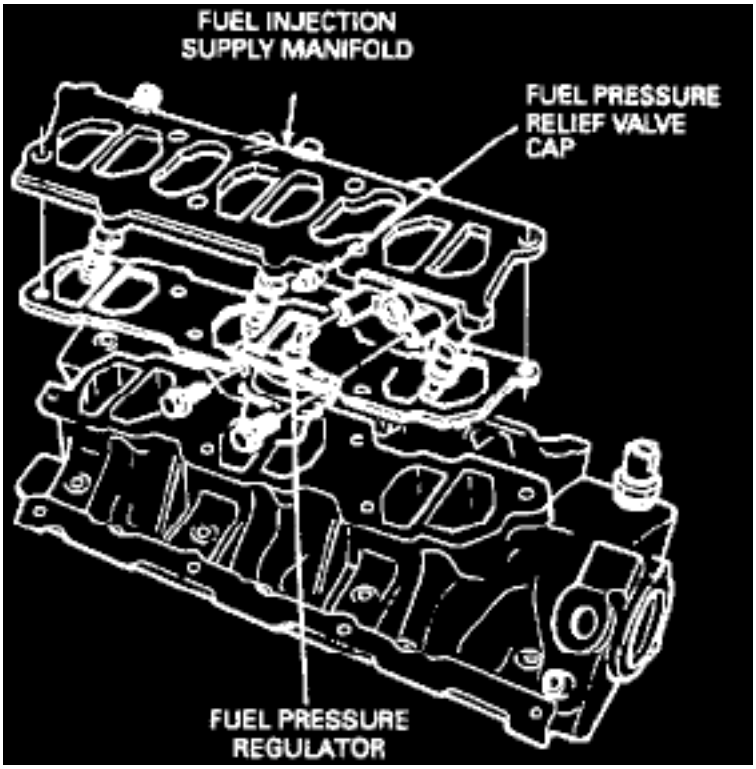
Blue 9-20 seconds

Pink 4-12 seconds

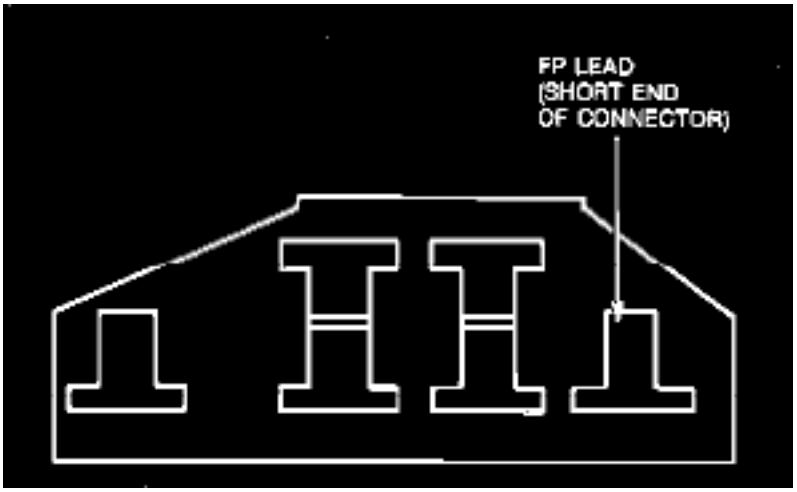
Fuel Pressure: Specifications

Key On Engine Off 35 - 45 psi

Key On Engine Running 30 - 40 psi



Fuel Injection Supply Manifold



Fuel Pressure: Testing and Inspection

STO Connector

STATIC PRESSURE TEST

1. Check for adequate fuel supply. 2. Turn key OFF 3. Install fuel pressure gauge to test port on fuel rail. 4. Install test lead to fuel pump lead of STO test connector. 5. Turn Key On Engine Off (KOEO). 6. Ground test lead to run fuel pump. 7. Check to determine if fuel pressure is within acceptable limits. Refer to SPECIFICATIONS.

a. If pressure is low but greater than 3 psi (indicates fuel pump is running but not enough pressure) check for:

^ Plugged fuel filter

^ Kinked fuel line

^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

^ Disconnect the fuel return line and note if fuel is being returned during this low pressure condition. If fuel is being returned, replace the fuel pressure regulator. Reconnect the fuel return line.

b. If pressure is less than 3 psi (pump not running) check for:

^ Defective fuse link

^ Inertia switch open

^ Wiring at fuel pump/tank connector loose or open

^ Fuel pump ground connection at chassis loose or defective

^ Improper fuel pump relay operation

If fuel supply and return lines are OK, and electrical supply and ground are OK, and fuel pressure is still low, replace fuel pump.

DYNAMIC PRESSURE TEST

1. Disconnect and plug the vacuum line to the pressure regulator.

2. Start engine and run at idle. Check to determine if fuel pressure is within acceptable limits.

a. If pressure is low check for:

^ Plugged fuel filter ^ Restricted fuel line ^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

3. Reconnect the vacuum line to the regulator.

If fuel supply and return lines are OK, and electrical supply and ground is OK, and fuel pressure is still low, replace fuel pump.

LEAKAGE TEST

1. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate operating pressure. 2. Remove ground from test lead and note pressure on gauge. Pressure should remain within 2 psi for 3 minutes after lead is ungrounded.

a. If pressure is not maintained check for leaking fuel

^ Lines ^ Connectors ^ Injectors

b. Disconnect fuel return line and plug engine side. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate

operating pressure. If pressure holds replace regulator and retest. Reconnect the fuel return line.

If pressure is not maintained replace fuel pump.

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

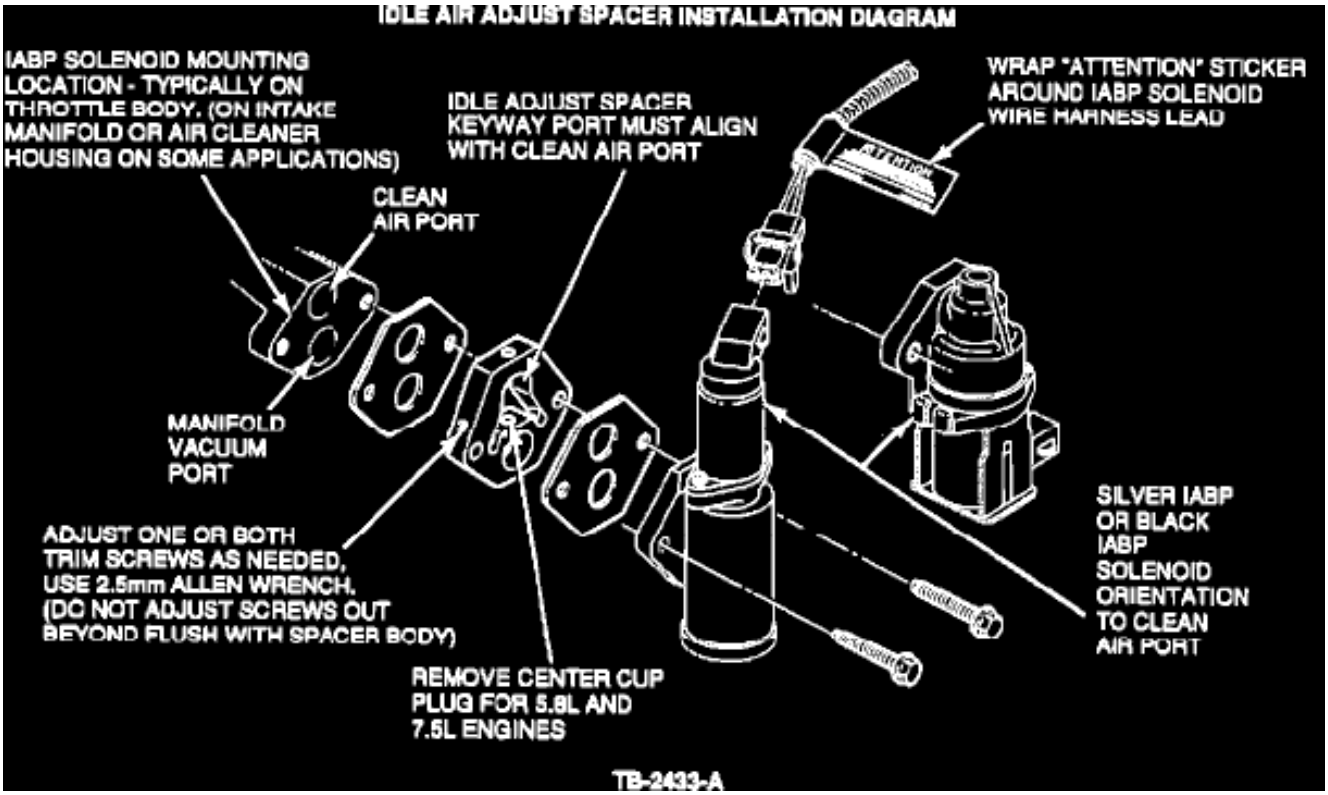
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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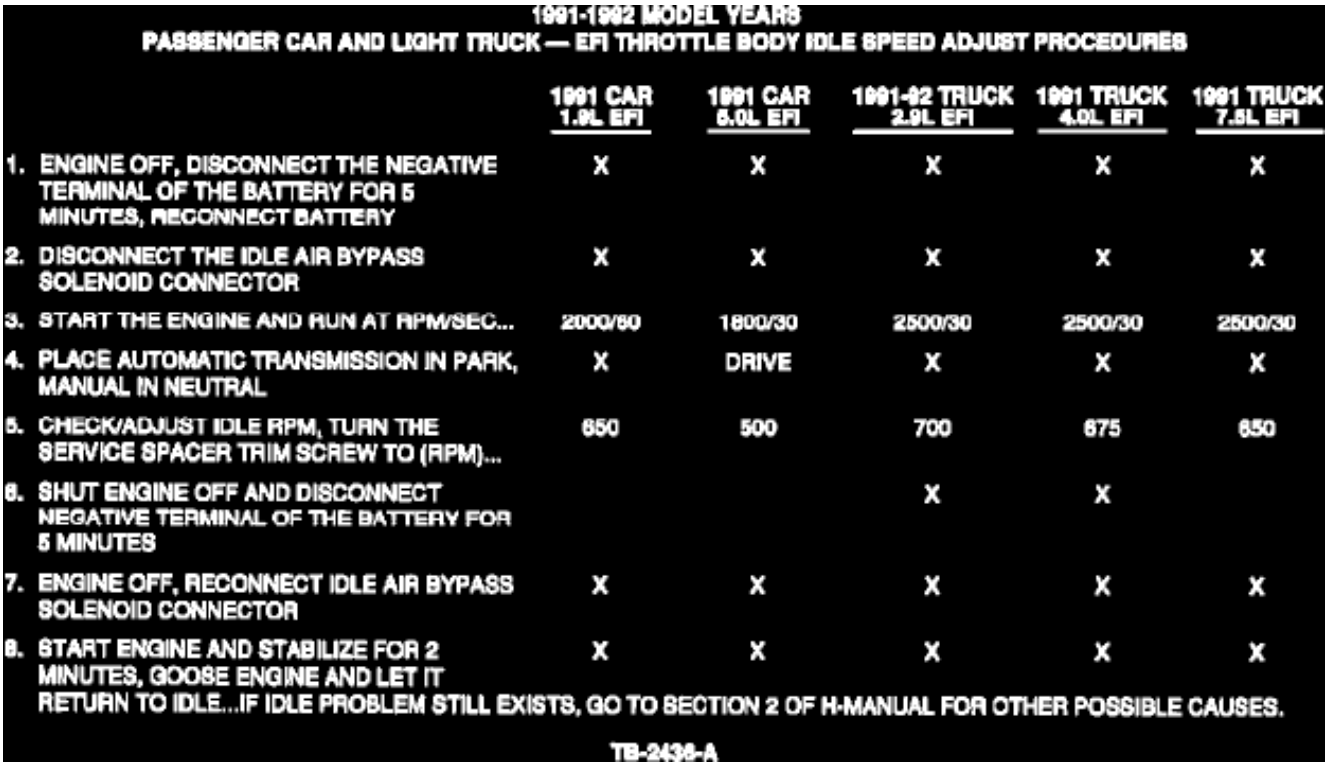
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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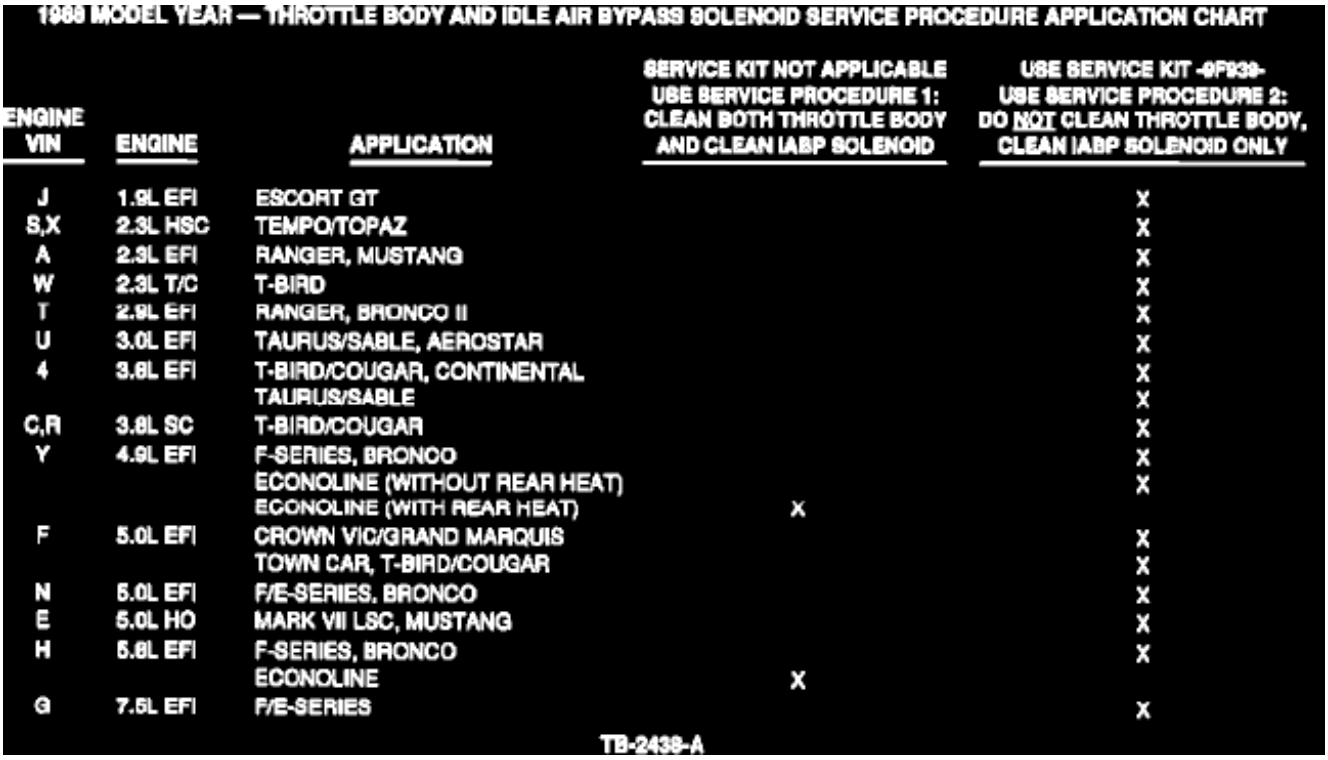
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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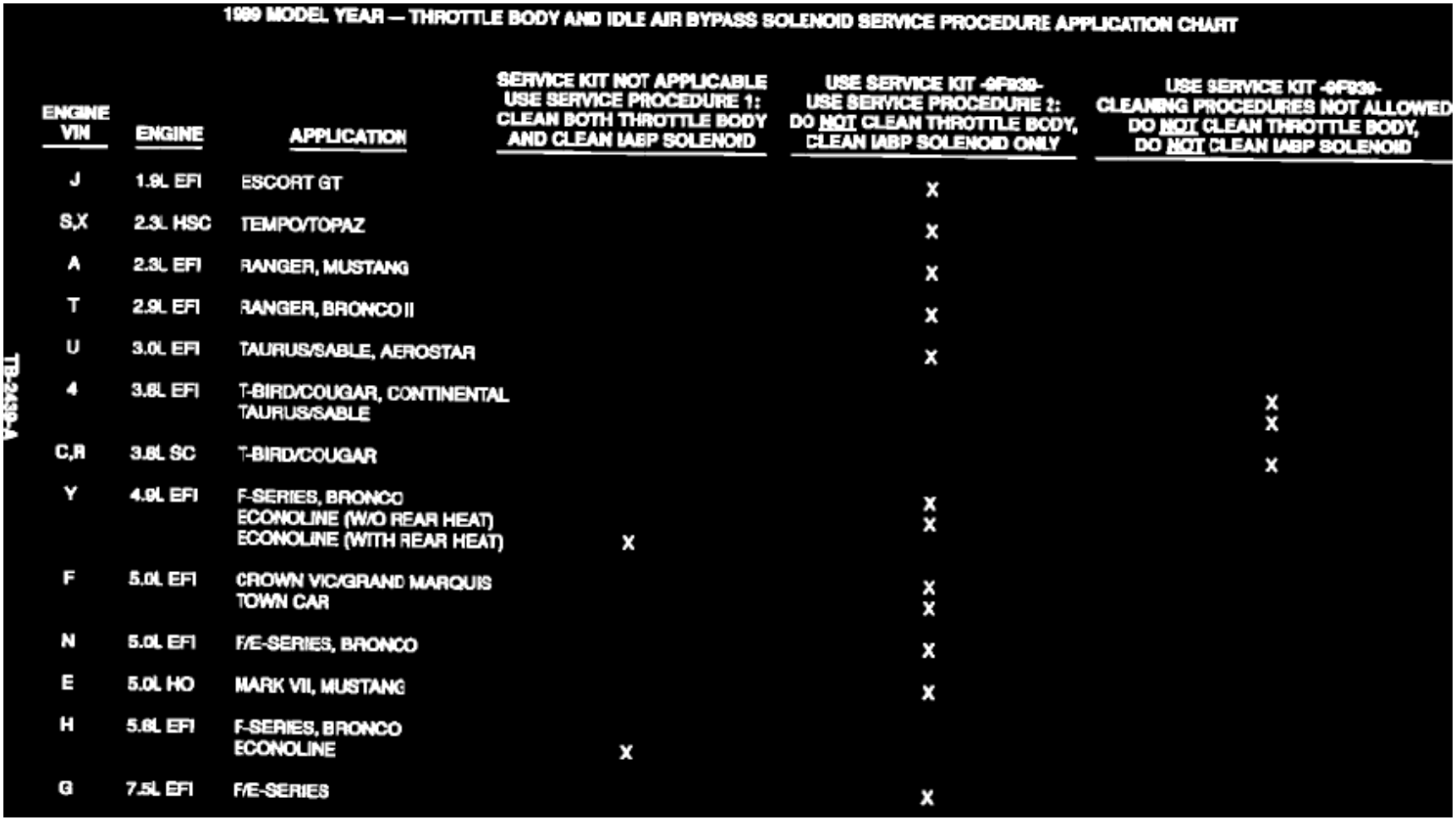
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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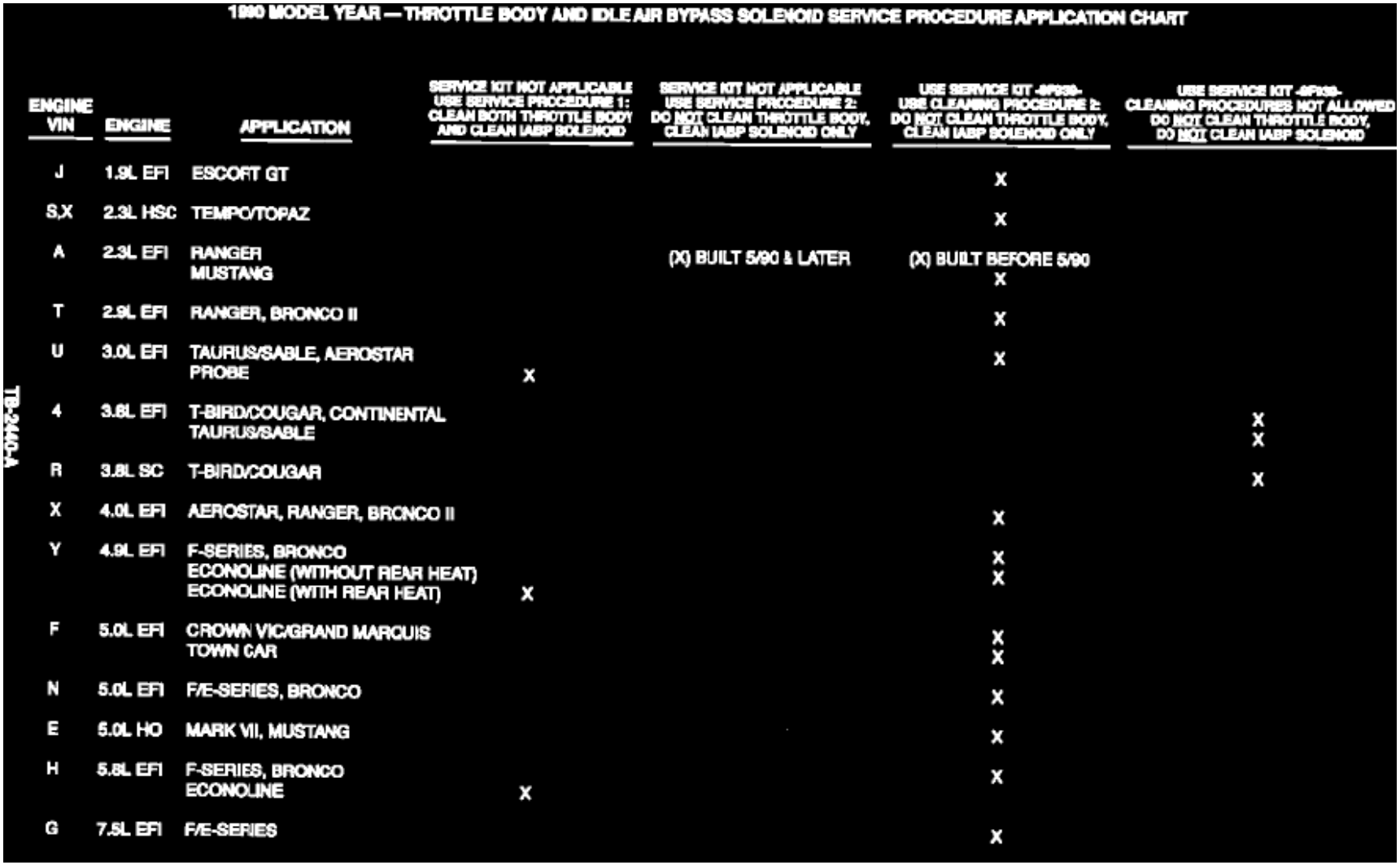
Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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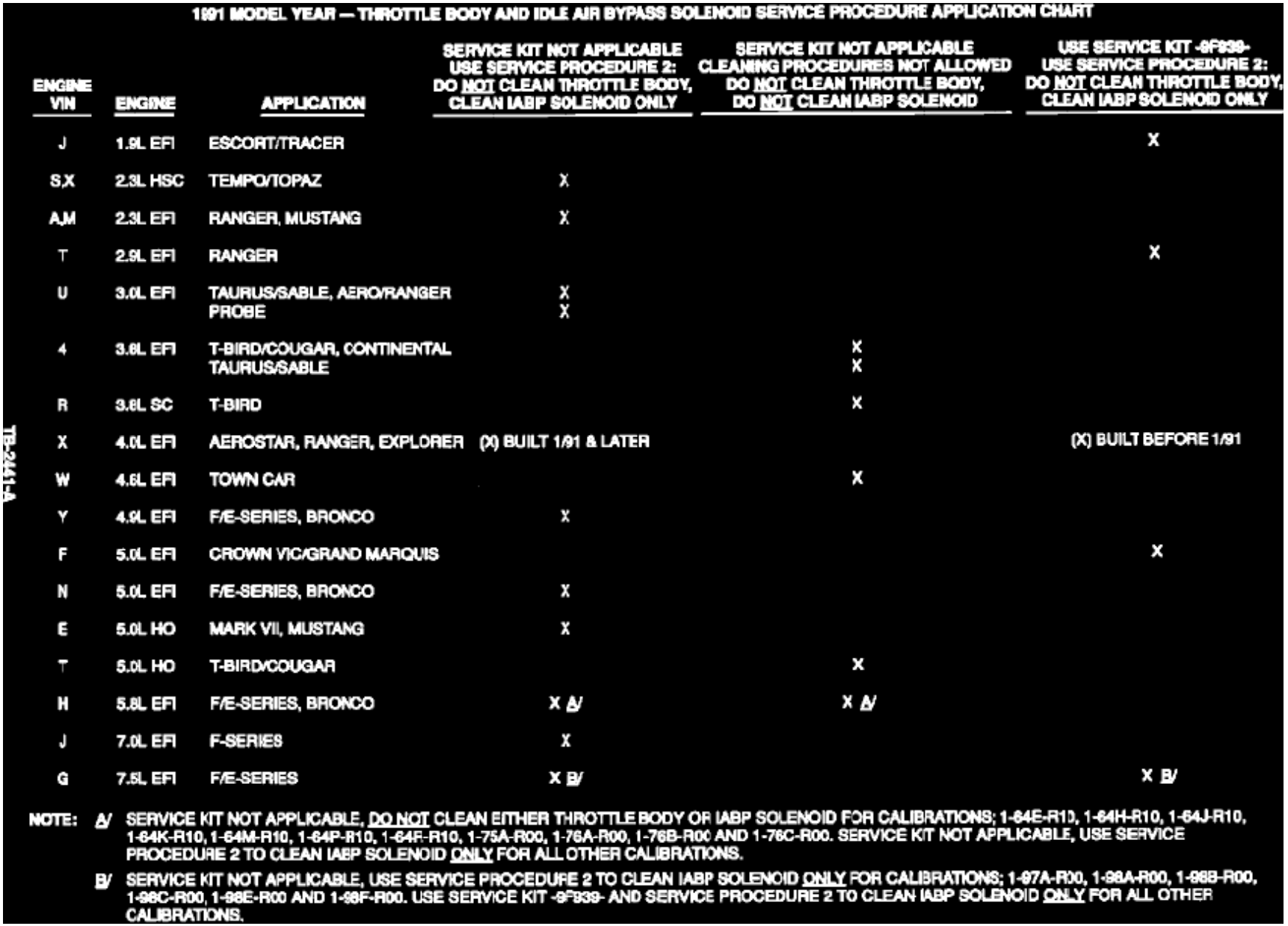
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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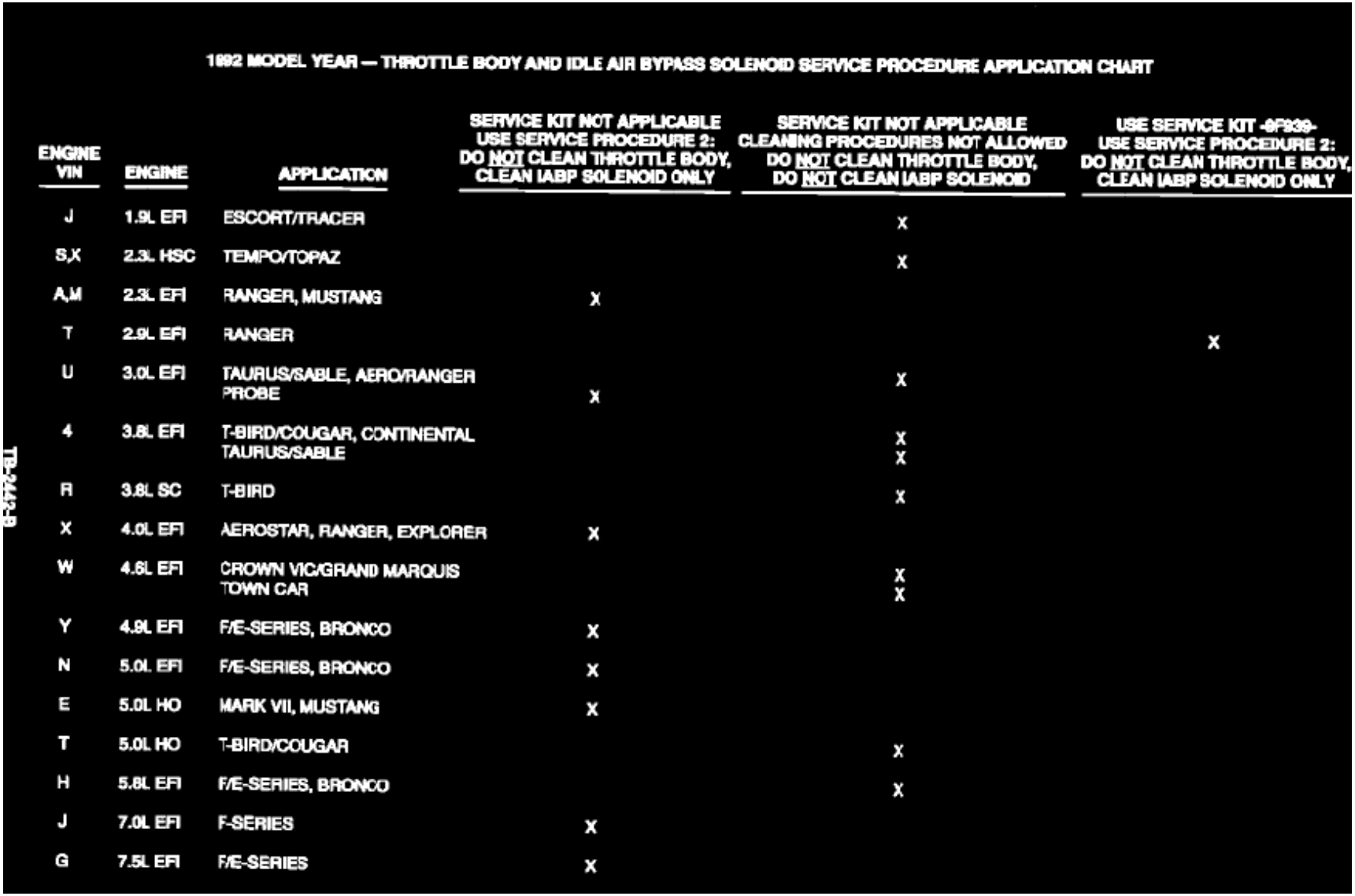
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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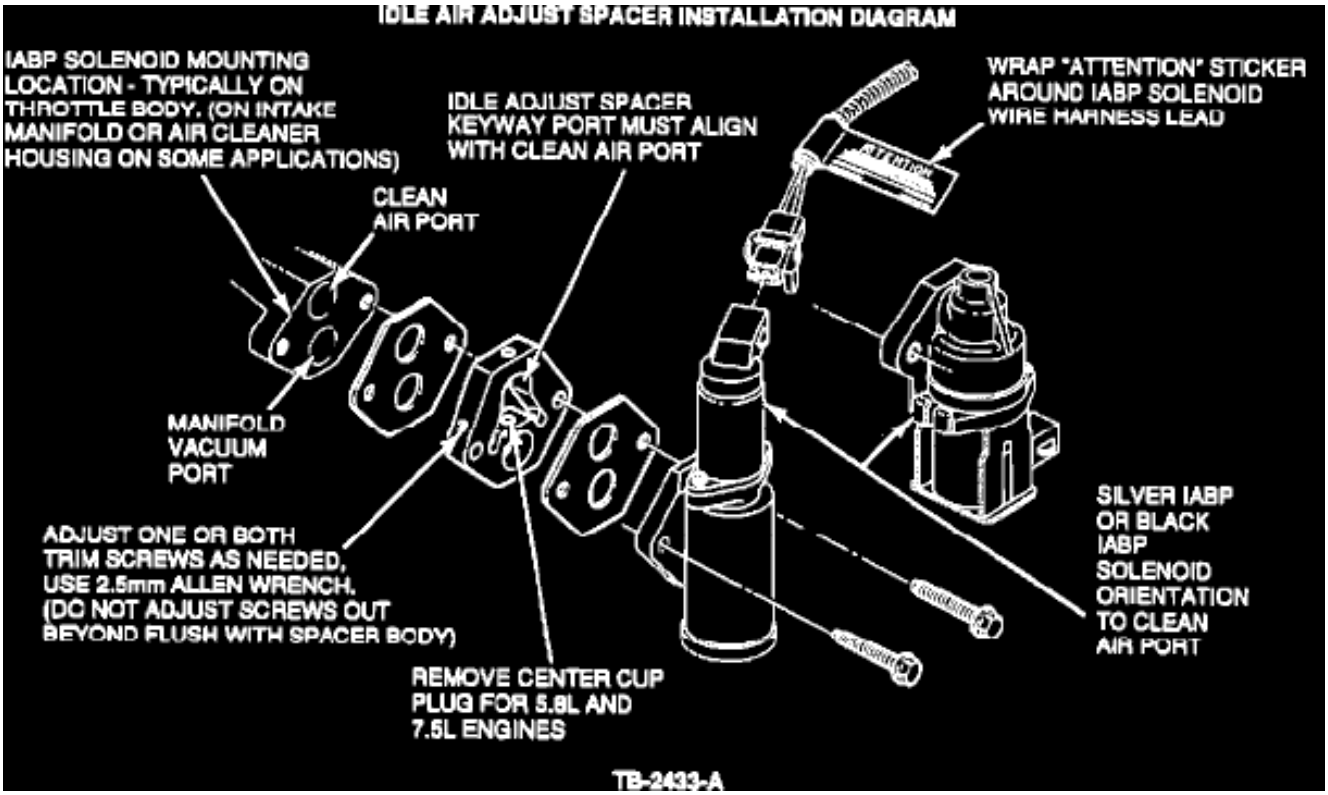
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

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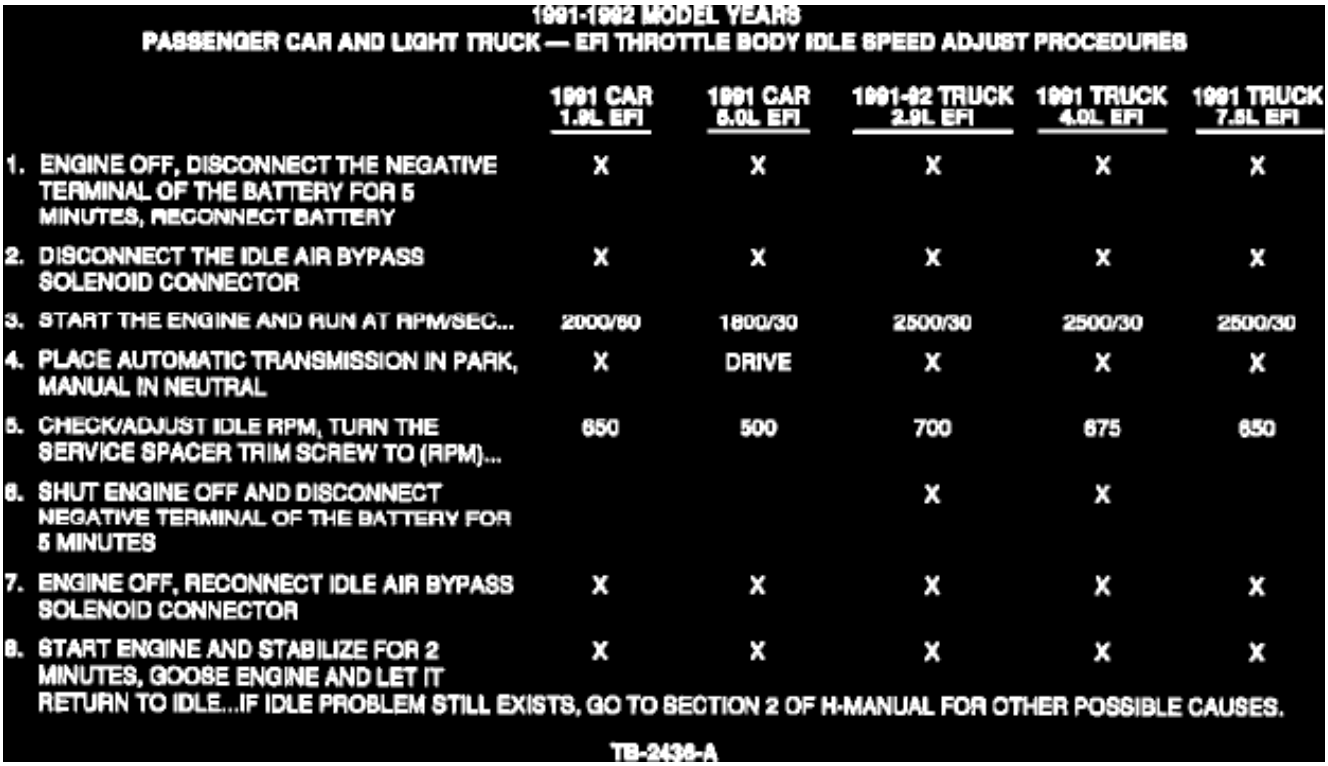
Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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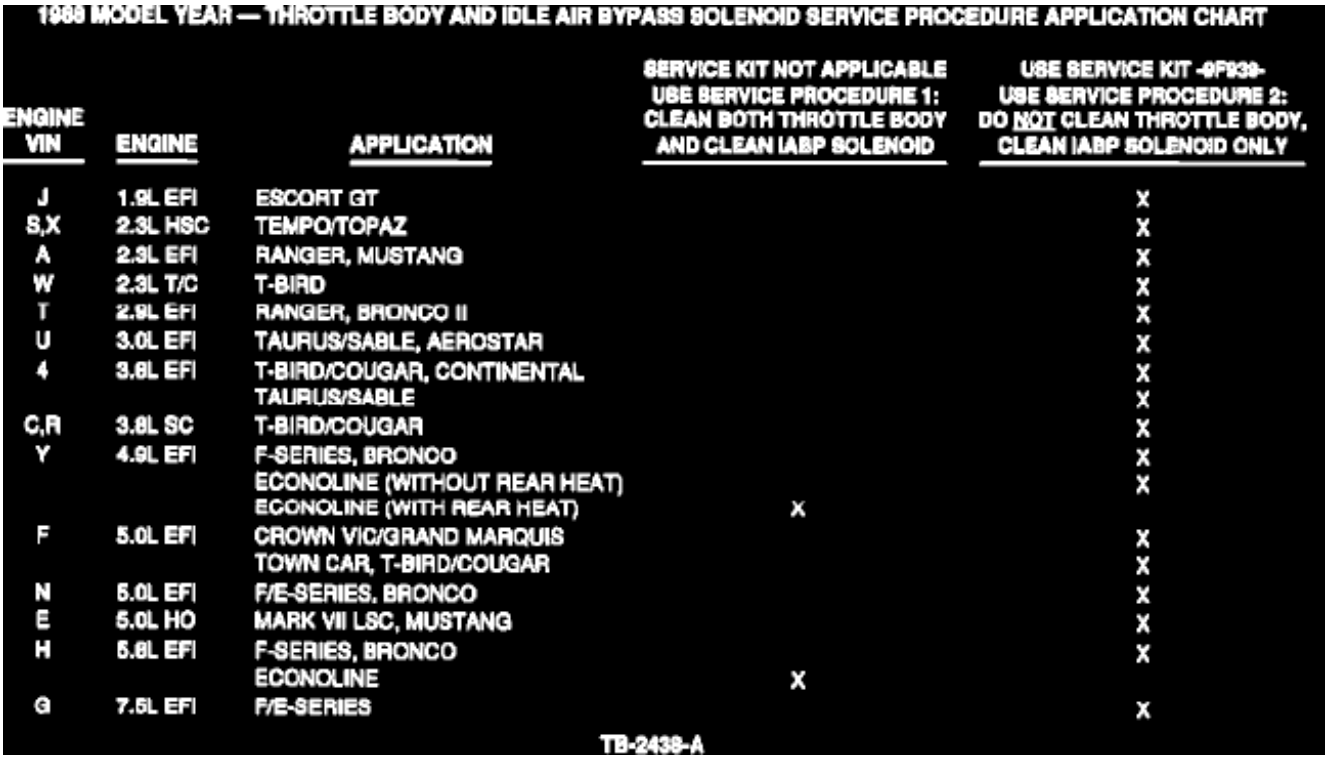
Figure 6



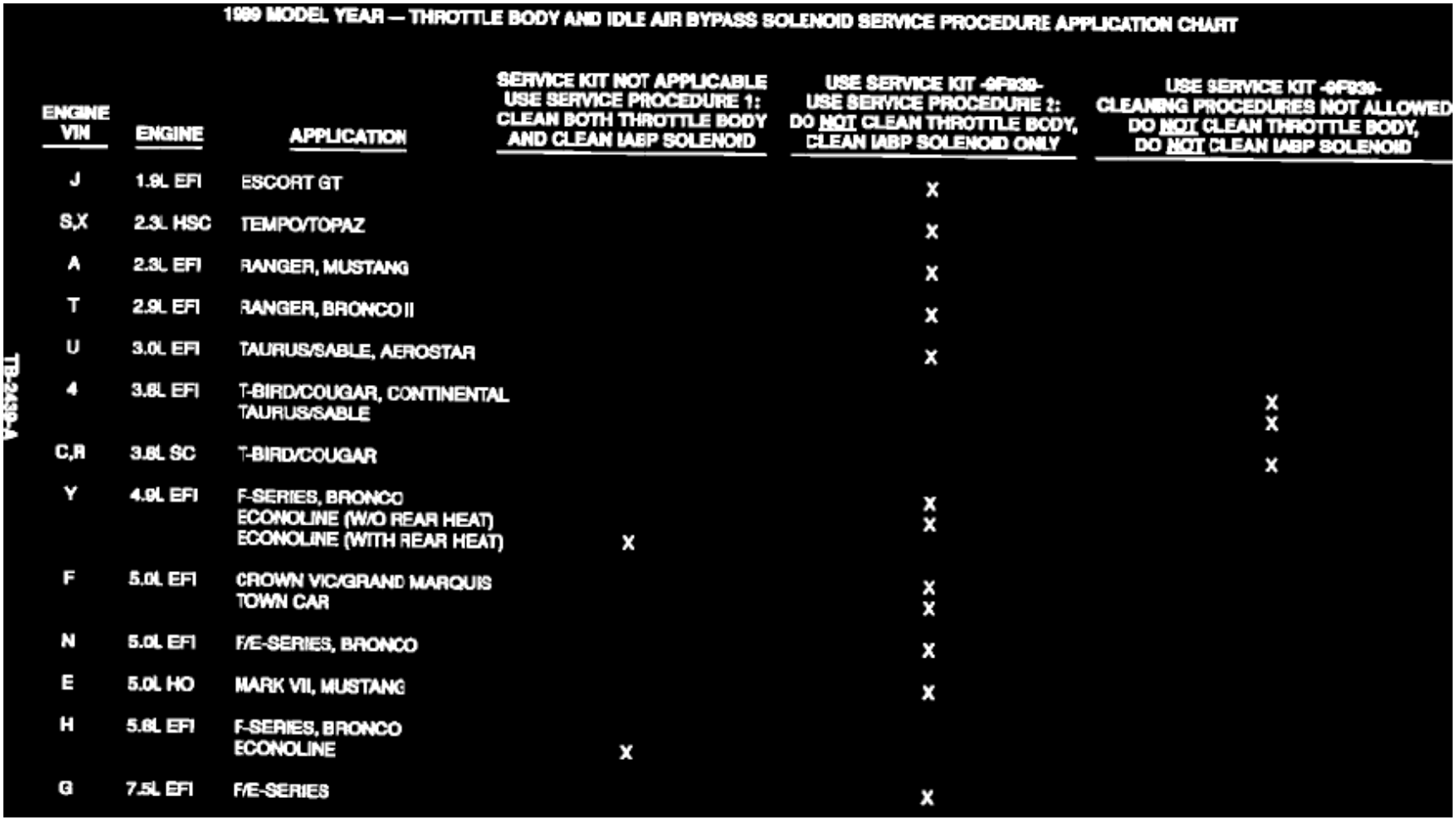
1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

TB-2438-A

Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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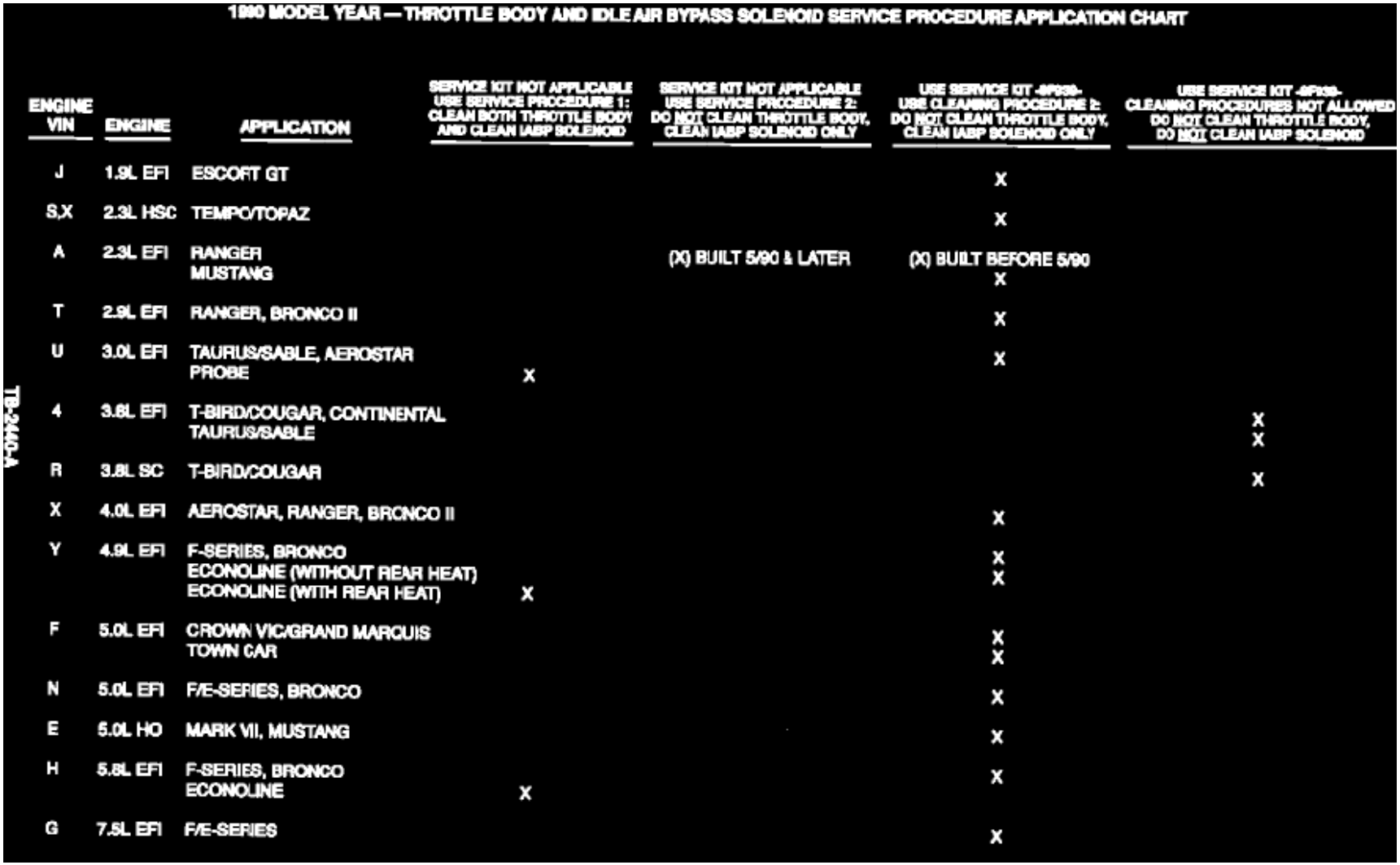
Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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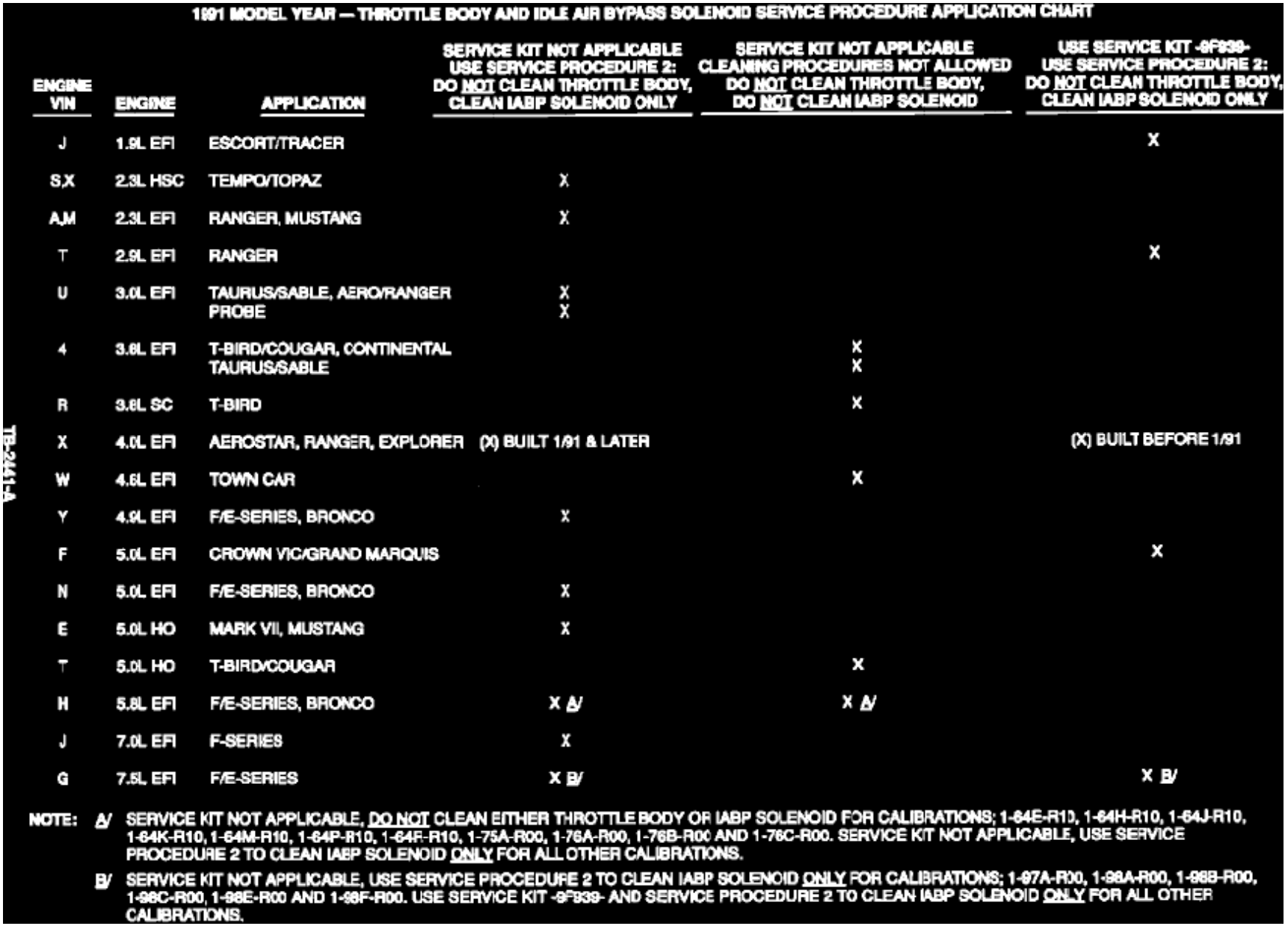
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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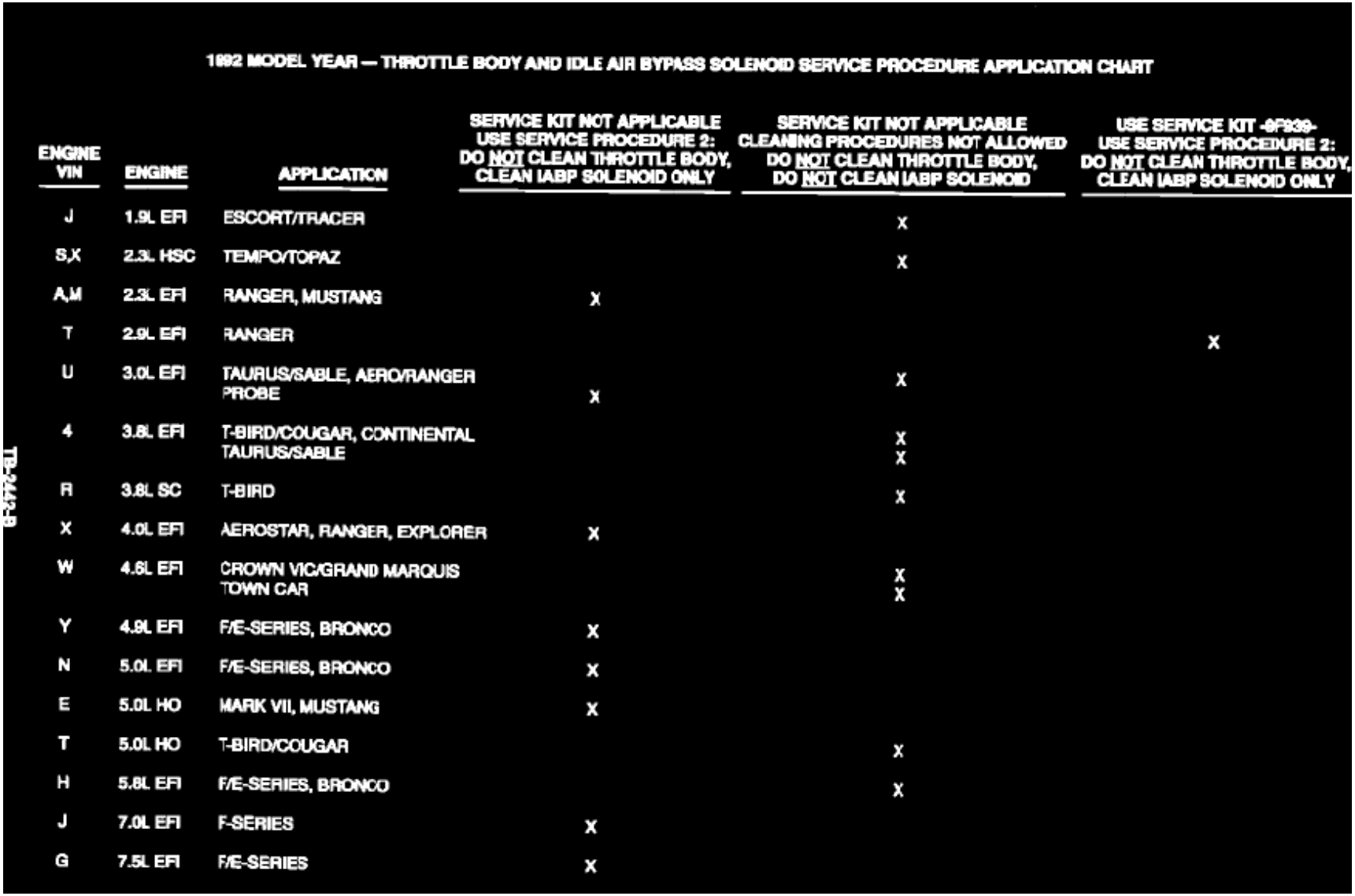
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Component Descriptions

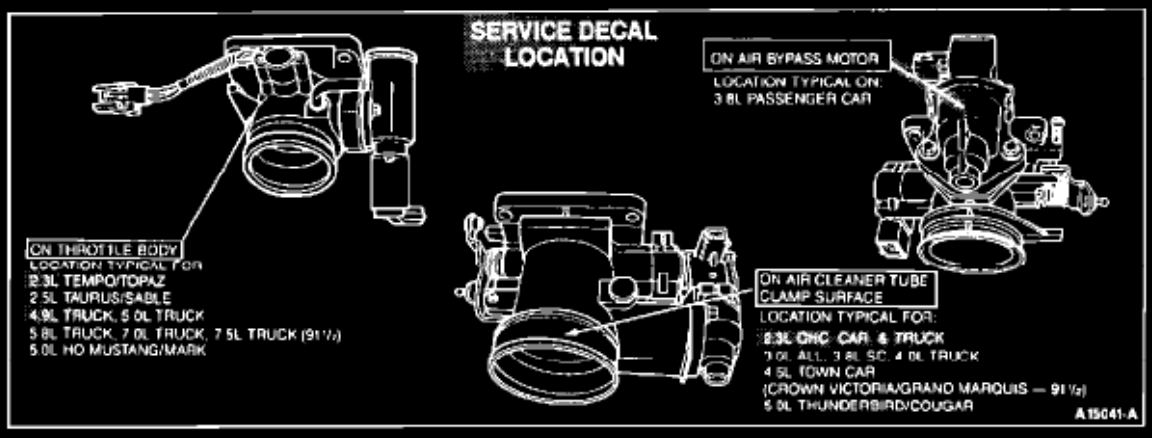


Figure 3

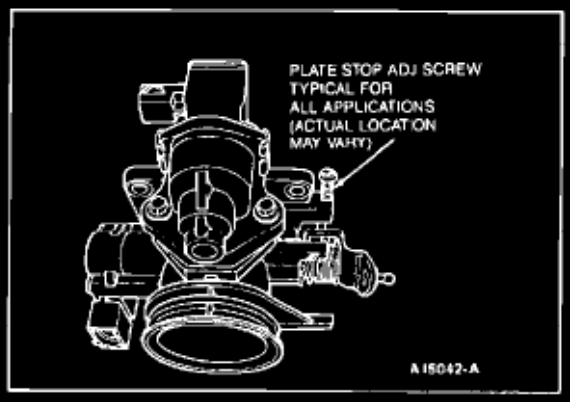


Figure 4

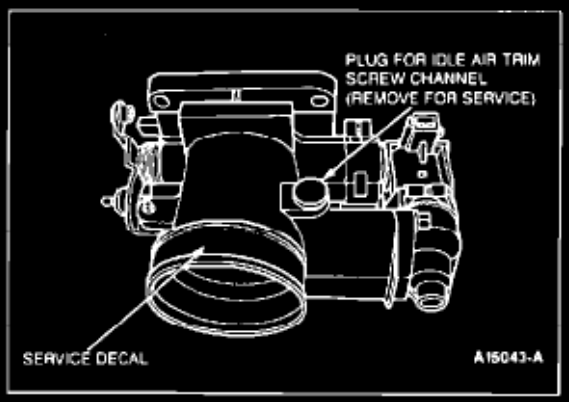


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

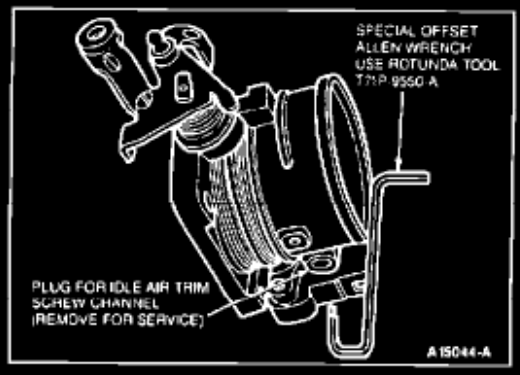
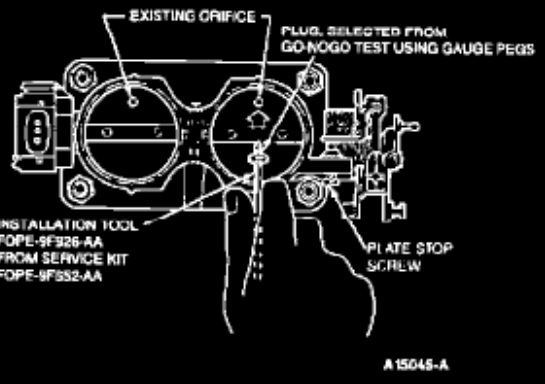


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off (reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Component Descriptions

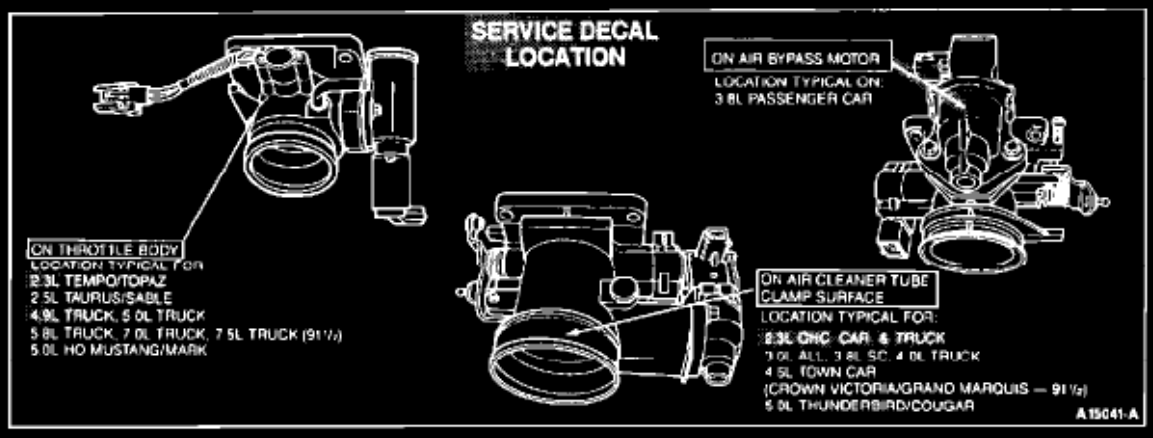


Figure 3

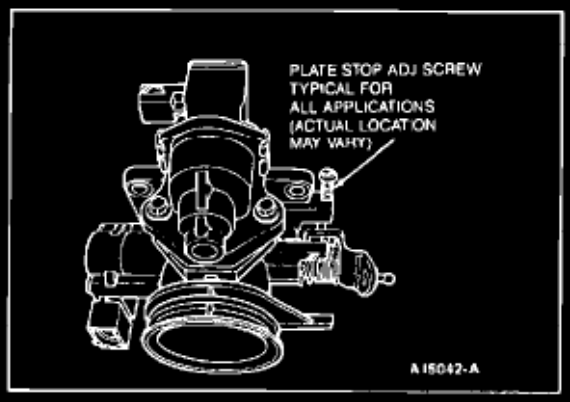


Figure 4

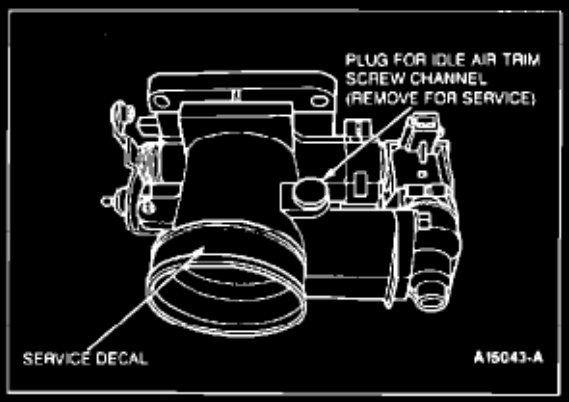


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

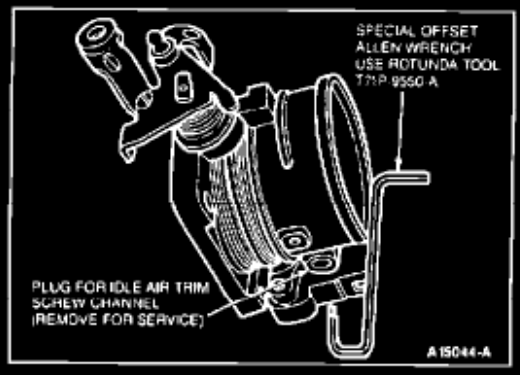
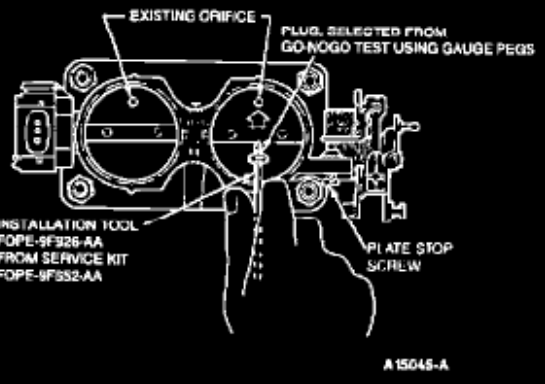


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Idle Speed > System Information > Technical Service Bulletins > All Other Service Bulletins for Idle Speed: > 9025B2 > Dec > 90 > Engine Idle Adjustment Procedures - Revision > Page 3223

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Idle Speed: By Symptom

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

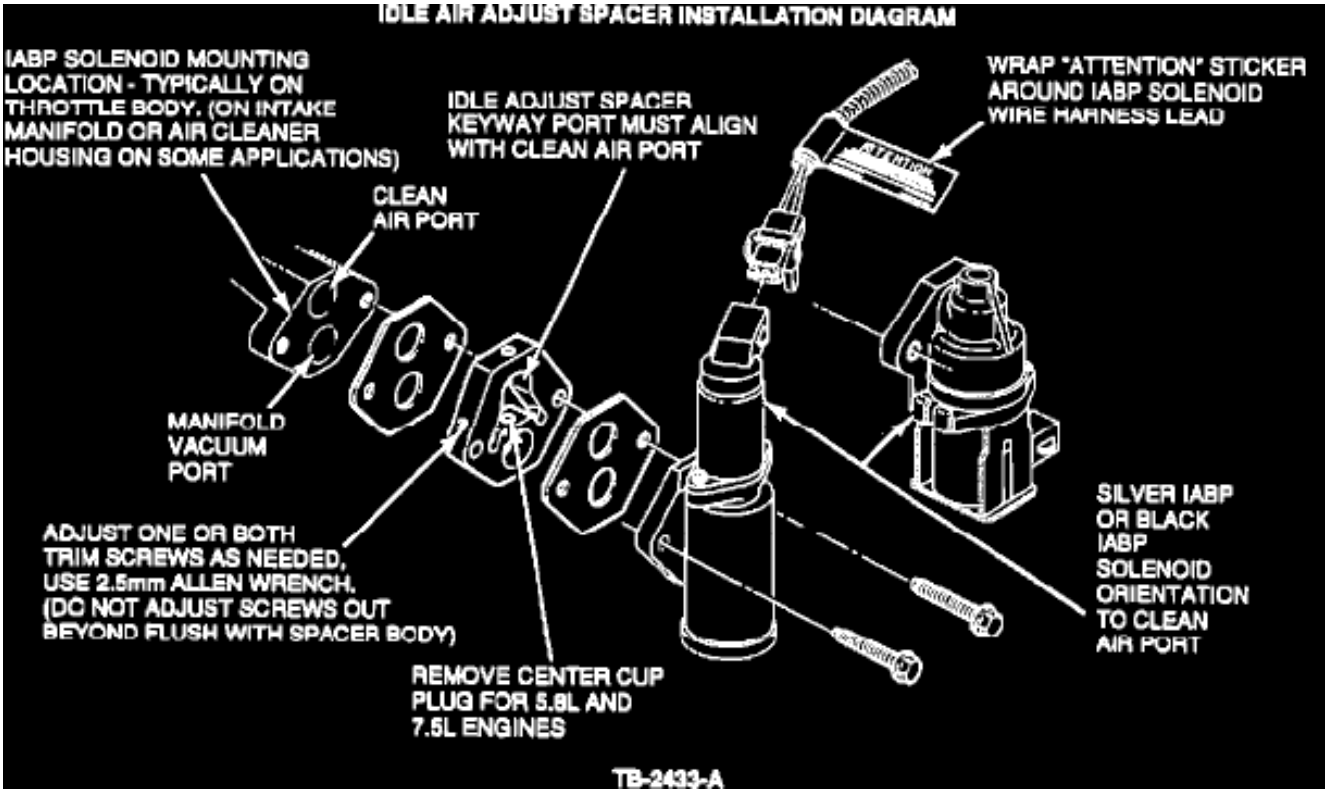
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

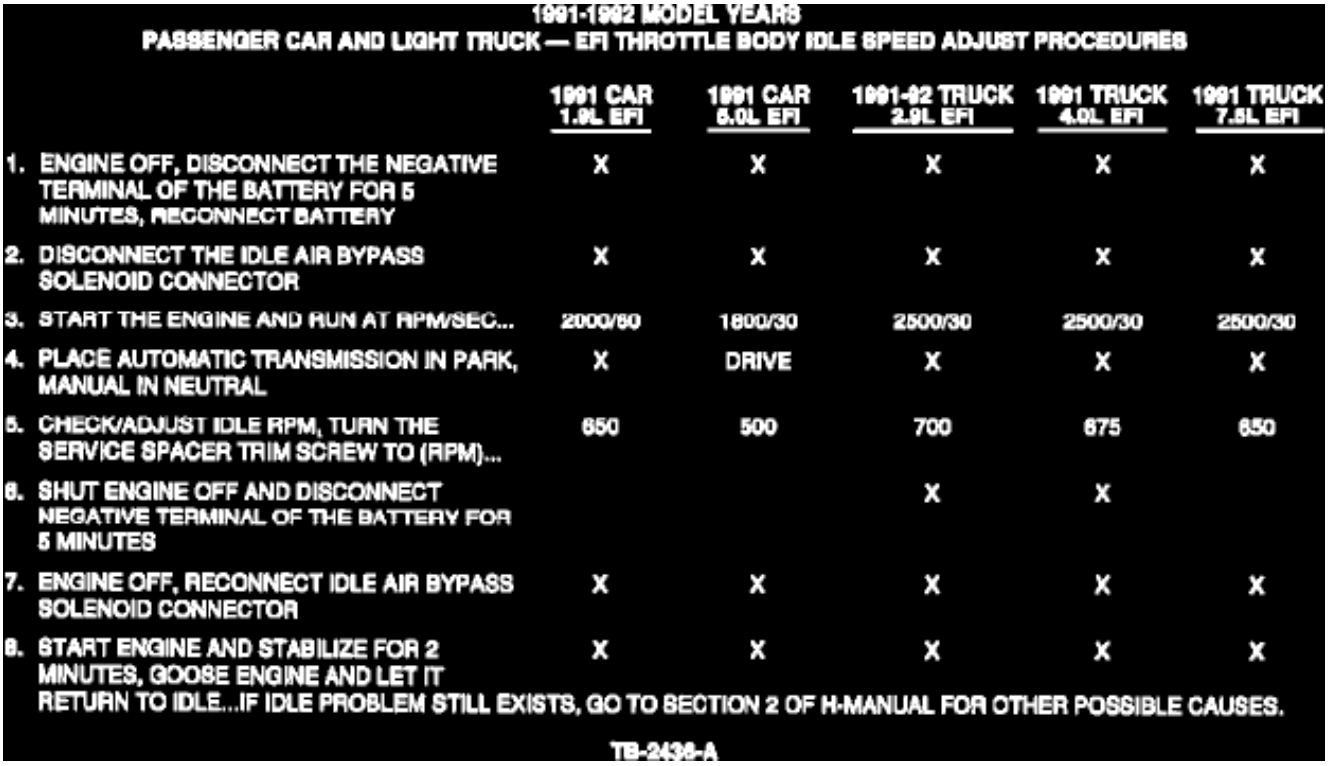
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1986 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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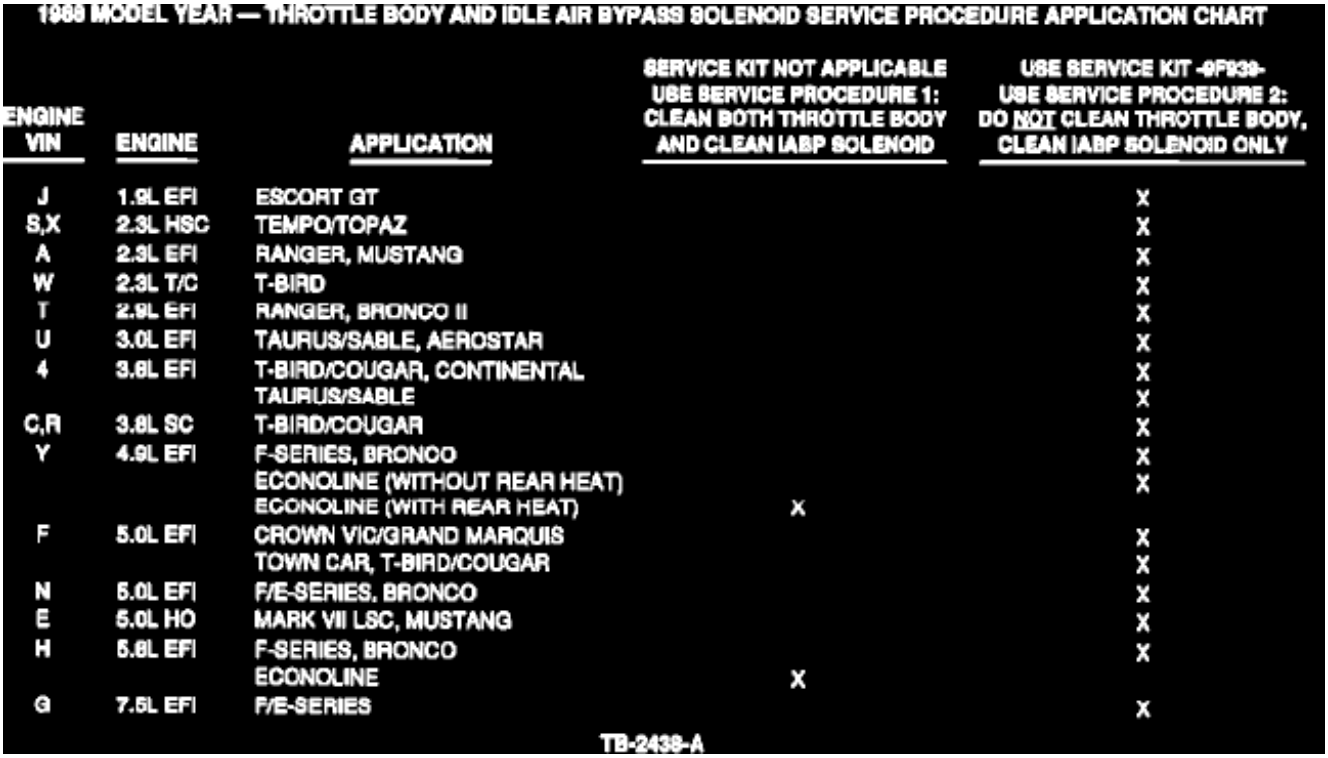
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

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Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSSL- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2411-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F836- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

SERVICE KIT -9F939-
APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-88	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

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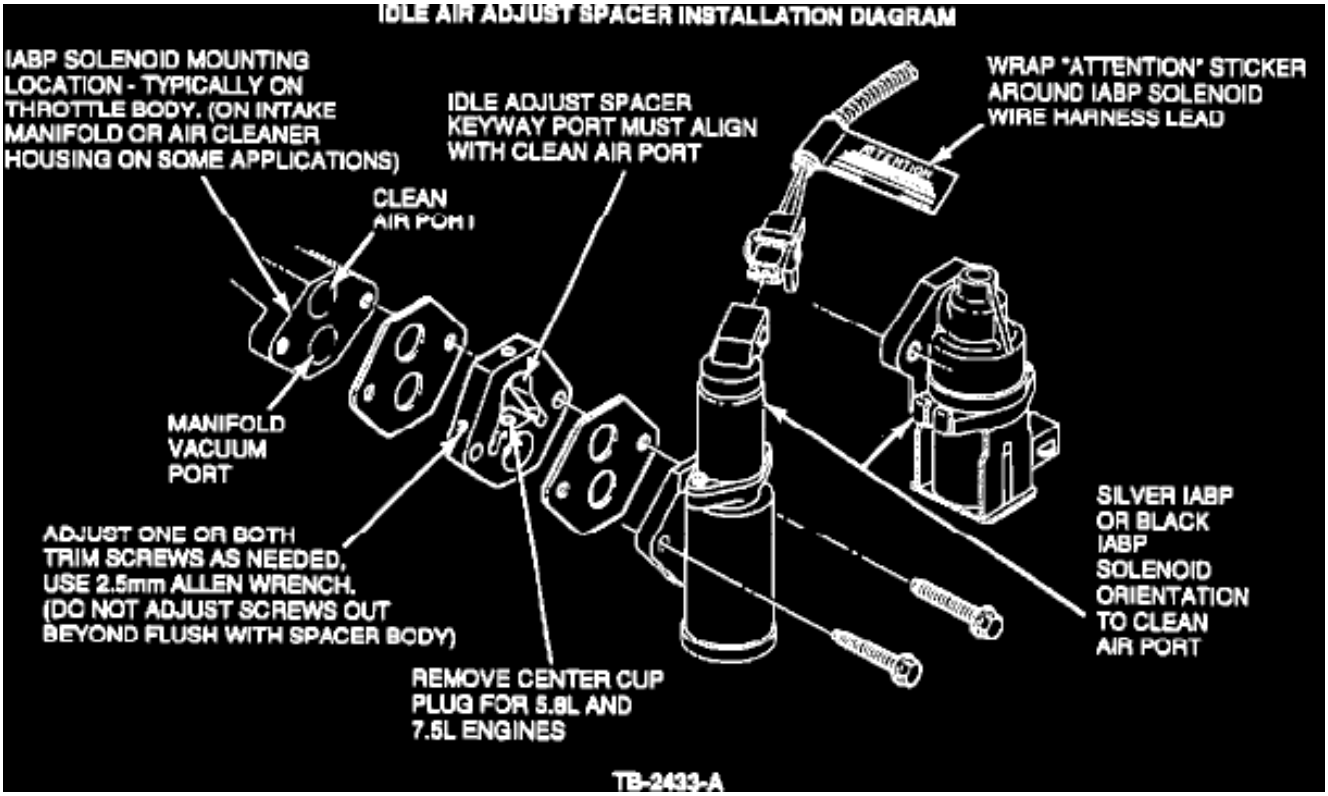
^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.



The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets

^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

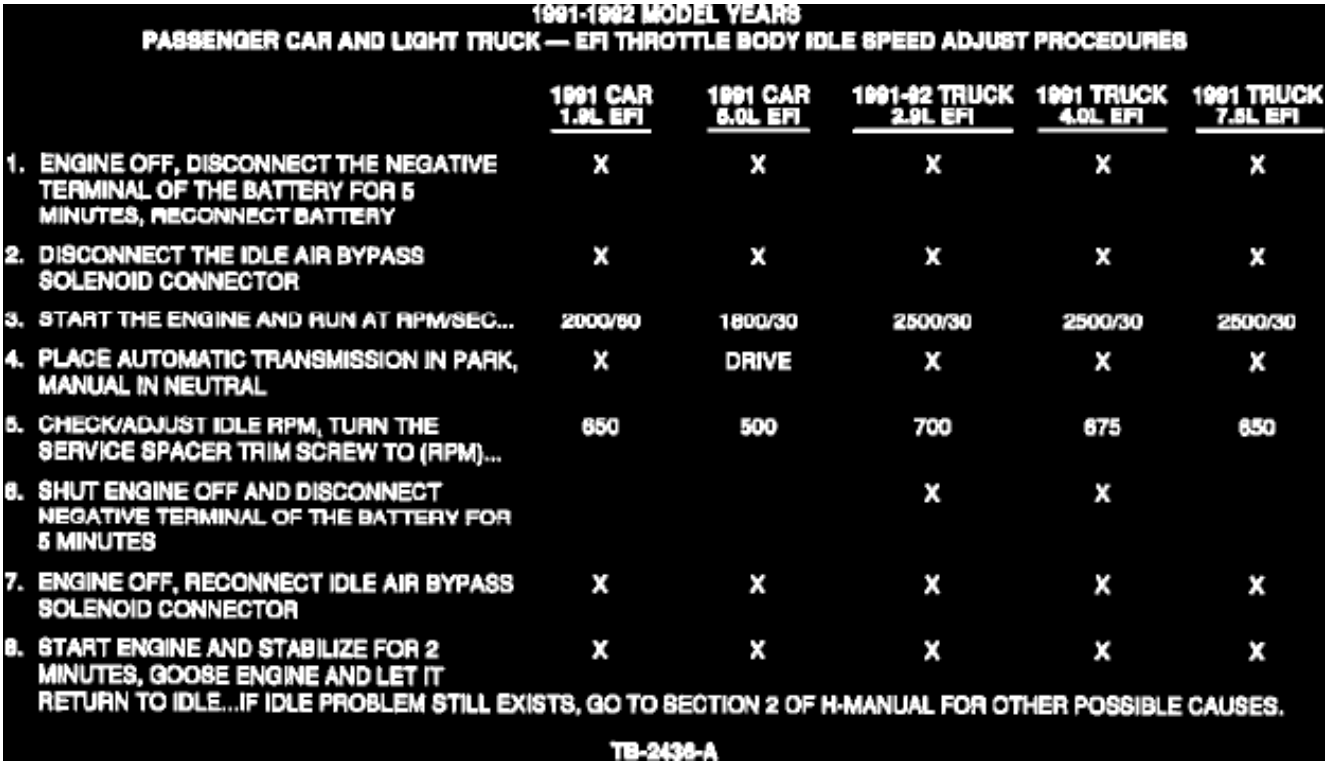
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1986-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1986 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1986 A:700 M:750	1986 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:650	1986 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 760	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1600/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

TB-2434-A

Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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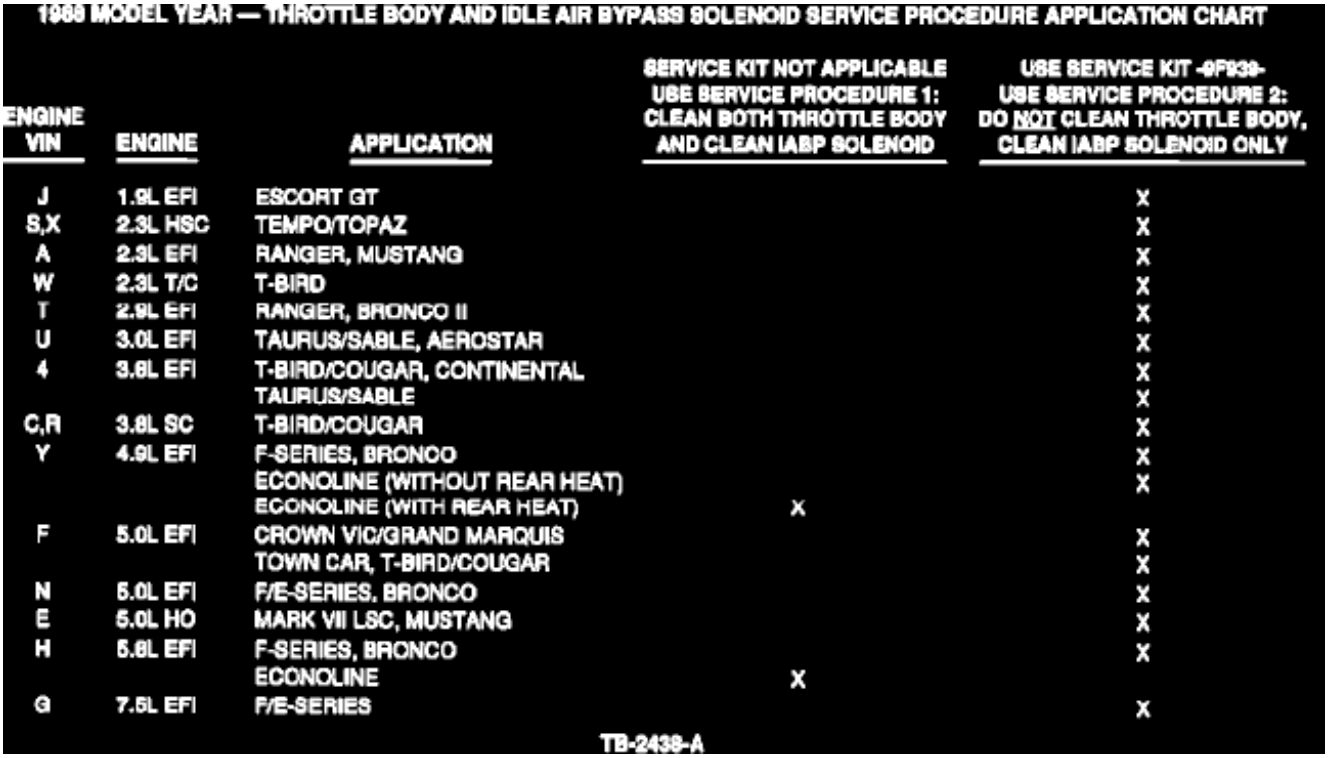
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

TB-2438-A

Figure 7

1989 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -4F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4F939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		
G	7.5L EFI	F/E-SERIES		X	

TB-2439-A

Figure 8

1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSS- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -4PSS- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 9

1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64F-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 10

1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT ~~-9F836-~~ USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TP-2442-B

Figure 11

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Idle Speed: Adjustments With 90TF-AA Throttle Body

*** UPDATED BY TSB 9111B4, 6/14/91; TSB 9025B2, 12/90

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5

Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-125 rpm.

RPM TOO LOW a.

Turn the plate stop screw to reach an idle speed of 675 +/- 25 rpm.

NOTE: During engine break-in reduce the idle rpm by 100 rpm. RPM TOO HIGH a.

Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6, if necessary.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

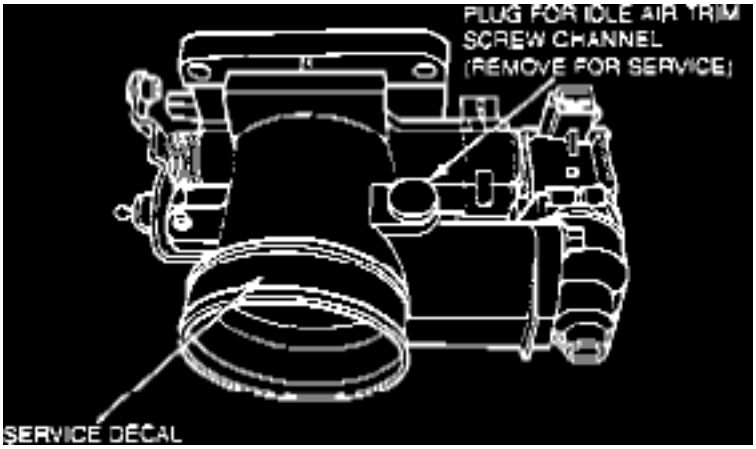
Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND

DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.



Idle Speed: Adjustments With 91TF-AA Throttle Body

*** UPDATED BY TSB 91-11B-4 6/14/91

NOTE: The curb and fast idle speeds are controlled by the Engine Control Assembly (ECA) and the Idle Speed Control Bypass Air Valve (ISC-BPA). The ISC-BPA valve is not adjustable. A large increase or decrease in closed plate airflow from the calibrated level will not allow this device to control the speed. The idle speed setting procedure has been revised considerably to reflect the expanded application of the Self-Test idle speed options and because the throttle body incorporates an orifice in the throttle plate to control idle airflow as part of the sludge tolerant design.

Air Trim Screw Channel Cover

Throttle bodies with sludge tolerant design (introduced 1991 1/2 model vehicles) are clearly identified with a Yellow/Black decal. This decal warns that the throttle plate stop screw must not be adjusted counterclockwise (backed off), as this will not reduce the engine speed but may cause the throttle plate to stick in the bore. Backing out the screw may be required if the throttle body has been previously serviced (a plug in the throttle plate orifice may be present) or the plate stop screw tampered with (TPS Self-Test output out of range). The decal also warns that the throttle body must NOT be cleaned inside the bore, as this cleaning will impair the sensitive coating. The sludge accumulation will not affect the idle air flow. The cleaning procedure for the ISC-BPA still applies.

REMEMBER

A change in idle airflow can occur not only at the throttle body, but other areas as well. You should enter the idle speed procedure only after other possible causes in the following areas are eliminated.

^ Contamination within the idle speed control device

^ Lack of fuel system control (excessively rich or lean)

^ Throttle sticking or binding

^ Engine not reaching operating temperature

^ Incorrect ignition timing

^ Incorrect or clogged PCV system

^ Vacuum leaks (intake manifold, vacuum hoses, vacuum reservoirs, power brake booster etc.

VERIFY

^ Transmission is in PARK (A/T), or NEUTRAL (M/T)

^ Parking brake is applied (automatic brake disconnected where applicable)

^ Wheels blocked

^ Engine at operating temperature

^ Proper fuel pressure and no exhaust smoke

^ Correct and clean PCV system

^ Heater, A/C, and other accessories OFF

^ Ignition timing is set to specification

^ EEC-IV diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved.

STEP 1

With the engine OFF, connect a tachometer, according to manufacturer's instructions. Disconnect the negative (-) terminal of the battery for 5 minutes, then reconnect it.

STEP 2

START the engine and let stabilize for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle.

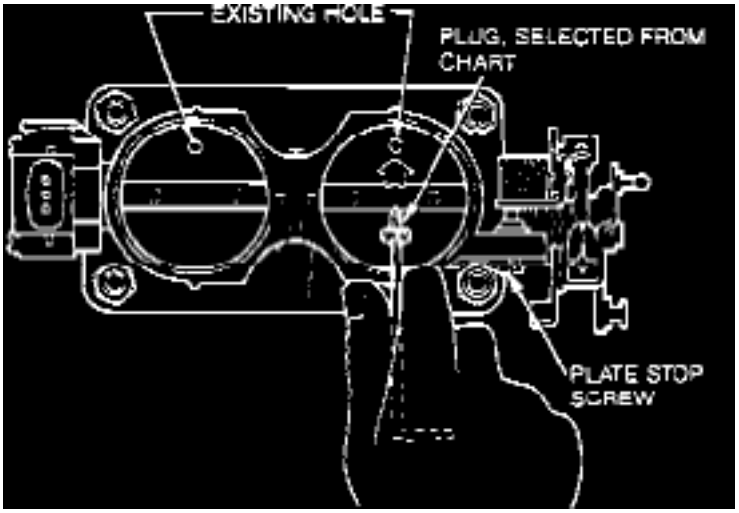
STEP 3

If the engine is not idling properly, turn the engine OFF, and disconnect Idle Speed Control Air Bypass Solenoid.

STEP 4

START and RUN the engine at 2500 rpm for 30 seconds.

STEP 5



Place the transmission is in PARK (A/T), or NEUTRAL (M/T).

STEP 6

Using a tachometer, verify idle rpm is 675 +50/-120 rpm.

Throttle Plate Orifice Plug

NOTE: A plug in the throttle body orifice will decrease idle rpm. Where as an orifice without a plug will increase idle rpm. Orifice plugs and installation tools are available in service kit # FOPZ-9F652-A.

RPM TOO LOW a.

Do not clean the throttle body, check for the plate orifice plug. ^

If there is no plug, turn the screw clockwise to the desired rpm.

^ If there is a plug from previous service, remove the plug, and adjust the screw in either direction as required. NOTE: Screw must be in contact with the lever pad after adjustment.

RPM TOO HIGH a.

Turn the engine OFF.

b. Disconnect air cleaner hose.

c. Temporarily block the orifice in the throttle plate with tape. If the orifice already has a plug from previous service proceed to Step (e).

d. RESTART the engine, and check the idle speed, using a tachometer. NOTE: On vehicles with Mass Air Flow Sensors, reconnect the air intake duct hose before checking rpm. If the engine stalls, crack open the plate stop screw, but DO NOT over adjust.

e. If rpm continues to be fast, perform KOEO Self-Test. ^

If TPS output code is within range, remove tape from throttle plate, and check for other possible causes.

^ If TPS output is out of range, adjust screw for proper TPS code. Lever must be in contact with the screw.

^ If rpm is still fast, terminate this procedure, then check for other possible causes.

f. If rpm drops to 675 or lower, or engine stalls, turn the engine OFF, disconnect the air cleaner hose, and remove tape from throttle plate.

g. Install the plug with proper color code depending on throttle plate orifice size.

h. Reconnect the air cleaner hose. START the engine, and check the idle rpm using a tachometer. Turn the plate stop screw clockwise until 675 +/- 25 rpm is achieved. NOTE: Do not turn the plate stop screw counterclockwise. This may cause the throttle plate to stick at idle.

STEP 7

Turn the engine OFF, and repeat Steps 4, 5, and 6.

STEP 8

Run the KOEO Self-Test for proper TPS code output.

STEP 9

Turn the engine OFF, and disconnect the battery for at least 5 minutes.

STEP 10

Reconnect the Idle Speed Control Air Bypass Solenoid. Verify the throttle plate is not stuck in the bore, and the linkage is not preventing throttle from closing.

STEP 11

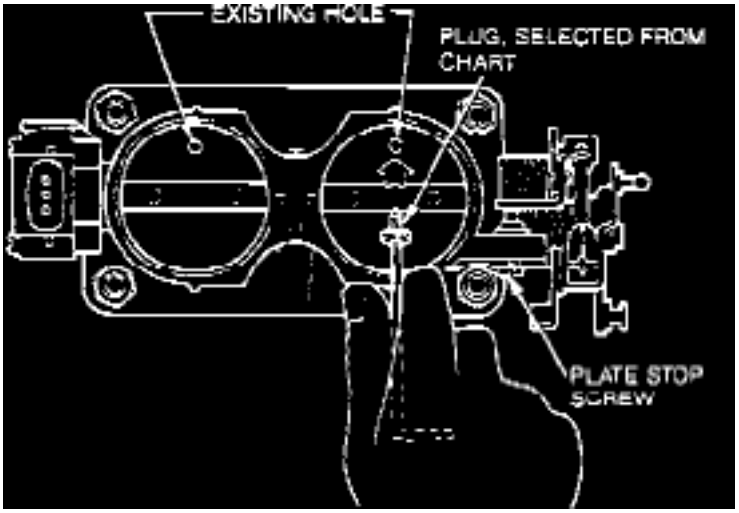
START the engine and idle for two minutes. Goose the accelerator and let the engine return to idle. Lightly depress and release the accelerator, then let engine idle. ^

If idle problem still exists, proceed to DIAGNOSIS AND TESTING PROCEDURES/TESTING PROCEDURES/QUICK TEST AND DIAGNOSTIC AIDS/VISUAL INSPECTION for other possible causes.

PROCEDURES FOR PLUG INSTALLATION

STEP 1

Remove air inlet tube(s) from throttle body.



Throttle Plate Orifice Plug

STEP 2

Select the proper color plug by using the Go/No-Go gauge pegs, included in the service kit (FOPZ-9F652-A).

STEP 3

Starting with the largest diameter gauge peg, attempt to insert through the throttle plate orifice.

STEP 4

If the gauge peg goes through the orifice, use the corresponding color plug. If the gauge peg does not go through, proceed with the next smaller gauge peg for Go/No-Go Test. NOTE: It is important that the largest Go/No-Go combination is used to determine the proper plug size.

STEP 5

If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe plate clean and then return to Step 3 to determine the proper plug size.

STEP 6

Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.

STEP 7

Open and snap closed the throttle several times to verify proper plug retention.

STEP 8

Reconnect the air inlet tube(s).

STEP 9

Reset idle rpm per engine requirement using the throttle plate stop screw.

Air Cleaner Fresh Air Duct/Hose: Technical Service Bulletins Engine - Water Entry Through Air Intake System

Article No. 94-3-8

02/09/94

^ AIR INTAKE - 2.9L, 3.0L, 4.0L EFI ENGINES - WATER ENTRY THROUGH AIR INTAKE SYSTEM

^ ENGINE - 2.9L, 3.0L, 4.0L EFI - POSSIBLE INTERNAL DAMAGE FROM WATER ENTRY THROUGH AIR INTAKE SYSTEM

LIGHT TRUCK: 1986-90 BRONCO II 1986-94 RANGER 1991-94 EXPLORER

This article is being republished in its entirety to add 1993-94 4.0L Ranger, 1993-94 3.0L Ranger and 1993-94 4.0L Explorer vehicles.

ISSUE: Reports have been received of internal engine damage caused by water entering the engine through the air intake system. This condition may occur when the vehicle is driven in normal wet conditions, such as water splash/spray from other vehicles, or when driven through shallow water. Improvements were made to the EFI engine air intake systems that have greatly reduced the number of reported incidences.

ACTION: Dealers should be assured that warranty repairs will be covered unless there Is evidence of owner misuse. This warranty repair policy will remain effective unless you are notified that a waterproof air intake system has been released.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-21-10 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

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Article No. 98-23-10

11/23/98

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NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

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OBDI DTCs

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22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
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29	97.9	155.8	1,000
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1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

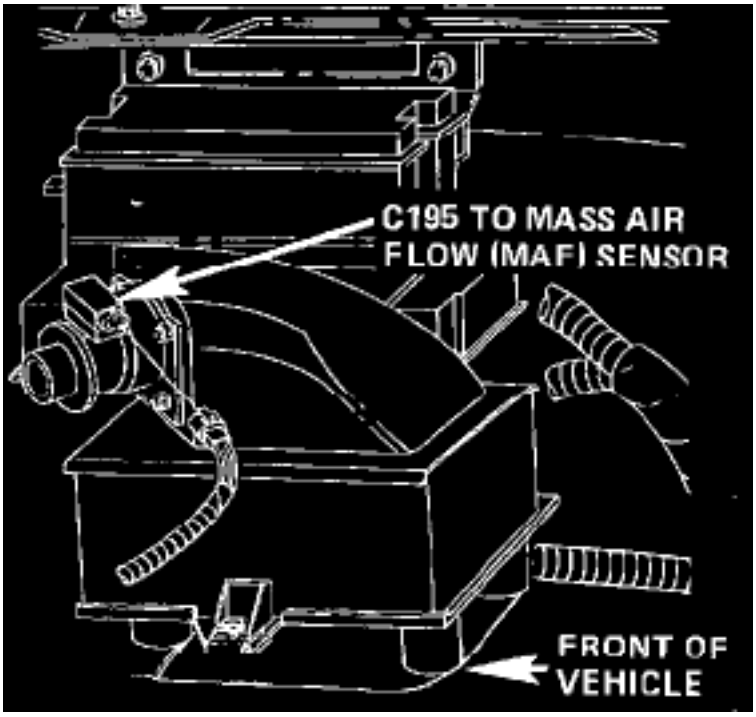
4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

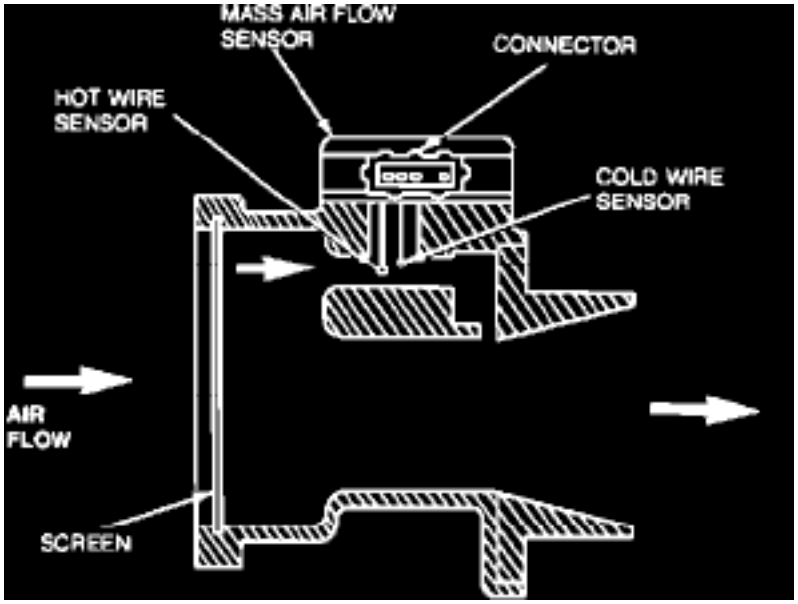
DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



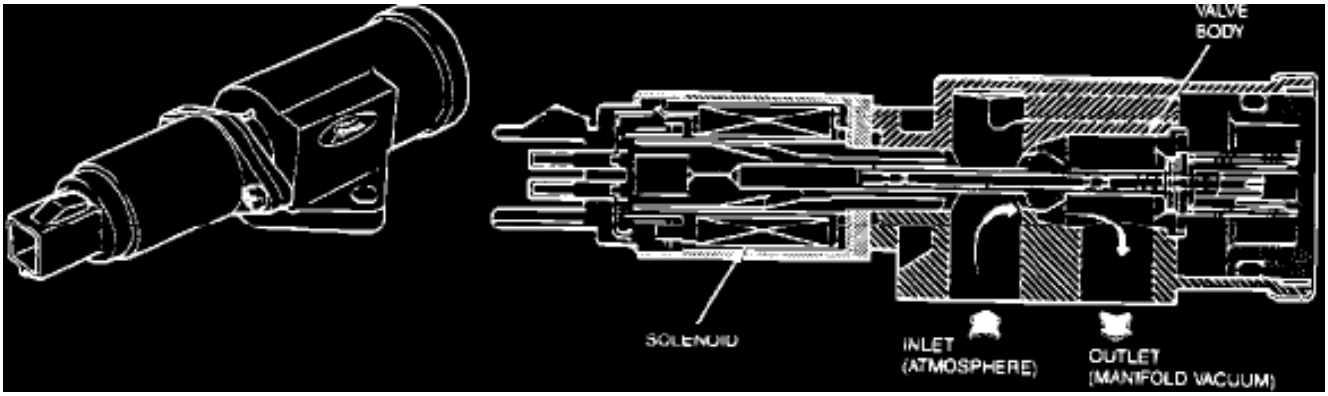
Mass Air Flow (MAF) Sensor



Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



Auxiliary Air Valve (Idle Speed): Description and Operation

Idle Air Bypass Valve

The Idle Speed Control Bypass Air (ISC-BPA) valve is used to control engine idle speed and is operated by the Engine Control Assembly (ECA). This valve allows air to pass around the throttle plates to control cold engine fast idle, no touch start, over temperature idle boost and engine idle load correction.

PART NUMBER	PART NAME
PM-3	Motorcraft Carburetor Tune-up Cleaner

Fuel: Customer Interest Engine - Carbon Knock On Acceleration

Article No: 01-19-7

10/01/01

^ ENGINE - 4.0L OHV - CARBON KNOCK ON ACCELERATION

^ NOISE - CARBON KNOCK ON ACCELERATION - VEHICLES EQUIPPED WITH 4.0L OHV ENGINE ONLY

FORD: 1990-1997 AEROSTAR 1990-2000 EXPLORER, RANGER

ISSUE Some vehicles equipped with the 4.0L OHV engine may exhibit an engine noise which may be perceived by the customer as a piston/connecting rod bearing knock. This carbon knock is heard only under load during the drive cycle. Carbon knock is a customer drive duty-cycle phenomenon that cannot be repaired with an engine exchange. This may be caused by carbon build-up within the combustion chamber.

ACTION Verify condition. If normal diagnostics fail to correct the condition, de-carbon the combustion chamber to help quiet the carbon knock noise. Refer to the following Service Procedure for details.

SERVICE PROCEDURE

1. Use Motorcraft Carburetor Tune-up Cleaner PM-3.

2. Carbon removal: a.

Disconnect canister purge line from throttle body.

b. Attach a vacuum line to the canister purge port.

c. At hot engine idle, allow the engine to ingest 1/2 to 2/3 of a can of Motorcraft Carburetor Tune-up Cleaner. Use caution not to ingest too quickly due to potential hydro-lock issues.

d Shut engine off and allow it to soak for one hour.

e. Start engine, allow engine to ingest the remainder of the Motorcraft Carburetor Tune-up Gleaner.

f. Remove vacuum line and re-install canister purge line.

g. Road test vehicle at 3500 RPM for 2-3 miles.

h. Repeat above procedure two times for a total of three times.

i. Change oil and filter.

3. Review the customers' driving habits. The recommended drive cycle should include daily periods of engine operation above 3,000 RPM, such as a brisk acceleration from a stop position. This will

break/burn the carbon off the piston head.

4. Use regular unleaded fuel, 87 Octane. Mid-grade and Premium fuels may increase the probability of carbon buildup, leading to a knock noise.

PARTS BLOCK

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

011907A Remove Carbon From 1.6 Hrs.

Combustion Chamber (Includes Time To Perform Procedure A Total Of Three Times)

DEALER CODING

CONDITION

BASIC PART NO. CODE

6108 42

OASIS CODES: 497000, 615000, 702000, 702100

Fuel: Customer Interest Engine - Rough Idle/Hesitation/Backfire/Stalling

Article No. 91-8-13

04/17/91

FUEL - USE OF UNLEADED GASOLINES - TIPS TO AVOID LEAN AIR - FUEL CONDITIONS

FORD: 1985-86 LTD 1985-88 EXP 1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-91 TAURUS 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1985-87 LYNX

1985-91 CAPRI, CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1989-91 F SUPER DUTY, F47, F53 1991 EXPLORER

ISSUE: Rough idle, hesitation, poor throttle response, induction backfire and stalls during cold start/warm up may be caused by the poor volatility of some high octane premium grade unleaded fuels (91 octane or higher (R+M)/2). When compared to regular grade unleaded fuel (87 octane (R+M)/2), high octane premium grade unleaded fuel may cause long crank time.

ACTION: Use a regular grade unleaded fuel in all vehicles, except where a premium unleaded fuel is recommended in the Owner Guide. If lean air-fuel type symptoms are experienced, determine the grade and brand of fuel used and offer the following service tips.

^ Advise those using a higher octane grade fuel to switch to a regular grade unleaded fuel. For those using a regular grade fuel, advise them to try another brand.

^ Do not advise using a higher octane unleaded fuel than is recommended for that specific engine. Ford engines are designed to perform best using a high quality regular grade unleaded fuel.

^ Only advise using a higher octane unleaded fuel to avoid potentially damaging spark knock or ping, but do so only after mechanical fixes are ineffective.

NOTE: ALL UNLEADED GASOLINES USED SHOULD CONTAIN DETERGENT ADDITIVES THAT ARE ADVERTISED AS HAVING "KEEP CLEAN" OR "CLEAN UP" PERFORMANCE FOR BOTH INTAKE VALVES AND FUEL INJECTORS.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

404000

PART NUMBER	PART NAME
PM-3	Motorcraft Carburetor Tune-up Cleaner

Fuel: All Technical Service Bulletins Engine - Carbon Knock On Acceleration

Article No: 01-19-7

10/01/01

^ ENGINE - 4.0L OHV - CARBON KNOCK ON ACCELERATION

^ NOISE - CARBON KNOCK ON ACCELERATION - VEHICLES EQUIPPED WITH 4.0L OHV ENGINE ONLY

FORD: 1990-1997 AEROSTAR 1990-2000 EXPLORER, RANGER

ISSUE Some vehicles equipped with the 4.0L OHV engine may exhibit an engine noise which may be perceived by the customer as a piston/connecting rod bearing knock. This carbon knock is heard only under load during the drive cycle. Carbon knock is a customer drive duty-cycle phenomenon that cannot be repaired with an engine exchange. This may be caused by carbon build-up within the combustion chamber.

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SERVICE PROCEDURE

1. Use Motorcraft Carburetor Tune-up Cleaner PM-3.

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d Shut engine off and allow it to soak for one hour.

e. Start engine, allow engine to ingest the remainder of the Motorcraft Carburetor Tune-up Gleaner.

f. Remove vacuum line and re-install canister purge line.

g. Road test vehicle at 3500 RPM for 2-3 miles.

h. Repeat above procedure two times for a total of three times.

i. Change oil and filter.

3. Review the customers' driving habits. The recommended drive cycle should include daily periods of engine operation above 3,000 RPM, such as a brisk acceleration from a stop position. This will break/burn the carbon off the piston head.

4. Use regular unleaded fuel, 87 Octane. Mid-grade and Premium fuels may increase the probability of carbon buildup, leading to a knock noise.

PARTS BLOCK

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

011907A Remove Carbon From 1.6 Hrs.

Combustion Chamber (Includes Time To Perform Procedure A Total Of Three Times)

DEALER CODING

CONDITION

BASIC PART NO. CODE

6108 42

OASIS CODES: 497000, 615000, 702000, 702100

Article No. 98-26-2

01/04/99

FUEL - INFORMATION ON GASOLINE - TIPS TO RESOLVE VOLATILITY RELATED DRIVEABILITY CONCERNS

FORD: 1985-97 THUNDERBIRD 1986-99 MUSTANG, TAURUS 1987-99 ESCORT 1988-94 TEMPO 1989-97 PROBE 1990-99 CROWN VICTORIA 1992-93 FESTIVA 1995-99 CONTOUR

LINCOLN-MERCURY: 1985-97 COUGAR 1986-92 MARK VII 1986-99 SABLE 1987-89 TRACER 1988-94 TOPAZ 1988-99 CONTINENTAL 1990-99 GRAND MARQUIS, TOWN CAR 1991-99 TRACER 1993-98 MARK VIII 1995-99 MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1986-97 AEROSTAR 1987-96 BRONCO 1989-97 F SUPER DUTY, F-350 1989-99 F-150, F-250 LD, RANGER 1991-99 EXPLORER 1992-99 ECONOLINE 1993-99 VILLAGER 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 SUPER DUTY F SERIES

MEDIUM/HEAVY TRUCK: 1990-97 F-700

This TSB article is being republished in its entirety to expand vehicle model coverage and revise the text.

ISSUE Some vehicles using winter blend fuels may exhibit a stall on start up and a no restart, hard start condition or a no start condition in unseasonably hot weather (greater than 27°C/80°F). These concerns may be related to fuel volatility from winter blend fuels during winter-spring and autumn-winter transitions and may result in a fuel pump vapor lock condition. This condition may appear to be a fuel pump failure but may be caused by winter blend fuel.

ACTION Refer to the following text for further information.

NOTE

FUEL TANK ADDITIVES WILL NOT RESOLVE THESE CONCERNS BECAUSE VAPOR FORMS FROM CAVITATION WITHIN THE FUEL PUMP.

FILLING THE TANK TO FULL MAY BE EFFECTIVE. ADVISE CUSTOMER TO USE THE RECOMMENDED OCTANE GRADE PER OWNER MANUAL AND NOT A HIGHER GRADE.

Explain to the customer that this concern may be due to a low tank level of winter blend fuel combined with unseasonably warm weather. Advise customer that filling the fuel tank to full may be effective in resolving this concern. Also, advise customer to use the recommended octane grade per their Owner Manual and not a higher grade.

BACKGROUND Gasolines are seasonally adjusted, meaning they have higher volatility (vaporize easier) in the winter and lower volatility in the summer. Government mandates to improve air quality have resulted in significant changes to gasolines, such as the mandatory use of oxygenates (ethanol, methyl tertiary butyl ether (MTBE), and others) in the winter or the reduction of Reid Vapor Pressure (RVP) in the summer. The addition of oxygenates (especially ethanol) increases volatility while the reduction of RVP reduces volatility.

Gasoline distribution practices often do not allow branded marketers to have much control over their gasoline's volatility other than RVP. Oxygenate (e.g., ethanol, MTBE) use is more dependent on local gasoline markets, rather than specific marketers practice. Therefore, it is difficult to recommend specific brands to avoid volatility related complaints.

OTHER APPLICABLE ARTICLES: 91-8-13

SUPERSEDES: 96-5-4

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES:402000, 404000, 602300, 603300,

607000, 607400, 608000, 608400, 609000, 609400, 610000, 611000, 611500, 612000, 614000, 614500, 623000

Article No. 96-10-7

05/06/96

FUEL - CALIFORNIA REFORMULATED GASOLINE (CARFG) - SERVICE TIP

FORD: 1983-86 LTD 1983-88 EXP 1983-96 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1985-94 TEMPO 1986-96 TAURUS 1989-96 PROBE 1995-96 CONTOUR

LINCOLN-MERCURY: 1980-83 MARK VI 1983-88 LN7 1983-96 COUGAR, GRAND MARQUIS, TOWN CAR 1984-92 MARK VII 1985-94 TOPAZ 1986-96 SABLE 1991-96 TRACER 1993-96 CONTINENTAL, MARK VIII 1995-96 MYSTIQUE

LIGHT TRUCK: 1983-96 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1984-90 BRONCO II 1986-96 AEROSTAR 1987-96 F SUPER DUTY 1991-96 EXPLORER 1993-96 VILLAGER 1995-96 WINDSTAR

ISSUE: California introduced CaRFG around March 1, 1996 and statewide it must be available at all service stations by June 1, 1996 to help reduce emissions and improve gasoline quality. It will replace the traditional gasoline sold in Northern California and improve the reformulated gasoline that has been sold in Southern California since January 1995. California Air Resources Board (CARB) projects smog forming emissions from motor vehicles to be reduced by about 15 percent.

ACTION: The following text is provided to give some answers to some commonly asked questions by our customers.

POSITION

Ford Motor Company recommends the use of CaRFG as a cost effective means of reducing emissions to provide cleaner air. We have participated in vehicle and laboratory testing of CaRFG to make sure it is acceptable for our customers' use. There are no unusual vehicle performance concerns expected based upon these studies. The use of CaRFG will not affect Ford's new vehicle and/or emissions warranty.

WHAT DOES CaRFG CONSIST OF?

CaRFG consists of the same basic components as other gasolines, but it reduces pollution because of its cleaner burning components. Features are:

^ reduced aromatic hydrocarbons to form less smog emissions

^ added oxygenates to reduce emissions

^ decreases the amount of fuel evaporating from the vehicle

^ lowered sulfur content to provide more efficient operation of the vehicle's catalytic converter

^ reduced benzene by about one-half

IS CaRFG MORE HAZARDOUS THAN CONVENTIONAL GASOLINES?

CaRFG is a hazardous substance like conventional gasoline. Precautions should continue to be taken to avoid exposure to vapors or liquid when it is pumped or handled. It should never be siphoned or swallowed.

HOW WILL CaRFG AFFECT VEHICLE PERFORMANCE?

Properly blended CaRFG should have no adverse effect on vehicle performance or the durability of engine and fuel system components. Its basic properties are not significantly different than other cleaner burning gasolines that have been used in the U.S. for several years.

If the vehicle is a certified California calibration 1996 or later model year, it was designed to operate on CaRFG gasoline. The vehicle will operate satisfactorily on gasolines in the other 49 states, but emission control system performance may be affected. Using gasolines other than CaRFG have substantially increased emissions from motor vehicles.

WILL THE USE OF CaRFG AFFECT CALIFORNIA VEHICLE WARRANTY?

No. The coverage of Ford's new vehicle warranty is not affected. In fact, Ford Owner Guides have consistently approved the use of properly blended reformulated gasolines containing oxygenates. Further information about properly fueling your vehicle is included in the Owner Guide.

WILL FUEL ECONOMY BE AFFECTED?

A very small reduction in fuel economy of less than one-half mile per gallon is possible if the customer was using gasoline without oxygenates. This is attributed to the lower energy content of oxygenates which have been in all Southern California gasolines since January of 1995 and in some gasolines since the 1970's.

Many factors affect fuel economy like driving habits, vehicle maintenance, weather conditions, etc. Fuel economy can vary by more than a mile per gallon from one fill-up to the next with the same gasolines.

For further details see TSB Article 95-12-2 for customer expectations regarding fuel economy.

ARE SPECIAL ADDITIVES NECESSARY FOR CaRFG?

No. It is not necessary to add anything to the vehicle fuel tank after the gasoline is purchased from the service station. California regulations require deposit control additives in CaRFG to minimize port fuel injector and intake valve deposits.

WILL OLDER VEHICLES OPERATE SATISFACTORILY WITH THE NEW CaRFG?

Older vehicles are expected to operate satisfactorily on CaRFG because vehicles have been operating on gasolines similar to CaRFG for a number of years. However, considerable testing indicates that older, high mileage vehicles are more susceptible to fuel system problems due to age and normal wear and tear regardless of whether they are operated on conventional or CaRFG gasolines. Owners of these older vehicles are encouraged to follow their vehicle manufacturer's recommendations regarding vehicle maintenance.

WILL THE SMELL BE DIFFERENT THAN CONVENTIONAL GASOLINE?

CaRFG is not expected to smell different than the gasoline most vehicles are currently using. If an unusual odor is noticed, it would probably be from oxygenates. Most service stations use vapor recovery systems to minimize the release of gasoline vapors while refueling.

The use of CaRFG should result in little or no "rotten egg" smell from the exhaust because CaRFG has much lower sulfur than conventional gasoline.

WAS CaRFG TESTED BEFORE INTRODUCTION?

It was tested for over five million miles in more than 800 vehicles under the guidance of CARB including experts representing automobile manufacturers, gasoline suppliers, fleet operations and government. There was no increase in problems identified with the use of CaRFG.

DOES CaRFG COST MORE?

The price at the pump cannot be accurately predicted, although a modest increase is likely. The price of CaRFG is subject to the competitive forces in the marketplace. Many factors including production costs, supply and demand, weather, crude oil prices, and taxes affect gasoline prices.

WHERE CAN I GET MORE INFORMATION ON CaRFG?

Additional information within the state of California on CaRFG is available from the California Air Resources Board toll-free at 1-800-922-7349 (within California only).

OTHER APPLICABLE ARTICLES: 95-12-2

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 404000, 623000

Article No. 91-8-13

04/17/91

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Article No. 98-26-2

01/04/99

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WARRANTY STATUS: INFORMATION ONLY

OASIS CODES:402000, 404000, 602300, 603300,

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Article No. 96-10-7

05/06/96

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POSITION

Ford Motor Company recommends the use of CaRFG as a cost effective means of reducing emissions to provide cleaner air. We have participated in vehicle and laboratory testing of CaRFG to make sure it is acceptable for our customers' use. There are no unusual vehicle performance concerns expected based upon these studies. The use of CaRFG will not affect Ford's new vehicle and/or emissions warranty.

WHAT DOES CaRFG CONSIST OF?

CaRFG consists of the same basic components as other gasolines, but it reduces pollution because of its cleaner burning components. Features are:

^ reduced aromatic hydrocarbons to form less smog emissions

^ added oxygenates to reduce emissions

^ decreases the amount of fuel evaporating from the vehicle

^ lowered sulfur content to provide more efficient operation of the vehicle's catalytic converter

^ reduced benzene by about one-half

IS CaRFG MORE HAZARDOUS THAN CONVENTIONAL GASOLINES?

CaRFG is a hazardous substance like conventional gasoline. Precautions should continue to be taken to avoid exposure to vapors or liquid when it is pumped or handled. It should never be siphoned or swallowed.

HOW WILL CaRFG AFFECT VEHICLE PERFORMANCE?

Properly blended CaRFG should have no adverse effect on vehicle performance or the durability of engine and fuel system components. Its basic properties are not significantly different than other cleaner burning gasolines that have been used in the U.S. for several years.

If the vehicle is a certified California calibration 1996 or later model year, it was designed to operate on CaRFG gasoline. The vehicle will operate satisfactorily on gasolines in the other 49 states, but emission control system performance may be affected. Using gasolines other than CaRFG have substantially increased emissions from motor vehicles.

WILL THE USE OF CaRFG AFFECT CALIFORNIA VEHICLE WARRANTY?

No. The coverage of Ford's new vehicle warranty is not affected. In fact, Ford Owner Guides have consistently approved the use of properly blended reformulated gasolines containing oxygenates. Further information about properly fueling your vehicle is included in the Owner Guide.

WILL FUEL ECONOMY BE AFFECTED?

A very small reduction in fuel economy of less than one-half mile per gallon is possible if the customer was using gasoline without oxygenates. This is attributed to the lower energy content of oxygenates which have been in all Southern California gasolines since January of 1995 and in some gasolines since the 1970's.

Many factors affect fuel economy like driving habits, vehicle maintenance, weather conditions, etc. Fuel economy can vary by more than a mile per gallon from one fill-up to the next with the same gasolines.

For further details see TSB Article 95-12-2 for customer expectations regarding fuel economy.

ARE SPECIAL ADDITIVES NECESSARY FOR CaRFG?

No. It is not necessary to add anything to the vehicle fuel tank after the gasoline is purchased from the service station. California regulations require deposit control additives in CaRFG to minimize port fuel injector and intake valve deposits.

WILL OLDER VEHICLES OPERATE SATISFACTORILY WITH THE NEW CaRFG?

Older vehicles are expected to operate satisfactorily on CaRFG because vehicles have been operating on gasolines similar to CaRFG for a number of years. However, considerable testing indicates that older, high mileage vehicles are more susceptible to fuel system problems due to age and normal wear and tear regardless of whether they are operated on conventional or CaRFG gasolines. Owners of these older vehicles are encouraged to follow their vehicle manufacturer's recommendations regarding vehicle maintenance.

WILL THE SMELL BE DIFFERENT THAN CONVENTIONAL GASOLINE?

CaRFG is not expected to smell different than the gasoline most vehicles are currently using. If an unusual odor is noticed, it would probably be from oxygenates. Most service stations use vapor recovery systems to minimize the release of gasoline vapors while refueling.

The use of CaRFG should result in little or no "rotten egg" smell from the exhaust because CaRFG has much lower sulfur than conventional gasoline.

WAS CaRFG TESTED BEFORE INTRODUCTION?

It was tested for over five million miles in more than 800 vehicles under the guidance of CARB including experts representing automobile manufacturers, gasoline suppliers, fleet operations and government. There was no increase in problems identified with the use of CaRFG.

DOES CaRFG COST MORE?

The price at the pump cannot be accurately predicted, although a modest increase is likely. The price of CaRFG is subject to the competitive forces in the marketplace. Many factors including production costs, supply and demand, weather, crude oil prices, and taxes affect gasoline prices.

WHERE CAN I GET MORE INFORMATION ON CaRFG?

Additional information within the state of California on CaRFG is available from the California Air Resources Board toll-free at 1-800-922-7349 (within California only).

OTHER APPLICABLE ARTICLES: 95-12-2

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 404000, 623000

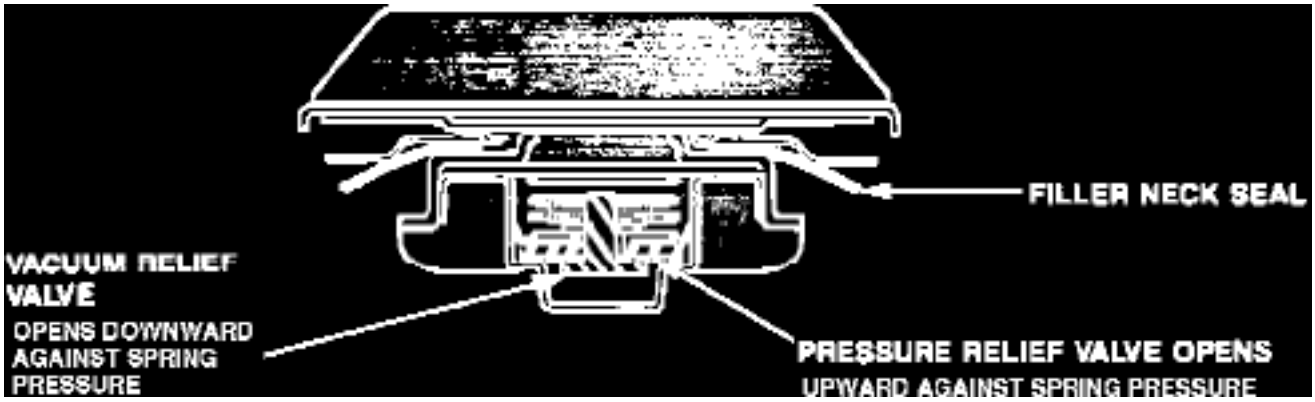
Fuel: Testing and Inspection

A fuel sample should be drawn from the bottom of the fuel tank so that any water present in the tank will be detected. The sample should be bright and clear. If the sample appears cloudy, or contaminated with water (as indicated by a layer at the bottom of the sample), this procedure should not be used, and the fuel system should be cleaned. 1. Using a 100 ml cylinder with 1 ml graduation marks, fill to the 90 ml mark. 2.

Add 10 ml of water to bring the total fluid volume to 100 ml and install a stopper.

3. Shake vigorously for 10 to 15 seconds. 4. Carefully loosen the stopper to release pressure. 5. Close the stopper and shake vigorously again for 10 to 15 seconds. 6. Put the graduated cylinder on a level surface for approximately 5 minutes to allow adequate liquid separation.

If alcohol is present in the fuel, the volume of the lower layer (which would now contain both alcohol and water) will be greater than 10 ml. For example, if the volume of the lower layer is increased to 15 ml, it will indicate at least 5 percent alcohol in the fuel. The actual amount of alcohol may be somewhat greater because this procedure does not extract all of the alcohol from the fuel.



Fuel Filler Cap: Description and Operation

The pressure-vacuum filler cap is designed to hold a slight pressure on the fuel. Since the evaporation rate decreases under slightly higher pressures, the cap helps to reduce evaporative emissions.

Fuel Tank Pressure/Vacuum Filler Cap

A rubber seal around the inside lip of the cap prevents fuel vapor from escaping to the atmosphere, as well as prevent fuel from spilling in the event of vehicle roll-over.

When vacuum in the tank exceeds a pressure differential of 0.5 psi to atmospheric pressure, the vacuum relief valve will allow atmospheric pressure to enter the tank.

If fuel tank pressure becomes 1.8 psi above atmospheric pressure, the pressure relief portion of the cap will open to the atmosphere.

Fuel Pressure Release: Service and Repair

CAUTION: FUEL SUPPLY LINES ON EFI ENGINES WILL REMAIN PRESSURIZED FOR SOME PERIOD OF TIME AFTER THE ENGINE IS SHUT OFF. THIS PRESSURE MUST BE RELIEVED BEFORE SERVICING OF THE FUEL SYSTEM IS BEGUN.

FUEL SYSTEM PRESSURE RELIEF - EFI ENGINES

Before opening the fuel system on vehicles with EFI engines, relieve fuel pressure as follows: 1. Locate and disconnect the electrical connection to either the fuel pump relay, the inertia switch or the in-line high pressure fuel pump.

2. Crank engine for approximately ten seconds.

Note: Engine may start and run for a short time. If so, crank engine an additional 5 seconds after engine stalls.

3. Re-connect the electrical connector that was disconnected in step 1 and disconnect battery ground cable.

Alternative Method

Some EFI vehicles have a port (fitting) on the fuel rail used for measuring fuel pressure. If so equipped, use the following method: -

Install fuel pressure relief tool No. T80L-9974-B or equivalent to measuring port on engine fuel rail.

- Position drain hose in suitable container, then depress relief button.

Fuel Injector: Technical Service Bulletins Fuel Injector Cleaner - Parts and Service Tips

Article No.: 94-8-9

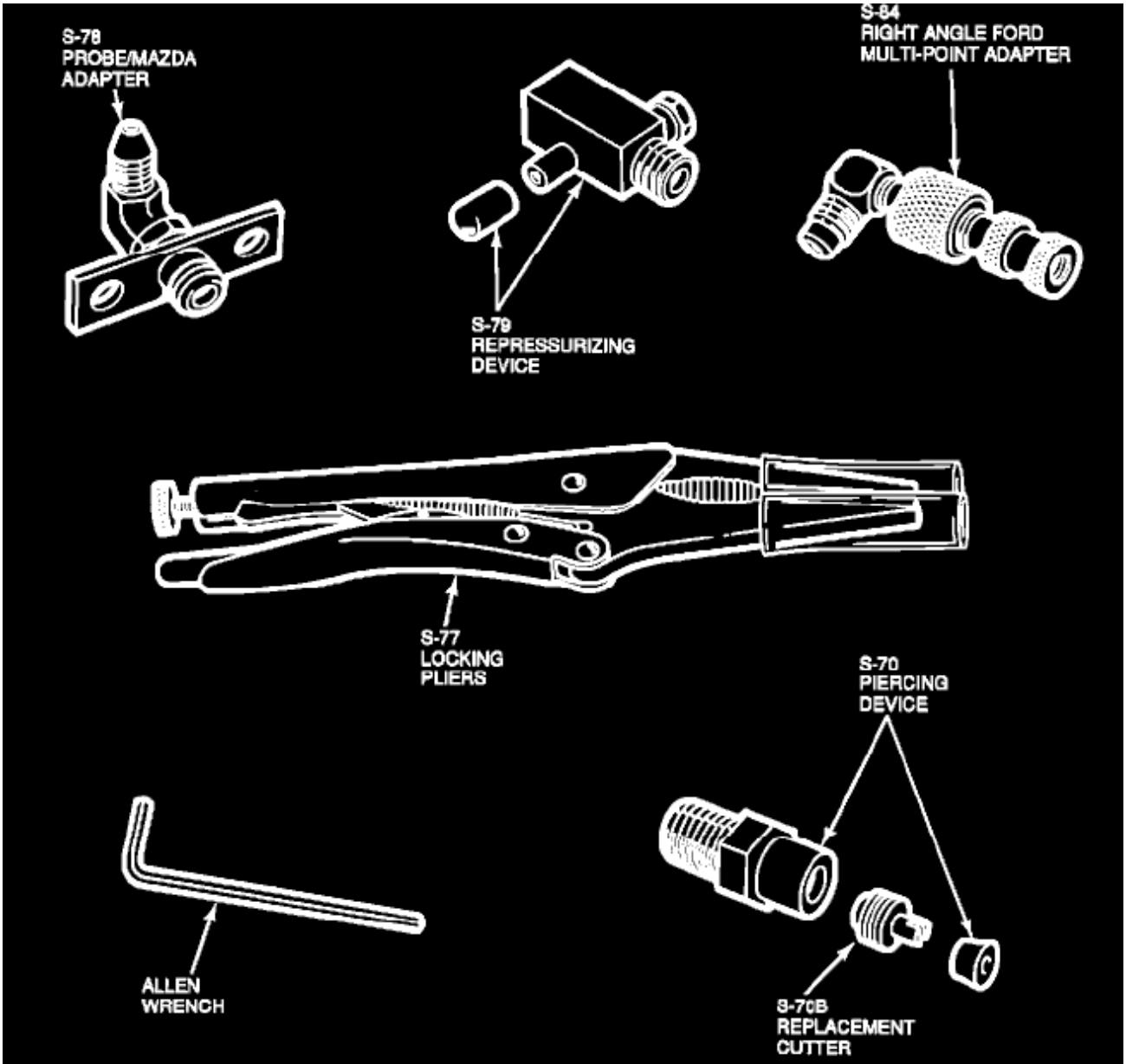
FUEL SYSTEM - MOTORCRAFT FUEL INJECTOR CLEANER - REPAIR PARTS AND SERVICE TIPS

FORD: 1987-88 EXP 1987-90 TAURUS, TEMPO 1987-91 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1990 PROBE

LINCOLN-MERCURY: 1987-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOWN CAR 1988-89 TRACER 1991 TRACER

LIGHT TRUCK: 1987-90 BRONCO 1987-91 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, F-47, F-53, RANGER 1991 EXPLORER

ISSUE: The Motorcraft fuel injector cleaning system consists of:



NEW FEATURES

As a result of suggestions from technicians in the field, a variety of new kit parts and features are now available in the CM-1000 (all vehicles) or the CM-1002 "Ford-Only" kit:

- A patented repressurizing device (Part #S-79. This device ensures that all the cleaner is used and that the empty container can be disposed of without special handling.
- An improved, longer lasting pressure regulator
- A replacement cutter for the S-70 piercing device (Part #S-70)
- A new piercing device made entirely of steel (Part #S-70)
- A right angle Ford Multi-point (Schrader valve) adaptor (Part #S-84). This adaptor makes it easier to connect to the Schrader valve on vehicles that are hard to access.
- A Probe/Mazda adaptor that replaces the fuel rail pressure regulator during the cleaning process (Part #S-78)
- A replacement depressor for the S-36 supply hose (Part #S-36d)
- A depressor for the Multi-point adaptor (Part #S-20d)

The following improvements are only available in the CM-1000 (all vehicles) kit (or by special order):

- New locking pliers for clamping hoses (Part #S-77)
- Fuel-resistant foam drawer liners
- A parts and adaptor location chart

Figure 2

TB-3671-A

^ The original all-car fuel injector cleaning kit (CM1000),

^ The new Ford-application fuel injector kit (CM 1002) and

^ Motorcraft Pressurized fuel injector cleaner (CM1001).

The Motorcraft Fuel injector cleaning method was introduced in TSB 91-19-3 as an alternate to the Rotunda Fuel Injector Tester / Cleaner, and is reimbursable as specified in the Service Labor Time Standards Manual. The Motorcraft injector cleaning system is available from the regular Parts Distribution System or from local Motorcraft Distributors.

ACTION: No action is required.

NOTE:

THIS TSB ARTICLE SUMMARIZES THE QUESTIONS ASKED MOST FREQUENTLY BY CALLERS TO THE MOTORCRAFT "800" LINE ABOUT THE MOTORCRAFT FUEL INJECTOR CLEANING METHOD. ALSO, A TOLL-FREE NUMBER IS AVAILABLE FOR ORDERING CLEANING KIT PARTS, OBTAINING INFORMATION AND MAKING SUGGESTIONS.

Q. Why do we sometimes experience insufficient pressure to completely empty a cleaning can?

A. If the can is pierced properly, you will seldom experience problems with inadequate pressure. However, to further reduce those instances of insufficient pressure to complete the cleaning process, Motorcraft recently made available a re-pressurizing device (S-79), which is included with all CM1000 and CM1002 kits, and is also available separately. The device allows service personnel to repressurize the can using compressed air whenever there is too little pressure to complete the cleaning procedure.

Although there have been some cases of actual low can pressure, by far, the largest number of low pressure complaints have been due to improper can piercing. For best results, In addition to being hung upside-down, during the cleaning process, the can must also be upside-down pierced.

Q. Why is it imperative that the can be pierced upside-down?

A. Motorcraft fuel injector cleaner and the pressurizing gas are packaged together in an aerosol can. The piercing device contains a seal, which is intended to seal against the threaded cup of the can before it is pierced. When using a new piercing device with a new seal, the can needn't be upside-down. However, after a few cans have been pierced, the piercing device seal becomes compressed, and piercing can take place before the seal makes full contact with the can.

The gas is always at the top of the can. Thus, if the can is pierced right-side up, the gas can rapidly escape before the seal makes full contact, resulting in insufficient pressure to do the cleaning job.

If the can is upside-down when pierced, the liquid cleaner is in contact with the component being pierced, and the worst that can happen before the seal makes contact is the loss of a few drops of cleaner.

Service personnel sometimes question the need to pierce the CM1001 cans upside-down, particularly if they have had experience with another injector cleaner packaged in what is referred to as a "barrier pack" can. In this case, the cleaner is in an inner aluminum tube which is surrounded by the pressurizing agent. In a barrier pack can, the pressurizing agent cannot escape unless a small rubber plug at the bottom of the can is removed.

Q. Why isn't CM1001 packaged in a barrier pack can?

A. There are several reasons. First, Motorcraft wants to provide an environmentally safe package, so it was decided to use compressed air or nitrogen to provide the pressure. It was not possible to use either of these gasses in the barrier pack cans since the cans cannot contain the required pressure for compressed air or nitrogen. Barrier cans generally use liquid propellant mixtures, and pressure is limited to 65-70 psig.

Also, with the barrier pack, upon completion of the cleaning procedure, a small amount of product remains in the collapsed inner tube, and the outer shell still contains the liquid propellant, which requires proper disposal. When the CM1001 can is empty, neither product nor pressurizing gas remains in the can.

Finally, the barrier pack can is considerably more expensive, and Motorcraft wanted to offer the most cost-effective cleaner possible.

Q. How can dealers obtain replacement and supplemental parts?

SHRADER CANADA LIMITED - MOTORCRAFT FUEL INJECTOR CLEANING PARTS

Part No.	Description	CM-1000 All Vehicles Kit Contents	CM-1002 Ford Only Kit Contents	Dealer Price
S-1	Hose Loop, Valve			$17.75
S-2	Hose Loop, 1/4" x 5/16"	X		14.00
S-4	Clamp, Hose	X		.60
S-5	Adapter, 5/16"	X		4.50
S-6	Plug, 5/16" Hose	X		4.00
S-7	Plug, Ford Return Hose			4.50
S-8	Plug, Ford Return Line - Inverted Flare	X	X	1.25
S-9	Plug, GM Return Line - O-Ring Seal	X		1.50
S-10	Plug, GM Return Line - Inverted Flare	X		.80
S-11	Plug, 12mm Return Line	X		1.50
S-12	Plug, 14mm Return Line, Swivel Nut	X		3.75
S-13	Adapter, Chrysler/AMC Supply	X		6.95
S-14	Adapter, 8mm Cold Start	X		12.50
S-15	Adapter, 10mm Cold Start	X		12.75
S-16	Adapter, GM TBI Banjo Bolt	X		15.75
S-17	Disconnect Tool, Ford 3/8" Return Line	X	X	8.75
S-18	Disconnect Tool, Ford 1/2" Supply Line	X	X	8.75
S-20	Adapter, Ford 5/16"-32 Multi-point Supply	X	X	8.50
S-21	Adapter, GM TBI - Inverted Flare	X		13.75
S-22	Adapter, GM TBI - O-Ring Seal	X		12.00
S-23	Adapter, 12mm Banjo	X		13.50
S-26	Adapter, 14mm Swivel Nut	X		10.75
S-27	Adapter, 12mm Swivel Nut			10.50
S-28	Seal Kit Assembly	X		23.00
S-35	Can Suspension Bracket	X	X	2.50
S-36	Hose, Supply			19.50
S-38	Regulator, Pressure			52.50
S-40	Adapter, GM Multi-point 7/16"-20, Right Angle			9.50
S-41	Disconnect Tool, GM 5/16" Return Line	X		5.00
S-42	Disconnect Tool, GM 3/8" Supply Line	X		5.00
S-43	Adapter, Ford 1/4" CFI Housing	X	X	9.00
S-44	Plug, Ford 3/8" Metal Quick Connect Return	X	X	10.25
S-45	Adapter, Ford 1/2" Metal Quick Connect Supply	X	X	7.50
S-46	Plug, Ford Plastic Quick Connect Return	X	X	19.75
S-47	Adapter, Ford Plastic Quick Connect Supply	X	X	14.75
S-48	Loop, Ford 3/8" x 1/2" Metal Quick Connect-Female			15.25
S-49	Loop, Ford 1/4" x 5/16" Plastic Quick Connect - Male			$19.25
S-50	Cap, Dust Cover, 5/16" - 32, Ford			.25
S-51	Adapter, Ford 3/8" Metal Quick Connect Supply Line	X	X	7.50
S-52	Adapter, 12mm Banjo Bolt	X		15.75
S-53	Cap Nut, 12mm	X		2.25
S-54	Bolt, European 12mm Dbl Banjo			4.25
S-55	Adapter, 5/16" BMW ( )etronic			23.50
S-56	Adapter, Asian 12mm Mitsubishi			16.50
A-57	Adapter, Asian 16mm Mitsubishi			16.50
S-58	Cap, Dust Cover 7/16" -20			1.65
S-61	Seal, E.F.I. Supply Return Quick Connect Plug - Asian 12mm			.25
S-62	Seal, Ford 5/16" -32 Multi-point Adapter			.25
S-63	Seal, Metal Quick Connect Supply - Asian 16mm			.25
S-64	Washer, Bronze, 12mm Banjo Bolt Adapter			.45
S-65	Washer, Bronze, 10mm Cold Start Adapter			.45
S-66	Washer, Bronze, 10mm Cold Start Adapter			.45
S-67	Seal, Can Piercing Device Seal, GM 7/16" Multi-point Adap. Seal, Supply Hose			.50 .50 .50
S-69	Assembly, Can Access. Regulator, Supply	X	X	109.50
S-70	Piercing Device			17.50
S-71	Shutoff Valve			11.00
S-72	Diaphragm, Monier Regulator			6.75
S-72a	Diaphragm, Norgren Regulator			6.75
S-72b	Diaphragm, Shrader Regulator			6.75
S-73b	Manual, Syst. Cleaning, Pictorial	X	X	20.50
S-74	Kit Box	X		33.50
S-75	Pressure Gauge			19.50
S-77	Hose Clamp Pliers	X		8.50
S-78	Adapter, Probe/Mazda Supply Fitting			22.00
S-79	Container Repressurizing Device	X	X	15.25
S-84	90° 3/16" -32 Multi-point Supply Adapter			7.75
F191**	Manual, System Cleaning			10.00

TO ORDER:

PHONE: 1-800-662-6891 or FAX: 1-313-291-0077

PLEASE NOTE:

- All taxes extra
- Prices are F.O.B. Shrader Canada Limited U.S. Office in Taylor, Michigan
- Prices subject to change without notice
- Billings will be made by Shrader Canada Limited

** Need an extra manual? While supplies last, the original Motorcraft F191 Instruction Manual provided with the original CM-1000 kit is being offered at the reduced Dealer price of only $10.00.

Figure 1

TB-3621-A

A. At the present time, all supplemental and replacement parts sales are handled directly by Shrader Canada Limited. Also, a toll-free number is available for ordering cleaning kit parts (1-800-662-6891). The Motorcraft fuel injector cleaner parts list/price sheet is shown in Figure 1.

The most frequently ordered parts are the S-20 Ford 5/16-32 multipoint adapter, the S-35 can suspension bracket and S-70 can piercing device, followed (in approximate order) by the S-67 and S-62 seals, the S-72 diaphragm, disassembly tools S-17, S-18, S-41, and S-42, the S-44 plug, the S-45 and S-61 adapters, the S-48 female loop, the S-38 regulator and the S-69 supply assembly.

Additional questions concerning the purchase of supplemental parts should be directed to Shrader Canada Limited, at 1-800-662-6891.

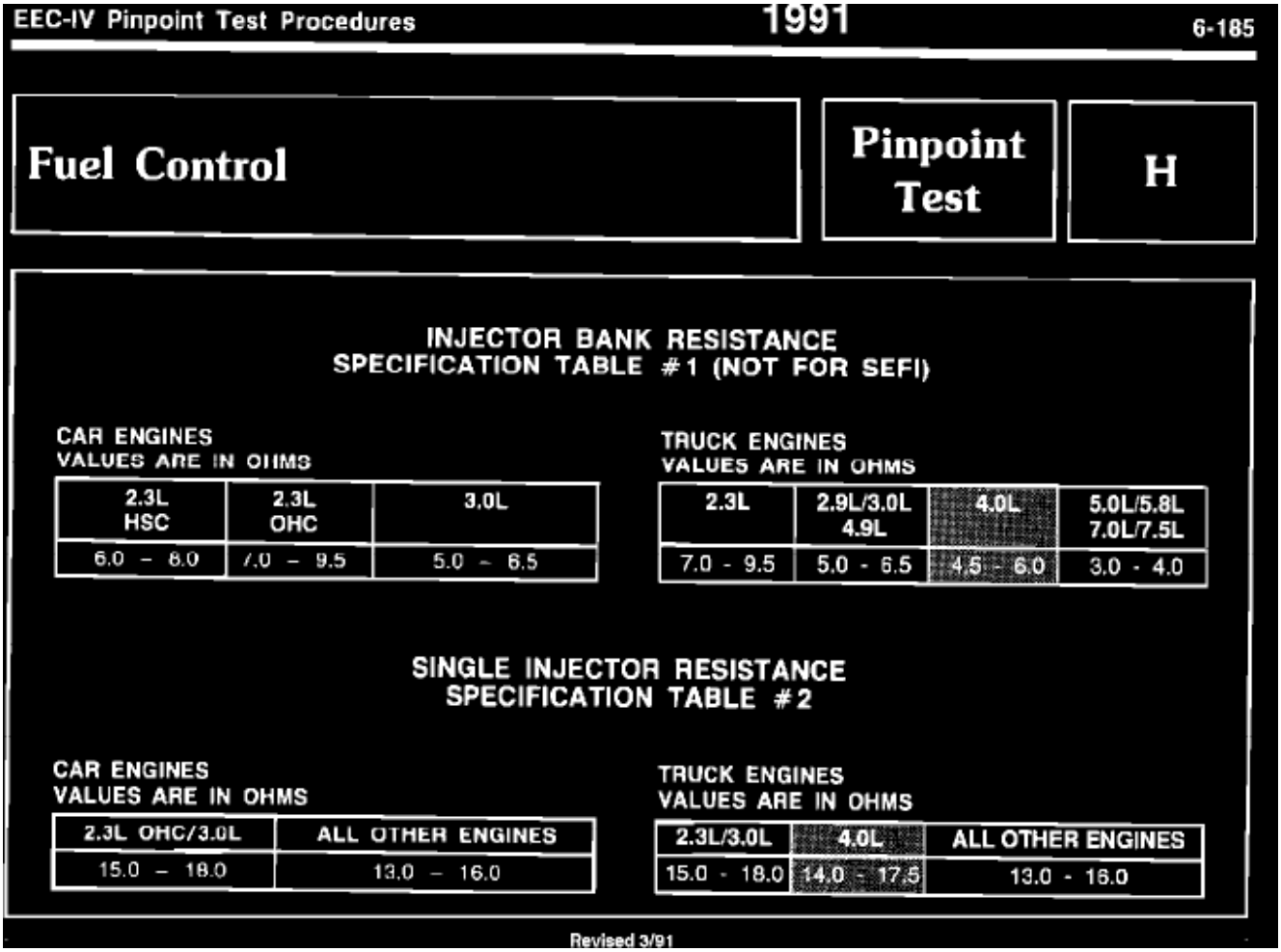
LIMITED TIME OFFER

A new installation video is available, and is included as part of CM-1002, Ford Application Kit. While supplies last, a free copy of the video will be

PART NUMBER	PART NAME	CLASS
CM-1000	Motorcraft Fuel Injection Cleaning kit	Z
CM-1001	Motorcraft Pressurized Fuel Injector Cleaner	Z
CM-1002	Motorcraft New Ford-Application Fuel Injector Kit	Z

provided to requesting dealerships who call 1-800-662-6891.

OTHER APPLICABLE ARTICLES: 91-19-3 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 404000, 490000



EEC-IV Pinpoint Test Procedures 1991 6-185

Fuel Control | **Pinpoint Test** | **H**

INJECTOR BANK RESISTANCE
SPECIFICATION TABLE #1 (NOT FOR SEFI)

CAR ENGINES
VALUES ARE IN OHMS

2.3L HSC	2.3L OHC	3.0L
6.0 - 8.0	7.0 - 9.5	5.0 - 6.5

TRUCK ENGINES
VALUES ARE IN OHMS

2.3L	2.9L/3.0L 4.9L	4.0L	5.0L/5.8L 7.0L/7.5L
7.0 - 9.5	5.0 - 6.5	4.5 - 6.0	3.0 - 4.0

SINGLE INJECTOR RESISTANCE
SPECIFICATION TABLE #2

CAR ENGINES
VALUES ARE IN OHMS

2.3L OHC/3.0L	ALL OTHER ENGINES
15.0 - 18.0	13.0 - 16.0

TRUCK ENGINES
VALUES ARE IN OHMS

2.3L/3.0L	4.0L	ALL OTHER ENGINES
15.0 - 18.0	14.0 - 17.5	13.0 - 16.0

Revised 3/91

Fuel Injector: Technical Service Bulletins Fuel Injector Specifications - Manual Revisions

Article No. 91-5B-27

03/22/91

ENGINE EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - PAGE 6-185 - FUEL INJECTOR RESISTANCE

SPECIFICATIONS ADDED

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The fuel injector resistance specifications for the 4.0L Engine were omitted from the charts on Page 6-185 of the 1991 Engine Emissions Diagnosis Shop Manual. These specifications appear as part of Pinpoint Test H, Fuel Control.

ACTION: Refer to the pages following this TSB article for the revised specification charts.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 490000

Fuel Injector: Technical Service Bulletins Fuel Injector - New Cleaning Method

Article No. 91-19-3

09/18/91

FUEL SYSTEM - NEW FUEL INJECTOR CLEANING METHOD - (3.OL PROBE ONLY)

FORD: 1987-88 EXP 1987-90 TAURUS, TEMPO 1987-91 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1990 PROBE

LINCOLN-MERCURY: 1987 LYNX 1987-90 SABLE, TOPAZ 1987-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOWN CAR 1990-91 TRACER

LIGHT TRUCK: 1987-90 BRONCO II 1987-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY, F-47, F-53 1991 EXPLORER

ISSUE: A new warranty-reimbursable method is now available for cleaning standard design pintle fuel injectors. (Deposit Resistant Injectors "DRI's" do not require cleaning.) This new method is an alternate to the current procedure which utilizes the Rotunda Fuel lnjector Tester/Cleaner and is reimbursable as specified in the Labor Time Standards Manual.

ACTION: If standard design pintle fuel injectors require cleaning, use the new cleaning method which utilizes Motorcraft Pressurized Fuel lnjector Cleaner (CM-1001) and the Motorcraft Fuel Injection Cleaning Kit (CM-1000). Both of these items are available from the regular Parts Distribution System or the local Motorcraft Distributor.

The kit features:

^ Application for most Ford and Lincoln-Mercury EFI vehicles.

^ Application for most other domestic and import EFI vehicles.

^ Effective for both central and multi-port EFI systems.

^ Quick and easy hook up.

^ Uses pre-mixed Motorcraft Pressurized Fuel Injector Cleaner.

^ Environmentally-compatible can pressurizing.

^ Steel wire-reinforced hoses.

^ Easy-to-follow illustrated Instruction Manual provides step-by-step connection and cleaning procedures.

^ Includes replacement parts kit with seals, washers, regulator diaphragms and dust caps.

^ Full 1-year Manufacturer's Warranty on defects in materials and/or workmanship.

^ Completely reorderable components.

PART NUMBER PART NAME CLASS

CM-1001 Motorcraft Pressurized Fuel Z

Injector Cleaner

CM-1000 Motorcraft Fuel Injection Z

Cleaning Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

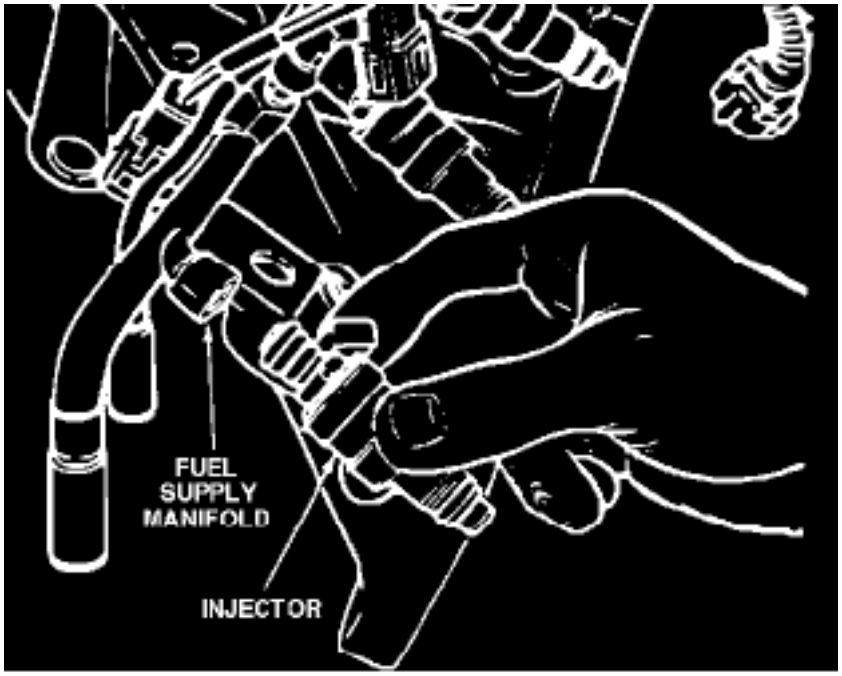
404000, 490000

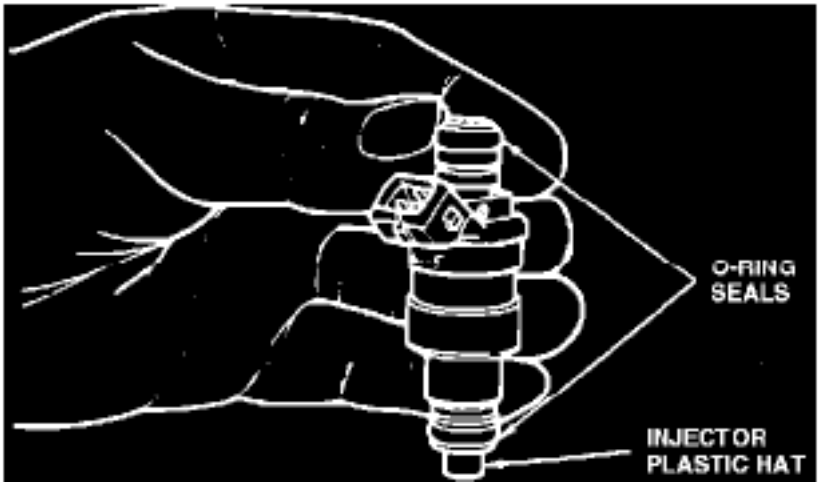
Fuel Injector: Specifications

Fuel Injector Resistance

Injector Resistance specification can be found in Powertrain Management/Computers and Controls/Testing and Inspecton/Pinpoint Test/ Test H

Look through Test H and look for Injector Resistance.


FUEL
SUPPLY
MANIFOLD
INJECTOR


O-RING
SEALS
INJECTOR
PLASTIC HAT

Fuel Injector: Locations

Fuel Injector

REMOVAL

1. Remove fuel tank cap and release pressure from fuel system by opening the fuel pressure relief valve.

2. Remove upper intake manifold as outlined in this section.

3. Remove fuel supply manifold as outlined in this section.

4. Carefully remove electrical harness connectors from individual injectors as required.

5. Remove injector retaining clips as required.

6. Grasping injector body, pull up while gently rocking injector from side to side.

Fuel Injector

7. Inspect injector o-rings (two per injector) for signs of deterioration. Replace as required.

8. Inspect injector "plastic hat" (covering the injector pintle) and washer for signs of deterioration. Replace as required. If has is missing, look for in in intake manifold.

INSTALLATION

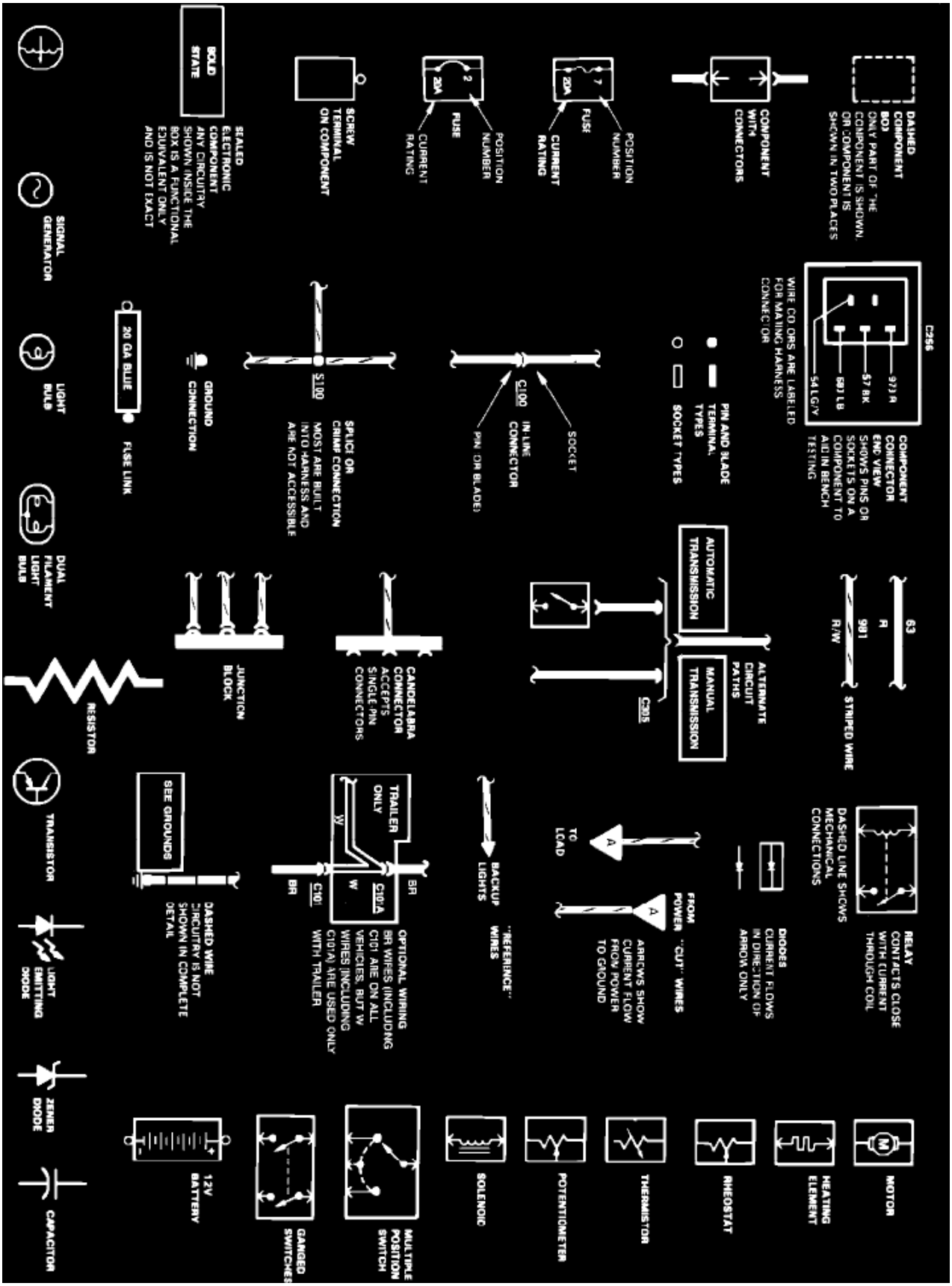
1. Lubricate new o-rings with light grade oil and install two on each injector.

NOTE: Never use silicone grease. It will clog the injector(s). 2.

Install injector(s), using a light twisting, pushing motion.

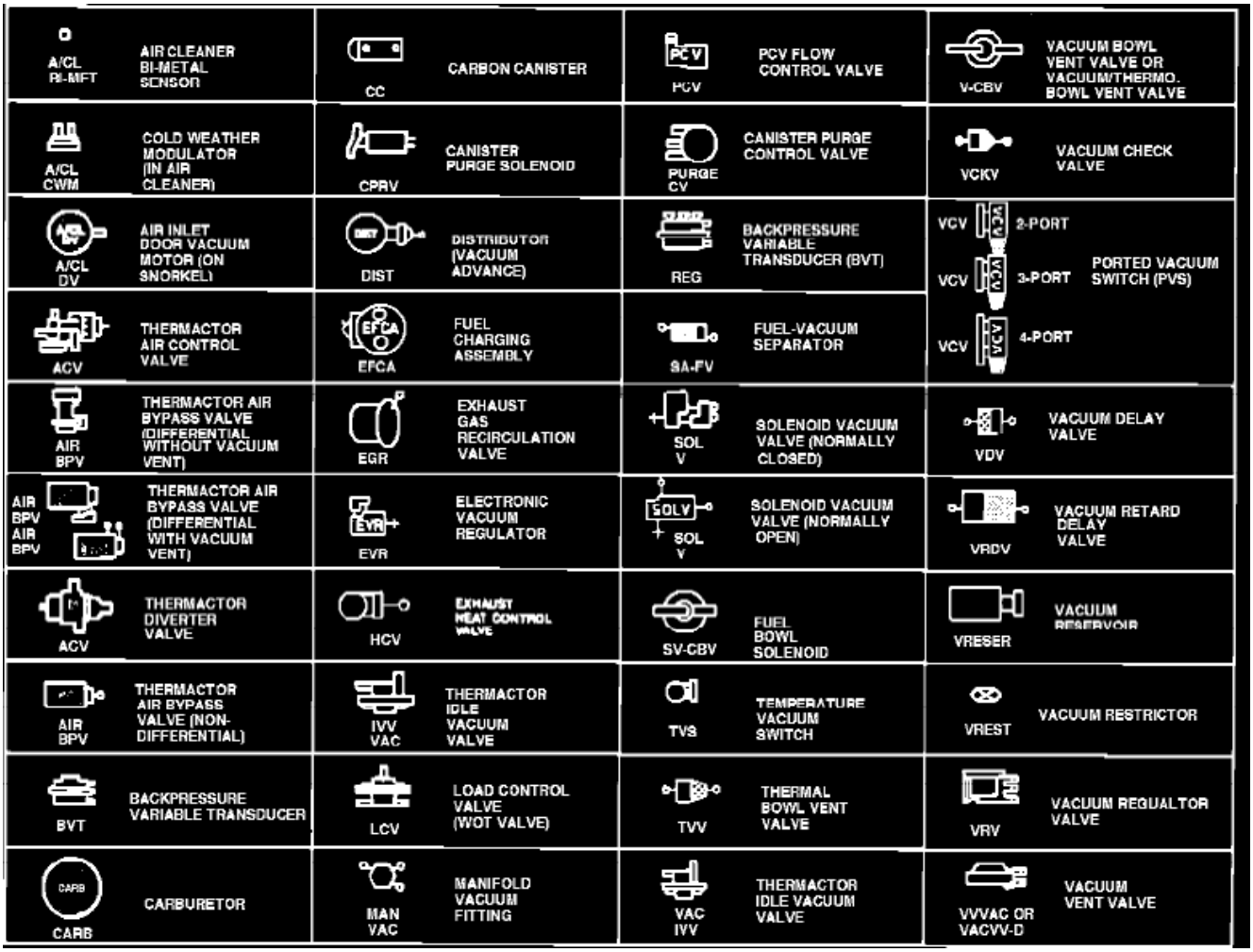
3. Install fuel supply manifold. Replace retainer clips if distorted.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Fuel Injector > Component Information > Diagrams > Diagram Information and Instructions

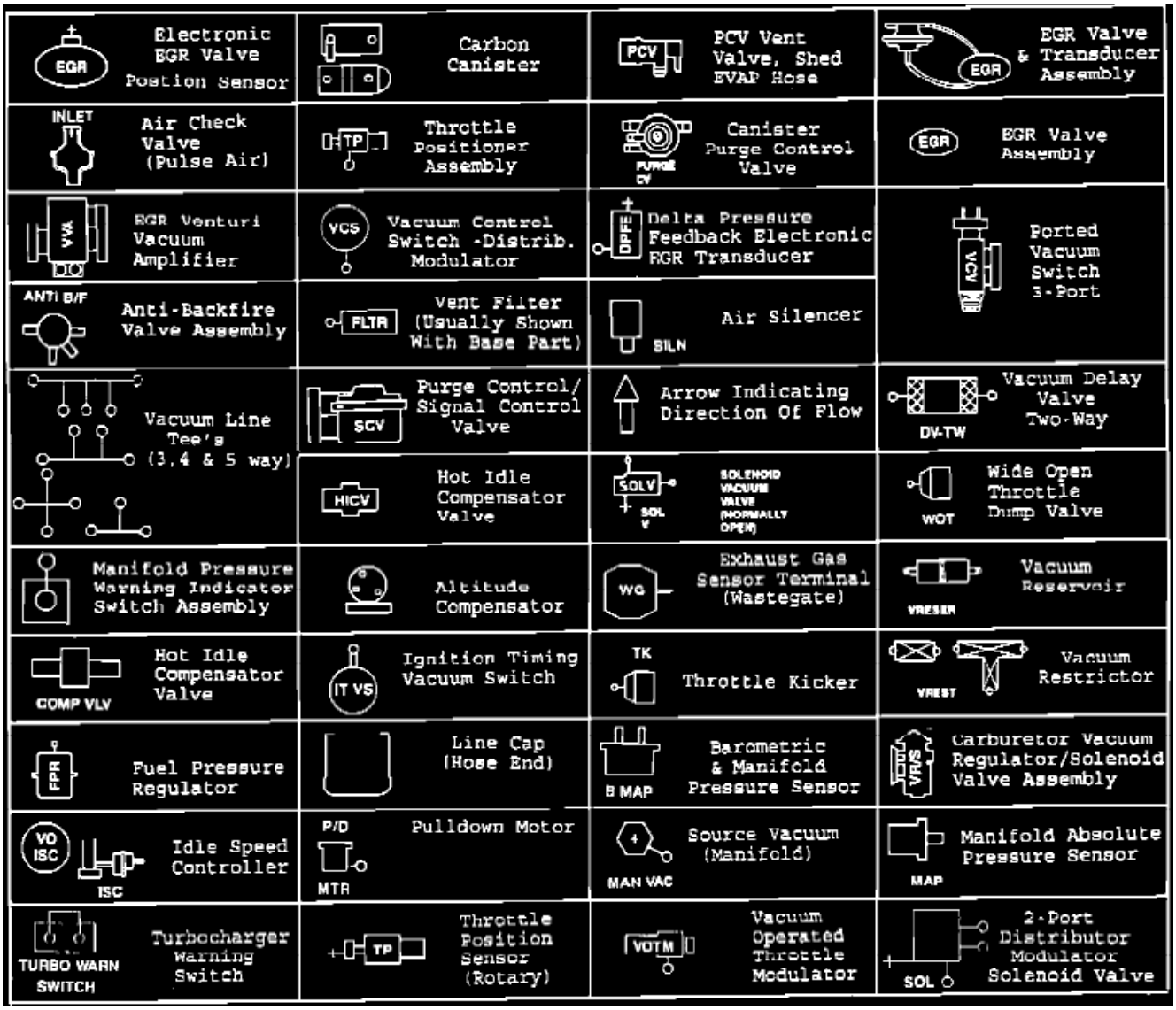


Fuel Injector: Diagram Information and Instructions

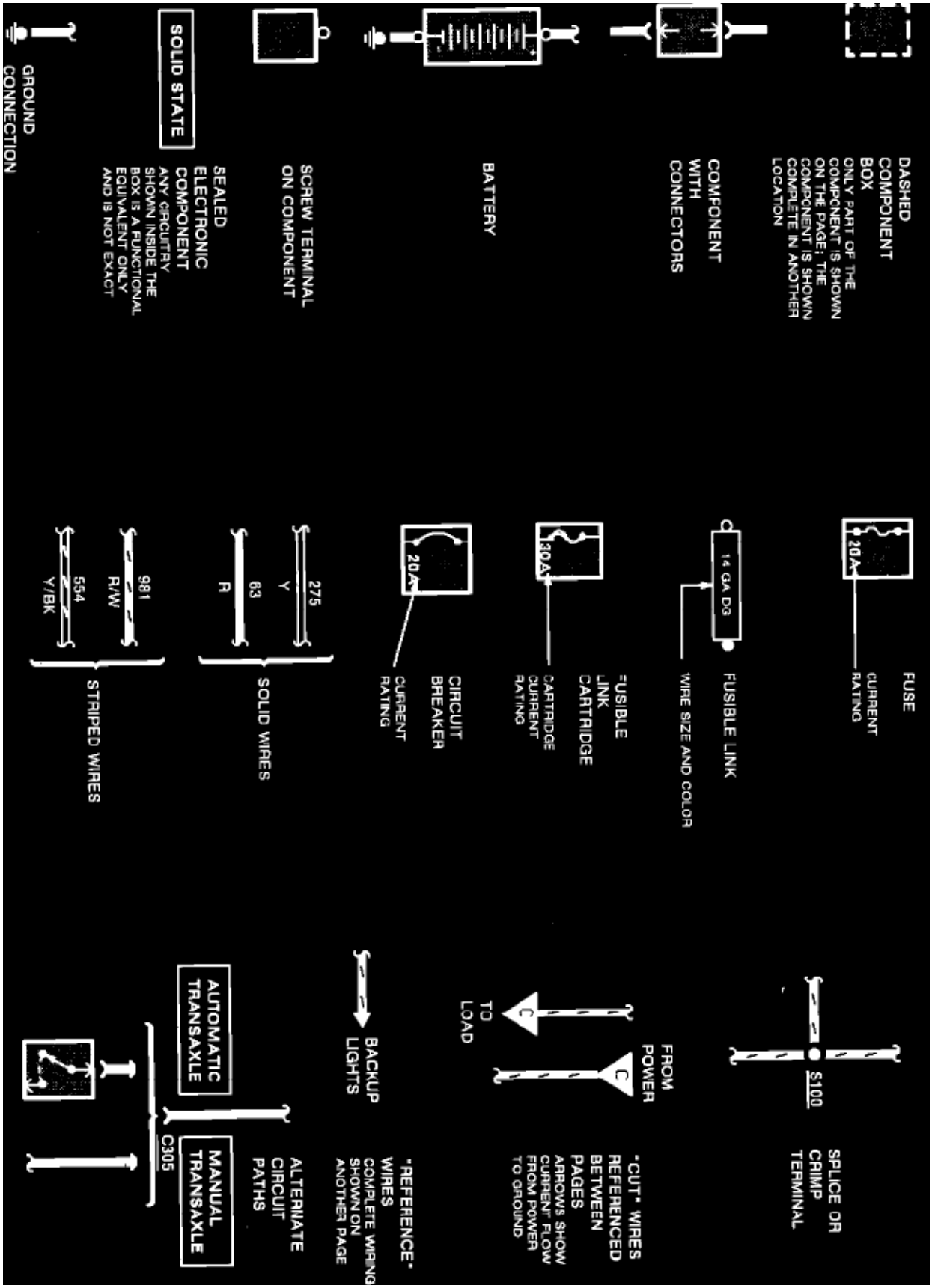
Symbol Identification



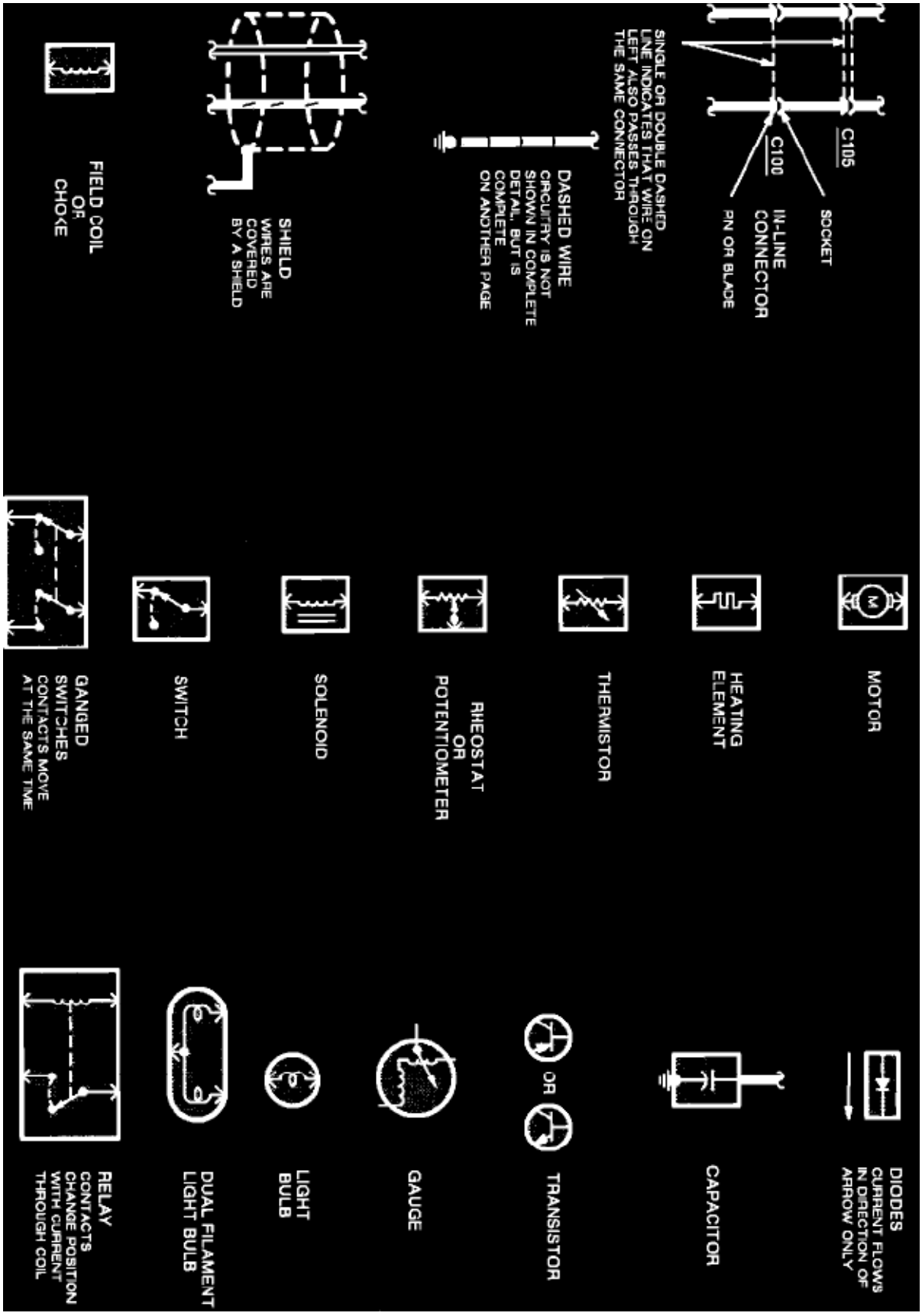
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
C
TO LOAD
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
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SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

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O: Orange

PK: Pink R: Red

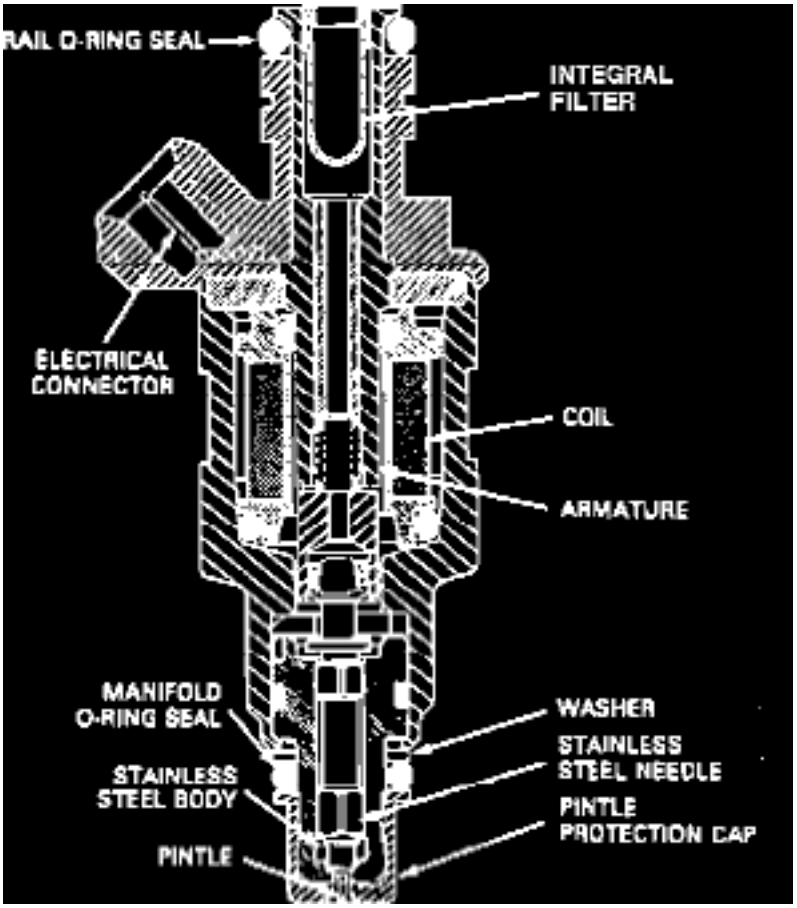
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuel Injector: Description and Operation

Fuel Injector

The fuel injector nozzles are electro-mechanical devices which meter and atomize fuel delivered to the engine. The injectors are mounted in the lower intake manifold and positioned so that their tips are directing fuel just ahead of the engine intake valves. This specialized solenoid has an armature and a needle or ball valve with a spring that holds the needle or ball closed against the valve seat. The armature opens the valve when it receives a current pulse from the system computer. When the solenoid is energized, it unseats the valve to inject fuel. The injector always opens the same distance, and the fuel pressure is maintained at a constant value by the pressure regulator. The amount of fuel delivered by the injector depends on the amount of time that the nozzle is open. This is the injector pulse width: the time in milliseconds that the nozzle is open. An electrical signal from the Electronic Control Assembly (ECA) activates the injector solenoid causing the pintle to move inward off the seat, allowing fuel to flow through the orifice. Atomization of the fuel is obtained by contouring the pintle at the point at where the fuel separates.

Fuel Injector: Testing and Inspection

NOTE: Make sure injectors have been cleaned with an approved cleaner prior to testing.

The injector balance test is done to verify a balance distribution of fuel to all cylinders. Start by hooking up a fuel pressure gauge at the schrader valve or Inline before the fuel pressure regulator (refer to gauge manufacturer instructions). Pressurize fuel rail by turning ignition on engine off (fuel pump energized). The pressure should rise to maximum working pressure. Refer to SPECIFICATIONS. Remove injector harness connector and connect an injector pulse tester, pulse one injector at a time. Allow pressure to rise and stabilize in between each injector tested.

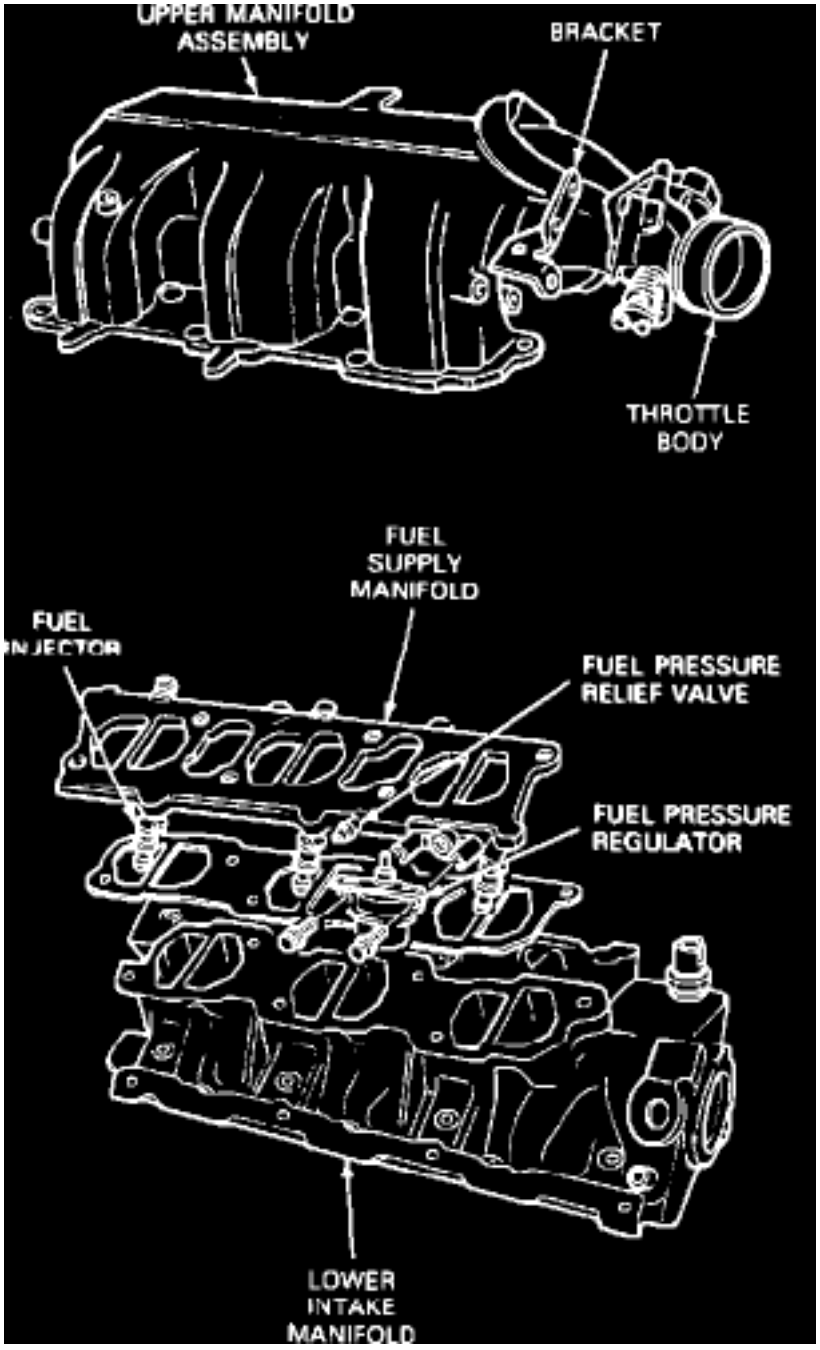
NOTE: The time each injector is pulsed is very important. Each injector should be pulsed at the same time interval, (example . . 1 ms each).

The rate of drop should be even across all the injectors. All pressure drops should be within 3% of each other, if not replace injector.

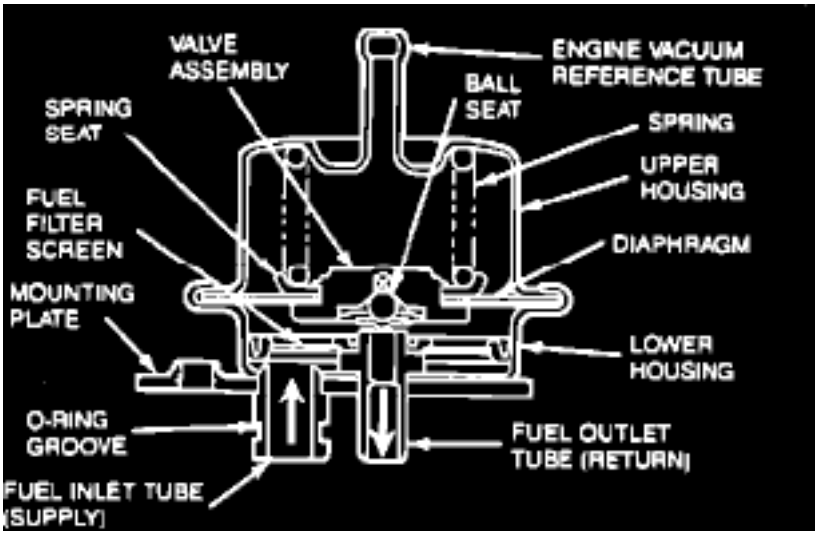
If there is no pressure drop when injector is pulsed, verify there is a good connection between the injector and pulse tester. If connection is good, a check of the injector circuit is required. First, check the resistance of the injector, if resistance is OK verify there is power to injector by reconnecting the injector harness connector and start the engine, use a "Noid" light to check for pulses (light off and on). If it does not light this is an indication of a problem in the injection to ECM circuit. Refer to COMPUTERIZED ENGINE CONTROLS for further testing. If light pulses, recheck pressure drop to verify malfunction.

NOTE:

It may not be possible to connect a noid light to the harness while connected to injector. If this is the case, connect noid to removed harness and check pulses.



Air Intake Manifold



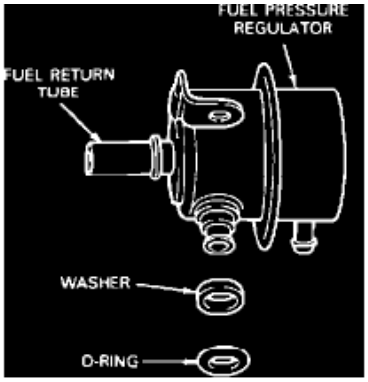
Fuel Pressure Regulator: Description and Operation

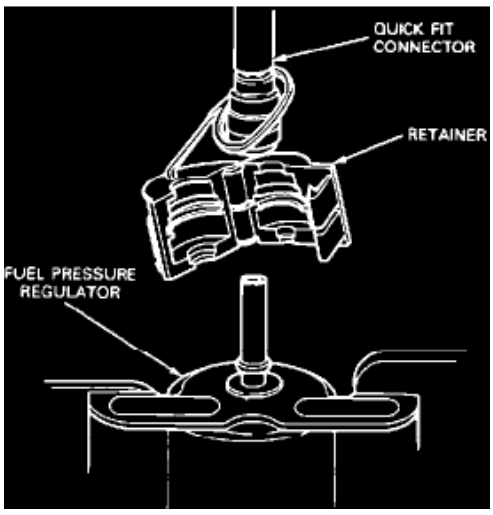
Fuel Pressure Regulator

The pressure regulator and fuel pump work together to maintain the required constant pressure at the injector tips. The regulator consists of a spring-loaded diaphragm-operated valve in a metal housing. The pressure regulator is located on the fuel supply manifold and installed on the return (downstream) side of the injectors. Downstream regulation minimizes fuel pressure pulsations caused by pressure drop across the injectors as the nozzles open. This design ensures positive fuel pressure at the injectors at all times and holds residual pressure in the lines when the engine is off. The pressure regulator used in a multipoint injection system has an intake manifold connection on the regulator vacuum chamber. This allows fuel pressure to be modulated by a combination of spring pressure and manifold vacuum acting on the diaphragm. Fuel in excess of that used by the engine, is bypassed through the regulator and returns to the fuel tank. The regulator shuts off the return line when the fuel pump is not running. This maintains pressure at the injectors for easy restarting and reduced vapor lock.

TEST STEP	RESULT ▶	ACTION TO TAKE
CHECK DIAPHRAGM INTEGRITY • Remove fuel tank filler cap. • **Release the fuel pressure from the fuel charging system at the schrader valve on the fuel rail.** • Install fuel pressure gauge. • Start and run engine for 10 seconds. • Turn engine off and wait 10 seconds. • Start and run engine again for 10 seconds. • Turn engine off. • Remove the vacuum hose from the fuel pressure regulator • Is fuel present at the vacuum port?	Yes ▶	REPLACE the fuel pressure regulator.
	No ▶	GO to **Check Regulator Valve Pressure.** RECONNECT vacuum hose.
CHECK REGULATOR VALVE PRESSURE • Start and run engine for 30 seconds. • Turn engine off. • Observe fuel pressure gauge. • Does fuel pressure drop more than 5 psi (34 kPa) after 60 seconds?	Yes ▶	**SERVICE leaks. REPEAT this Test Step if fuel pressure still drops. REPLACE regulator.**
	No ▶	**GO to Check Valve Seat Leakage.**
CHECK VALVE SEAT LEAKAGE • Release the fuel pressure from the fuel charging system. **See Check Diaphragm Integrity.** • Remove the fuel pressure regulator. • Inspect gasket and O-ring for cracks and cuts, or other defects. • Connect a hand held vacuum pump to the fuel return tube (7/32 in. diameter tube, centered on base plate). • Apply 20 in-Hg vacuum. • Does vacuum drop below 10 in.-Hg within 10 seconds?	Yes ▶	REPLACE fuel pressure regulator.

Fuel Pressure Regulator


FUEL PRESSURE REGULATOR
FUEL RETURN TUBE
WASHER
O-RING


QUICK FIT CONNECTOR
RETAINER
FUEL PRESSURE REGULATOR

Fuel Pressure Regulator: Service and Repair

Fuel Pressure Regulator

REMOVAL

1. Release pressure from fuel system at fuel pressure relief valve (Schrader) on fuel rail assembly. To gain access to fuel pressure relief valve, valve cap must first be removed.

2. Remove vacuum line at pressure regulator.

3. Disconnect the fuel return line from the fuel pressure regulator as follows: a. Disengage the locking tabs on the connector retainer and separate the retainer halves. b. Inspect the visible internal portion of the fitting for dirt accumulation. Clean the fitting before disassembly. c. To disengage the fitting from the regulator insert a fuel line coupling key into the slots in the coupling. d. Using the tool, pull the fitting from the regulator.

4. Remove two retaining screws from regulator housing.

5. Remove presure regulator assembly o-ring and washer. Discard washer and inspect o-ring for signs of cracks or deterioration.

6. Inspect fuel return tube for kinks and abrasions.

INSTALLATION

1. Install new washer and o-ring on regulator.

2. Lubricate fuel pressure regulator o-ring with a light oil.

NOTE: Never use silicone grease. It will clog the injectors. 3.

Ensure surfaces of fuel pressure regulator and fuel injection manifold are clean.

4. Install fuel pressure regulator on injector manifold. Tighten the retaining screws. Refer to SPECIFICATIONS.

5. Install vacuum line to regulator.

6. Install the fuel return line to the fuel presure regulator by pushing it onto the fuel pressure regulator line up to the shoulder on the regulator line.

CAUTION: The connector should grip the regulator line securely.

Fuel Pressure Regulator

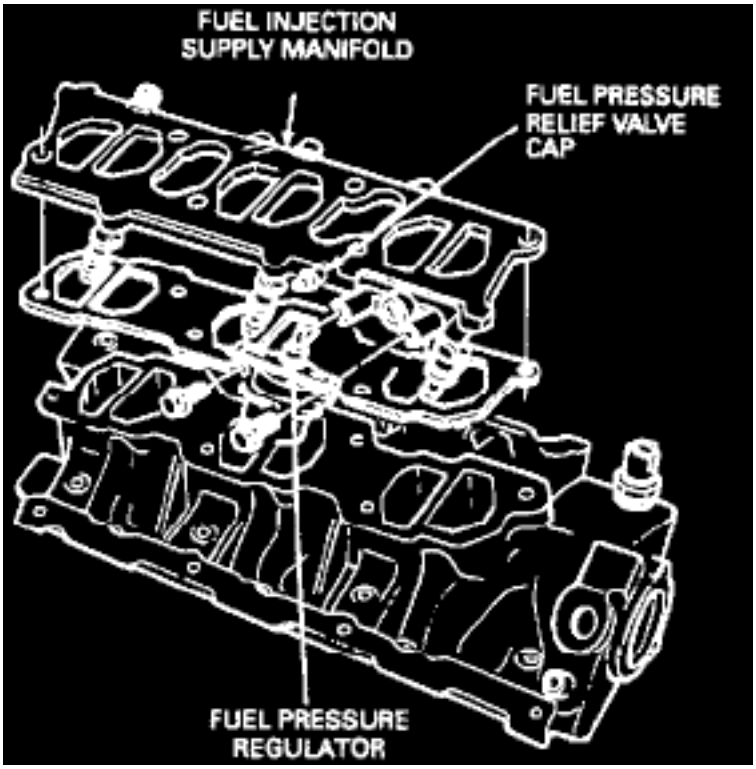
7. Install the connector retainer and snap the two halves of the retainer together.

8. Install the cap on the relief valve if removed.

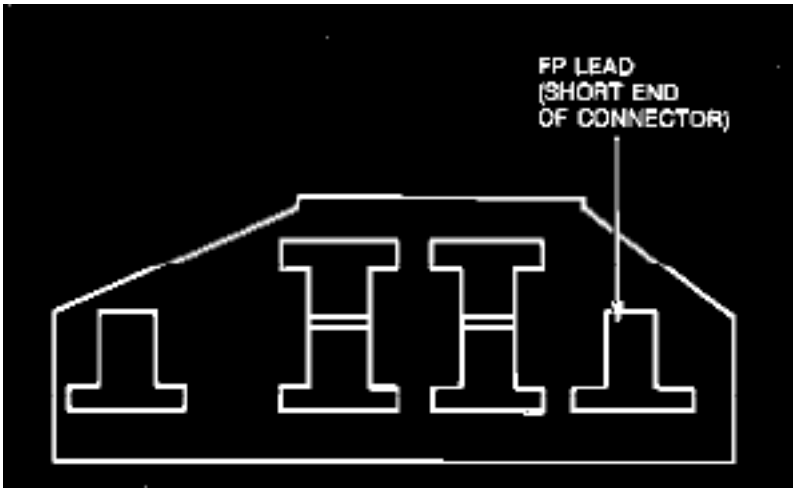
Fuel Pressure: Specifications

Key On Engine Off 35 - 45 psi

Key On Engine Running 30 - 40 psi



Fuel Injection Supply Manifold



Fuel Pressure: Testing and Inspection

STO Connector

STATIC PRESSURE TEST

1. Check for adequate fuel supply. 2. Turn key OFF 3. Install fuel pressure gauge to test port on fuel rail. 4. Install test lead to fuel pump lead of STO test connector. 5. Turn Key On Engine Off (KOEO). 6. Ground test lead to run fuel pump. 7. Check to determine if fuel pressure is within acceptable limits. Refer to SPECIFICATIONS.

a. If pressure is low but greater than 3 psi (indicates fuel pump is running but not enough pressure) check for:

^ Plugged fuel filter

^ Kinked fuel line

^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

^ Disconnect the fuel return line and note if fuel is being returned during this low pressure condition. If fuel is being returned, replace the fuel pressure regulator. Reconnect the fuel return line.

b. If pressure is less than 3 psi (pump not running) check for:

^ Defective fuse link

^ Inertia switch open

^ Wiring at fuel pump/tank connector loose or open

^ Fuel pump ground connection at chassis loose or defective

^ Improper fuel pump relay operation

If fuel supply and return lines are OK, and electrical supply and ground are OK, and fuel pressure is still low, replace fuel pump.

DYNAMIC PRESSURE TEST

1. Disconnect and plug the vacuum line to the pressure regulator.

2. Start engine and run at idle. Check to determine if fuel pressure is within acceptable limits.

a. If pressure is low check for:

^ Plugged fuel filter ^ Restricted fuel line ^ Low voltage to pump (should be within 0.5 volts of battery voltage at connector).

3. Reconnect the vacuum line to the regulator.

If fuel supply and return lines are OK, and electrical supply and ground is OK, and fuel pressure is still low, replace fuel pump.

LEAKAGE TEST

1. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate operating pressure. 2. Remove ground from test lead and note pressure on gauge. Pressure should remain within 2 psi for 3 minutes after lead is ungrounded.

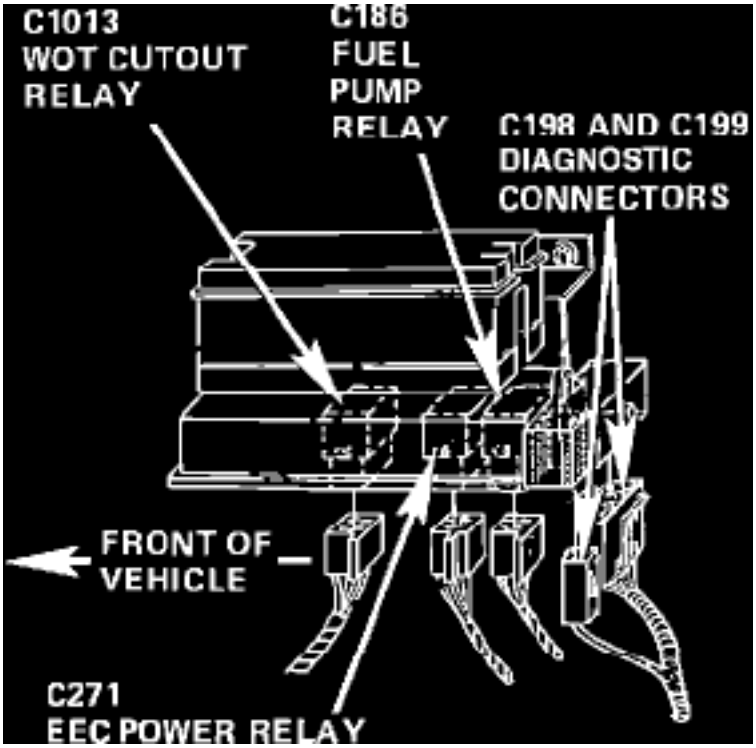
a. If pressure is not maintained check for leaking fuel

^ Lines ^ Connectors ^ Injectors

b. Disconnect fuel return line and plug engine side. Momentarily activate fuel pump by grounding test lead. Raise pressure to approximate

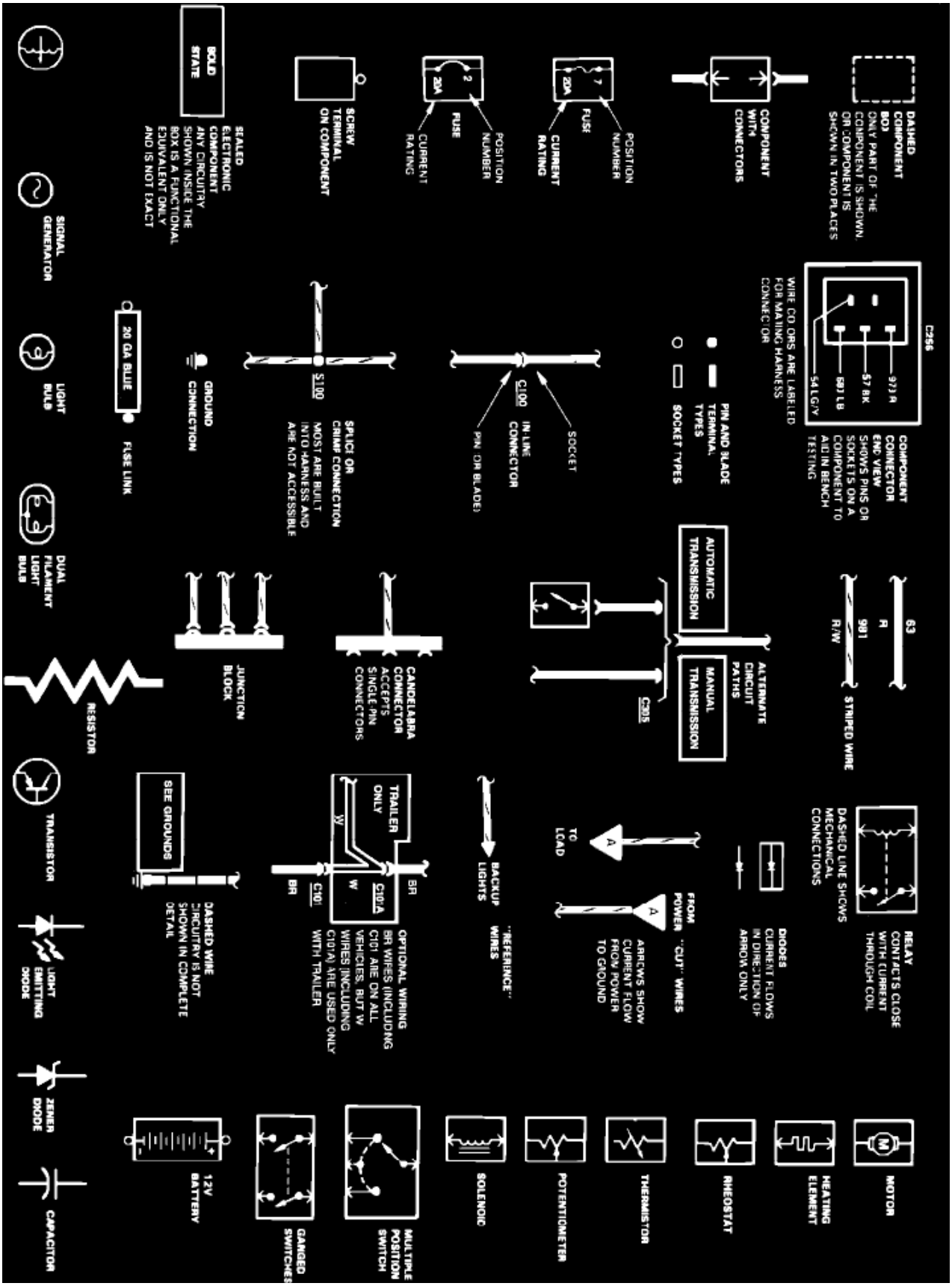
operating pressure. If pressure holds replace regulator and retest. Reconnect the fuel return line.

If pressure is not maintained replace fuel pump.



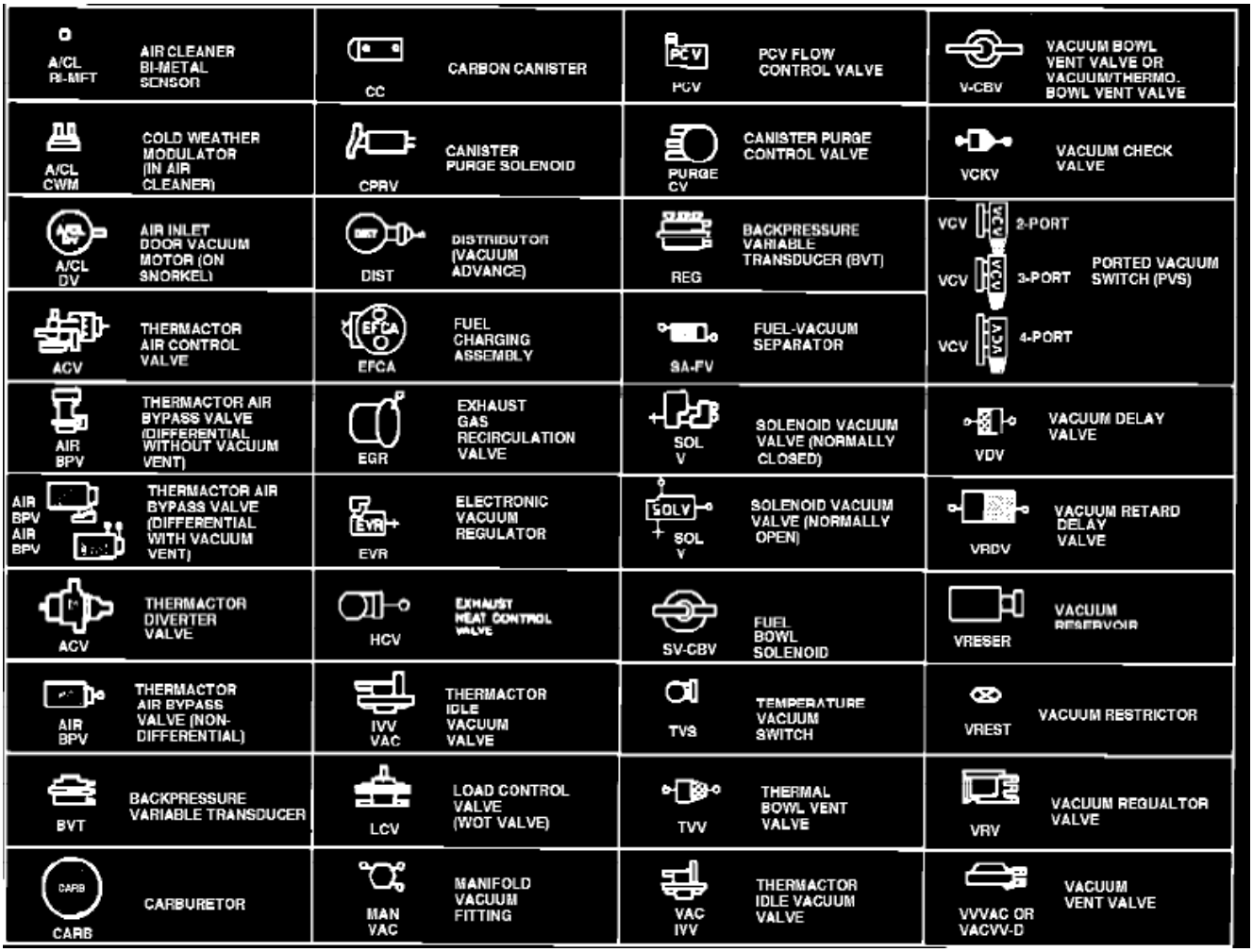
Relay And Diagnostic Connectors

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Fuel Pump > Fuel Pump Relay > Component Information > Diagrams > Diagram Information and Instructions

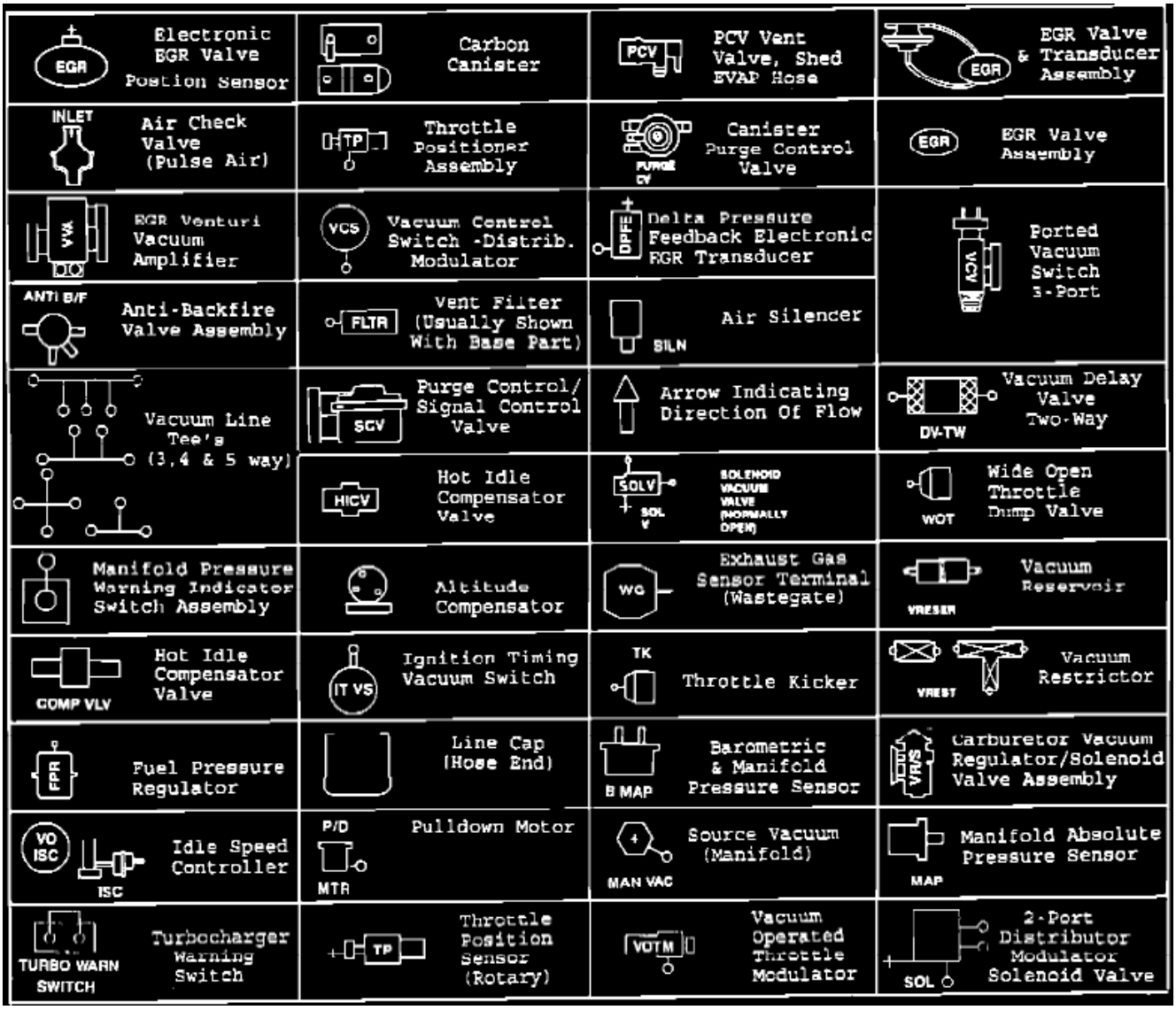


Fuel Pump Relay: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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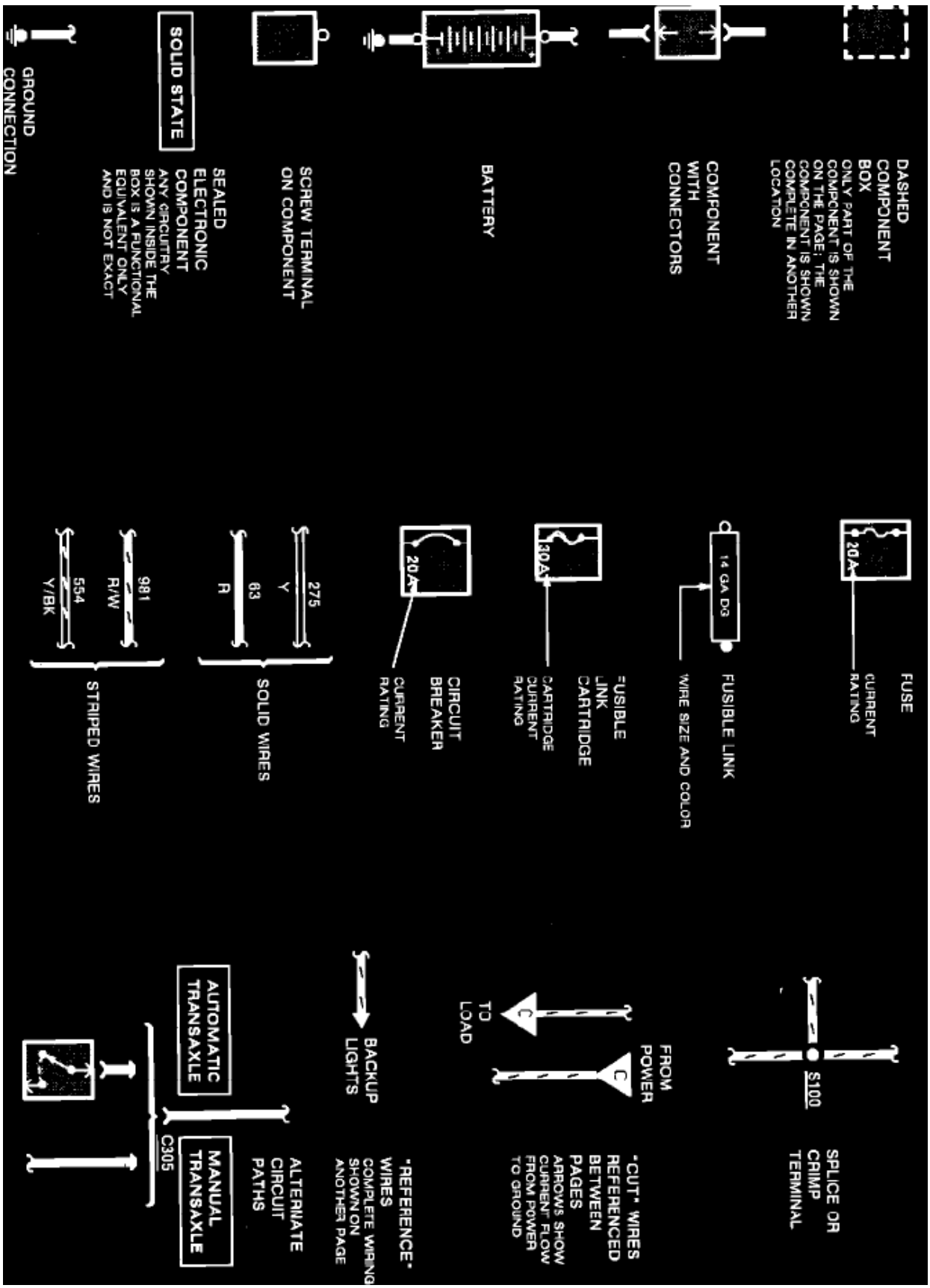
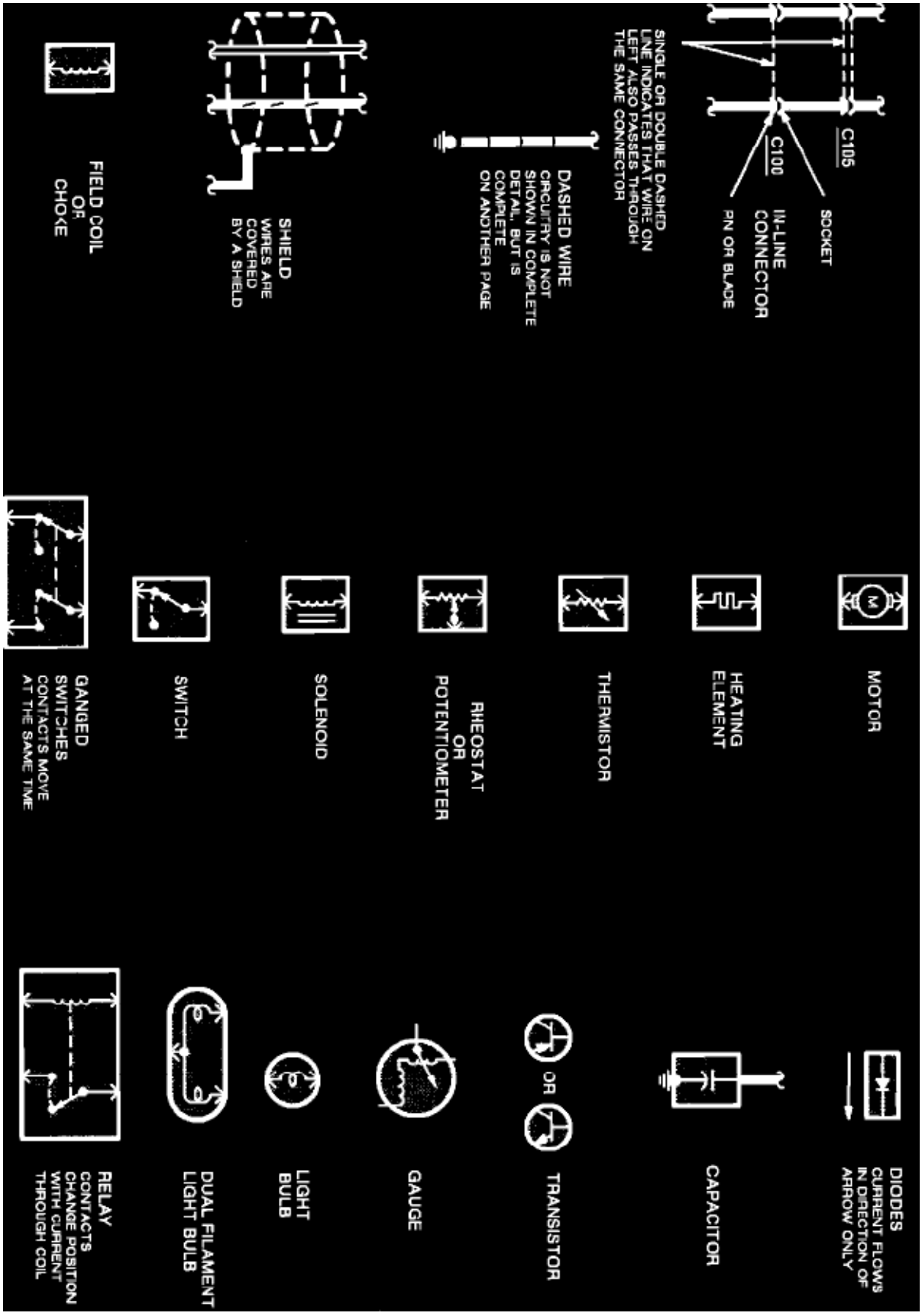


Electrical Symbols


C105
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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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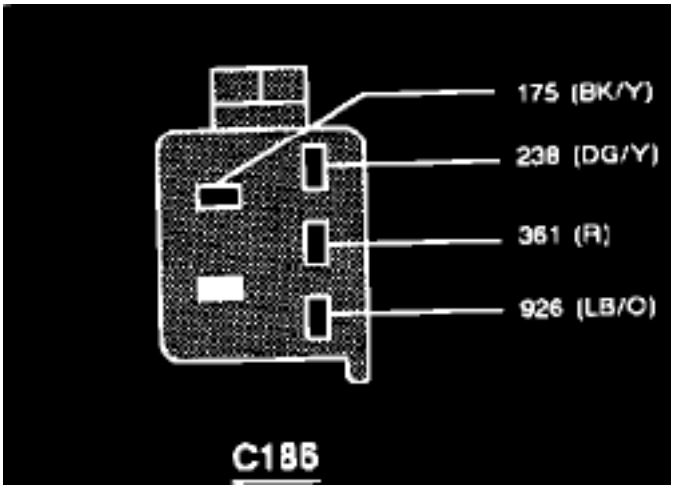
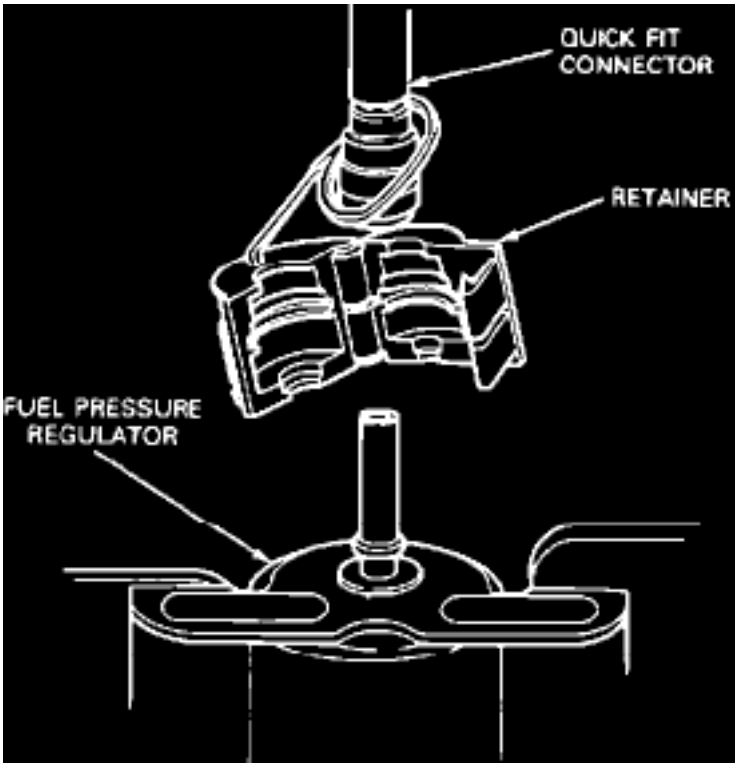


Fuel Pump Relay Connector

Fuel Pump Relay: Description and Operation

When the ignition switch is turned ON, the Electronic Engine Control (EEC) power relay is ENERGIZED, providing power to the fuel pump relay. Fuel pump power is provided through the fuel pump relay contacts and an inertia switch. If the ignition switch is not turned to the START position in approximately one second, a timer circuit in the Engine Control Assembly (ECA) will open the ground circuit to the fuel pump relay, causing the fuel pump relay contacts to OPEN. This action stops the power supply to the fuel pump. When the ignition switch is turned to the START position, the ECA closes the ground circuit to the fuel pump relay, resuming operation of the fuel pump. After the engine switch is returned to the ON position, power to the fuel pump is supplied through the fuel pump relay. The ECA monitors engine speed and OPENS the fuel pump relay ground circuit if the engine speed drops below 120 rpm.



Fuel Injection Supply Manifold Assembly: Service and Repair

REMOVAL

1. Thoroughly clean the engine.

2. Release pressure from fuel system at fuel pressure relief valve (Schrader) on fuel rail assembly. To gain access to fuel pressure relief valve, valve cap must first be removed.

3. Remove the upper intake manifold assembly as outlined in this section.

4. Disconnect the fuel supply line fitting at the fuel manifold.

5. Disconnect the fuel return line from the fuel pressure regulator as follows: a. Disengage the locking tabs on the connector retainer and separate the retainer halves. b. Inspect the visible internal portion of the fitting for dirt accumulation. Clean the fitting before disassembly. c. To disengage the fitting from the regulator, push the fitting toward the regulator, insert the finger on fuel line coupling key, into the slots in the

coupling.

d. Using the tool, pull the fitting from the regulator.

NOTE: If the fitting has been properly disengaged, the fitting should slide off the regulator with minimum effort. 6.

Remove the six Torx(R) head stud bolts retaining the fuel manifold and remove the manifold.

7. Remove the injectors from the fuel supply manifold and wipe cup clean with a clean, dry cloth.

INSTALLATION

1. Make sure the injector caps are clean and free of contamination. Inspect injector o-rings. Replace if required.

CAUTION: Do not attempt to clean the injector pintle or metering orifice with brushes or tools.

2. Carefully wipe the injector recesses in the manifold and make sure they are free of contamination. Light grease the recesses.

CAUTION: Do not use silicone grease to lubricate o-rings. Silicone grease can plug injectors.

3. Locate the three injectors on the RH side recesses of the intake manifold. Then locate the three on the left.

4. Position the fuel supply manifold and press down firmly until the injectors are fully seated in the fuel supply manifold and lower intake manifold. The fuel supply manifold should be fully seated on the lower intake manifold.

5. Install the six Torx(R) head stud bolts and tighten. Refer to SPECIFICATIONS.

6. Install the fuel supply line and tighten the fitting to 20-24 N-m (15-18 ft. lb)

7. Install the fuel return line to the fuel pressure regulator by pushing it onto the fuel pressure regulator line up to the shoulder on the regulator line.

CAUTION:

The connector should grip the regulator line securely.

Fuel Pressure Regulator

8. Install the connector retainer and snap the two halves of the retainer together.

9. Install the upper intake manifold as detailed in this section.

10. After the upper intake manifold has been install and before the fuel injector wire connectors have been connected, turn the key to the "ON" position.

This will cause the fuel pump to run for 2-3 seconds and pressurize the system.

11. Using a clean paper towel, check for leaks where the fuel injector is installed into the fuel rail. 12. Install the injector wire connectors and the vacuum line to the regulator. 13. Install the air inlet tube from the throttle body to the air cleaner. 14. Start the engine and let it idle for two minutes. 15. Turn the engine off and check for fuel leaks where the fuel injector is installed in the fuel manifold and the intake manifold.

Fuel Return Line: Technical Service Bulletins Nylon Fuel Lines - Servicing Procedure

Article No. 92-12-16

DATE: 06-03-92

FUEL LINES-NYLON-SERVICING PROCEDURE

LIGHT TRUCK: 1985-92 F-150-350 SERIES 1986-90 BRONCO II 1986-92 AEROSTAR, BRONCO, ECONOLINE, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

ISSUE: Metal fuel lines and connectors have been replaced with nylon lines and connectors on the subject vehicles. A procedure has been developed for servicing damaged nylon fuel lines.

ACTION: If a nylon fuel line requires service, use the following procedure.

FUEL SYSTEM SERVICE PROCEDURE FOR NYLON FUEL TUBES AND PUSH CONNECT FITTINGS

FUEL LINES AND HOSES

WARNING: FUEL SUPPLY LINES ON VEHICLES WITH FUEL INJECTED ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUT DOWN WHICH COULD RESULT IN PERSONAL INJURY. THE PRESSURE MUST BE RELIEVED, AS OUTLINED PER THE FUEL SYSTEM PRESSURE RELIEF PROCEDURE, BEFORE SERVICING THE FUEL SYSTEM. READ ALL CAUTIONARY NOTES PRIOR TO RELIEVING THE PRESSURIZED FUEL SYSTEM.

FUEL TUBES - PLASTIC (NYLON)

CAUTION: FORD APPROVED NYLON FUEL TUBING IS MADE FROM MATERIAL WHICH HAS BEEN TESTED AND PROVEN TO BE ACCEPTABLE FOR USE WITH COMMERCIALLY AVAILABLE FUELS. IT IS ALSO RESISTANT TO MOST ENVIRONMENTAL CONDITIONS. AVOID USING ALTERNATE TUBING MATERIALS. USE OF NON-APPROVED TUBING COULD POSE A HAZARD IN SERVICE.

CAUTION: PLASTIC FUEL TUBES MUST NOT BE REPAIRED USING HOSE AND HOSE CLAMPS. PUSH CONNECT FITTINGS CANNOT BE REPAIRED EXCEPT TO REPLACE THE RETAINING CLIPS. IF THE PLASTIC TUBES OR PUSH CONNECT FITTINGS BECOME DAMAGED AND LEAK, APPROVED SERVICE PARTS MUST BE USED TO SERVICE THE FUEL LINES.

MAJOR SERVICE OPERATIONS - FUEL LINES

Vehicles equipped with nylon fuel tubes and push connect fittings have three (3) types of service that can be performed to the fuel lines...

^ Replacing nylon tubing (splicing nylon to nylon)

^ Replacing push connector fittings

^ Replacing damaged push connect tube ends.

NOTE: FORMED SECTIONS (BENDS) OF NYLON FUEL LINES CANNOT BE REPAIRED USING STRAIGHT TUBING. STRAIGHT SERVICE TUBING WILL KINK IF BENT. FORMED NYLON FUEL LINE IS REOUIRED TO REPLACE THE DAMAGED SECTION.

SPLICING NYLON TO NYLON

1. Relieve the fuel system pressure as outlined in the Service Manual. Read the previously cited Warning prior to relieving the pressurized fuel system.

2. Cut out the damaged section of tubing (straight non-formed sections only) and retain as a guide.

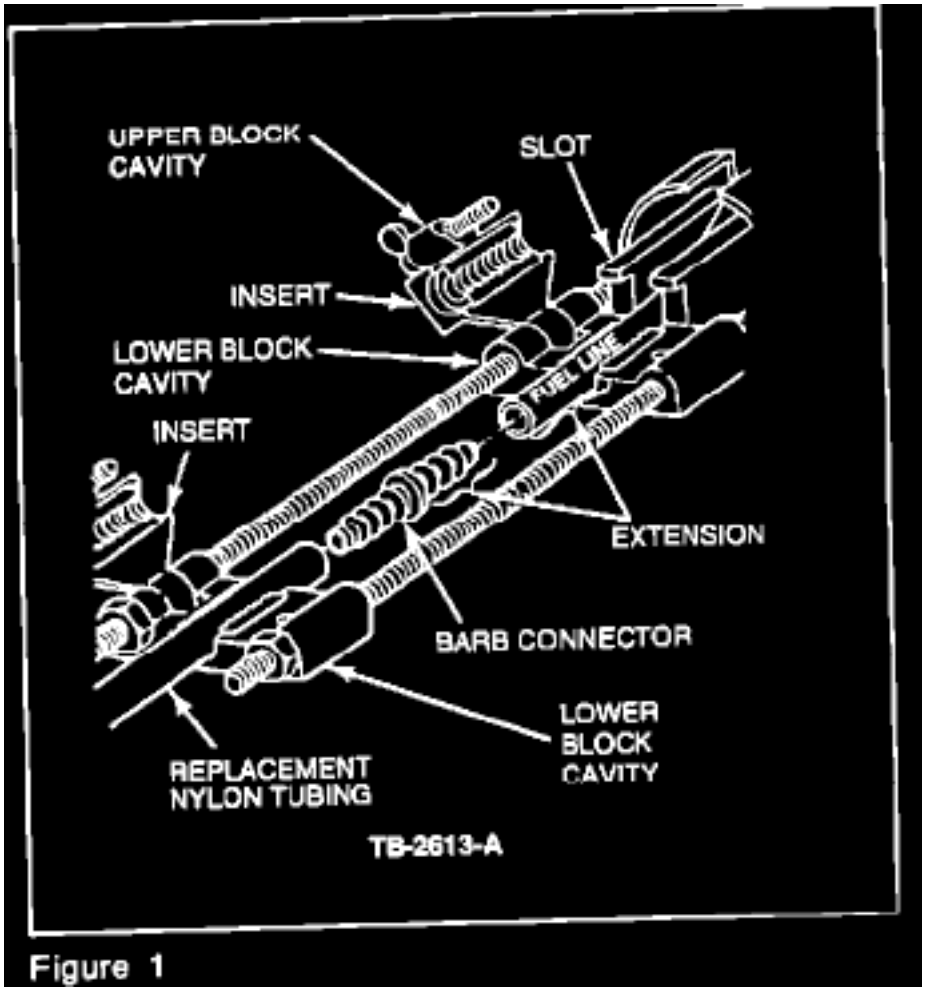


Figure 1

3. Cut a section of nylon service tubing, type 11 or 12, of the same diameter and length as the damaged section of tubing.

NOTE: TYPE 11 OR 12 NYLON SERVICE TUBING IS AVAILABLE IN 6.3MM (1/4"), 7.9MM (5/16") AND 9.5MM (3/8") DIAMETER SIZES.

4. Select the proper nylon barbed connector(s) for completing the splice...

^ 7.9mm (5/16") - Part Number (N806120-S)

^ 9.5mm (3/8") - Part Number (N806119-S)

Two (2) in-line connectors are required for each splice.

NOTE: TO MAKE INSERTION OF THE BARB CONNECTORS INTO THE NYLON LINE EASIER, THE TUBE END MAY BE SOAKED IN A CUP OF BOILING WATER FOR ONE (1) MINUTE BEFORE PUSHING THE BARB CONNECTOR INTO THE NYLON. USE ROTUNDA TOOL 134-000001 OR EQUIVALENT TO ASSIST IN ASSEMBLY.

5. Set up Rotunda Tool 134-000001 for in-line splice as shown in Figure 1.

a. Select the proper inserts for the fuel line size and install into both sets of upper and lower block cavities.

b. Connect the block cavity to the ratcheting rod of the Rotunda Tool with the slot in line with the slot in the ratcheting tool barrel

c. Install both sets of upper and lower block cavities to the threaded rods of the ratcheting tool, Figure 1.

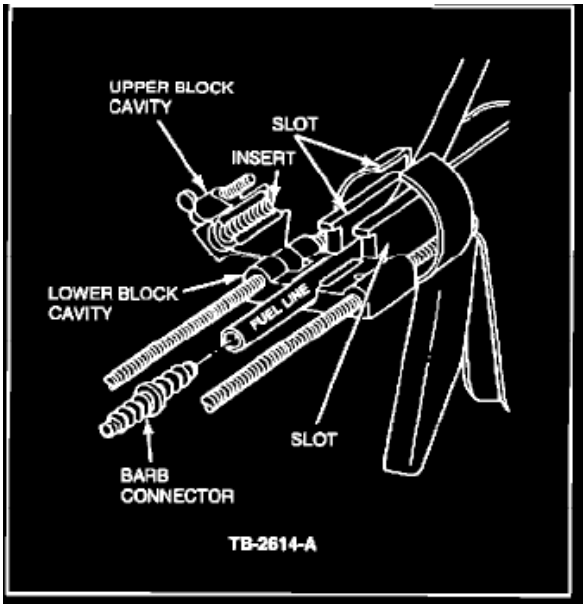


Figure 2

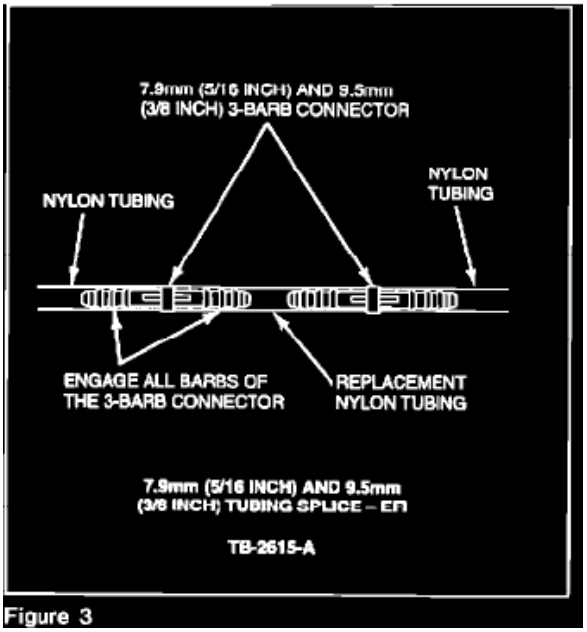


Figure 3

d. Install one fuel line into the lower block cavity closest to the ratcheting end of the tool so that the extension of the fuel line is slightly greater than the barb length of the connector, Figure 2.

e. Route the fuel line through the slot in the tool, Figure 2.

f. Close the upper block cavity onto the lower block cavity and tighten the thumb screw securely.

g. Place the replacement tubing in the forward lower block cavity and repeat Steps d and e.

h. Place the barb connector between the ends of the lines to be spliced and ratchet the tool until the nylon line has covered all three (3) barbs of the connector on both ends.

i. After completing the splice, unscrew the thumb screws and release the lines. Repeat Steps d through h on the opposite line end to complete the splice.

6. The completed fuel line splice is shown in Figure 3.

7. Install any remaining clips which were removed for this service. Check to be sure the fuel lines are secure in the original clips.

8. Start the engine and check for leaks.

PART NUMBER PART NAME CLASS

N806119-S Connector - Hose Push CG

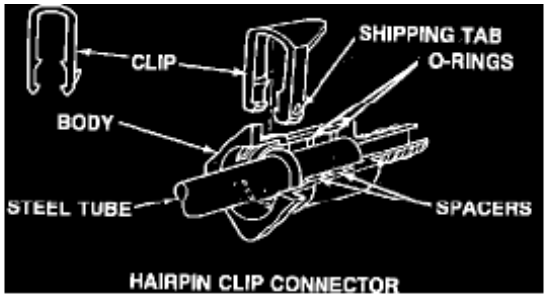
Connect (3/8")

N806120-S Connector - Hose Push CG

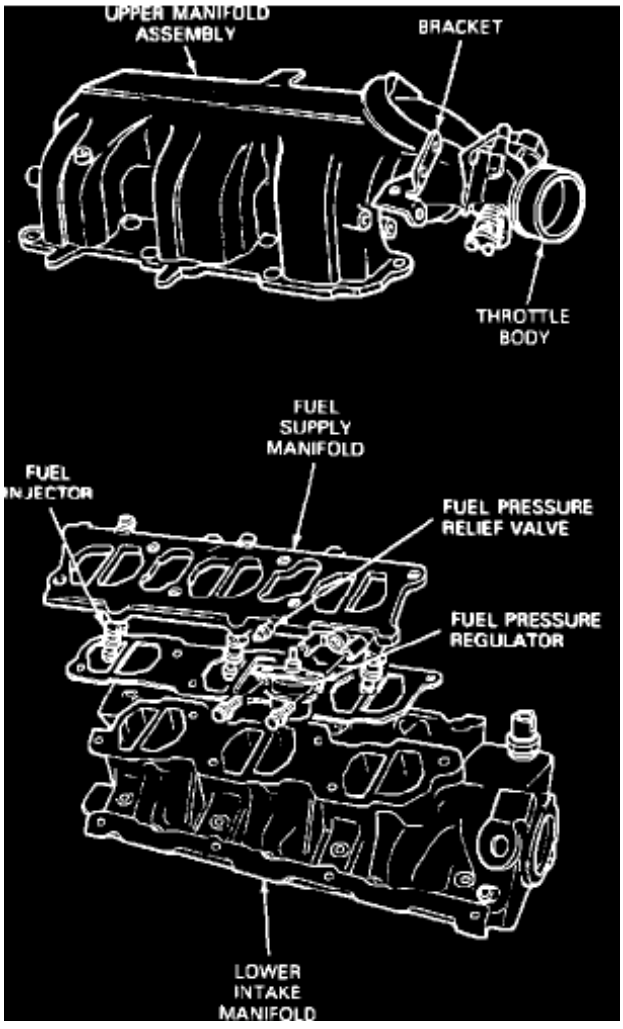
Connect (5/16")

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

404000, 490000



HAIRPIN CLIP CONNECTOR



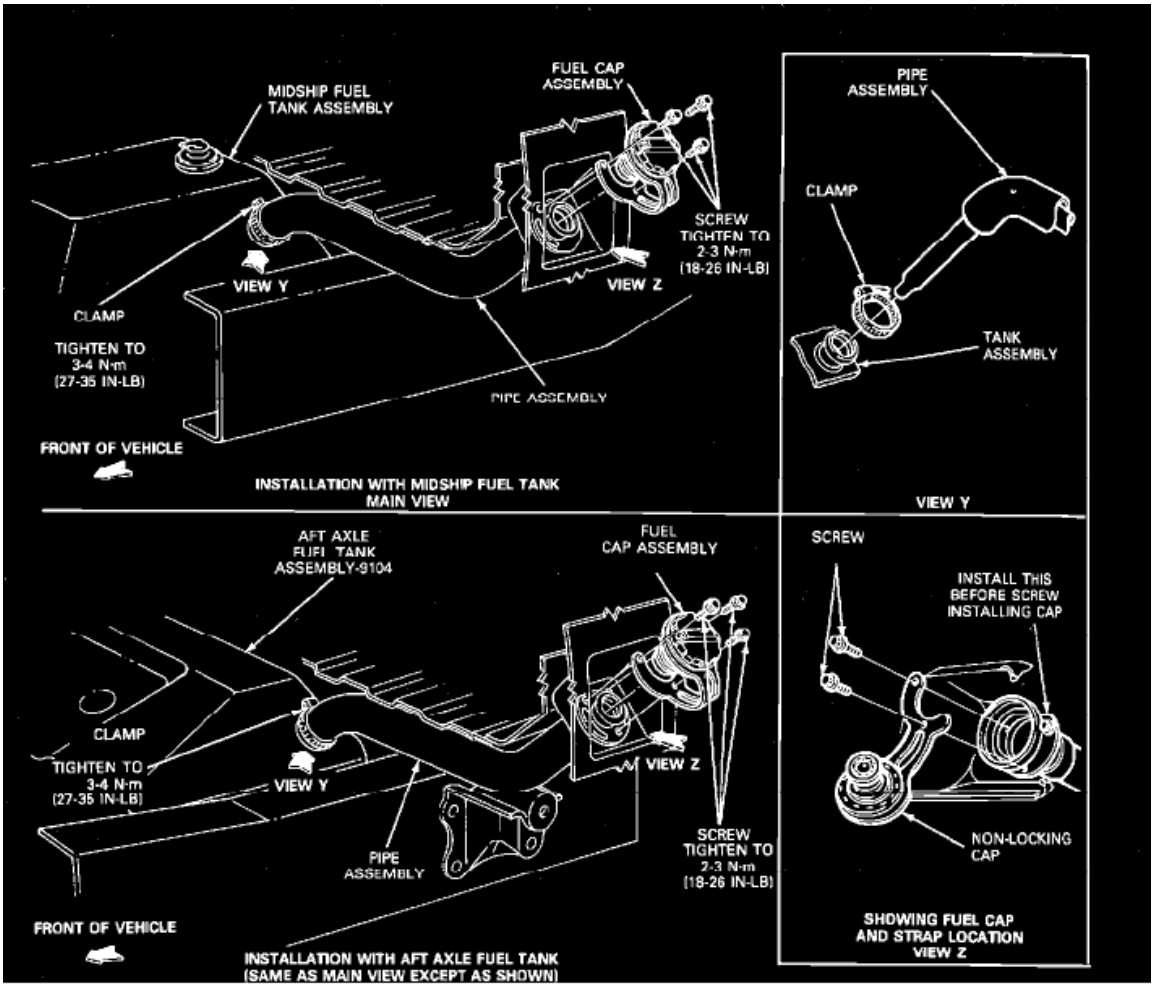
Fuel Return Line: Description and Operation

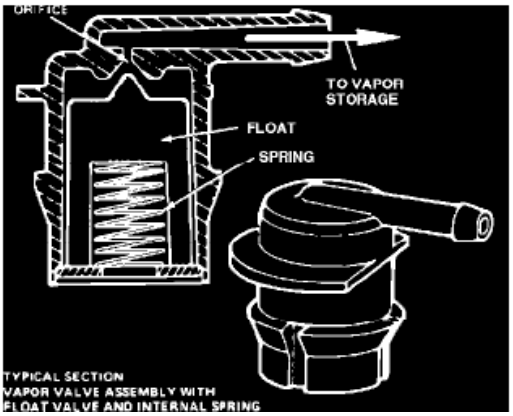
Hairpin Clip Connector

FUEL LINES AND CONNECTORS Fuel injection systems often use special kinds of fittings to ensure leakproof connections. Some high-pressure fittings use O-ring seals instead of the traditional flare connections. The O-rings are made of special materials that can withstand contact with gasoline and alcohol-blend fuels. Whenever you replace one of these O-rings, you must use a new part specifically designed for fuel system service. The O-rings used in air conditioning systems are not satisfactory. Ford uses nylon fuel tubing with several unique push-connect fittings. Special barbed connectors are required to join sections of nylon tubing together. Connectors that join nylon to steel tubing also have barbed ends for the nylon lines, but they use O-rings to seal the steel line. Ford uses two kinds of retainer clips on these connectors. Fittings for 5/16 and 3/8 inch lines have hairpin clips. Fittings for 1/4 inch lines have duckbill clips.

Air Intake Manifold

FUEL SUPPLY MANIFOLD The fuel supply manifold assembly delivers high pressure fuel from the vehicle fuel supply line to the six fuel injectors. The assembly consists of two preformed tubes or stampings, one for fuel supply and one for fuel return. The fuel pressure manifold assembly has six injector connectors, a mounting flange for the fuel pressure regulator, and is mounted to the lower manifold assembly.


MIDSHIP FUEL TANK ASSEMBLY
FUEL CAP ASSEMBLY
SCREW TIGHTEN TO 2-3 N·m (18-26 IN-LB)
VIEW Y
VIEW Z
CLAMP
TIGHTEN TO 3-4 N·m (27-35 IN-LB)
PIPE ASSEMBLY
FRONT OF VEHICLE
INSTALLATION WITH MIDSHIP FUEL TANK
MAIN VIEW
PIPE ASSEMBLY
CLAMP
TANK ASSEMBLY
VIEW Y
AFT AXLE FUEL TANK ASSEMBLY-9104
FUEL CAP ASSEMBLY
CLAMP
TIGHTEN TO 3-4 N·m (27-35 IN-LB)
VIEW Y
VIEW Z
PIPE ASSEMBLY
SCREW TIGHTEN TO 2-3 N·m (18-26 IN-LB)
FRONT OF VEHICLE
INSTALLATION WITH AFT AXLE FUEL TANK
(SAME AS MAIN VIEW EXCEPT AS SHOWN)
SCREW
INSTALL THIS BEFORE SCREW INSTALLING CAP
NON-LOCKING CAP
SHOWING FUEL CAP AND STRAP LOCATION
VIEW Z


ORIFICE
TO VAPOR STORAGE
FLOAT
SPRING
TYPICAL SECTION
VAPOR VALVE ASSEMBLY WITH
FLOAT VALVE AND INTERNAL SPRING

Fuel Filler System

FUEL TANK FILLER NECK

To prevent accidental filling with other than unleaded fuel, vehicles that require unleaded fuel have a special filler tube. This filler tube has a restriction in it so that the only nozzles that can be inserted are the smaller diameter nozzles of pumps dispensing unleaded fuel.

It is recommended that the amount of fuel put in the tank when filling be limited to the automatic pump shutoff. Due to the expansion of fuel during temperature increases, or overfilling ("topping off") can cause fuel overflow at the filler cap when the vehicle is standing or the cap is removed. If the vehicle has two tanks, use fuel from both tanks after fill-up to reduce fuel levels.

Orifice Rollover Valve

ORIFICE/ROLLOVER VALVE ASSEMBLY The orifice valve tends to meter the amount of fuel vapor passing out of the tank. The fuel vapors trapped in the sealed fuel tank are vented through the orifice fuel tank vapor valve assembly. The vapors then leave the valve assembly through a single vapor line and continue to the carbon canister in the engine compartment for storage, until they are purged to the engine.

SEALED FILL CAP The sealed cap incorporates a built-in pressure-vacuum relief valve. Fuel system vacuum relief is provided after approximately .5 inch vacuum is reached inside the tank. Pressure relief is provided when pressure inside the tank builds up approximately 1.8 psi. Under normal operating conditions, the fill cap operates as a check valve preventing vapors from escaping the tank through the cap.

VAPOR VENT In-tank venting provides a vapor space above the gasoline surface in the fuel tank. This area is sufficient to permit adequate breathing space for the tank vapor valve assembly under all static and most dynamic condition.

Fuel Supply Line: Customer Interest Fuel Line - Knocking Noises

Article No. 93-5-11

March 3, 1993

^ FUEL SYSTEM - 4.0L - FUEL LINE "KNOCKING" NOISE

^ NOISE - "KNOCKING" FROM FUEL LINE - 4.0L

LIGHT TRUCK: 1990-92 AEROSTAR, RANGER 1991-92 EXPLORER

This TSB is being republished in its entirety to include additional actions for 1990 model year trucks.

ISSUE: A fuel line "knocking" noise, which sounds like a bearing/piston noise, may occur. This noise is more audible at lower ambient temperatures - below 45~ (7~ C). This noise is caused by hydraulic pulsations in the fuel line.

ACTION: Install a new fuel line assembly (F2TZ-9J338-M). Refer to the following procedure for service details. This repair applies to 1990-92 Rangers, 1991-92 Explorers and 1990-92 Aerostars built before 12-1-91.

1. Confirm that the vehicle has a fuel system knocking concern.

a. Operate the engine at idle.

b. Place a mechanic's stethoscope on the fuel supply line in the engine compartment to verify that the knocking source is in the fuel line.

c. If a fuel line knocking noise is diagnosed, proceed to Step 2.

WARNING: FOLLOW ALL PRE AND POST SERVICE SAFETY PROCEDURES THAT ARE REQUIRED WHEN WORKING ON FUEL SYSTEM COMPONENTS.

2. Remove the fuel supply manifold. Refer to the appropriate Light Truck Service Manual, Section 03-04D, for fuel supply manifold assembly removal procedure.

3. Locate the engine/chassis fuel line couplings in the engine compartment.

a. Remove the fuel line safety clips. Refer to the 1991 Aerostar, Explorer, Ranger Truck Service Manual, Page 10-01-10, for removal information.

b. Disconnect the fuel line spring lock connectors.

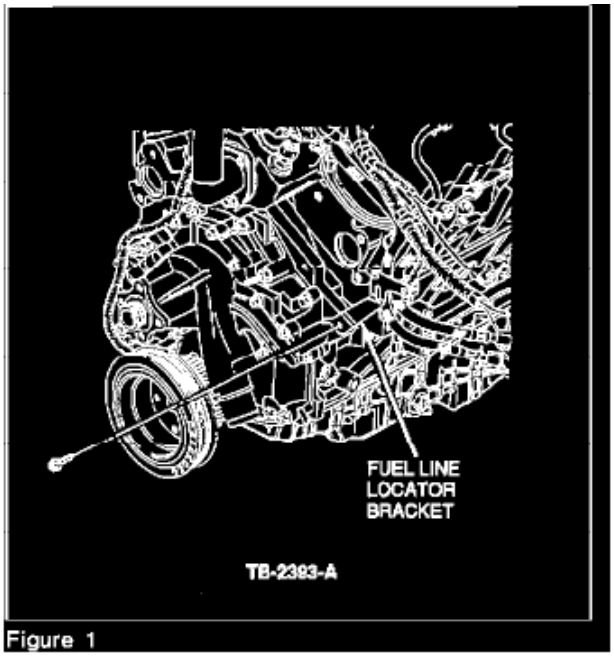


Figure 1

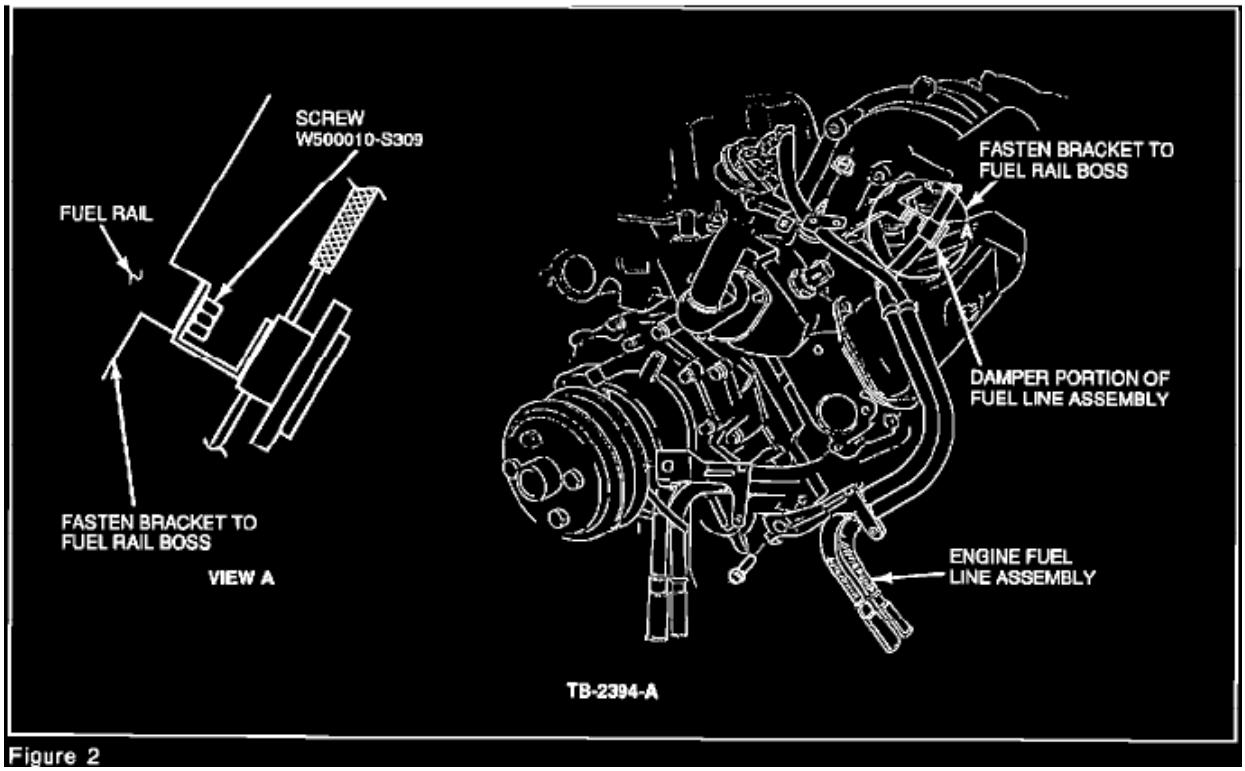


Figure 2

4. Remove the fuel line bracket/cylinder block bolt as shown in Figure 1.

5. Install the new fuel supply manifold (F1TZ-9D280-B). Refer to the appropriate Light Truck Service Manual, Section 03-04D, "Fuel Supply Manifold Assembly - Installation" procedure, Steps 1 to 5 only.

6. Install a new fuel line assembly (F2TZ-9J338-M). Refer to Steps 6, 7 and 8 of the Service Manual procedure.

7. Fasten the fuel line assembly bracket to the cylinder block. Tighten the bolts to 30-41 lb.ft. (40-55 N-m).

8. Locate and fasten the damper portion of the fuel line assembly to the fuel supply manifold using screw (W500010-S309) as shown in Figure 2. Tighten to 6-7 lb.ft. (8-9 N-m).

9. Continue with the "Fuel Supply Manifold Assembly - Installation procedure in the Service Manual, Steps 9 to 13.

10. Connect the fuel line spring lock connectors and reinstall safety clips.

11. Complete the "Fuel Supply Manifold Assembly - Installation" procedure in the Service Manual, Steps 14 and 15.

PART NUMBER	PART NAME	CLASS
F1TZ-9D280-B	Fuel Supply Manifold	C
F2TZ-9J338-M	Fuel Line Assembly (1991/92 Model Vehicles)	C
W500010-S309	M6 Screw	C
F0TZ-9E436-A	Gasket (Fuel Rail - 2 Req.)	B
F1TZ-9C968-A	Pressure Regulator (1990 Models Only)	B
F0TZ-9J338-G	Fuel Line Assembly (1990 Models Only)	C

WARNING: FOLLOW ALL SAFETY/LEAK CHECK PROCEDURES THAT ARE DETAILED IN THE LIGHT TRUCK SERVICE MANUAL FOR FUEL SYSTEM COMPONENTS.

ADDITIONAL ACTIONS FOR 1990 MODEL YEAR TRUCKS

1. After fuel supply manifold removal, follow the "Fuel Pressure Regulator" removal procedure.

2. After "Fuel Supply Manifold - Installation" Step 5, install a new pressure regulator (F1TZ-9C968-A).

3. Install a new fuel line assembly (F0TZ-9J338-G).

SUPERSEDES: 92-19-6, 92-4-12

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models, 1992 Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

930511A Replace Fuel line Assembly 1.8 Hr.

(Ranger And Explorer)

930511B Replace Fuel Line 2.1 Hr.

Assembly (Aerostar)

DEALER CODING BASIC PART NO.

CONDITION CODE

9J338 56

OASIS CODES: 404000, 497000, 702000

Fuel Supply Line: All Technical Service Bulletins Fuel Line - Knocking Noises

Article No. 93-5-11

March 3, 1993

^ FUEL SYSTEM - 4.0L - FUEL LINE "KNOCKING" NOISE

^ NOISE - "KNOCKING" FROM FUEL LINE - 4.0L

LIGHT TRUCK: 1990-92 AEROSTAR, RANGER 1991-92 EXPLORER

This TSB is being republished in its entirety to include additional actions for 1990 model year trucks.

ISSUE: A fuel line "knocking" noise, which sounds like a bearing/piston noise, may occur. This noise is more audible at lower ambient temperatures - below 45~ (7~ C). This noise is caused by hydraulic pulsations in the fuel line.

ACTION: Install a new fuel line assembly (F2TZ-9J338-M). Refer to the following procedure for service details. This repair applies to 1990-92 Rangers, 1991-92 Explorers and 1990-92 Aerostars built before 12-1-91.

1. Confirm that the vehicle has a fuel system knocking concern.

a. Operate the engine at idle.

b. Place a mechanic's stethoscope on the fuel supply line in the engine compartment to verify that the knocking source is in the fuel line.

c. If a fuel line knocking noise is diagnosed, proceed to Step 2.

WARNING: FOLLOW ALL PRE AND POST SERVICE SAFETY PROCEDURES THAT ARE REQUIRED WHEN WORKING ON FUEL SYSTEM COMPONENTS.

2. Remove the fuel supply manifold. Refer to the appropriate Light Truck Service Manual, Section 03-04D, for fuel supply manifold assembly removal procedure.

3. Locate the engine/chassis fuel line couplings in the engine compartment.

a. Remove the fuel line safety clips. Refer to the 1991 Aerostar, Explorer, Ranger Truck Service Manual, Page 10-01-10, for removal information.

b. Disconnect the fuel line spring lock connectors.

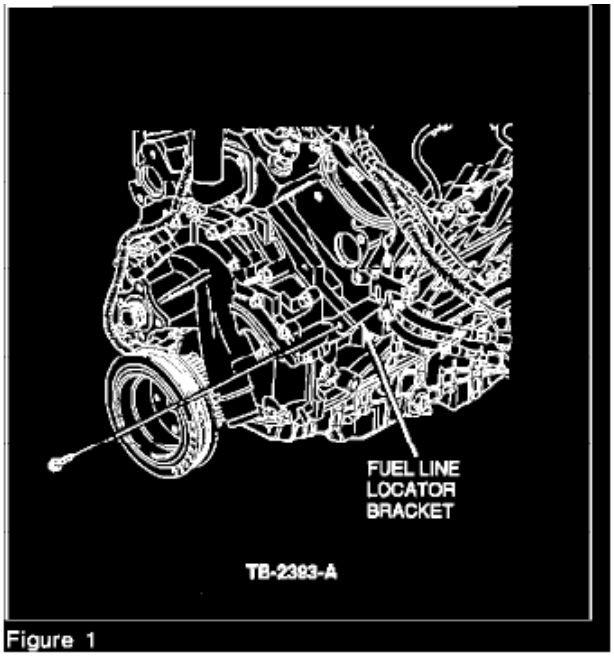


Figure 1

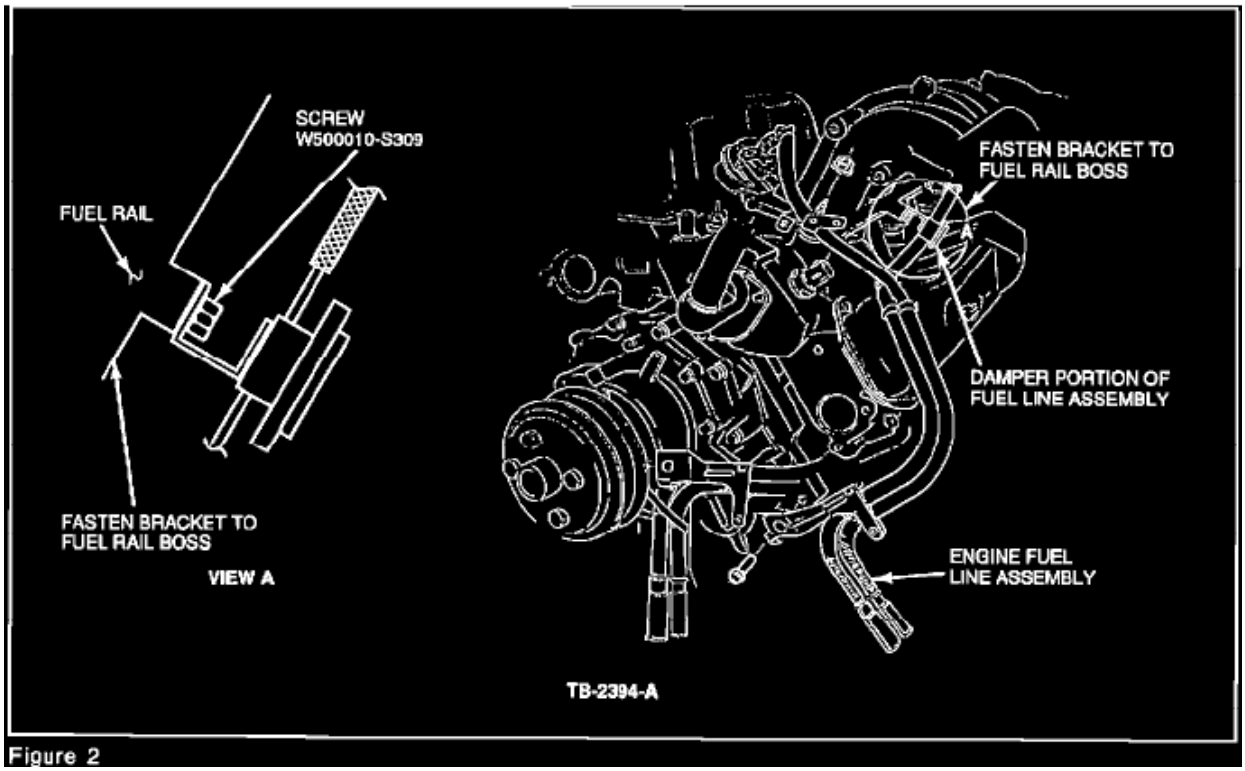


Figure 2

4. Remove the fuel line bracket/cylinder block bolt as shown in Figure 1.

5. Install the new fuel supply manifold (F1TZ-9D280-B). Refer to the appropriate Light Truck Service Manual, Section 03-04D, "Fuel Supply Manifold Assembly - Installation" procedure, Steps 1 to 5 only.

6. Install a new fuel line assembly (F2TZ-9J338-M). Refer to Steps 6, 7 and 8 of the Service Manual procedure.

7. Fasten the fuel line assembly bracket to the cylinder block. Tighten the bolts to 30-41 lb.ft. (40-55 N-m).

8. Locate and fasten the damper portion of the fuel line assembly to the fuel supply manifold using screw (W500010-S309) as shown in Figure 2. Tighten to 6-7 lb.ft. (8-9 N-m).

9. Continue with the "Fuel Supply Manifold Assembly - Installation procedure in the Service Manual, Steps 9 to 13.

10. Connect the fuel line spring lock connectors and reinstall safety clips.

11. Complete the "Fuel Supply Manifold Assembly - Installation" procedure in the Service Manual, Steps 14 and 15.

PART NUMBER	PART NAME	CLASS
F1TZ-9D280-B	Fuel Supply Manifold	C
F2TZ-9J338-M	Fuel Line Assembly (1991/92 Model Vehicles)	C
W500010-S309	M6 Screw	C
F0TZ-9E436-A	Gasket (Fuel Rail - 2 Req.)	B
F1TZ-9C968-A	Pressure Regulator (1990 Models Only)	B
F0TZ-9J338-G	Fuel Line Assembly (1990 Models Only)	C

WARNING: FOLLOW ALL SAFETY/LEAK CHECK PROCEDURES THAT ARE DETAILED IN THE LIGHT TRUCK SERVICE MANUAL FOR FUEL SYSTEM COMPONENTS.

ADDITIONAL ACTIONS FOR 1990 MODEL YEAR TRUCKS

1. After fuel supply manifold removal, follow the "Fuel Pressure Regulator" removal procedure.

2. After "Fuel Supply Manifold - Installation" Step 5, install a new pressure regulator (F1TZ-9C968-A).

3. Install a new fuel line assembly (F0TZ-9J338-G).

SUPERSEDES: 92-19-6, 92-4-12

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models, 1992 Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

930511A Replace Fuel line Assembly 1.8 Hr.

(Ranger And Explorer)

930511B Replace Fuel Line 2.1 Hr.

Assembly (Aerostar)

DEALER CODING BASIC PART NO.

CONDITION CODE

9J338 56

OASIS CODES: 404000, 497000, 702000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Fuel Supply Line > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Fuel Supply Line: > 921216 > Jun > 92 > Nylon Fuel Lines - Servicing Procedure

Fuel Supply Line: All Technical Service Bulletins Nylon Fuel Lines - Servicing Procedure

Article No. 92-12-16

DATE: 06-03-92

FUEL LINES-NYLON-SERVICING PROCEDURE

LIGHT TRUCK: 1985-92 F-150-350 SERIES 1986-90 BRONCO II 1986-92 AEROSTAR, BRONCO, ECONOLINE, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

ISSUE: Metal fuel lines and connectors have been replaced with nylon lines and connectors on the subject vehicles. A procedure has been developed for servicing damaged nylon fuel lines.

ACTION: If a nylon fuel line requires service, use the following procedure.

FUEL SYSTEM SERVICE PROCEDURE FOR NYLON FUEL TUBES AND PUSH CONNECT FITTINGS

FUEL LINES AND HOSES

WARNING: FUEL SUPPLY LINES ON VEHICLES WITH FUEL INJECTED ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUT DOWN WHICH COULD RESULT IN PERSONAL INJURY. THE PRESSURE MUST BE RELIEVED, AS OUTLINED PER THE FUEL SYSTEM PRESSURE RELIEF PROCEDURE, BEFORE SERVICING THE FUEL SYSTEM. READ ALL CAUTIONARY NOTES PRIOR TO RELIEVING THE PRESSURIZED FUEL SYSTEM.

FUEL TUBES - PLASTIC (NYLON)

CAUTION: FORD APPROVED NYLON FUEL TUBING IS MADE FROM MATERIAL WHICH HAS BEEN TESTED AND PROVEN TO BE ACCEPTABLE FOR USE WITH COMMERCIALLY AVAILABLE FUELS. IT IS ALSO RESISTANT TO MOST ENVIRONMENTAL CONDITIONS. AVOID USING ALTERNATE TUBING MATERIALS. USE OF NON-APPROVED TUBING COULD POSE A HAZARD IN SERVICE.

CAUTION: PLASTIC FUEL TUBES MUST NOT BE REPAIRED USING HOSE AND HOSE CLAMPS. PUSH CONNECT FITTINGS CANNOT BE REPAIRED EXCEPT TO REPLACE THE RETAINING CLIPS. IF THE PLASTIC TUBES OR PUSH CONNECT FITTINGS BECOME DAMAGED AND LEAK, APPROVED SERVICE PARTS MUST BE USED TO SERVICE THE FUEL LINES.

MAJOR SERVICE OPERATIONS - FUEL LINES

Vehicles equipped with nylon fuel tubes and push connect fittings have three (3) types of service that can be performed to the fuel lines...

^ Replacing nylon tubing (splicing nylon to nylon)

^ Replacing push connector fittings

^ Replacing damaged push connect tube ends.

NOTE: FORMED SECTIONS (BENDS) OF NYLON FUEL LINES CANNOT BE REPAIRED USING STRAIGHT TUBING. STRAIGHT SERVICE TUBING WILL KINK IF BENT. FORMED NYLON FUEL LINE IS REOUIRED TO REPLACE THE DAMAGED SECTION.

SPLICING NYLON TO NYLON

1. Relieve the fuel system pressure as outlined in the Service Manual. Read the previously cited Warning prior to relieving the pressurized fuel system.

2. Cut out the damaged section of tubing (straight non-formed sections only) and retain as a guide.

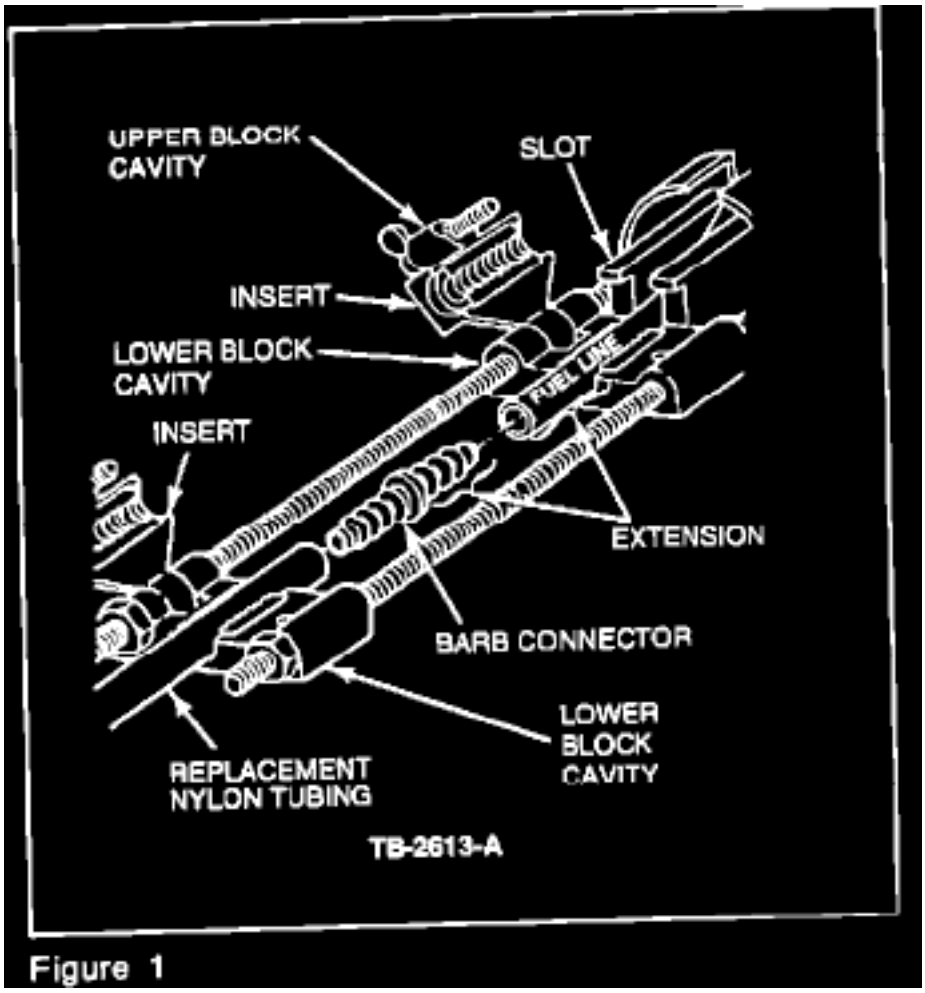


Figure 1

3. Cut a section of nylon service tubing, type 11 or 12, of the same diameter and length as the damaged section of tubing.

NOTE: TYPE 11 OR 12 NYLON SERVICE TUBING IS AVAILABLE IN 6.3MM (1/4"), 7.9MM (5/16") AND 9.5MM (3/8") DIAMETER SIZES.

4. Select the proper nylon barbed connector(s) for completing the splice...

^ 7.9mm (5/16") - Part Number (N806120-S)

^ 9.5mm (3/8") - Part Number (N806119-S)

Two (2) in-line connectors are required for each splice.

NOTE: TO MAKE INSERTION OF THE BARB CONNECTORS INTO THE NYLON LINE EASIER, THE TUBE END MAY BE SOAKED IN A CUP OF BOILING WATER FOR ONE (1) MINUTE BEFORE PUSHING THE BARB CONNECTOR INTO THE NYLON. USE ROTUNDA TOOL 134-000001 OR EQUIVALENT TO ASSIST IN ASSEMBLY.

5. Set up Rotunda Tool 134-000001 for in-line splice as shown in Figure 1.

a. Select the proper inserts for the fuel line size and install into both sets of upper and lower block cavities.

b. Connect the block cavity to the ratcheting rod of the Rotunda Tool with the slot in line with the slot in the ratcheting tool barrel

c. Install both sets of upper and lower block cavities to the threaded rods of the ratcheting tool, Figure 1.

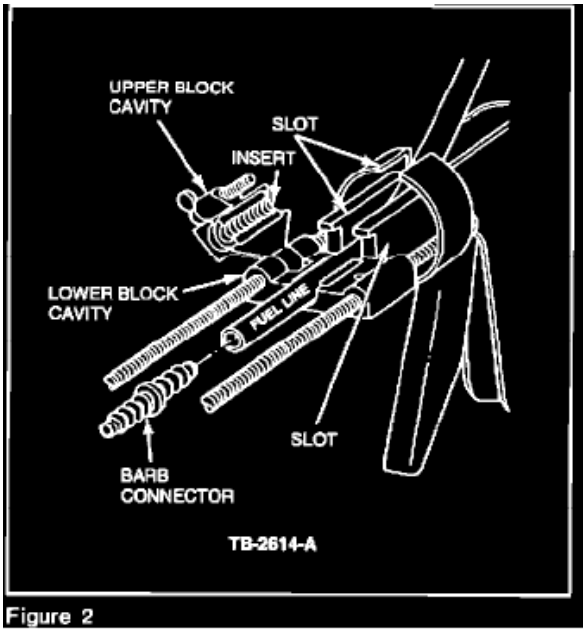


Figure 2

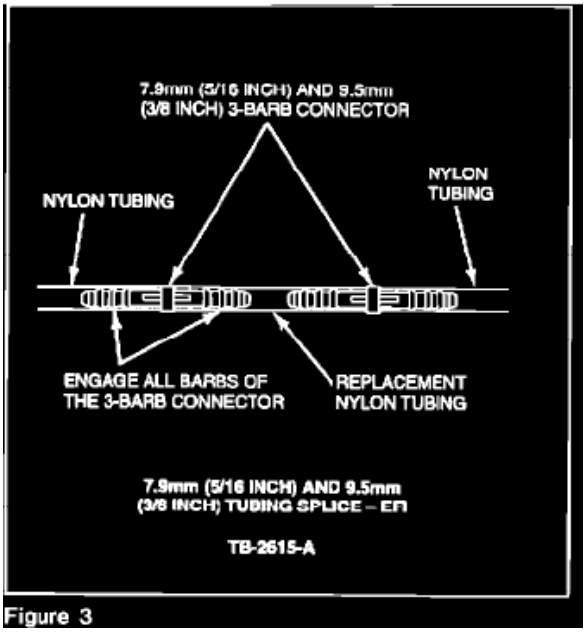


Figure 3

d. Install one fuel line into the lower block cavity closest to the ratcheting end of the tool so that the extension of the fuel line is slightly greater than the barb length of the connector, Figure 2.

e. Route the fuel line through the slot in the tool, Figure 2.

f. Close the upper block cavity onto the lower block cavity and tighten the thumb screw securely.

g. Place the replacement tubing in the forward lower block cavity and repeat Steps d and e.

h. Place the barb connector between the ends of the lines to be spliced and ratchet the tool until the nylon line has covered all three (3) barbs of the connector on both ends.

i. After completing the splice, unscrew the thumb screws and release the lines. Repeat Steps d through h on the opposite line end to complete the splice.

6. The completed fuel line splice is shown in Figure 3.

7. Install any remaining clips which were removed for this service. Check to be sure the fuel lines are secure in the original clips.

8. Start the engine and check for leaks.

PART NUMBER PART NAME CLASS

N806119-S Connector - Hose Push CG

Connect (3/8")

N806120-S Connector - Hose Push CG

Connect (5/16")

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

404000, 490000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Fuel Supply Line > Component Information > Technical Service Bulletins > All Other Service Bulletins for Fuel Supply Line: > 921216 > Jun > 92 > Nylon Fuel Lines - Servicing Procedure

Fuel Supply Line: All Technical Service Bulletins Nylon Fuel Lines - Servicing Procedure

Article No. 92-12-16

DATE: 06-03-92

FUEL LINES-NYLON-SERVICING PROCEDURE

LIGHT TRUCK: 1985-92 F-150-350 SERIES 1986-90 BRONCO II 1986-92 AEROSTAR, BRONCO, ECONOLINE, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

ISSUE: Metal fuel lines and connectors have been replaced with nylon lines and connectors on the subject vehicles. A procedure has been developed for servicing damaged nylon fuel lines.

ACTION: If a nylon fuel line requires service, use the following procedure.

FUEL SYSTEM SERVICE PROCEDURE FOR NYLON FUEL TUBES AND PUSH CONNECT FITTINGS

FUEL LINES AND HOSES

WARNING: FUEL SUPPLY LINES ON VEHICLES WITH FUEL INJECTED ENGINES WILL REMAIN PRESSURIZED FOR LONG PERIODS OF TIME AFTER ENGINE SHUT DOWN WHICH COULD RESULT IN PERSONAL INJURY. THE PRESSURE MUST BE RELIEVED, AS OUTLINED PER THE FUEL SYSTEM PRESSURE RELIEF PROCEDURE, BEFORE SERVICING THE FUEL SYSTEM. READ ALL CAUTIONARY NOTES PRIOR TO RELIEVING THE PRESSURIZED FUEL SYSTEM.

FUEL TUBES - PLASTIC (NYLON)

CAUTION: FORD APPROVED NYLON FUEL TUBING IS MADE FROM MATERIAL WHICH HAS BEEN TESTED AND PROVEN TO BE ACCEPTABLE FOR USE WITH COMMERCIALLY AVAILABLE FUELS. IT IS ALSO RESISTANT TO MOST ENVIRONMENTAL CONDITIONS. AVOID USING ALTERNATE TUBING MATERIALS. USE OF NON-APPROVED TUBING COULD POSE A HAZARD IN SERVICE.

CAUTION: PLASTIC FUEL TUBES MUST NOT BE REPAIRED USING HOSE AND HOSE CLAMPS. PUSH CONNECT FITTINGS CANNOT BE REPAIRED EXCEPT TO REPLACE THE RETAINING CLIPS. IF THE PLASTIC TUBES OR PUSH CONNECT FITTINGS BECOME DAMAGED AND LEAK, APPROVED SERVICE PARTS MUST BE USED TO SERVICE THE FUEL LINES.

MAJOR SERVICE OPERATIONS - FUEL LINES

Vehicles equipped with nylon fuel tubes and push connect fittings have three (3) types of service that can be performed to the fuel lines...

^ Replacing nylon tubing (splicing nylon to nylon)

^ Replacing push connector fittings

^ Replacing damaged push connect tube ends.

NOTE: FORMED SECTIONS (BENDS) OF NYLON FUEL LINES CANNOT BE REPAIRED USING STRAIGHT TUBING. STRAIGHT SERVICE TUBING WILL KINK IF BENT. FORMED NYLON FUEL LINE IS REOUIRED TO REPLACE THE DAMAGED SECTION.

SPLICING NYLON TO NYLON

1. Relieve the fuel system pressure as outlined in the Service Manual. Read the previously cited Warning prior to relieving the pressurized fuel system.

2. Cut out the damaged section of tubing (straight non-formed sections only) and retain as a guide.

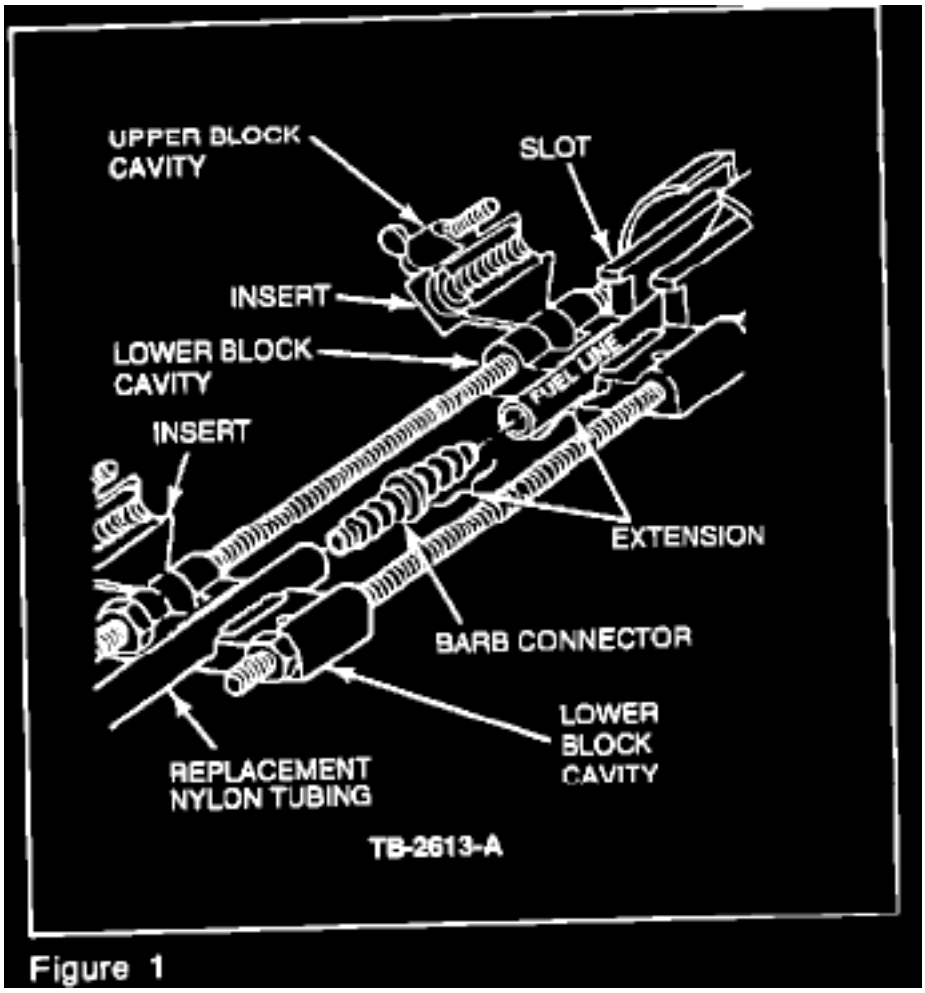


Figure 1

3. Cut a section of nylon service tubing, type 11 or 12, of the same diameter and length as the damaged section of tubing.

NOTE: TYPE 11 OR 12 NYLON SERVICE TUBING IS AVAILABLE IN 6.3MM (1/4"), 7.9MM (5/16") AND 9.5MM (3/8") DIAMETER SIZES.

4. Select the proper nylon barbed connector(s) for completing the splice...

^ 7.9mm (5/16") - Part Number (N806120-S)

^ 9.5mm (3/8") - Part Number (N806119-S)

Two (2) in-line connectors are required for each splice.

NOTE: TO MAKE INSERTION OF THE BARB CONNECTORS INTO THE NYLON LINE EASIER, THE TUBE END MAY BE SOAKED IN A CUP OF BOILING WATER FOR ONE (1) MINUTE BEFORE PUSHING THE BARB CONNECTOR INTO THE NYLON. USE ROTUNDA TOOL 134-000001 OR EQUIVALENT TO ASSIST IN ASSEMBLY.

5. Set up Rotunda Tool 134-000001 for in-line splice as shown in Figure 1.

a. Select the proper inserts for the fuel line size and install into both sets of upper and lower block cavities.

b. Connect the block cavity to the ratcheting rod of the Rotunda Tool with the slot in line with the slot in the ratcheting tool barrel

c. Install both sets of upper and lower block cavities to the threaded rods of the ratcheting tool, Figure 1.

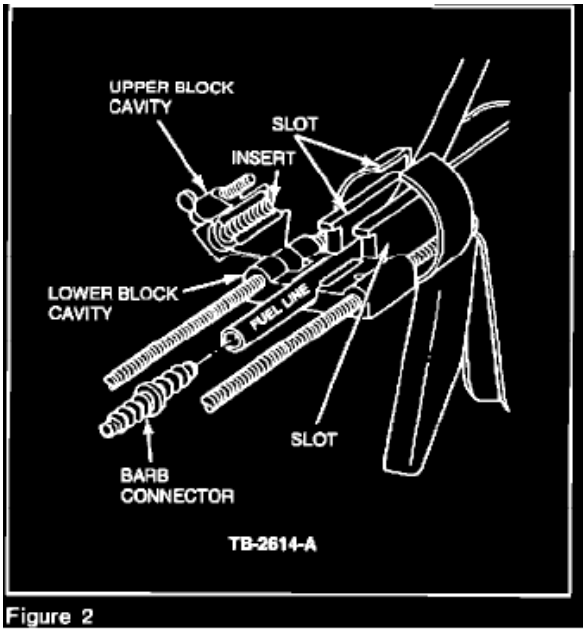


Figure 2

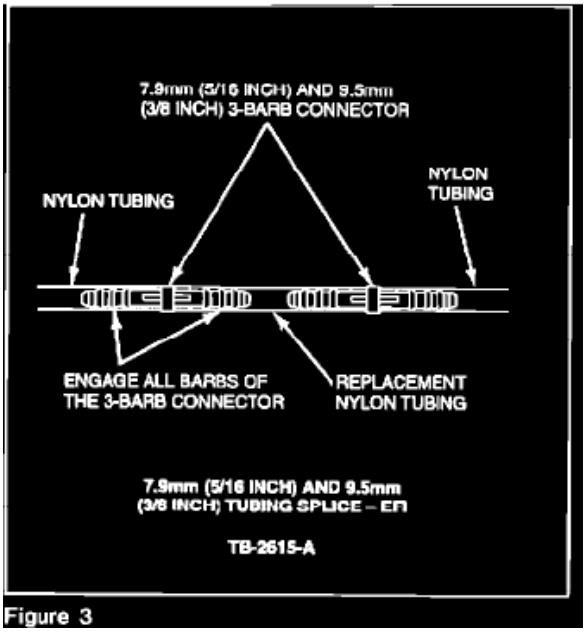


Figure 3

d. Install one fuel line into the lower block cavity closest to the ratcheting end of the tool so that the extension of the fuel line is slightly greater than the barb length of the connector, Figure 2.

e. Route the fuel line through the slot in the tool, Figure 2.

f. Close the upper block cavity onto the lower block cavity and tighten the thumb screw securely.

g. Place the replacement tubing in the forward lower block cavity and repeat Steps d and e.

h. Place the barb connector between the ends of the lines to be spliced and ratchet the tool until the nylon line has covered all three (3) barbs of the connector on both ends.

i. After completing the splice, unscrew the thumb screws and release the lines. Repeat Steps d through h on the opposite line end to complete the splice.

6. The completed fuel line splice is shown in Figure 3.

7. Install any remaining clips which were removed for this service. Check to be sure the fuel lines are secure in the original clips.

8. Start the engine and check for leaks.

PART NUMBER PART NAME CLASS

N806119-S Connector - Hose Push CG

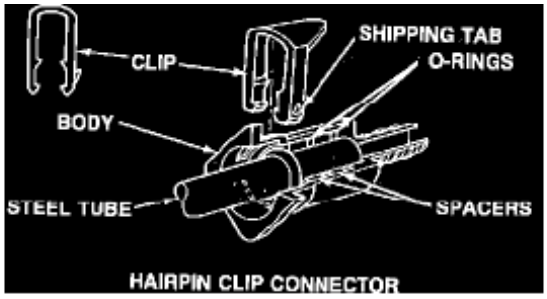
Connect (3/8")

N806120-S Connector - Hose Push CG

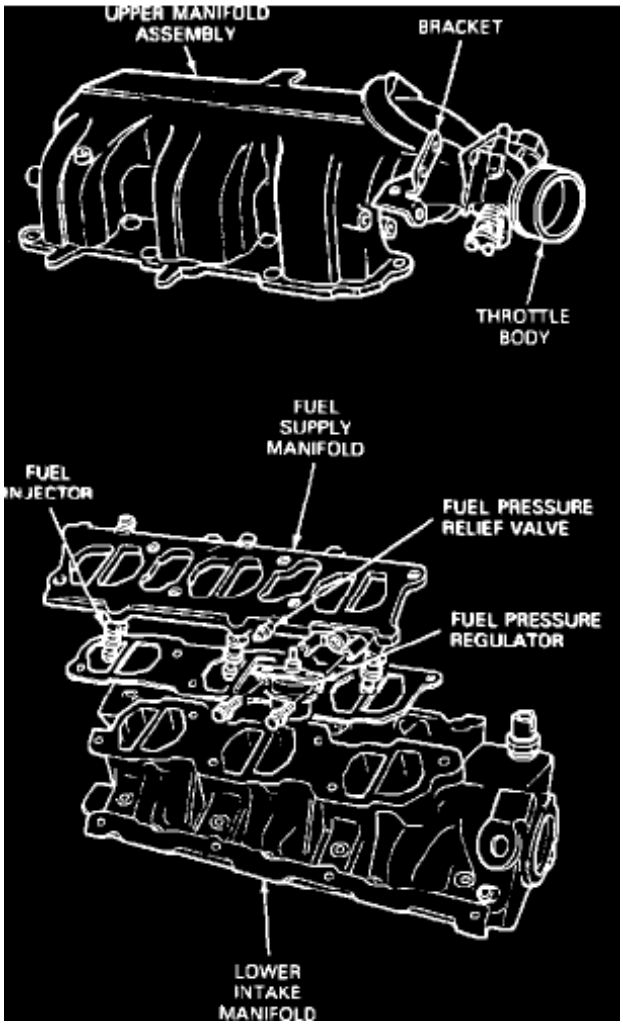
Connect (5/16")

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

404000, 490000



HAIRPIN CLIP CONNECTOR



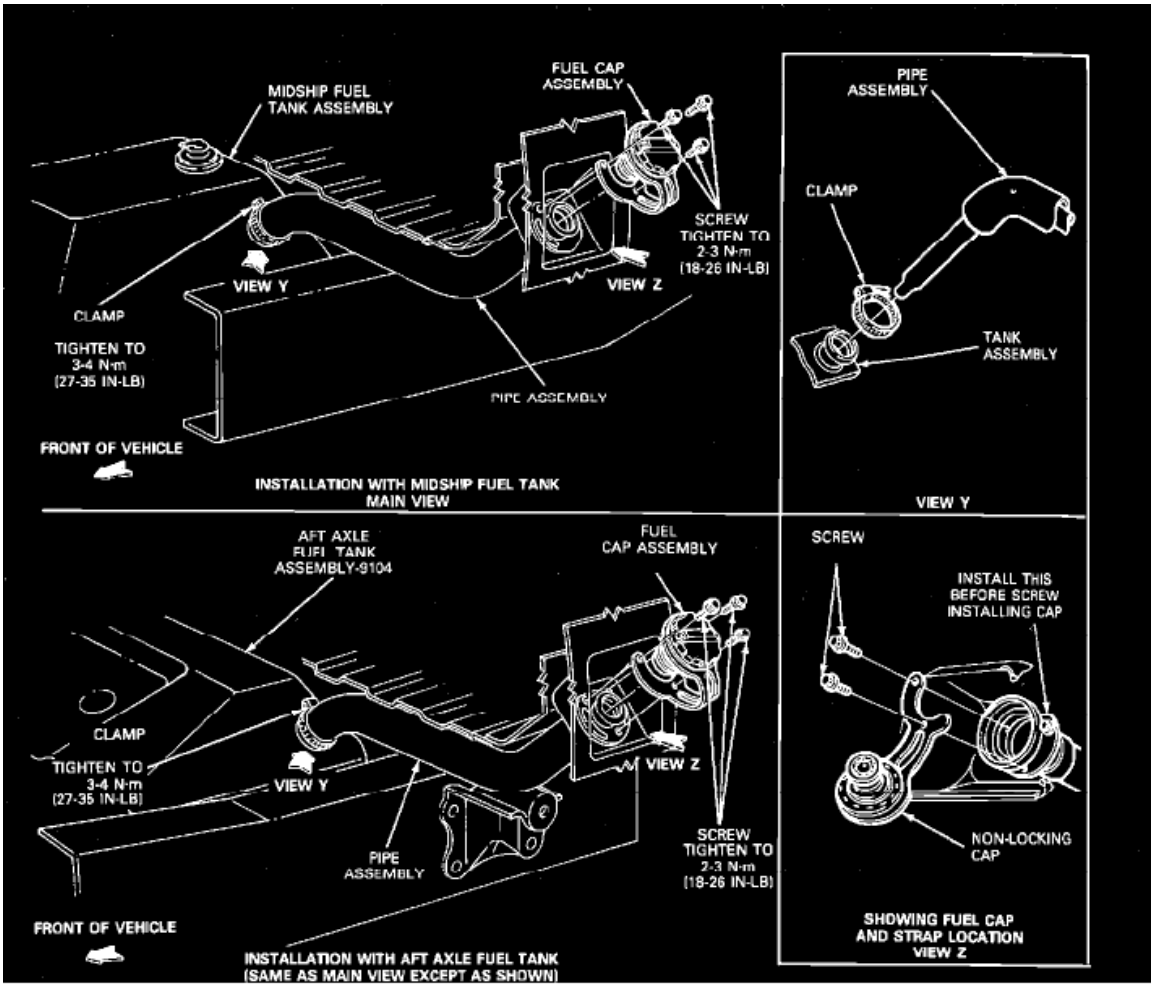
Fuel Supply Line: Description and Operation

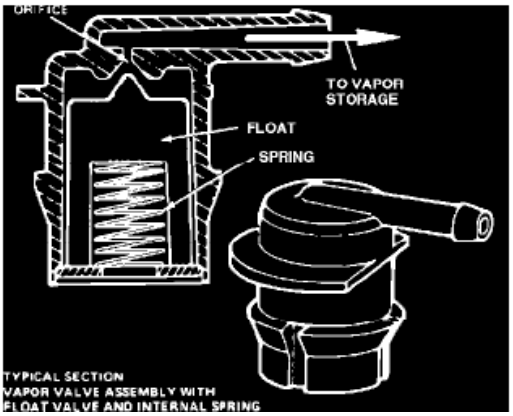
Hairpin Clip Connector

FUEL LINES AND CONNECTORS Fuel injection systems often use special kinds of fittings to ensure leakproof connections. Some high-pressure fittings use O-ring seals instead of the traditional flare connections. The O-rings are made of special materials that can withstand contact with gasoline and alcohol-blend fuels. Whenever you replace one of these O-rings, you must use a new part specifically designed for fuel system service. The O-rings used in air conditioning systems are not satisfactory. Ford uses nylon fuel tubing with several unique push-connect fittings. Special barbed connectors are required to join sections of nylon tubing together. Connectors that join nylon to steel tubing also have barbed ends for the nylon lines, but they use O-rings to seal the steel line. Ford uses two kinds of retainer clips on these connectors. Fittings for 5/16 and 3/8 inch lines have hairpin clips. Fittings for 1/4 inch lines have duckbill clips.

Air Intake Manifold

FUEL SUPPLY MANIFOLD The fuel supply manifold assembly delivers high pressure fuel from the vehicle fuel supply line to the six fuel injectors. The assembly consists of two preformed tubes or stampings, one for fuel supply and one for fuel return. The fuel pressure manifold assembly has six injector connectors, a mounting flange for the fuel pressure regulator, and is mounted to the lower manifold assembly.


MIDSHIP FUEL TANK ASSEMBLY
FUEL CAP ASSEMBLY
SCREW TIGHTEN TO 2-3 N·m (18-26 IN-LB)
VIEW Y
VIEW Z
CLAMP
TIGHTEN TO 3-4 N·m (27-35 IN-LB)
PIPE ASSEMBLY
FRONT OF VEHICLE
INSTALLATION WITH MIDSHIP FUEL TANK
MAIN VIEW
PIPE ASSEMBLY
CLAMP
TANK ASSEMBLY
VIEW Y
AFT AXLE FUEL TANK ASSEMBLY-9104
FUEL CAP ASSEMBLY
CLAMP
TIGHTEN TO 3-4 N·m (27-35 IN-LB)
VIEW Y
VIEW Z
PIPE ASSEMBLY
SCREW TIGHTEN TO 2-3 N·m (18-26 IN-LB)
FRONT OF VEHICLE
INSTALLATION WITH AFT AXLE FUEL TANK
(SAME AS MAIN VIEW EXCEPT AS SHOWN)
SCREW
INSTALL THIS BEFORE SCREW INSTALLING CAP
NON-LOCKING CAP
SHOWING FUEL CAP AND STRAP LOCATION
VIEW Z


ORIFICE
TO VAPOR STORAGE
FLOAT
SPRING
TYPICAL SECTION
VAPOR VALVE ASSEMBLY WITH
FLOAT VALVE AND INTERNAL SPRING

Fuel Filler System

FUEL TANK FILLER NECK

To prevent accidental filling with other than unleaded fuel, vehicles that require unleaded fuel have a special filler tube. This filler tube has a restriction in it so that the only nozzles that can be inserted are the smaller diameter nozzles of pumps dispensing unleaded fuel.

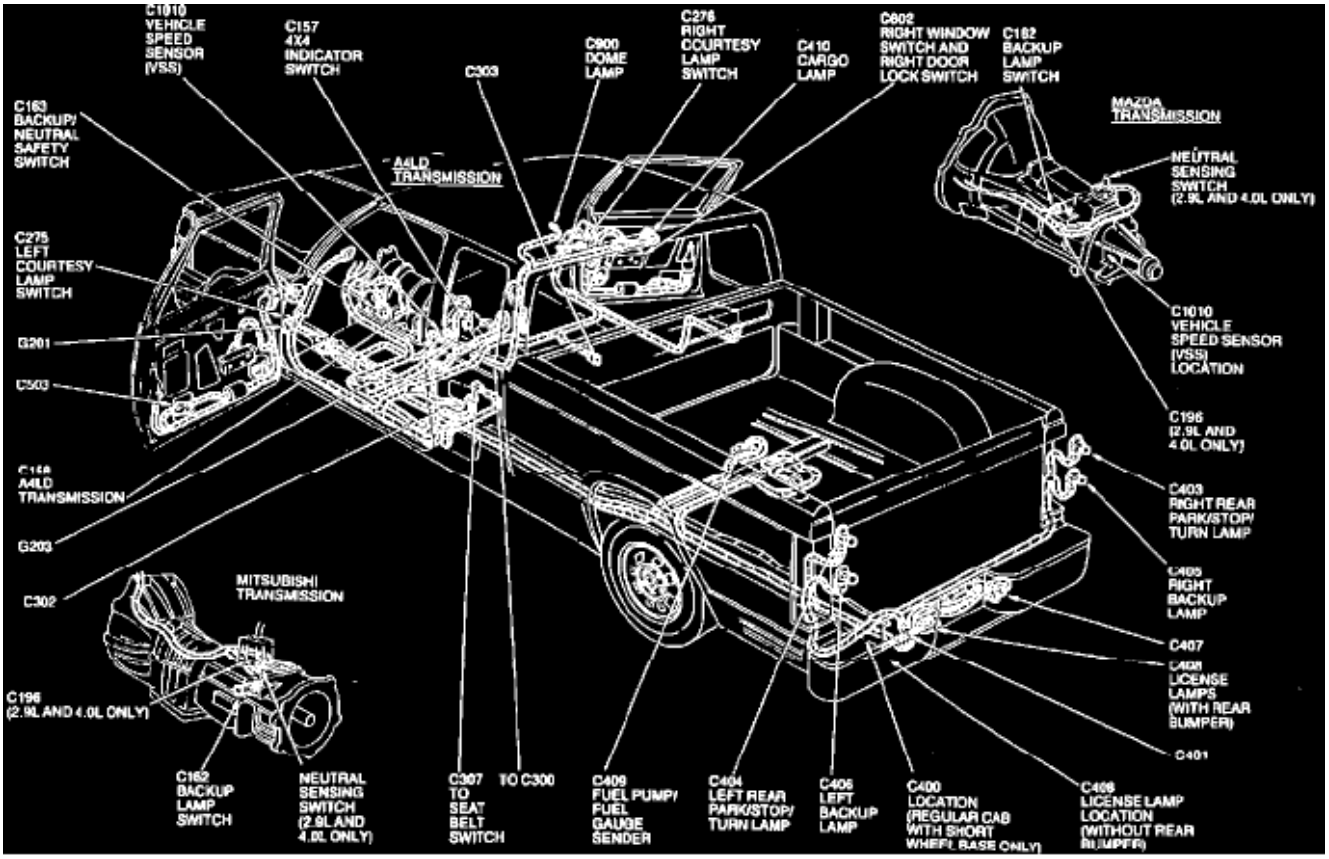
It is recommended that the amount of fuel put in the tank when filling be limited to the automatic pump shutoff. Due to the expansion of fuel during temperature increases, or overfilling ("topping off") can cause fuel overflow at the filler cap when the vehicle is standing or the cap is removed. If the vehicle has two tanks, use fuel from both tanks after fill-up to reduce fuel levels.

Orifice Rollover Valve

ORIFICE/ROLLOVER VALVE ASSEMBLY The orifice valve tends to meter the amount of fuel vapor passing out of the tank. The fuel vapors trapped in the sealed fuel tank are vented through the orifice fuel tank vapor valve assembly. The vapors then leave the valve assembly through a single vapor line and continue to the carbon canister in the engine compartment for storage, until they are purged to the engine.

SEALED FILL CAP The sealed cap incorporates a built-in pressure-vacuum relief valve. Fuel system vacuum relief is provided after approximately .5 inch vacuum is reached inside the tank. Pressure relief is provided when pressure inside the tank builds up approximately 1.8 psi. Under normal operating conditions, the fill cap operates as a check valve preventing vapors from escaping the tank through the cap.

VAPOR VENT In-tank venting provides a vapor space above the gasoline surface in the fuel tank. This area is sufficient to permit adequate breathing space for the tank vapor valve assembly under all static and most dynamic condition.



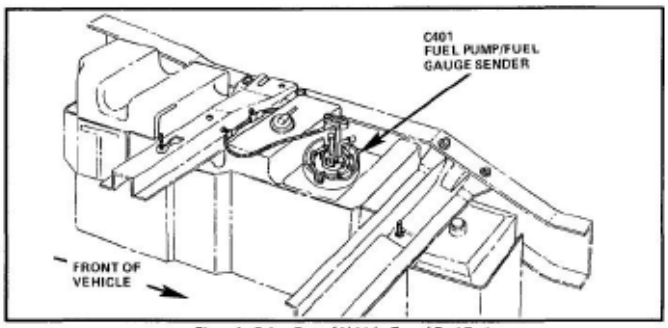
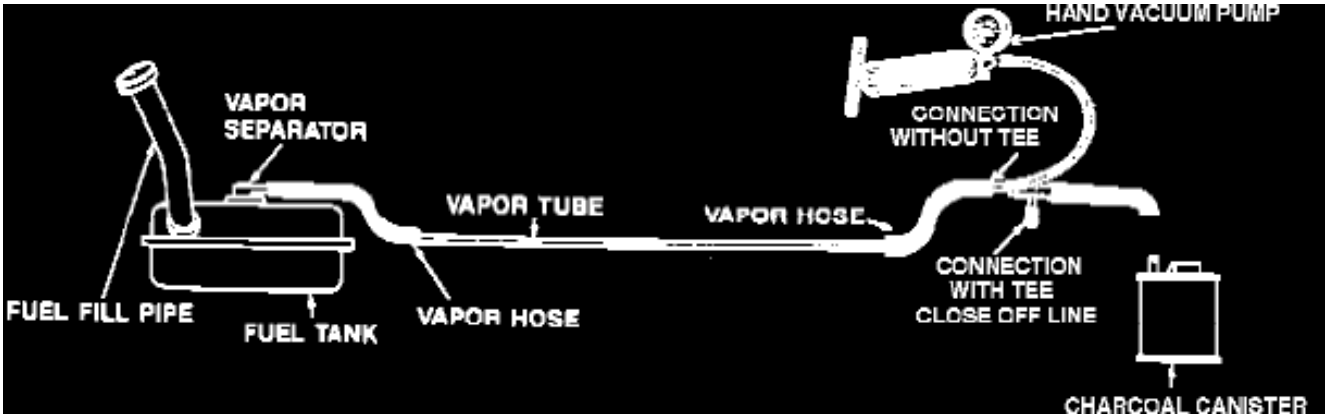


Figure 1 - Below Rear of Vehicle, Top of Fuel Tank

Fuel Gauge Sender: Locations

Body Components

Below Rear Of Vehicle, Top Center Of Fuel Tank



Fuel Tank Pressure Release Valve: Testing and Inspection

Testing Fuel Tank Ventilation System

1. Check for broken seals at the filler cap, filler neck, the tank vapor vent valve, and between hose/tubing connections. Make repairs as necessary.

2. Check the vacuum and vapor hoses for kinks, cuts, cracks, and blockage. Make repairs as necessary.

3. Connect a hand vacuum pump to the fuel tank vapor vent line at the canister.

4. Apply 2.5 inches of vacuum. CAUTION: DO NOT apply any more than 2.5" vacuum. Vacuum should hold. If not, inspect hoses for leakage points.

5. Open the fuel tank filler cap. Applied vacuum at the pump should drop to 0 immediately. If not, inspect hoses for blockage.

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

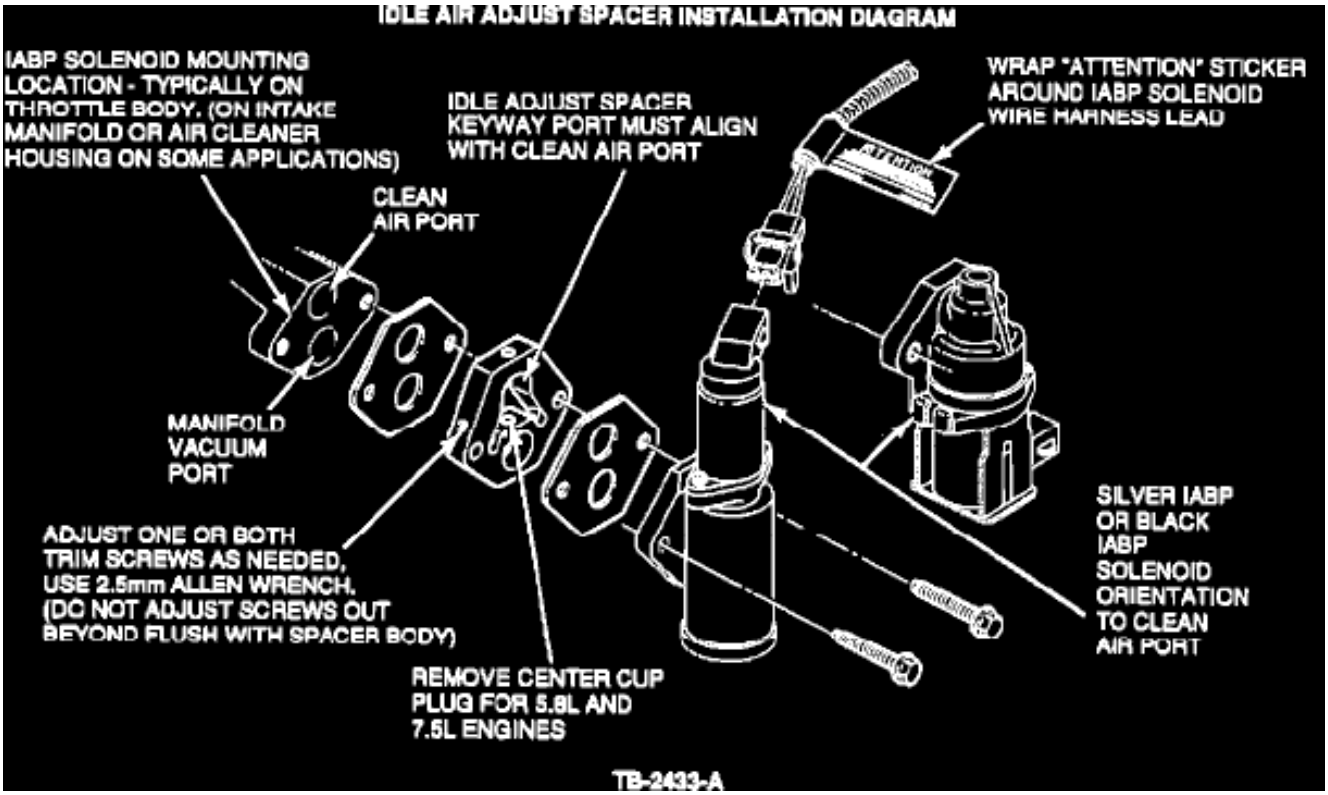
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

TB-2434-A

Figure 3

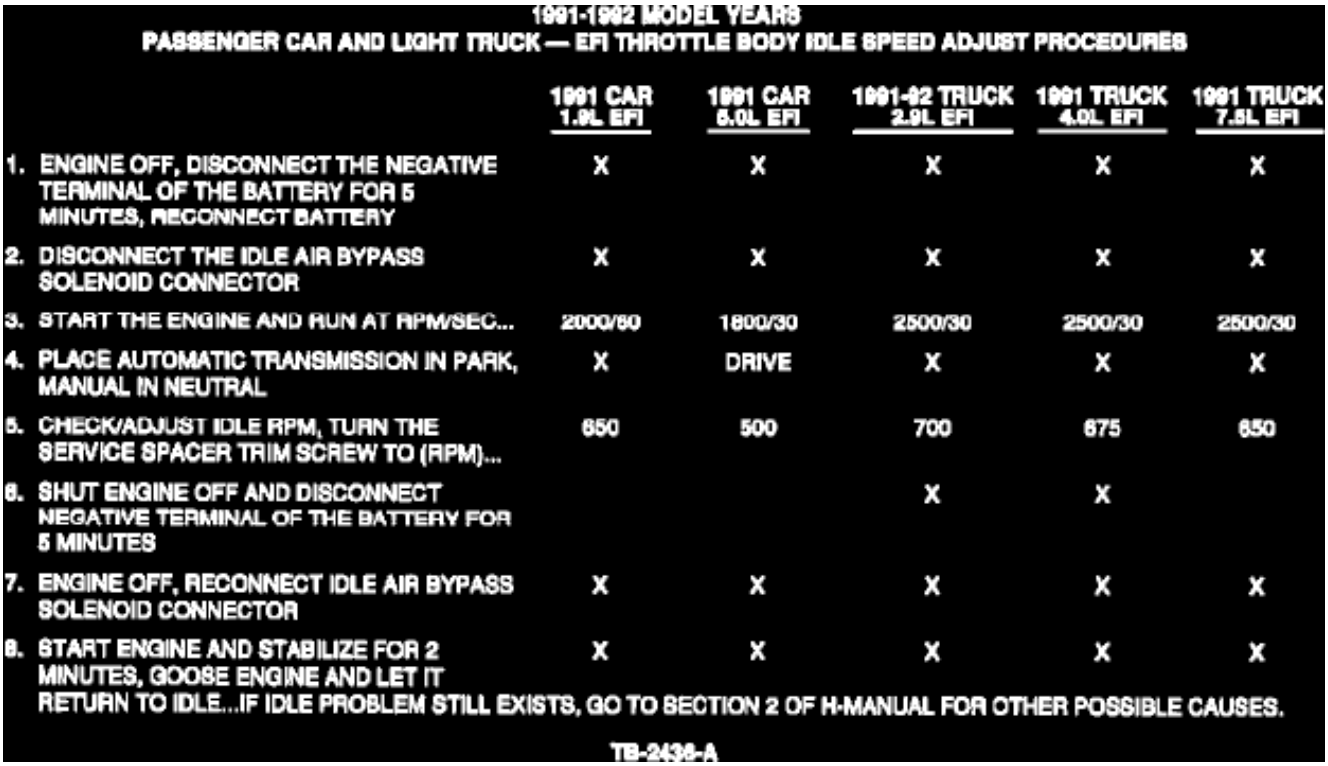
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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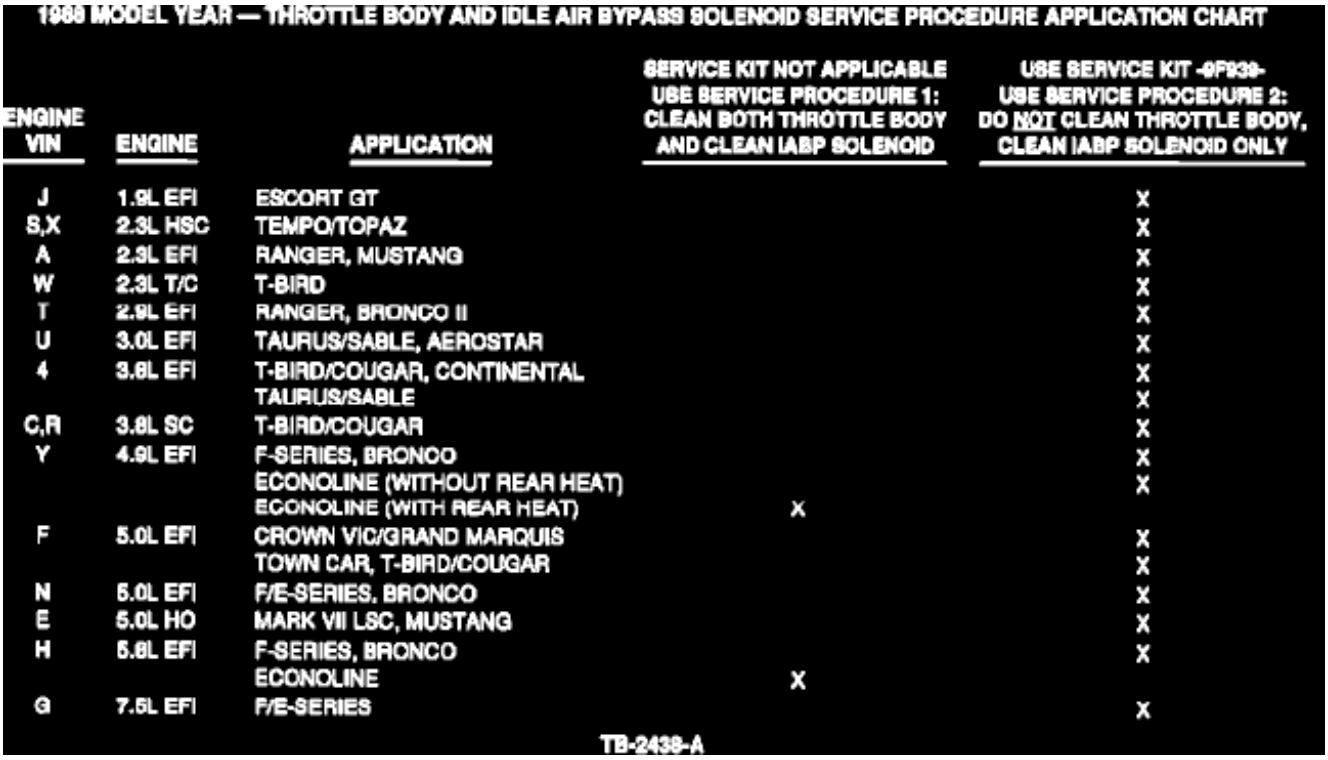
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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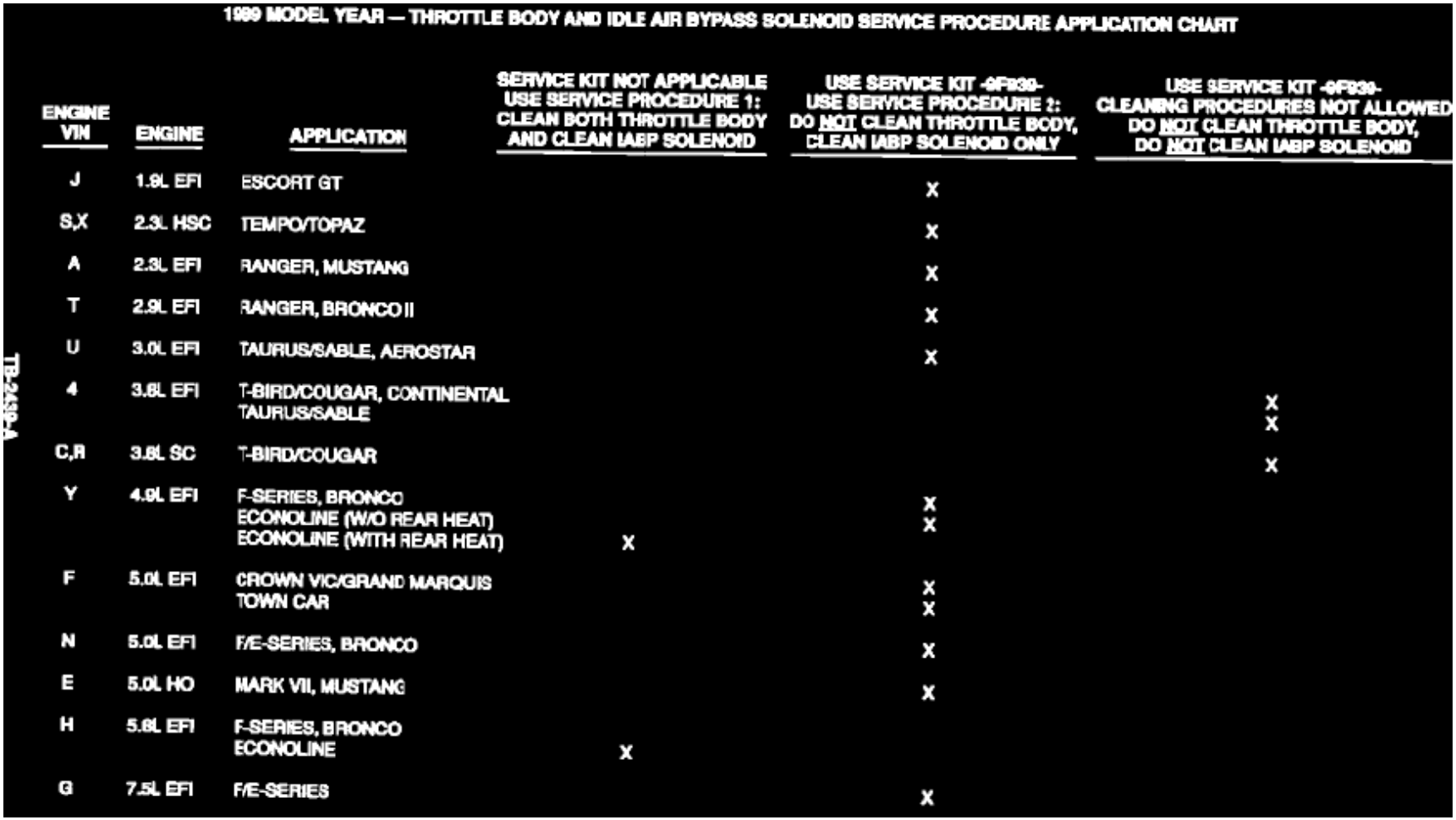
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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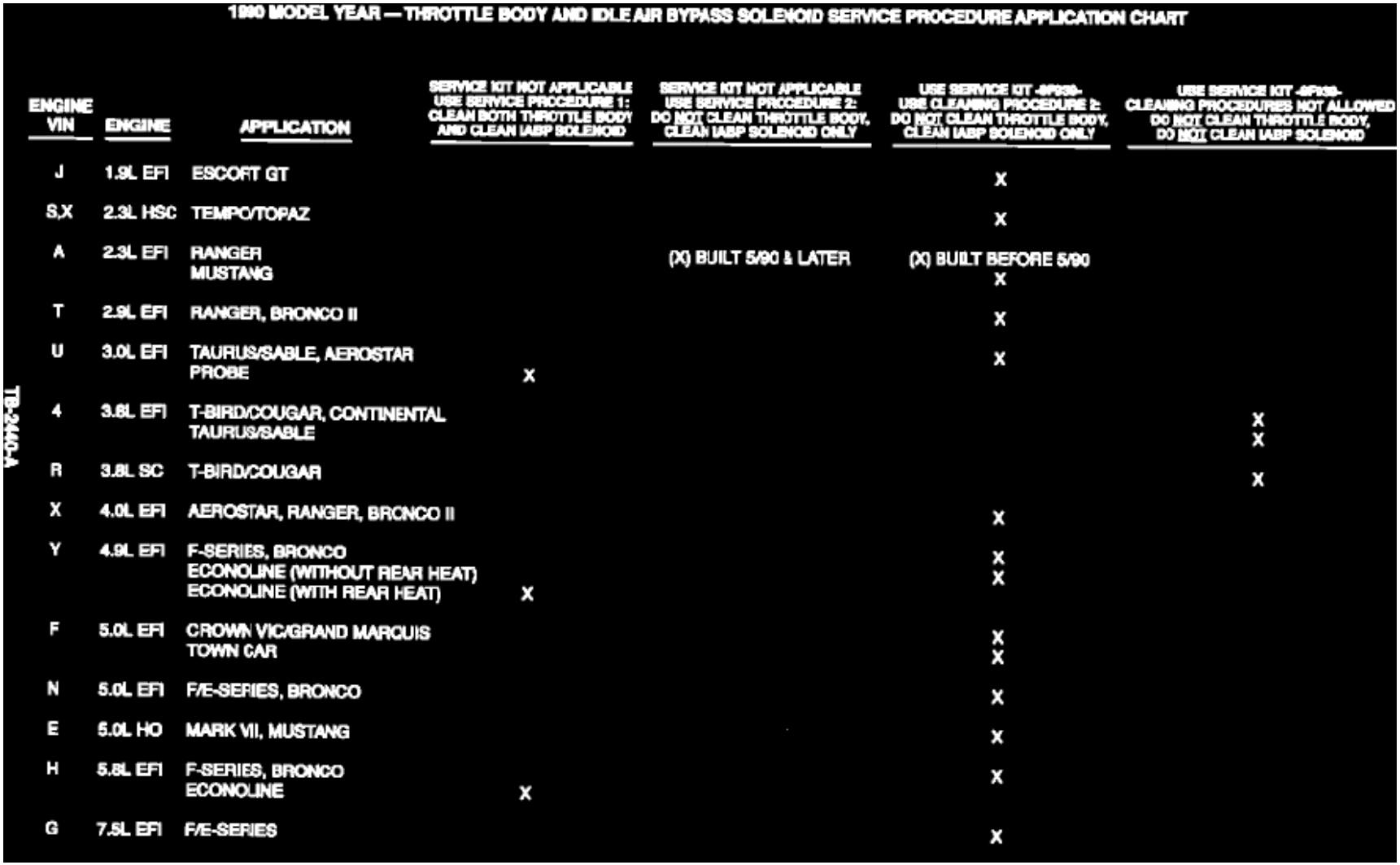
Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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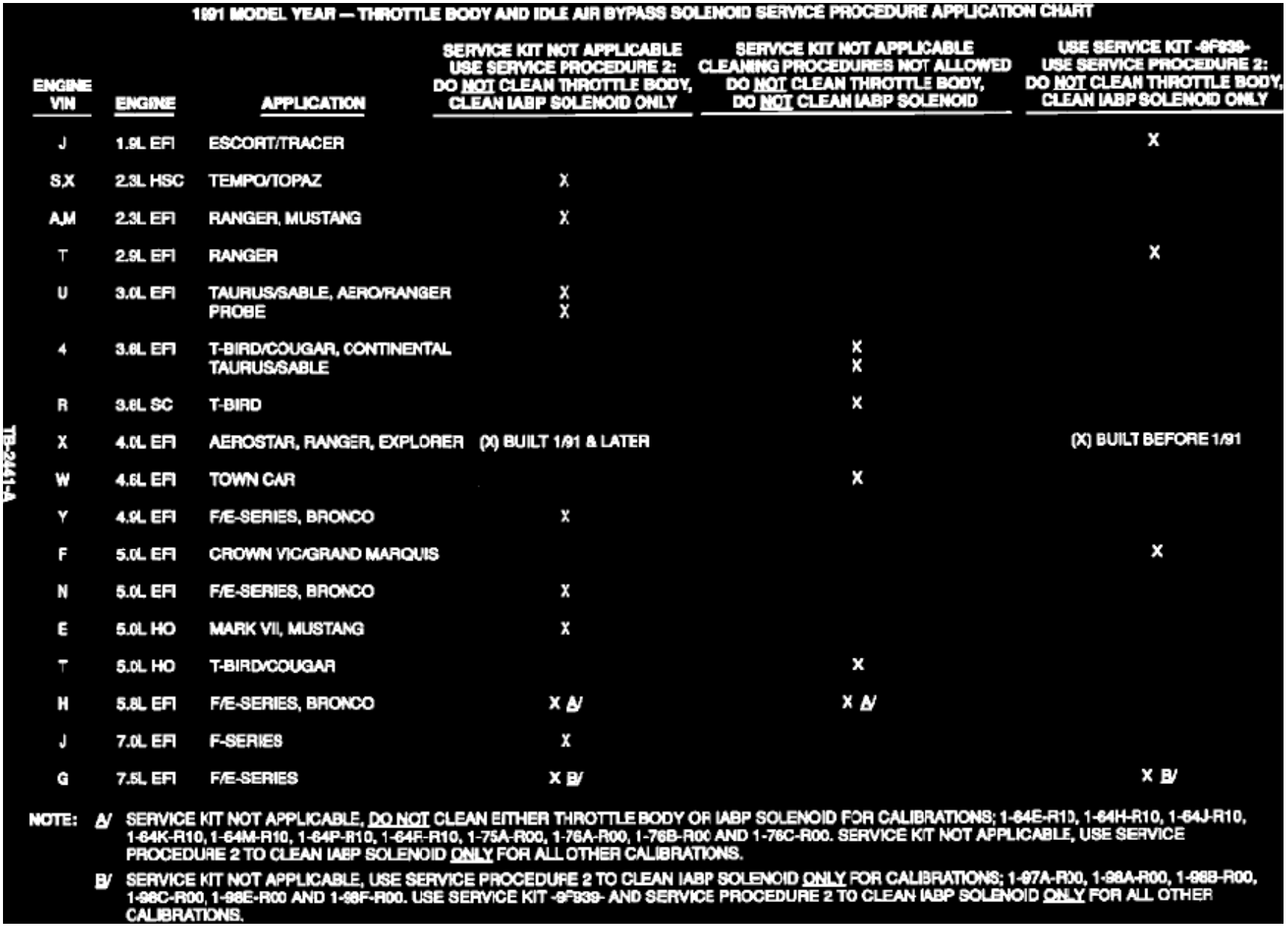
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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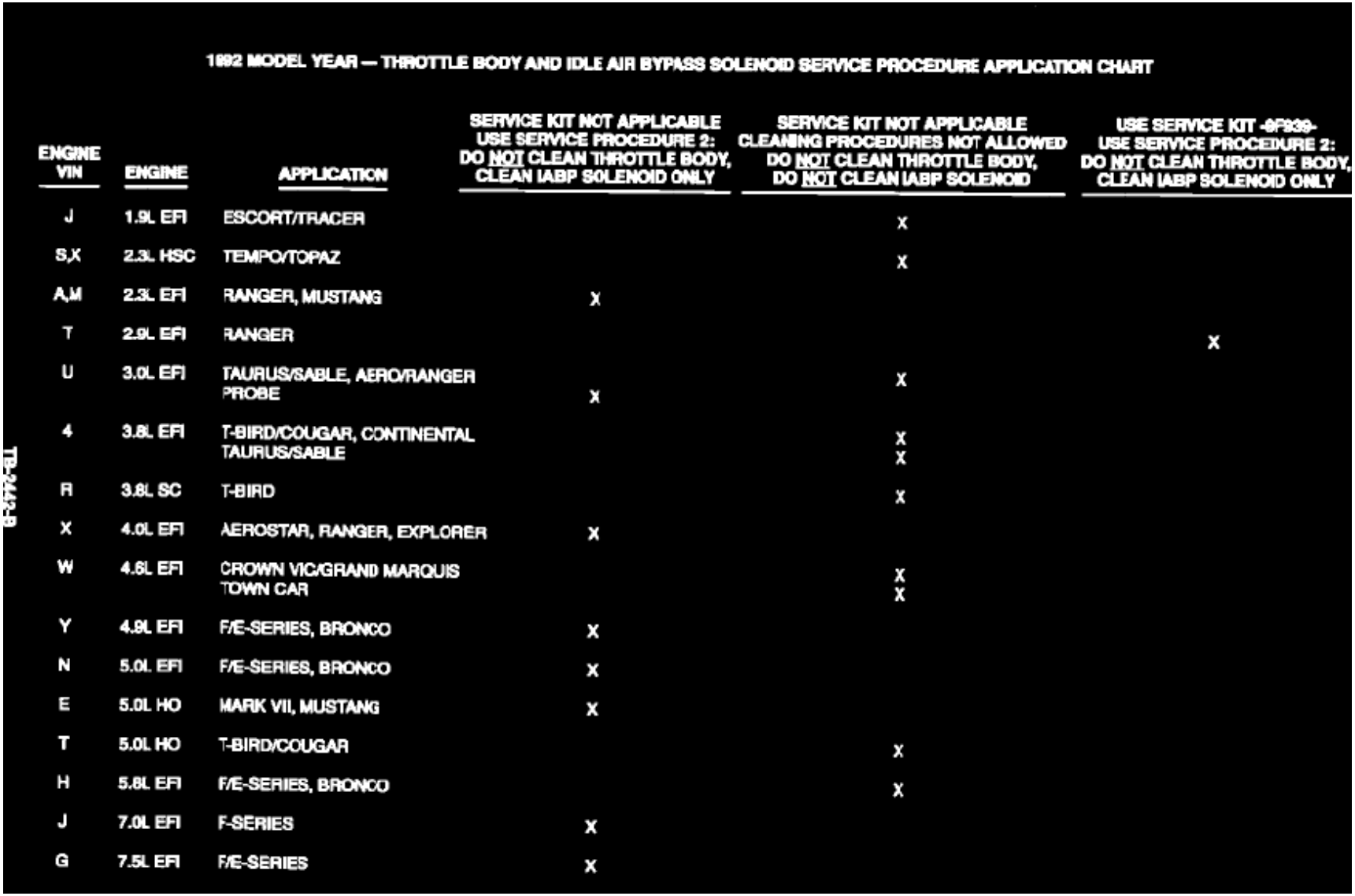
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

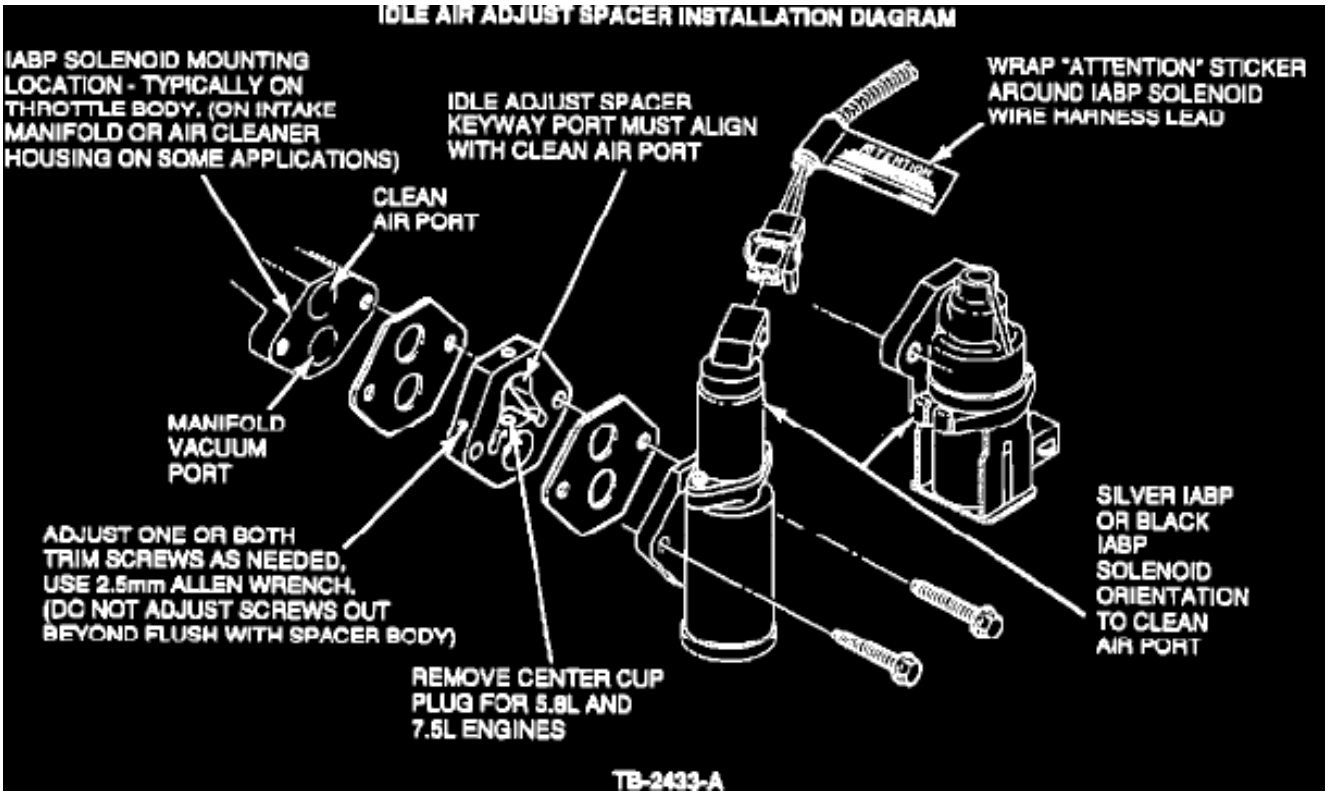
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

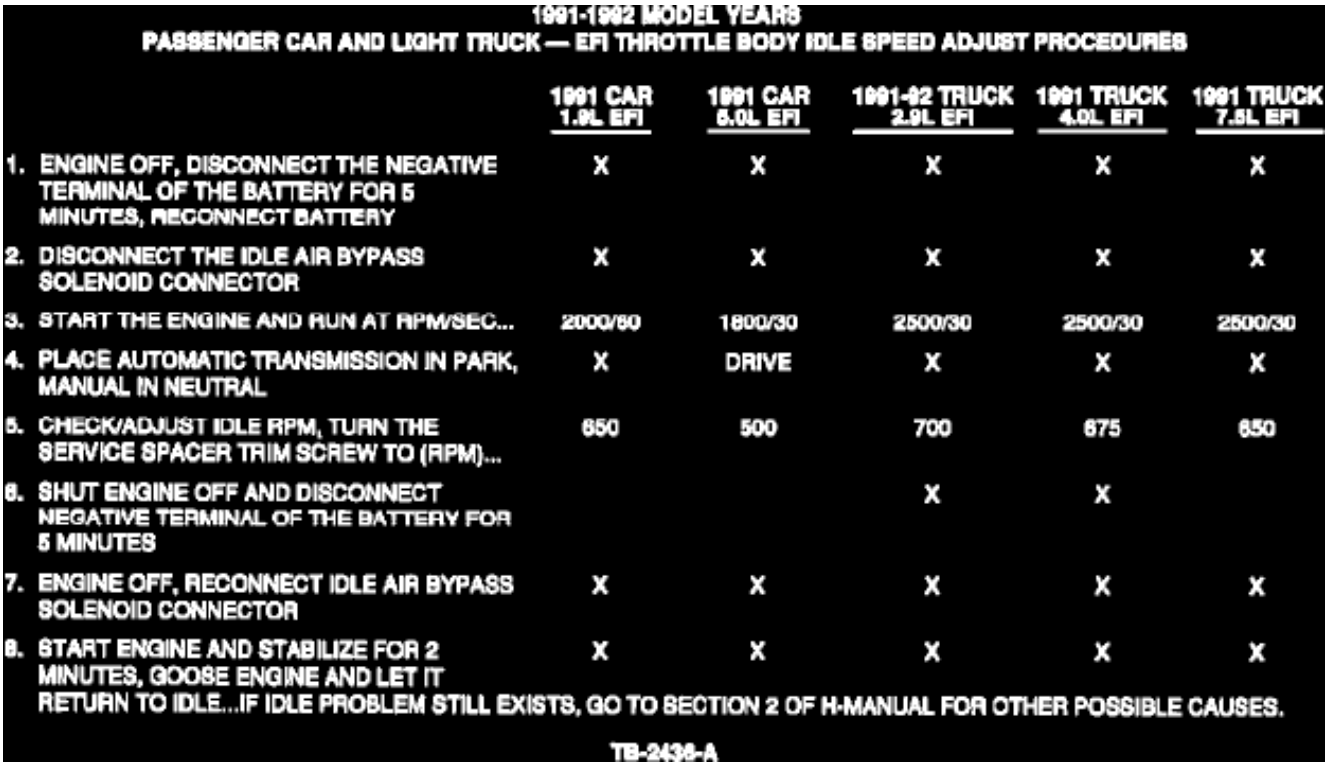
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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Figure 6

1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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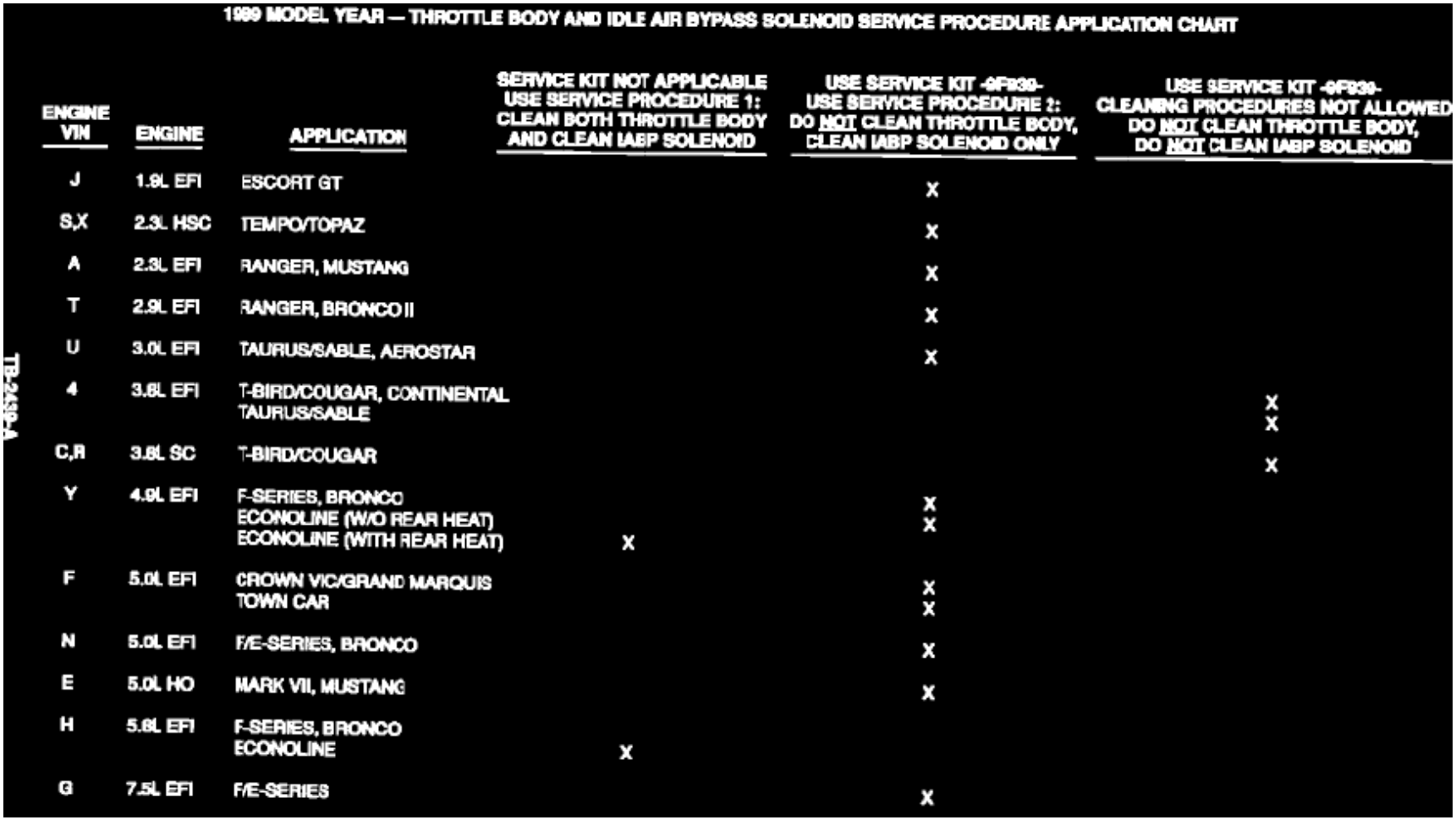
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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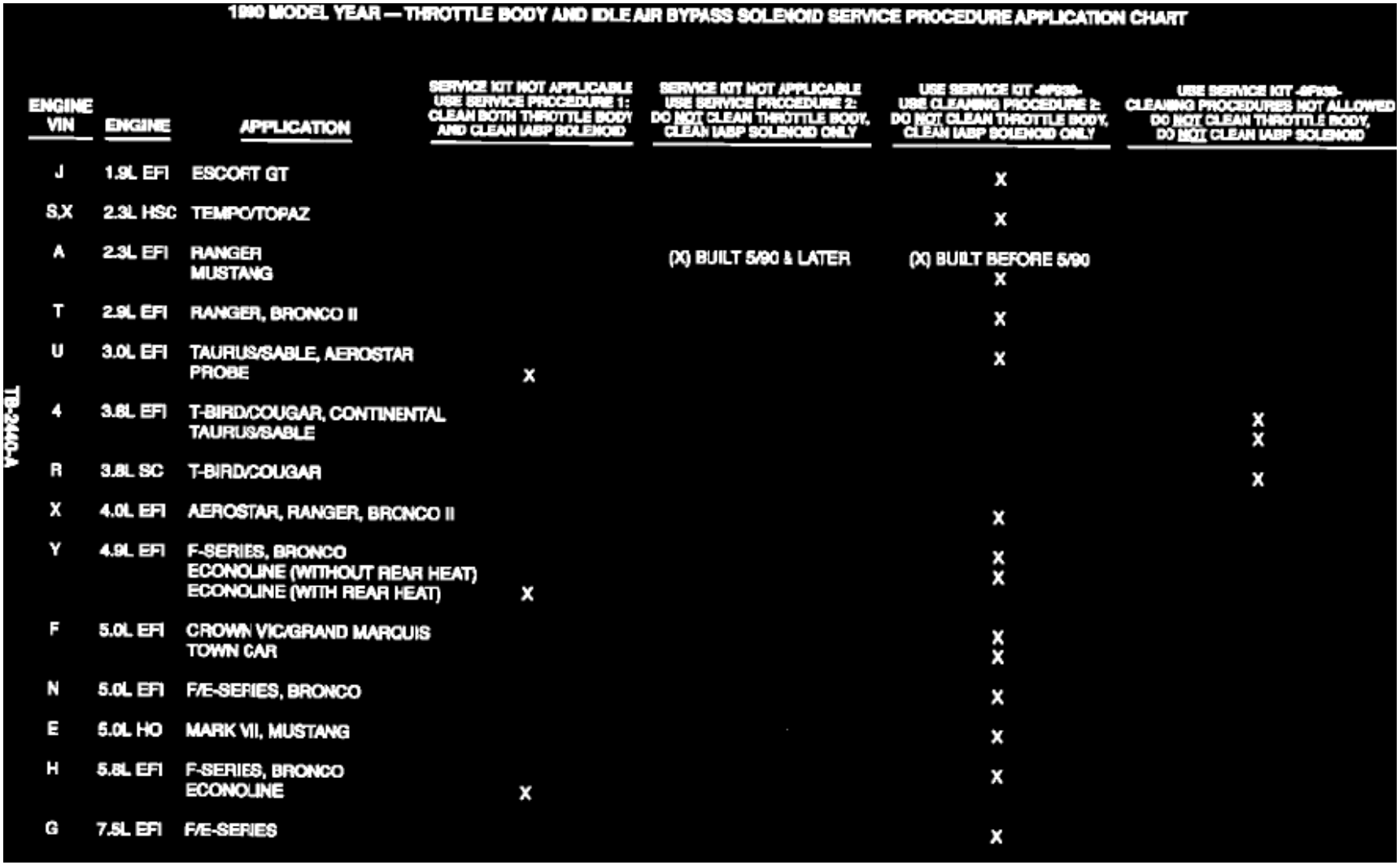
Figure 9

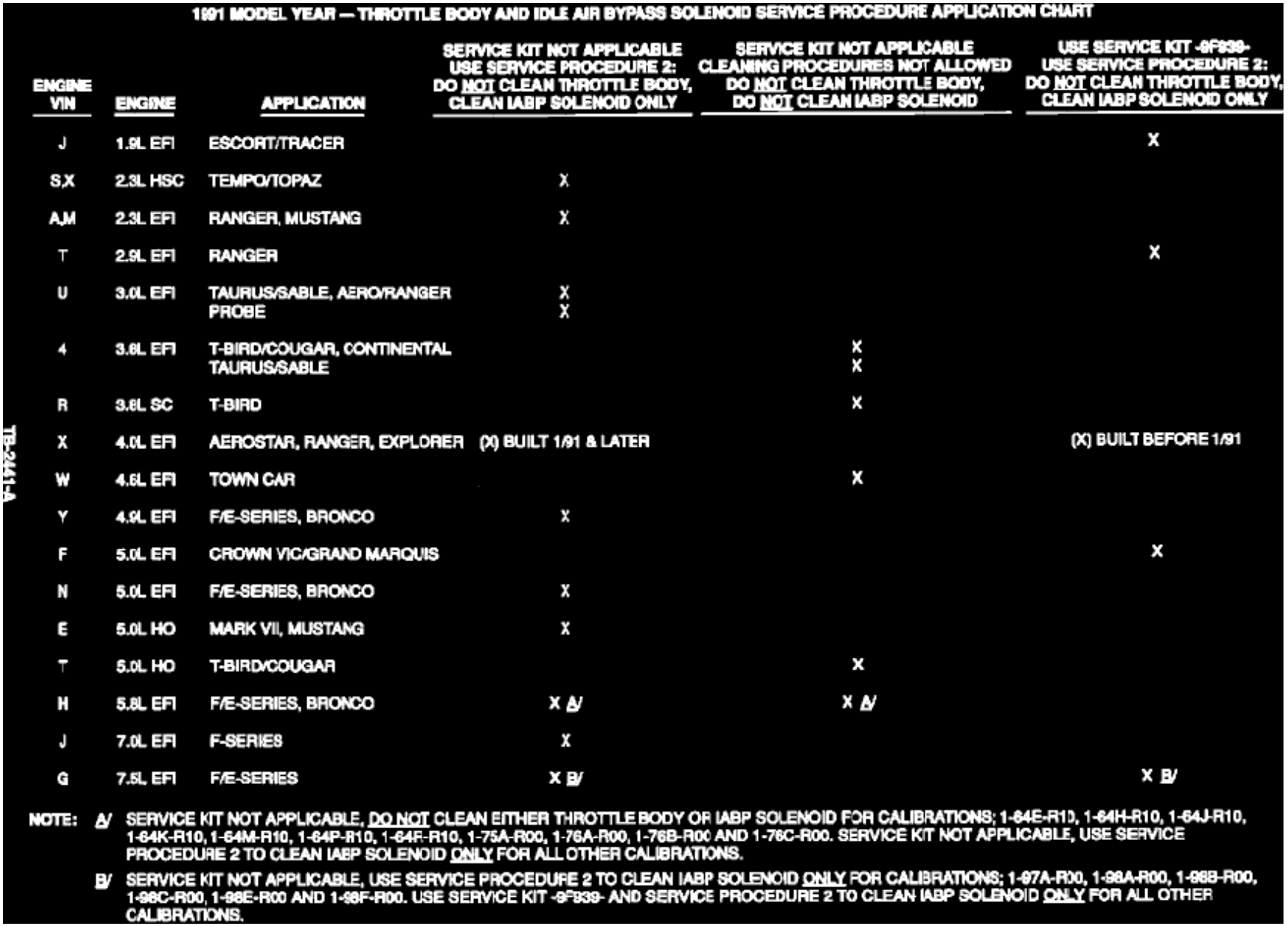


1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

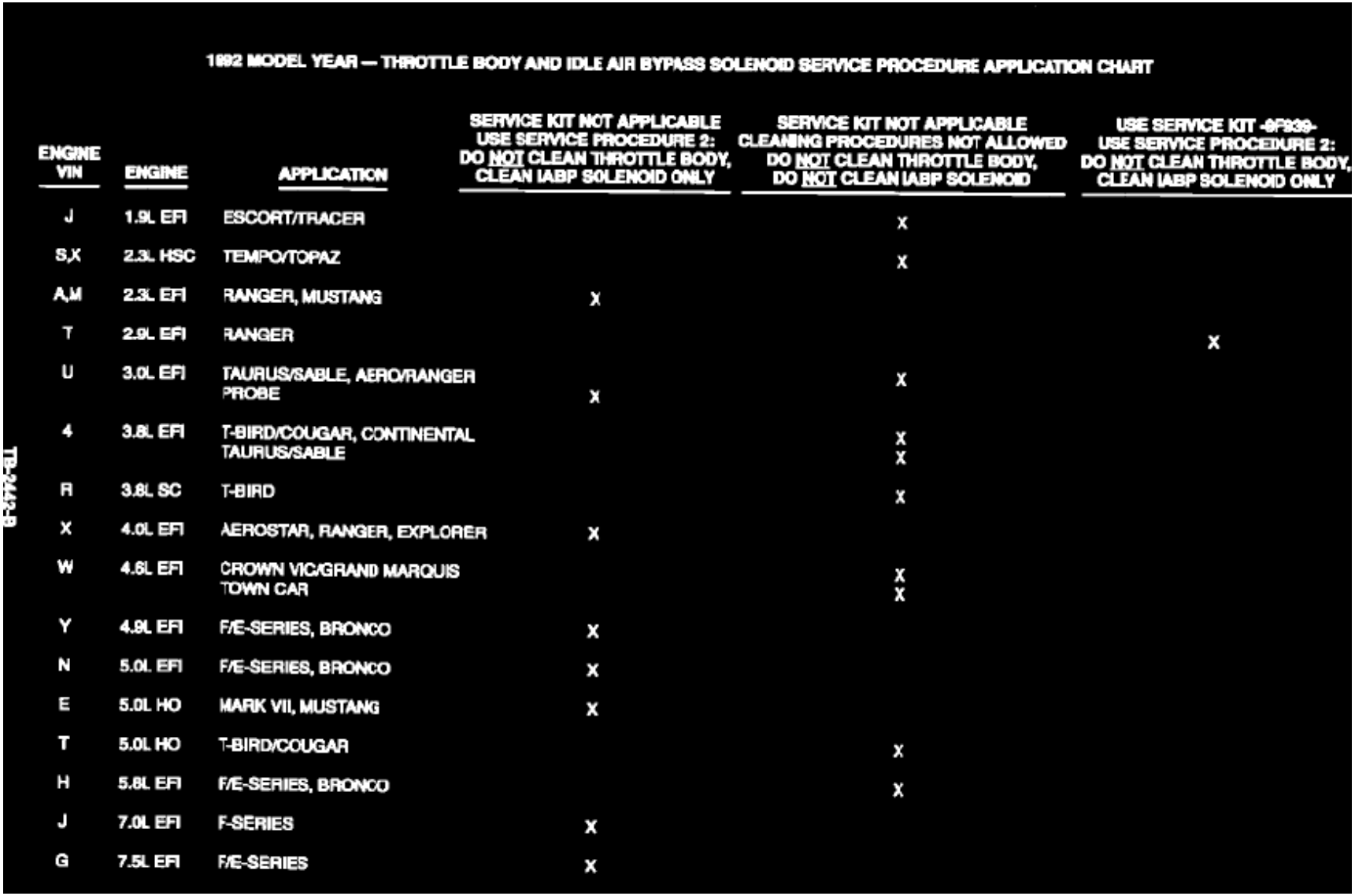
ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TA-24428

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

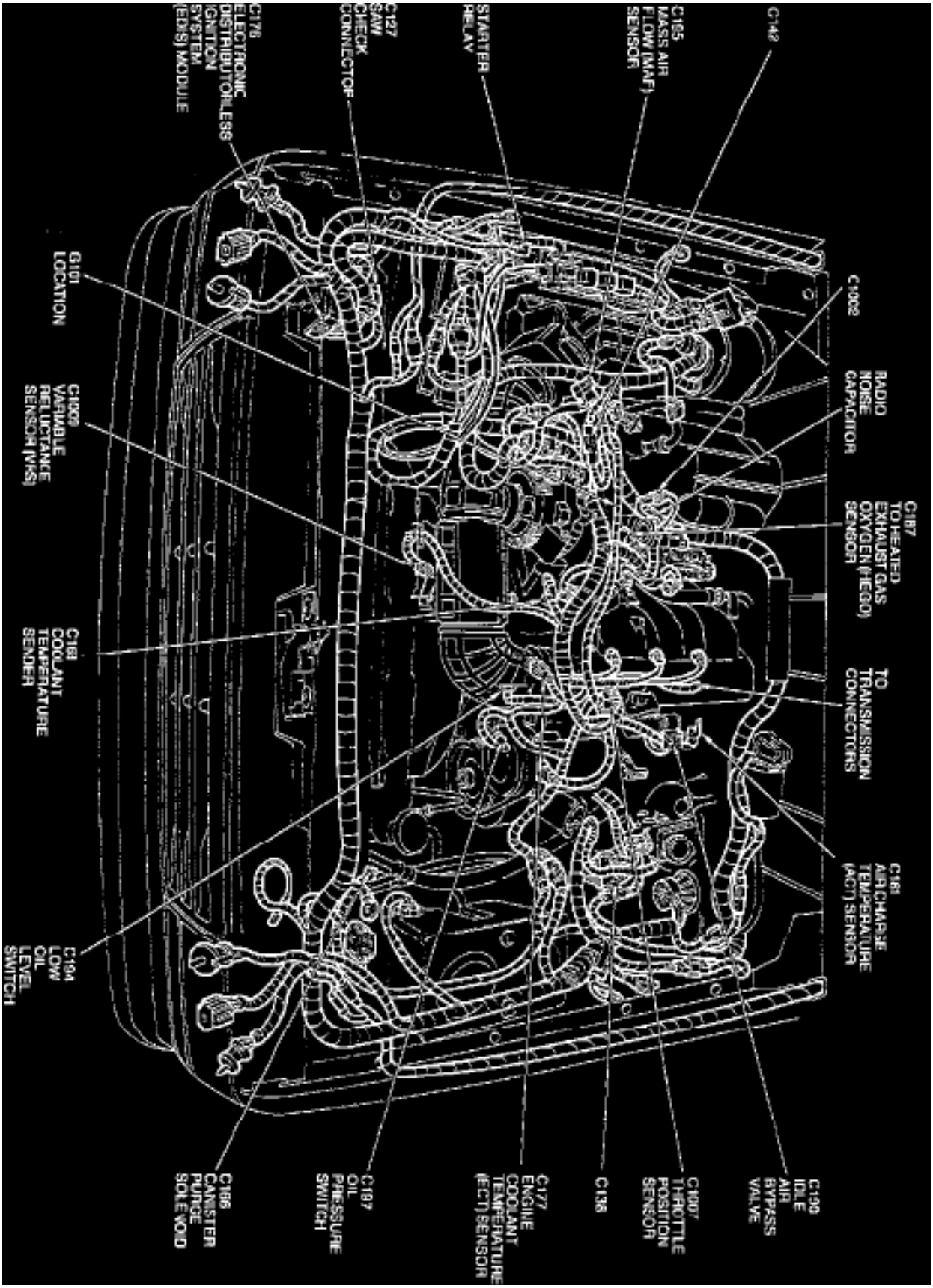
Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

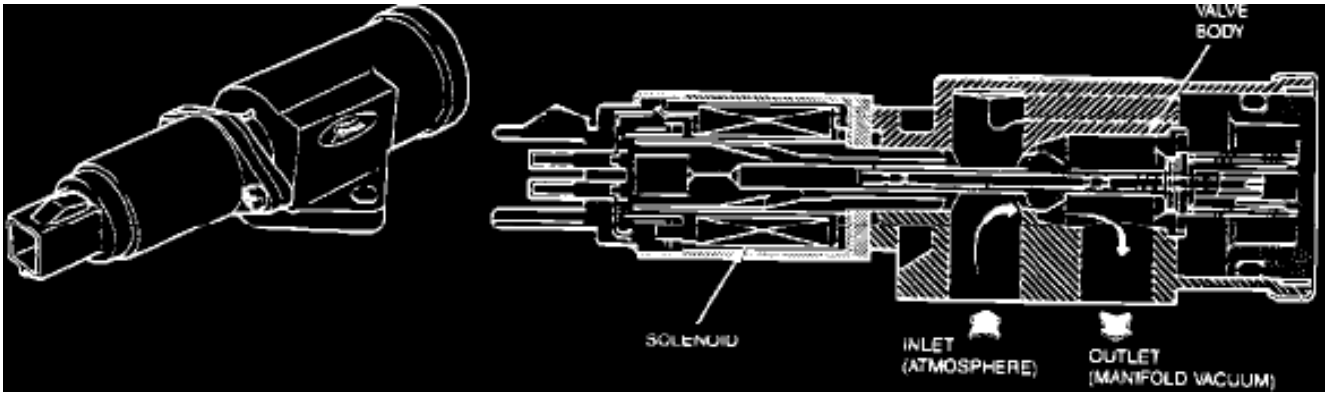

C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C167
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C161
COOLANT
TEMPERATURE
SENDER
C190
LOW
OIL
LEVEL
SWITCH
C190
IDLE
AIR
BYPASS
VALVE
C1007
THROTTLE
POSITION
SENSOR
C136
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C197
OIL
PRESSURE
SWITCH
C166
CANISTER
PURGE
SOLENOID

Idle Speed/Throttle Actuator - Electronic: Locations

Engine Compartment Components.

Top LH Side Of Engine

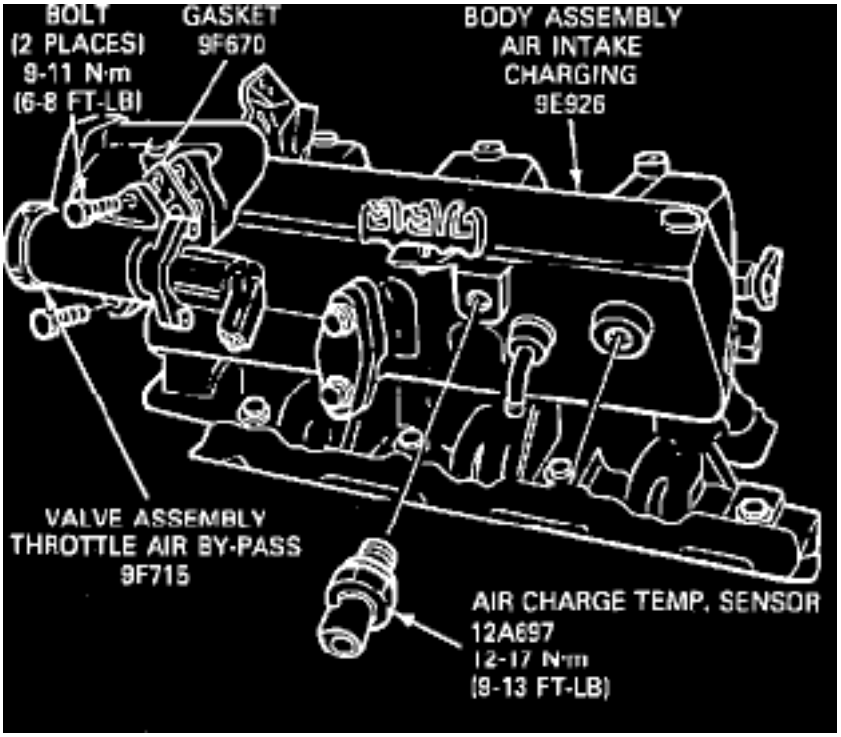
Applicable to: 4.0L/V6-244



Idle Speed/Throttle Actuator - Electronic: Description and Operation

Idle Air Bypass Valve

The Idle Speed Control Bypass Air (ISC-BPA) valve is used to control engine idle speed and is operated by the Engine Control Assembly (ECA). This valve allows air to pass around the throttle plates to control cold engine fast idle, no touch start, over temperature idle boost and engine idle load correction.



Idle Speed/Throttle Actuator - Electronic: Service and Repair

Intake Manifold

1. Disconnect the Idle Speed Control By-Pass Air (ISC-BPA) valve assembly connector from the wiring harness.

2. Remove the two ISC-BPA retaining bolts.

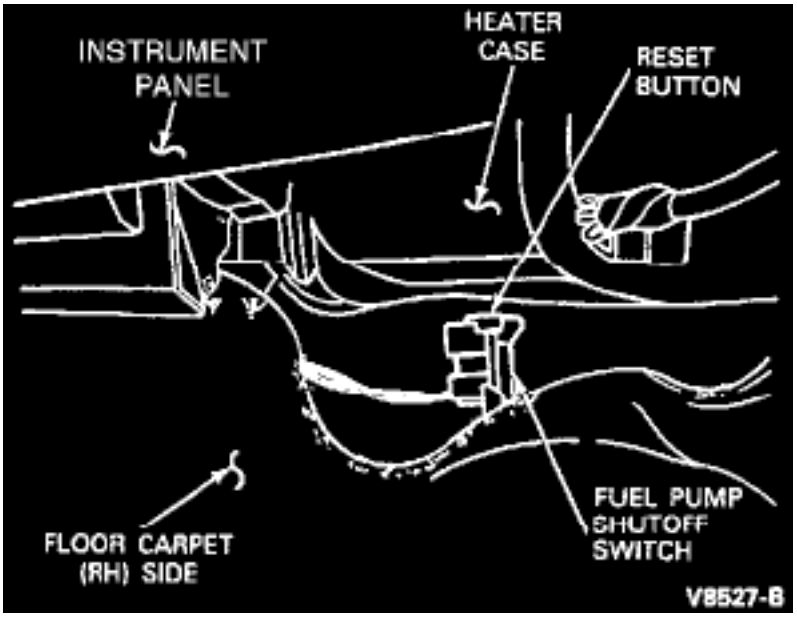
3. Remove the ISC-BPA valve and gasket.

4. Clean the gasket mating surfaces. NOTE: If scraping is necessary, use care not to damage ISC-BPA valve or throttle body gasket surfaces, or drop material into the throttle body.

5. Install the gasket and ISC-BPA valve on the throttle body.

6. Install the retaining screws, torquing them to 72-96 lb. in. (9-11 N-m).

7. Connect the electrical connection for the ISC-BPA valve.

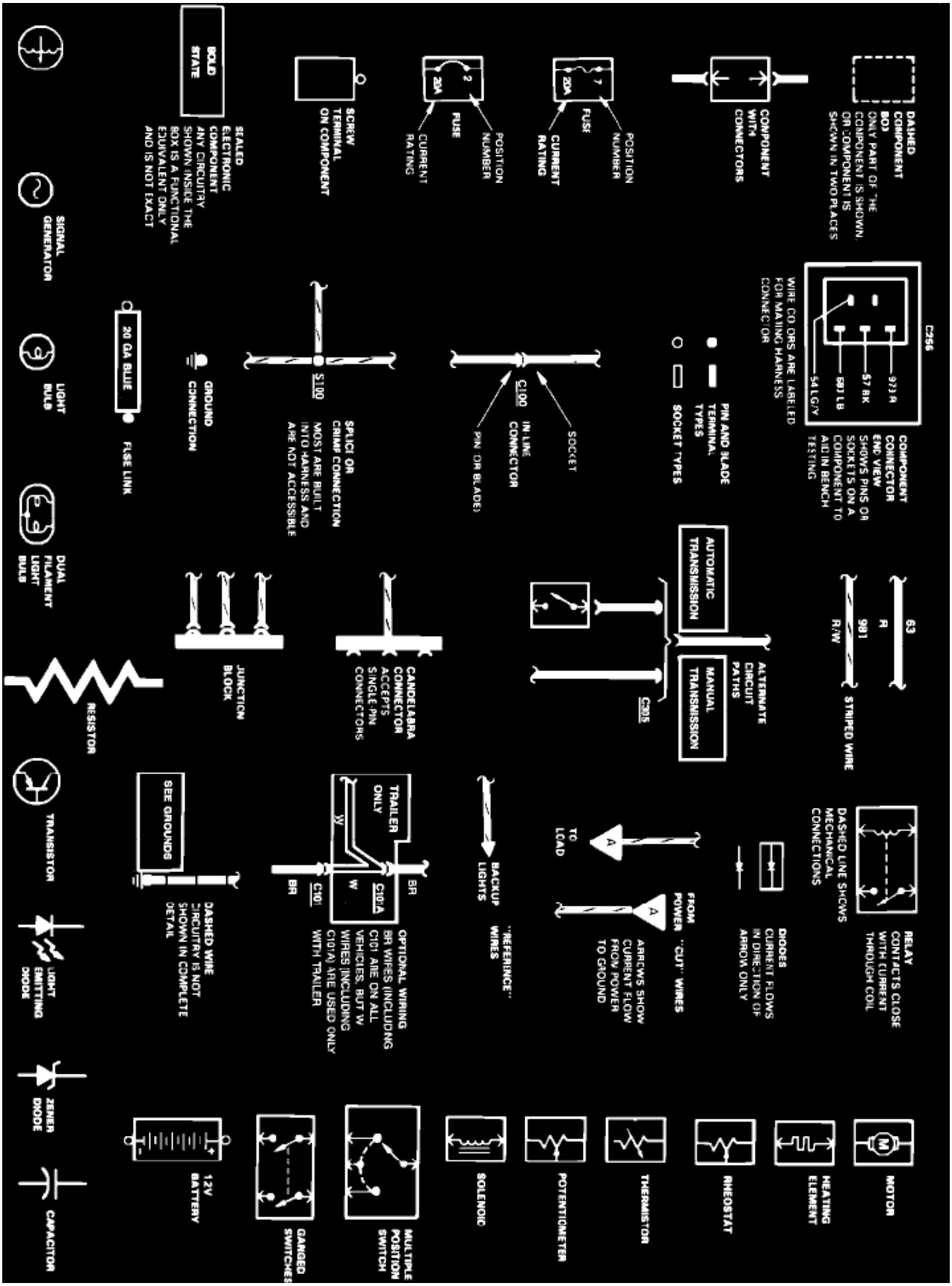


Fuel Pump Inertia Switch: Locations

Inertia Switch

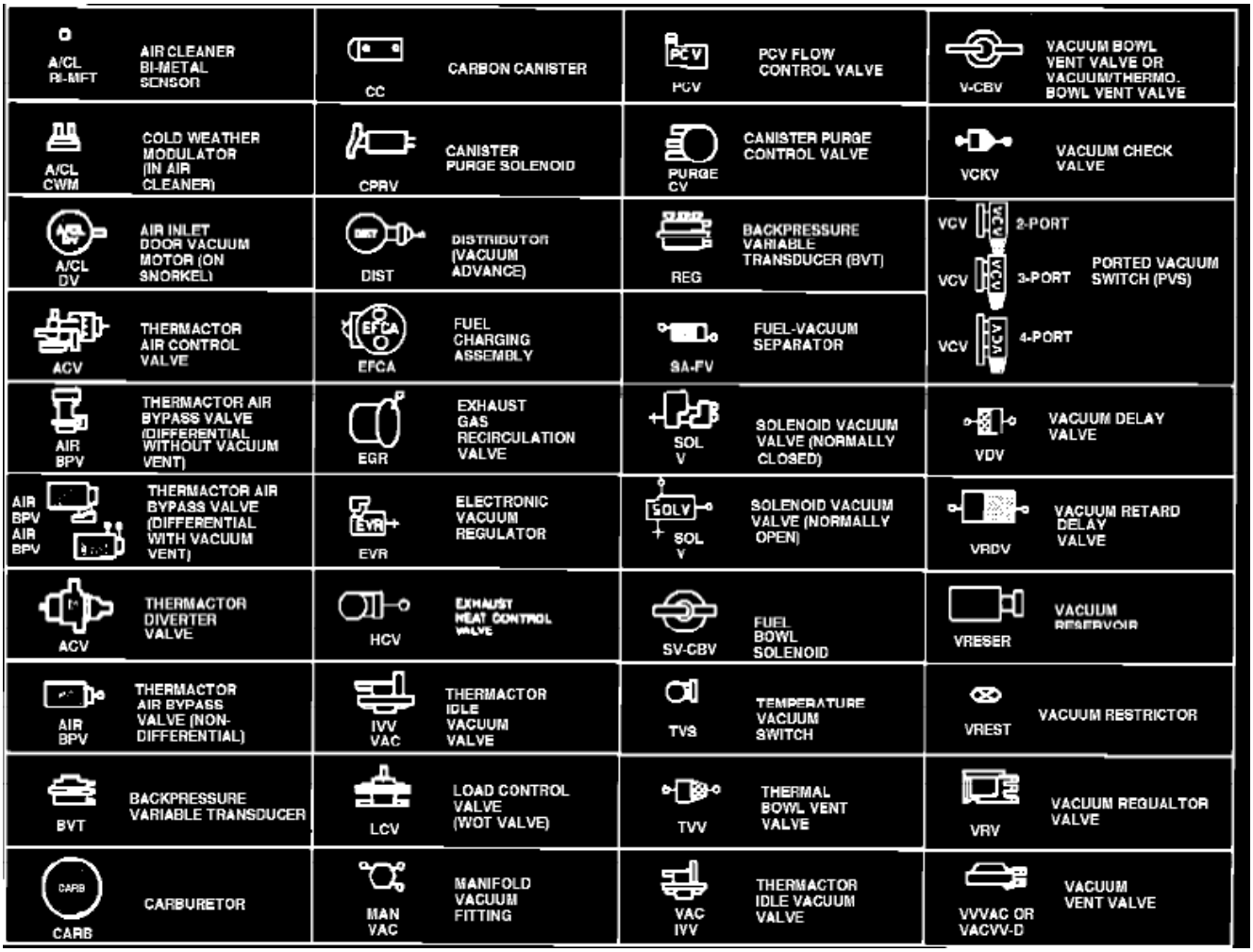
The inertia switch is located below the instrument panel, to the right of the transmission hump.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Fuel Pump Inertia Switch <--> [Inertia Fuel Shutoff Switch] > Component Information > Diagrams > Diagram Information and Instructions

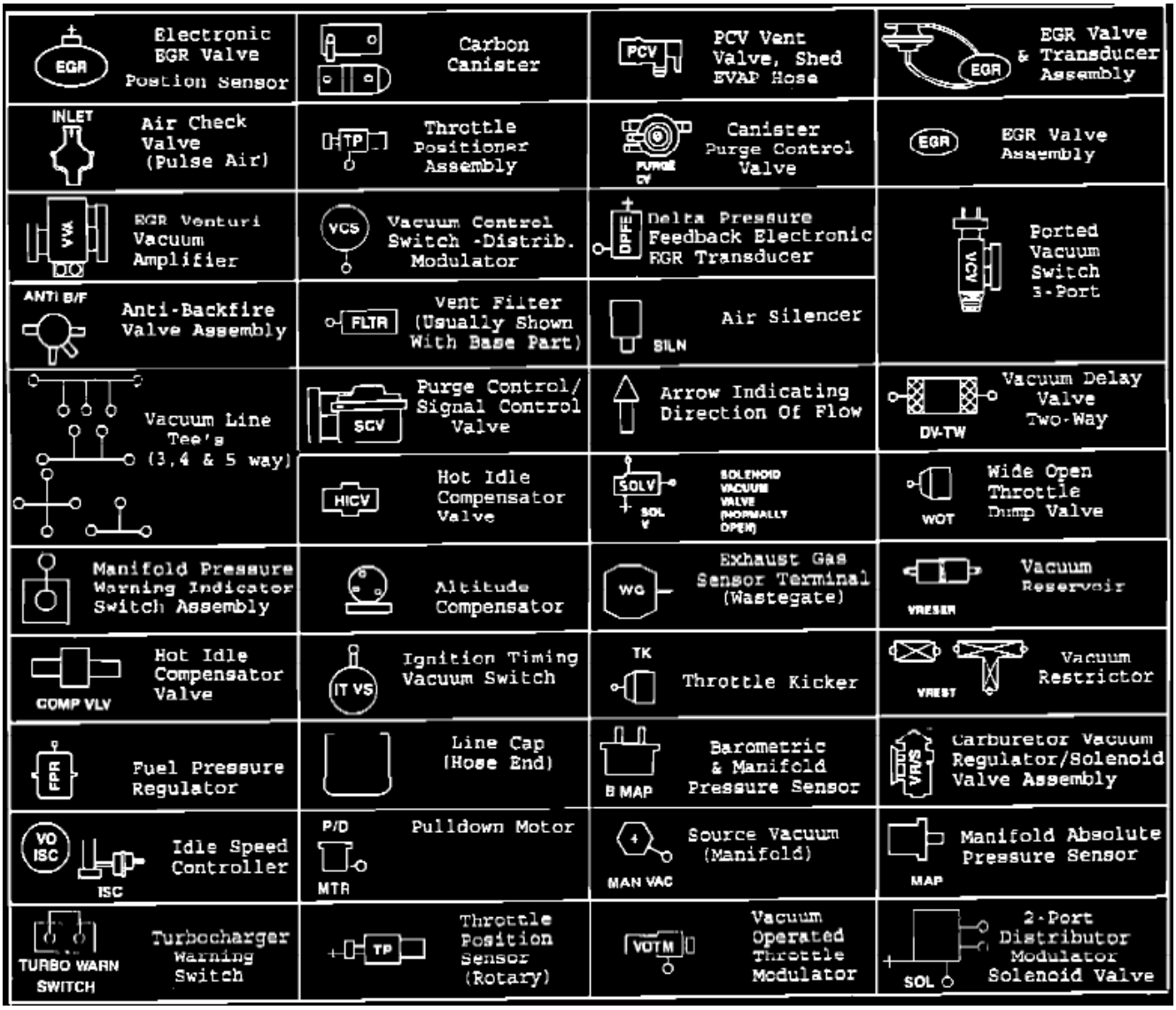


Fuel Pump Inertia Switch: Diagram Information and Instructions

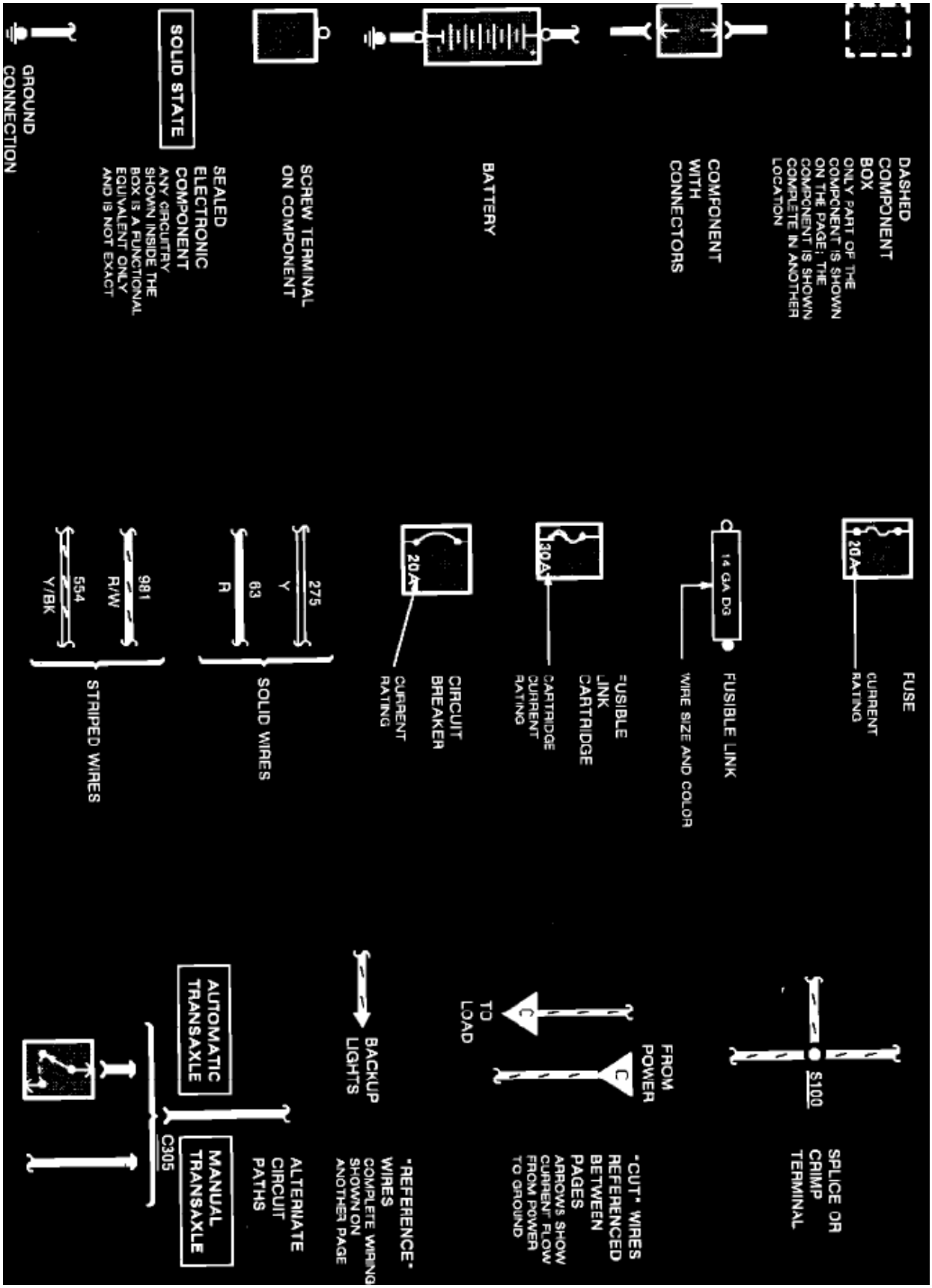
Symbol Identification



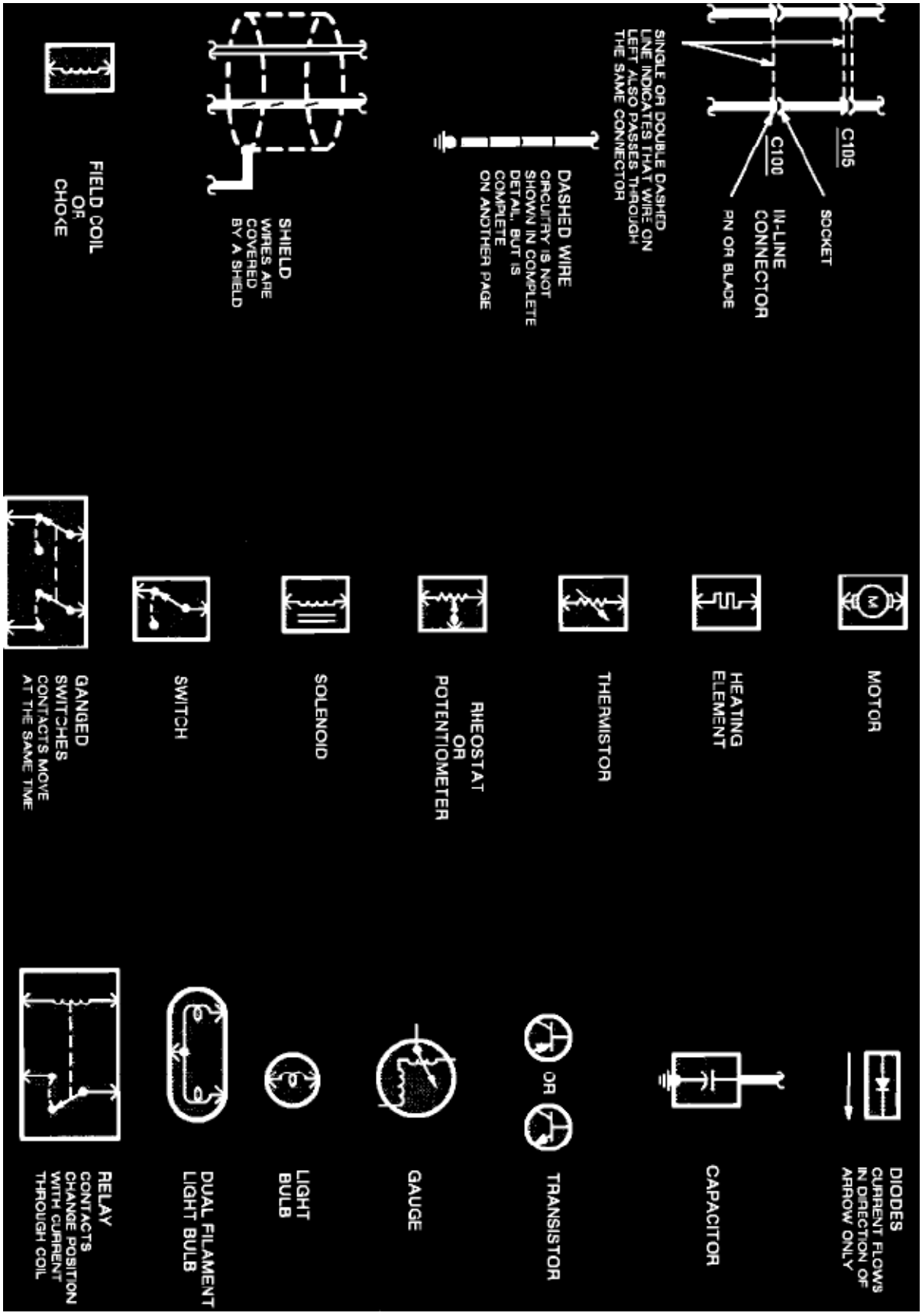
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

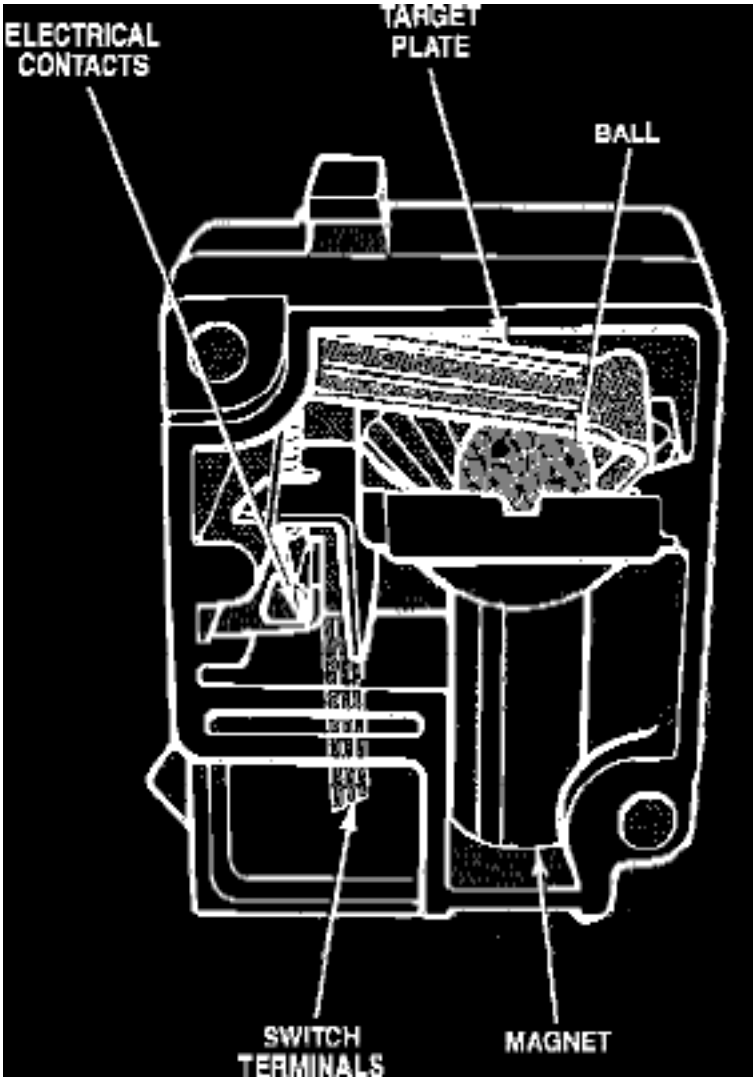
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuel Pump Inertia Switch: Description and Operation

Typical Inertia Fuel Shut-Off Switch

The inertia switch is used to open the power circuit to the fuel pump, or the control circuit to the fuel pump relay, in case of an accident. The inertia switch must be manually reset by pushing the reset button located on top of the inertia switch.

Operation of the inertia switch is as follows:

A steel ball is held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate, which opens the electrical contacts.

Fuel Pump Inertia Switch: Service and Repair

TO RESET SWITCH 1.

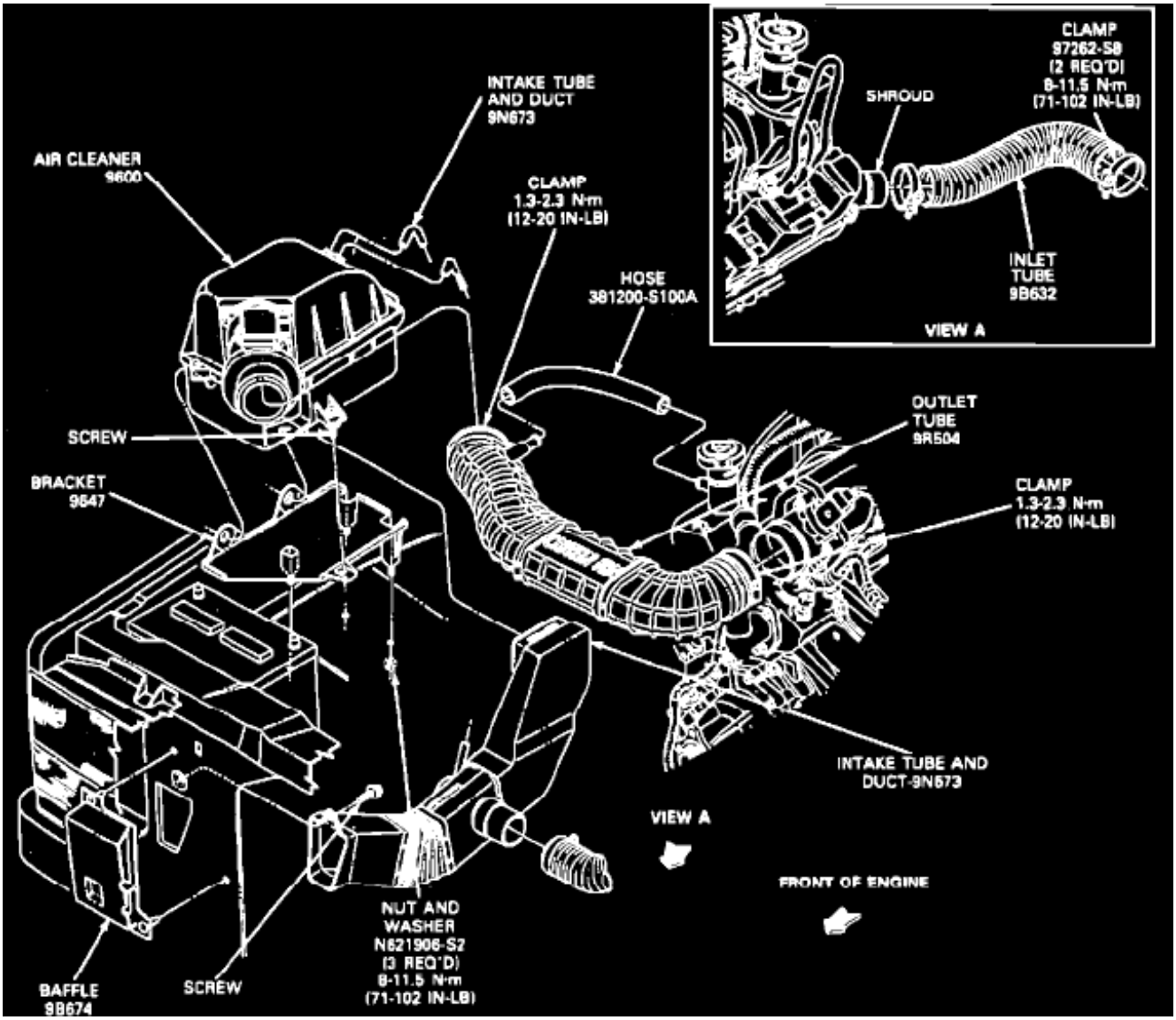
Turn ignition switch to OFF.

2. Check for leaking fuel in the engine compartment, fuel lines and tank(s).

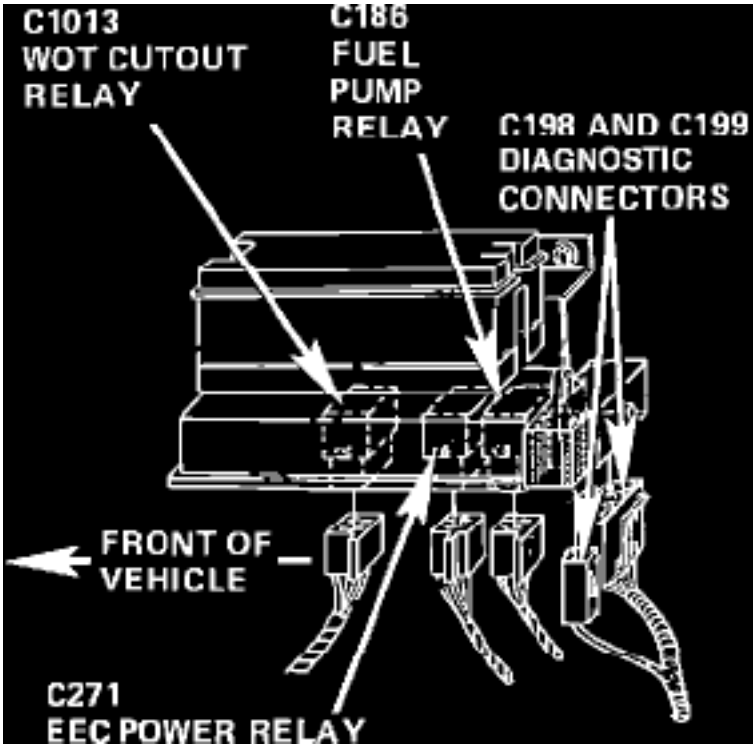
3. If no fuel leak is apparent, reset the switch by pushing the reset button on the top of the switch.

4. Turn ignition switch to START for a few seconds, then to OFF.

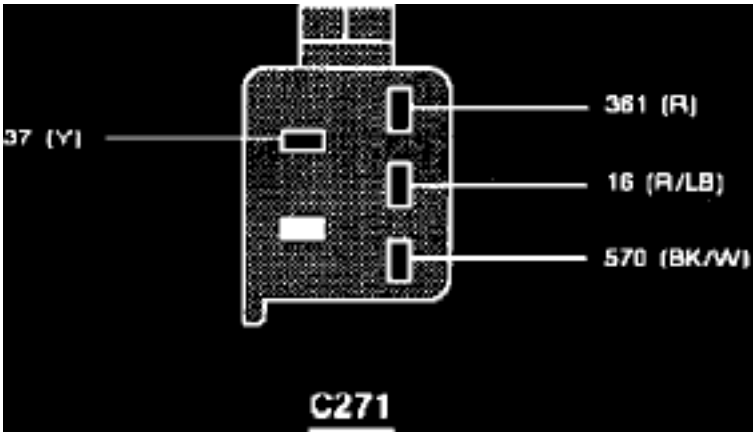
5. Again, check for leaking fuel.



Inlet Air Temperature Control System



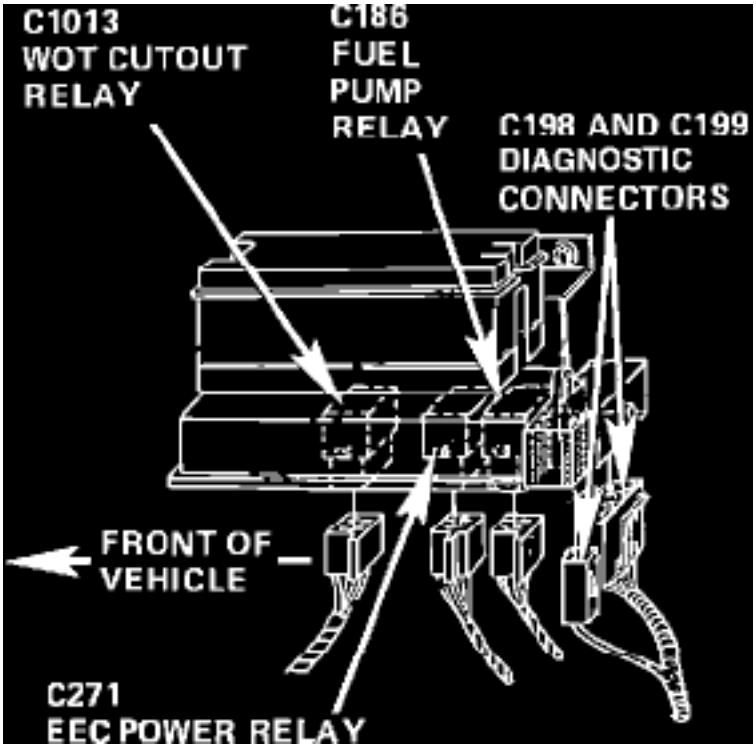
Relay And Diagnostic Connectors



EEC-IV Power Relay Connector

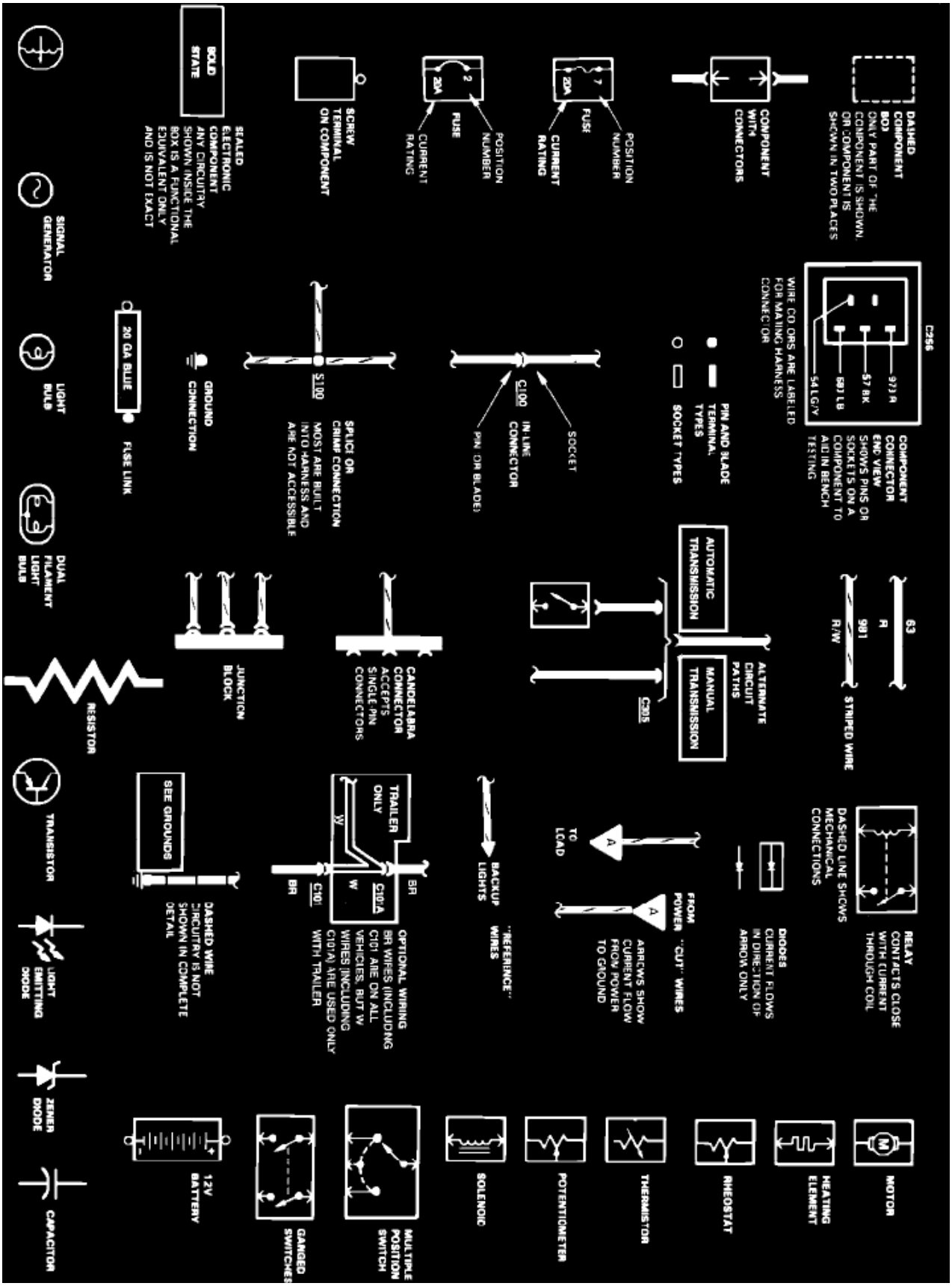
Main Relay (Computer/Fuel System): Description and Operation

The Engine Control Assembly (ECA) receives its operating voltage from the Electronic Engine Control (EEC) power relay. When the ignition switch is turned ON, the normally OPEN contact points of the relay CLOSE and supply power to the ECA. The control coil circuit of the relay contains a diode, wired in series, to prevent relay operation if the battery polarity is reversed, preventing damage to the ECA.



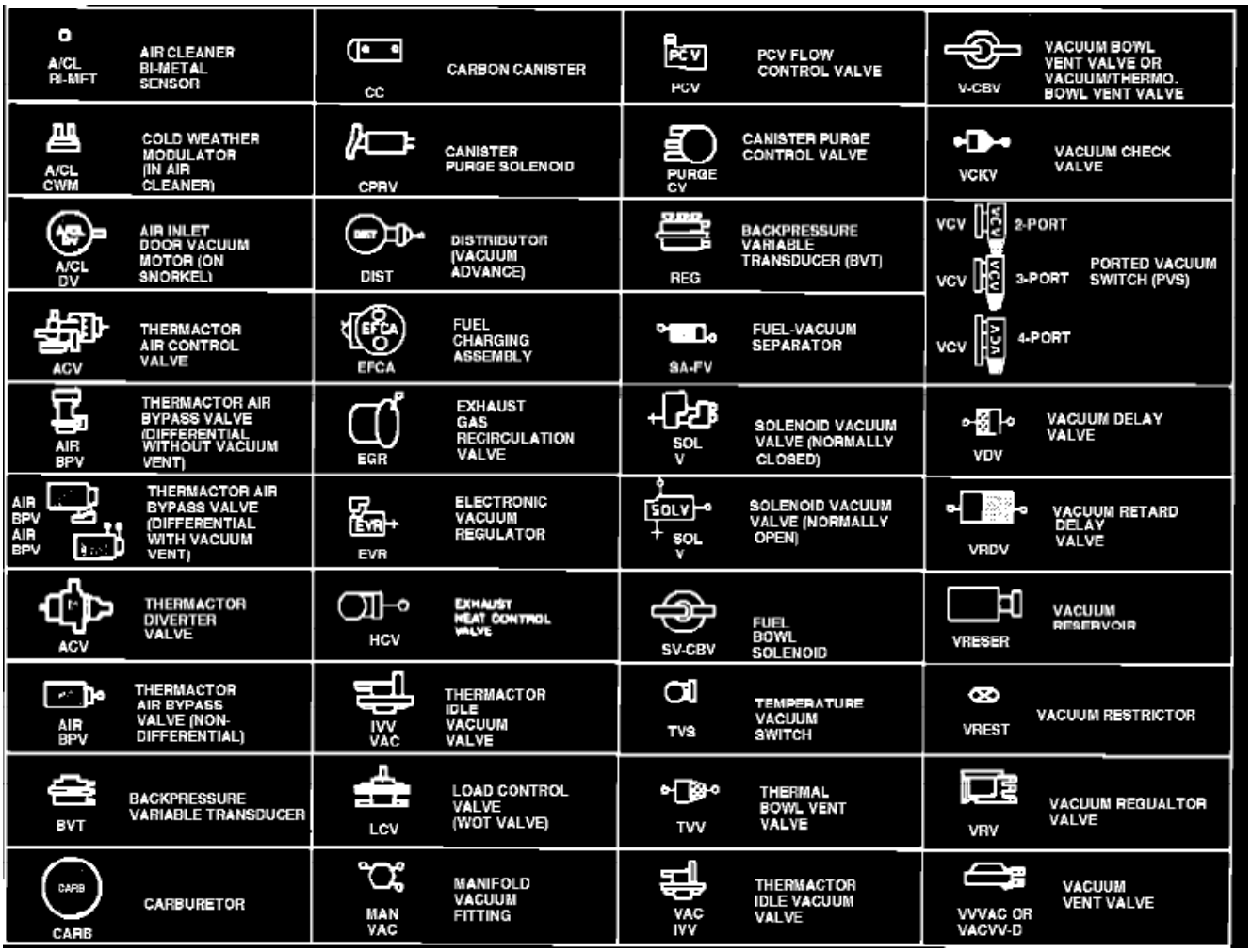
Relay And Diagnostic Connectors

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Relays and Modules - Fuel Delivery and Air Induction > Fuel Pump Relay > Component Information > Diagrams > Diagram Information and Instructions

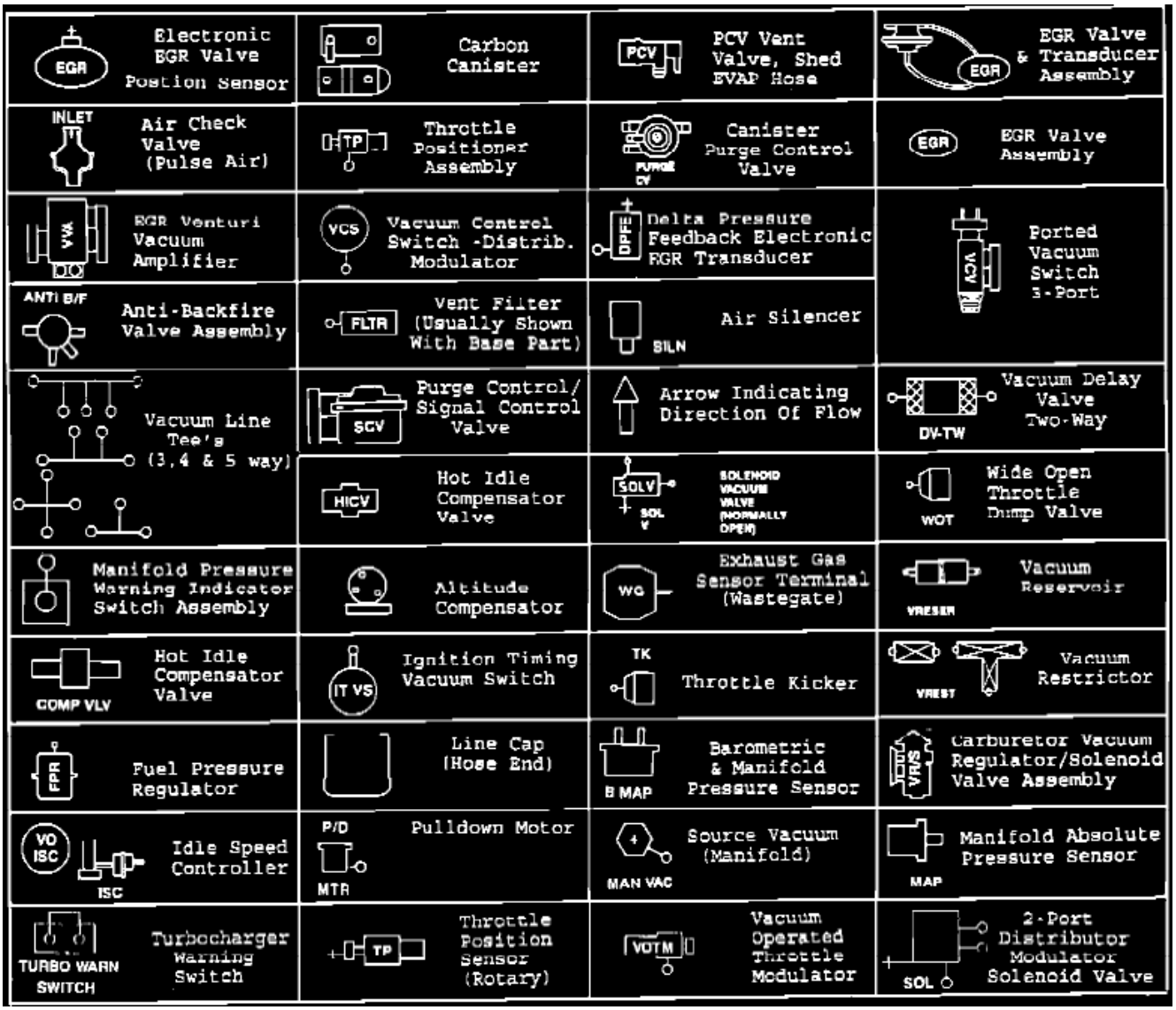


Fuel Pump Relay: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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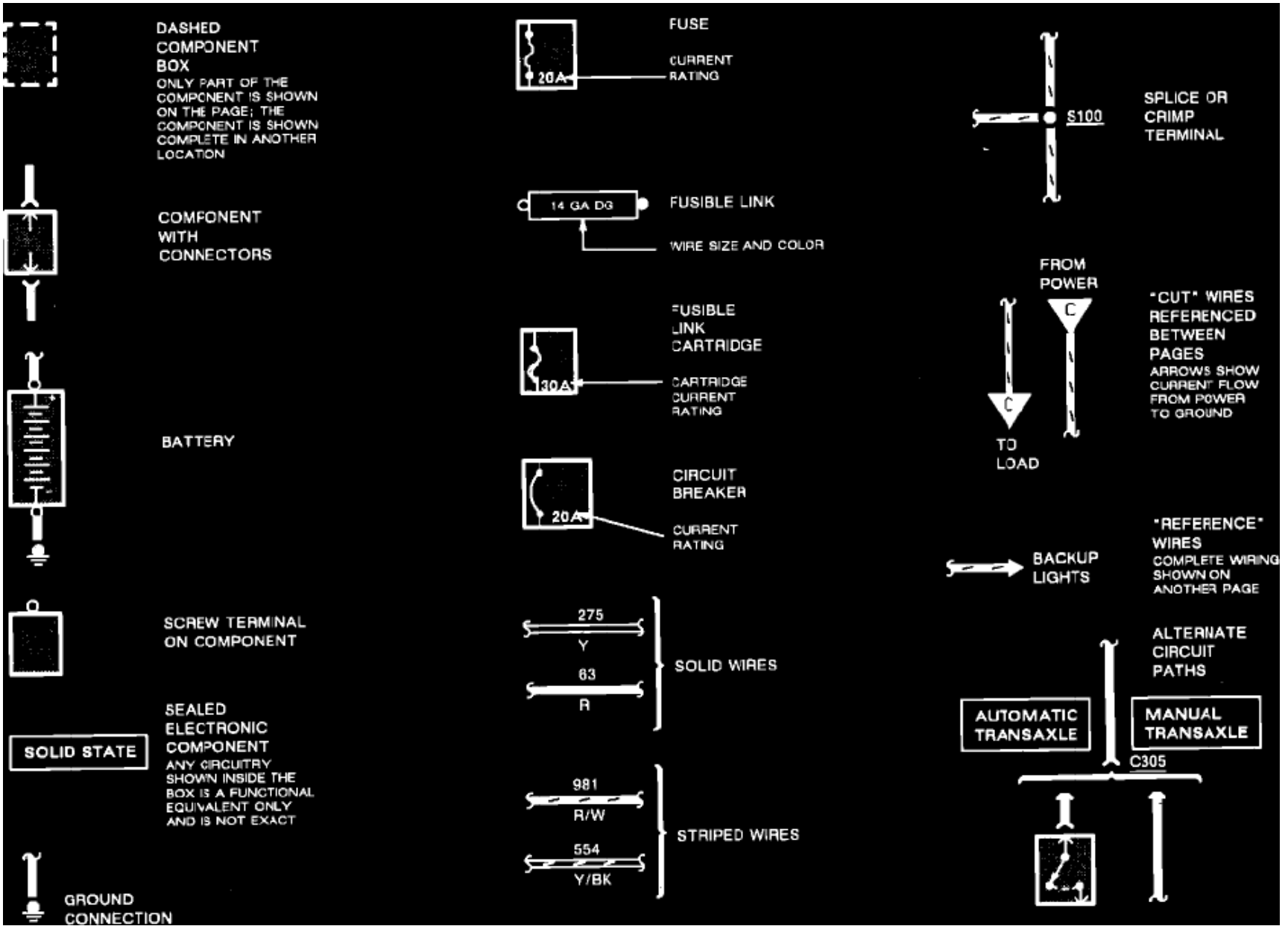
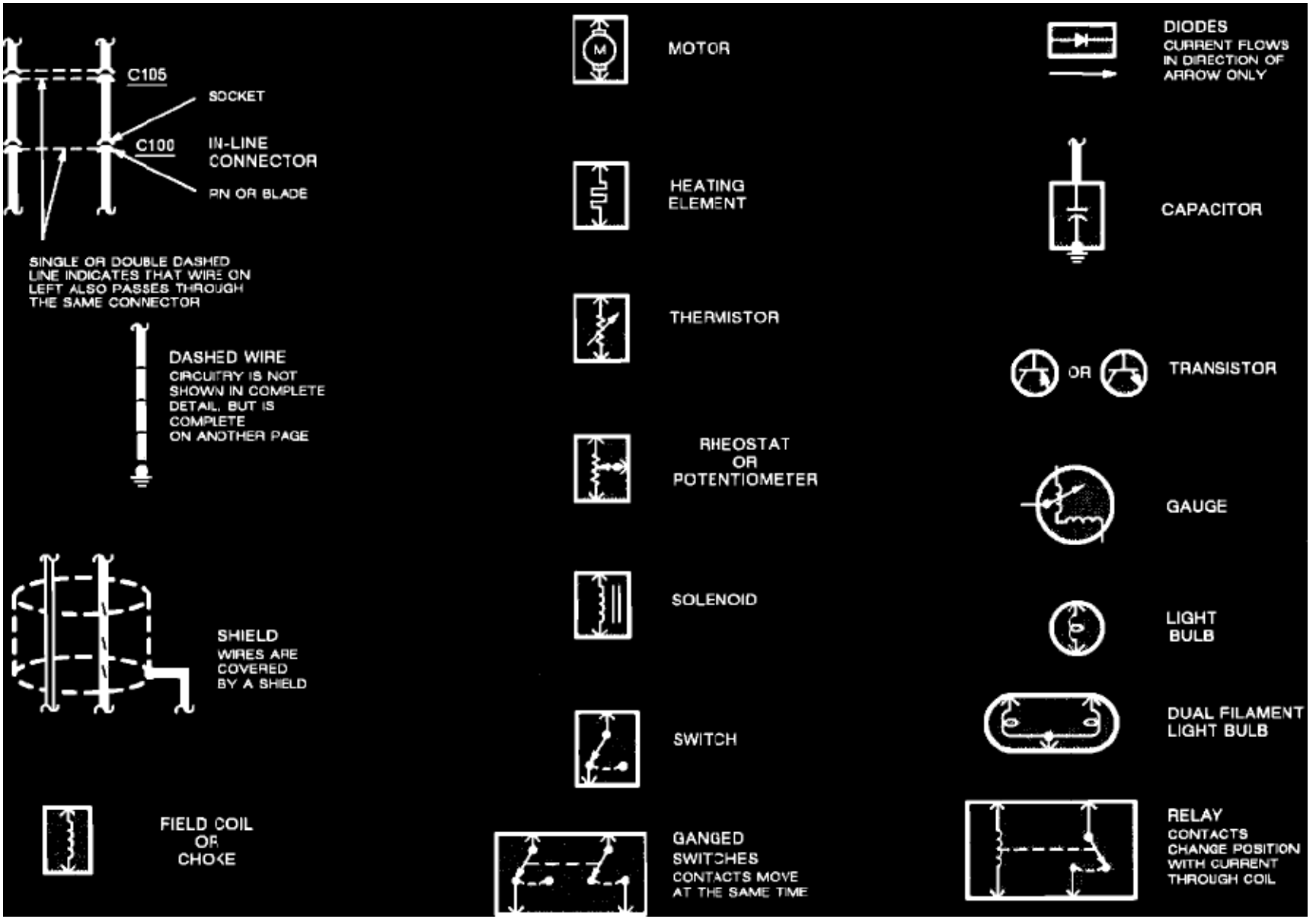

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

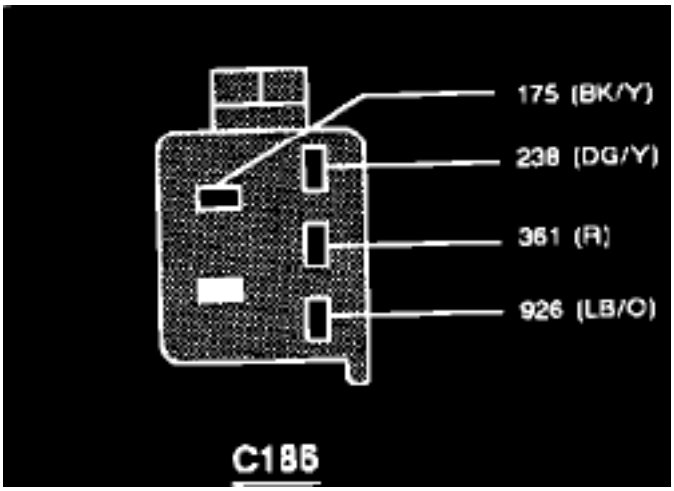
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuel Pump Relay Connector

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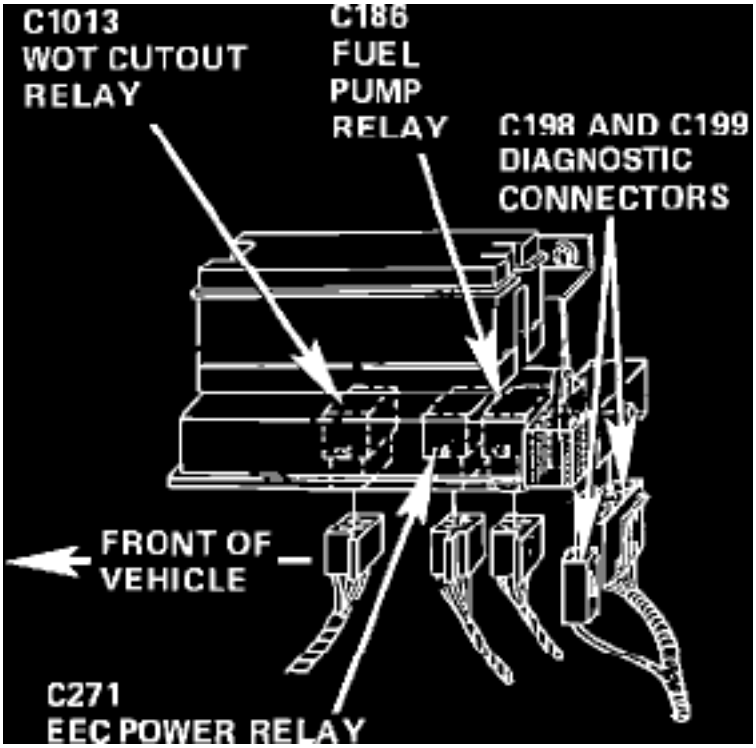
When the ignition switch is turned ON, the Electronic Engine Control (EEC) power relay is ENERGIZED, providing power to the fuel pump relay. Fuel pump power is provided through the fuel pump relay contacts and an inertia switch. If the ignition switch is not turned to the START position in approximately one second, a timer circuit in the Engine Control Assembly (ECA) will open the ground circuit to the fuel pump relay, causing the fuel pump relay contacts to OPEN. This action stops the power supply to the fuel pump. When the ignition switch is turned to the START position, the ECA closes the ground circuit to the fuel pump relay, resuming operation of the fuel pump. After the engine switch is returned to the ON position, power to the fuel pump is supplied through the fuel pump relay. The ECA monitors engine speed and OPENS the fuel pump relay ground circuit if the engine speed drops below 120 rpm.



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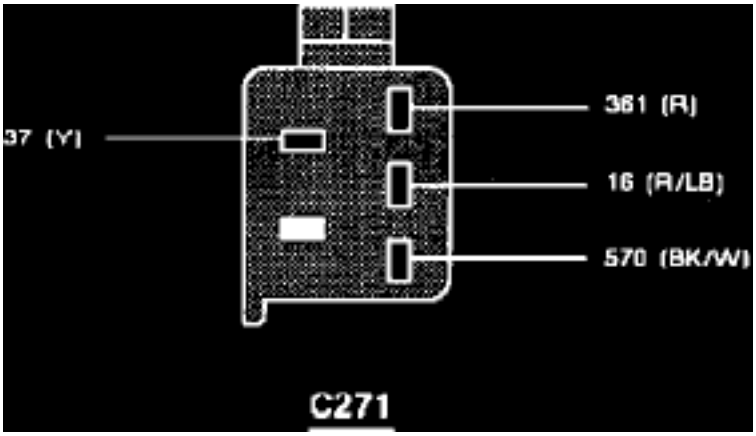

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Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Sensors and Switches - Fuel Delivery and Air Induction > Mass Air Flow (MAF) Sensor <--> [Air Flow Meter/Sensor] > Component Information > Technical Service Bulletins > Customer Interest for Mass Air Flow (MAF) Sensor: > 98-23-10 > Nov > 98 > Engine - Lean Driveability Symptoms

Mass Air Flow (MAF) Sensor: Customer Interest Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

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ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

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DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

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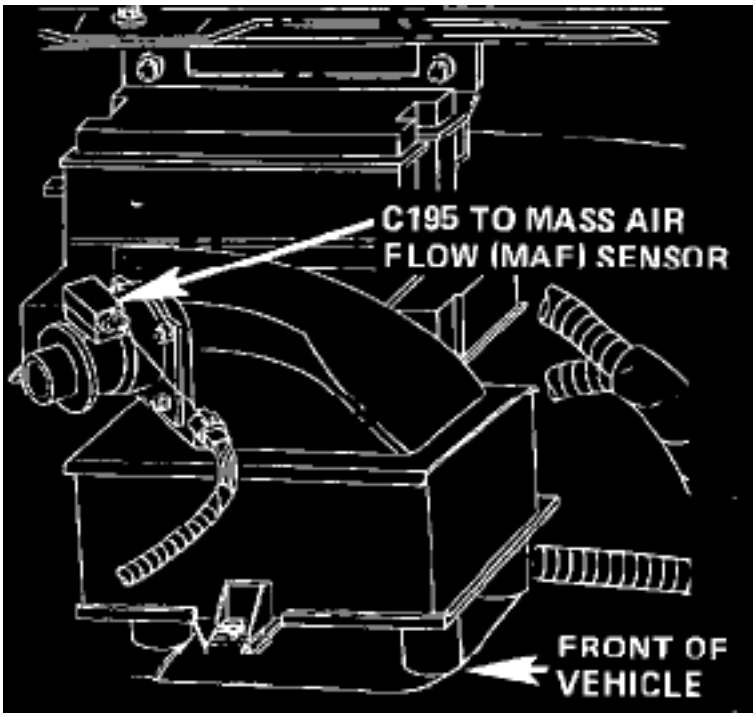
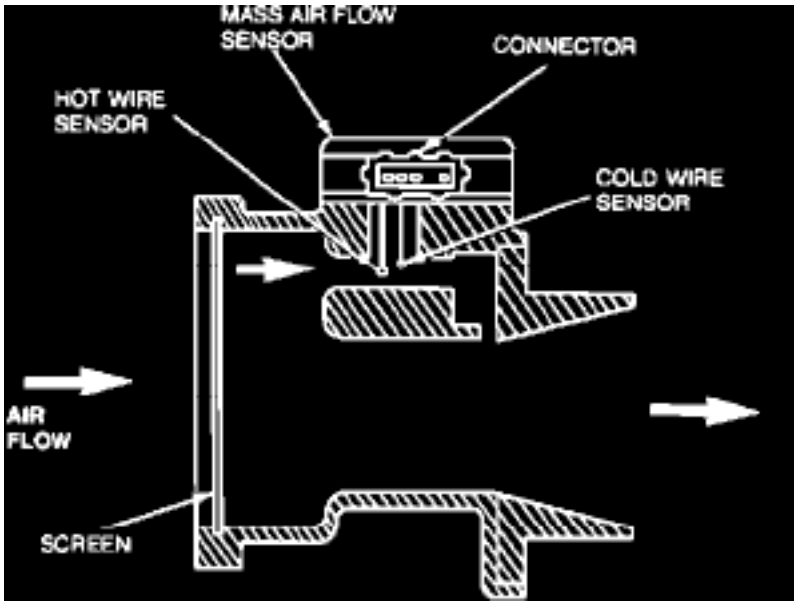
After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298



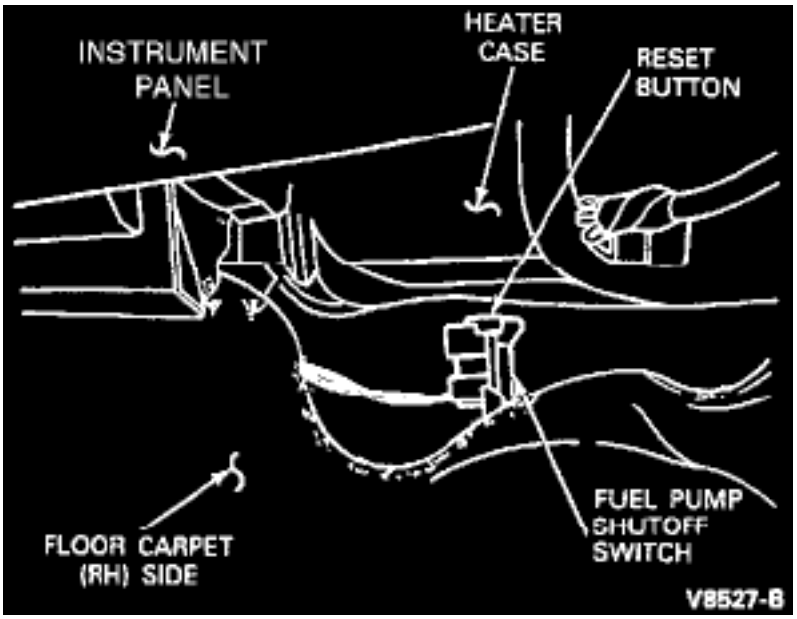
Mass Air Flow (MAF) Sensor



Mass Air Flow (MAF) Sensor: Description and Operation

Mass Air Flow Sensor

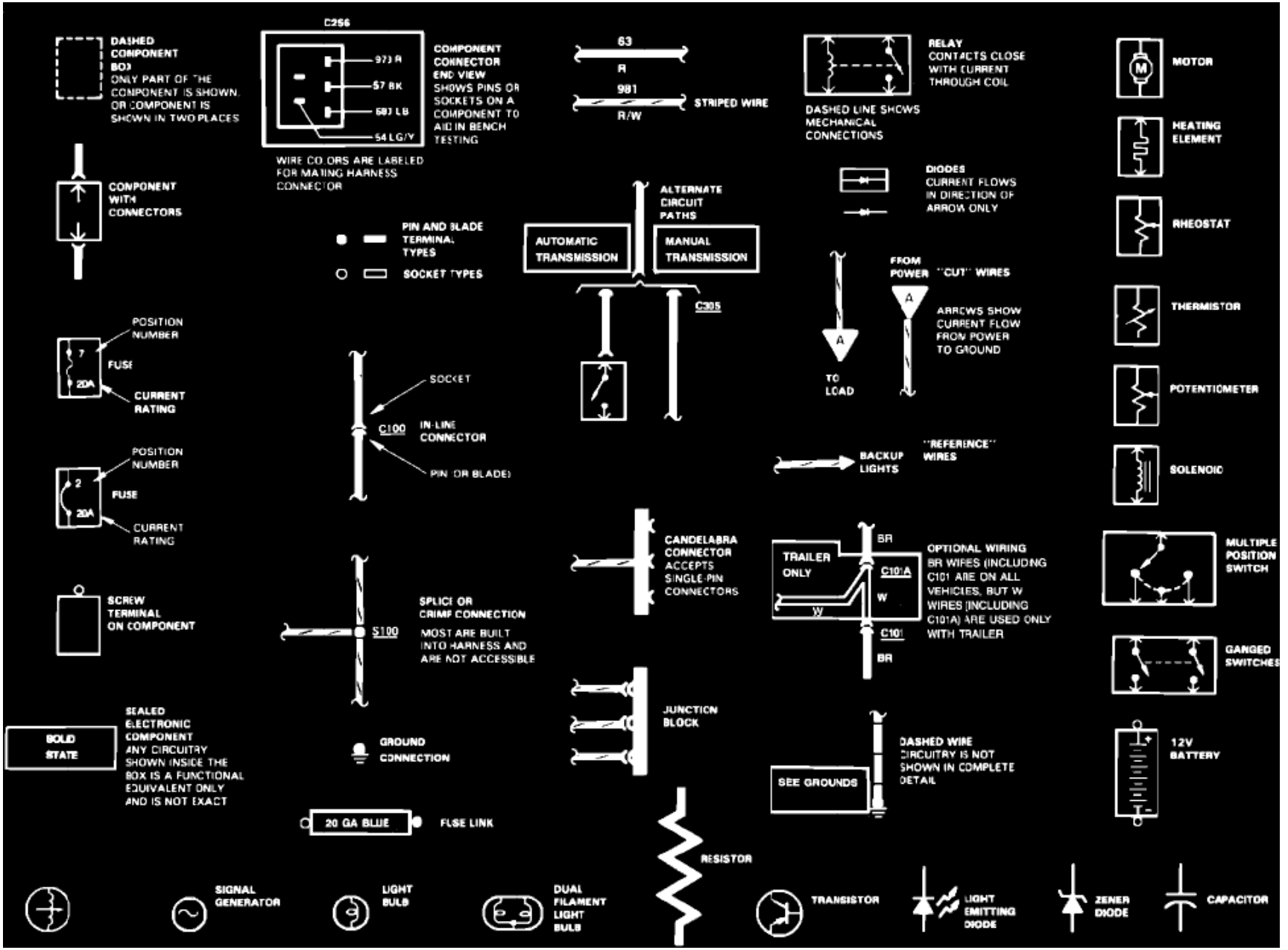
The Mass AirFlow (MAF) sensor, located between the air filter and the throttle body, is used to measure the mass of the air entering the engine due to volumetric displacement. The MAF sensor operates on the principle that if a mass is maintained at a constant temperature above the ambient environment, then the thermal loss is proportional to the mass flow of the cooling medium it is subjected to. The electronic module of the MAF sensor heats a wire element to 392°F (200°C) above ambient temperature. As air passes through the sensor, the air cools the wire element. The MAF sensor supplies more power to the wire to keep it at a constant temperature difference. When a drop in power useage occurs, the MAF sends a signal to the Engine Control Assembly (ECA) indicating the drop. The signal increases with the airflow into the engine.



Fuel Pump Inertia Switch: Locations

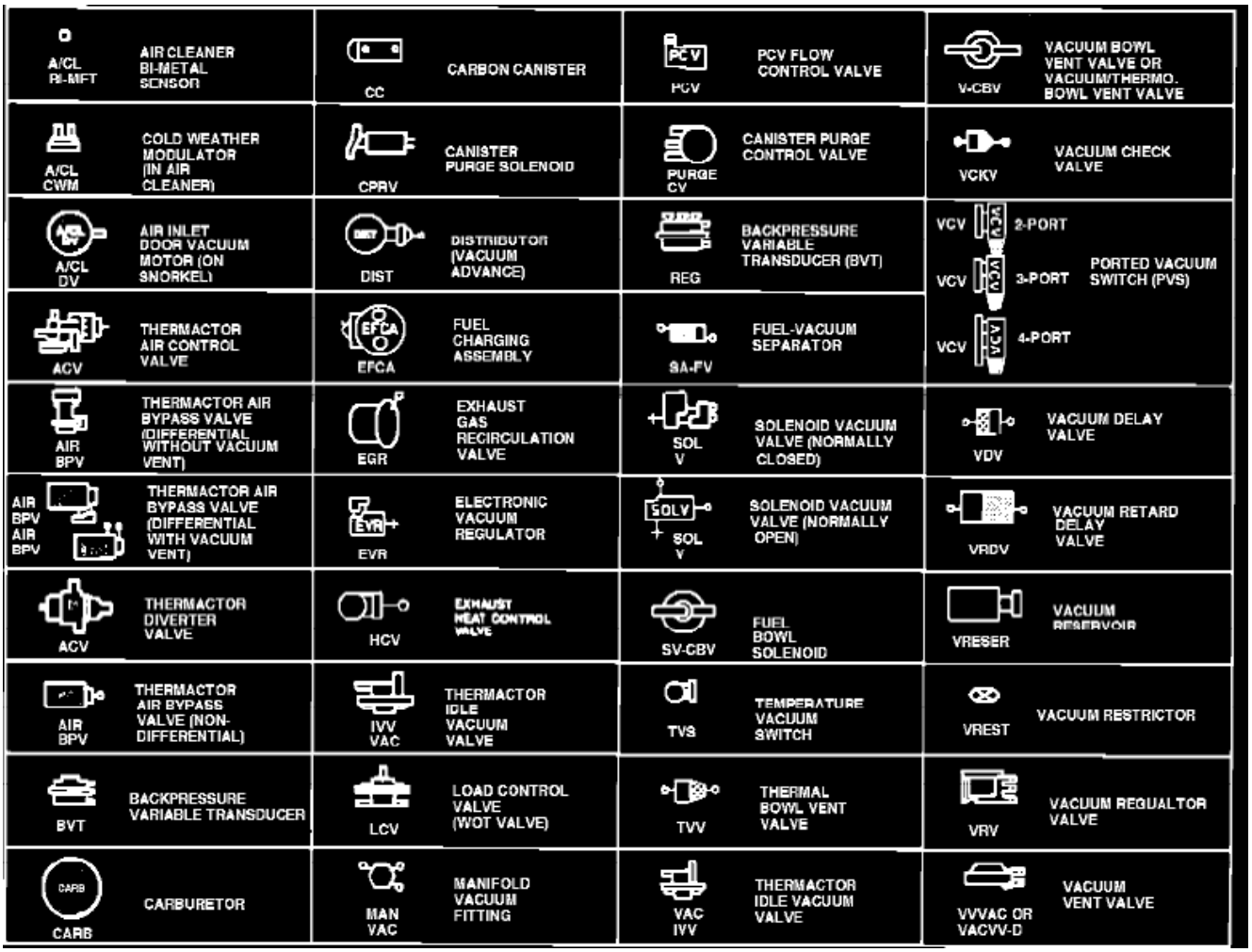
Inertia Switch

The inertia switch is located below the instrument panel, to the right of the transmission hump.

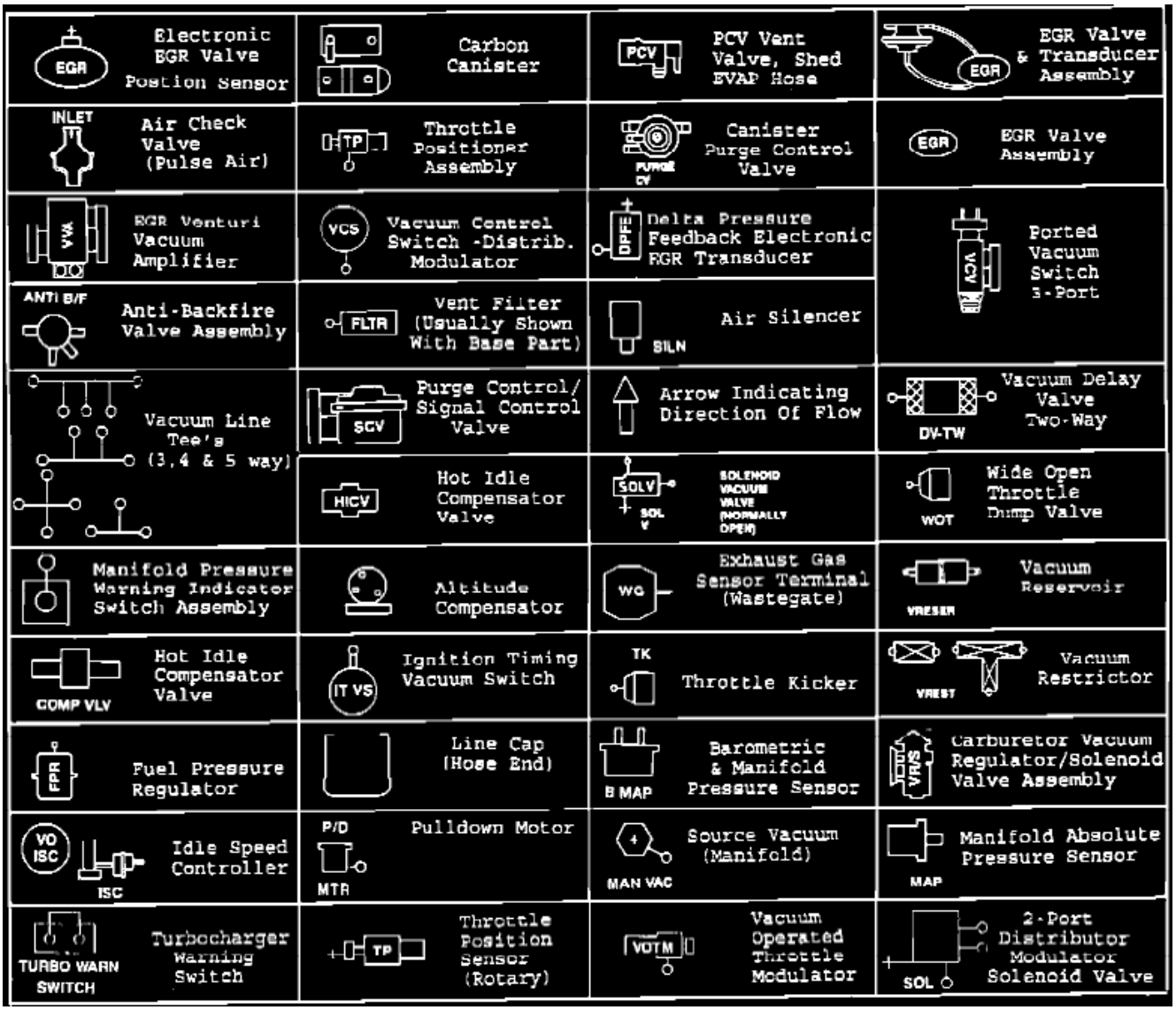


Fuel Pump Inertia Switch: Diagram Information and Instructions

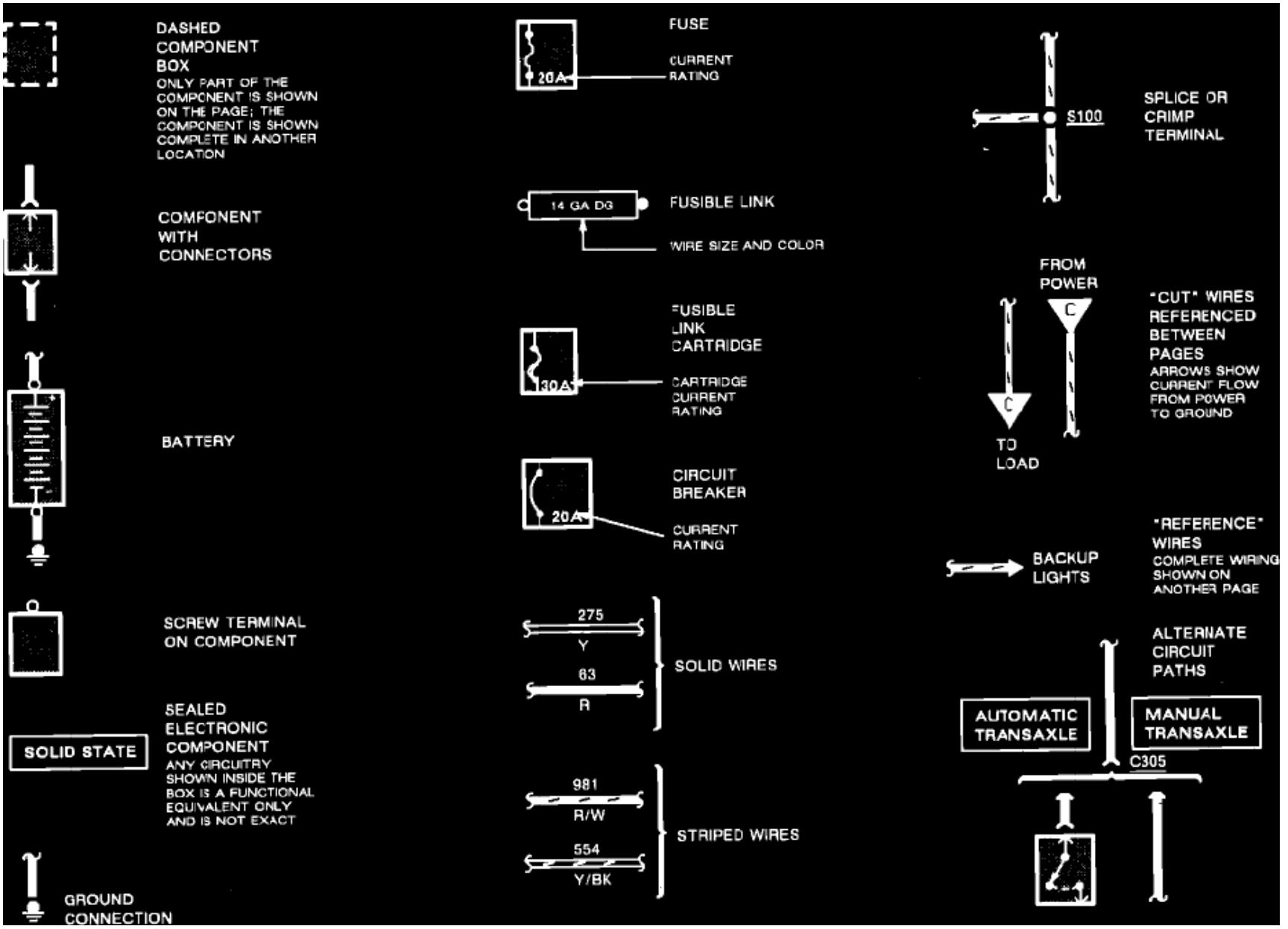
Symbol Identification

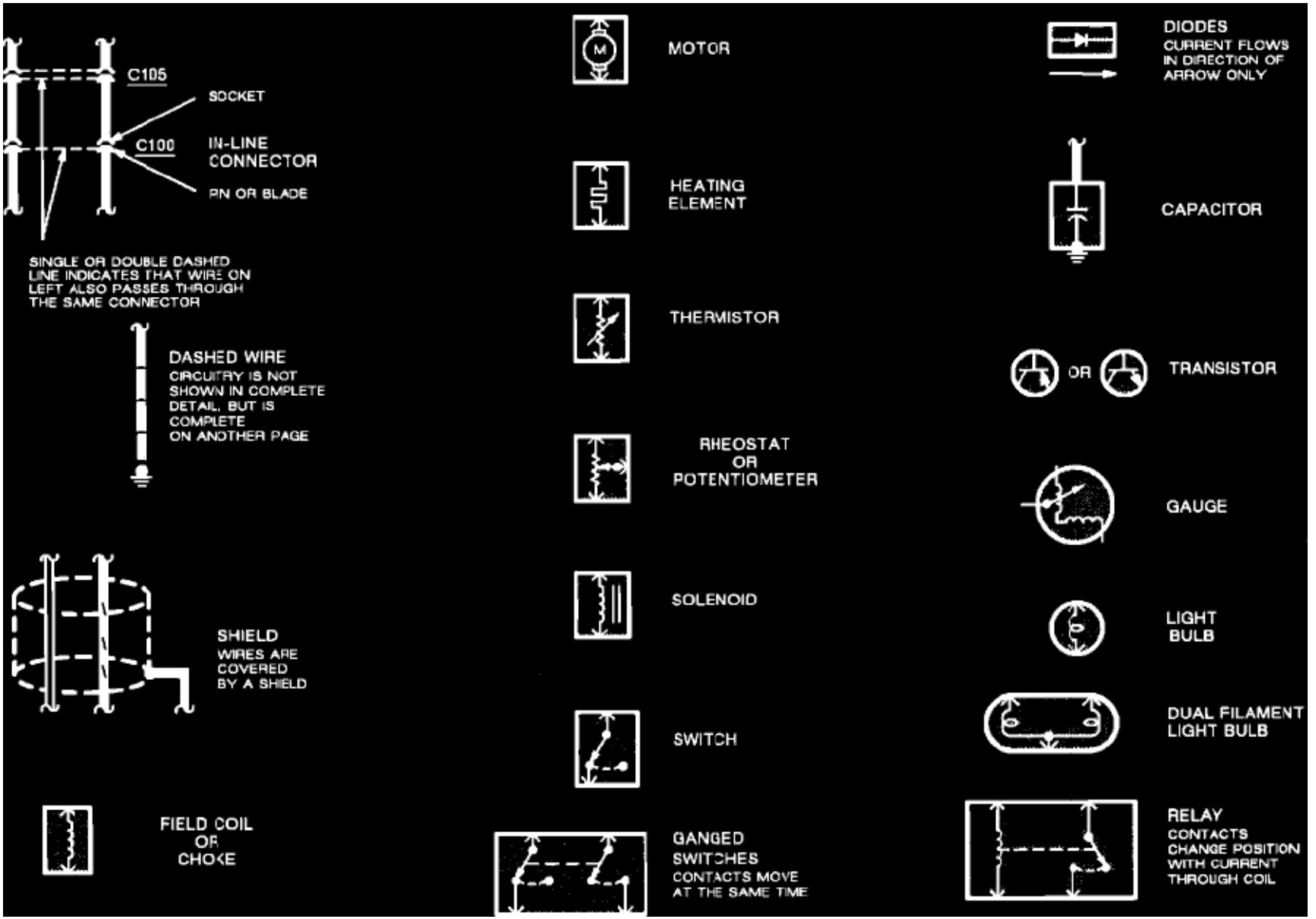


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

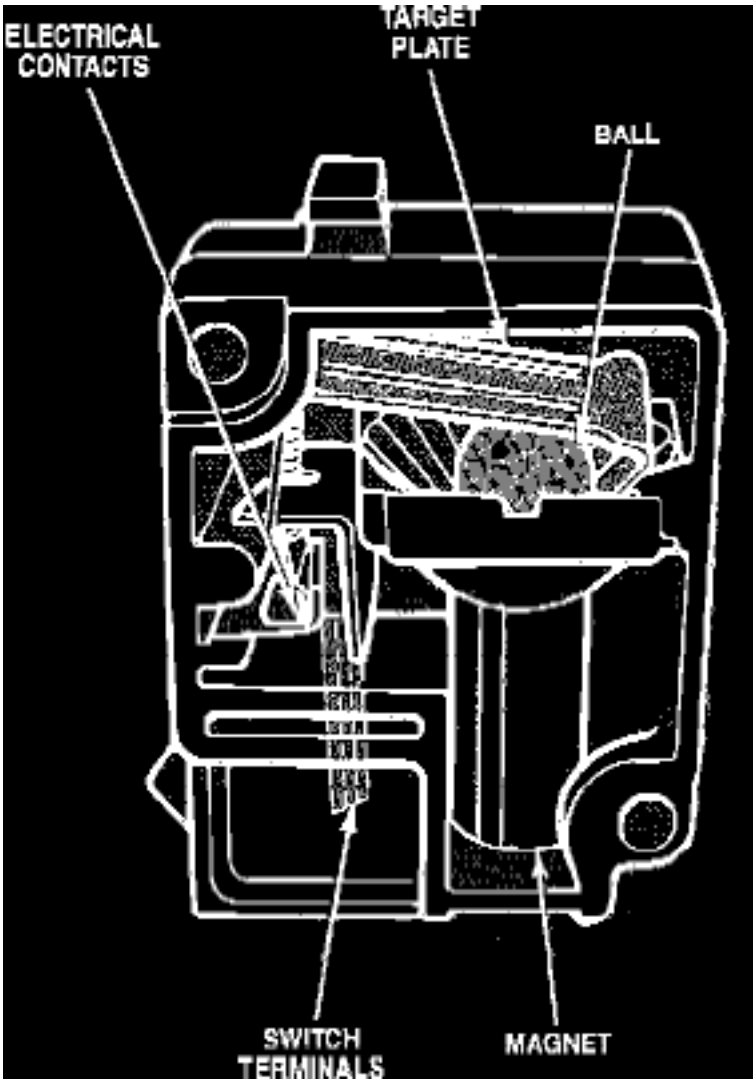
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuel Pump Inertia Switch: Description and Operation

Typical Inertia Fuel Shut-Off Switch

The inertia switch is used to open the power circuit to the fuel pump, or the control circuit to the fuel pump relay, in case of an accident. The inertia switch must be manually reset by pushing the reset button located on top of the inertia switch.

Operation of the inertia switch is as follows:

A steel ball is held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate, which opens the electrical contacts.

Fuel Pump Inertia Switch: Service and Repair

TO RESET SWITCH 1.

Turn ignition switch to OFF.

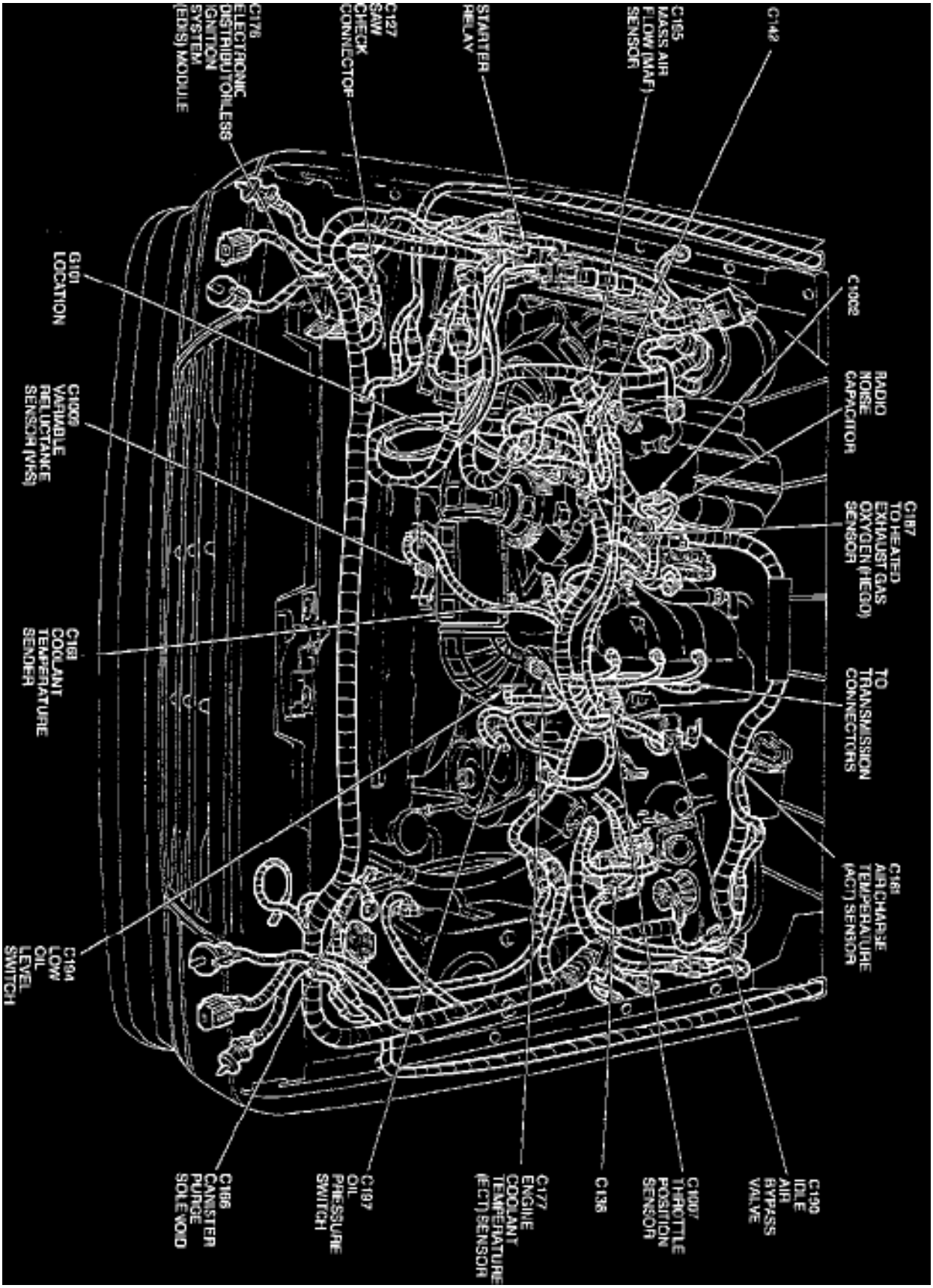
2. Check for leaking fuel in the engine compartment, fuel lines and tank(s).

3. If no fuel leak is apparent, reset the switch by pushing the reset button on the top of the switch.

4. Turn ignition switch to START for a few seconds, then to OFF.

5. Again, check for leaking fuel.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Sensors and Switches - Fuel Delivery and Air Induction > Throttle Position Sensor > Component Information > Locations

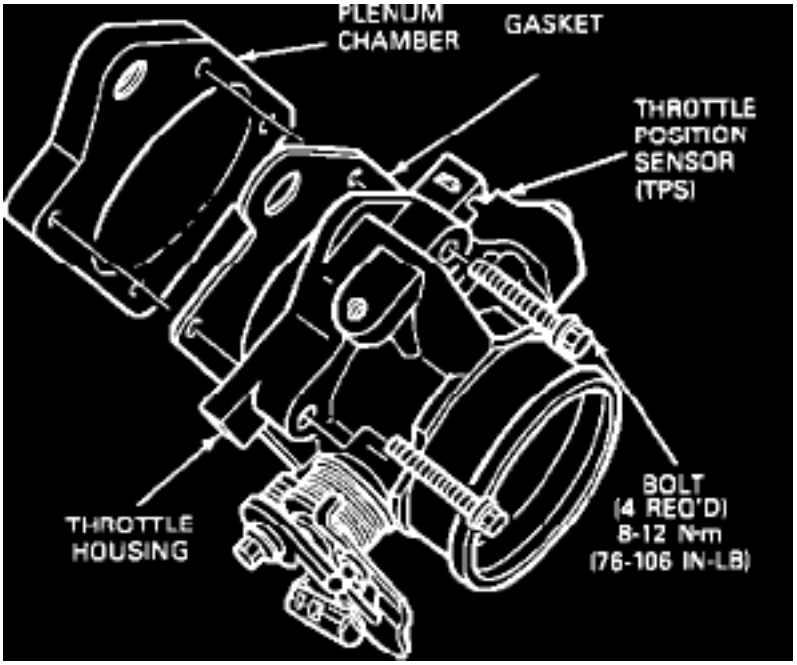


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



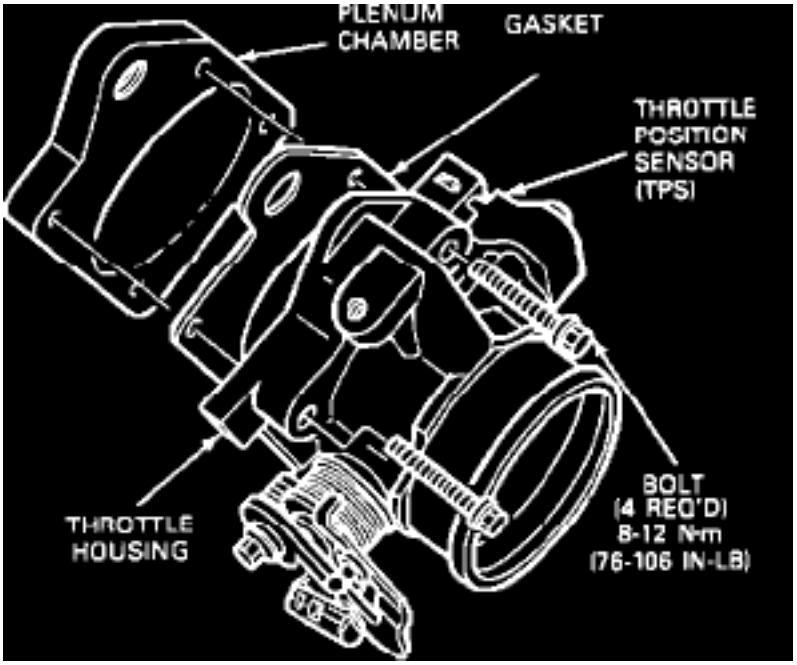
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

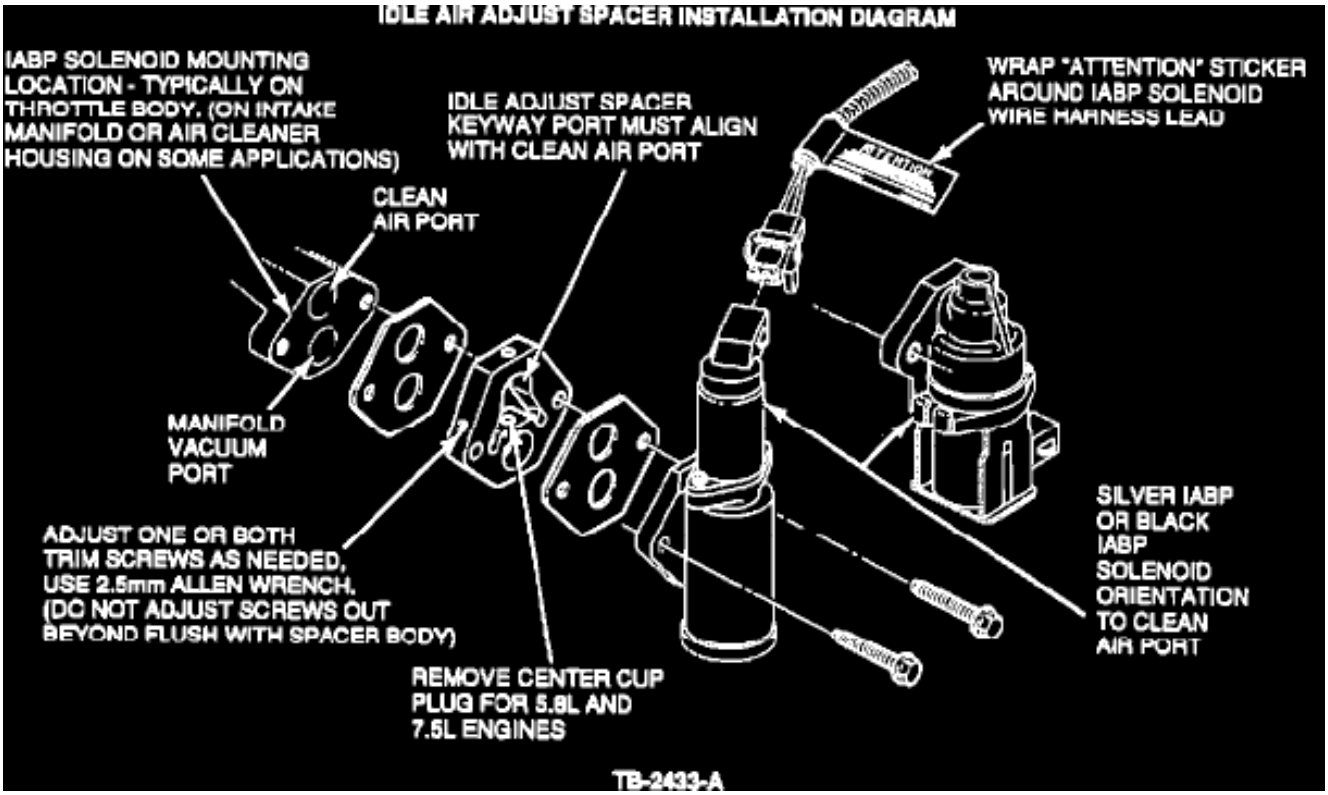
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

TB-2434-A

Figure 3

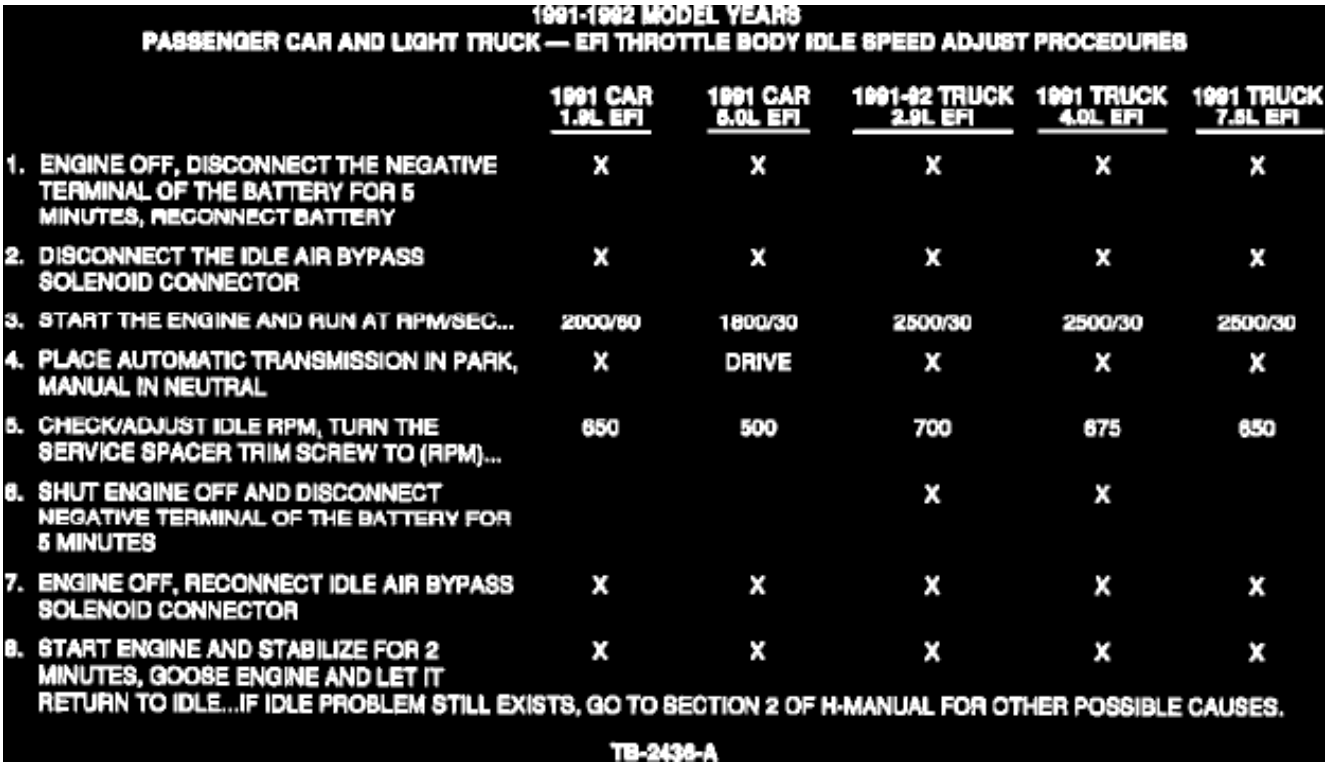
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

TB-2436-A

Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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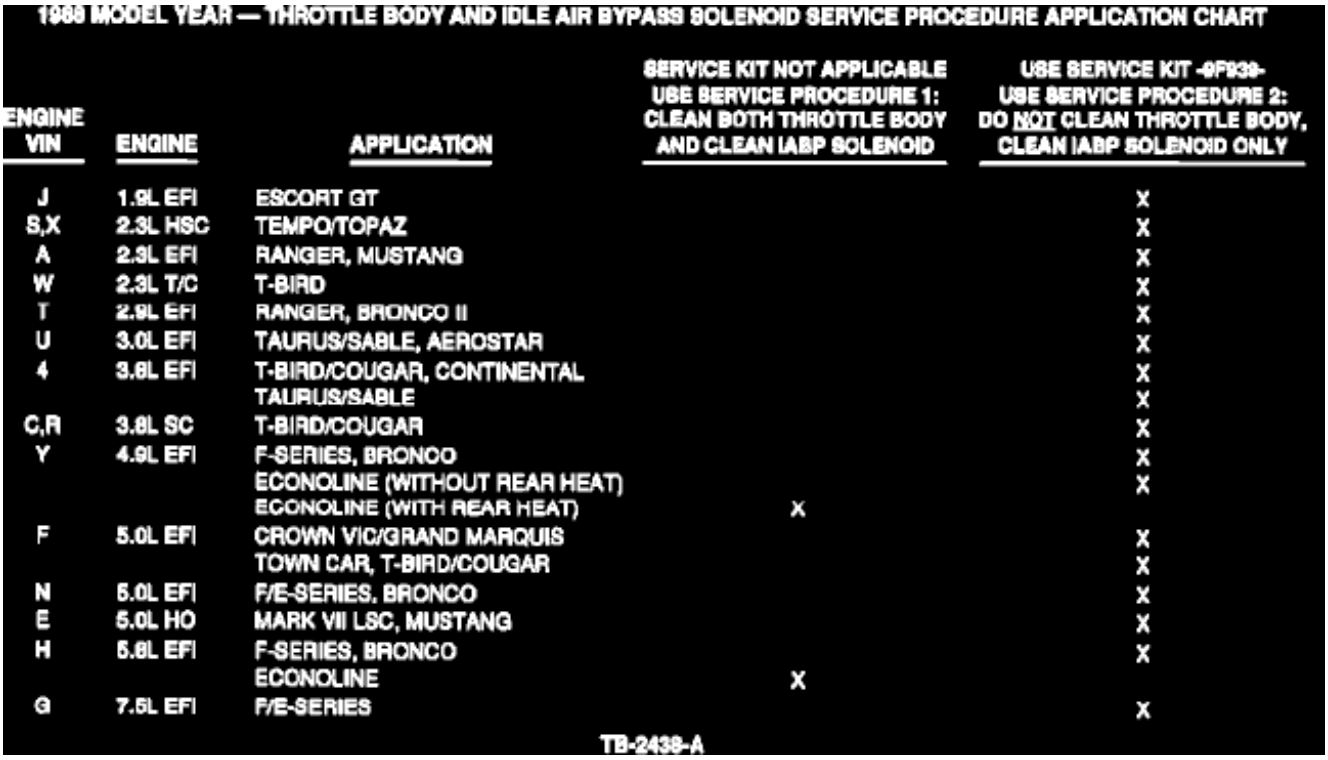
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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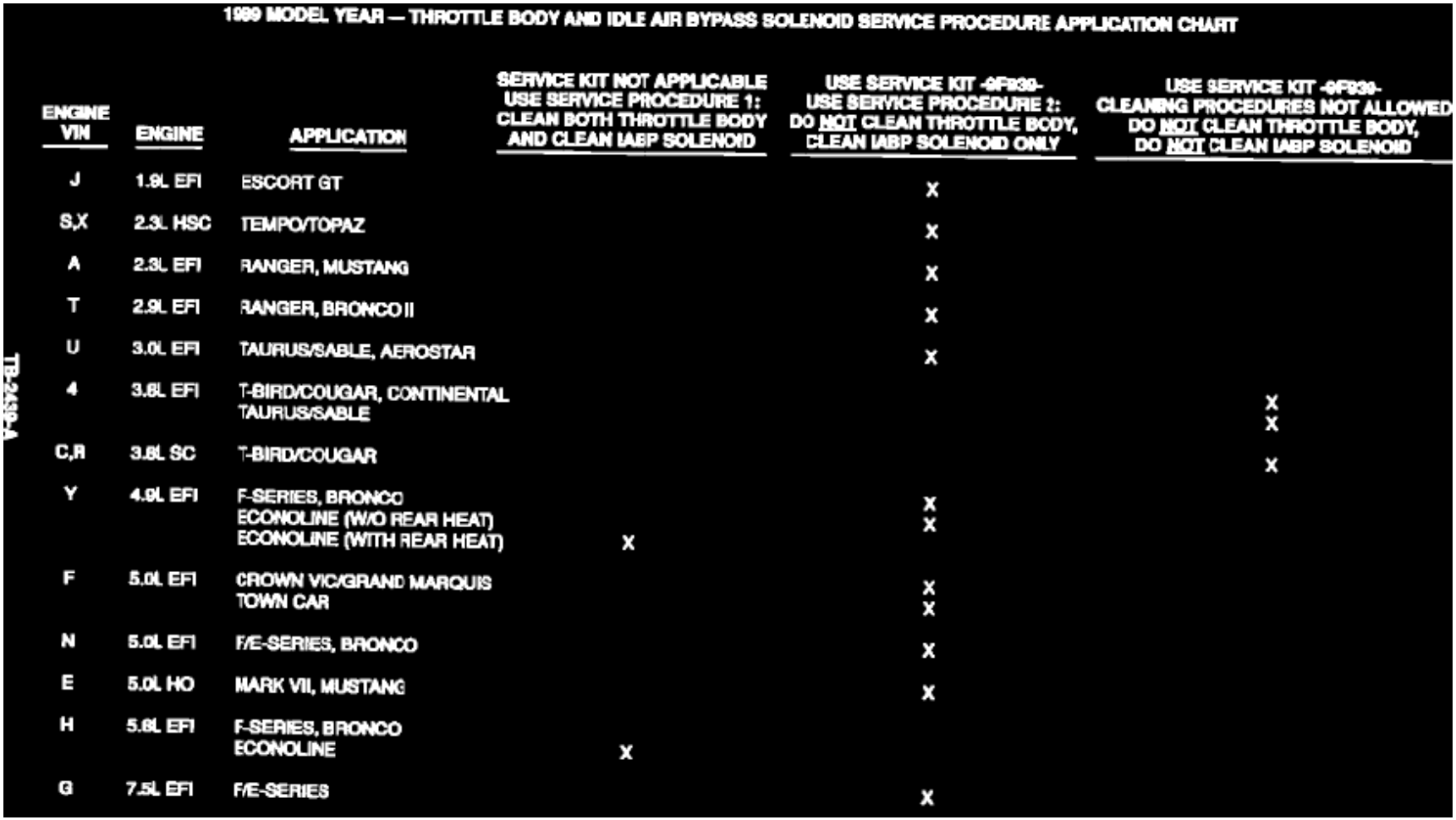
Figure 7

Figure 8

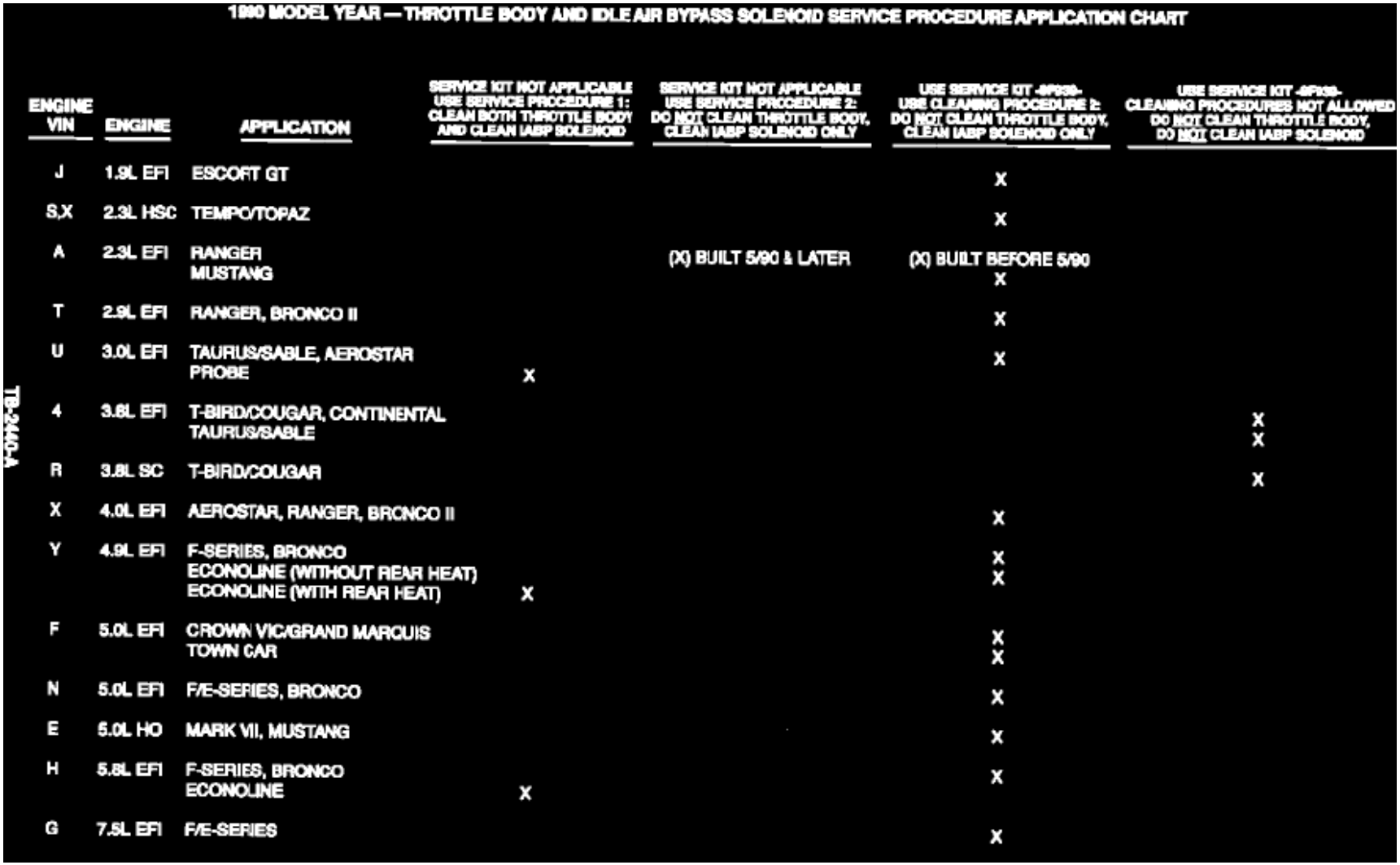


1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

TB-2439-A

Figure 9



1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

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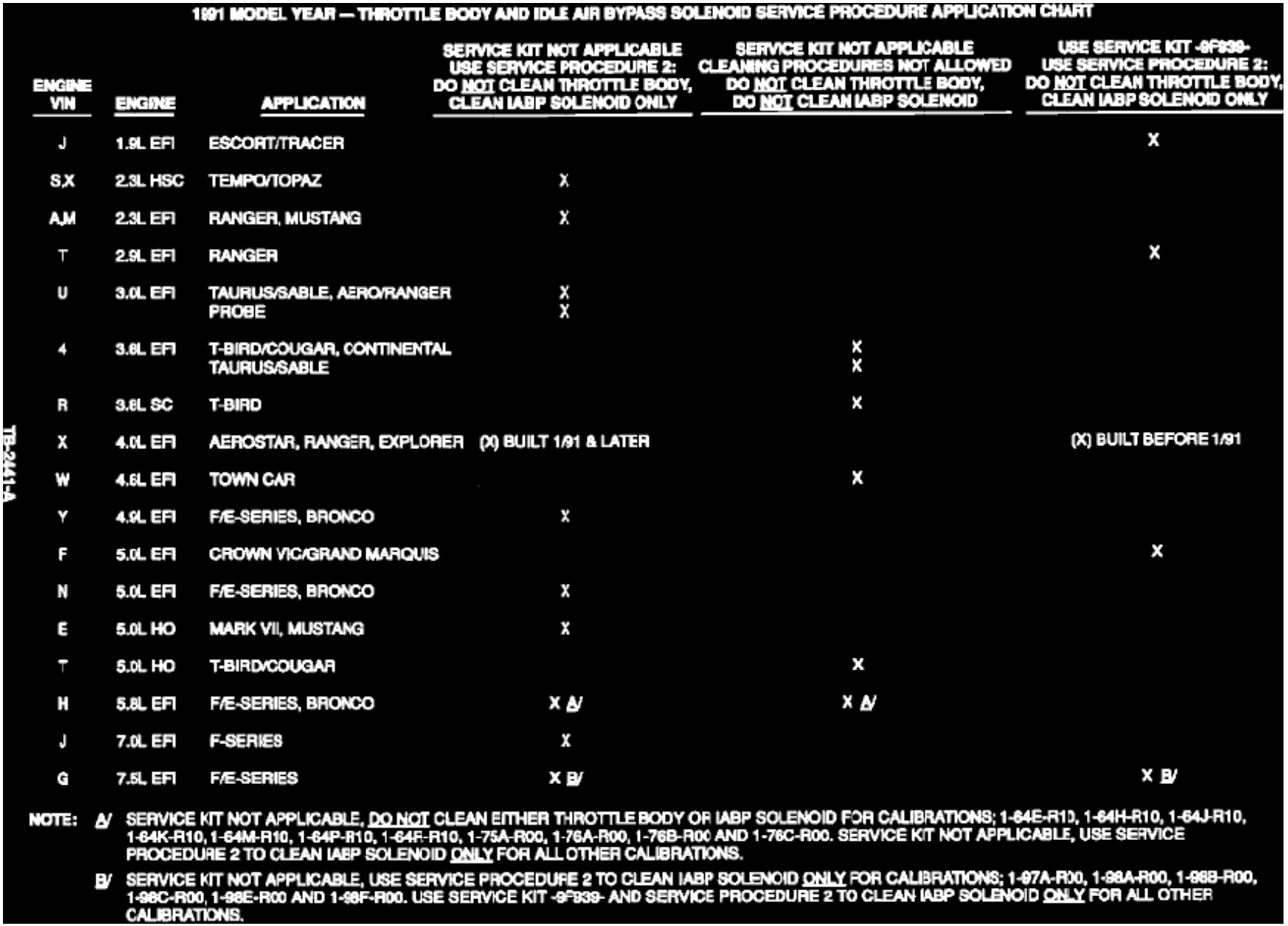
Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

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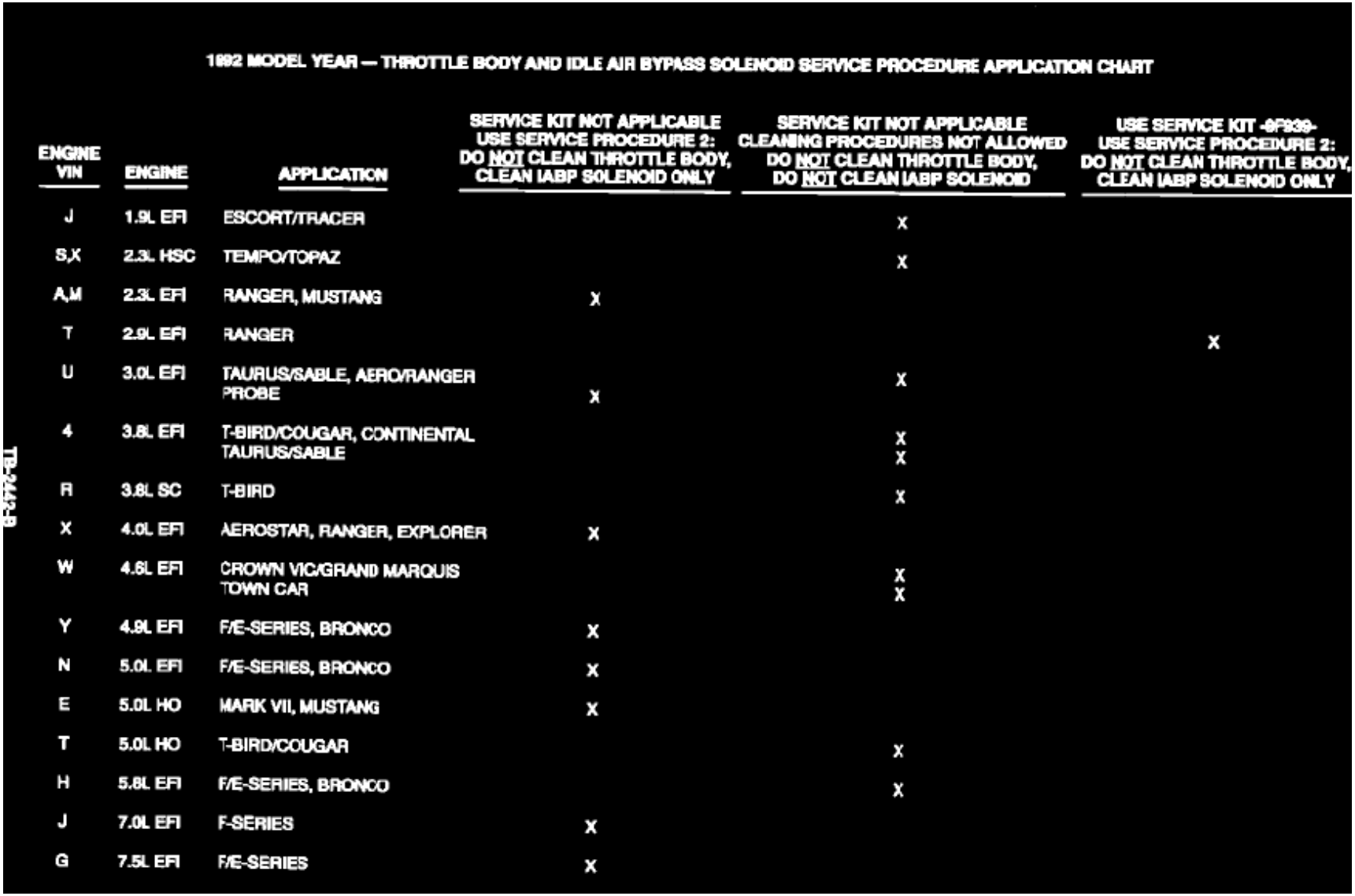
NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

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THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Technical Service Bulletin # 91257 Date: 911213

Engine - Hard Cold Starts/Hesitation/Stalls On Start-Up

Article No. 91-25-7

12/13/91

^ HARD COLD START - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

^ HESITATION/STALLS - DURING INITIAL START-UP, IDLE OR DECEL - EFI ENGINES - SLUDGE IN THROTTLE BODY AND/OR IDLE AIR BY-PASS VALVE

FORD: 1983-87 EXP 1983-91 ESCORT 1984-90 MUSTANG, THUNDERBIRD 1986-90 TAURUS 1986-91 CROWN VICTORIA 1988-90 TEMPO

LINCOLN-MERCURY: 1983-85 LN7 1983-87 LYNX 1984-88 CAPRI 1984-90 COUGAR 1986-90 CONTINENTAL, MARK VII, SABLE 1986-91 GRAND MARQUIS, TOWN CAR 1988-90 TOPAZ 1991 TRACER

LIGHT TRUCK: 1985-90 BRONCO II, BRONCO 1985-91 ECONOLINE, F-150-350 SERIES 1985-92 RANGER 1986-91 AEROSTAR 1991 EXPLORER

ISSUE: Hard cold starts, hesitation and stalls on initial start-up or during idle or decel may be caused by sludge in the throttle body and/or idle by-pass valve. Sludge deposits or oil film on the throttle body bore and plate or the idle air by-pass valve may cause one or more of the following conditions.

^ Hard Cold Start

^ Stall On Initial Start-Up

^ Stall During Idle

^ Stall During Decel

^ Rough Idle

^ Rolling Idle

^ Hesitation During Acceleration

ACTION: A new idle air by-pass service kit (F2PZ-9F939-A) is now available for service use to correct sludge contamination concerns of the throttle bore and plate only. It eliminates the need to clean the majority of past model throttle body applications. Cleaning is not required on sludge tolerant throttle body designs released for 1991 and newer model years.

SERVICE KIT -9F939-

APPLICATION CHART — EFI PORT FUEL INJECTION ENGINES

MODEL YEAR	CAR APPLICATION	ENGINE
1983-85	ESCORT GT/LYNX, EXP/LN7	1.6L EFI
1986-87	ESCORT GT/LYNX, EXP	1.9L EFI
1988-90	ESCORT GT	1.9L EFI
1991	ESCORT/TRACER	1.9L EFI
1987-90	MUSTANG	2.3L EFI
1984-86	THUNDERBIRD/COUGAR, MUSTANG/CAPRI	2.3L TC
1988-90	TEMPO/TOPAZ	2.3L HO/HSC
1986-90	TAURUS/SABLE	3.0L EFI
1988-90*	TAURUS/SABLE	3.8L EFI
1988-90	THUNDERBIRD/COUGAR	3.8L EFI/SC
1988-90	CONTINENTAL	3.8L EFI
1986-91	CROWN VICTORIA/GRAND MARQUIS, TOWN CAR	5.0L EFI
1986-88	THUNDERBIRD/COUGAR	5.0L EFI
1986-87	CONTINENTAL, MARK VII	5.0L EFI
1986-90	MARK VII LSC, MUSTANG	5.0L HO

MODEL YEAR	LIGHT TRUCK APPLICATION	ENGINE
1985	BRONCO II	2.3L EFI
1985-90**	RANGER	2.3L EFI
1986-87	AEROSTAR	2.3L EFI
1986-92	RANGER/BRONCO II	2.9L EFI
1986-90	AEROSTAR	3.0L EFI
1990-91***	RANGER, EXPLORER, AEROSTAR	4.0L EFI
1987-90	F-SERIES/BRONCO	4.9L EFI
1987-90	ECONOLINE (WITHOUT REAR HEAT)	4.9L EFI
1985-90	F-SERIES/BRONCO, ECONOLINE	5.0L EFI
1988-90	F-SERIES/BRONCO	5.8L EFI
1987-91****	F-SERIES, ECONOLINE	7.5L EFI

NOT FOR USE ON THE FOLLOWING EFI ENGINE APPLICATIONS:

1988-90	FESTIVA	1.3L EFI
1988-89	TRACER	1.6L EFI
1985-89	XR4Ti	2.3L TC
1988-89	SCORPIO	2.9L EFI
1989-90	PROBE	2.2L, 2.2L TC AND 3.0L EFI
1989-90	TAURUS	3.0L SHO
1987-90	ECONOLINE	4.9L EFI (WITH REAR HEAT)
1988-90	ECONOLINE	5.8L EFI

NOT APPLICABLE FOR 1991 MODEL YEAR EXCEPT WHERE LISTED
NOT APPLICABLE FOR 1992 MODEL YEAR EXCEPT WHERE LISTED

* CUT OUT HOOD INSULATION PAD, IF NECESSARY, TO AVOID POSSIBLE CONTACT WITH THE IABP SOLENOID.
** 1990 MODEL YEAR BUILT BEFORE 5/90
*** 1991 MODEL YEAR BUILT BEFORE 1/91
**** 1991 MODEL YEAR ALL CALIBRATIONS **EXCEPT** 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00.

TB-2432-A

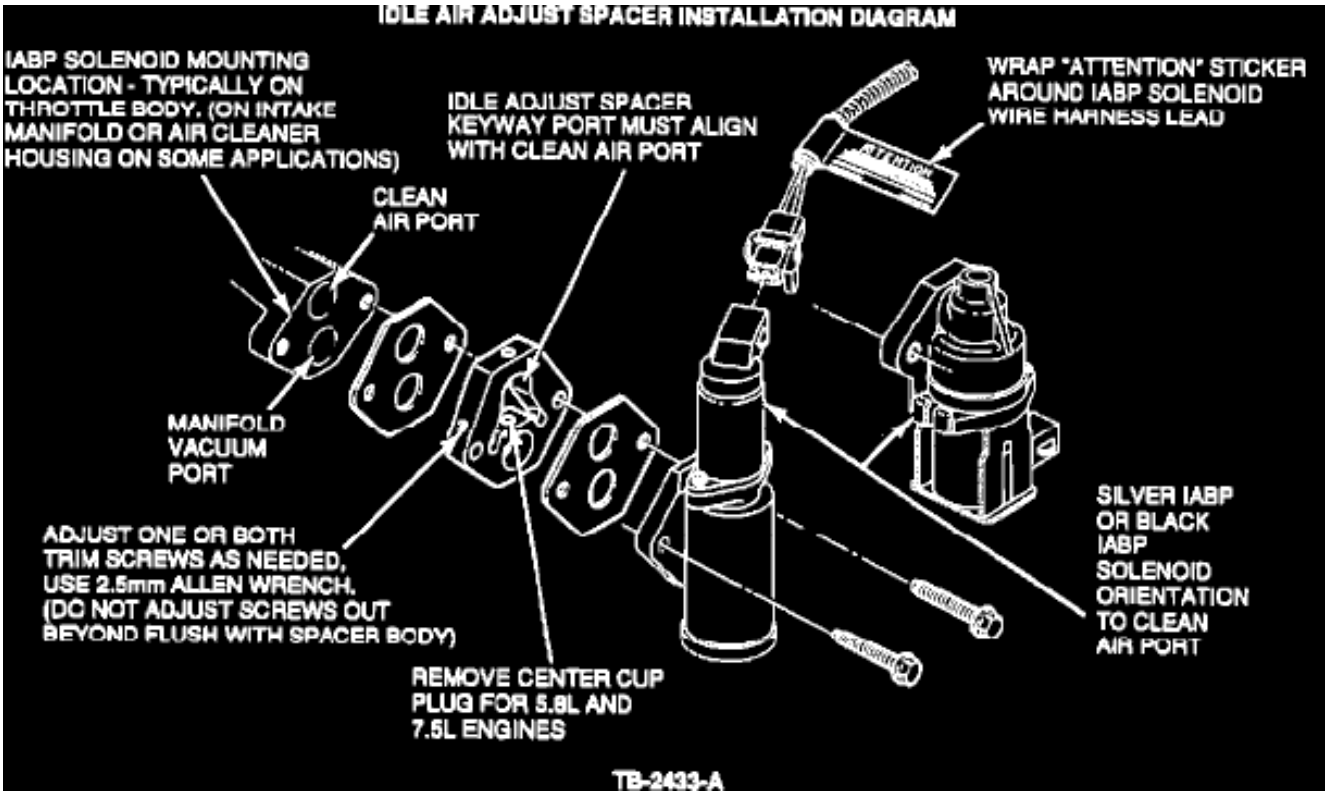
Figure 1

Install an idle air by-pass service kit (F2PZ-9F939-A) as applicable to provide a permanent correction for symptoms caused by throttle body sludge deposits. Refer to the instruction sheet included in the kit for installation details. Refer to Figure 1 for a specific application list of EFI (port fuel Injection) engines involved in this TSB article.

The idle air by-pass service kit (F2PZ-9F939-A) includes the following items.

^ One (1) Idle Adjust Spacer

^ Two (2) Gaskets



^ Two (2) Attaching Bolts

^ One (1) "Attention" Sticker

^ One (1) Instruction Sheet

Figure 2

Refer to Figure 2 for a pictorial of the kits components.

NOTE: EFFECTIVE WITH THIS TSB, THROTTLE BODY CLEANING IS NO LONGER COVERED UNDER 5/50 EMISSIONS WARRANTY,

UNLESS AS SPECIFIED IN THE FOLLOWING APPLICATION CHARTS. FAILURE TO FOLLOW THE CORRECT PROCEDURE MAY RESULT IN THE CLAIM BEING DISALLOWED.

The idle air adjust spacer incorporates sludge tolerant design features that eliminate throttle body sludge related conditions. Once installed, throttle body cleaning is not allowed and periodic adjustment of the throttle body is not required.

Procedures, Warranty and Labor

CHECKS TO MAKE PRIOR TO SERVICE KIT INSTALLATION

Confirm that the following items are not causing the idle quality concern before proceeding with the service kit installation.

^ Contamination within the idle air by-pass solenoid

^ Lack of fuel system control (excessively rich or lean)

^ Ignition timing change

^ Incorrect or malfunctioning EGR system

^ Incorrect or malfunctioning cooling system

^ Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable)

^ EEC diagnostics have been performed and vehicle malfunction indicated service output codes have been resolved and cleared.

If any of the areas listed above are found to be at fault, correct them before proceeding with the service kit installation.

Idle Speed Adjustment

WARNING: BEFORE PROCEEDING WITH THE IDLE SPEED ADJUSTMENT, VERIFY THAT THE FOLLOWING ITEMS ARE TAKEN CARE

OF PROPERLY.

^ The transmission is in PARK or Neutral.

^ The parking brake is applied.

^ The wheels are properly blocked.

^ The engine is at operating temperature.

^ The heater, A/C, cooling fan and other accessories are OFF.

1983-1990 MODEL YEARS — PASSENGER CAR — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1983-85 1.6L EFI	1986-90 1.9L HO	1984-88 2.3L TC	1987-90 2.3L OHC	1988-90 2.3L HSC/HO	1986-90 3.0L EFI	1988-90 3.8L EFI/SC	1986-90 5.0L EFI/HO
1. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC					X	X		
2. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A					X	X		
3. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
4. START ENGINE AND RUN AT: RPM/SEC...	2000/60	2000/60	2000/120	1500/30	2500/30	1989-90 2000/30	1988 2500/30	1986-88 1800/30
5. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	DRIVE	PARK	PARK	PARK	DRIVE	DRIVE	PARK	DRIVE
6. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	SEE DECAL FOR BASE IDLE	1986-87 SEE DECAL 1988-90 975	750	1987-88 525 1989-90 A:650 M:600	A:1050 M:1575	1986 625 1987 700 1988-90 760	550	500
7. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT						X		X
8. ENGINE OFF, RECONNECT SPOUT LINE					X	X		
9. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE					X	X		
10. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
11. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.								
12. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT						X	X	X

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Figure 3

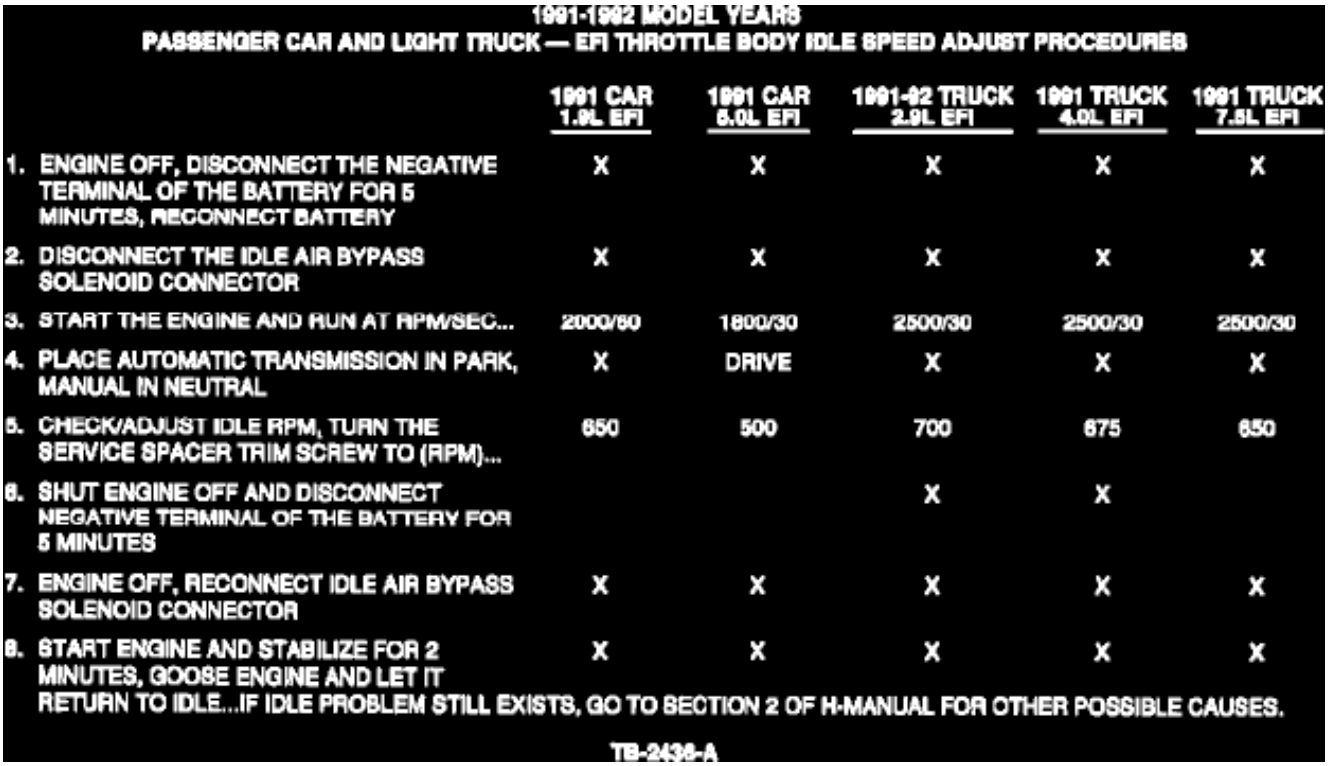
1985-1990 MODEL YEARS — LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1985-90 2.3L OHC	1985-90 2.9L EFI	1986-90 3.0L EFI	1990 4.0L EFI	1987-90 4.9L EFI	1985-90 5.0L EFI	1988-90 5.8L EFI	1987-90 7.5L EFI
1. INSTALL FEELER GAUGE BETWEEN THROTTLE STOP SCREW & LEVER					1989-90 0.050"	1989-90 A:0.050" M:0.030"	1989-90 0.030"	
2. UNPLUG SPOUT LINE AND VERIFY THAT IGNITION TIMING IS BASE ±2° BTDC	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
3. REMOVE PCV HOSE AT VALVE AND INSTALL .2" DIAMETER ORIFICE TOOL T86P-9600-A			1986-87 X					
4. DISCONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
5. START ENGINE AND RUN AT: RPM/SEC...	1985-87 1500/20	1986-87 2000/120	1986-90 2500/30	2500/30	1987-88 1800/30	1985-88 1600/30	1988 1600/60	2500/30
	1988-90 2500/30	1988-90 2500/30						
6. PLACE AUTO TRANS IN... MANUAL IN NEUTRAL	PARK	PARK	DRIVE	PARK	1987-88 DRIVE 1989-90 PARK	1985-88 DRIVE 1989-90 PARK	1988 DRIVE 1989-90 PARK	PARK
7. CHECK/ADJUST IDLE RPM: TURN THE SERVICE SPACER TRIM SCREW TO (RPM)	1985-87, 1989-90 575	1988 A:700 M:750	1988 A:850 M:1040	675	1987-88 A:550 M:850	1985-88 A:550 M:850	1988 A:575 M:600	650
	1988 625	1987 A:700 M:650	1987 A:900 M:1050		1989 @650 #750	1989-90 A:675 M:700	1989-90 A:C6 780	
		1988-90 725	1988-90 A:625 M:725		1990 A:675 M:700		1989-90 A:E4OD & MAN 730	
8. SHUT ENGINE OFF AND DISCONNECT BATTERY FOR 5 MIN, RECONNECT		X	X	X	X	X		
9. REMOVE FEELER GAUGE					1989-90 X	1989-90 X	1989-90 X	
10. ENGINE OFF, RECONNECT SPOUT LINE	1990 X		1986-87 X		1989-90 X	1989-90 X	1989-90 X	
11. REMOVE ORIFICE FROM PCV HOSE, RECONNECT TO PCV VALVE			1986-87 X					
12. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X	X	X	X
13. START ENGINE AND STABILIZE FOR 2 MIN, GOOSE ENGINE AND LET IT RETURN TO IDLE...	X	X	X	X	X	X	X	X
	IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.							
14. ON AUTOMATIC OVERDRIVE TRANS, CHECK TV ADJUSTMENT					X	X		

@ 1989 MODEL YEAR 4.9L CALIBRATIONS: 7-52ER-, 7-52JR-, 7-52KR-, 7-52MR-, 7-52QR-, 7-52RR-, 7-52ZR-, 7-72JR-
# 1989 MODEL YEAR 4.9L ALL OTHER CALIBRATIONS

TB-2435-A

Figure 4



1991-1992 MODEL YEARS
PASSENGER CAR AND LIGHT TRUCK — EFI THROTTLE BODY IDLE SPEED ADJUST PROCEDURES

	1991 CAR 1.9L EFI	1991 CAR 5.0L EFI	1991-92 TRUCK 2.9L EFI	1991 TRUCK 4.0L EFI	1991 TRUCK 7.5L EFI
1. ENGINE OFF, DISCONNECT THE NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES, RECONNECT BATTERY	X	X	X	X	X
2. DISCONNECT THE IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
3. START THE ENGINE AND RUN AT RPM/SEC...	2000/60	1800/30	2500/30	2500/30	2500/30
4. PLACE AUTOMATIC TRANSMISSION IN PARK, MANUAL IN NEUTRAL	X	DRIVE	X	X	X
5. CHECK/ADJUST IDLE RPM, TURN THE SERVICE SPACER TRIM SCREW TO (RPM)...	650	500	700	675	650
6. SHUT ENGINE OFF AND DISCONNECT NEGATIVE TERMINAL OF THE BATTERY FOR 5 MINUTES			X	X	
7. ENGINE OFF, RECONNECT IDLE AIR BYPASS SOLENOID CONNECTOR	X	X	X	X	X
8. START ENGINE AND STABILIZE FOR 2 MINUTES, GOOSE ENGINE AND LET IT RETURN TO IDLE...IF IDLE PROBLEM STILL EXISTS, GO TO SECTION 2 OF H-MANUAL FOR OTHER POSSIBLE CAUSES.	X	X	X	X	X

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Figure 5

The EFI throttle body idle speed adjustment procedures for the various model year passenger cars and light trucks are outlined in step-by-step procedures featured in Figures 3, 4 and 5. Select the appropriate procedure for the vehicle involved and adjust the throttle body idle RPM accordingly, after service kit installation.

THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
1983-85 MODEL YEARS				
J	1.6L EFI	1983-85 ESCORT GT/LYNX, EXP/LN7		X
W	2.3L T/C	1984-85 T-BIRD, MUSTANG/CAPRI		X
A	2.3L EFI	1985 RANGER/BRONCO II		X
N	5.0L EFI	1985 F/E-SERIES, BRONCO		X
1986 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L EFI	RANGER, AEROSTAR		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
1987 MODEL YEAR				
J	1.9L EFI	ESCORT GT/LYNX, EXP		X
A	2.3L OHC	RANGER, AEROSTAR, MUSTANG		X
W	2.3L T/C	T-BIRD/COUGAR, MUSTANG/CAPRI		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
Y	4.9L EFI	ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X	X
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR, T-BIRD/COUGAR CONTINENTAL, MARK VII		X X X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
G	7.5L EFI	F/E-SERIES		X

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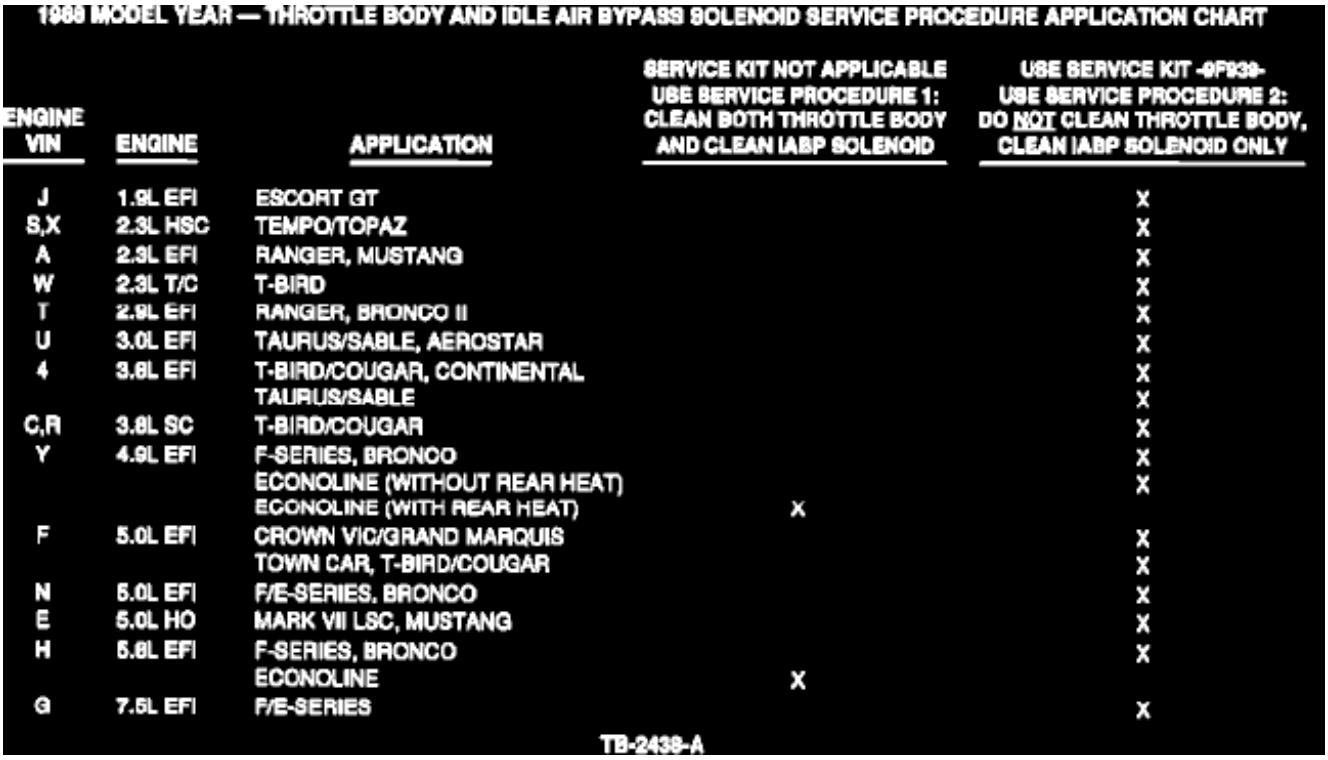
Figure 6



1988 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT GT		X
S,X	2.3L HSC	TEMPO/TOPAZ		X
A	2.3L EFI	RANGER, MUSTANG		X
W	2.3L T/C	T-BIRD		X
T	2.9L EFI	RANGER, BRONCO II		X
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL		X
		TAURUS/SABLE		X
C,R	3.8L SC	T-BIRD/COUGAR		X
Y	4.9L EFI	F-SERIES, BRONCO		X
		ECONOLINE (WITHOUT REAR HEAT)		X
		ECONOLINE (WITH REAR HEAT)	X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS		X
		TOWN CAR, T-BIRD/COUGAR		X
N	5.0L EFI	F/E-SERIES, BRONCO		X
E	5.0L HO	MARK VII LSC, MUSTANG		X
H	5.8L EFI	F-SERIES, BRONCO		X
		ECONOLINE	X	
G	7.5L EFI	F/E-SERIES		X

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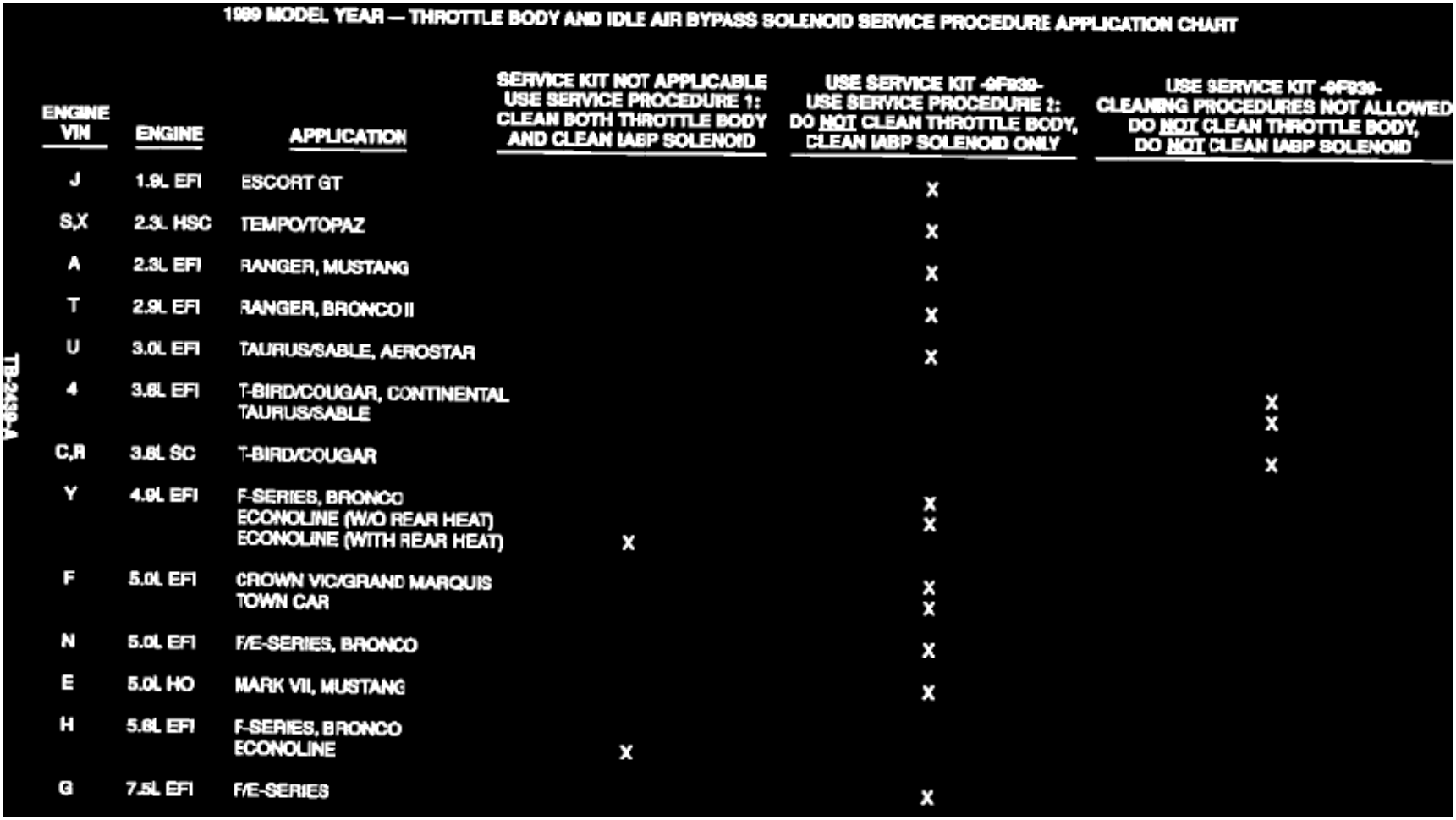
Figure 7

Figure 8



1999 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	USE SERVICE KIT -6P939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A	2.3L EFI	RANGER, MUSTANG		X	
T	2.9L EFI	RANGER, BRONCO II		X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE			X X
C,R	3.8L SC	T-BIRD/COUGAR			X
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (W/O REAR HEAT) ECONOLINE (WITH REAR HEAT)	 X	X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
N	5.0L EFI	F/E-SERIES, BRONCO		X	
E	5.0L HO	MARK VII, MUSTANG		X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	 X		
G	7.5L EFI	F/E-SERIES		X	

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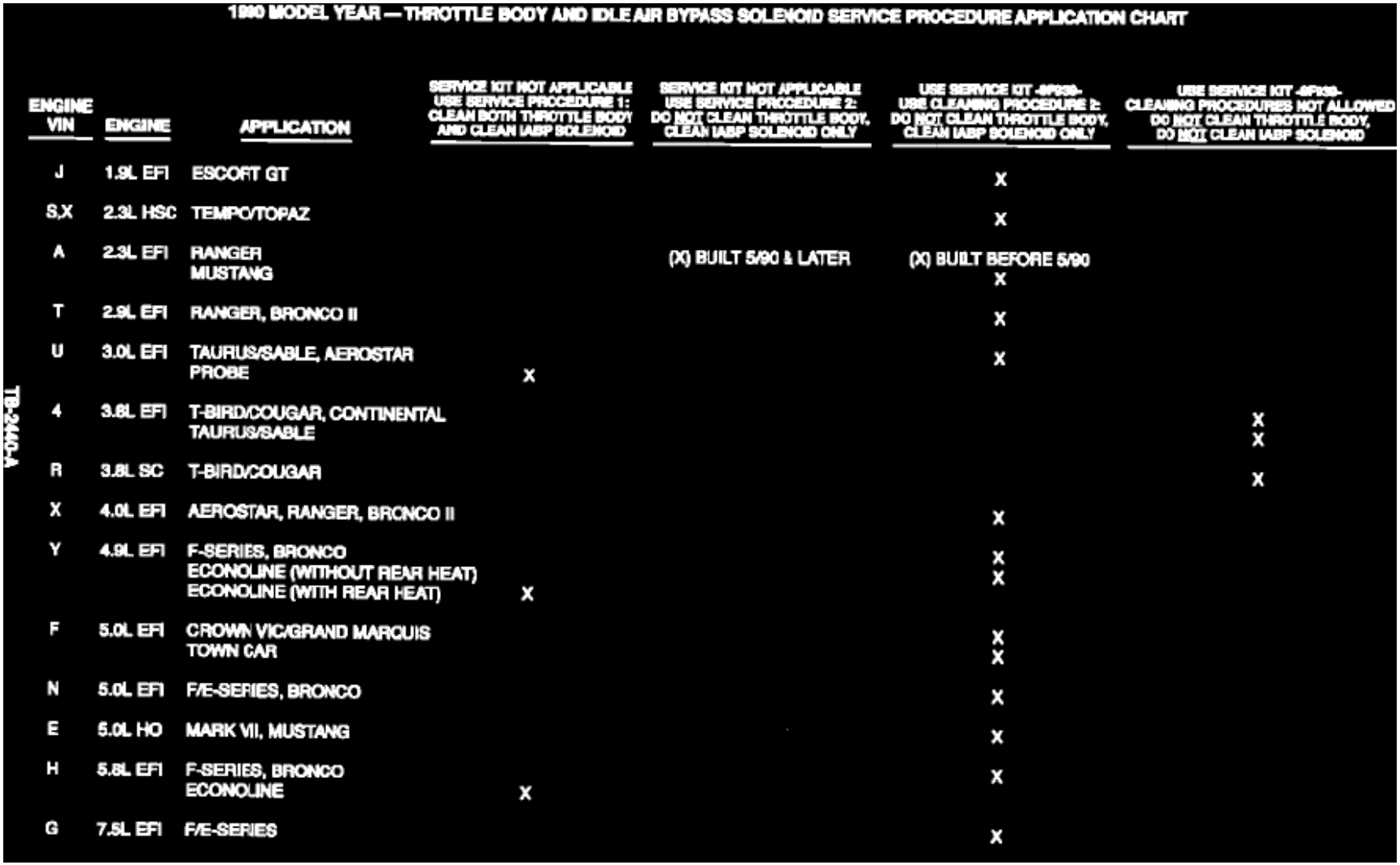
Figure 9

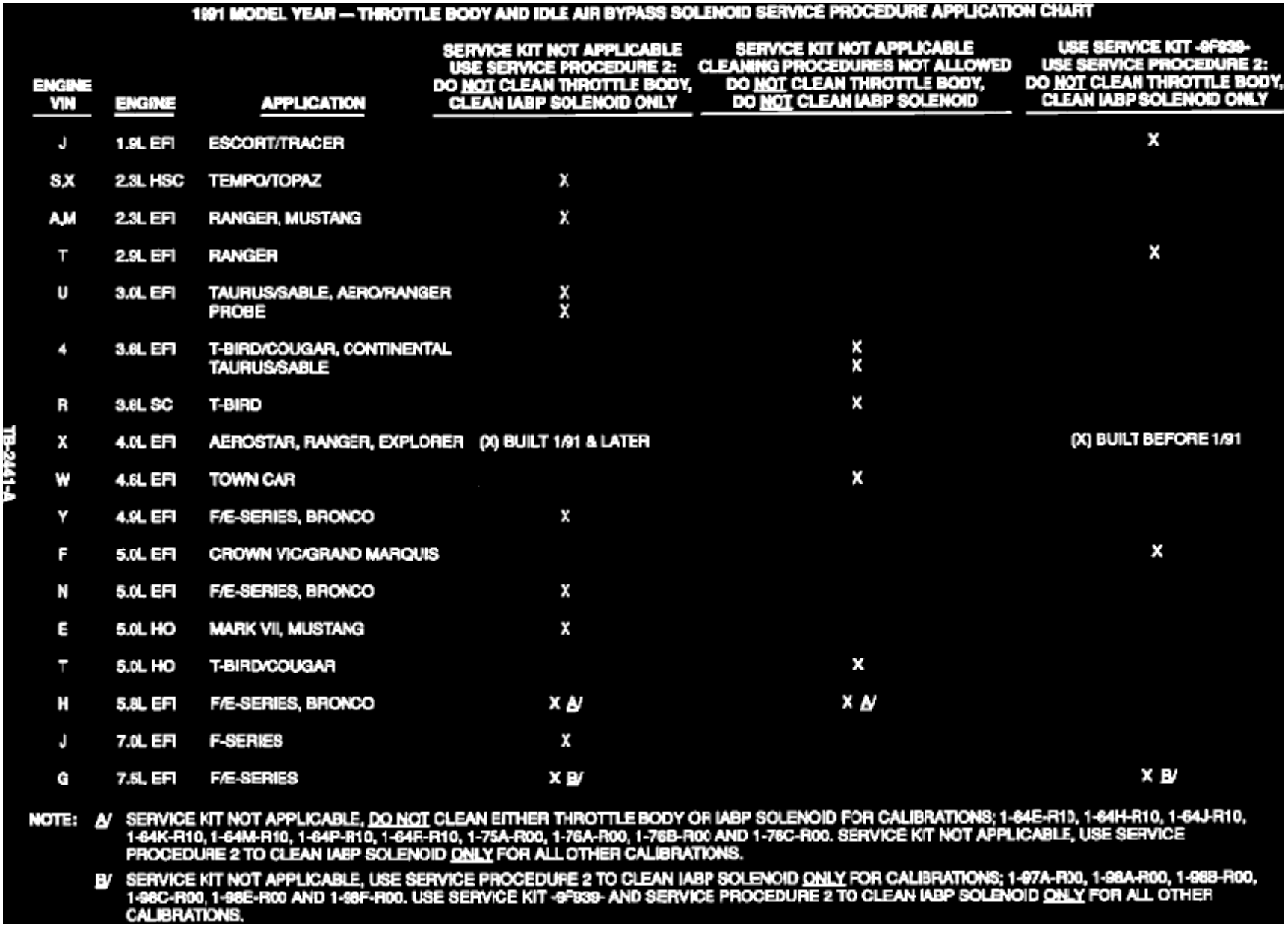


1990 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 1: CLEAN BOTH THROTTLE BODY AND CLEAN IABP SOLENOID	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- USE CLEANING PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	USE SERVICE KIT -6P939- CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID
J	1.9L EFI	ESCORT GT			X	
S,X	2.3L HSC	TEMPO/TOPAZ			X	
A	2.3L EFI	RANGER MUSTANG		(X) BUILT 5/90 & LATER	(X) BUILT BEFORE 5/90 X	
T	2.9L EFI	RANGER, BRONCO II			X	
U	3.0L EFI	TAURUS/SABLE, AEROSTAR PROBE	X		X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE				X X
R	3.8L SC	T-BIRD/COUGAR				X
X	4.0L EFI	AEROSTAR, RANGER, BRONCO II			X	
Y	4.9L EFI	F-SERIES, BRONCO ECONOLINE (WITHOUT REAR HEAT) ECONOLINE (WITH REAR HEAT)	X		X X	
F	5.0L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR			X X	
N	5.0L EFI	F/E-SERIES, BRONCO			X	
E	5.0L HO	MARK VII, MUSTANG			X	
H	5.8L EFI	F-SERIES, BRONCO ECONOLINE	X		X	
G	7.5L EFI	F/E-SERIES			X	

TB-2440-A

Figure 10



1991 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

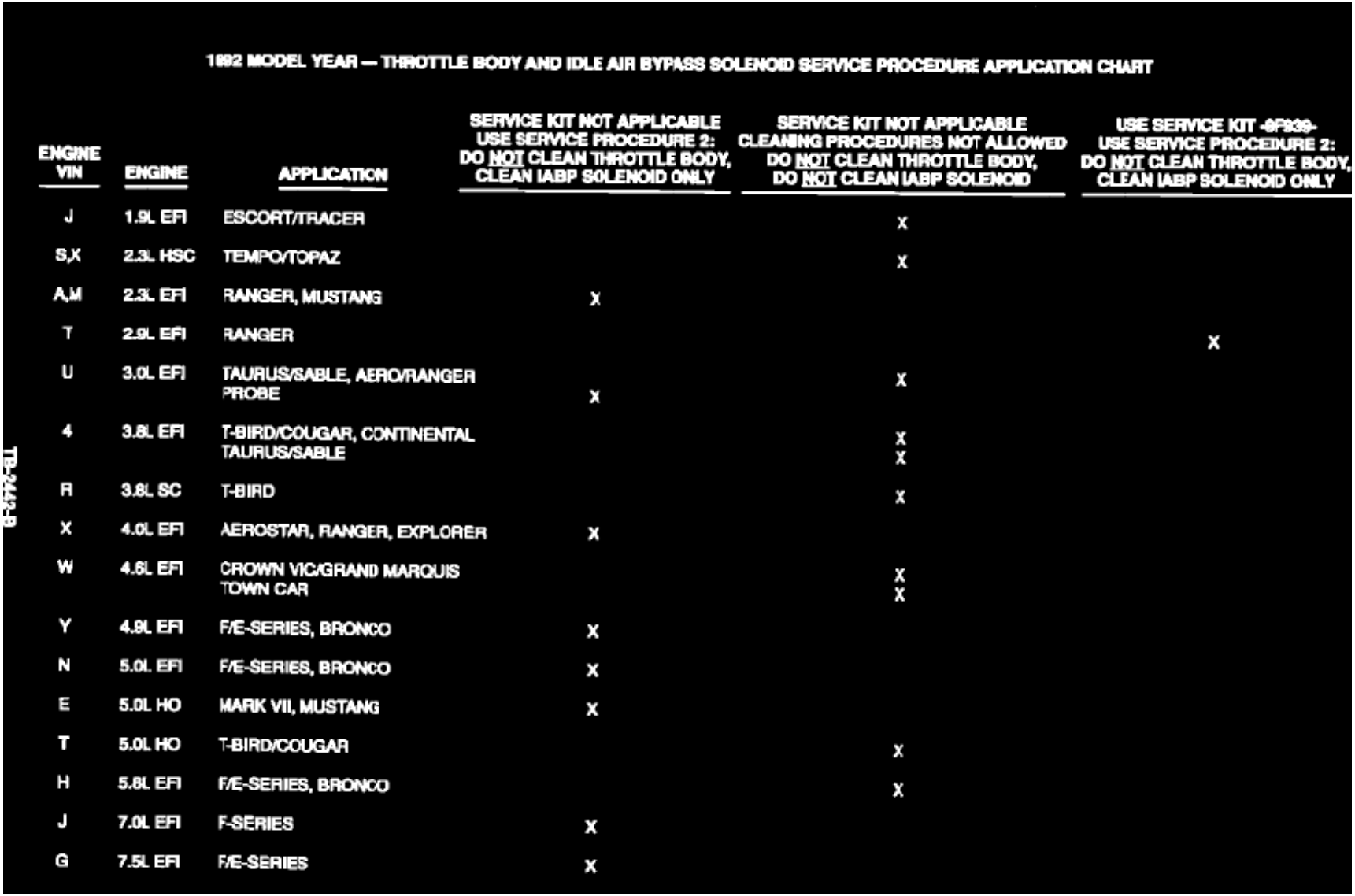
ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -9F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER			X
S,X	2.3L HSC	TEMPO/TOPAZ	X		
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X X		
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	(X) BUILT 1/91 & LATER		(X) BUILT BEFORE 1/91
W	4.6L EFI	TOWN CAR		X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
F	5.0L EFI	CROWN VIC/GRAND MARQUIS			X
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO	X A/	X A/	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X B/		X B/

TB-2441-A

NOTE: A/ SERVICE KIT NOT APPLICABLE, DO NOT CLEAN EITHER THROTTLE BODY OR IABP SOLENOID FOR CALIBRATIONS; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00 AND 1-76C-R00. SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

B/ SERVICE KIT NOT APPLICABLE, USE SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR CALIBRATIONS; 1-97A-R00, 1-98A-R00, 1-98B-R00, 1-98C-R00, 1-98E-R00 AND 1-98F-R00. USE SERVICE KIT -9F939- AND SERVICE PROCEDURE 2 TO CLEAN IABP SOLENOID ONLY FOR ALL OTHER CALIBRATIONS.

Figure 11



1992 MODEL YEAR — THROTTLE BODY AND IDLE AIR BYPASS SOLENOID SERVICE PROCEDURE APPLICATION CHART

ENGINE VIN	ENGINE	APPLICATION	SERVICE KIT NOT APPLICABLE USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY	SERVICE KIT NOT APPLICABLE CLEANING PROCEDURES NOT ALLOWED DO NOT CLEAN THROTTLE BODY, DO NOT CLEAN IABP SOLENOID	USE SERVICE KIT -6F939- USE SERVICE PROCEDURE 2: DO NOT CLEAN THROTTLE BODY, CLEAN IABP SOLENOID ONLY
J	1.9L EFI	ESCORT/TRACER		X	
S,X	2.3L HSC	TEMPO/TOPAZ		X	
A,M	2.3L EFI	RANGER, MUSTANG	X		
T	2.9L EFI	RANGER			X
U	3.0L EFI	TAURUS/SABLE, AERO/RANGER PROBE	X	X	
4	3.8L EFI	T-BIRD/COUGAR, CONTINENTAL TAURUS/SABLE		X X	
R	3.8L SC	T-BIRD		X	
X	4.0L EFI	AEROSTAR, RANGER, EXPLORER	X		
W	4.6L EFI	CROWN VIC/GRAND MARQUIS TOWN CAR		X X	
Y	4.9L EFI	F/E-SERIES, BRONCO	X		
N	5.0L EFI	F/E-SERIES, BRONCO	X		
E	5.0L HO	MARK VII, MUSTANG	X		
T	5.0L HO	T-BIRD/COUGAR		X	
H	5.8L EFI	F/E-SERIES, BRONCO		X	
J	7.0L EFI	F-SERIES	X		
G	7.5L EFI	F/E-SERIES	X		

TA-24428

THROTTLE BODY AND IDLE AIR BY-PASS SOLENOID SERVICE PROCEDURE

Detailed application charts for throttle body and idle air by-pass solenoid service procedures by engine VIN # /engine displacement/vehicle application and model year are shown in Figures 6 through 11. Refer to these charts to see if the service kit is to be installed and which service cleaning procedure, if any, is to be used.

SERVICE CLEANING PROCEDURES

The following items should be noted prior to beginning the service cleaning procedure.

^ Confirm that the correct service cleaning procedure is identified in the Application Charts, Figures 6-11, for the vehicle/engine combination being

serviced.

^ Do not clean throttle bodies identified to accept service kit (F2PZ-9F939-A), IDLE AIR ADJUST SPACER.

^ Use a 1" (25.4 mm) to 1-1/2" (38.1 mm) wire stemmed horse hair or nylon bottle cleaner type brush.

^ Use rubber gloves and eye protection.

^ Do not clean throttle bodies identified with a yellow/black "ATTENTION" label.

^ Do not clean "Black" plastic air by-pass valves. Refer to TSB 89-13-8 for service details.

^ Do not run vehicles with air flow meters when the air duct is removed.

^ Do not use carburetor cleaner as a cleaning solvent. Use Carburetor Tune-up Cleaner (D9AZ-19579-AA).

Procedure # 1

THROTTLE BODY AND IDLE AIR BY-PASS VALVE CLEANING

CAUTION: DO NOT RUN VEHICLES EQUIPPED WITH AIR FLOW METERS DURING THE CLEANING PROCEDURE. IF THERE IS A

YELLOW/BLACK "ATTENTION" LABEL ON THE THROTTLE BODY ADVISING NOT TO CLEAN, OR IF THE VEHICLE IS IDENTIFIED AS ACCEPTING SERVICE KIT (F2PZ-9F939-A), USE PROCEDURE # 2 FOR IDLE AIR BY-PASS VALVE CLEANING ONLY.

1. Plug the actuator into the connector in the Rotunda Cleaner/Tester, Tool 113-00009.

2. Remove the air duct to the throttle body inlet.

3. Disoonnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine. Do not start engines that have air flow meters.

6. Spray just enough Carburetor Tune-up Cleaner (D9AZ-19579-AA) into the throttle bore to wet the bore and throttle plate.

7. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

8. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

9. After a fifteen (15) minute soak, saturate the cleaning brush with solvent and scrub between the throttle body bore and plate while holding the throttle wide open.

NOTE: IT IS NECESSARY TO APPLY SOME PRESSURE ON THE BRUSH WHILE SCRUBBING.

10. Repeat saturating the brush and scrubbing for one (1) to two (2) minutes, making sure to reach into the corners where the throttle shaft meets the bore wall.

11. Start the actuator and the start the engine. Do not start engines that have air flow meters.

12. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute to wash away residue. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

13. Spray Carburetor Tune-up Cleaner into the idle by-pass valve passage leading to the inlet of the valve for up to one (1) minute. Do not spray for longer than six (6) continuous seconds on engines that have air flow meters and are not running.

14. Stop actuator and stop engine, if running.

NOTE: MAKE SURE THE THROTTLE PLATES OPERATE FREELY AND CLOSE PROPERLY.

15. Reinstall the air duct.

16. Start and run the engine for about one (1) minute to dry out the solvent residue.

17. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

18. Disconnect the actuator from the idle air by-pass valve.

19. Reattach the control signal lead to the air by-pass valve.

20. Check engine for normal operation. It may be necessary to reset the idle speed due to a previous adjustment for an idle concern. (Refer to the respective Powertrain/Emissions Diagnosis Service Manual, Throttle Body Section, for idle speed adjust procedure.)

Procedure # 2 Idle Air By-Pass Valve Cleaning Only

CAUTION: THIS CLEANING PROCEDURE MAY BE USED WITH SLUDGE TOLERANT THROTTLE BODIES WHICH ARE IDENTIFIED

WITH A YELLOW/BLACK "ATTENTION" LABEL AND THOSE USING SERVICE KIT (F2PZ-9F939-A). NO ATTEMPT SHOULD BE MADE TO CLEAN THROTTLE BODY BORE/PLATE AREA BY DIRECT SPRAYING OR SCRUBBING. DO NOT RUN VEHICLES WITH AIR FLOW METERS DURING CLEANING PROCEDURE.

1. Plug the actuator into the connector in the Rotunda Air By-Pass Valve Adapter 113-00009, or equivalent.

2. Remove the air duct to the throttle body inlet.

3. Disconnect the idle air by-pass valve signal lead.

4. Attach the actuator harness plug to the idle air by-pass valve.

5. Start the actuator and then start the engine.

NOTE: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

6. Spray the Carburetor Tune-up Cleaner for about five (5) seconds into the idle air by-pass valve inlet passage while the actuator is operating.

CAUTION: AVOID DIRECT SPRAYING ON THROTTLE PLATE/BORE AREA.

7. Stop the engine and actuator. Let everything soak for fifteen (15) minutes.

8. Start the actuator and the start the engine.

CAUTION: DO NOT START ENGINES THAT HAVE AIR FLOW METERS.

9. Spray Carburetor Tune-up Cleaner into the throttle bore for up to one (1) minute.

CAUTION: DO NOT SPRAY FOR LONGER THAN SIX (6) CONTINUOUS SECONDS ON ENGINES THAT HAVE AIR FLOW METERS AND

ARE NOT RUNNING.

10. Stop actuator and stop engine if running.

11. Reinstall the air duct.

12. Start and run the engine for about one (1) minute to dry out the solvent residue.

13. Operate the actuator to make sure the solvent is purged from the idle by-pass valve.

14. Disconnect the actuator from the idle air by-pass valve.

15. Reattach the control signal lead to the air by-pass valve.

16. Check engine for normal operation.

NOTE: IT SHOULD NOT BE NECESSARY TO RESET THE IDLE SPEED SINCE ONLY THE IDLE AIR BY-PASS VALVE WAS SERVICED IN THIS PROCEDURE

Warranty Coverage

Throttle bodies and idle air by-pass valves on all EFI (Port Fuel Injection) engines through the 1992 model year that can be cleaned (as identified in the application charts) are covered under 5/50 Emissions Warranty Coverage.

For those throttle bodies identified as having sludge tolerant designs or using service kit (F2PZ-9F939-A) where cleaning is not allowed per the application charts, the warranty claims for

cleaning will not be reimbursed even within the 12/12 warranty coverage period. Cleaning is not allowed. Service kit installation (single time) is covered under 5/50 emission warranty.

Labor Standards Operations

The labor operations shown in the following Operation/Description/Time columns are identified by procedure number and vehicle line. Specific engines for various vehicles are identified in the sludge cleaning procedure application charts. The throttle body cleaning operations with combinations and the air by-pass valve cleaning combinations will appear in future Labor Manuals under the following operation numbers.

^ 9926 B - Throttle body and idle air by-pass valve cleaning

^ 9926 B2 - Adjust idle speed

^ 9715 A - Air by-pass valve cleaning only

^ 9715 A1 - Adjust idle speed

PART NUMBER PART NAME CLASS

F2PZ-9F939-A Idle Air By-pass Service Kit B

D9AZ-19579-AA Carburstor Tune-Up Cleaner BG

OTHER APPLICABLE ARTICLES: 89-13-8 SUPERSEDES:

88-24-5, 88-24-6, 89-16-5, 91-10-9, 91-7-4

Operation Description

WARRANTY STATUS: Eligible Under Warranty

Coverage As Stated In The Text Of This Article

OPERATION DESCRIPTION TIME

912507A Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1983-85 Escort, EXP, LN7, LYNX 1.6L EFI.

912507B Idle Air By-Pass Valve 0.5 Hr.

Cleaning - 1986-91 Escort 1.9L EFI, 1986/87 EXP, Lynx 1.9L EFI, 1991 Tracer 1.9L EFI.

912507C Idle Air By Pass Valve 0.5 Hr.

Cleaning - 1984-87 Mustang 2.3L T/C, 1986/87 Capri, Cougar 2.3L T/C, 1984-88 T-Bird 2.3L T/C, 1987/92 Mustang 2.3L EFI.

912507D Idle By-Pass Valve Cleaning 0.6 Hr.

- 1988-91 Tempo, Topaz 2.3L HSC, 1985-92 Ranger 2.3L EFI.

912507E Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986/87 Aerostar 2.3L EFI, 1985 Bronco II 2.3L EFI.

912507F Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-90 Bronco II 2.9L EFI, 1986-92 Ranger 2.9L EFI.

912507G Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1991/92 Probe 3.0L EFI, 1986-91 Taurus 3.0L EFI, 1987-91 Sable 3.0L EFI.

912507H Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1986-91 Aerostar 3.0L EFI, 1991 Ranger 3.0L EFI.

912507I Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1988 Continental, Cougar, Taurus, T-Bird, Sable 3.8L EFI. 1988 Cougar, T-Bird 3.8L S/C.

912507J Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1990-92 Aerostar 4.0L EFI, 1990 Bronco II 4.0L EFI, 1991/92 Explorer 4.0L EFI, 1990-92 Ranger 4.0L EFI.

912507K Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 Bronco 4.9L EFI, 1987-92 F-Series 4.9L EFI, 1987/90 Econoline (Without Rear Heater) 4.9L EFI, 1991/92 Econoline (All) 4.9L EFI.

912507L Idle Air By-Pass Valve 0.6 Hr.

Cleaning - 1986-88 Cougar, T-Bird 5.0L EFI, 1986-87 Continental, Mark VII 5.OL EFI, 1986/91 Crn - Victoria, Grn - Marquis 5.0L EFI, 1986-92 Mark VII 5.0L HO, 1982-92 Mustang 5.0L HO.

912507M Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1985-92 Bronco, E-Series, F-Series 5.0L EFI.

912507N Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1988-90 Bronco, F-Series 5.8L. 1991 Econo, F-Series, Bronco 5.8L (Do not Clean Solenoid, Calib; 1-64E-R10, 1-64H-R10, 1-64J-R10, 1-64K-R10, 1-64M-R10, 1-64P-R10, 1-64R-R10, 1-75A-R00, 1-76A-R00, 1-76B-R00, 1-76C-R00.

912507O Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1991/92 F And B Series, 7.0L EFI.

912507P Idle Air By-Pass Valve 0.7 Hr.

Cleaning - 1987-92 E-Series, F-Series 7.5L EFI.

912507Q Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1989/90 Probe 3.0L EFI.

912507R Throttle Body And Idle Air 0.8 Hr.

By-Pass Valve Cleaning - 1987-90 Econoline (With Rear Heat) 4.9L EFI.

912507S Throttle Body And Idle Air 0.9 Hr.

By-Pass Valve Cleaning - 1988-90 Econoline 5.8L EFI.

912507T Service Kit Install - All Cars 1.0 Hr.

And Light Trucks (Except Aerostar And Econoline) - Refer To The Service Procedure Application

Charts, For Vehicle Application.

912507U Service Kit Install - 1.2 Hr.

Aerostar, Econoline - Refer To Service Procedure Application Charts - For Vehicle Application.

DEALER CODING

BASIC PART NO. CONDITION CODE

9E926 49

OASIS CODES: 602300, 607000, 607400, 607700, 608400, 611500, 618400

Idle Airflow - Adjustment Procedures Revision

Article No. 91-11B-4

06/14/91

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 9-24 AND 9-25 - IDLE AIRFLOW ADJUSTMENT PROCEDURES REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGES 9-19 AND 9-22 - TOOL PART NUMBERS CHANGED

FORD: 1991 PROBE, TAURUS

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: Idle Airflow Adjustment procedures for the 1991 3.0L Probe, 3.0L SHO Taurus and 4.0L Aerostar/Ranger/Explorer have been revised. The following Manual is affected:

^ 1991 Engine/Emissions Diagnosis Manual Pages 9-19, 9-22, 9-24 and 9-25

ACTION: Refer to the pages in this TSB article for the updated information.

OTHER APPLICABLE ARTICLES: 90-25B-2

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 690000

Component Descriptions

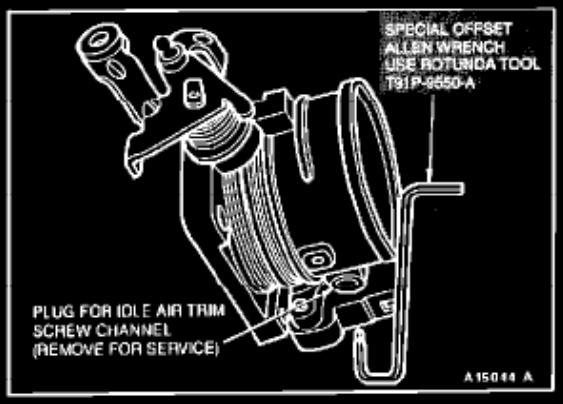
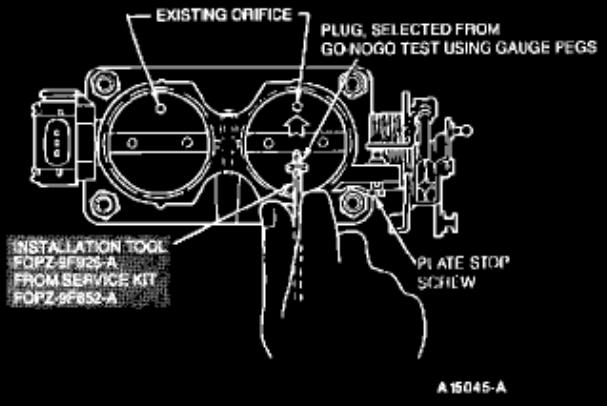


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPZ-9F652-A.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR		
ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B
2.3L EFI HSC	All	B
2.3L EFI OHC	All	B
2.5L SEFI HSC	All	A
3.0L	All Except SHO	A
3.0L SHO	Taurus	B
3.8L	All	A
3.8L Supercharge	All	A
4.6L 2V	All	A
5.0L SEFI *	Grand Marquis, Crown Victoria	B
	Lincoln Town Car	
5.0L HO	Thunderbird, Cougar	A
5.0L HO	Mustang, Mark VII	B

TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE
2.3L EFI OHC	All	D
2.9L EFI *	All	D
3.0L EFI	All	D
4.0L EFI *3	All	D
4.9L EFI	All	C
5.0L EFI	NON E4OD	D
5.0L EFI	E4OD	C
5.8L EFI	U/8500	C
5.8L EFI	O/8500	2
7.0L EFI	All	C
7.5L EFI - 1991 *	All	D
7.5L EFI - 1991 1/2	All	D

2 - Procedure 'D' for 1991 except E-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate stop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'B' for Passenger Cars with No Self-Test Idle Speed Check Provisions

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	1.9L SEFI	2.3L EFI HSC	2.3L EFI OHC	3.0L SHO	5.0L SEFI Grand Marquis Crown Victoria	5.0L HO Mustang Mark
1 Engine off, disconnect the negative (–) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X
2 Start engine and stabilize for two minutes,then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly? **NOTE: If electric fan comes on wait until it turn itself off.**	X	X	X	X		
3 If engine does not idle properly proceed with this procedure.	X	X	X	X	X	X[1]
4 Unplug SPOUT line and verify ignition timing is base 12 deg BTDC (refer to decal).		X		X		
5 Remove PCV hose from intake manifold and plug it. Remove CAMP hose from intake manifold and connect Rotunda Tool T89P-9600-AH between PCV and CAMP ports.				X		
6 Remove PCV hose at the PCV valve and install .200 inch dia orifice (TOOL T86P-9600-A).		X				
7 Shut engine off and install a .025" feeler gauge between plate stop screw and throttle lever.						X
8 Disconnect the idle speed control air bypass solenoid.	X	X	X	X		
9 Start engine and run at rpm/time (no touch start).	2000/60 sec	2500/30 sec	1500/30 sec	Idle		Idle
10 Place automatic transmission in PARK, manual transmission in NEUTRAL.	Park	Drive	Park	Neutral	Park	Park
11 Engine off, back out throttle plate stop screw. Clear off the throttle lever pad.					X	
12 With a .010 in feeler gauge between the plate stop screw and throttle lever pad, turn the screw in until contact.					1 7/8 Turns	
13 Check idle rpm to the range using a tachometer.	600±150	A 950±150 M 1550±200	A 650±150 M600±150	800±30		675±50
A. If rpm is too low	X	X	X	X		X
a. Turn the plate stop screw to the value shown in Step 13 ±25 rpm (during engine break-in reduce the rpm by 100)	X			X		
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug, turn screw clockwise to the desired rpm. Rpm ±25, if there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.		X	X			X[2]
B. If rpm is too high	X	X	X	X		X
a. Turn the plate stop screw to the value shown in Step 13 ±25 rpm.	X			X		
b. Turn engine off.		X	X			X
c. Disconnect air cleaner hose		X	X			X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.		X	X			X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.		X	X			X
f. If rpm continues to be fast, perform test in Step 16. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must in contact the screw. If rpm is still fast terminate this procedure and go to Section 2 for other possible causes.		X	X			
g. If rpm drops to value in Step 13 or below engine or engine stalls turn the engine off, disconnect air cleaner hose, remove the tape.		X	X			X
h. Install the plug with proper color code depending on orifice size — See Fig. 7 for installation procedure.		X	X			X
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 13.		X	X			X
14 Remove the feeler gauge between plate stop screw and throttle lever.						X[2]
15 Shut engine off and disconnect battery for 5 minutes minimum.				X		X
16 Run KOEO Self-Test for proper TPS output code.		X	X			X

Revised 5/91

Continued

Procedure 'B' for Passenger Cars with No Self-Test Idle Speed Check Provisions (Continued)

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	1.9L SEFI	2.3L EFI HSC	2.3L EFI OHC	3.0L SHO	5.0L SEFI Grand Marquis Crown Victoria	5.0L HO Mustang Mark
17 Remove orifice from PVC hose and reconnect to PVC valve.		X				
18 Reconnect SPOUT line.		X		X		
19 Remove Rotunda Tool. Unplug PCV hose. Reconnect CAMP and PCV hoses to the intake manifold.				X		
20 Engine off, reconnect idle speed control-air bypass solenoid, verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X		
21 Start engine and stabilize for two minutes then goose engine and let it return to idle, lightly depress and release the accelerator let engine idle.	X	X	X		X	X
	If idle problem still persists, go to Section 2 for other possible causes.					
22 On Automatic Overdrive Transmission (AOD) applications check TV pressure adjustment.					X	X

1 In some cases, even if idle speed is OK, proceed with this procedure if customer symptom persists (idle speed control duty cycle may be out of range).
2 Key Off/Restart/Recheck idle for two minutes (eliminates possibility of entering part throttle mode).

Revised 5/91

Component Descriptions

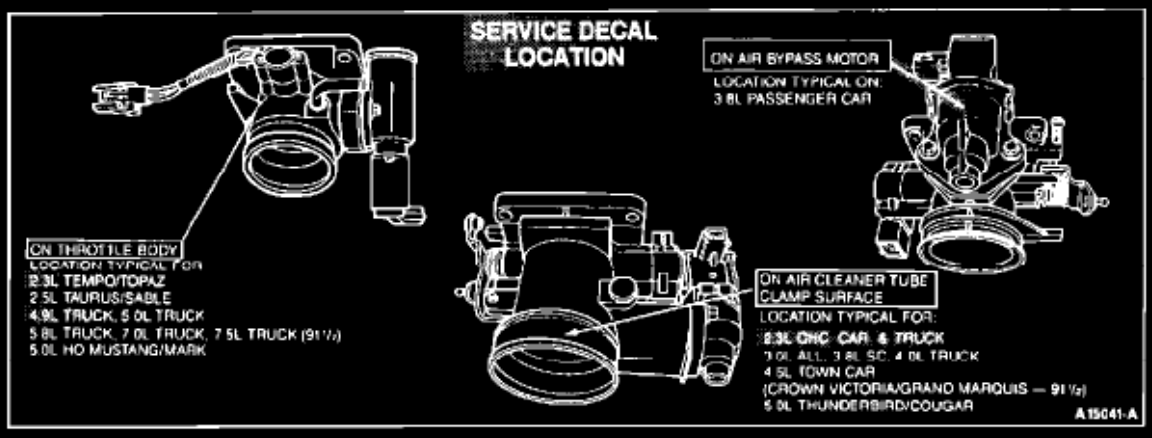


Figure 3

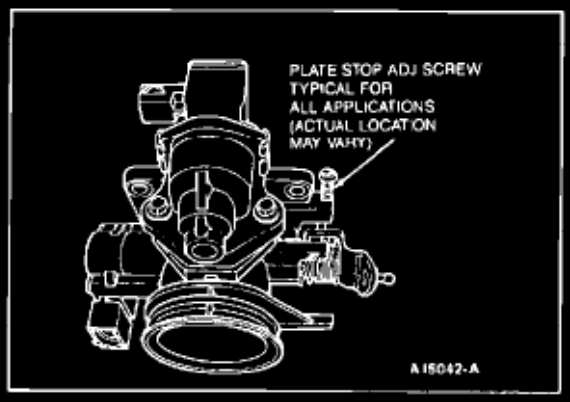


Figure 4

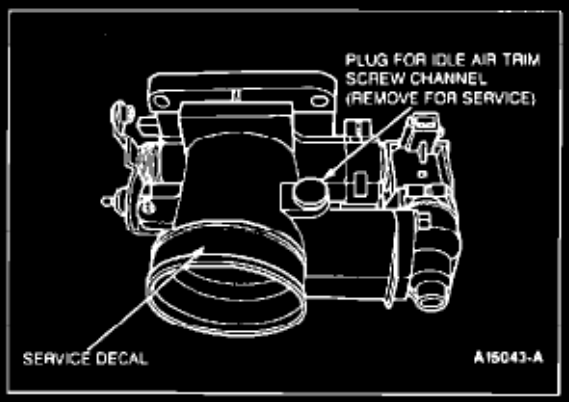


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

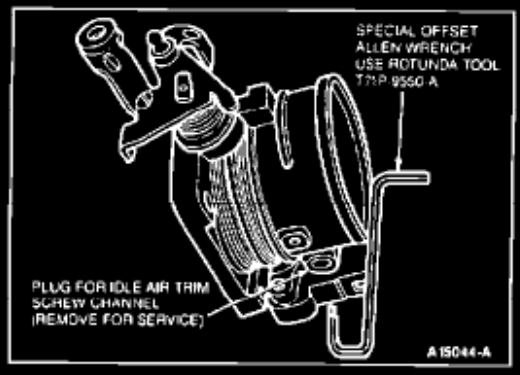
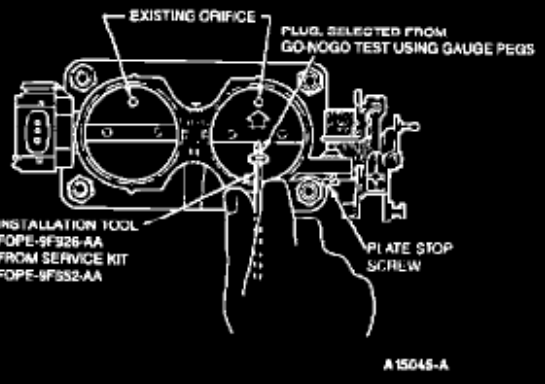


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K CALIBRATION 3/	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off (reconnect idle speed control-air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Throttle Body > Component Information > Technical Service Bulletins > All Other Service Bulletins for Throttle Body: > 9111B4 > Jun > 91 > Idle Airflow - Adjustment Procedures Revision

Idle Airflow - Adjustment Procedures Revision

Article No. 91-11B-4

06/14/91

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 9-24 AND 9-25 - IDLE AIRFLOW ADJUSTMENT PROCEDURES REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGES 9-19 AND 9-22 - TOOL PART NUMBERS CHANGED

FORD: 1991 PROBE, TAURUS

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: Idle Airflow Adjustment procedures for the 1991 3.0L Probe, 3.0L SHO Taurus and 4.0L Aerostar/Ranger/Explorer have been revised. The following Manual is affected:

^ 1991 Engine/Emissions Diagnosis Manual Pages 9-19, 9-22, 9-24 and 9-25

ACTION: Refer to the pages in this TSB article for the updated information.

OTHER APPLICABLE ARTICLES: 90-25B-2

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 690000

Component Descriptions

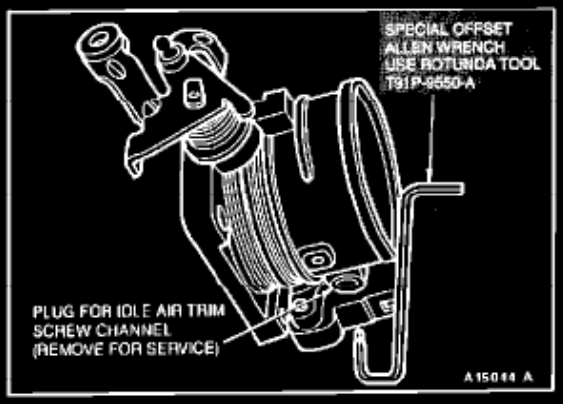
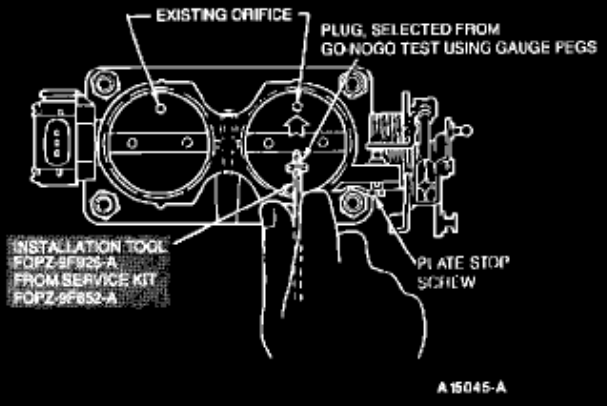


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPZ-9F652-A.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR		
ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B
2.3L EFI HSC	All	B
2.3L EFI OHC	All	B
2.5L SEFI HSC	All	A
3.0L	All Except SHO	A
3.0L SHO	Taurus	B
3.8L	All	A
3.8L Supercharge	All	A
4.6L 2V	All	A
5.0L SEFI *	Grand Marquis, Crown Victoria	B
	Lincoln Town Car	
5.0L HO	Thunderbird, Cougar	A
5.0L HO	Mustang, Mark VII	B

TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE
2.3L EFI OHC	All	D
2.9L EFI *	All	D
3.0L EFI	All	D
4.0L EFI *3	All	D
4.9L EFI	All	C
5.0L EFI	NON E4OD	D
5.0L EFI	E4OD	C
5.8L EFI	U/8500	C
5.8L EFI	O/8500	2
7.0L EFI	All	C
7.5L EFI - 1991 *	All	D
7.5L EFI - 1991 1/2	All	D

2 - Procedure 'D' for 1991 except E-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate stop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'B' for Passenger Cars with No Self-Test Idle Speed Check Provisions

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	1.9L SEFI	2.3L EFI HSC	2.3L EFI OHC	3.0L SHO	5.0L SEFI Grand Marquis Crown Victoria	5.0L HO Mustang Mark
1 Engine off, disconnect the negative (–) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X
2 Start engine and stabilize for two minutes,then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly? **NOTE: If electric fan comes on wait until it turn itself off.**	X	X	X	X		
3 If engine does not idle properly proceed with this procedure.	X	X	X	X	X	X[1]
4 Unplug SPOUT line and verify ignition timing is base 12 deg BTDC (refer to decal).		X		X		
5 Remove PCV hose from intake manifold and plug it. Remove CAMP hose from intake manifold and connect Rotunda Tool T89P-9600-AH between PCV and CAMP ports.				X		
6 Remove PCV hose at the PCV valve and install .200 inch dia orifice (TOOL T86P-9600-A).		X				
7 Shut engine off and install a .025" feeler gauge between plate stop screw and throttle lever.						X
8 Disconnect the idle speed control air bypass solenoid.	X	X	X	X		
9 Start engine and run at rpm/time (no touch start).	2000/60 sec	2500/30 sec	1500/30 sec	Idle		Idle
10 Place automatic transmission in PARK, manual transmission in NEUTRAL.	Park	Drive	Park	Neutral	Park	Park
11 Engine off, back out throttle plate stop screw. Clear off the throttle lever pad.					X	
12 With a .010 in feeler gauge between the plate stop screw and throttle lever pad, turn the screw in until contact.					1 7/8 Turns	
13 Check idle rpm to the range using a tachometer.	600±150	A 950±150 M 1550±200	A 650±150 M600±150	800±30		675±50
A. If rpm is too low	X	X	X	X		X
a. Turn the plate stop screw to the value shown in Step 13 ±25 rpm (during engine break-in reduce the rpm by 100)	X			X		
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug, turn screw clockwise to the desired rpm. Rpm ±25, if there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.		X	X			X[2]
B. If rpm is too high	X	X	X	X		X
a. Turn the plate stop screw to the value shown in Step 13 ±25 rpm.	X			X		
b. Turn engine off.		X	X			X
c. Disconnect air cleaner hose		X	X			X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.		X	X			X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.		X	X			X
f. If rpm continues to be fast, perform test in Step 16. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must in contact the screw. If rpm is still fast terminate this procedure and go to Section 2 for other possible causes.		X	X			
g. If rpm drops to value in Step 13 or below engine or engine stalls turn the engine off, disconnect air cleaner hose, remove the tape.		X	X			X
h. Install the plug with proper color code depending on orifice size — See Fig. 7 for installation procedure.		X	X			X
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 13.		X	X			X
14 Remove the feeler gauge between plate stop screw and throttle lever.						X[2]
15 Shut engine off and disconnect battery for 5 minutes minimum.				X		X
16 Run KOEO Self-Test for proper TPS output code.		X	X			X

Revised 5/91

Continued

Procedure 'B' for Passenger Cars with No Self-Test Idle Speed Check Provisions (Continued)

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	1.9L SEFI	2.3L EFI HSC	2.3L EFI OHC	3.0L SHO	5.0L SEFI Grand Marquis Crown Victoria	5.0L HO Mustang Mark
17 Remove orifice from PVC hose and reconnect to PVC valve.		X				
18 Reconnect SPOUT line.		X		X		
19 Remove Rotunda Tool. Unplug PCV hose. Reconnect CAMP and PCV hoses to the intake manifold.				X		
20 Engine off, reconnect idle speed control-air bypass solenoid, verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X		
21 Start engine and stabilize for two minutes then goose engine and let it return to idle, lightly depress and release the accelerator let engine idle.	X	X	X		X	X
	If idle problem still persists, go to Section 2 for other possible causes.					
22 On Automatic Overdrive Transmission (AOD) applications check TV pressure adjustment.					X	X

1 In some cases, even if idle speed is OK, proceed with this procedure if customer symptom persists (idle speed control duty cycle may be out of range).
2 Key Off/Restart/Recheck idle for two minutes (eliminates possibility of entering part throttle mode).

Revised 5/91

Component Descriptions

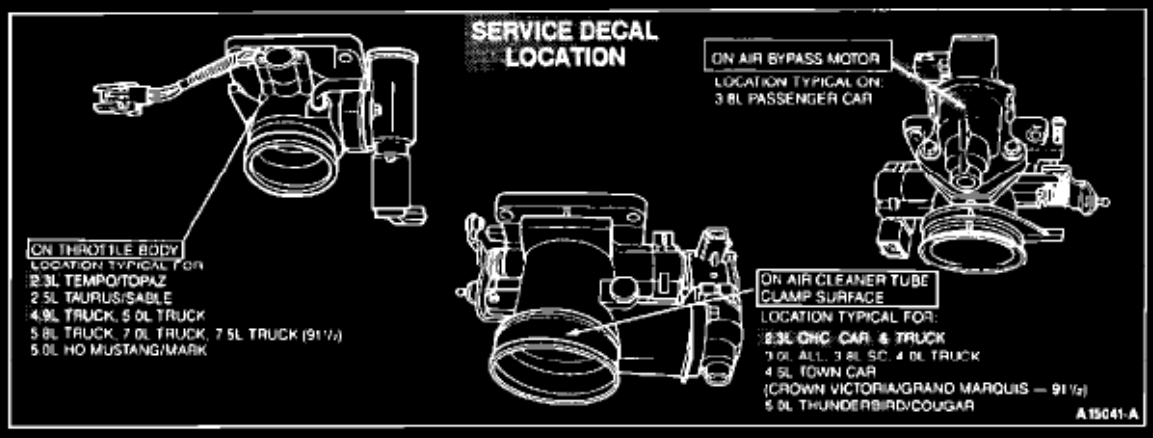


Figure 3

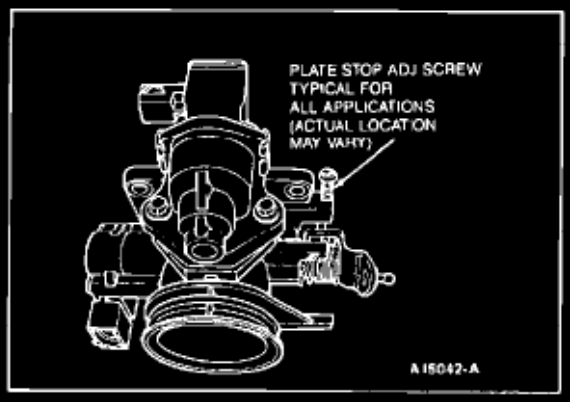


Figure 4

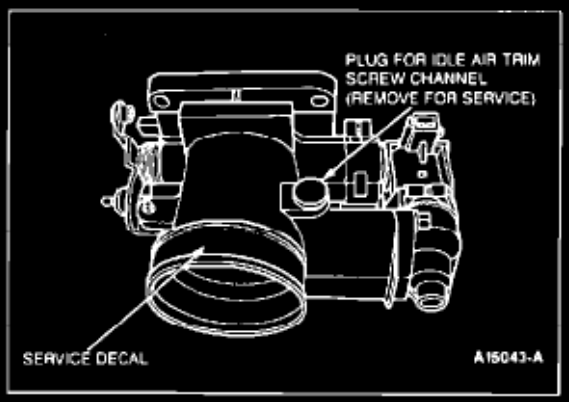


Figure 5

Revised 12/90

Technical Service Bulletin # 9025B2 Date: 901221

Engine Idle Adjustment Procedures - Revision

ENGINE/EMISSIONS DIAGNOSIS SHOP MANUAL - 1991 - SECTION 9 - IDLE ADJUST PROCEDURES REVISED FOR APPLICATIONS WITHOUT SLUDGE TOLERANT THROTTLE BODY Article No. 90-25B-2 FORD:

1991 PROBE

LIGHT TRUCK: 1991 AEROSTAR, EXPLORER, RANGER

ISSUE: The Idle Adjust Procedures in the 1991 Engine/Emissions Diagnosis Shop Manual have been revised to cover applications that do not have the sludge tolerant throttle body. These are 1991 Aerostar, Explorer, and Ranger trucks with 4.0L engines. The 3.0L Probe has a sludge tolerant throttle body.

ACTION: Refer to the pages following this TSB article for the revised procedures.

NOTE: A SLUDGE TOLERANT THROTTLE BODY IS IDENTIFIED BY A 91TF-AA PREFIX AND SUFFIX IN THE PART NUMBER.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY

Component Descriptions

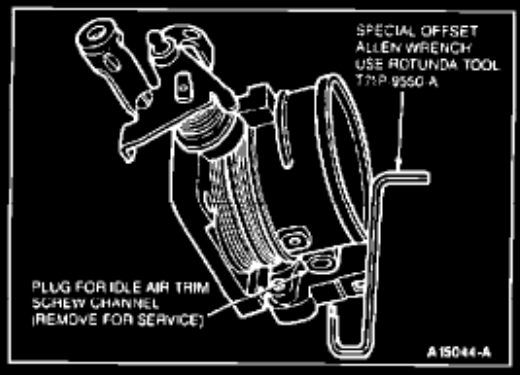
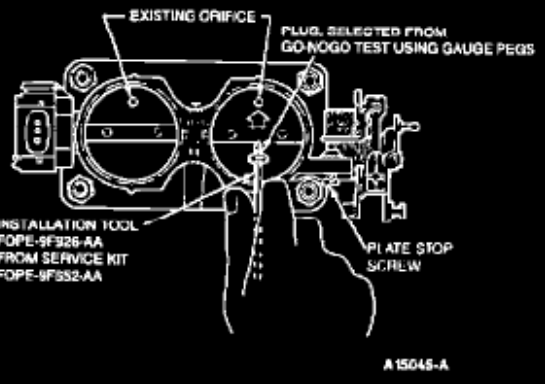


Figure 6



1. Remove air inlet tube(s) from throttle body.
2. Select the proper color plug by using the Go/NoGo gauge pegs included with the service kit FOPE-9F852-AA.
3. Starting with the largest diameter gauge peg, attempt to insert it through the throttle plate orifice.
4. If the gauge peg goes through the orifice, use the corresponding color plug.
   If it does not go through, proceed with the next smaller gauge peg for Go/NoGo Test.

NOTE: It is important that the largest Go/NoGo combination is used to determine the proper plug size.

5. If the smallest gauge peg does not go through the orifice, use the reamer bit and handle included with the service kit to enlarge the plate orifice. Wipe bearing grease on both sides of the plate orifice and on the reamer bit to hold the brass chips. After reaming, wipe the plate clean and then return to Step 3 to determine the proper plug size.
6. Using the installation tool from the service kit, push the plug into the orifice until bottoming out at the throttle plate.
7. Open and snap shut the throttle several times to verify proper plug retention.
8. Reconnect air inlet tube(s).
9. Reset idle rpm per engine requirement using the throttle plate stop screw.

Figure 7

Idle Airflow Adjust Procedure For All EFI and SEFI Systems

- Cooling system filled
- Engine at operating temperature
- Proper fuel pressure and no exhaust smoke
- Heater, A/C, and other accessories OFF
- Correct/clean PCV system if required
- Ignition timing set to specification
- EEC-IV diagnostics have been performed and vehicle malfunction indicated Service output codes have been resolved

Procedure

Choose procedure A, B, C or D from the table below for the engine being serviced. (The applications with self-test idle speed check provisions use procedure 'A' or 'C' and those without use procedure 'B' or 'D' depending on car or truck). An asterisk (*) below shows only applications without sludge tolerant throttle body design.

CAR			TRUCK		
ENGINE CID	VEHICLE LINES	PROCEDURE	ENGINE CID	VEHICLE LINES	PROCEDURE
1.9L SEFI *	All	B	2.3L EFI OHC	All	D
2.3L EFI HSC	All	B	2.9L EFI *	All	D
2.3L EFI OHC	All	B	3.0L EFI	All	D
2.5L SEFI HSC	All	A	4.0L EFI *3	All	D
3.0L	All	A	4.9L EFI	All	C
3.8L	All	A	5.0L EFI	NON E4OD	D
3.8L Supercharge	All	A	5.0L EFI	E4OD	C
4.6L 2V	All	A	5.8L EFI	O/8500	C
5.0L SEFI *	Grand Marquis, Crown Victoria	B	5.8L EFI	O/8500	2
	Lincoln Town Car		7.0L EFI	All	C
5.0L HO	Thunderbird, Cougar	A	7.5L EFI - 1991 *	All	D
5.0L HO	Mustang, Mark VII	B	7.5L EFI - 1991 1/2	All	D

DELETION

2 - Procedure 'D' for 1991 except F-250 with 0-64K calibration and procedure C for 1991 E-250 with 0-64K calibration and for all 1991 1/2

3 - Sludge tolerant throttle body introduced 1991 1/2

See Fig. 4 for typical plate atop screw location referred to in the attached procedure.

See Fig. 5 and 6 for air trim screw location referred to in the attached procedure A.

See Fig. 7 for plug installation (in the plate orifice) procedure referred to in the attached procedures.

Procedure 'A' for Passenger Cars with Self-Test Idle Speed Check Provisions

DELETION

(USE ONLY STEPS MARKED 'X' FOR THE ENGINE BEING SERVICED)	2.5L	3.0L	3.8L	3.8L SC	4.6L 2V	5.0L HO THUNDERBIRD COUGAR
1 Activate engine running self-test	X	X	X	X	X	X
2 After Service Code 11 or 111 has been displayed, wait 4 seconds then quickly unlatch and within 4 seconds latch the STI button	X	X	X	X	X	X
3 A single pulse code indicates the entry mode, then observe the Self-Test Output (STO) of the STAR Tester in Item 4. If adjustment is required in Item 4, refer to possible causes listed in previous section and correct them as required and then continue with this procedure if necessary.	X	X	X	X	X	X
4 (A) Constant tone, solid light or "STO LO" readout means base idle rpm is within range. To exit test, unlatch STI button, then wait four seconds for reinitialization (after 10 minutes it will exit by itself).	X	X	X	X	X	X
(B) Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor is out of range due to over adjustment; adjustment may be required.	X	X	X	X	X	X
(C) Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required, go to Step 6.	X	X	X	X	X	X
(D) Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required, go to Step 5.	X	X	X	X	X	X
5 If rpm is too slow, follow applicable procedure for the engine being serviced.	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw counter-clockwise until conditions in Step 4(A) are satisfied for air trim location. (See Figure 5 or 6).				X	X	X
B. Do not clean the throttle body. Check for the plate orifice plug. If there is no plug turn screw clockwise until conditions in Step 4(A) are satisfied. If there is a plug from previous service remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X	X	X			
6 If rpm is too high, follow applicable procedure for the engine being serviced	X	X	X	X	X	X
A. Do not clean the throttle body, turn the air trim screw clockwise until conditions in Step 4(A) are satisfied for air trim screw location (see Figure 5 or 6).				X	X	X
B Turn engine OFF	X	X	X			
a. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step (C)	X	X	X			
b. Restart the engine and check idle speed using Self-Test (mass air packages require air intake hose to be reattached first). If engine stalled, crack open the plate with plate stop screw. (Figure 4)	X	X	X			
c. If rpm continues to be fast, perform test in Step 7 if TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range adjust screw for proper TPS code (lever pad must be in contact with screw after adjustment). If rpm is still fast, terminate this procedure and - go to Section 2 for other possible causes.	X	X	X			
d. However, if rpm drops to or below the desired level, as indicated by Self-Test Output tone, turn the engine off disconnect air cleaner hose, remove the tape.	X	X	X			
e. Install the plug with proper color code depending on throttle plate orifice size - see Fig. 7 for installation procedure.	X	X	X			
f. Reconnect the air cleaner hose - start the engine turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) until conditions in Step 4A are satisfied.	X	X	X			
7 Run KOEO Self-Test for proper TPS output code.	X	X	X			
8 Verify the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X			
9 On automatic overdrive transmission (AOD) applications check TV pressure adjustment		X	X			

DELETION

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions

USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 9ITF-AA THROTTLE BODY	4.0L EFI WITH 9ITF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI O/8500 ALL 1991 EXCEPT E-250 B-64K CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
1 Engine off, disconnect the negative (-) terminal of the battery for five minutes, then reconnect it.	X	X	X	X	X	X	X	X	X
2 Start engine and stabilize for two minutes. Then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?	X	X	X	X	X	X	X	X	X
3 If engine does not idle properly proceed with this procedure	X	X	X	X	X	X	X	X	X
4 With engine off, install specified feeler gauge between the throttle plate stop screw and throttle lever.						A.050 M.030	A.050 M.030		
5 Unplug SPOUT line and verify ignition timing is base ±2 deg BTDC (refer to decal)	X					X	X		
6 Disconnect the idle speed control air bypas solenoid	X	X	X	X	X	X	X	X	X
7 Start engine and run at rpm for the duration of.....	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	2500 30 SEC	IDLE 120 SEC	IDLE 120 SEC	2500 30 SEC	2500 30 SEC
8 Place automatic transmission in ..... Manual transmission in NEUTRAL	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK	PARK
9 Check idle rpm to the range using a tachometer - see Note 1 below	550 +25/ -75	725 +0/ -125	600 +75/ -50	675 +50/ -120	675 +50/ 125	A 675 M 700 ±150	C6 700 M&E4OD 730 ±150	650±150	650±150
A. If rpm is too low	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm (during engine break-in reduce the rpm by 100)		X			X			X	
b. Do not clean the throttle body, check for the plate orifice plug. If there is no plug turn screw clockwise to the desired rpm. If there is plug from previous service, remove plug and then adjust screw in either direction as required. Screw must be in contact with the lever pad after adjustment.	X		X	X		X	X		X
B. If rpm is too high.....	X	X	X	X	X	X	X	X	X
a. Turn the plate stop screw to the value shown in Step 9 ±25 rpm		X			X			X	
b. Turn engine off.	X		X	X		X	X		X
c. Disconnect air cleaner hose.	X		X	X		X	X		X
d. Block off the orifice in the throttle plate temporarily with tape. If the orifice already has a plug from previous service, go to Step f.	X		X	X		X	X		X
e. Restart the engine and check idle speed using a tachometer (mass air applications will require air cleaner hose to be reattached before rpm check. If engine stalled, crack open the plate with stop screw. Do not over adjust.	X		X	X		X	X		X
f. If rpm continues to be last, perform test in Step 11. If TPS output code is within range, remove tape, go to Section 2 for other causes. If out of range, adjust screw for proper TPS code. Lever pad must be in contact with the screw. If rpm is still last, terminate this procedure and go to Section 2 for other possible casuses.	X		X	X		X	X		X
g. If rpm drops to value in Step 9 or below or engine stalls, turn engine off, disconnect air cleaner hose, remove tip tape.	X		X	X		X	X		X
h. Install the plug with proper color code depending on throttle plate orifice size — See Figure 7 for installation procedure.	X		X	X		X	X		X

Continued

Procedure 'D' for Trucks with No Self-Test Idle Speed Check Provisions (Continued)

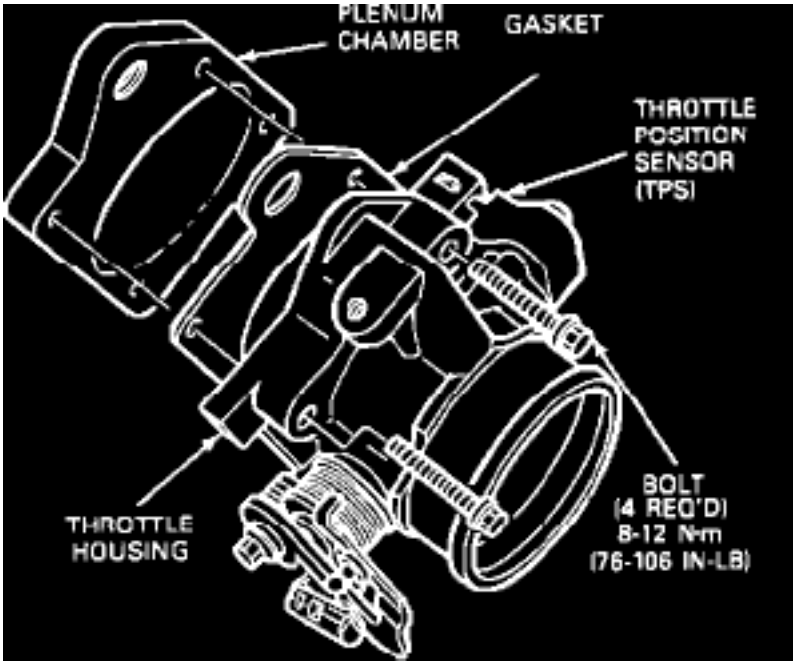
USE ONLY STEPS MARKED "X" FOR THE ENGINE BEING SERVICED (Continued)	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI WITH 81TF-AA THROTTLE BODY	4.0L EFI WITH 90TF-AA THROTTLE BODY	5.0L EFI (NON-E4OD)	5.8L EFI D/8500 ALL 1991 EXCEPT F-250 D-64K 3/ CALIBRATION	7.5L EFI 1991	7.5L EFI 1991 1/2
i. Reconnect the air cleaner hose — start the engine. Check idle rpm using a tachometer. Turn the plate stop screw clockwise (do not turn it counter-clockwise as this may cause the throttle plate to stick at idle) to the nominal rpm ±25 rpm shown in Step 9.	X		X	X		X	X		X
10 Shut engine off and repeat Steps 7, 8 and 9 if necessary.	X	X	X	X	X				
11 Run KOEO Self Test for proper TPS output code.	X	X	X	X	X	X	X	X	X
12 Shut engine off and disconnect battery for 5 minutes minimum.	X	X	X	X	X	X	X		
13 Remove feeler gauge from throttle plate stop screw and throttle lever pad.						X	X		
14 Reconnect SPOUT line.	X					X	X		
15 Engine off (reconnect idle speed control--air bypass solenoid. Verify that the throttle is not stuck in the bore and linkage is not preventing throttle from closing.	X	X	X	X	X	X	X	X	X
16 Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle, if idle problem still exists go to Section 2 for other possible causes.	X	X	X	X	X	X 2/	X 2/	X	X
17 On Automatic Overdrive Transmission (AOD) applications, check TV pressure adjustment.						X			

NOTE 1: On 5.0L and 5.8L, only in Step 9. If you must turn the plate stop screw in, shut engine off, make estimated adjustment. Start engine, repeat Steps 7,8,9.

2/ In Step 16, engine rpm oscillation may be caused by the throttle plate open far enough to expose the canister purge ports. To verify this, disconnect purge port and plug. If the problem is resolved, close the throttle plate just enough to eliminate oscillations.

3/ For 1991 1/2 use procedure 'C'.

Revised 12/90



Throttle Body: Description and Operation

Throttle Body Assembly

The air intake throttle body assembly controls airflow to the engine through a single butterfly-type valve. The throttle position is controlled by a conventional cable through throttle linkage. The body is a single-piece die casting made of aluminum. It has a single bore with an air bypass channel around the throttle plate. This bypass channel provides engine idle control as regulated by an air bypass valve assembly mounted directly to the throttle body. The valve assembly is an electro-mechanical device controlled by the EEC-IV computer. It incorporates a linear actuator which positions a variable area metering valve. Other features of the air intake throttle body assembly include: a.

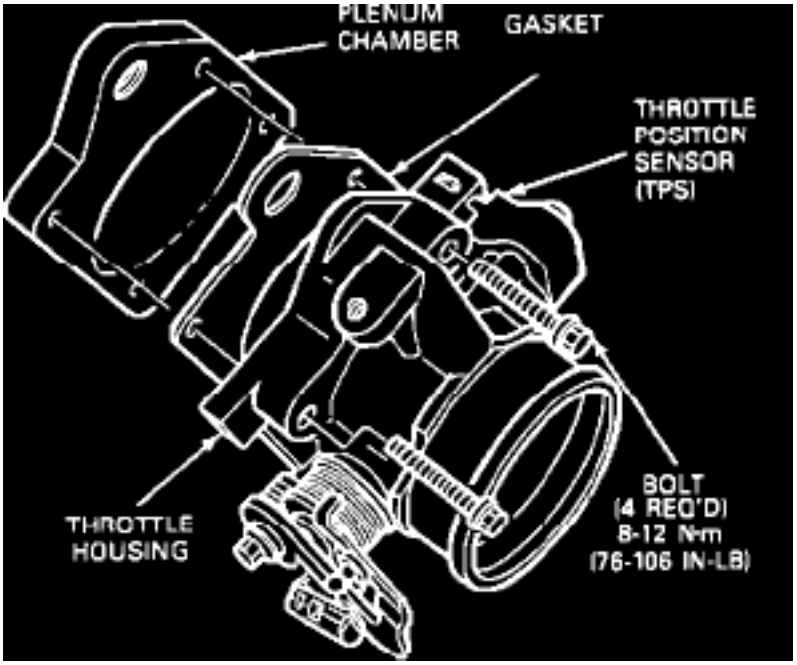
An adjustment screw to set the throttle plate at idle position. This screw is pre-set at the factory.

b. A pre-set stop to locate the WOT position.

c. A throttle body mounted throttle position sensor.

d. Provision for EGR valve and sensor mounting.

e. Individual vacuum taps (as required) for PCV, EVAP and vacuum sensing EEC sensors and controls.



Throttle Body: Service and Repair

Throttle Body Assembly

INSTALLATION

1. Ensure that both throttle body and upper intake manifold gasket surfaces are clean.

NOTE: If scraping is necessary, be careful not to damage gasket surfaces of throttle body and upper manifold assemblies, or allow material to drop into

manifold.

2. Install throttle body gasket on two screws installed in the throttle body.

3. Install throttle body to upper intake manifold. See procedure in the section.

4. Secure throttle body assembly to upper intake manifold with two remaining screws. Refer to SPECIFICATIONS.

5. Connect throttle position sensor electrical connector.

6. Connect canister purge hose to fitting beneath throttle body.

7. Install the snow/ice shield.

ACCELERATOR PEDAL AND THROTTLE BODY DIAGNOSIS PROCEDURE		
CONDITION	**POSSIBLE SOURCE**	**ACTION**
Accelerator pedal is hard to push down or it feels rough, raspy and/or sticky.	•Full pedal travel to WOT is restricted.	Go to Test A.
	•Worn or damaged cable.	Go to Test C.
	•Restricted pedal operation.	Adjust carpet, mat or wiring as required.
High engine idle speed.	•Cable ball socket extends beyond the throttle lever ball stud.	Refer to the throttle body diagnosis procedure in the appropriate section of the Powertrain Control/Emission Control Diagnosis Manual.
	•Restricted pedal operation.	Adjust carpet, mat or wiring as required.
	•Worn or damaged cable.	Go to Test C.

TEST A		
PROCEDURE	**RESULT**	**ACTION**
Disconnect the cable from the throttle body. Make sure the disconnected end of the cable does not come in contact with any of the surrounding parts. Operate the pedal by hand. Is full travel of the pedal to WOT restricted?	Yes No	Adjust insulator or trim items as required. Go to Test B.

Throttle Cable/Linkage: Technical Service Bulletins Accelerator Cable - Service Procedures/Tips

Article No. 94-15-16

07/27/94

^ ACCELERATOR CABLE - NEW SERVICE PROCEDURES - SERVICE TIPS

^ ACCELERATOR CABLE - SERVICE TIPS - REVISED DIAGNOSTIC PROCEDURES

LIGHT TRUCK: 1989-94 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1991-94 EXPLORER

ISSUE: Some Accelerator Cables are being replaced without an accurate check for cable wear or damage. Some cables may be replaced unnecessarily.

ACEELERATOR PEDAL AND THROTTLE BODY DIAGNOSIS

TEST A

TEST B		
PROCEDURE	**RESULT**	**ACTION**
Cable end should remain disconnected from the throttle body.	Yes	Refer to the throttle body diagnosis procedure in the appropriate section in the Powertrain Control/Emission Diagnosis Manual.
Operate the pedal by foot. Is the pedal operation smooth?	No	Check the foot pedal assembly for free operation or check for worn or damaged cable by following Test C.

TEST C (ALL VEHICLES EXCEPT WINDSTAR)		
PROCEDURE	**RESULT**	**ACTION**
Disconnect the cable end from the ball stud at the throttle body.	Yes	If yes to any of the questions, replace the cable as required. Refer to the appropriate Service Manual for removal and installation procedures.
Make sure the disconnected end of the cable does not come in contact with any of the surrounding parts. From inside the vehicle, pull the cable wire through its entire travel. Does it feel rough, sticky or restricted?	No	If no to all of the questions, the cable is functioning properly. Refer to the appropriate section of the Powertrain Control/Emission Diagnosis Manual for throttle body diagnosis procedures and adjustments or adjust carpet as required.
When you let go of the wire after pulling on it, does the wire stick or hesitate to return to its original position? Compress the spring at the throttle body end of the cable. Does the spring stick or fail to return to its original position at a rapid rate when released?		

TEST B

TEST C (EXCEPT WINDSTAR)

TEST C (WINDSTAR ONLY)		
PROCEDURE	**RESULT**	**ACTION**
Disconnect the cable from the cam at the throttle body. Make sure the disconnected end of the cable does not come in contact with any of the surrounding parts.	Yes	If yes to any question, replace the cable as required. Refer to the 1995 Windstar Service Manual for removal and installation procedures.
Is the wire kinked, frayed or damaged? Pull the cable wire through its entire travel from the dash panel end and then from the throttle body end. Does it feel sticky, rough or restricted?	No	If no to all questions, the cable is functioning properly. Refer to the throttle body diagnosis procedures in the appropriate section of the Powertrain Control/Emission Diagnosis Manual or adjust carpet as required.

TEST C (WINDSTAR)

ACTION: Refer to the Diagnostic Charts for the proper service procedure if an Accelerator Cable concern is suspected.

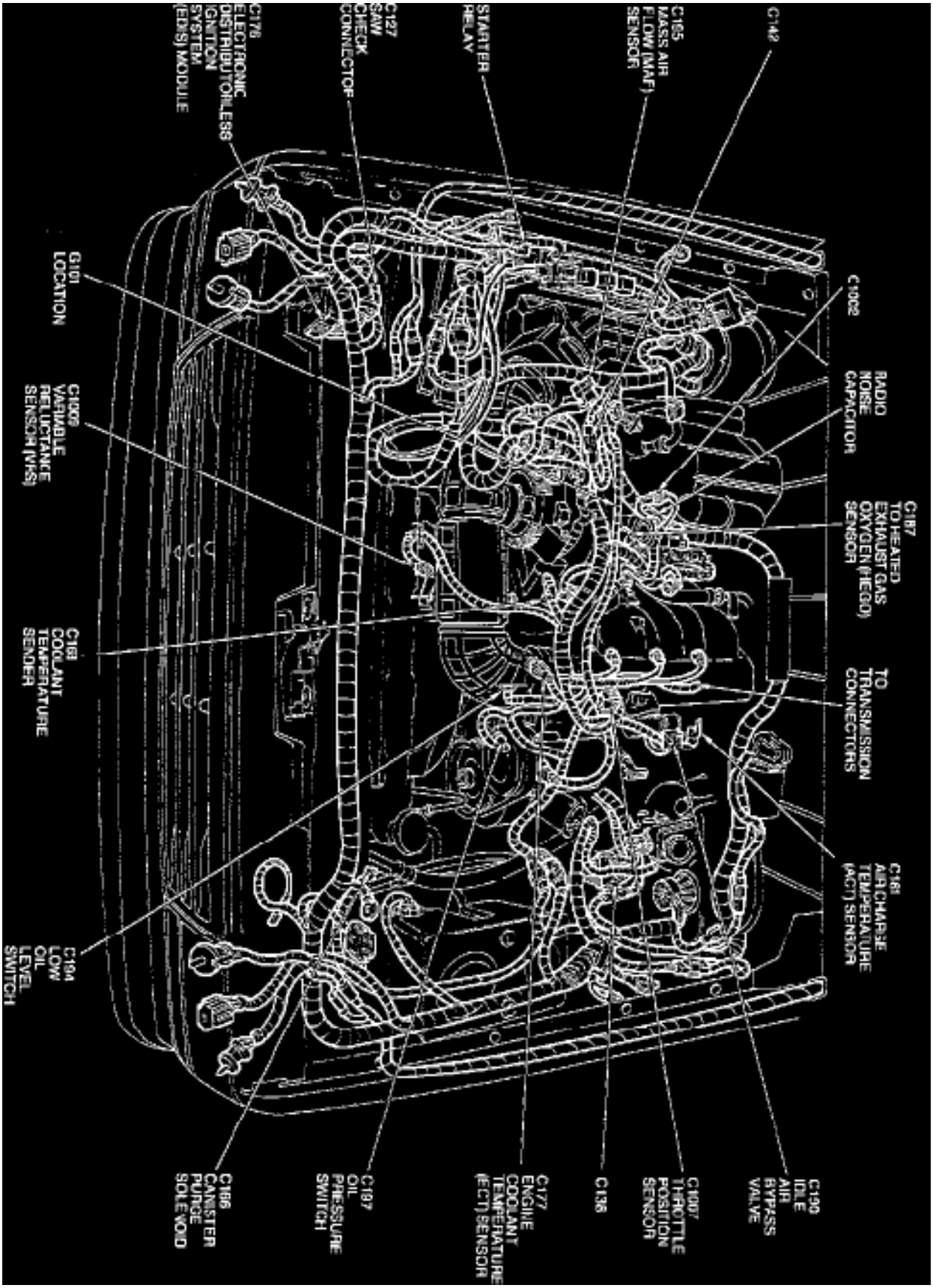
Follow the instructions carefully, and do not replace the accelerator cable before it is examined and determined to be worn or damaged.

NOTE:

ACCELERATOR CABLE SHOULD NOT BE LUBRICATED AND IS NOT SERVICEABLE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 404000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Fuel Delivery and Air Induction > Throttle Position Sensor > Component Information > Locations

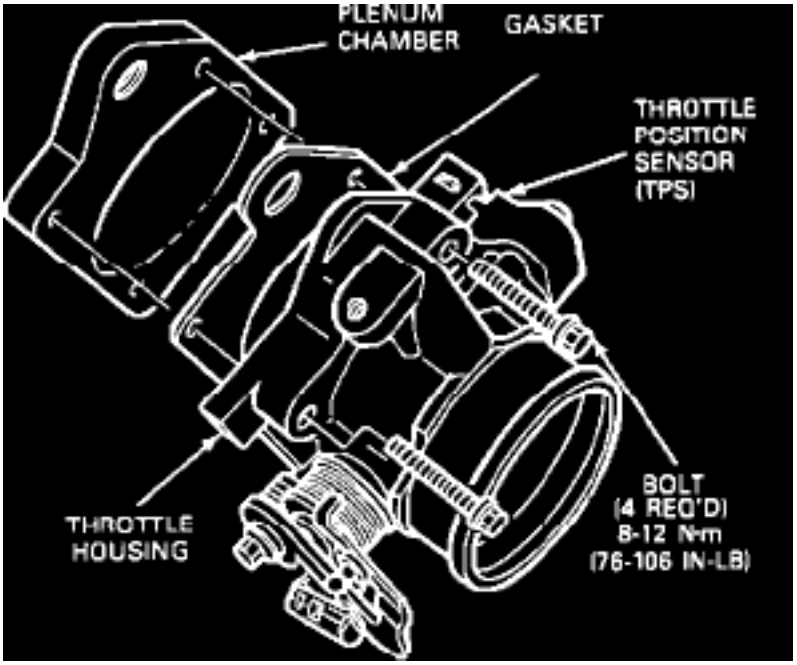


Throttle Position Sensor: Locations

Engine Compartment Components.

Top LH Front Of Engine

Applicable to: 4.0L/V6-244



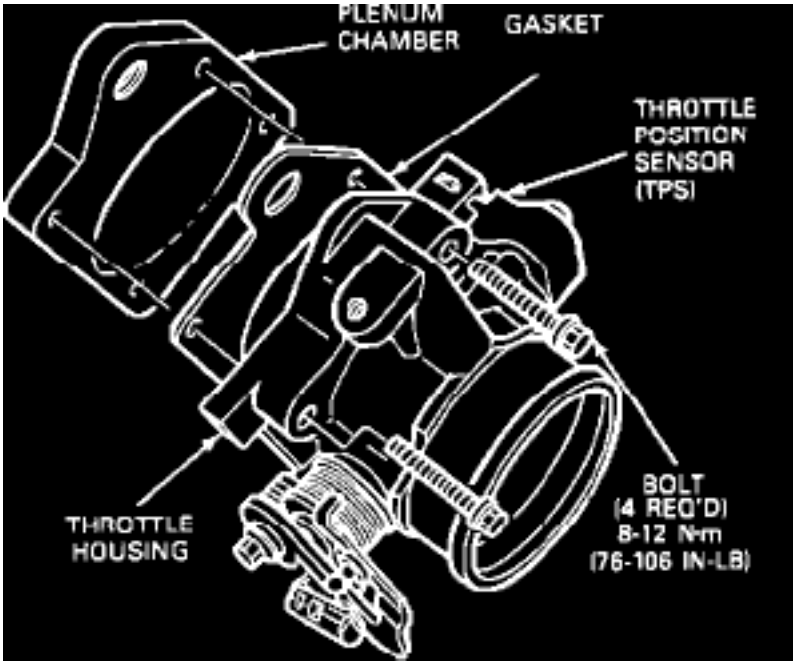
Throttle Position Sensor: Description and Operation

Throttle Body Assembly

The Throttle Position (TP) sensor, mounted on the throttle body, is a potentiometer that monitors throttle plate angle and sends a signal to the Engine Control Assembly (ECA). The TP sensor contains a pivot arm that moves along a curved resistor. One of the sensor leads supplies a five (5) volt reference signal (sent by the ECA) to the resistor. The second lead is used to ground the resistor. The third lead is for the voltage signal to the ECA. As the throttle plates move, the pivot arm moves along the curved resistor and receives a varying voltage signal. The ECA reads this signal and converts it into throttle plate angle. The voltage signal ranges from approximately one (1) volt at idle to approximately five (5) volts at wide open throttle. The TP sensor will also set a fault code when the ECA determines the output signal to be out of the normal operating range.

Throttle Position Sensor: Adjustments

The Throttle Position (TP) sensor is non-adjustable. If the voltage readings are out of range, the sensor must be replaced.



Throttle Position Sensor: Service and Repair

Throttle Body Assembly

1. Disconnect the Throttle Position (TP) sensor from the wiring harness.

2. If reinstalling the same TP sensor, mark the position of the TP sensor by scribing a mark on the sensor and throttle body.

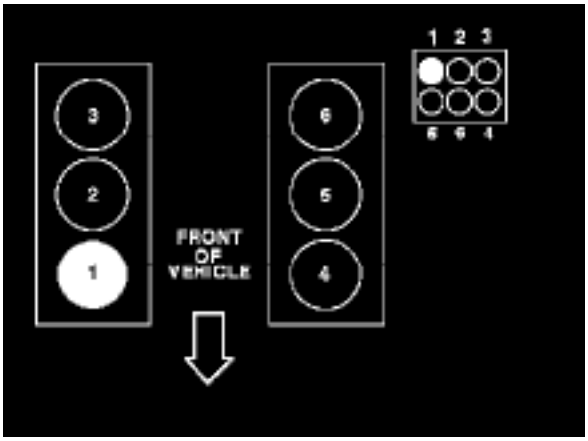
3. Remove the TP sensor retaining screws, then remove the TP sensor and gasket.

4. Install a new gasket and the TP sensor, positioning the throttle position sensor so that the connector is facing rearward. Rotate the TP sensor clockwise to align the scribe mark (from step 2).

5. Install the TP sensor retaining screws, tightening to 11-16 lb. in. (1.2-1.8 N-m).

6. Connect the TP sensor electrical connector.

NOTE: The TP sensor is not adjustable.



Firing Order: Specifications

V6 Firing Order: 1 4 2 5 3 6

Technical Service Bulletin # 9111B6 Date: 910614

Octane Adjust Shorting Bar - Revised Procedures

Article No. 91-11B-6

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1989 - PAGE 17-289 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGE 17-329 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGE 5-22 - EEC-IV QUICK TEST STEP 12.0 - CAR DIAGNOSIS BY SYMPTOM CHART REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 6-305 THROUGH 6-307 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

FORD: 1989-91 TAURUS, THUNDERBIRD 1991 ESCORT, MUSTANG

LINCOLN-MERCURY: 1989-90 COUGAR 1991 TRACER

LIGHT TRUCK: 1989-91 RANGER 1991 AEROSTAR, EXPLORER

ISSUE: Additional information regarding removal of the Octane Adjust Shorting Bar is required to assure compliance with Federal (EPA) Emission Standards. The following Manuals are affected on the pages indicated:

^ 1989 Engine/Emissions Diagnosis Page 17-289

^ 1990 Engine/Emissions Diagnosis Page 17-329

^ 1991 Engine/Emissions Diagnosis Page 5-22 and Pages 6-305 through 307

ACTION: Refer to the pages in this TSB article for the additional information.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 690000

Octane Adjust	Pinpoint Test	KP

Note

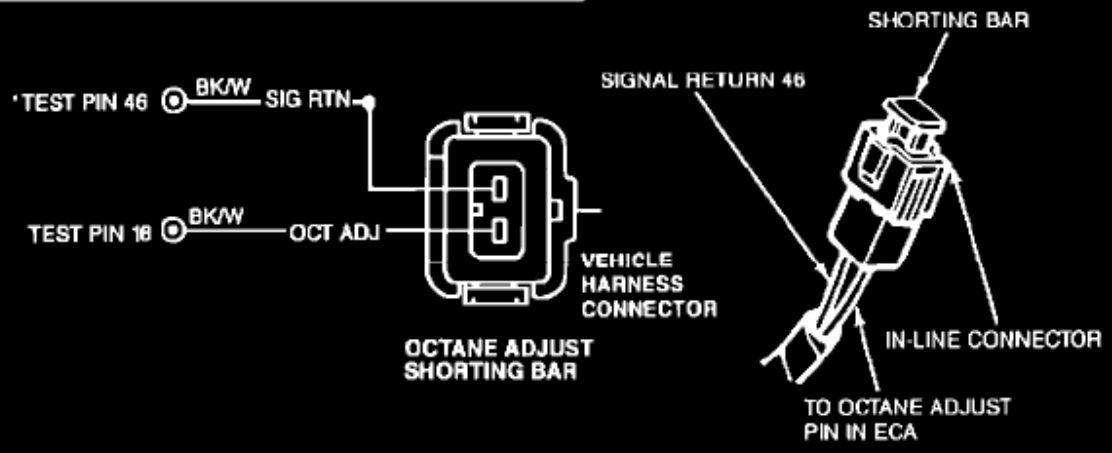
You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: Signal Return, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



OCTANE ADJUST SHORTING BAR LOCATIONS

APPLICATION	LOCATION
2.3L EFI Truck	Passenger side of fender apron, taped to the self-test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to self-test connector.

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9686-D

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

Octane Adjust Shorting Bar Locations

Application	Location
1.9L MA SEFI	Near EEC-IV power relay, fuel pump relay and processor in passenger compartment.
2.3L EFI Truck	Passenger side of fender apron, taped to the Self-Test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to Self-Test connector.
4.0L MA EFI Aerostar	Driver side, engine cowl near windshield wiper motor take-out (alongside MAP take-out).
4.0L MA EFI Ranger/ Bronco II	Passenger side of fender apron, taped to the Self-Test connector.

Test Pin 18 (44 and 43) OCT ADJ

Application	Wire Color
2.3L EFI Truck 3.0L SEFI SHO 3.8L SEFI SC	DK/W
4.0L Aerostar	O
4.0L Ranger	W/R
1.9L MA SEFI	GR/W

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

EEC-IV QUICK TEST STEP: Diagnosis By Symptom

12.0

12.0 CAR DIAGNOSIS BY SYMPTOM CHART

Symptom	Pinpoint Test Step Direction												
	1.9L MA SEFI	2.3L OHC EFI	2.3L HSC EFI	2.5L AXODE SEFI	3.0L EFI PROBE	3.0L AXODE SEFI	3.0L SHO SEFI	3.8L AXODE SEFI	3.8L RWD SEFI	3.8L SC SEFI	4.6L 2V SEFI	5.0L SEFI	5.0L MA SEFI
Stumble after hot restart	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21
Fuel pump runs with engine off	—	—	—	X14	X14	X14	X14	X14	—	—	J22	J22	
Gasoline fumes under hood	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Black Exhaust Smoke	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Spark knock	KP5	KP5	—	—	DG1 or SEC. 11	—	KP5	—	—	KP5	KP5	—	—
Cooling fan does not operate Low speed cooling fan does not operate High speed cooling fan does not operate	KF10	X18	—	X18	X18	X18	X18	X18	—	X18	—	—	—
Low speed cooling fan always on	KF25	X35	—	X35	X35	X35	X35	X35	—	X35	—	—	—
High speed cooling fan always on	KF25	—	—	X40	X40	X40	x40	—	X40	X40	—	—	—

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

NOTE: The Octane Adjust shorting bar is similar in shape to the SPOUT in-line connector and on some applications the PSPS circuit will also have a shorting bar connector. **DO NOT** remove the shorting bar unless you have been directed by an application specific Technical Service Bulletin (TSB).

Test Pin 18, 29 or 44 — OCT ADJ

Application	Wire Color
1.9L Escort/Tracer	GR/W
Car: 2.3L Mustang Truck: 2.3L Ranger 4.0L Explorer	DG
3.0L SHO	PK
3.8L SC	BK/W
4.0L Ranger	O
4.6L MA SEFI	W/R

Test Pin 46 — SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
3.8L SC SEFI	BK/W
All Others	GY/R

DELETION

Revised 5/91

Octane Adjust	Pinpoint Test	KP

TEST STEP	RESULT ▶	ACTION TO TAKE
KP1 VISUALLY INSPECT OCTANE ADJUST IN-LINE CONNECTOR SERVICE CODE 57/341		
Service Code 57/341 indicates Octane Adjust shorting bar is not in or the OCT ADJ circuit is open. • Key off. • Visually inspect Octane Adjust in-line connector. • **Is the shorting bar removed?**	Yes ▶	GO to KP2.
	No ▶	GO to KP4.
KP2 CHECK FOR MODIFICATION DECAL		
• Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶	Testing complete. If vehicle has spark knock concern, GO to Section 2.
	No ▶	GO to KP3.
KP3 CHECK FOR SERVICE CODE 57/341		
• Replace Octane Adjust shorting bar. • Key off. • Activate self-test. • **Is service code 57/341 present?**	Yes ▶	GO to KP4.
	No ▶	Testing complete. EEC system OK.
KP4 CHECK CONTINUITY OF OCTANE ADJUST CIRCUIT		
NOTE: There should be continuity from OCT ADJ circuit thru the in-line connector and shorting bar to SIG RTN circuit. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected • Measure resistance between Test Pin 46 and OCT ADJ Test Pin at the breakout box (see schematic for appropriate OCT ADJ circuit test pin). • **Is the resistance less than 5 ohms?**	Yes ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test.
	No ▶	SERVICE open OCT ADJ circuit or shorting bar or SIG RTN circuit. REMOVE breakout box. RERUN Quick Test.

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

TEST STEP	RESULT ▶	ACTION TO TAKE
KP5 CHECK FOR SERVICE CODE 11 • Start engine and idle vehicle at operating temperature. • Key off. • Activate self-test. • Key on, engine off. • **Is service code 11 or 111 present?**	Yes ▶ No ▶	GO to KP6. **For service code 57/341:** GO to KP1. **For all other codes:** RETURN to Quick Test.
KP6 VERIFY IN-LINE CONNECTOR SHORTING BAR IS INSTALLED • Key off. • Visually inspect Octane Adjust in-line connector. • **Is shorting bar installed?**	Yes ▶ No ▶	GO to KP8. GO to KP7.
KP7 CHECK FOR MODIFICATION DECAL • Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	GO to KP10. REPLACE shorting bar. GO to Section 2 to address spark knock concern.
KP8 CHECK FOR TSB • Is there a Technical Service Bulletin (TSB) authorizing the removal of the Octane Adjust shorting bar?	Yes ▶ No ▶	GO to KP9. GO to Section 2 to address spark knock concern.
KP9 REMOVE SHORTING BAR • Remove shorting bar only if there is a TSB authorization. • Drive vehicle to verify spark knock. • **Is spark knock present?**	Yes ▶ No ▶	GO to KP10. Testing complete. EEC system OK.

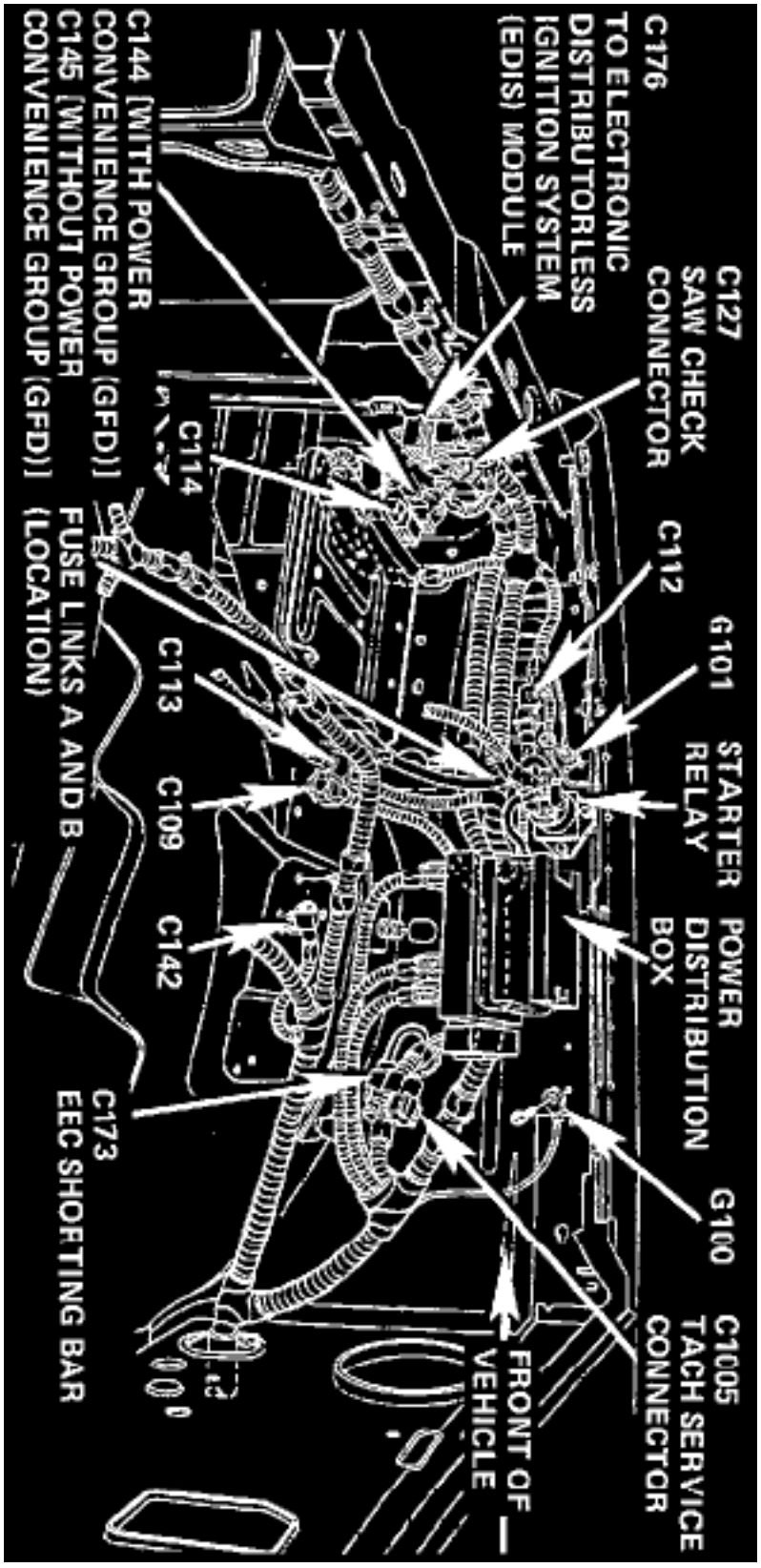
Revised 5/91

Octane Adjust

Pinpoint Test **KP**

TEST STEP	RESULT	ACTION TO TAKE
KP10 CHECK OCTANE ADJUST CIRCUIT FOR A SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • Measure resistance between OCT ADJ circuit at the in-line connector and Test Pin 40/60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	GO to **KP11**.
	No ▶	SERVICE short circuit. REMOVE breakout box. If spark knock is still present, GO to Section 2.
KP11 CHECK PROCESSOR INTEGRITY • Key off. • Shorting bar removed because of TSB authorization. • Breakout box installed, processor connected. • Key on. • Measure voltage between Octane Adjust circuit and Test Pin 40/60 at the breakout box. • **Is voltage greater than 4.0 volts?**	Yes ▶	REMOVE breakout box. If spark knoock is still present, GO to Section 2.
	No ▶	REPLACE processor. REMOVE breakout box. If spark knock is still present, GO to Section 2.

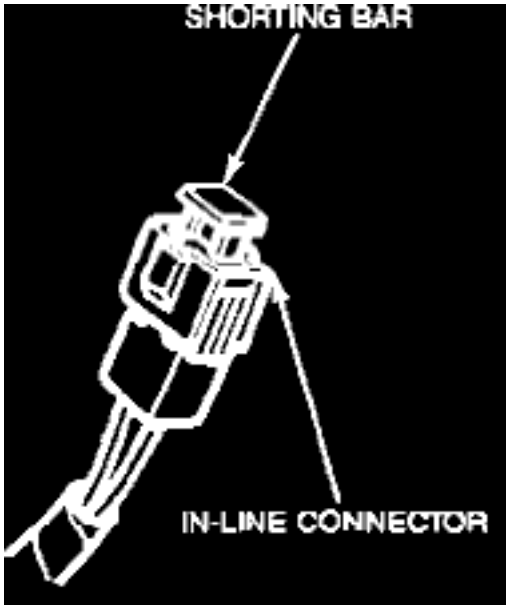
New 5/91


C127
SAW CHECK
CONNECTOR
C176
TO ELECTRONIC
DISTRIBUTORLESS
IGNITION SYSTEM
(EDIS) MODULE
C112
G101
STARTER
RELAY
POWER
DISTRIBUTION
BOX
G100
C1005
TACH SERVICE
CONNECTOR
C114
C113
C109
C142
C144 [WITH POWER
CONVENIENCE GROUP (GFD)]
C145 [WITHOUT POWER
CONVENIENCE GROUP (GFD)]
FUSE LINKS A AND B
(LOCATION)
C173
EEC SHIFTING BAR
FRONT OF
VEHICLE

Ignition Timing Connector: Locations

Component Location

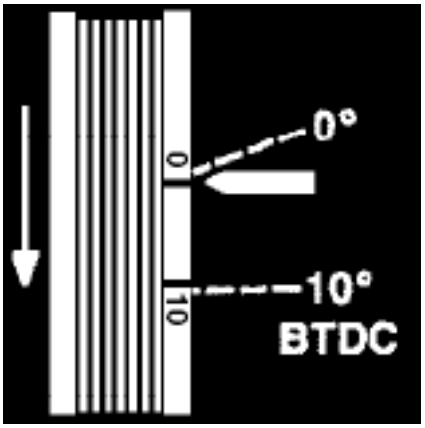
The SPOUT connector (SAW check connector C127) is located at the RH front of the engine compartment in front of the battery.



Ignition Timing Connector: Description and Operation

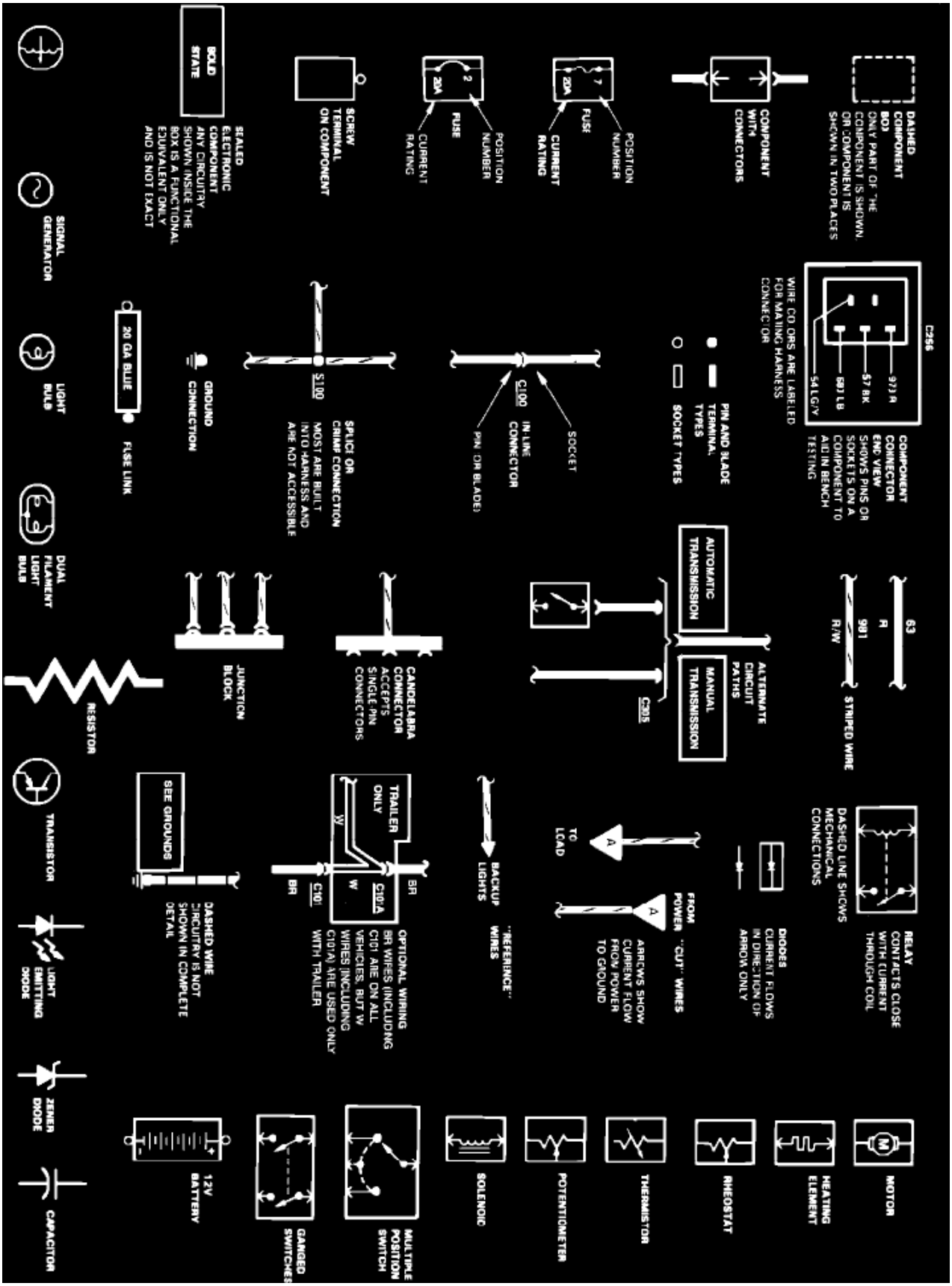
In-line Connector With Shorting Bar

The octane adjustment switch is used to retard the ignition timing three to four degrees. When the switch jumper is INSTALLED, the timing is normal. With the jumper REMOVED, the timing is retarded. This is done to allow for optimum spark advance for effective combustion of the air/fuel mixture.



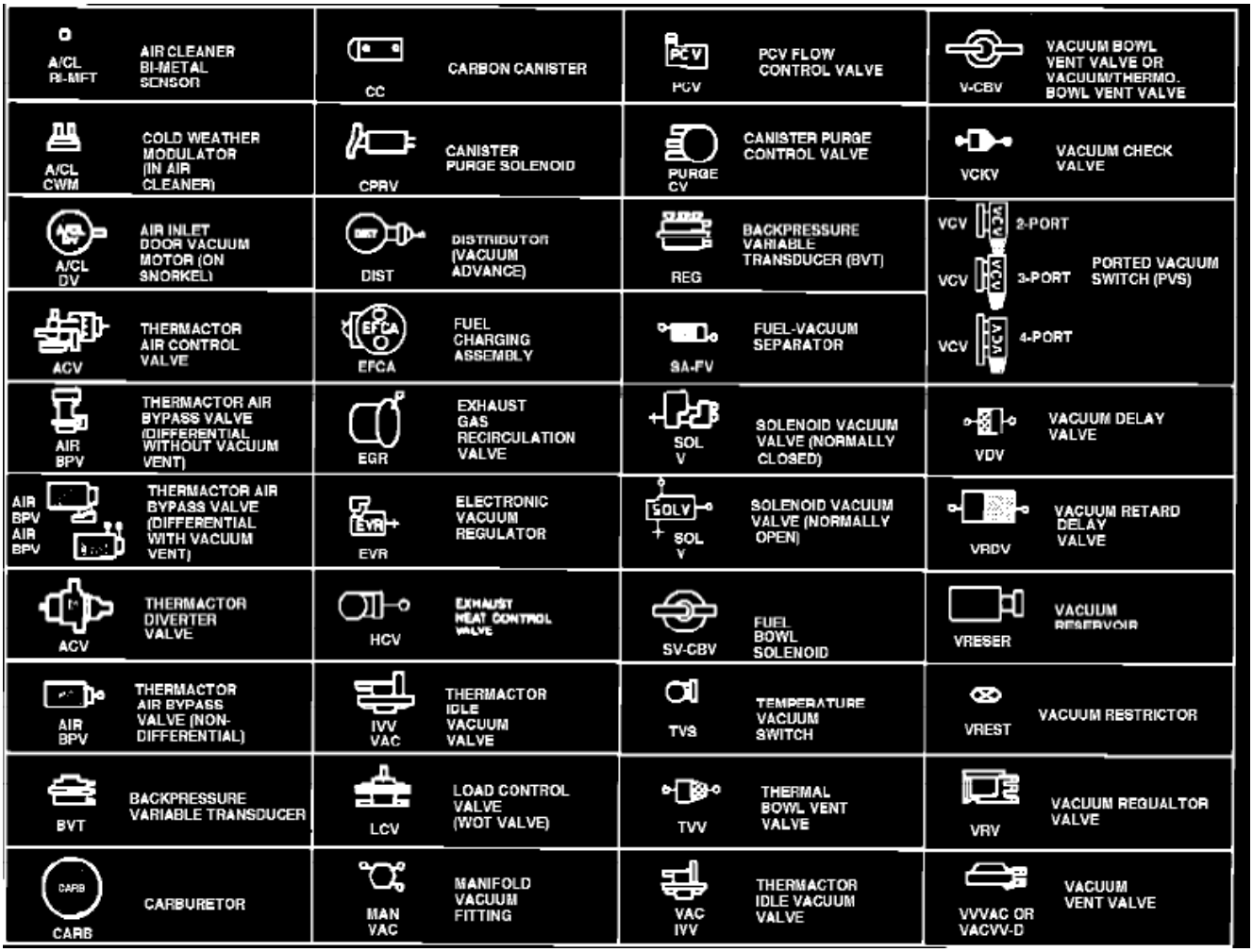
Timing Marks

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Ignition System > Camshaft Position Sensor > Component Information > Diagrams > Diagram Information and Instructions

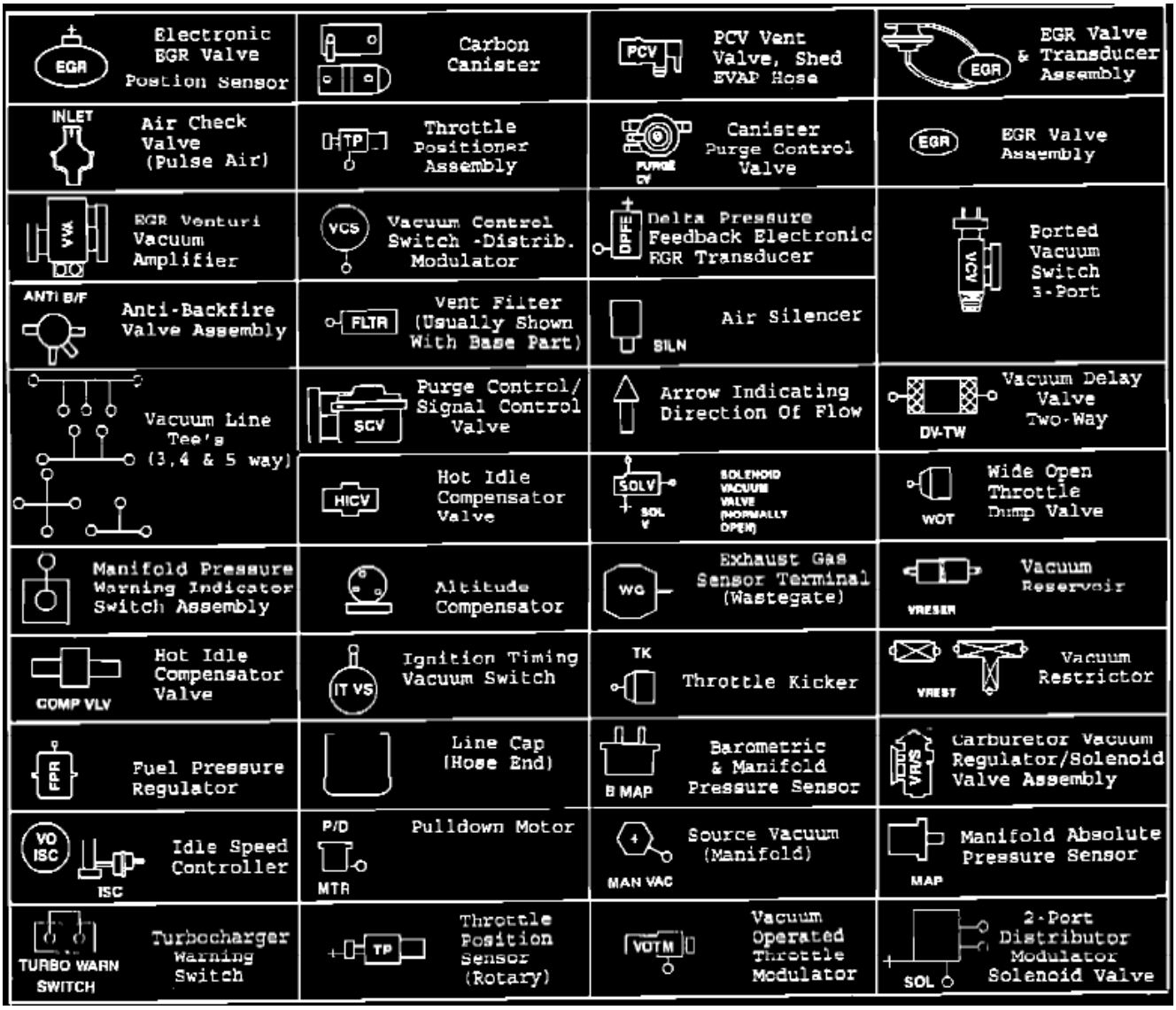


Camshaft Position Sensor: Diagram Information and Instructions

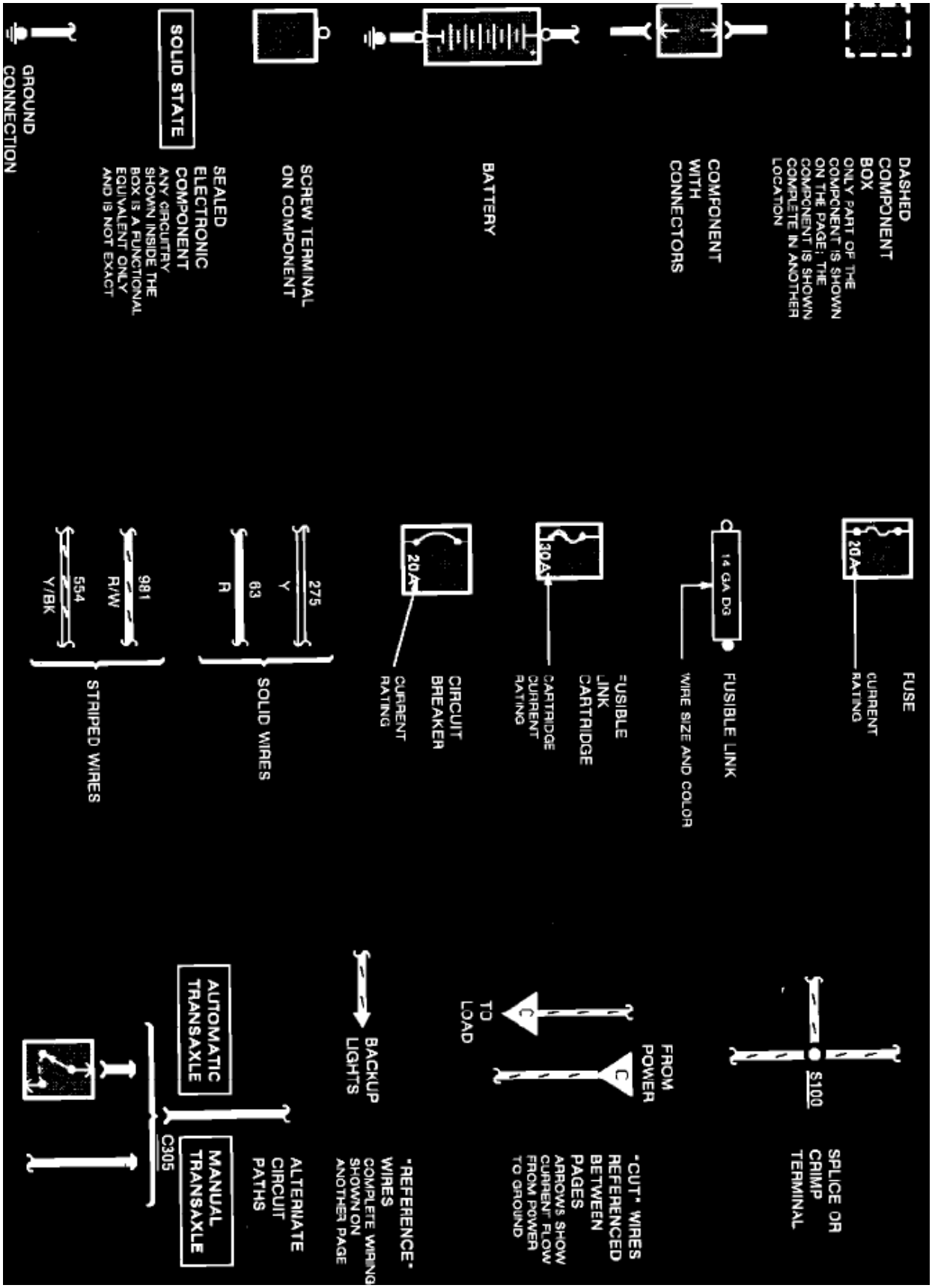
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
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554
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SPLICE OR CRIMP TERMINAL
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ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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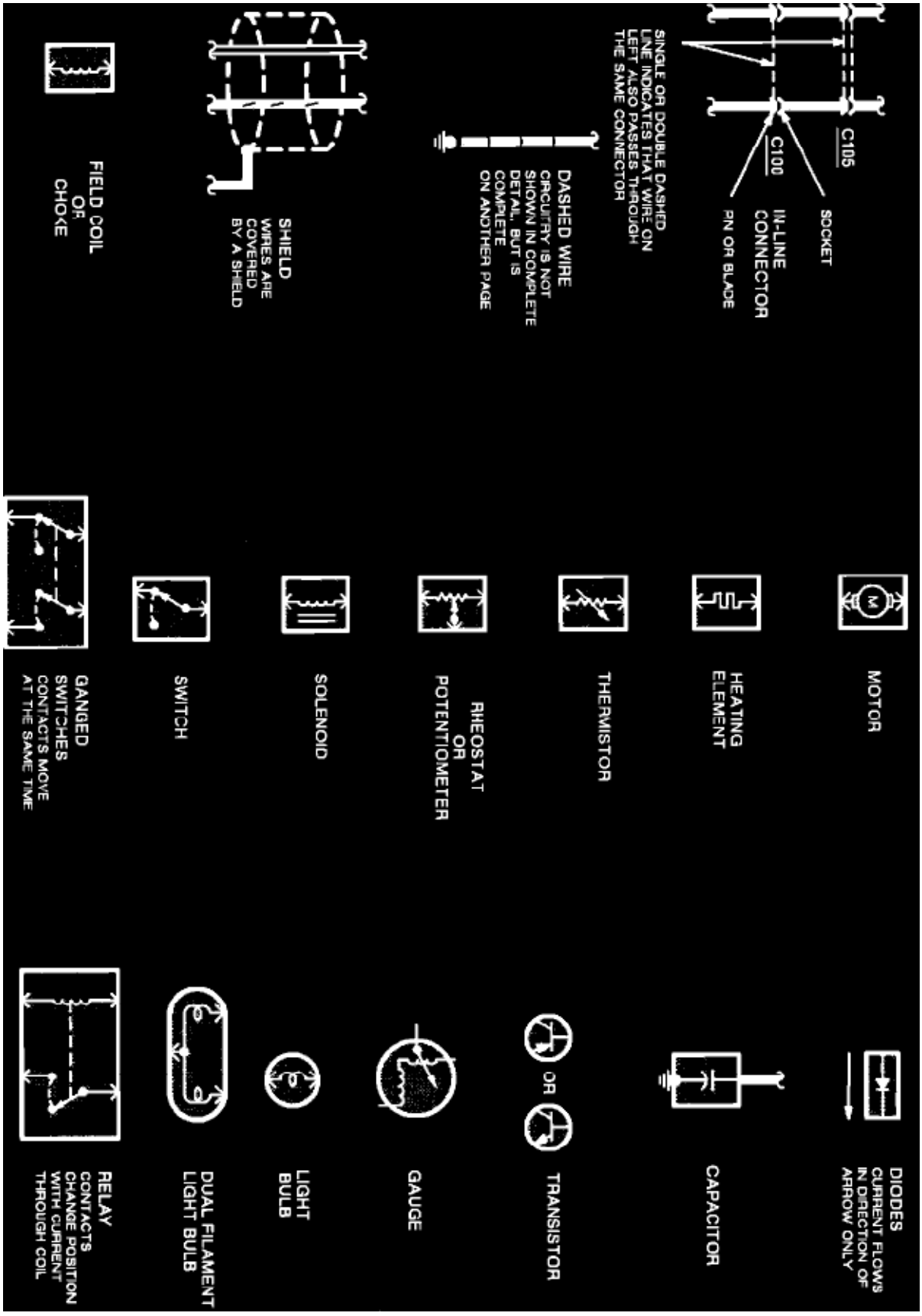
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
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SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
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SHIELD
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HEATING ELEMENT
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OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

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O: Orange

PK: Pink R: Red

P: Purple

T: Tan

V: Violet

W: White

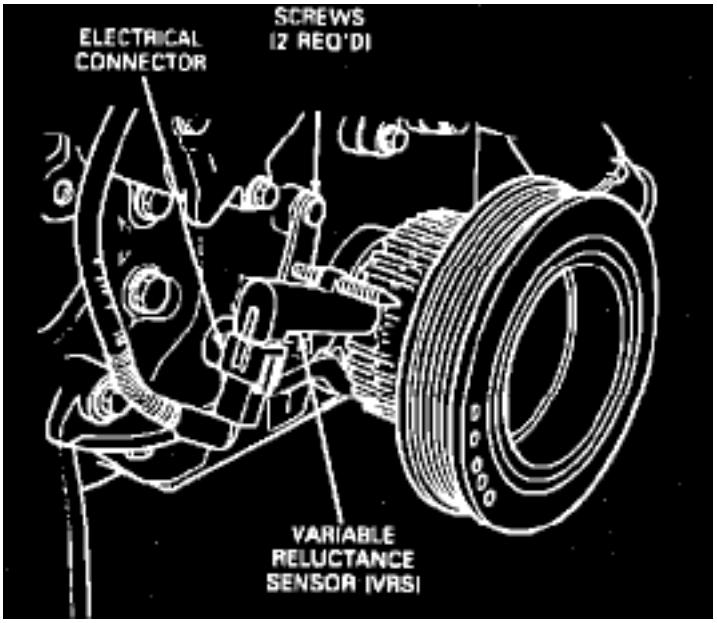
Y: Yellow

Crankshaft Position Sensor: Specifications

FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

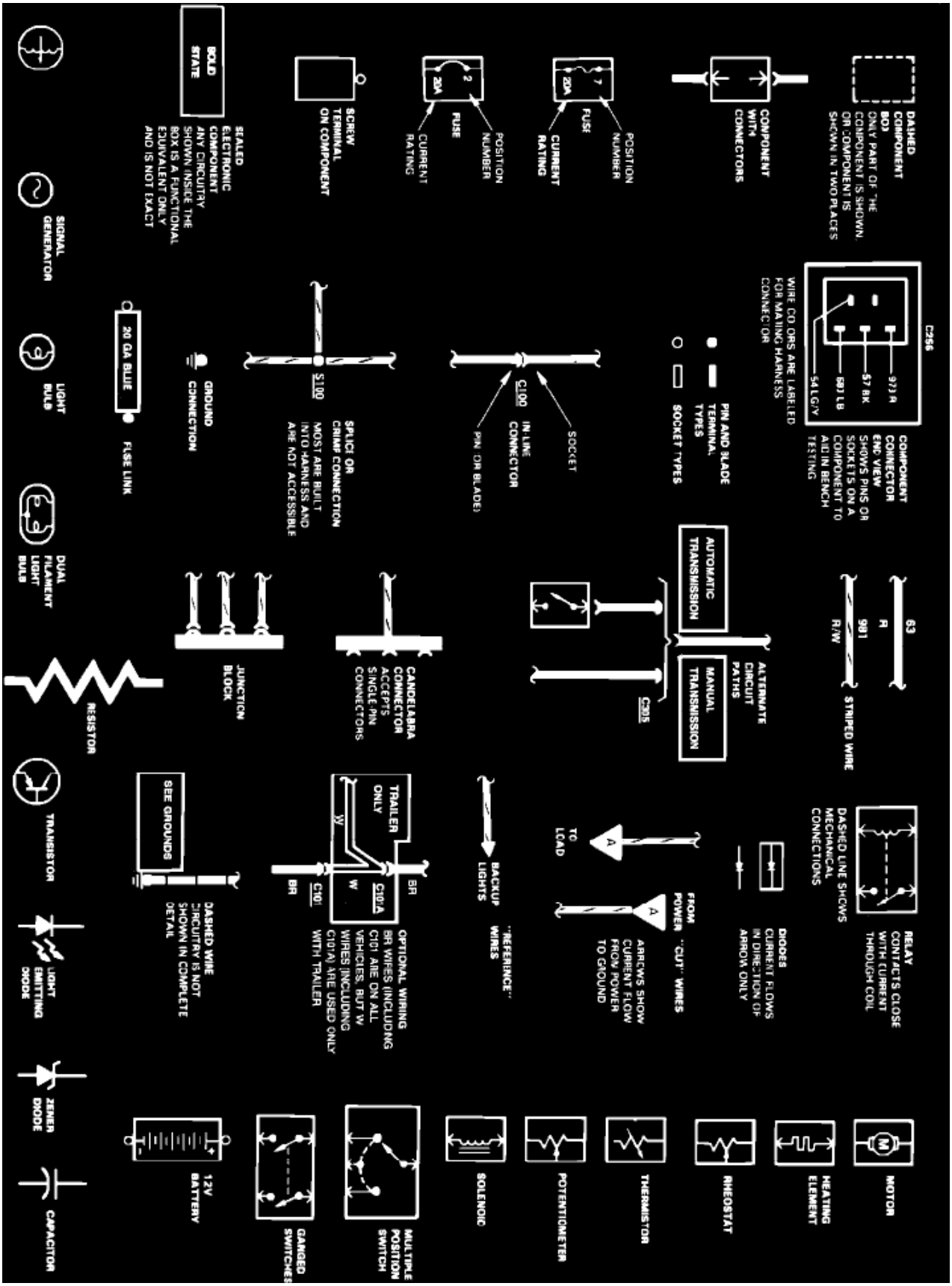
TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)



Variable Reluctance (Crankshaft Position) Sensor

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Ignition System > Crankshaft Position Sensor > Component Information > Diagrams > Diagram Information and Instructions



Crankshaft Position Sensor: Diagram Information and Instructions

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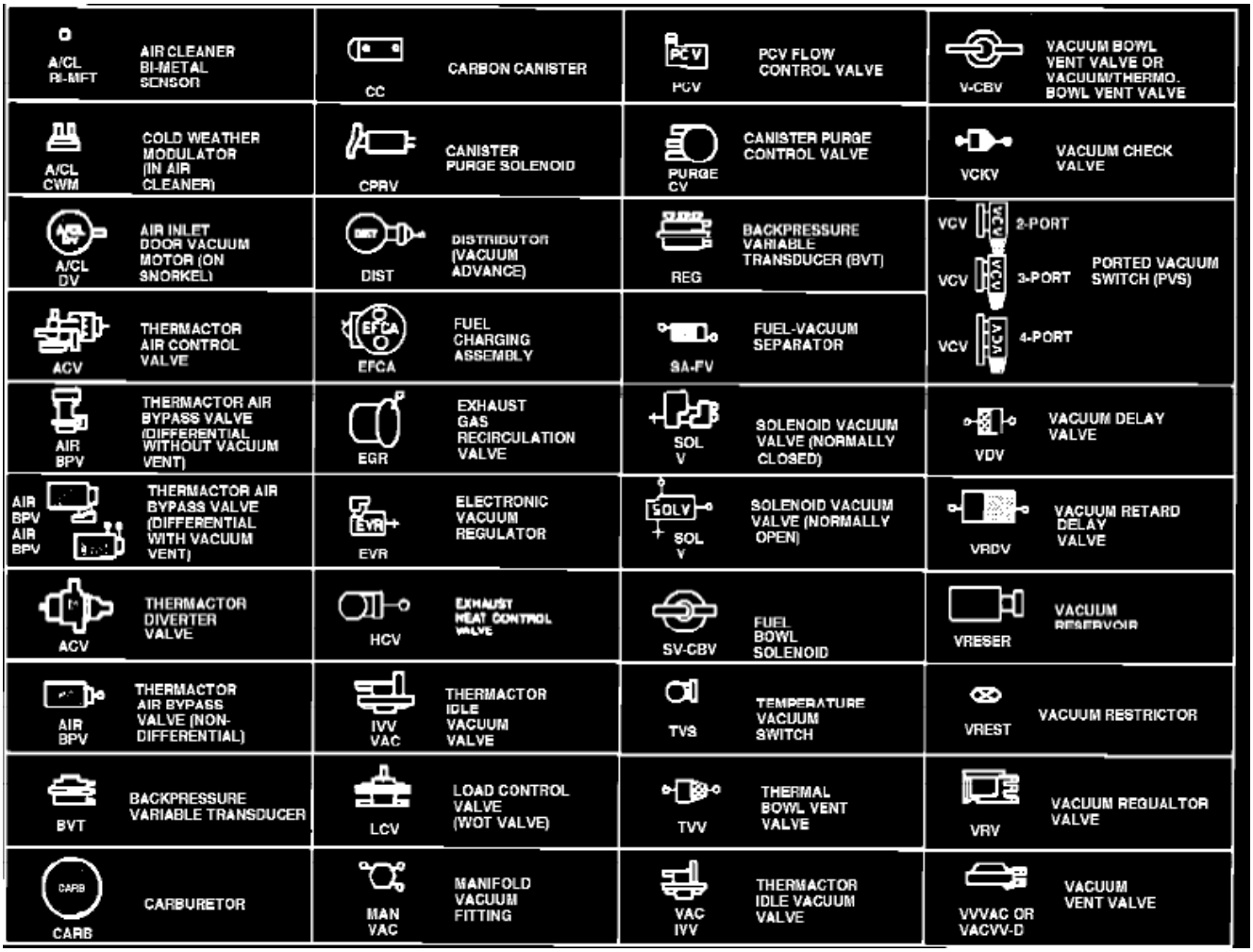

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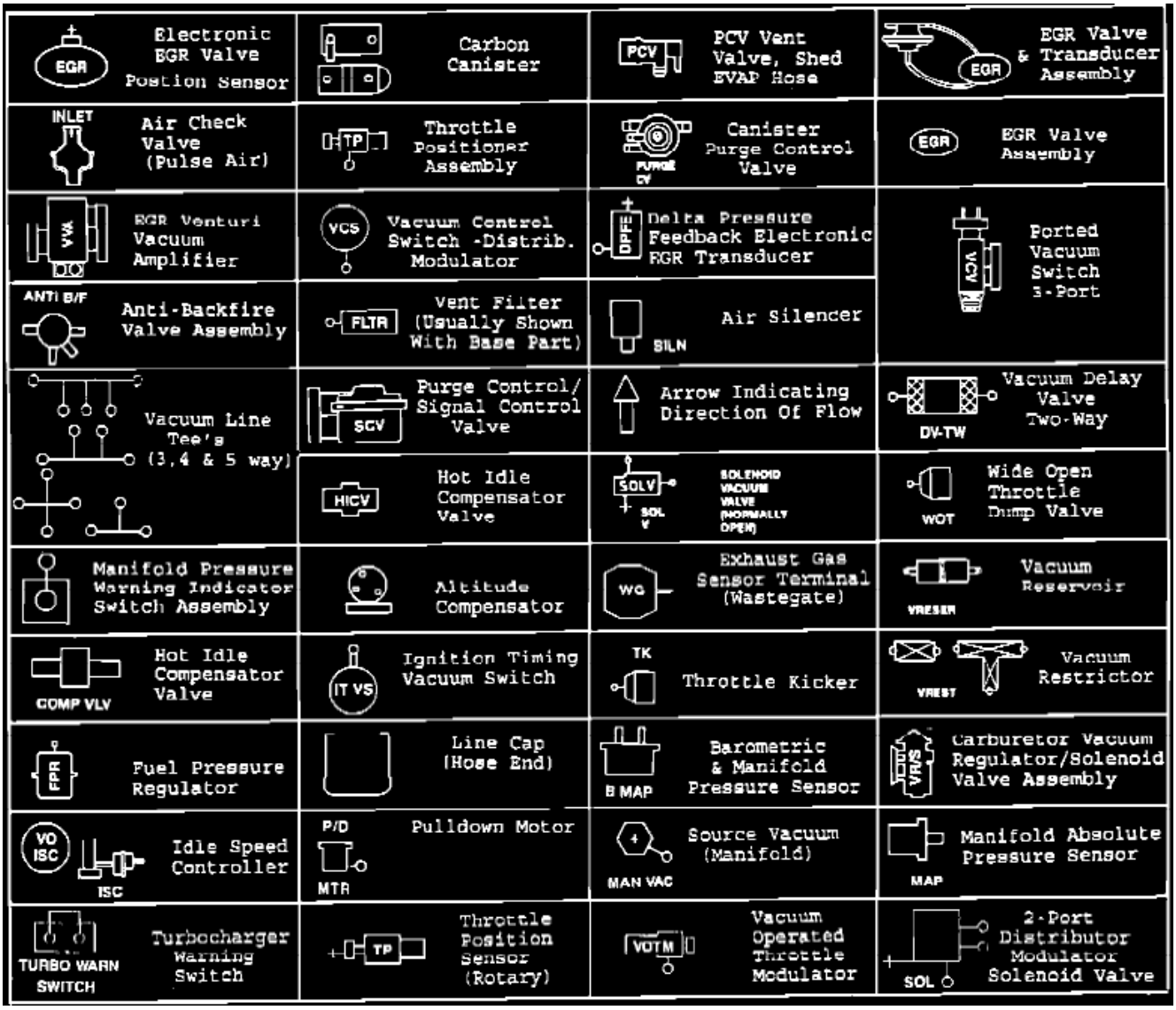

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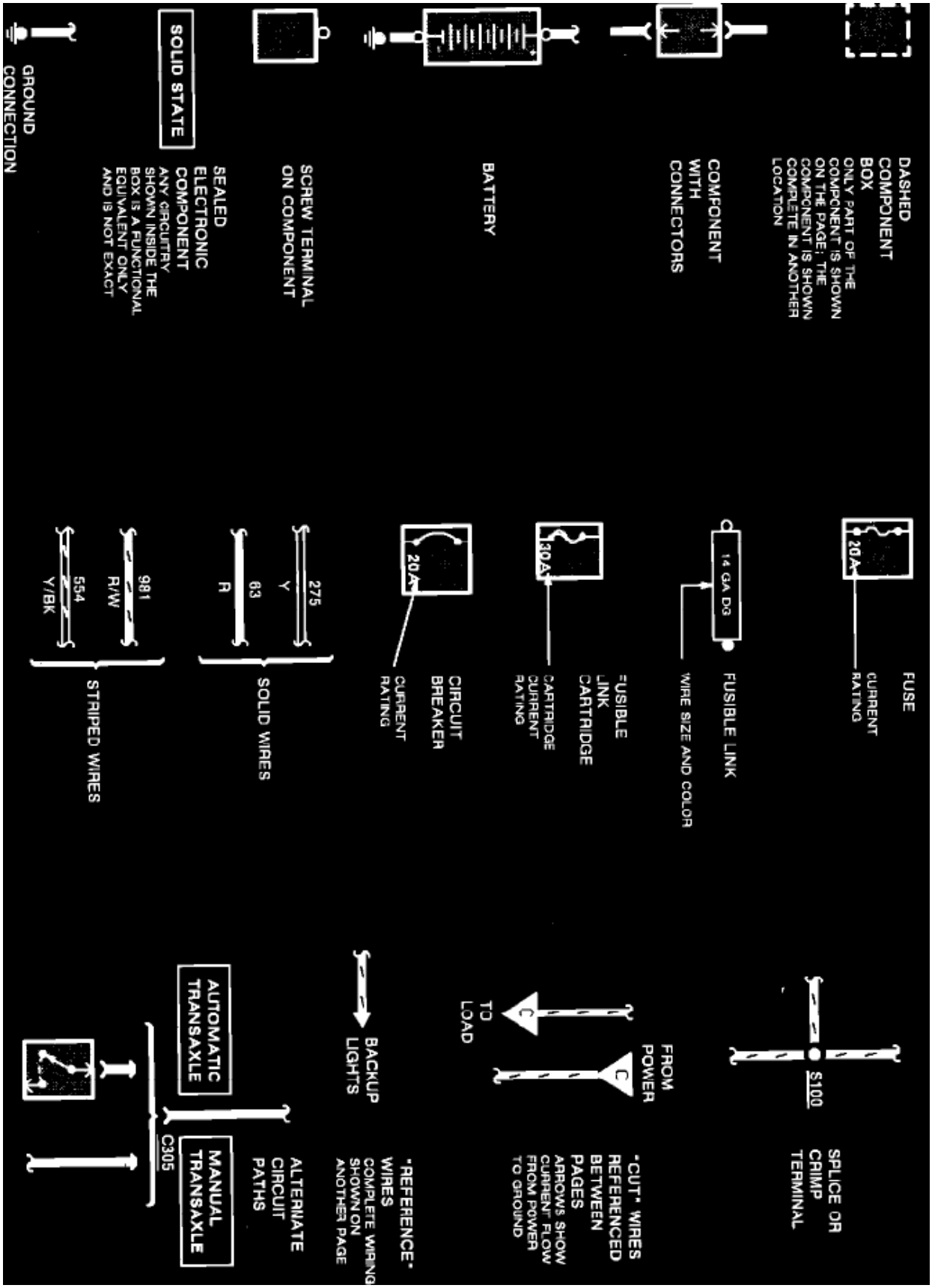
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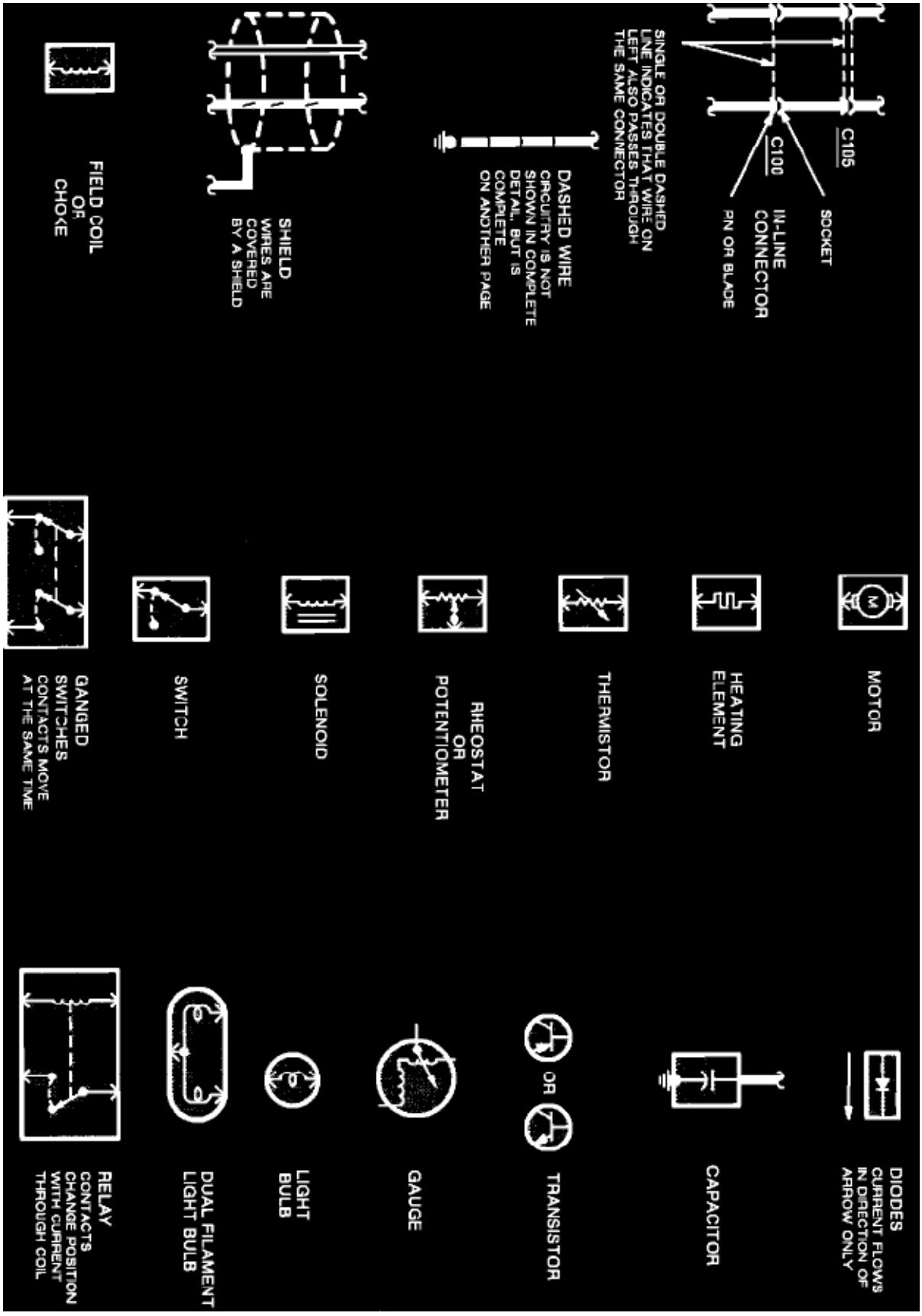
MANUAL TRANSAXLE
C305

Electrical Symbols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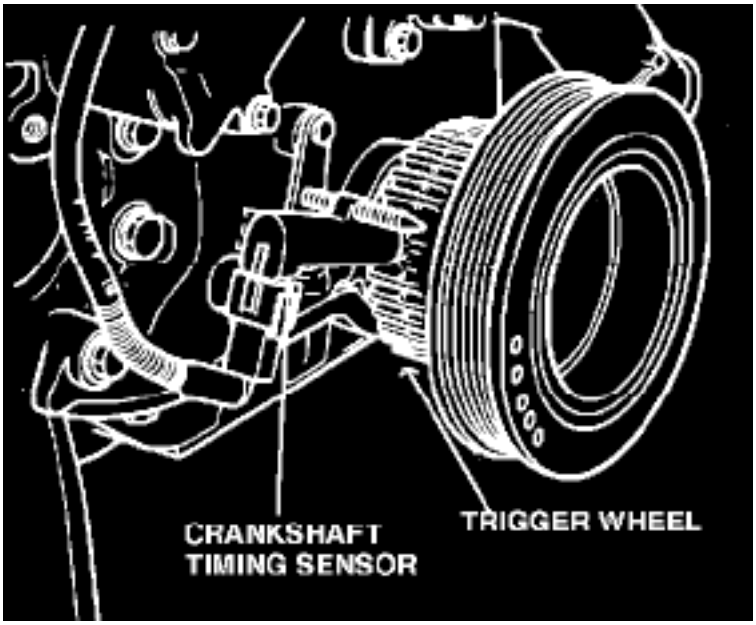
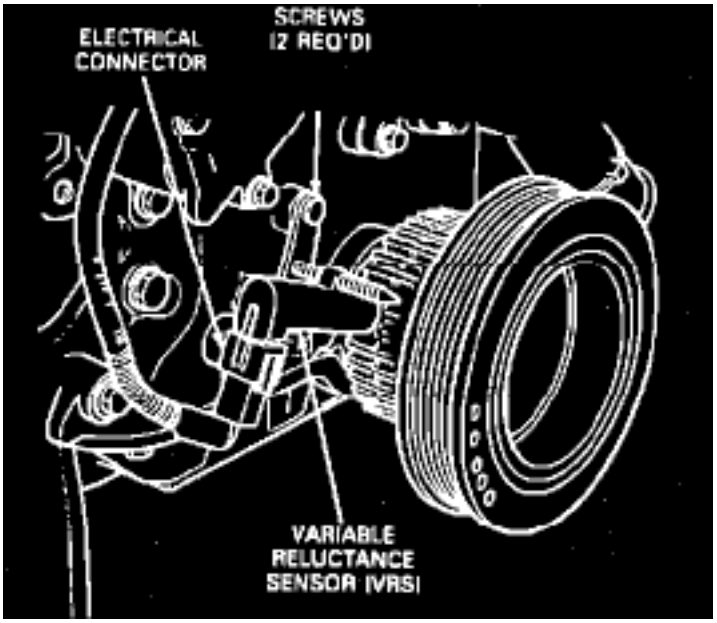


Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

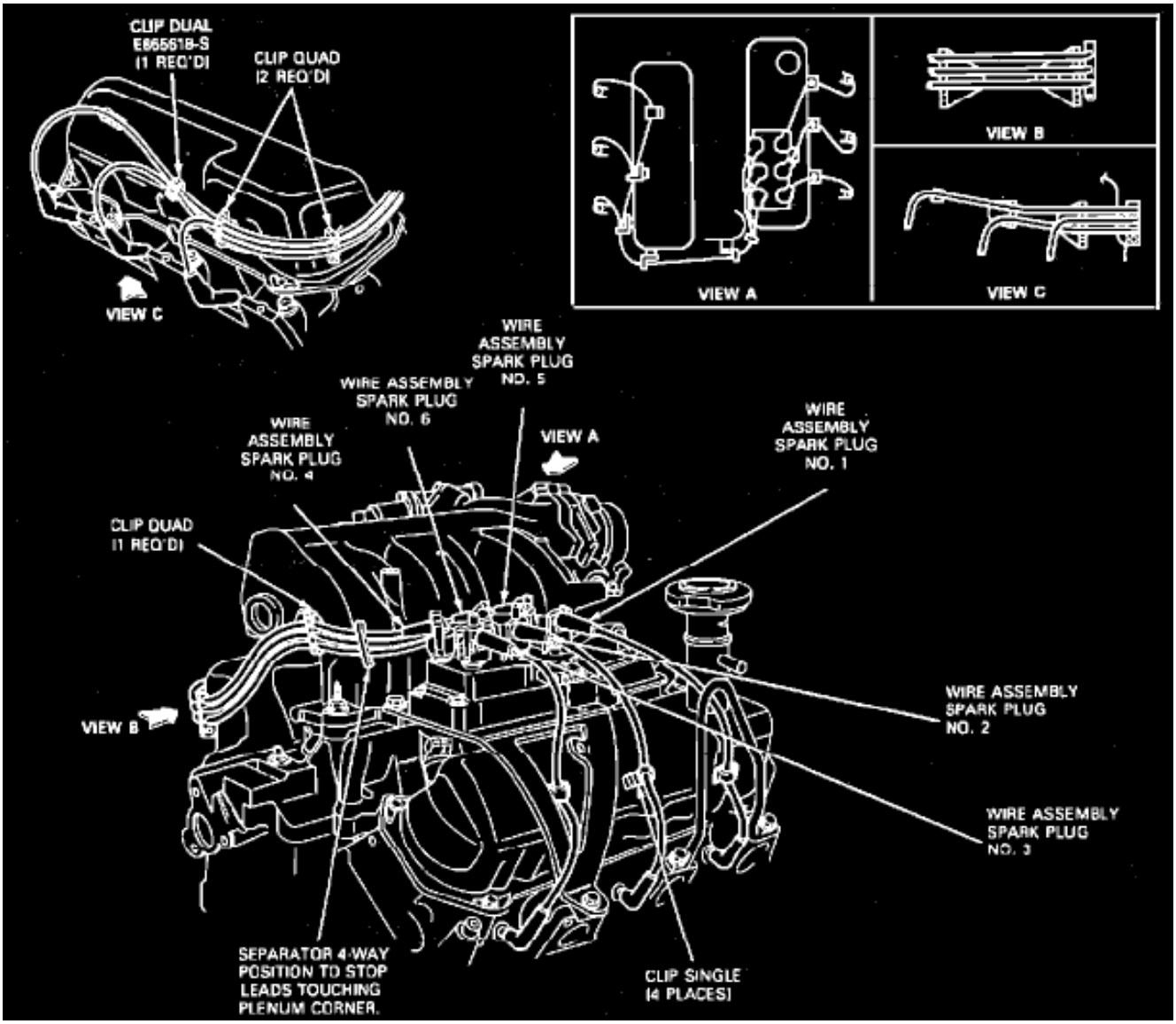
INSTALLATION:

1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

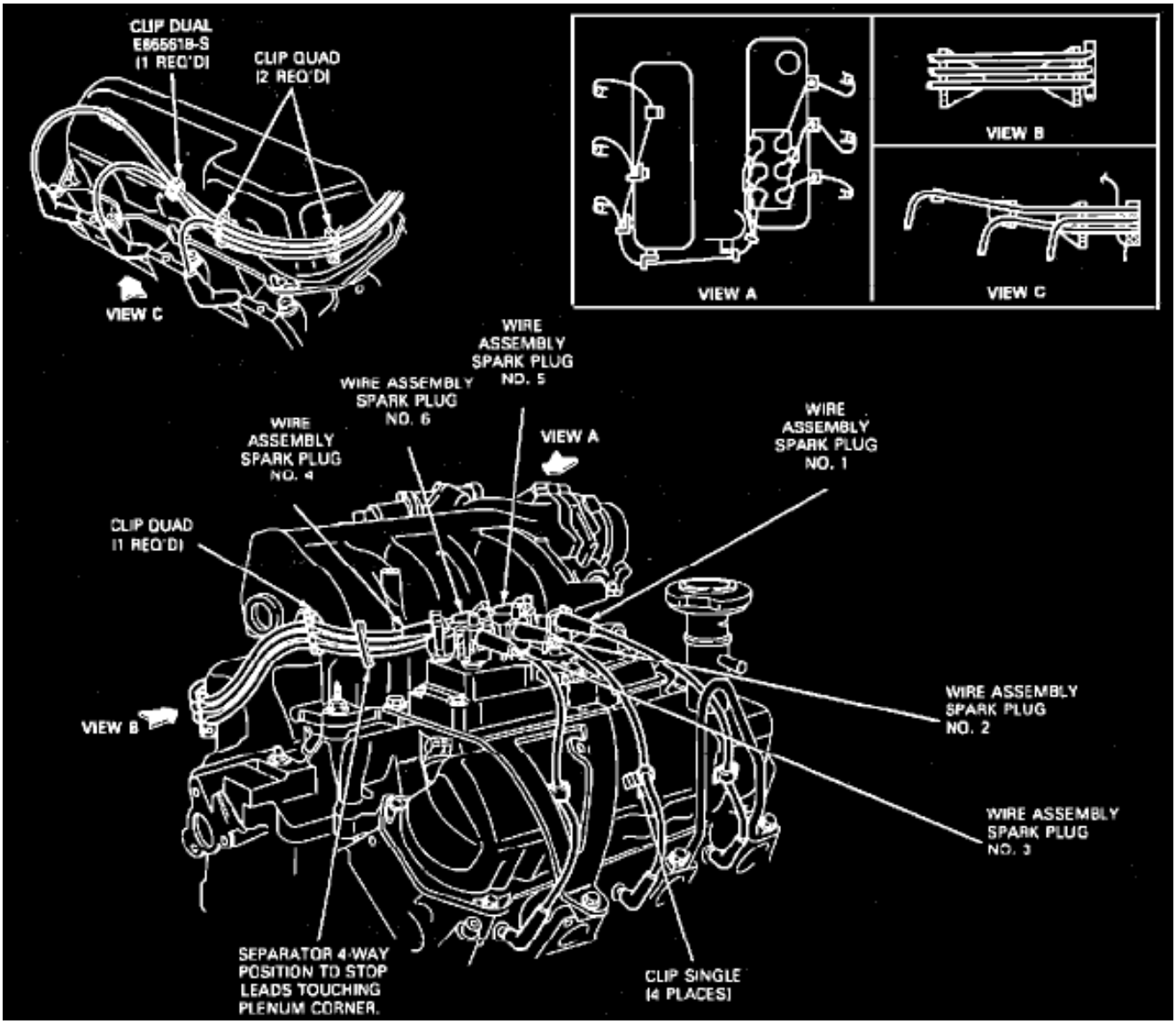
2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

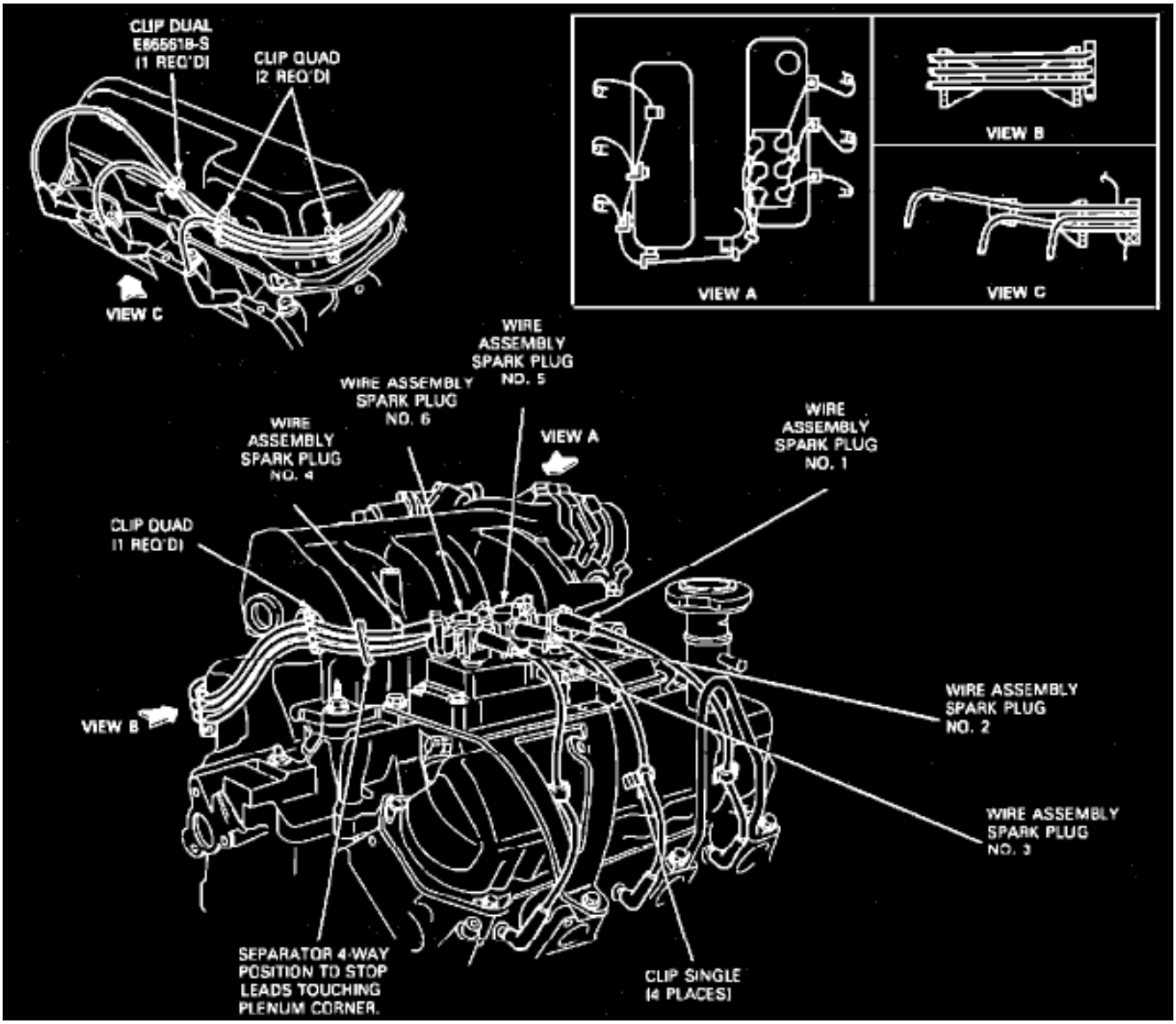
4. Connect the negative battery cable.



Spark Plug Wire Assembly



Spark Plug Wire Assembly



Ignition Cable: Service and Repair

Spark Plug Wire Assembly

Removal:

1. When removing spark plug wires from the spark plugs, use the spark plug wire remover T74P-6666-A or equivalent. Grasp and twist the boot back and forth on the plug insulator to free the boot.

2. Use the special tool or equivalent to pull the boot from the plug. Do not pull on the wire directly, as it may become separated from the connector inside the boot.

3. To remove the wires from the coil pack, squeeze the locking tabs of the coil wire retainer and remove using a twisting and pulling motion. Do not pull on the wire.

INSTALLATION:

CAUTION: Proper installation of spark plug wires is critical to vehicle operation. If one spark plug wire is not properly installed on the spark plug or ignition coil, both spark plugs connected to that coil may not fire under load.

1. Whenever a high tension wire is removed for any reason from a spark plug or ignition coil, or a new high tension wire is installed, Silicone Dielectric Compound D7AZ-19A331-A or equivalent must be applied to the boot prior to installation. Using a small tool, coat the entire interior surface of the boot.

2. Install each wire on the proper ignition coil terminal. The terminal cylinder numbers are identified on the ignition coil pack. Ensure that both coil boot retainer locking tabs have engaged.

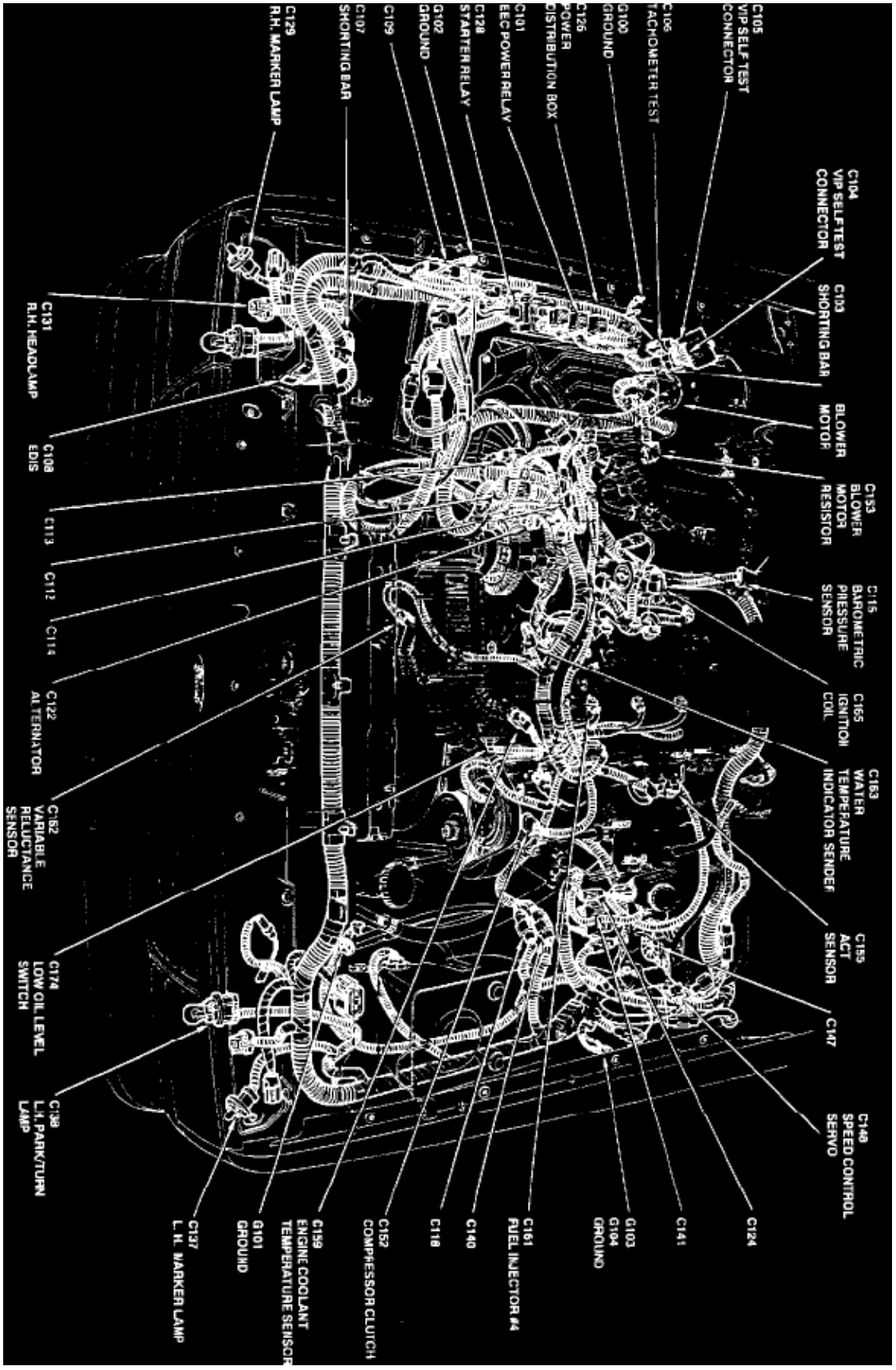
3. Remove the wire retaining brackets from the old wiring set and install the brackets on the new wires in the same position. Install the wires and retaining brackets on the engine.

4. Connect the wires to the proper Spark plugs.

Ignition Coil: Specifications

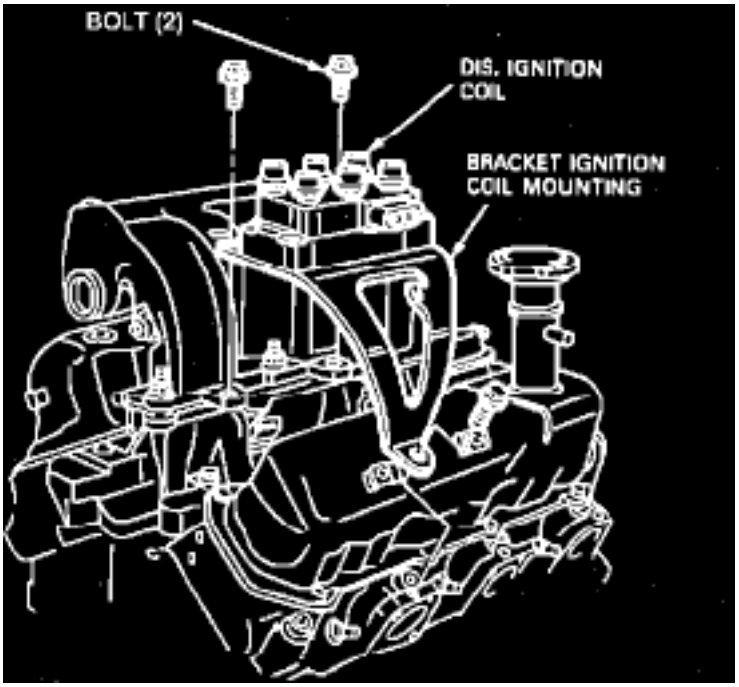
TORQUE VALUES:

Coil Pack Bracket-to Cylinder Head And Plenum ..... 19-22 lb.ft. (16-30 Nm) Coil Pack Mounting Bolts .... 44-62 lb.in. (5-7 Nm)

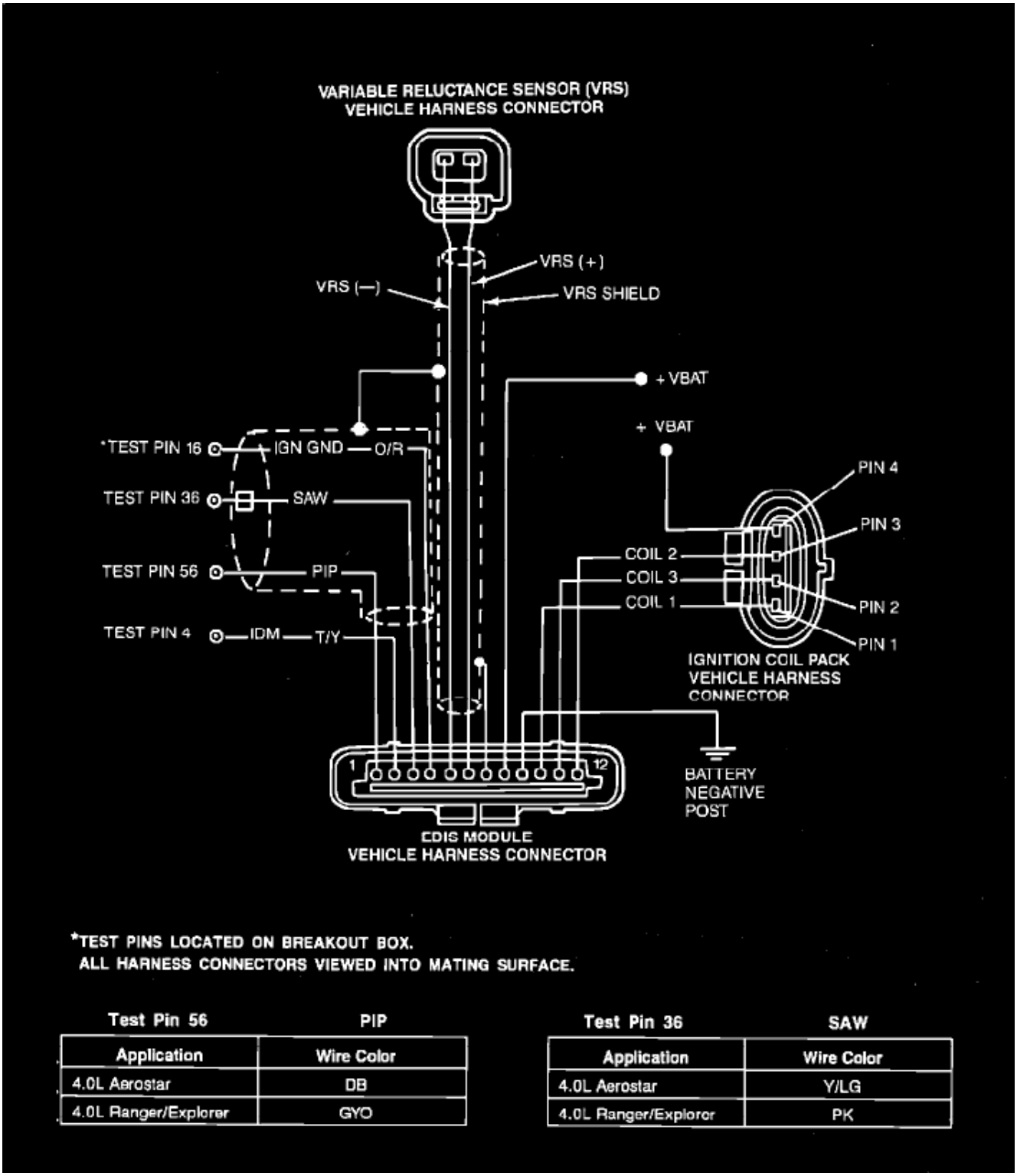

C104
VIP SELFTEST
CONNECTOR
C105
VIP SELF TEST
CONNECTOR
C106
TACHOMETER TEST
G100
GROUND
C126
POWER
DISTRIBUTION BOX
C101
EEC POWER RELAY
C128
STARTER RELAY
G102
GROUND
C109
C107
SHORTING BAR
C129
R.H. MARKER LAMP
C131
R.H. HEADLAMP
C108
EDIS
C113
C112
C114
C122
ALTERNATOR
C133
SHORTING BAR
BLOWER
MOTOR
C153
BLOWER
MOTOR
RESISTOR
C115
BAROMETRIC
PRESSURE
SENSOR
C165
IGNITION
COIL
C163
WATER
TEMPERATURE
INDICATOR SENDER
C155
ACT
SENSOR
C147
C148
SPEED CONTROL
SERVO
C124
C141
G103
G104
GROUND
C161
FUEL INJECTOR #4
C140
C118
C152
COMPRESSOR CLUTCH
C159
ENGINE COOLANT
TEMPERATURE SENSOR
G101
GROUND
C137
L.H. MARKER LAMP
C136
L.H. PARK/TURN
LAMP
C174
LOW OIL LEVEL
SWITCH
C162
VARIABLE
RELUCTANCE
SENSOR

Ignition Coil: Locations

Component Location



Coil Pack Assembly

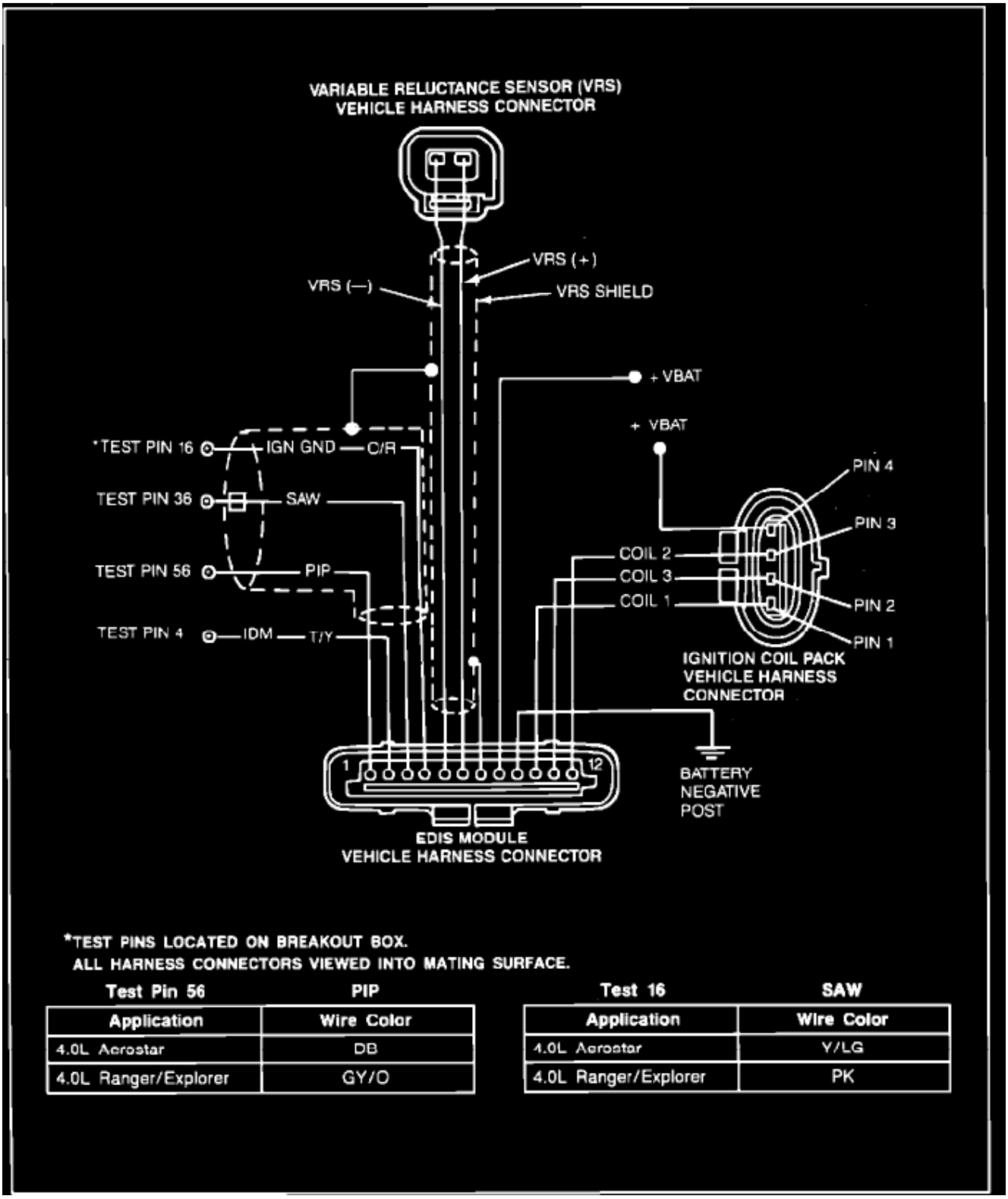


Test Pin 56	PIP
Application	Wire Color
4.0L Aerostar	DB
4.0L Ranger/Explorer	GYO

Test Pin 36	SAW
Application	Wire Color
4.0L Aerostar	Y/LG
4.0L Ranger/Explorer	PK

Ignition Coil: Diagrams

EEC-IV Pinpoint Test



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

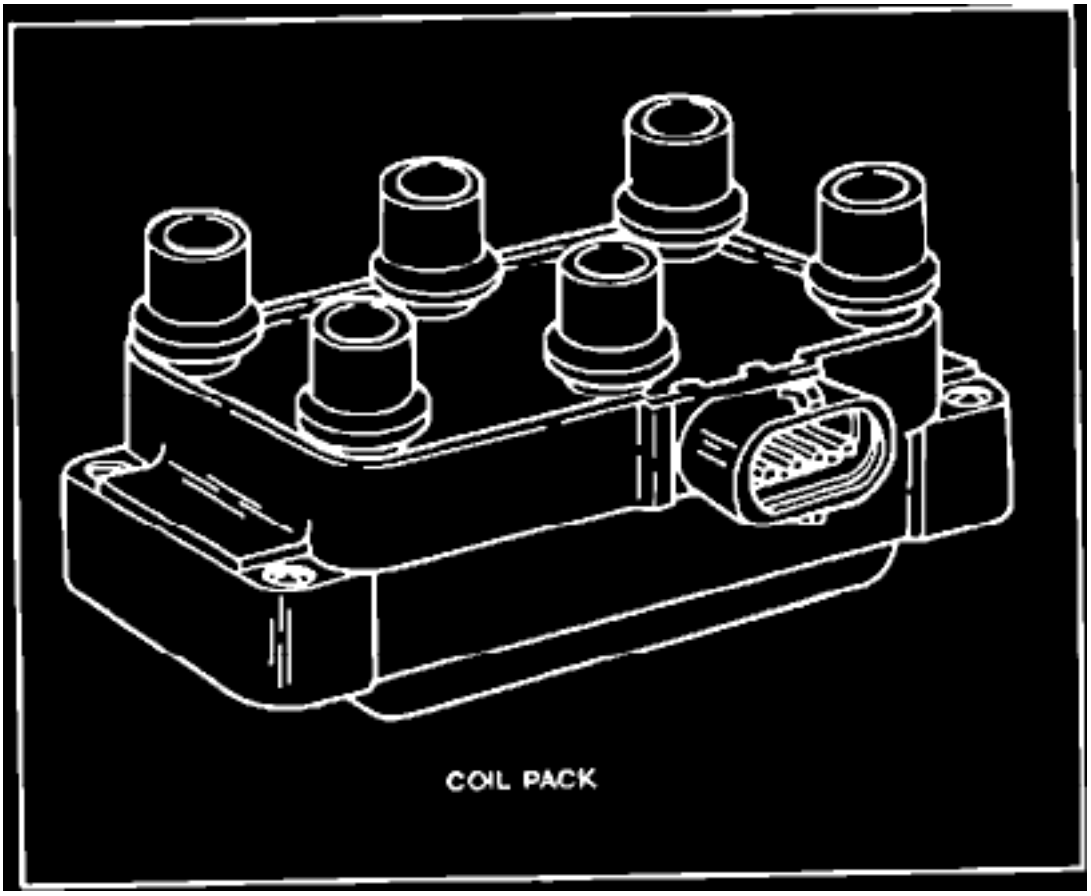
Test Pin 56 — PIP

Application	Wire Color
4.0L Aerostar	DB
4.0L Ranger/Explorer	GY/O

Test 16 — SAW

Application	Wire Color
4.0L Aerostar	Y/LG
4.0L Ranger/Explorer	PK

EEC-IV Pinpoint Test

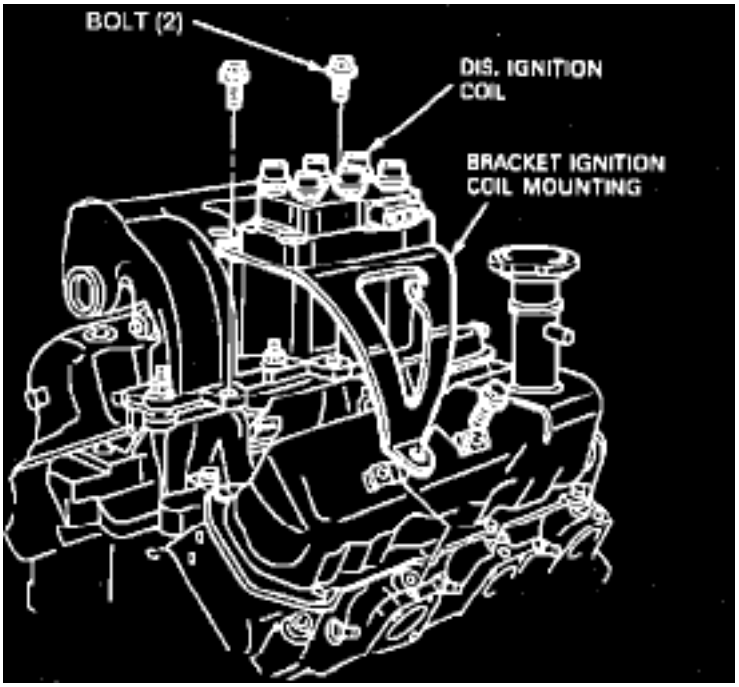


Ignition Coil: Description and Operation

Coil Pack

The ignition coil pack contains three separate ignition coils, controlled by the EDIS module through three coil leads. Each ignition coil fires two spark plugs simultaneously; one plug on the compression stroke and one on the exhaust stroke. The spark plug fired on the exhaust stroke uses very little of the ignition coils stored energy. The Majority of energy is used by spark plug on the compression stroke. Since these two spark plugs are connected in series, firing voltage of one plug will be negative with respect to ground, while voltage of the other will be positive with respect to ground.

PIN 1 (COIL 1 PRIMARY) IS THE GROUND PATH TO PIN 10 OF THE EDIS MODULE PIN 2 (COIL 3 PRIMARY) IS THE GROUND PATH TO PIN 11 OF THE EDIS MODULE PIN 3 (COIL 2 PRIMARY) IS THE GROUND PATH TO PIN 12 OF THE EDIS MODULE PIN 4 PROVIDES BATTERY VOLTAGE FOR THE COIL PRIMARY CIRCUITS



Ignition Coil: Service and Repair

Coil Pack Assembly

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the electrical connector from the coil pack.

3. Remove the spark plug wires by squeezing the locking tabs to release the coil boot retainers.

4. Remove the coil pack mounting screws and remove the coil pack.

INSTALLATION:

1. Install the coil pack and mounting screws, and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

2. Connect the spark plug wires and connect the electrical connector to the coil pack.

3. Connect the negative battery cable.

Ignition Control Module: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: All Technical Service Bulletins Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

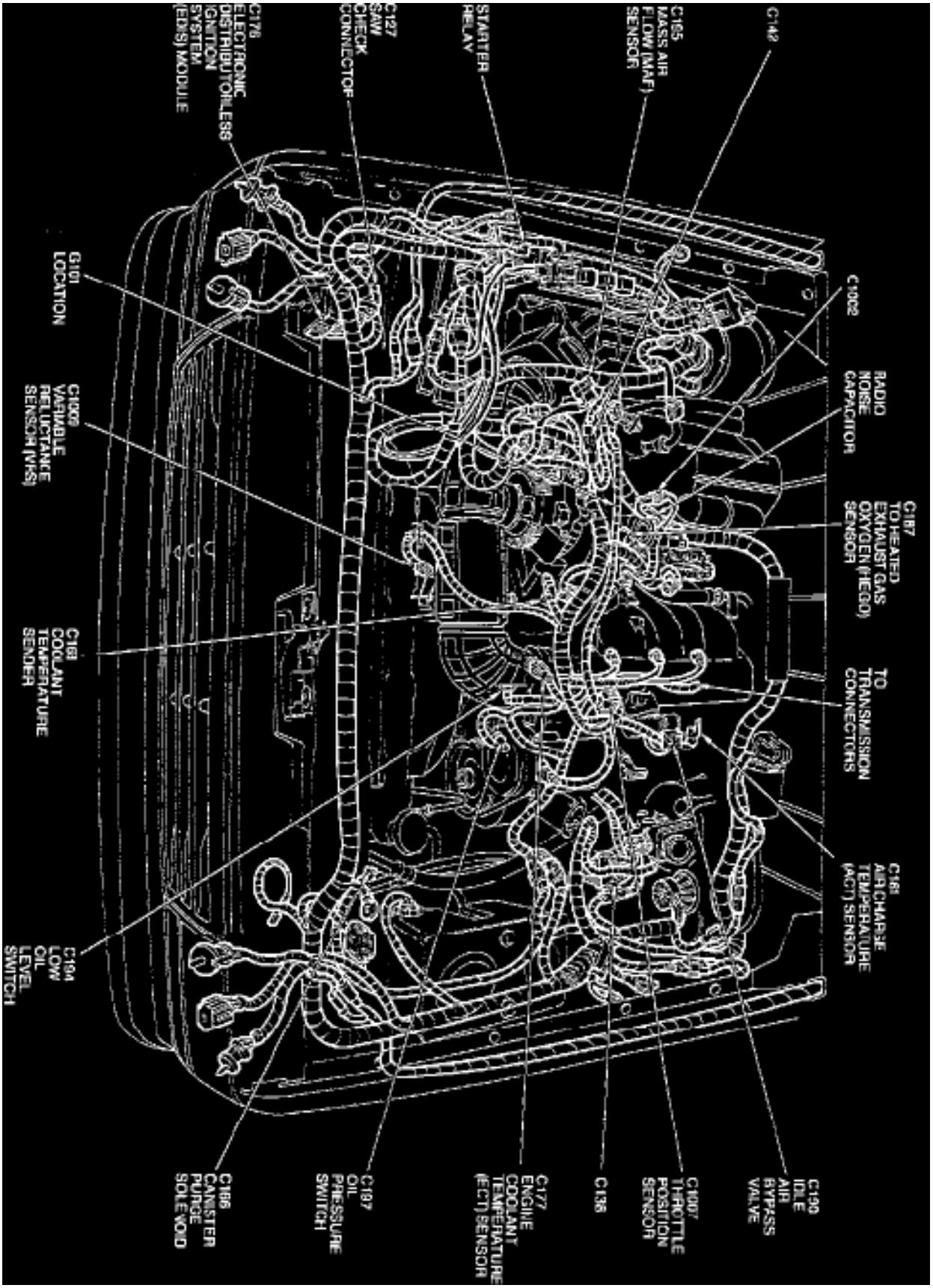
12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: Specifications

TORQUE VALUES:

Ignition Module Mounting Bolts ..... 22-31 lb.in. (2.5-3.5 Nm)

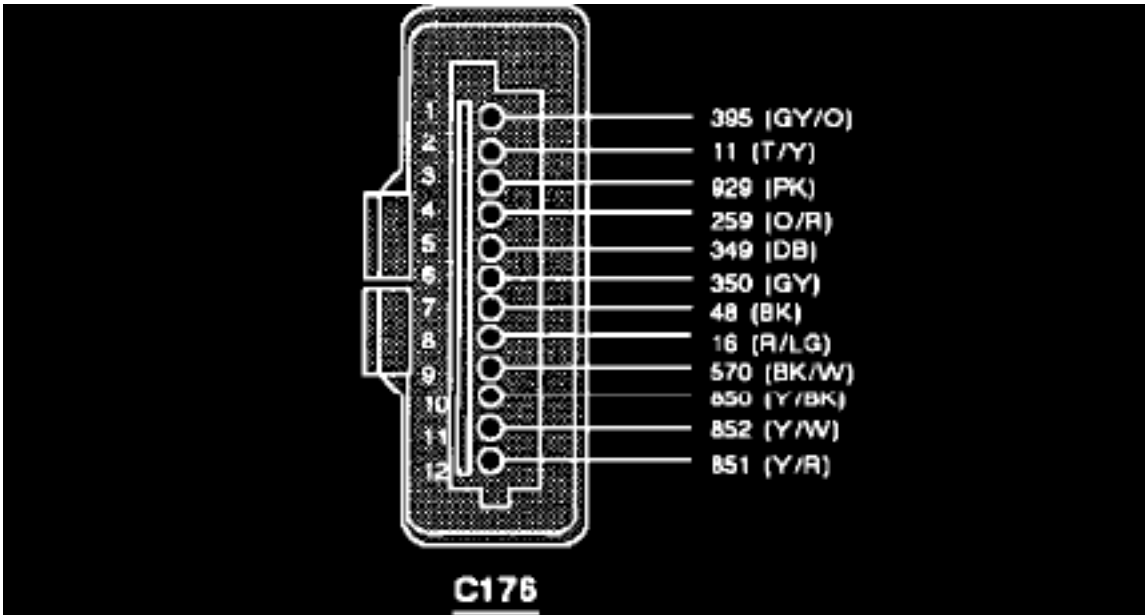

C142
C165
MASS AIR
FLOW (MAF)
SENSOR
C127
SAW
CHECK
CONNECTOR
STARTER
RELAY
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1008
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C161
COOLANT
TEMPERATURE
SENDER
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C190
IDLE
AIR
BYPASS
VALVE
C1007
THROTTLE
POSITION
SENSOR
C136
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C197
OIL
PRESSURE
SWITCH
C196
CANISTER
PURGE
SOLENOID
C194
LOW
OIL
LEVEL
SWITCH

Ignition Control Module: Locations

Engine Compartment Components.

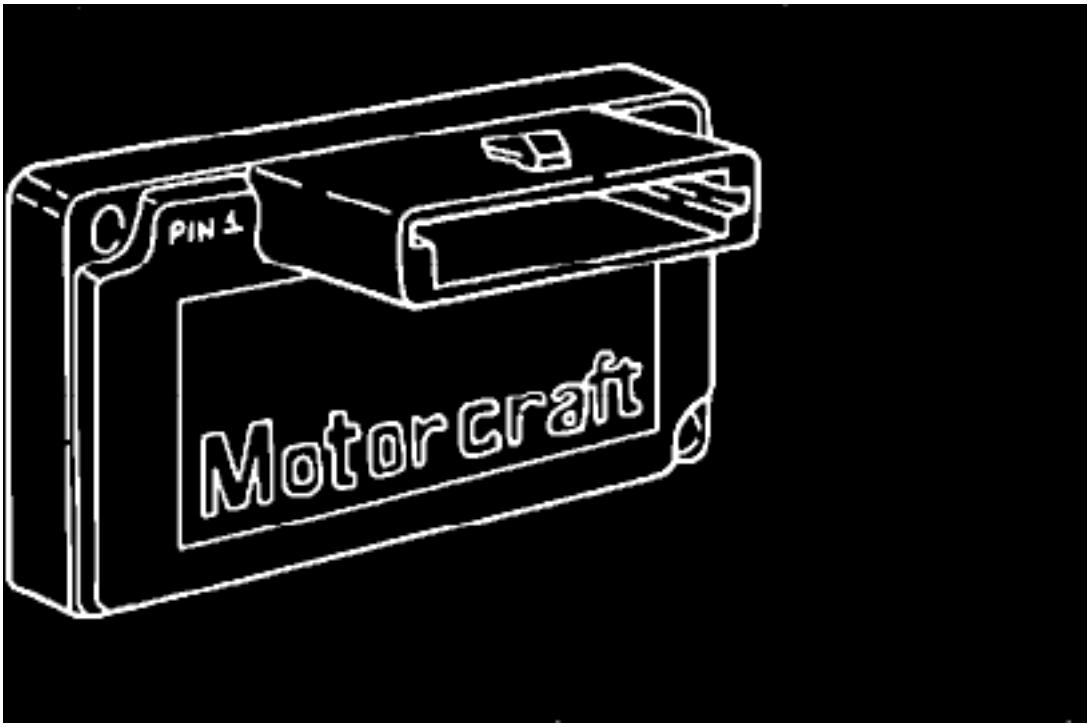
RH Front Corner Of Engine Compartment, Mounted On Upper Radiator Support

Applicable to: 4.0L/V6-244



PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	395 (GY/O)	Profile Ignition Pickup (PIP)
2	11 (T/Y)	Electronic Diagnostic Monitor (EDM)
3	929 (PK)	Spark Advance Word (SAW)
4	259 (O/R)	Ignition Ground To EEC Module
5	349 (DB)	Variable Reluctance Sensor (-)
6	350 (GY)	Variable Reluctance Sensor (+)
7	48 (BK)	VRS and EDIS Ignition Shield
8	16 (R/LG)	Power
9	570 (BK/W)	Power Ground
10	850 (Y/BK)	Drive for Ignition Coil "A"
11	852 (Y/W)	Drive for Ignition Coil "C"
12	851 (Y/R)	Drive for Ignition Coil "B"

Electronic Distributorless Ignition System (EDIS) Module Connector

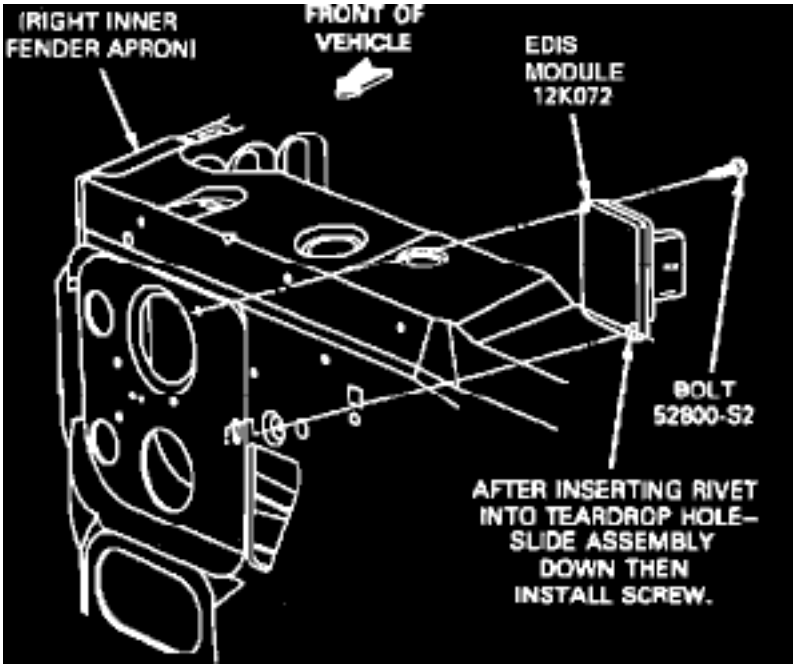


Ignition Control Module: Description and Operation

Module And Pin-Out

The EDIS module receives the Variable Reluctance Sensor (VRS) signal from the crankshaft sensor and the Spark Advance Word (SAW) signal from the EEC IV module. During normal operation, Profile Ignition Pickup (PIP) is sent to the EEC IV module from the EDIS module, providing base timing and RPM information. The VRS signal provides the EDIS module with the information required to synchronize the ignition coils for proper firing sequence. The Spark Angle Word (SAW) signal is a pulse width modulated signal and contains the optimum spark timing information. Spark angle is determined by the EDIS module using a zero excess dwell control routine.

PIN 1 PIP PIN 2 IDM (IGNITION DIAGNOSTIC MONITOR) PIN 3 SAW (SPARK ADVANCE WORD) PIN 4 IGN GRD (IGNITION GROUND) PIN 5 VRS- (VARIABLE RELUCTOR SENSOR NEGATIVE) PIN 6 VRS+ (VARIABLE RELUCTOR SENSOR POSITIVE) PIN 7 VRS SHIELD PIN 8 VBAT (IGNITION POWER TO COMPONENT) PIN 9 GND (BATTERY NEGATIVE) PIN 10 COIL 1 (CYL 1 and 5) PIN 11 COIL 2 (CYL 2 and 6) PIN 12 COIL 3 (CYL 3 and 4)



Ignition Control Module: Service and Repair

REMOVAL:

Ignition Module

1. Disconnect both battery cables, then remove the battery from the vehicle. 2. Disconnect the electrical connector from the ignition module.

NOTE: To disconnect the module connector, push on the connector where it says PUSH, then slide the connector from the module.

3. Remove the ignition module retaining bolt and remove the module by sliding the assembly up until it is released from the teardrop shaped hole in

the sheet metal.

INSTALLATION:

1. Place the module on the sheet metal so the retaining rivet passes through the hole, then slide the module down into position. Install the retaining

bolt. Torque to 22-31 in lb (2.2-3.5 Nm).

2. Connect the electrical connector to the module. 3. Install the battery and cables.

Technical Service Bulletin # 9111B6 Date: 910614

Octane Adjust Shorting Bar - Revised Procedures

Article No. 91-11B-6

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1989 - PAGE 17-289 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1990 - PAGE 17-329 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGE 5-22 - EEC-IV QUICK TEST STEP 12.0 - CAR DIAGNOSIS BY SYMPTOM CHART REVISED

^ ENGINE/EMISSIONS DIAGNOSIS MANUAL - 1991 - PAGES 6-305 THROUGH 6-307 - PINPOINT TEST KP REVISED TO PROVIDE ADDITIONAL INFORMATION CONCERNING REMOVAL OF OCTANE ADJUST SHORTING BAR

FORD: 1989-91 TAURUS, THUNDERBIRD 1991 ESCORT, MUSTANG

LINCOLN-MERCURY: 1989-90 COUGAR 1991 TRACER

LIGHT TRUCK: 1989-91 RANGER 1991 AEROSTAR, EXPLORER

ISSUE: Additional information regarding removal of the Octane Adjust Shorting Bar is required to assure compliance with Federal (EPA) Emission Standards. The following Manuals are affected on the pages indicated:

^ 1989 Engine/Emissions Diagnosis Page 17-289

^ 1990 Engine/Emissions Diagnosis Page 17-329

^ 1991 Engine/Emissions Diagnosis Page 5-22 and Pages 6-305 through 307

ACTION: Refer to the pages in this TSB article for the additional information.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 690000

Octane Adjust	Pinpoint Test	KP

Note

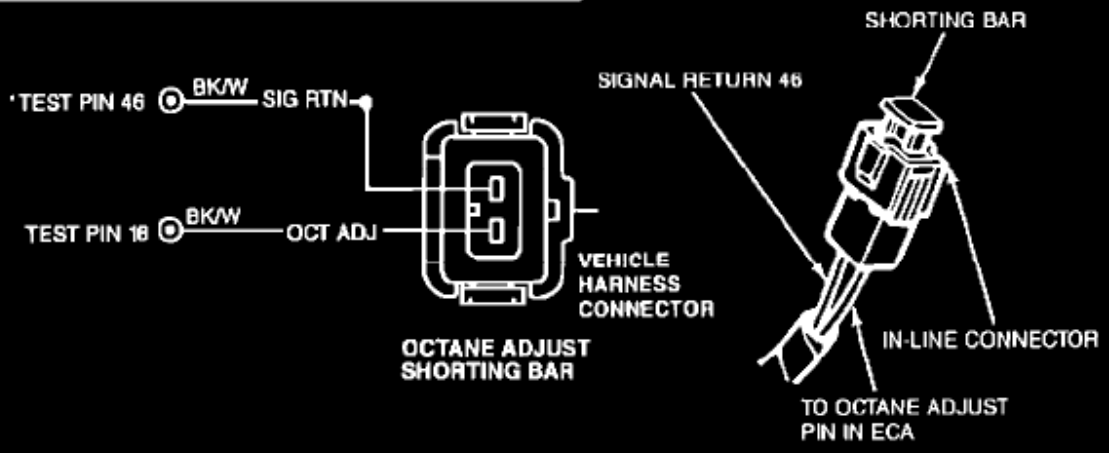
You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: Signal Return, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



OCTANE ADJUST SHORTING BAR LOCATIONS

APPLICATION	LOCATION
2.3L EFI Truck	Passenger side of fender apron, taped to the self-test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to self-test connector.

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9686-D

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

Revised 5/91

Octane Adjust

Pinpoint Test

KP

Octane Adjust Shorting Bar Locations

Application	Location
1.9L MA SEFI	Near EEC-IV power relay, fuel pump relay and processor in passenger compartment.
2.3L EFI Truck	Passenger side of fender apron, taped to the Self-Test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to Self-Test connector.
4.0L MA EFI Aerostar	Driver side, engine cowl near windshield wiper motor take-out (alongside MAP take-out).
4.0L MA EFI Ranger/ Bronco II	Passenger side of fender apron, taped to the Self-Test connector.

Test Pin 18 (44 and 43) OCT ADJ

Application	Wire Color
2.3L EFI Truck 3.0L SEFI SHO 3.8L SEFI SC	DK/W
4.0L Aerostar	O
4.0L Ranger	W/R
1.9L MA SEFI	GR/W

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

NOTE: Use a higher octane grade of fuel to address the spark knock concern.
DO NOT remove the Octane Adjust shorting bar unless you have been directed by an application specific Technical Service Bulletin.

EEC-IV QUICK TEST STEP: Diagnosis By Symptom

12.0

12.0 CAR DIAGNOSIS BY SYMPTOM CHART

Symptom	Pinpoint Test Step Direction												
	1.9L MA SEFI	2.3L OHC EFI	2.3L HSC EFI	2.5L AXODE SEFI	3.0L EFI PROBE	3.0L AXODE SEFI	3.0L SHO SEFI	3.8L AXODE SEFI	3.8L RWD SEFI	3.8L SC SEFI	4.6L 2V SEFI	5.0L SEFI	5.0L MA SEFI
Stumble after hot restart	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21	H21
Fuel pump runs with engine off	—	—	—	X14	X14	X14	X14	X14	—	—	J22	J22	
Gasoline fumes under hood	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Black Exhaust Smoke	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Spark knock	KP5	KP5	—	—	DG1 or SEC. 11	—	KP5	—	—	KP5	KP5	—	—
Cooling fan does not operate Low speed cooling fan does not operate High speed cooling fan does not operate	KF10	X18	—	X18	X18	X18	X18	X18	—	X18	—	—	—
Low speed cooling fan always on	KF25	X35	—	X35	X35	X35	X35	X35	—	X35	—	—	—
High speed cooling fan always on	KF25	—	—	X40	X40	X40	x40	—	X40	X40	—	—	—

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

NOTE: The Octane Adjust shorting bar is similar in shape to the SPOUT in-line connector and on some applications the PSPS circuit will also have a shorting bar connector. **DO NOT** remove the shorting bar unless you have been directed by an application specific Technical Service Bulletin (TSB).

Test Pin 18, 29 or 44 OCT ADJ

Application	Wire Color
1.9L Escort/Tracer	GR/W
Car: 2.3L Mustang Truck: 2.3L Ranger 4.0L Explorer	DG
3.0L SHO	PK
3.8L SC	BK/W
4.0L Ranger	O
4.6L MA SEFI	W/R

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
3.8L SC SEFI	BK/W
All Others	GY/R

DELETION

Revised 5/91

Octane Adjust — Pinpoint Test KP

TEST STEP	RESULT	ACTION TO TAKE
KP1 VISUALLY INSPECT OCTANE ADJUST IN-LINE CONNECTOR SERVICE CODE 57/341 Service Code 57/341 indicates Octane Adjust shorting bar is not in or the OCT ADJ circuit is open. • Key off. • Visually inspect Octane Adjust in-line connector. • **Is the shorting bar removed?**	Yes No	GO to KP2. GO to KP4.
KP2 CHECK FOR MODIFICATION DECAL • Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes No	Testing complete. If vehicle has spark knock concern, GO to Section 2. GO to KP3.
KP3 CHECK FOR SERVICE CODE 57/341 • Replace Octane Adjust shorting bar. • Key off. • Activate self-test. • **Is service code 57/341 present?**	Yes No	GO to KP4. Testing complete. EEC system OK.
KP4 CHECK CONTINUITY OF OCTANE ADJUST CIRCUIT **NOTE: There should be continuity from OCT ADJ circuit thru the in-line connector and shorting bar to SIG RTN circuit.** • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected • Measure resistance between Test Pin 46 and OCT ADJ Test Pin at the breakout box (see schematic for appropriate OCT ADJ circuit test pin). • **Is the resistance less than 5 ohms?**	Yes No	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE open OCT ADJ circuit or shorting bar or SIG RTN circuit. REMOVE breakout box. RERUN Quick Test.

Revised 5/91

Octane Adjust

Pinpoint Test **KP**

TEST STEP	RESULT	ACTION TO TAKE
KP5 CHECK FOR SERVICE CODE 11 • Start engine and idle vehicle at operating temperature. • Key off. • Activate self-test. • Key on, engine off. • **Is service code 11 or 111 present?**	Yes ▶ No ▶	GO to KP6. **For service code 57/341:** GO to KP1. **For all other codes:** RETURN to Quick Test.
KP6 VERIFY IN-LINE CONNECTOR SHORTING BAR IS INSTALLED • Key off. • Visually inspect Octane Adjust in-line connector. • **Is shorting bar installed?**	Yes ▶ No ▶	GO to KP8. GO to KP7.
KP7 CHECK FOR MODIFICATION DECAL • Is there a modification decal attached to the vehicle indicating that the Octane Adjust shorting bar was removed?	Yes ▶ No ▶	GO to KP10. REPLACE shorting bar. GO to Section 2 to address spark knock concern.
KP8 CHECK FOR TSB • Is there a Technical Service Bulletin (TSB) authorizing the removal of the Octane Adjust shorting bar?	Yes ▶ No ▶	GO to KP9. GO to Section 2 to address spark knock concern.
KP9 REMOVE SHORTING BAR • Remove shorting bar only if there is a TSB authorization. • Drive vehicle to verify spark knock. • **Is spark knock present?**	Yes ▶ No ▶	GO to KP10. Testing complete. EEC system OK.

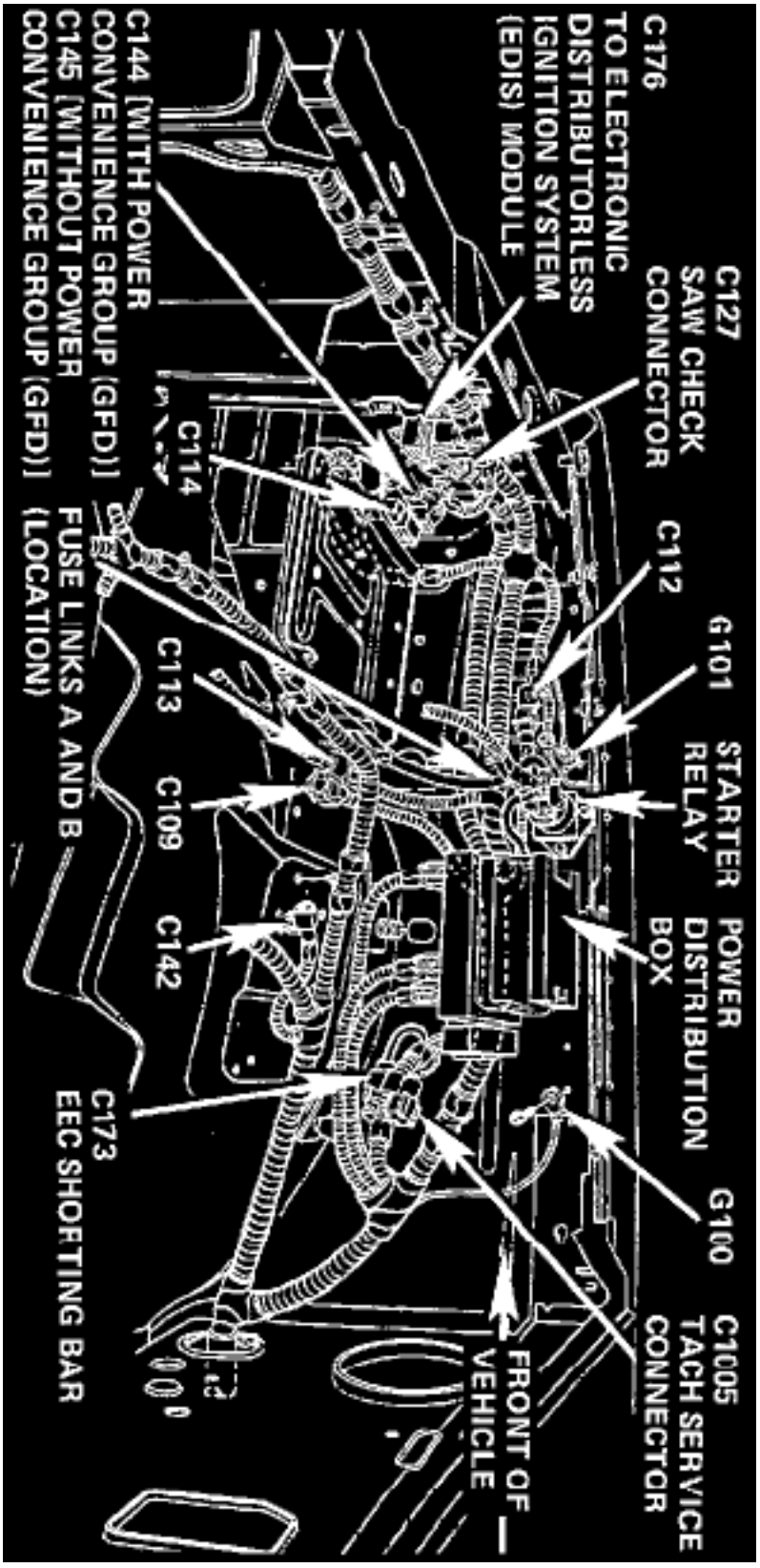
Revised 5/91

Octane Adjust

Pinpoint Test **KP**

TEST STEP	RESULT	ACTION TO TAKE
KP10 CHECK OCTANE ADJUST CIRCUIT FOR A SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • Measure resistance between OCT ADJ circuit at the in-line connector and Test Pin 40/60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	GO to **KP11**.
	No ▶	SERVICE short circuit. REMOVE breakout box. If spark knock is still present, GO to Section 2.
KP11 CHECK PROCESSOR INTEGRITY • Key off. • Shorting bar removed because of TSB authorization. • Breakout box installed, processor connected. • Key on. • Measure voltage between Octane Adjust circuit and Test Pin 40/60 at the breakout box. • **Is voltage greater than 4.0 volts?**	Yes ▶	REMOVE breakout box. If spark knoock is still present, GO to Section 2.
	No ▶	REPLACE processor. REMOVE breakout box. If spark knock is still present, GO to Section 2.

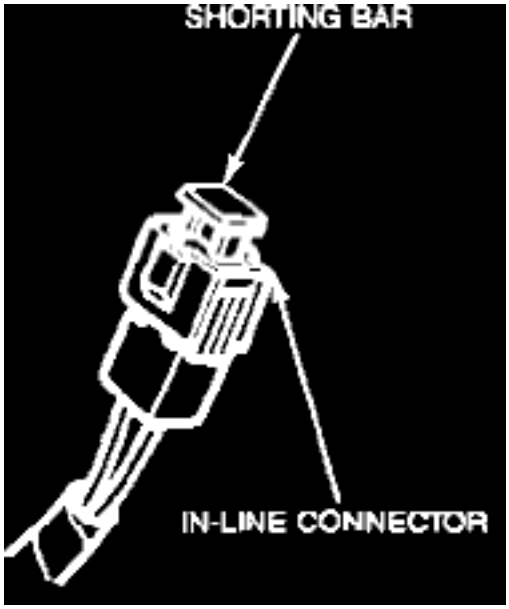
New 5/91


C127
SAW CHECK
CONNECTOR
C176
TO ELECTRONIC
DISTRIBUTORLESS
IGNITION SYSTEM
(EDIS) MODULE
C112
G101
STARTER
RELAY
POWER
DISTRIBUTION
BOX
G100
C1005
TACH SERVICE
CONNECTOR
C114
C113
C109
C142
C144 [WITH POWER
CONVENIENCE GROUP (GFD)]
C145 [WITHOUT POWER
CONVENIENCE GROUP (GFD)]
FUSE LINKS A AND B
(LOCATION)
C173
EEC SHIFTING BAR
FRONT OF
VEHICLE

Ignition Timing Connector: Locations

Component Location

The SPOUT connector (SAW check connector C127) is located at the RH front of the engine compartment in front of the battery.



Ignition Timing Connector: Description and Operation

In-line Connector With Shorting Bar

The octane adjustment switch is used to retard the ignition timing three to four degrees. When the switch jumper is INSTALLED, the timing is normal. With the jumper REMOVED, the timing is retarded. This is done to allow for optimum spark advance for effective combustion of the air/fuel mixture.

Ignition Control Module: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Ignition System > Relays and Modules - Ignition System > Ignition Control Module > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Ignition Control Module: > 95102 > May > 95 > Connector, DIS Ignition Revised

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: All Technical Service Bulletins Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

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ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

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AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

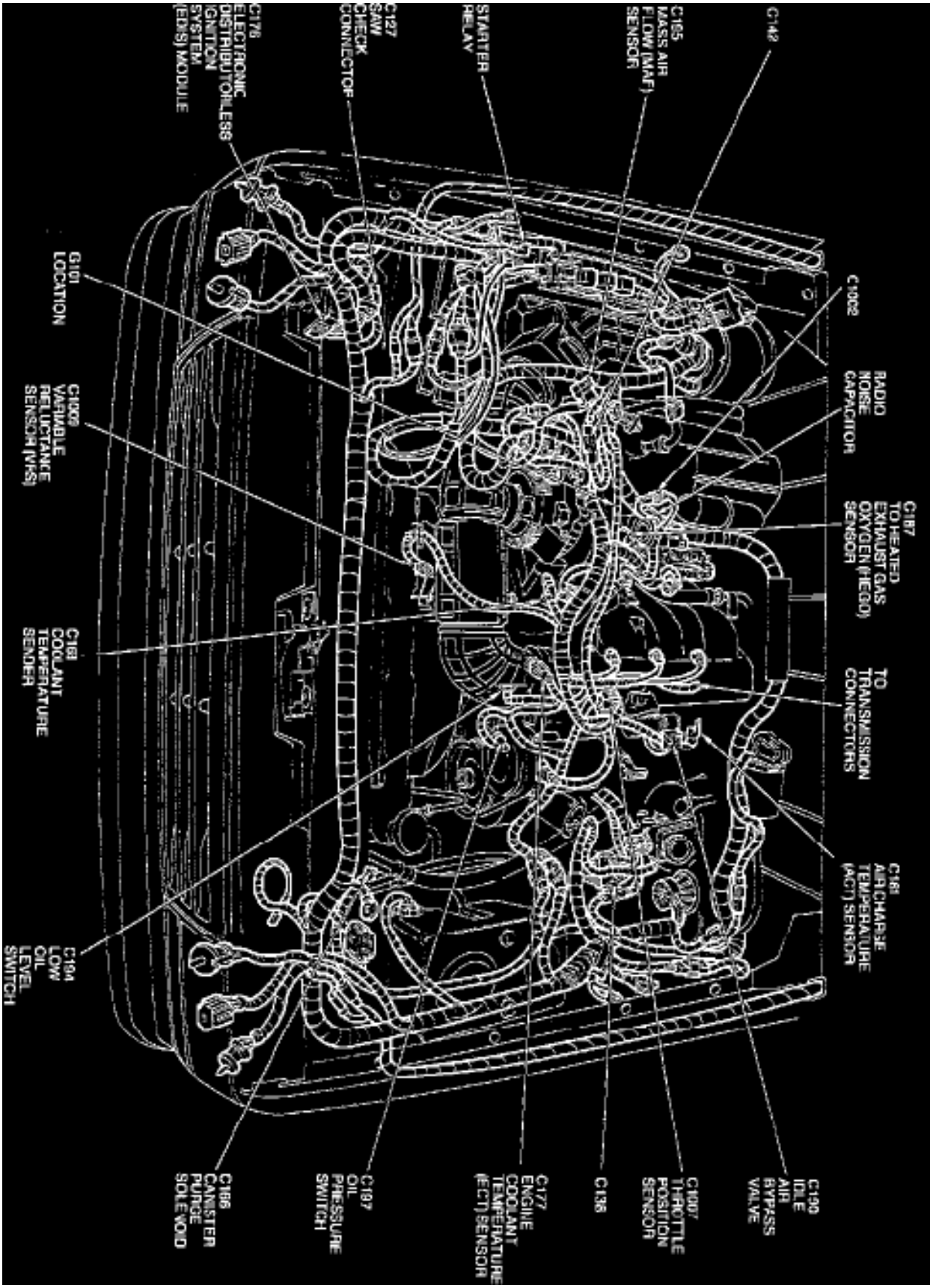
12A581 H2

OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Ignition Control Module: Specifications

TORQUE VALUES:

Ignition Module Mounting Bolts ..... 22-31 lb.in. (2.5-3.5 Nm)

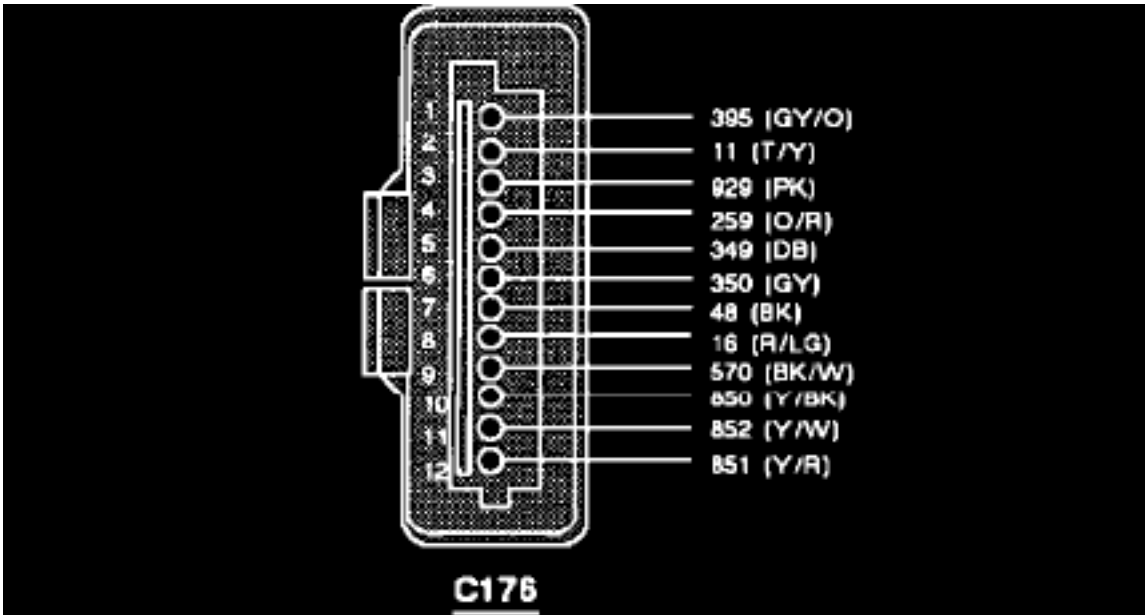

C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C161
COOLANT
TEMPERATURE
SENDER
C190A
LOW
OIL
LEVEL
SWITCH
C166
CANISTER
PURGE
SOLENOID
C197
OIL
PRESSURE
SWITCH
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C136
C1007
THROTTLE
POSITION
SENSOR
C190
IDLE
AIR
BYPASS
VALVE

Ignition Control Module: Locations

Engine Compartment Components.

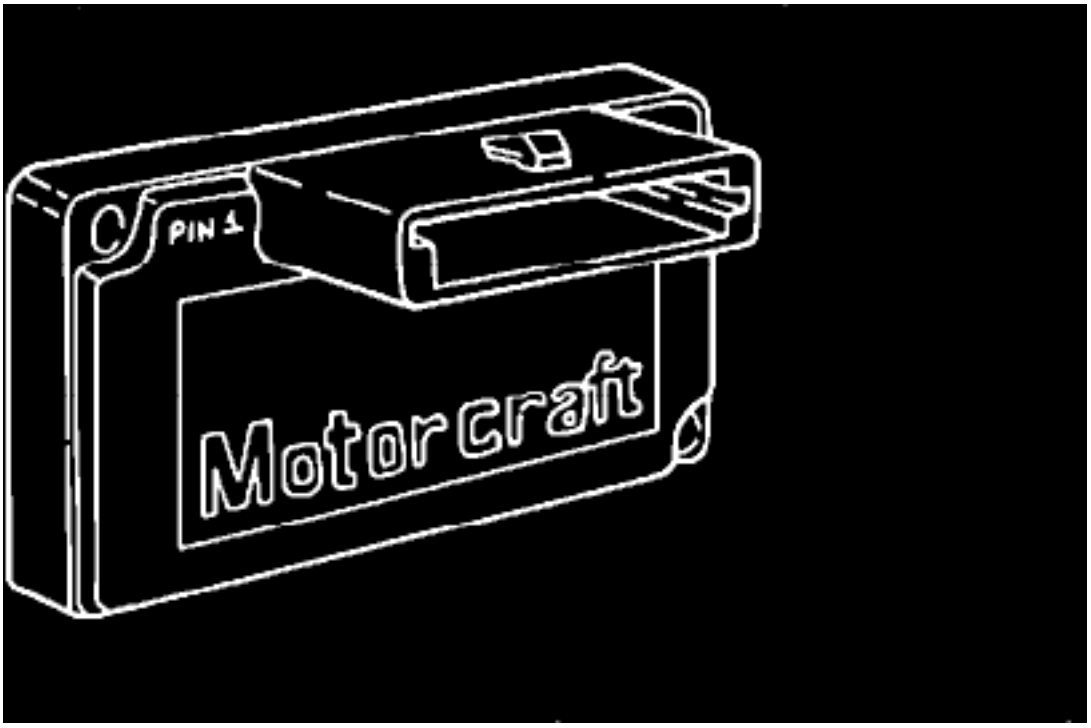
RH Front Corner Of Engine Compartment, Mounted On Upper Radiator Support

Applicable to: 4.0L/V6-244



PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	395 (GY/O)	Profile Ignition Pickup (PIP)
2	11 (T/Y)	Electronic Diagnostic Monitor (EDM)
3	929 (PK)	Spark Advance Word (SAW)
4	259 (O/R)	Ignition Ground To EEC Module
5	349 (DB)	Variable Reluctance Sensor (-)
6	350 (GY)	Variable Reluctance Sensor (+)
7	48 (BK)	VRS and EDIS Ignition Shield
8	16 (R/LG)	Power
9	570 (BK/W)	Power Ground
10	850 (Y/BK)	Drive for Ignition Coil "A"
11	852 (Y/W)	Drive for Ignition Coil "C"
12	851 (Y/R)	Drive for Ignition Coil "B"

Electronic Distributorless Ignition System (EDIS) Module Connector

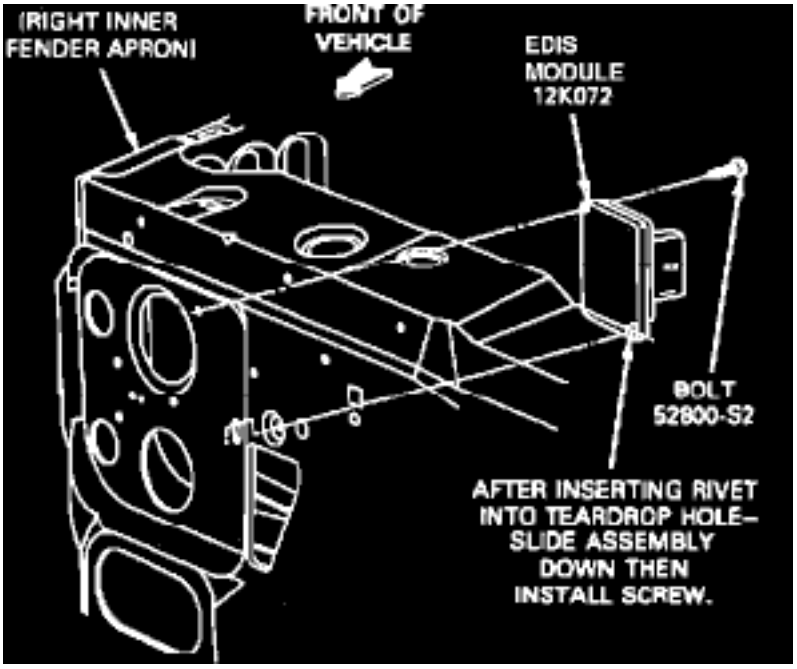


Ignition Control Module: Description and Operation

Module And Pin-Out

The EDIS module receives the Variable Reluctance Sensor (VRS) signal from the crankshaft sensor and the Spark Advance Word (SAW) signal from the EEC IV module. During normal operation, Profile Ignition Pickup (PIP) is sent to the EEC IV module from the EDIS module, providing base timing and RPM information. The VRS signal provides the EDIS module with the information required to synchronize the ignition coils for proper firing sequence. The Spark Angle Word (SAW) signal is a pulse width modulated signal and contains the optimum spark timing information. Spark angle is determined by the EDIS module using a zero excess dwell control routine.

PIN 1 PIP PIN 2 IDM (IGNITION DIAGNOSTIC MONITOR) PIN 3 SAW (SPARK ADVANCE WORD) PIN 4 IGN GRD (IGNITION GROUND) PIN 5 VRS- (VARIABLE RELUCTOR SENSOR NEGATIVE) PIN 6 VRS+ (VARIABLE RELUCTOR SENSOR POSITIVE) PIN 7 VRS SHIELD PIN 8 VBAT (IGNITION POWER TO COMPONENT) PIN 9 GND (BATTERY NEGATIVE) PIN 10 COIL 1 (CYL 1 and 5) PIN 11 COIL 2 (CYL 2 and 6) PIN 12 COIL 3 (CYL 3 and 4)



Ignition Control Module: Service and Repair

REMOVAL:

Ignition Module

1. Disconnect both battery cables, then remove the battery from the vehicle. 2. Disconnect the electrical connector from the ignition module.

NOTE: To disconnect the module connector, push on the connector where it says PUSH, then slide the connector from the module.

3. Remove the ignition module retaining bolt and remove the module by sliding the assembly up until it is released from the teardrop shaped hole in

the sheet metal.

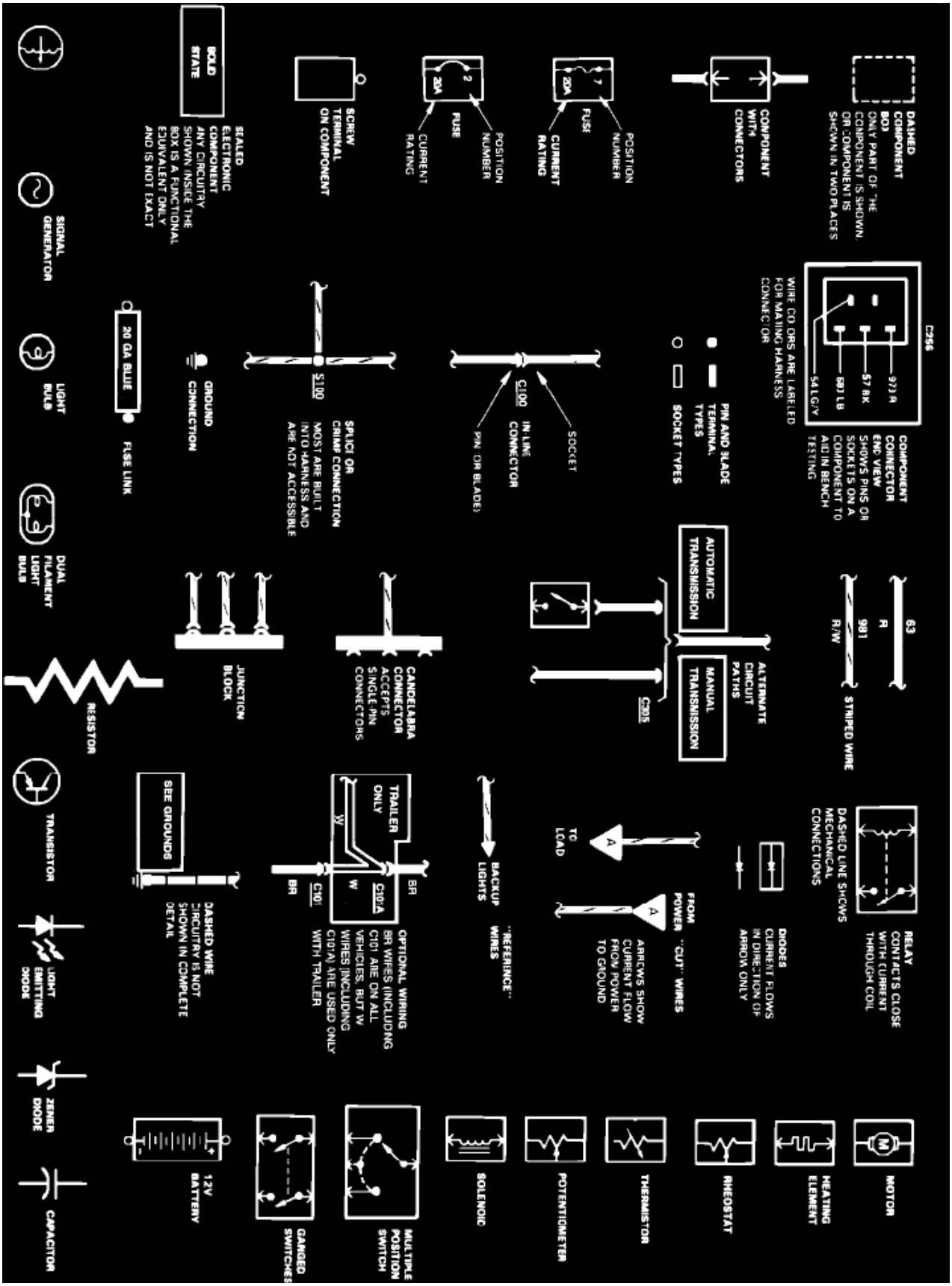
INSTALLATION:

1. Place the module on the sheet metal so the retaining rivet passes through the hole, then slide the module down into position. Install the retaining

bolt. Torque to 22-31 in lb (2.2-3.5 Nm).

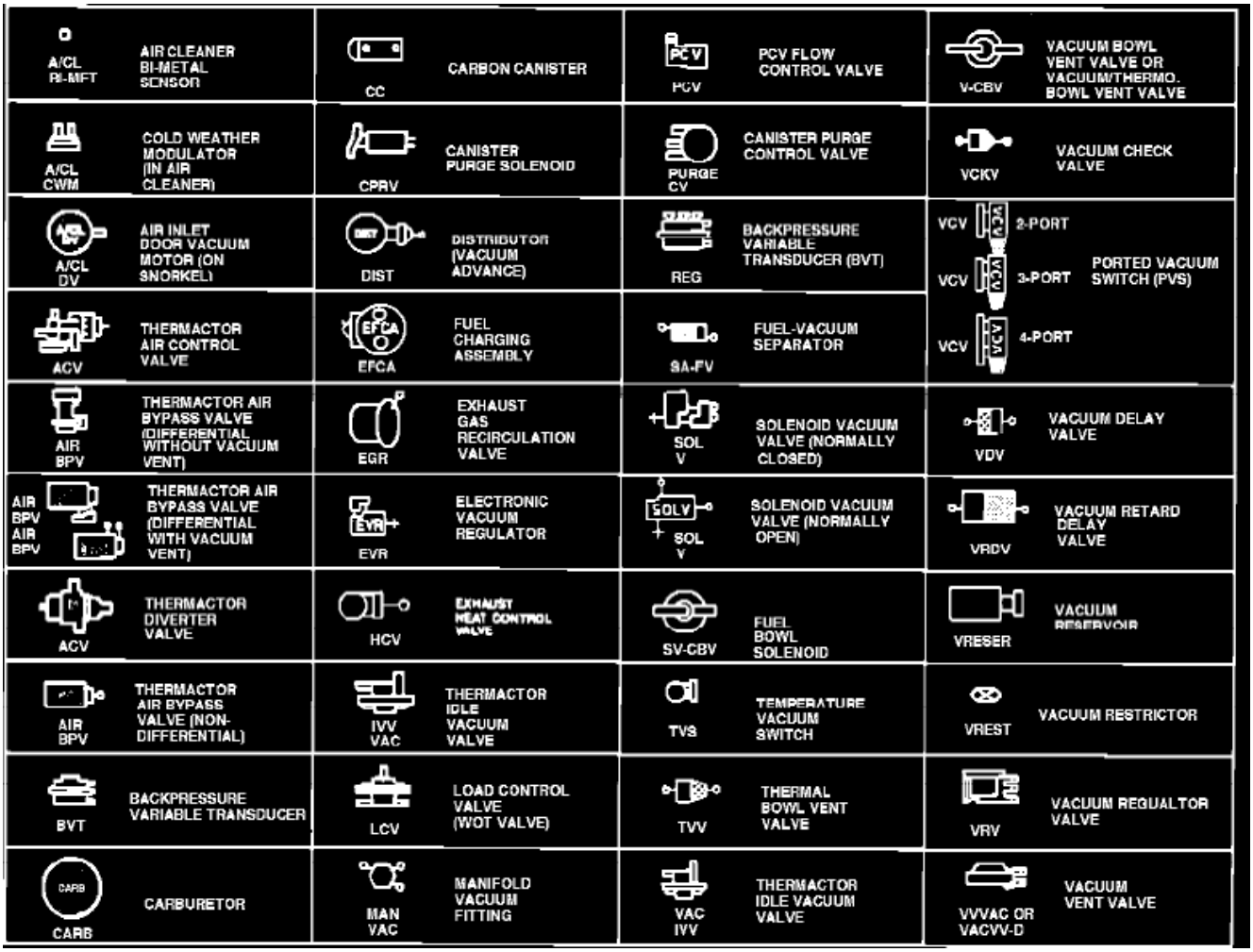
2. Connect the electrical connector to the module. 3. Install the battery and cables.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Ignition System > Sensors and Switches - Ignition System > Camshaft Position Sensor > Component Information > Diagrams > Diagram Information and Instructions

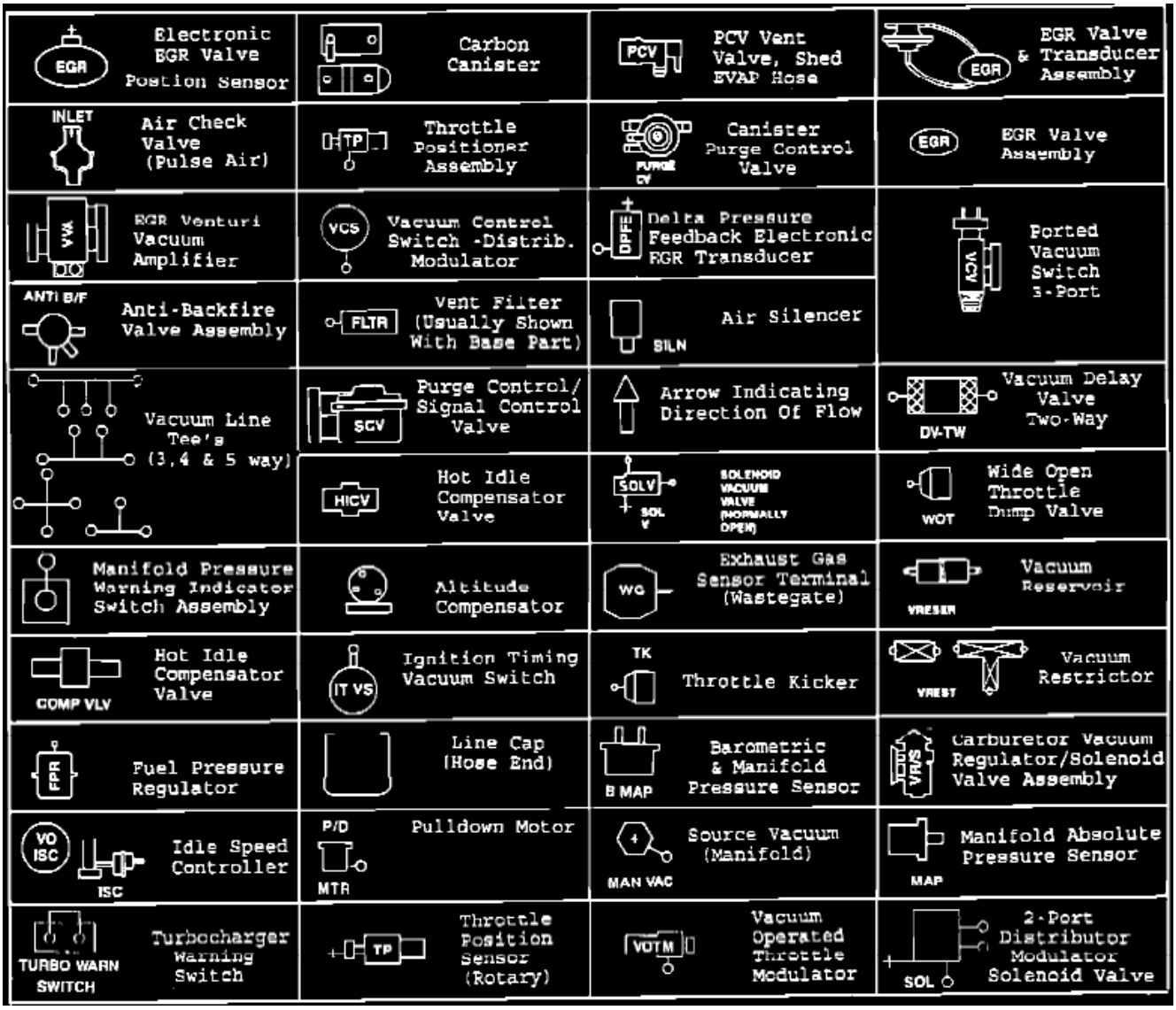


Camshaft Position Sensor: Diagram Information and Instructions

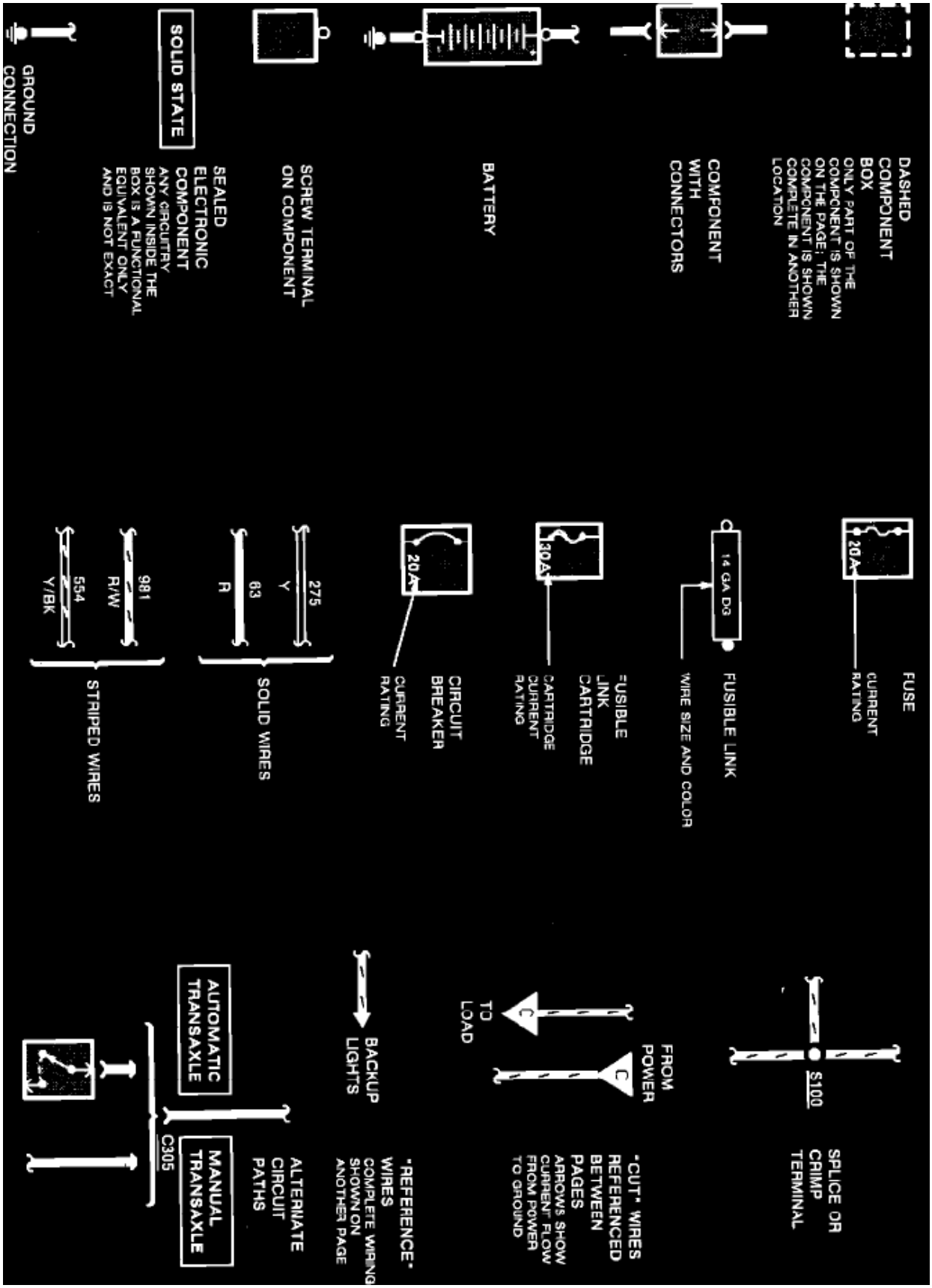
Symbol Identification



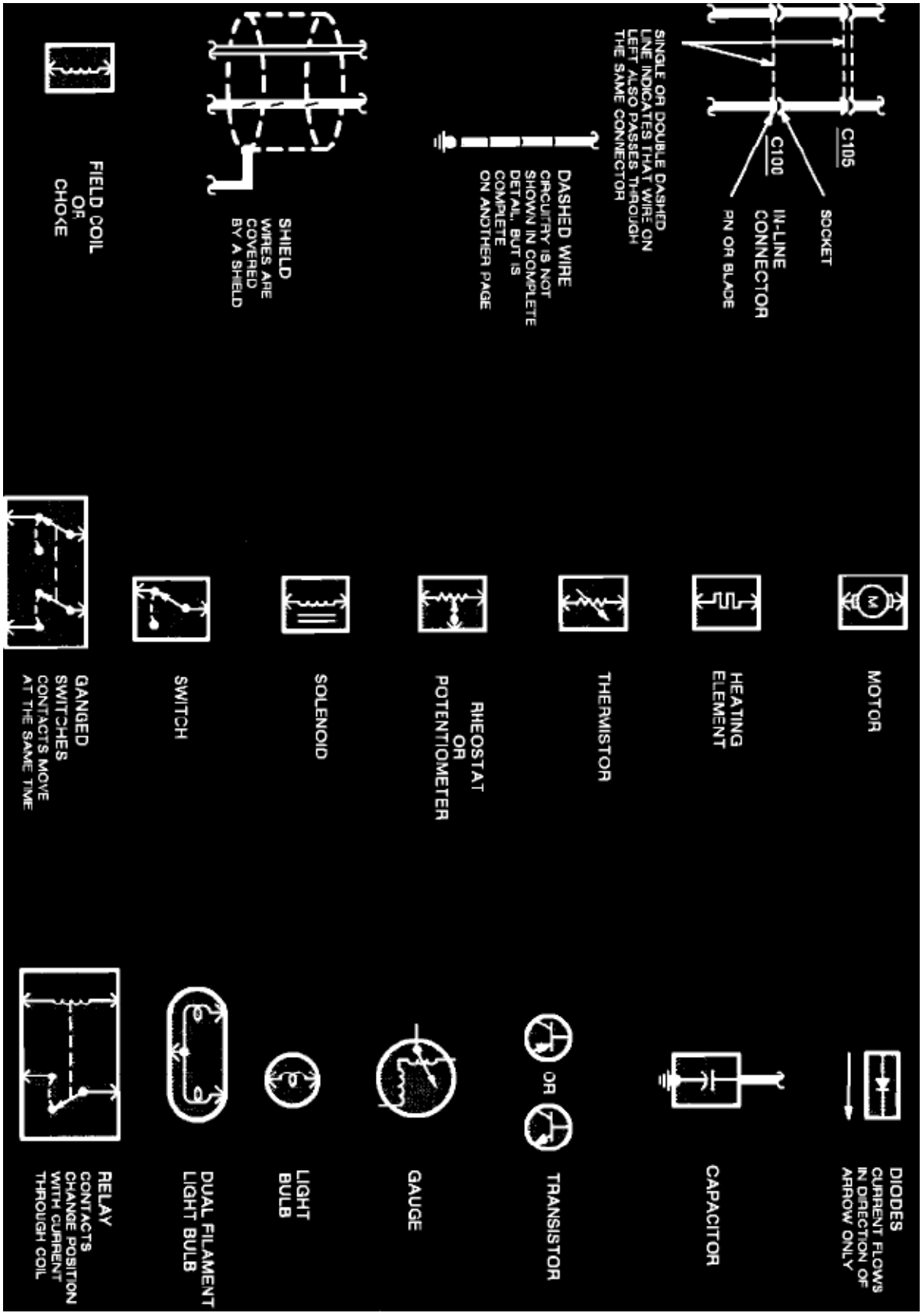
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
FROM POWER
C
TO LOAD
C
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
BACKUP LIGHTS
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

T: Tan

V: Violet

W: White

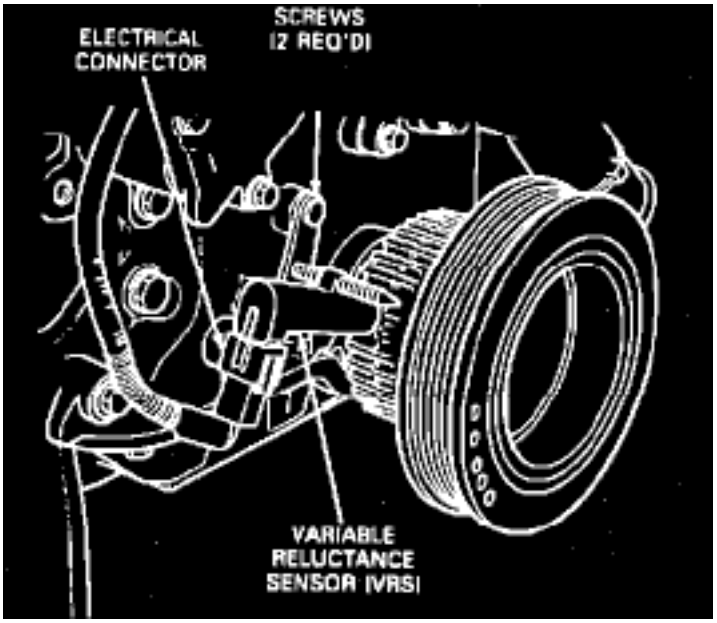
Y: Yellow

Crankshaft Position Sensor: Specifications

FIRING ORDER .... 1 - 4 - 2 - 5 - 3 - 6

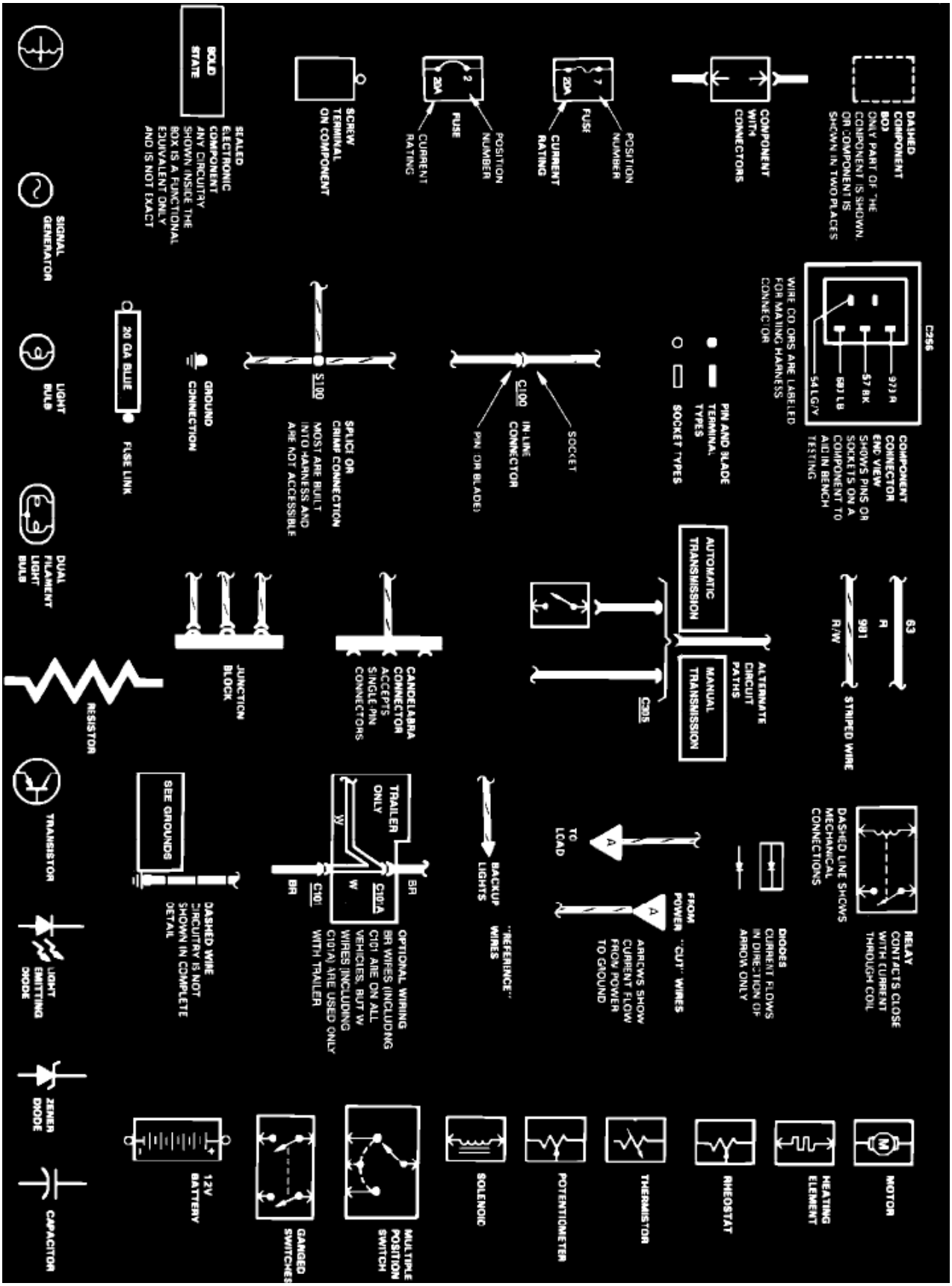
TORQUE VALUES:

Crankshaft Pulley Bolt
.....
103-132 lb.ft. (140-180 Nm) Ignition Coil Pack Bracket-to Cylinder Head And Plenum
..... 19-22 lb.ft. (16-30 Nm)
Ignition Coil Pack Mounting Bolts
.....
44-62 lb.in. (5-7 Nm) Ignition Module Mounting Bolts
..... 22-31
lb.in. (2.5-3.5 Nm) Spark Plugs .... 10-15 lb.ft. (14-20 Nm) Variable Reluctance
(Crankshaft Position) Sensor Mounting Bolts
..... 75-106 lb.in. (8.5-12 Nm)



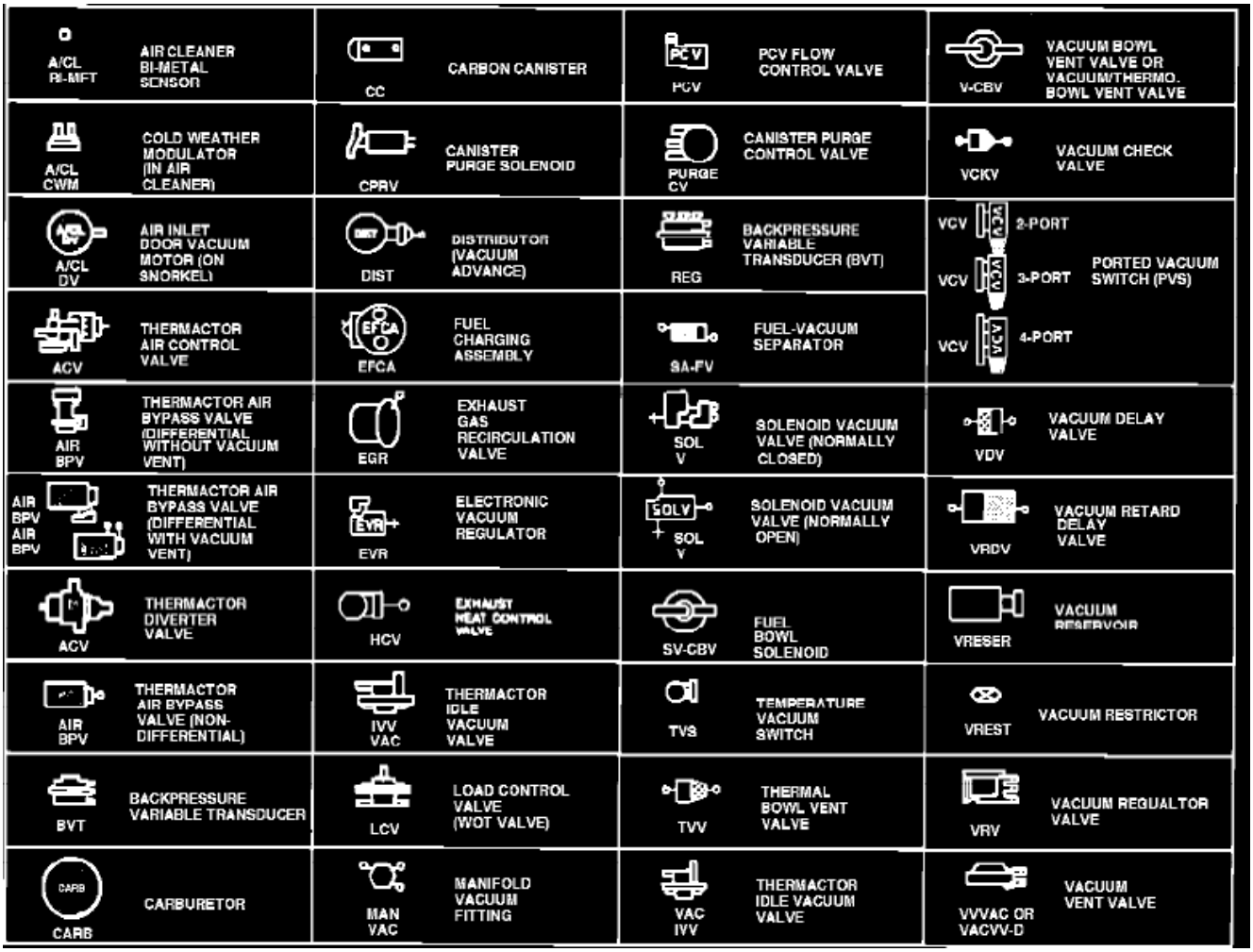
Variable Reluctance (Crankshaft Position) Sensor

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Ignition System > Sensors and Switches - Ignition System > Crankshaft Position Sensor > Component Information > Diagrams > Diagram Information and Instructions

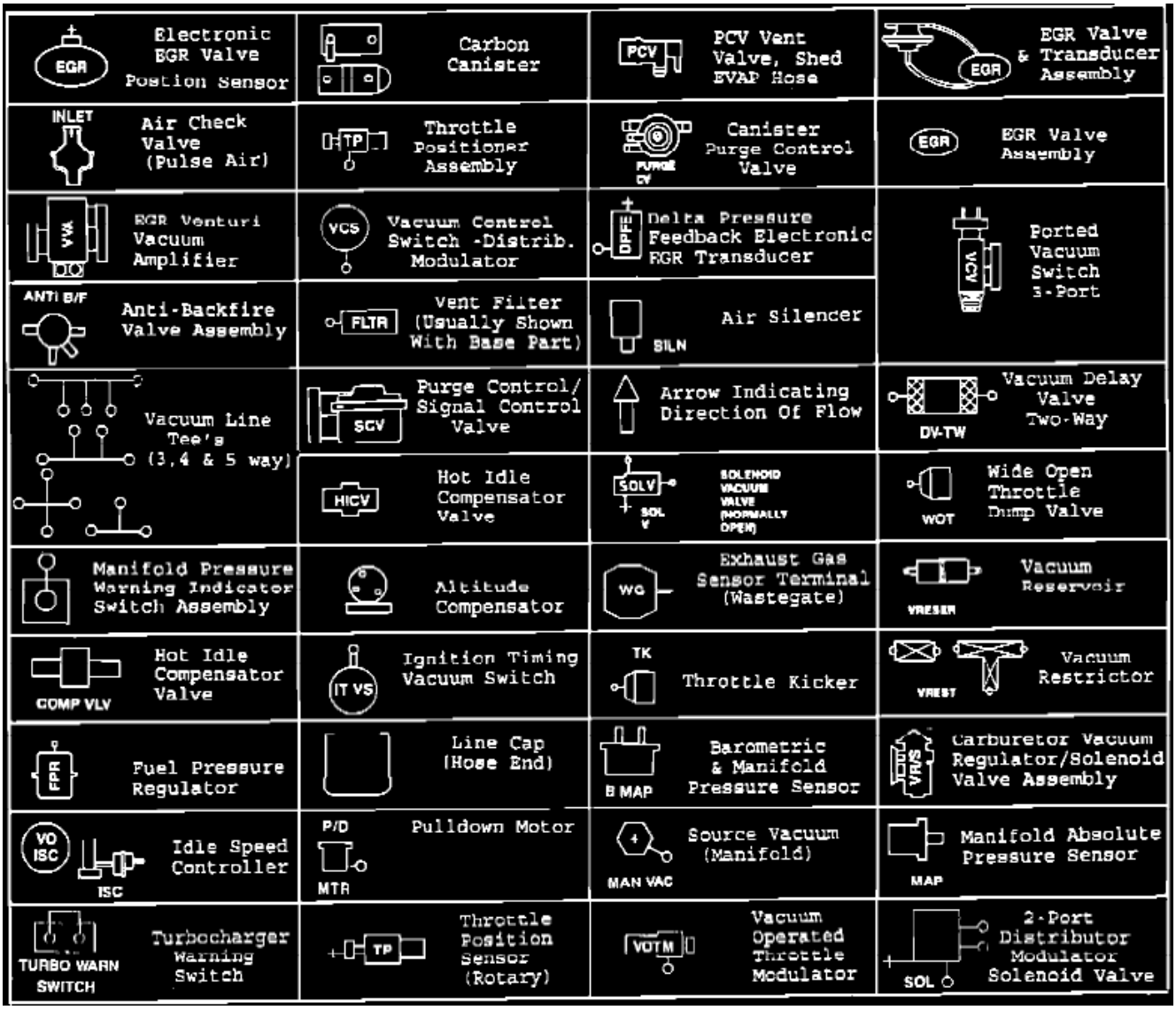


Crankshaft Position Sensor: Diagram Information and Instructions

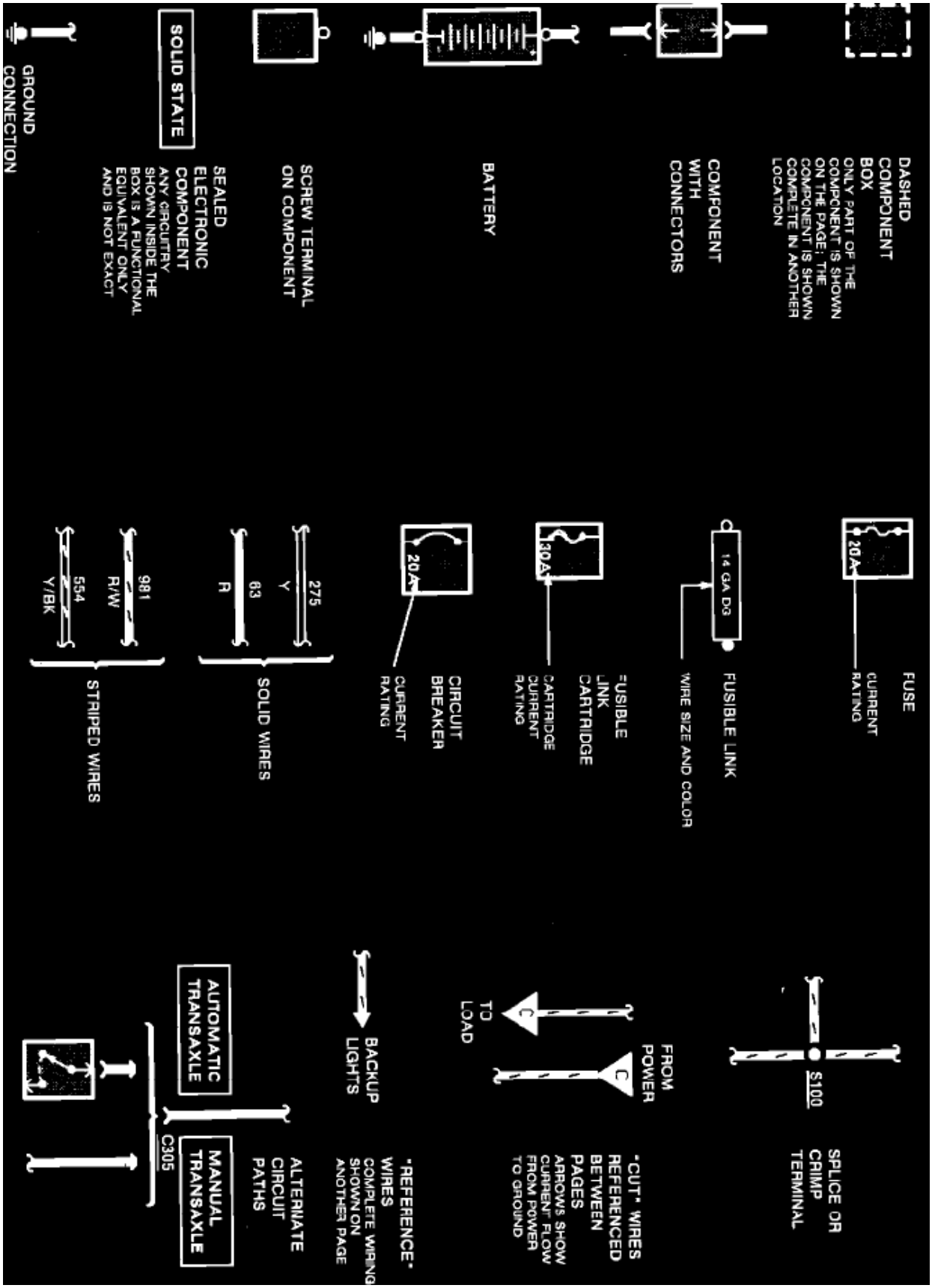
Symbol Identification



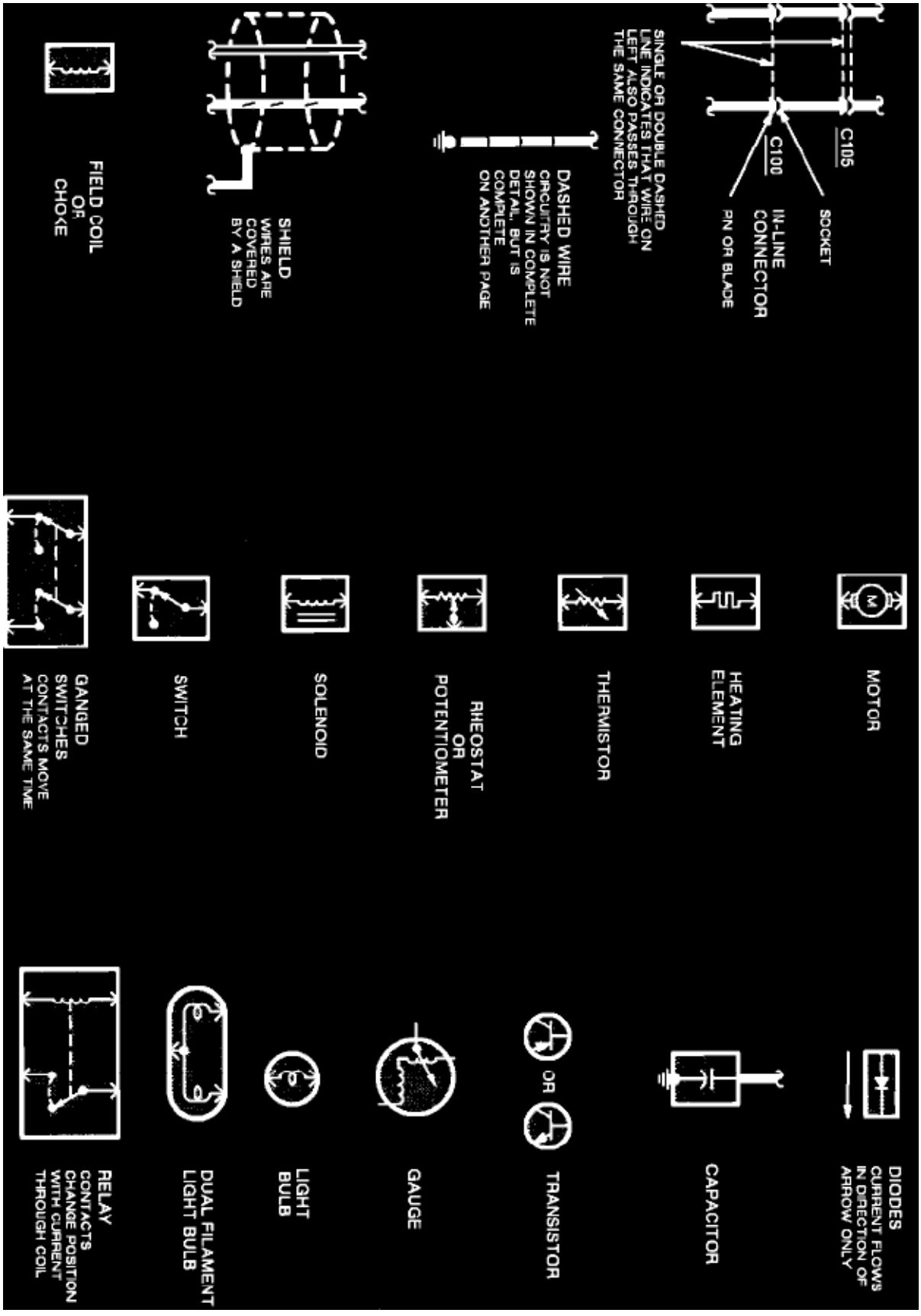
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

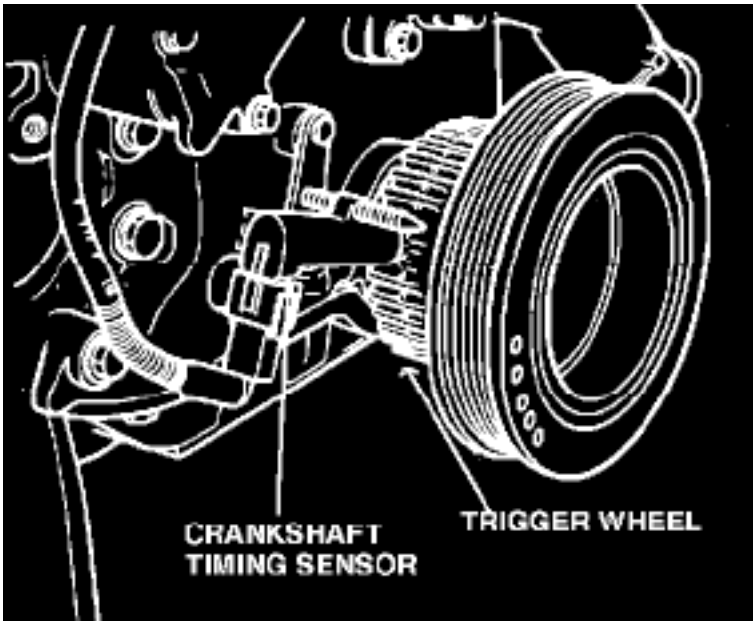
P: Purple

T: Tan

V: Violet

W: White

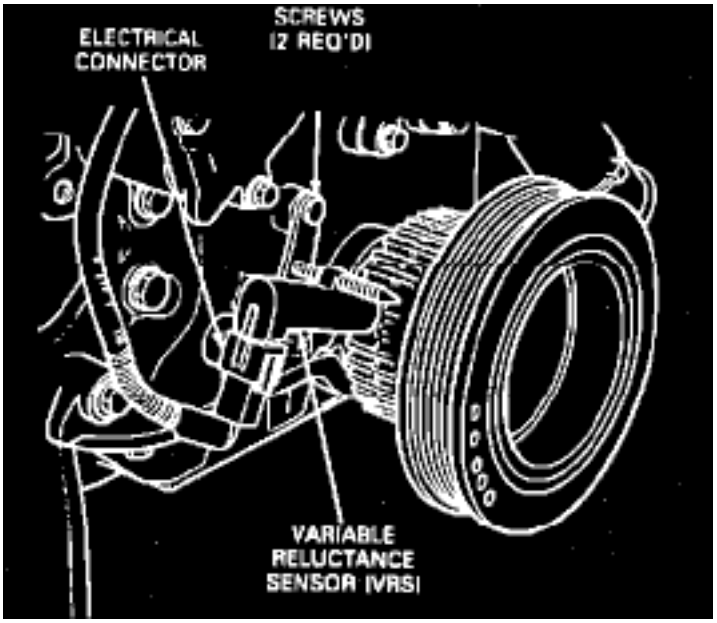
Y: Yellow



Crankshaft Position Sensor: Description and Operation

Crankshaft Timing Sensor

The crankshaft timing sensor is a variable reluctance type sensor. It is triggered by a 35 tooth trigger wheel tooth configuration machined into the rear of the crankshaft dampener. The signal generated by this sensor is called a Variable Reluctance Sensor (VRS) signal. The VRS signal provides the base timing and rpm information to the EDIS module. Base timing is set at 10° and is not adjustable.



Crankshaft Position Sensor: Service and Repair

Variable Reluctance (Crankshaft Position) Sensor

REMOVAL:

1. Disconnect the negative battery cable.

2. Disconnect the sensor electrical connector from the wiring harness.

3. Remove the Variable Reluctance (Crankshaft Position) Sensor mounting bolts and remove the sensor.

INSTALLATION:

1. Position the Variable Reluctance (Crankshaft Position) Sensor assembly on the engine.

2. Install the two sensor attaching bolts and tighten to specified torque. (SEE SPECIFICATIONS/MECHANICAL)

3. Route the sensor wiring harness and connect the electrical connector to the sensor.

4. Connect the negative battery cable.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

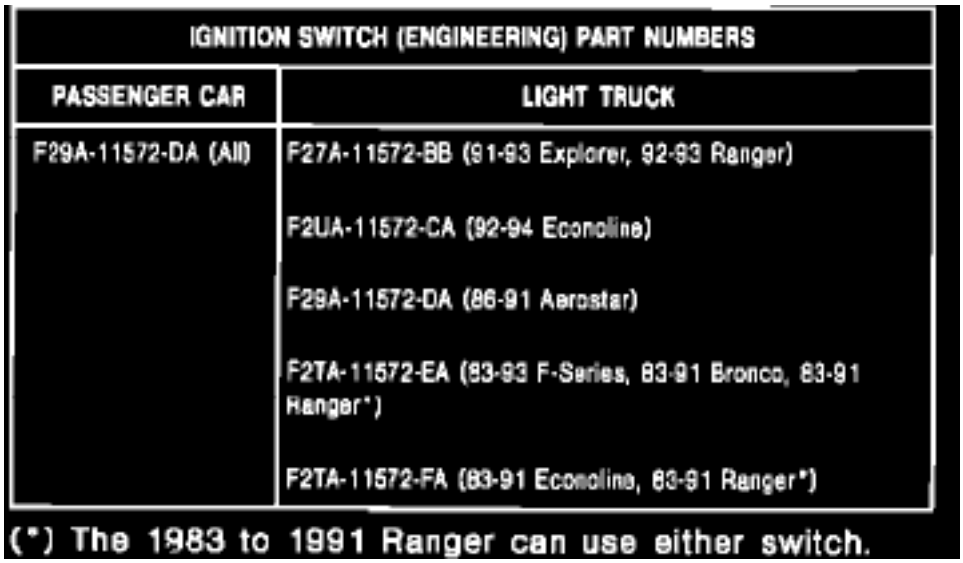
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

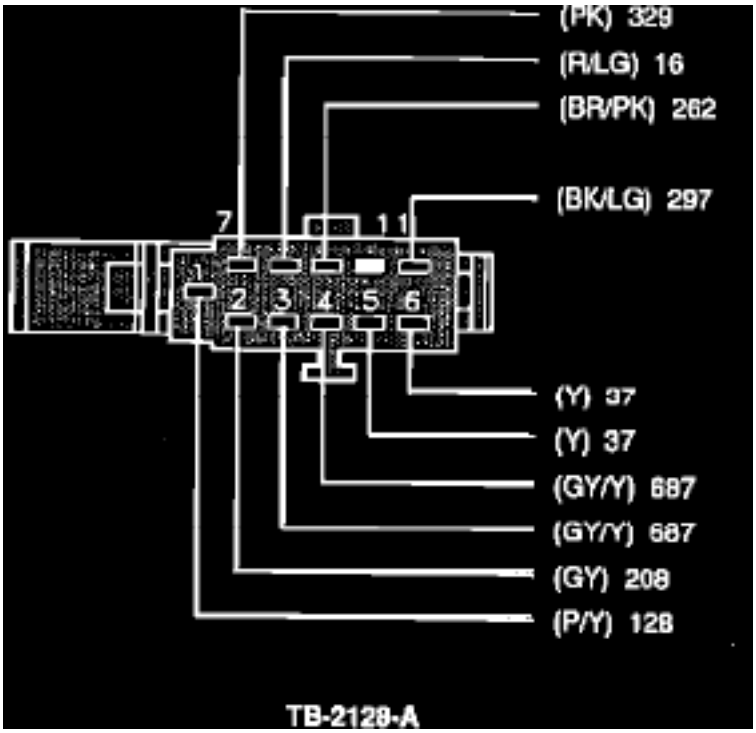
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: Customer Interest Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

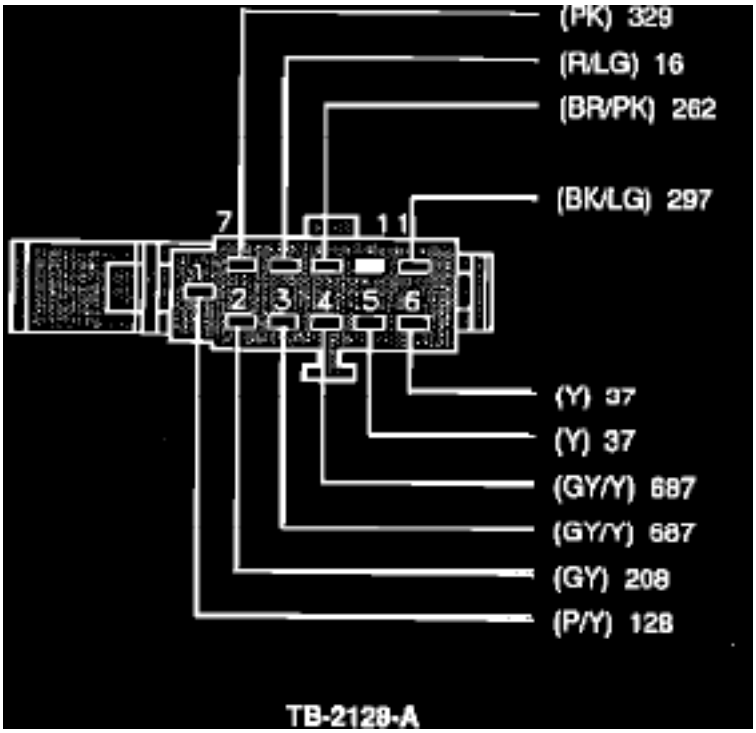
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

Spark Plug: Customer Interest Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

Spark Plug: All Technical Service Bulletins Engine - Loss of Power At High Engine Speeds

Article No. 92-3-8

01/29/92

LOSS OF POWER - 4.0L - AT HIGH ENGINE SPEEDS BETWEEN 3800 AND 4700 RPM - CANADIAN VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

ISSUE: A loss of power may occur at engine speeds between 3800 and 4700 RPM under wide open throttle. After several months use, this can be caused by an interaction between MMT (octane enhancer additive in Canadian fuel) contaminated spark plugs and the EDIS (Electronic Distributorless Ignition System) module. A check engine light concern may be present with Self-Test Codes 18 (212 three digit code) and 45 in continuous memory.

ACTION: If service is required, confirm the concern and, if necessary, replace the EDIS module and spark plugs. Refer to the following procedure for service details.

1. Confirm the customer concern by accelerating the vehicle at wide open throttle from 3000 RPM to 4700 RPM with the transmission in second gear.

^ If the vehicle exhibits a loss of power (caused by fuel shutoff of one of the fuel banks) in this RPM range, follow Steps 2 and 3.

^ Otherwise, follow the Powertrain Control/Emissions Diagnosis Manual's diagnostic procedures.

NOTE:

FUEL SHUTOFF (REV. LIMITER) AT 4850 RPM FOR AUTOMATICS AND 5200 RPM FOR MANUAL TRANSMISSIONS IS NORMAL AND SHOULD NOT BE CONFUSED WITH THIS CONCERN.

2. Replace all the spark plugs.

3. Replace the EDIS module (F1TZ-12KO72-B).

NOTE:

THIS MODULE WILL ELIMINATE THE PREMATURE FUEL SHUTOFF CONCERN. THE RED DEPOSITS ON THE SPARK PLUGS WILL STILL OCCUR AFTER TIME. THIS IS CONSIDERED NORMAL FOR THIS TYPE OF FUEL.

PART NUMBER PART NAME CLASS

F1TZ-12K072-B EDIS Module B

AWSF42C Spark Plug (Pkg / 10) BG

AWSF42P Spark Plug (Pkg / 10) B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models, Basic Warranty Coverage, Emissions Warranty Coverage

OPERATION DESCRIPTION TIME

920308A Replace Spark Plugs And 1.3 Hr.

EDIS Module

DEALER CODING

BASIC PART NO. CONDITION CODE

12K072 08

OASIS CODES: 614000, 614500

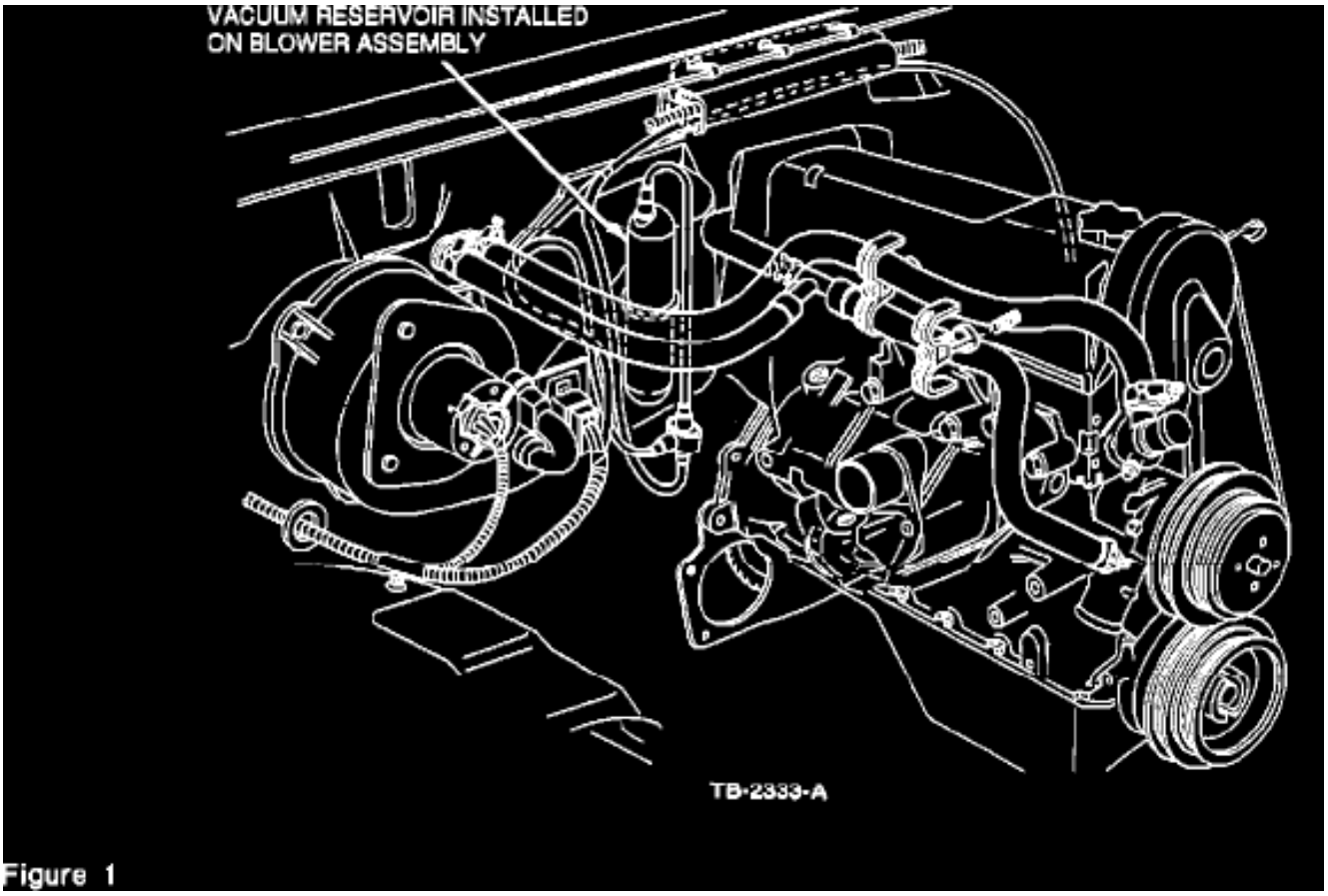


Figure 1

Vacuum Tank: All Technical Service Bulletins Heater - Air Flow From Panel During Heavy Acceleration

Article No. 94-4-11

02/23/94

HEATER - OBJECTIONABLE AIRFLOW FROM PANEL REGISTERS DURING HEAVY ACCELERATION - NON A/C VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

This TSB article is being republished in its entirety to include 1992 Model vehicles.

ISSUE: Objectionable airflow from the heater system panel registers may occur when the system is in the OFF mode and the vehicle is under heavy acceleration. This condition is caused by movement of the fresh air door when the vacuum to the door actuator is lost during heavy acceleration.

ACTION: Installation of a vacuum hose/reservoir/check valve assembly will provide sufficient vacuum level to maintain proper operation of the heater system in the OFF mode. Refer to the following procedure for service details.

SERVICE PROCEDURE

1. Remove the blower assembly from the vehicle.

2. Drill two holes in the blower assembly, in a vertical position, to allow for installation of the vacuum reservoir. Refer to Figure 1.

3. Using two screws, mount the vacuum reservoir as shown in Figure 1.

4. Disconnect the existing vacuum check valve.

5. Remove the vacuum line which sourced the heater system check valve and attached to an engine vacuum port. Refer to Figure 1.

6. Discard the check valve and vacuum line.

7. Reinstall the blower assembly in the vehicle.

8. Route the new vacuum line and check valve (attached to the reservoir) as the original vacuum line was routed and attach to the original vacuum port.

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300

Spark Plug: Specifications Spark Plug Gap

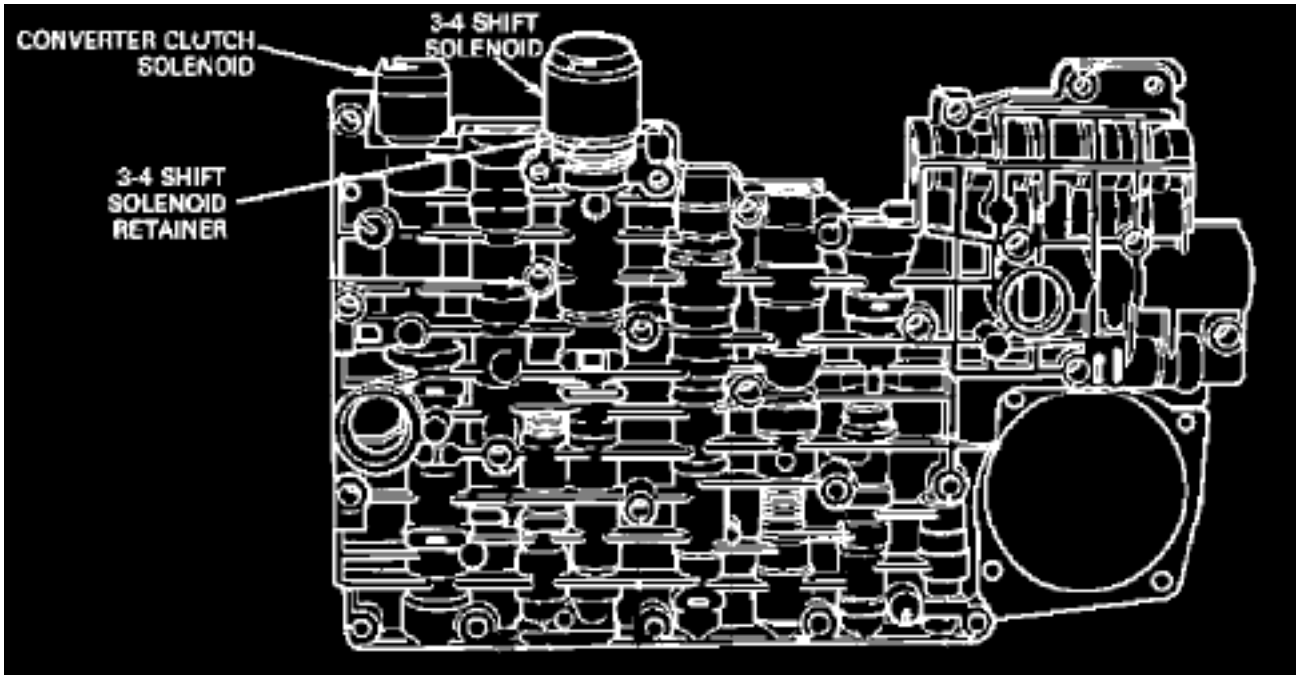
SPARK PLUG

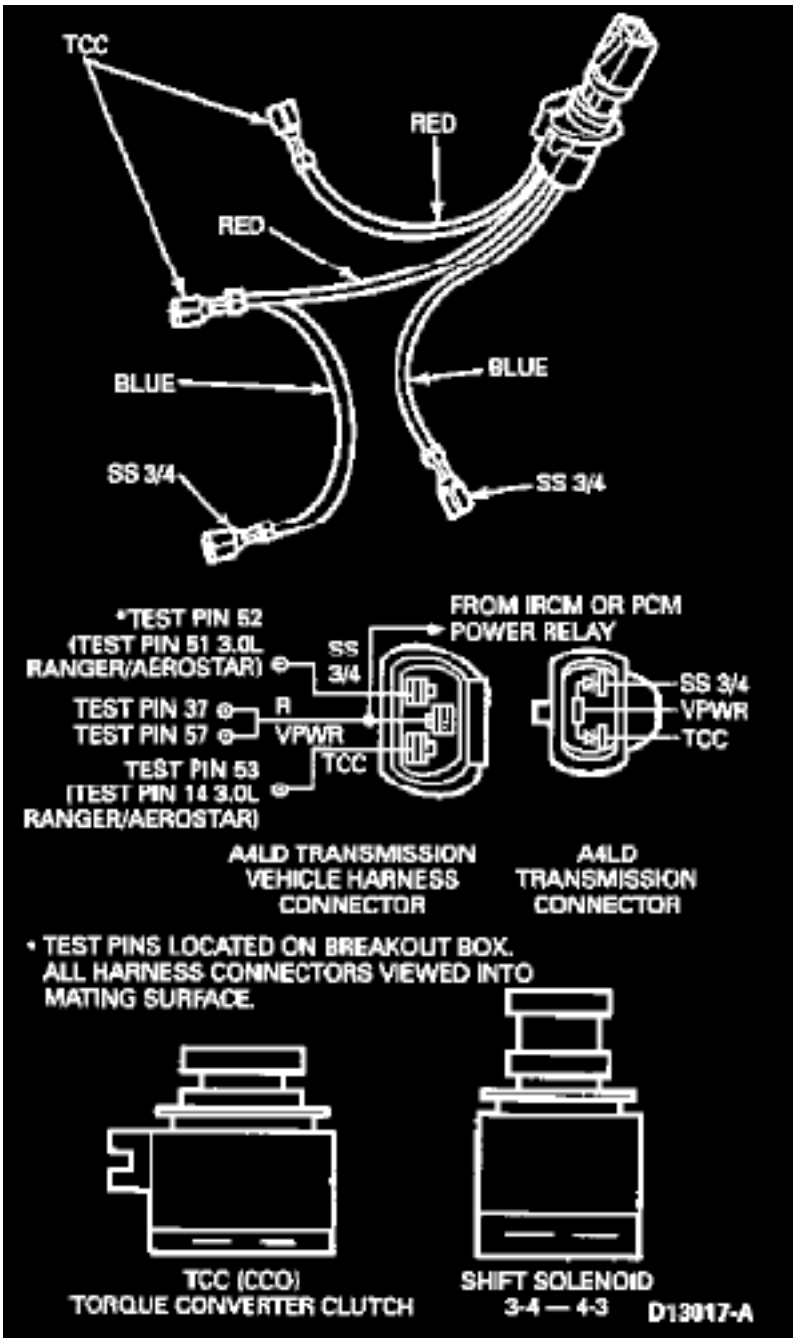
Electrode Gap ..... 0.052-0.056 in (1.3-1.4 mm)

Spark Plug: Specifications Tightening Torque

SPARK PLUG

Tightening Torque ..... 10-16 ft lb (14-22 Nm)


CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

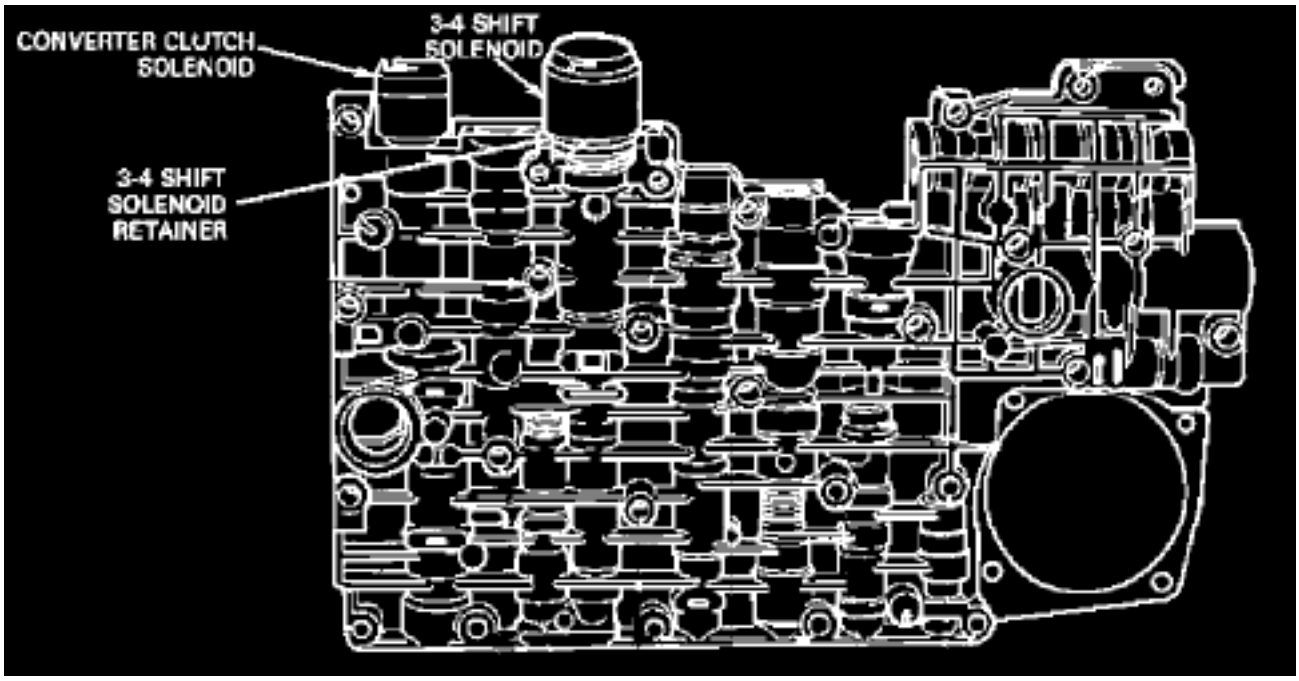


Shift Solenoid: Description and Operation

Shift Solenoid 3-4 (SS 3-4)

The 3-4 shift solenoid is used to control the 3-4/4-3 shift valve.

Transmission Function: Used to shift from third gear to fourth gear, and fourth gear to third gear.

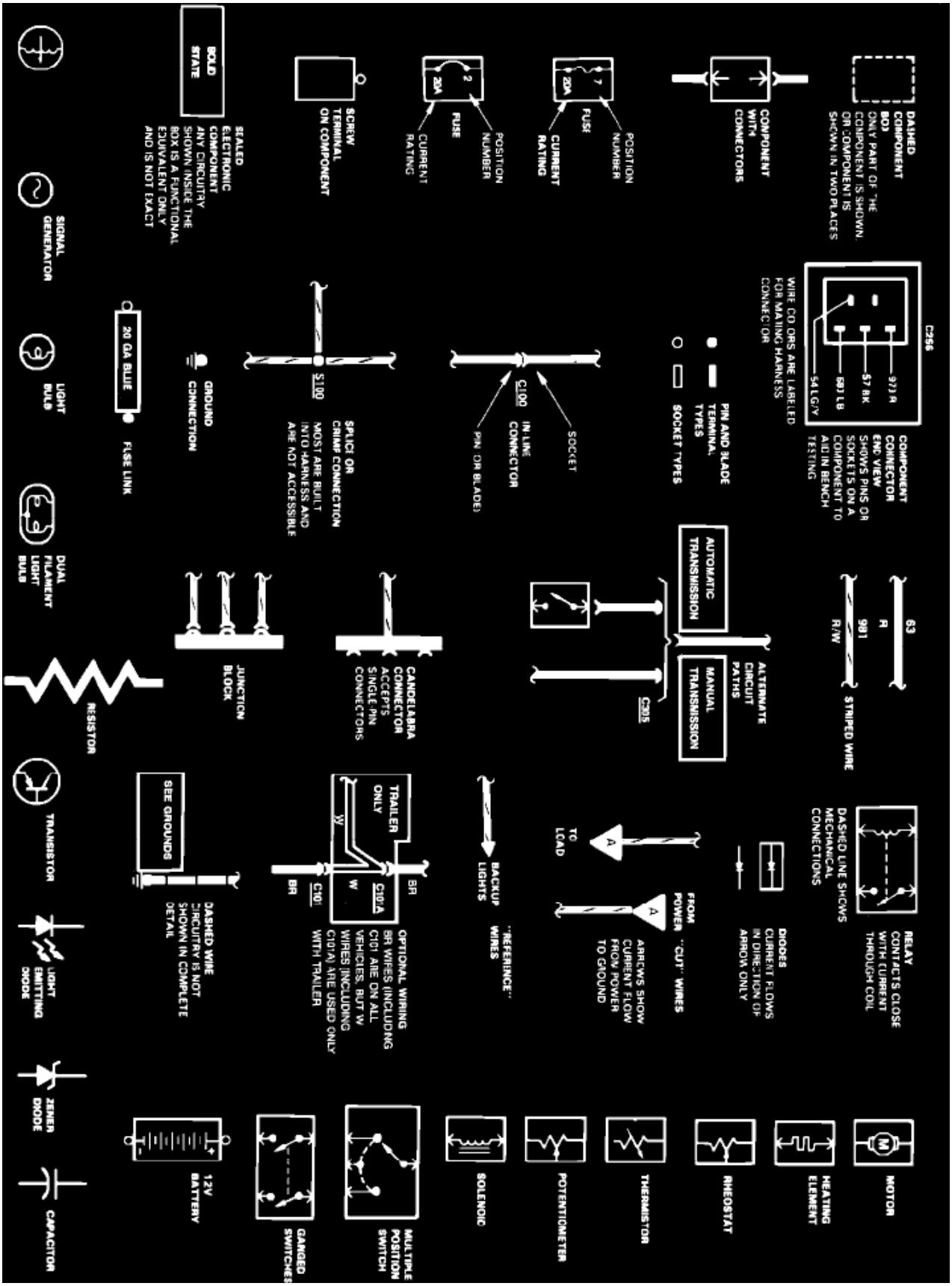

CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

Converter Clutch Override Solenoid: Description and Operation

Torque Converter Clutch Solenoid (TCC)

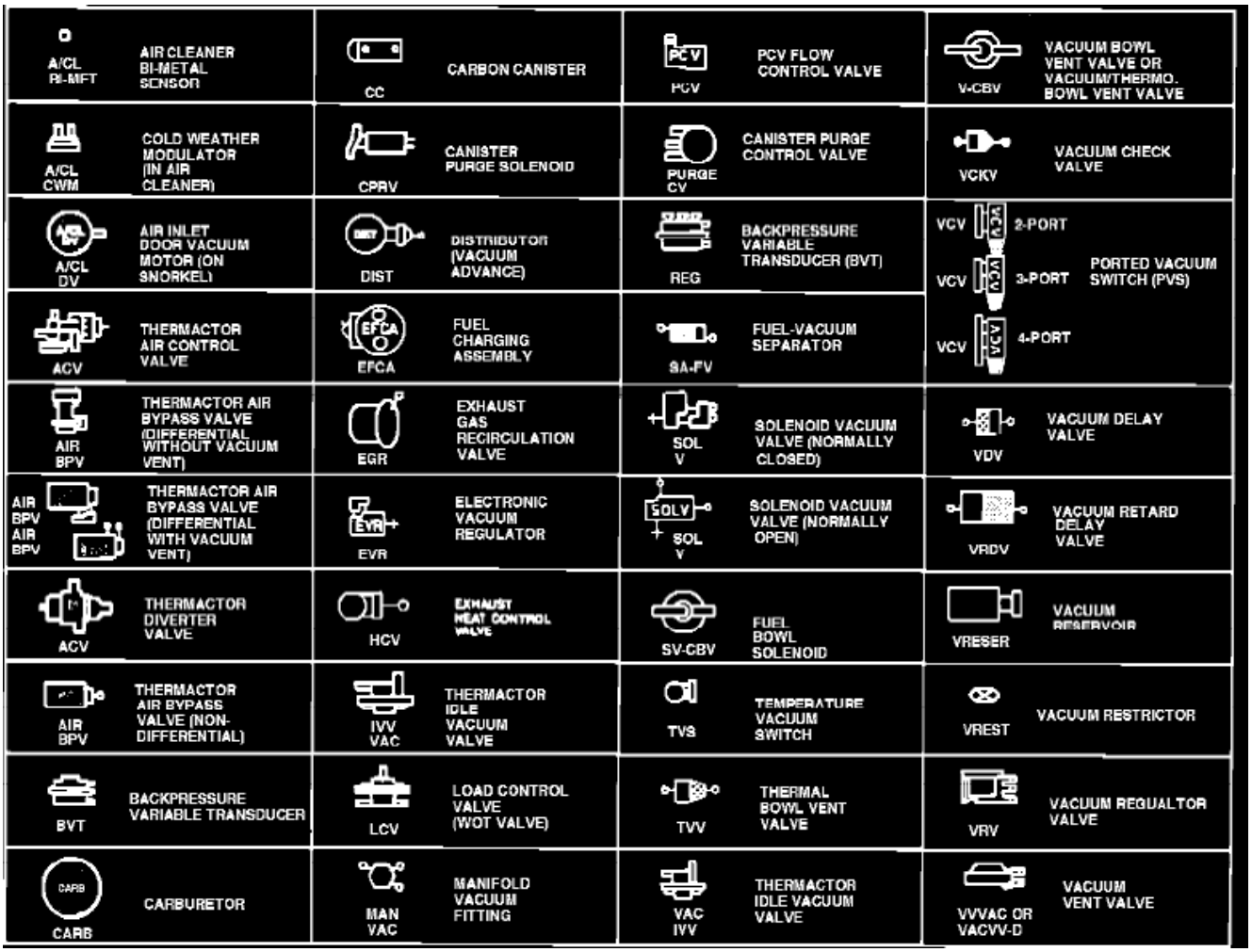
The torque torque converter clutch solenoid (TCC) is used to control the apply and release of the torque converter clutch.

Transmission Function: Used to engage the torque converter clutch.

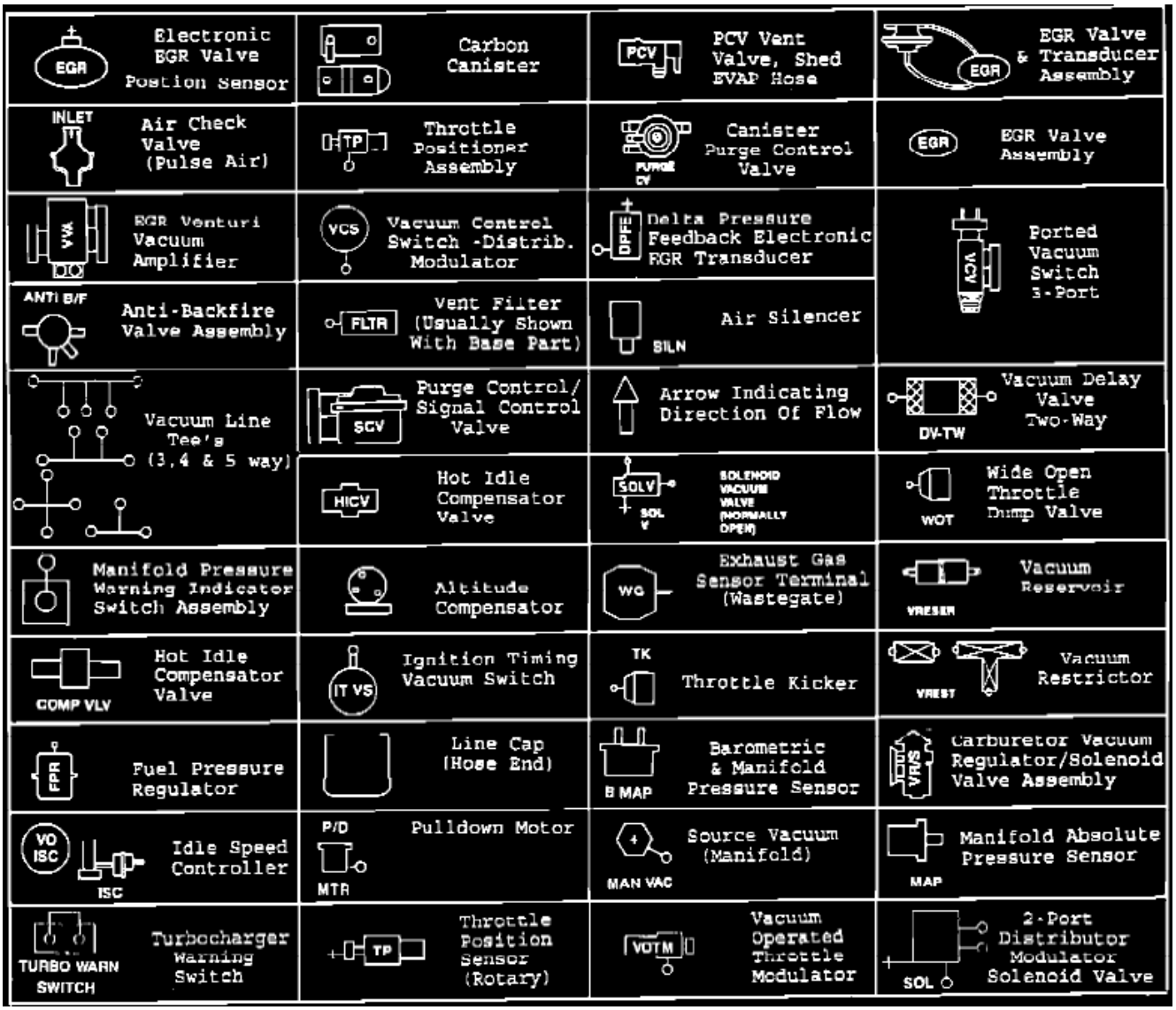


Transfer Case Actuator: Diagram Information and Instructions

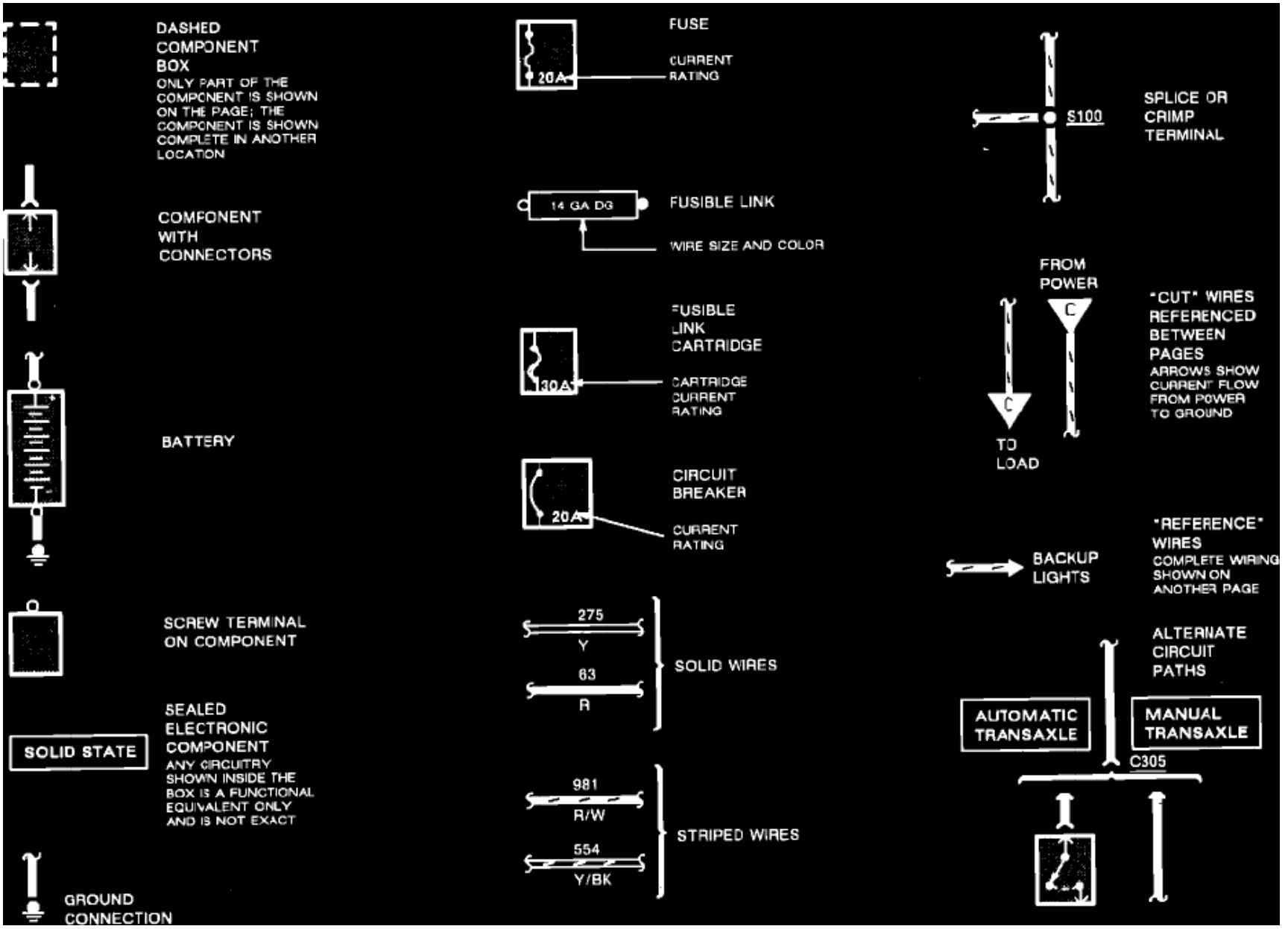
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
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ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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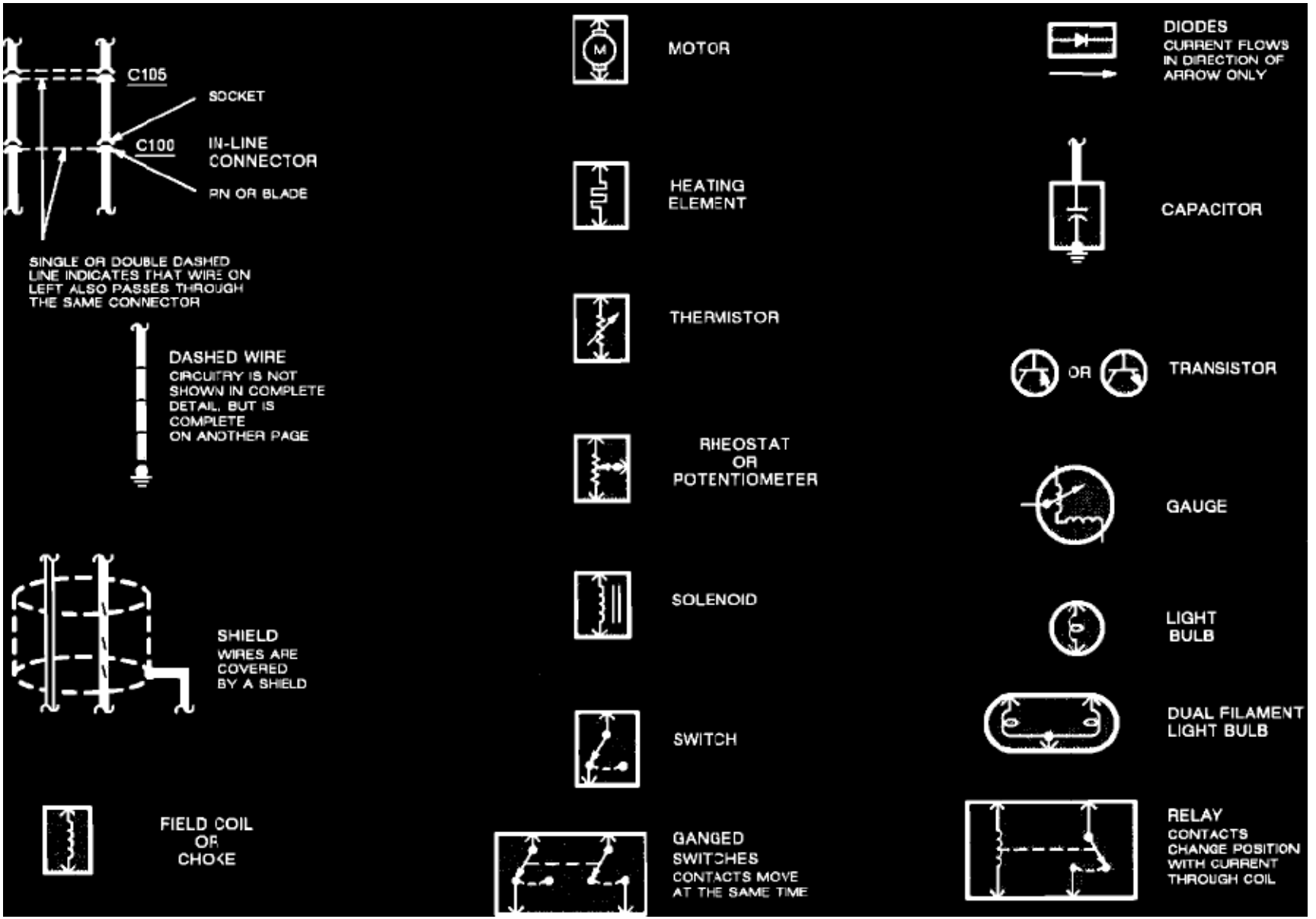
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

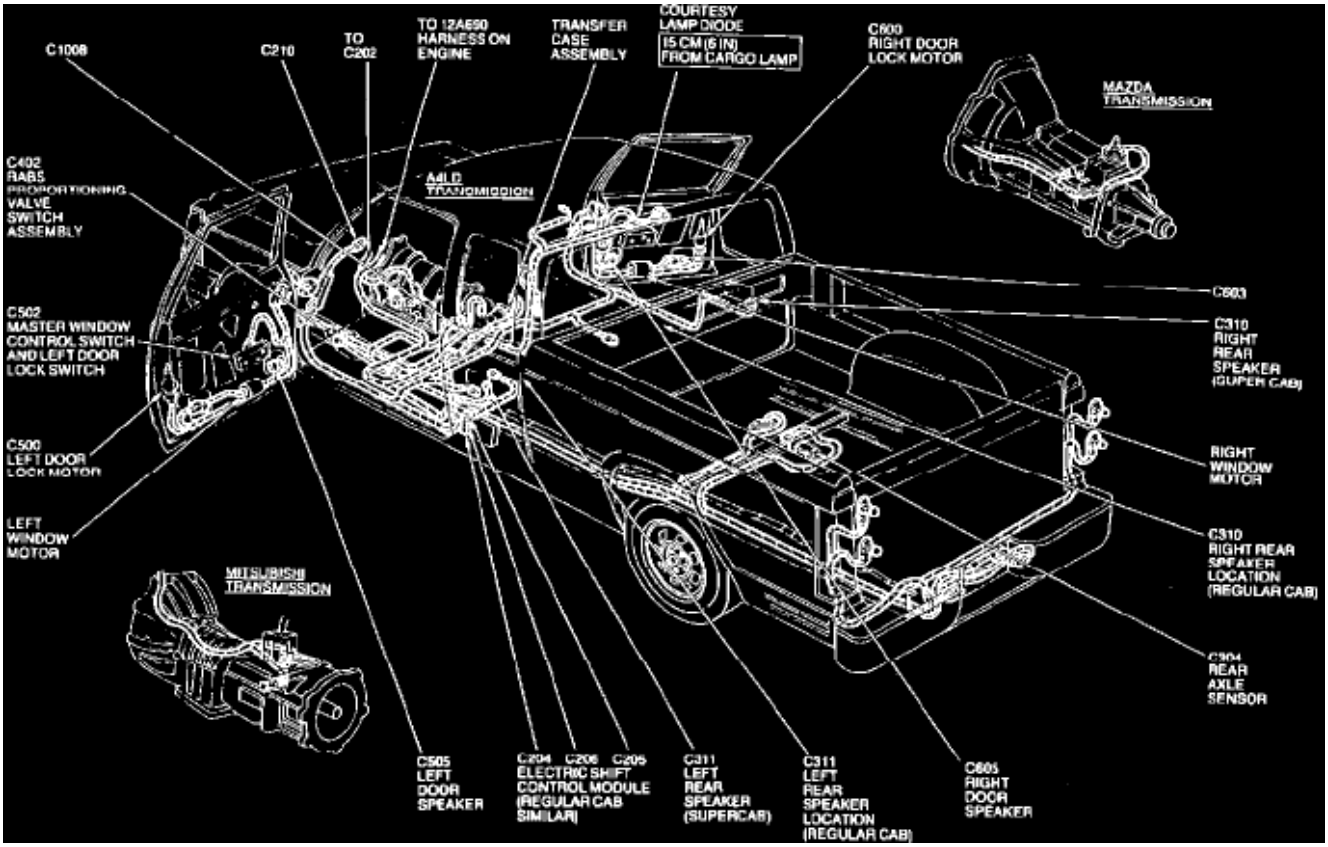
V: Violet

W: White

Y: Yellow

Transfer Case Actuator: Description and Operation

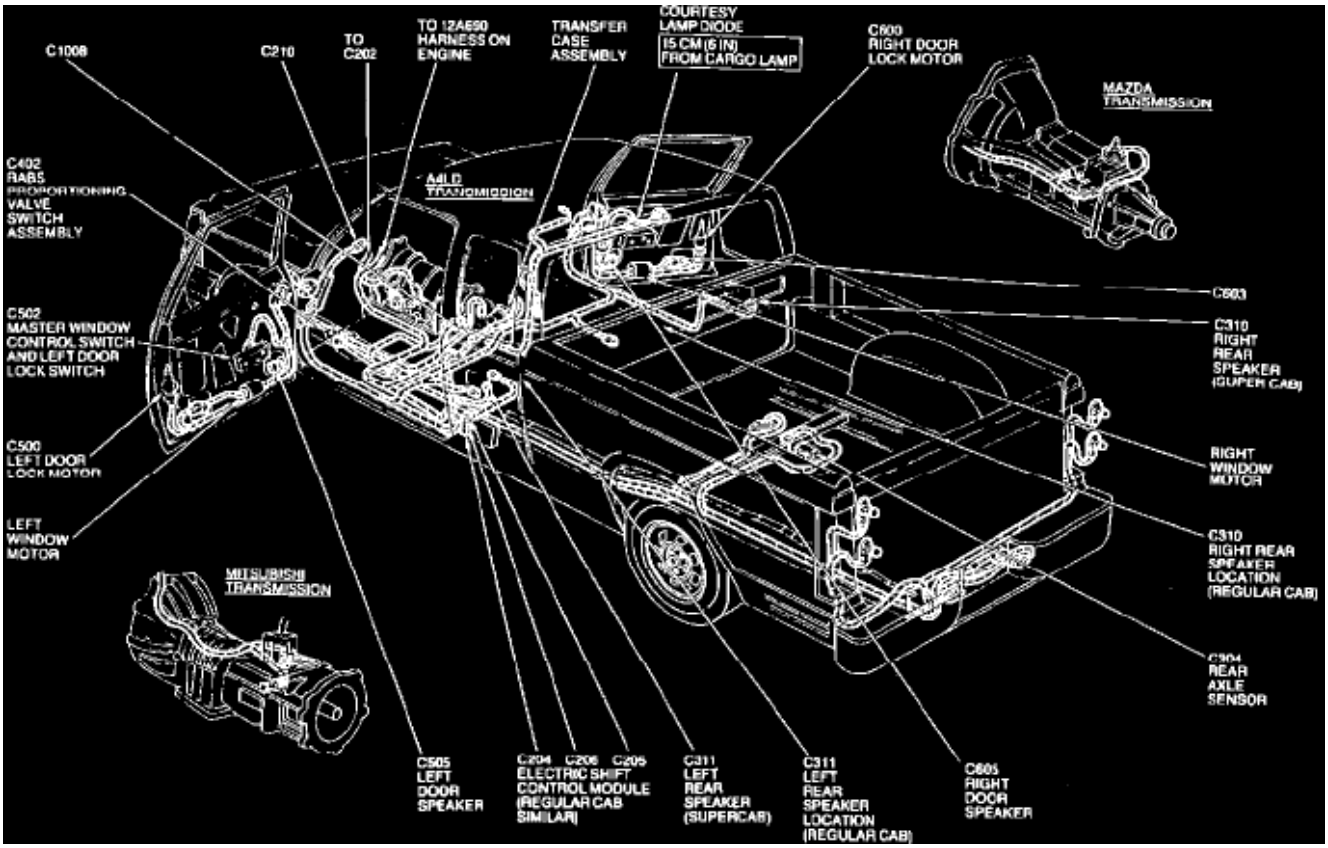
The electronic shift motor prompts a rotary helical cam to move the 2W-4W shift fork and 4H-4L reduction shift fork to the selected vehicle drive postion.



Control Module: Locations Regular Cab

Body Components

Lower LH Rear Corner Of Cab



Control Module: Locations Supercab

Body Components

Between Bottom Of LH ``B'' Pillar & Rear Of Cab

Electronic Shift Control Module: Technical Service Bulletins Transfer Case - Revised Shift Procedures

Article No. 90-18-10

^ ELECTRONIC SHIFT MODULE (4X4) - MODIFIED OPERATION

^ TRANSFER CASE - 4X4 ELECTRONIC SHIFT MODULE - REVISED OPERATION PROCEDURE

LIGHT TRUCK: 1986-90 BRONCO II

1986-91 BRONCO, RANGER 1991 EXPLORER

ISSUE: The shift procedures into and out of LOW RANGE are revised for Ranger, Bronco and Explorer trucks built after 8/1/90 due to module changes. The new module will also be used to service prior model year trucks.

ACTION: If service is required on models built prior to 8/1/90, advise the customers of the following changes made to their vehicles.

Operation of the 1991 modules have been changed as follows:

To shift into 4 LOW: ^

Truck must be in 4x4 HIGH by previously pressing the 4x4 switch

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press LOW RANGE switch

To shift out of 4 LOW:

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press the LOW RANGE switch to shift back into 4x4 HIGH

^ Press the 4x4 HIGH switch to shift into 2 HIGH if desired

Previously, the module would respond to the LOW RANGE input from any mode (2H, 4H, 4L). If conditions A and B above are not met, the module would respond by flashing the 4 LOW indicator and wait until conditions A and B are met before completing the shift into or out of LOW RANGE. If LOW RANGE was selected while in 2 HIGH mode, the module would shift to 4 HIGH before flashing the indicator.

PART NUMBER PART NAME CLASS

F1TZ-7E453-A 4X4 Electronic Shift Module B

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

508000

Electronic Shift Control Module: Technical Service Bulletins Electric Shift Module Wiring Schematic - Correction

Article No. 91-3-11

02/02/91

0GTRANSFER CASE - 4X4 ELECTRIC SHIFT MODULE - EVTM WIRING CORRECTIONS

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Some of the wiring schematics shown in the EVTMs contain errors which make circuit tracing difficult. A complete update of these schematics will be made in the near future.

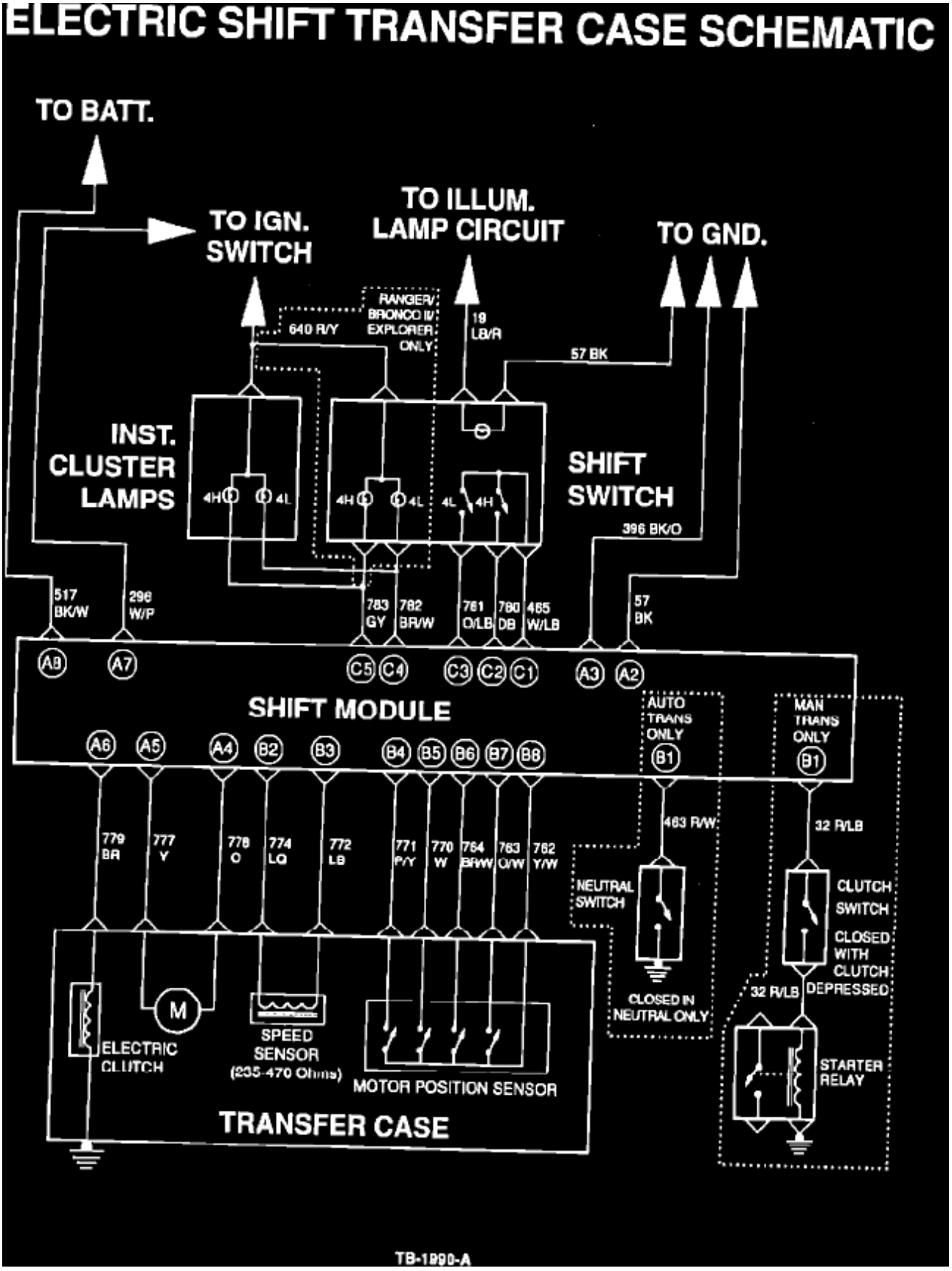

ELECTRIC SHIFT TRANSFER CASE SCHEMATIC
TO BATT.
TO IGN. SWITCH
TO ILLUM. LAMP CIRCUIT
TO GND.
RANGER/ BRONCO II/ EXPLORER ONLY
640 R/Y
19 LB/R
57 BK
INST. CLUSTER LAMPS
4H
4L
SHIFT SWITCH
396 BK/O
517 BK/W
296 W/P
783 GY
782 BR/W
781 O/LB
780 DB
485 W/LB
57 BK
A8
A7
C5
C4
C3
C2
C1
A3
A2
SHIFT MODULE
A6
A5
A4
B2
B3
B4
B5
B6
B7
B8
AUTO TRANS ONLY
B1
MAN TRANS ONLY
B1
779 BR
777 Y
778 O
774 LG
772 LB
771 P/Y
770 W
764 BR/W
763 O/W
762 Y/W
463 R/W
32 R/LB
NEUTRAL SWITCH
CLUTCH SWITCH
CLOSED WITH CLUTCH DEPRESSED
32 R/LB
CLOSED IN NEUTRAL ONLY
M
ELECTRIC CLUTCH
SPEED SENSOR (235-470 Ohms)
MOTOR POSITION SENSOR
STARTER RELAY
TRANSFER CASE
TB-1990-A

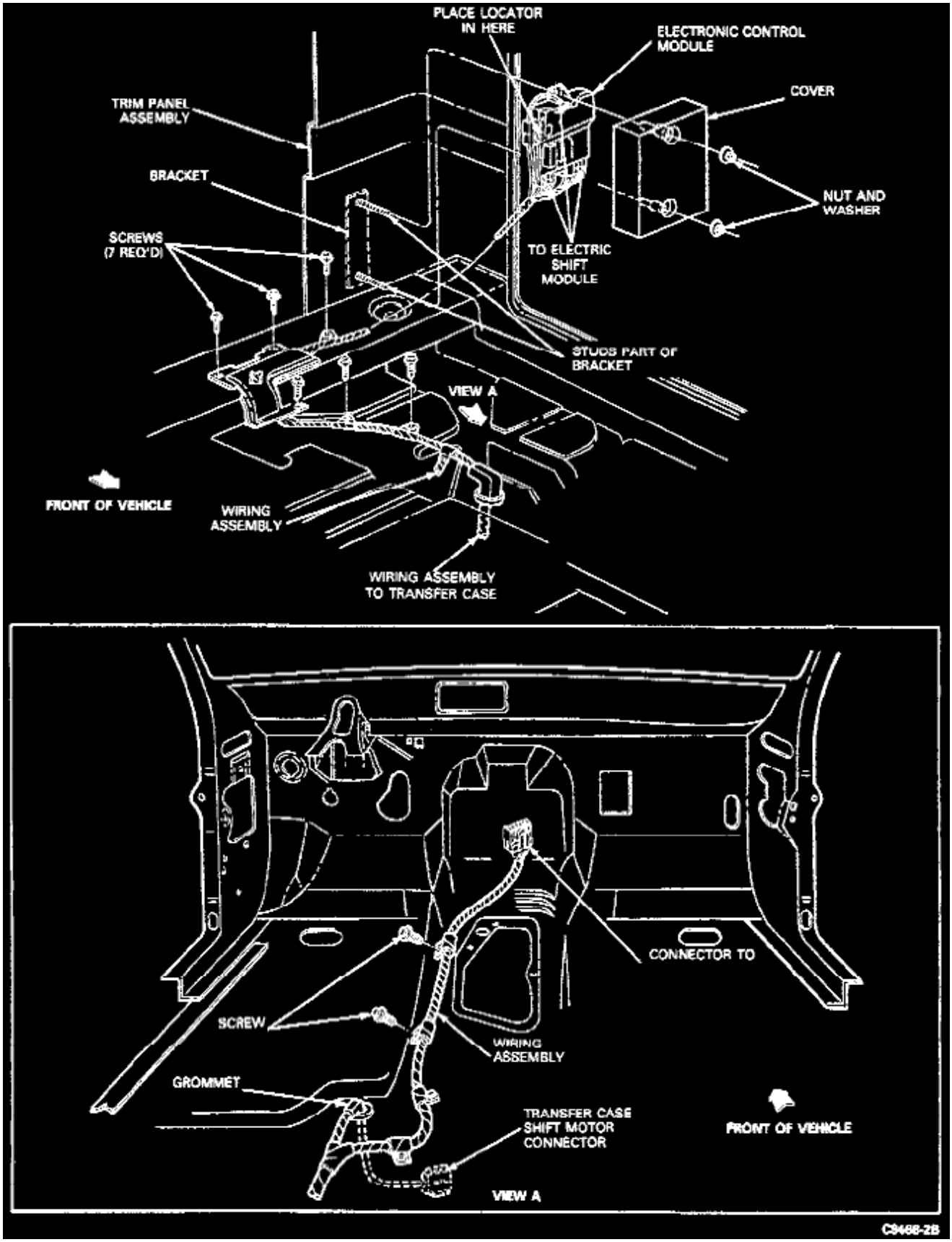
Figure 1

ACTION: In the interim, refer to the simplified schematic, Figure 1. It shows the electrical circuitry for the transfer case shift mechanism while deleting connectors and interconnects with other circuits for clarity.

OTHER APPLICABLE ARTICLES: None

WARRANTY STATUS: INFORMATION ONLY

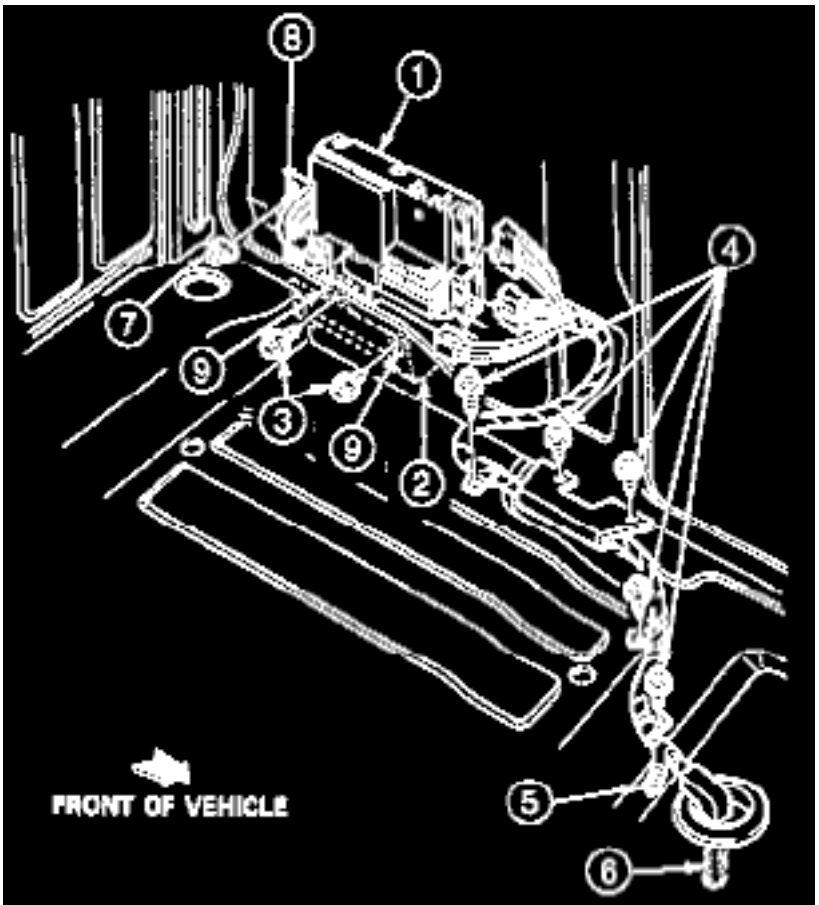
OASIS CODES: 203200, 290000, 508000, 590000



Electronic Shift Control Module: Locations Regular Cab

Electronic Control Module Location

The Electric Shift Control Module is located at the lower Left Hand rear corner of cab.



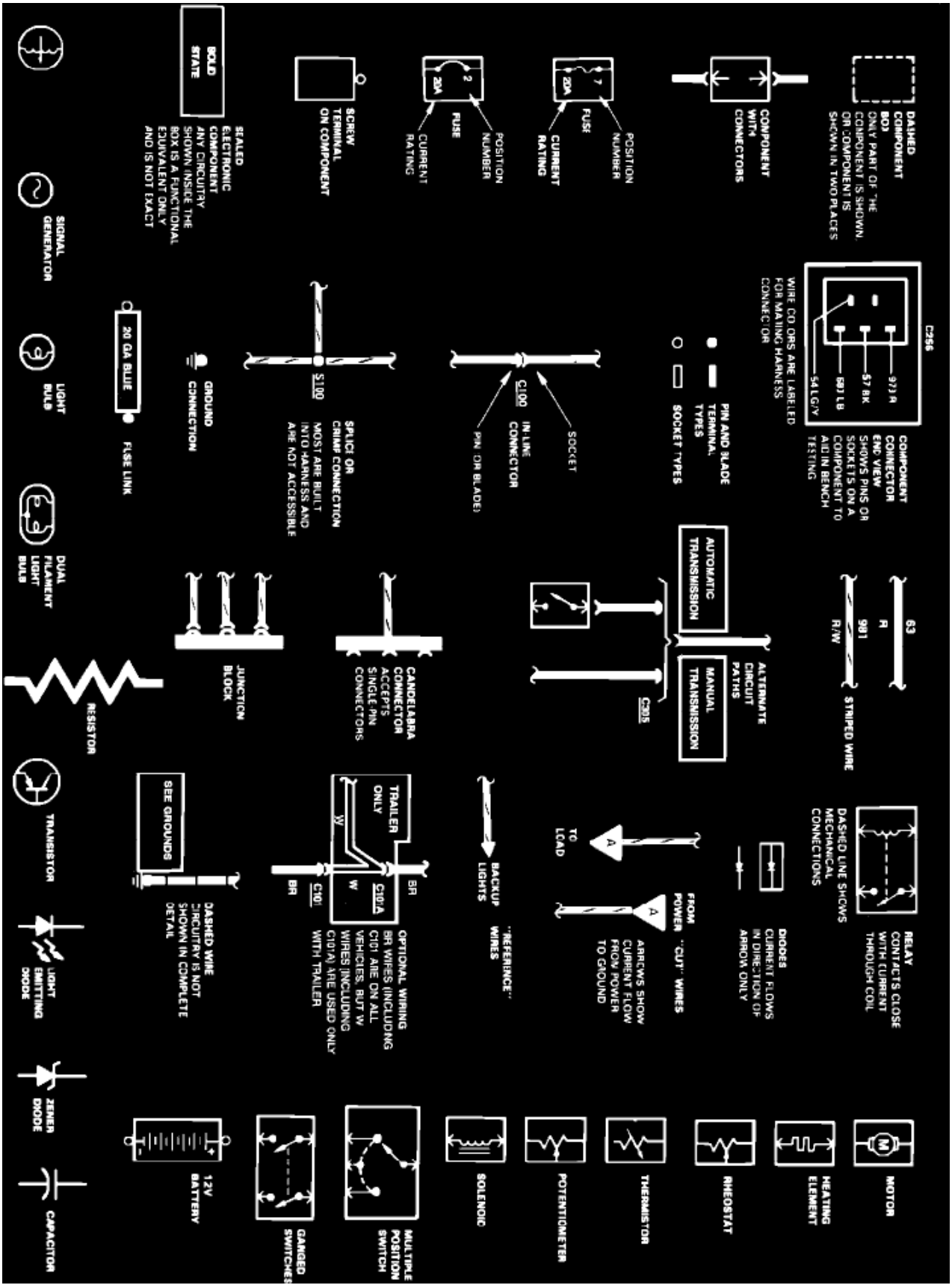
Item No.	Description
1	Electronic Control Module
2	Bracket, Shift Module
3	Screw (2 Req.)
4	Screw (5 Req.)
5	Wiring Assembly
6	Wiring Assembly
7	Nut and Washer Assembly
8	Stud Part for Module Bracket
9	Nut Assembly (2 Req.)

CC10860-A

Electronic Shift Control Module: Locations Supercab

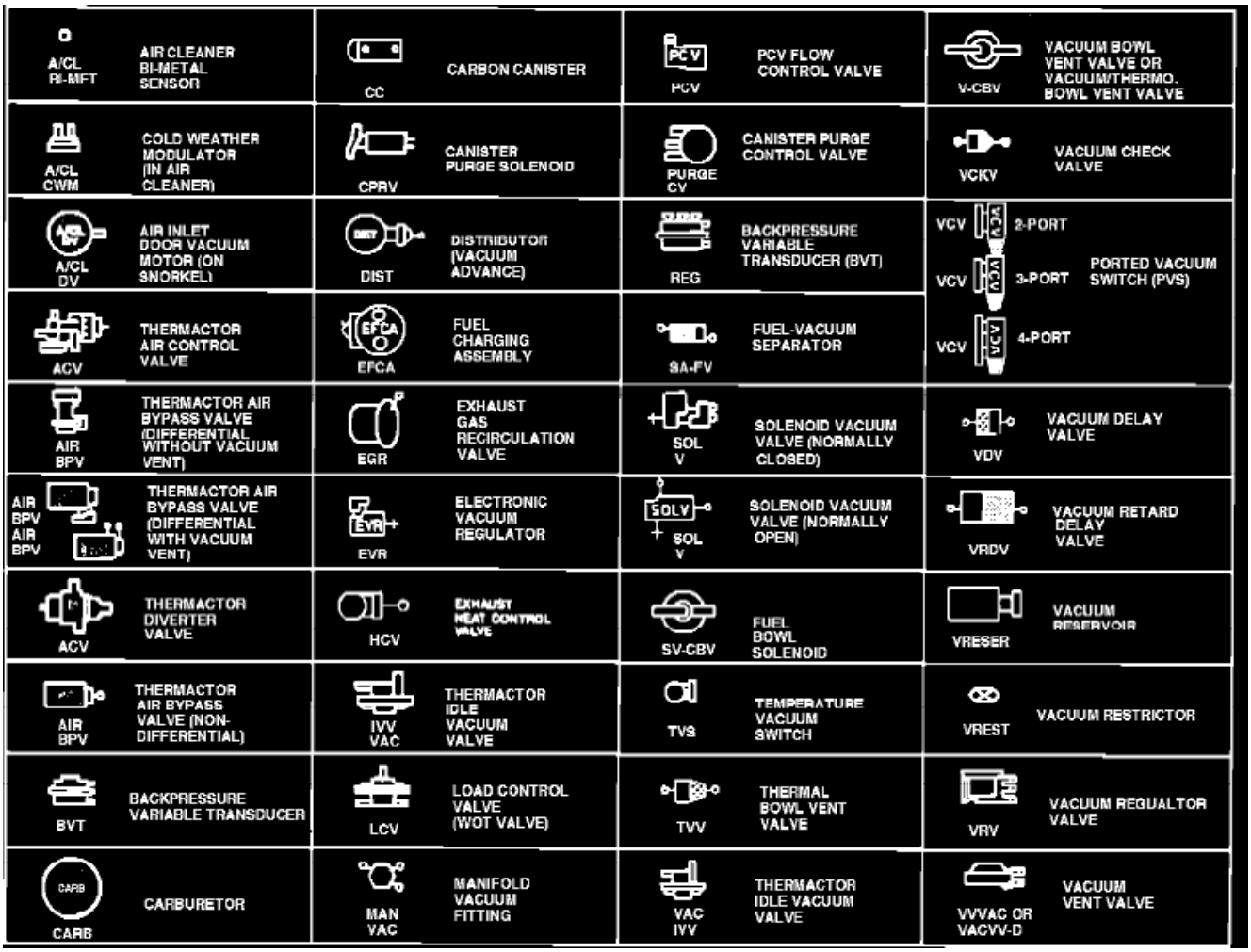
Control Module Circuits, Ranger SuperCab

The Electric Shift Control Module is located between the bottom of the Left Hand "B" pillar and the rear of the cab.

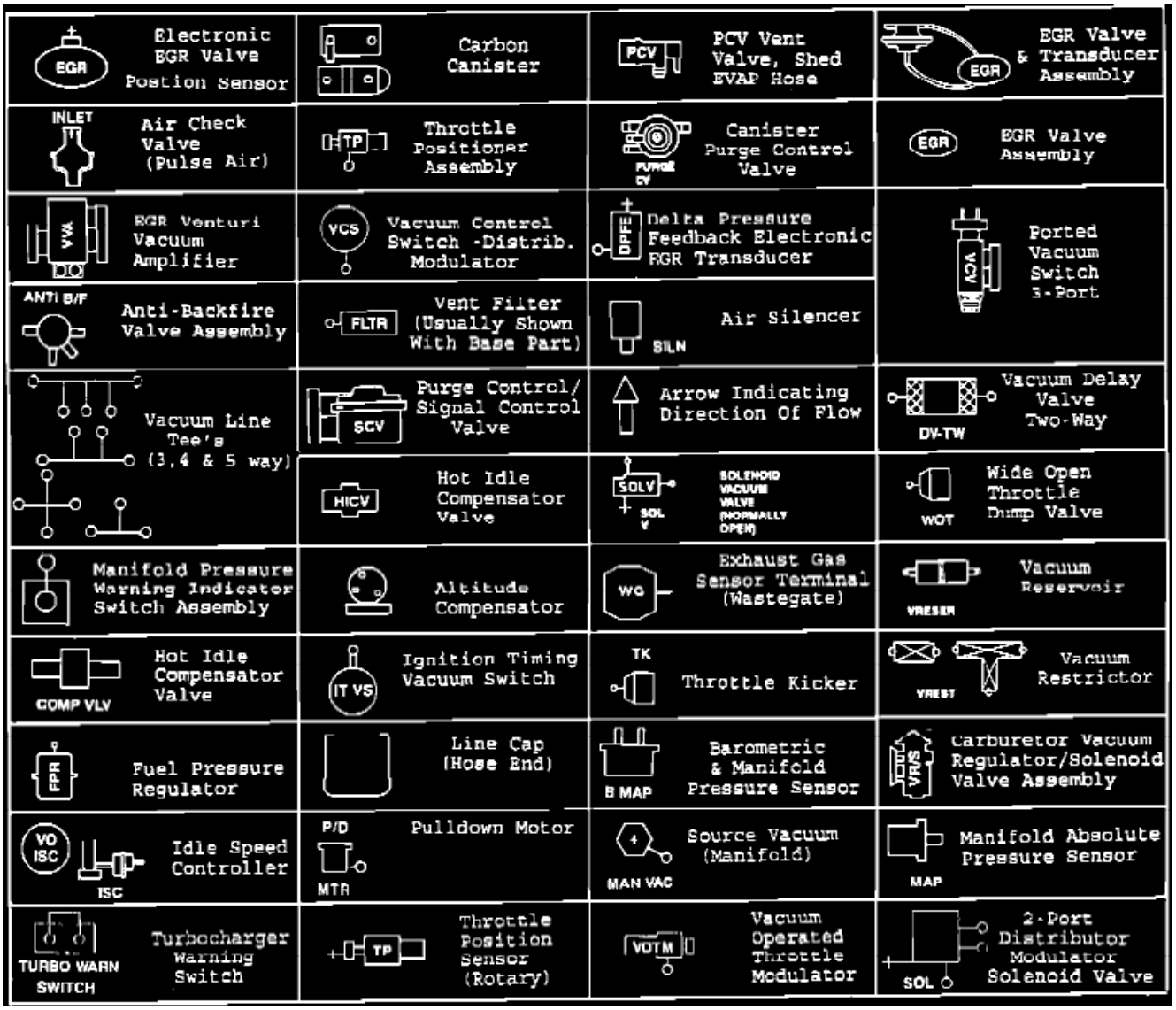


Electronic Shift Control Module: Diagram Information and Instructions

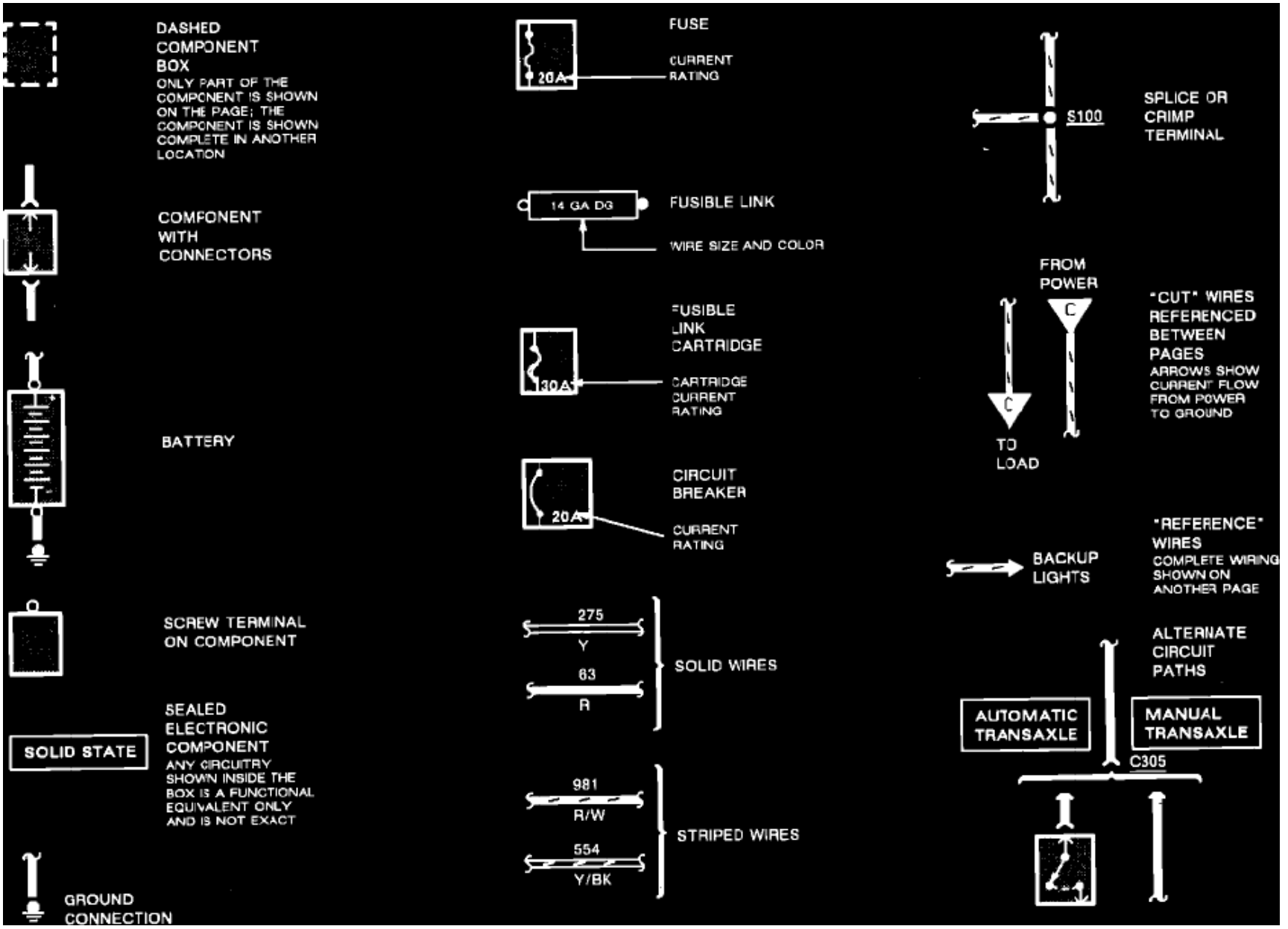
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
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SCREW TERMINAL ON COMPONENT
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ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
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Y/BK
STRIPED WIRES
S100
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C
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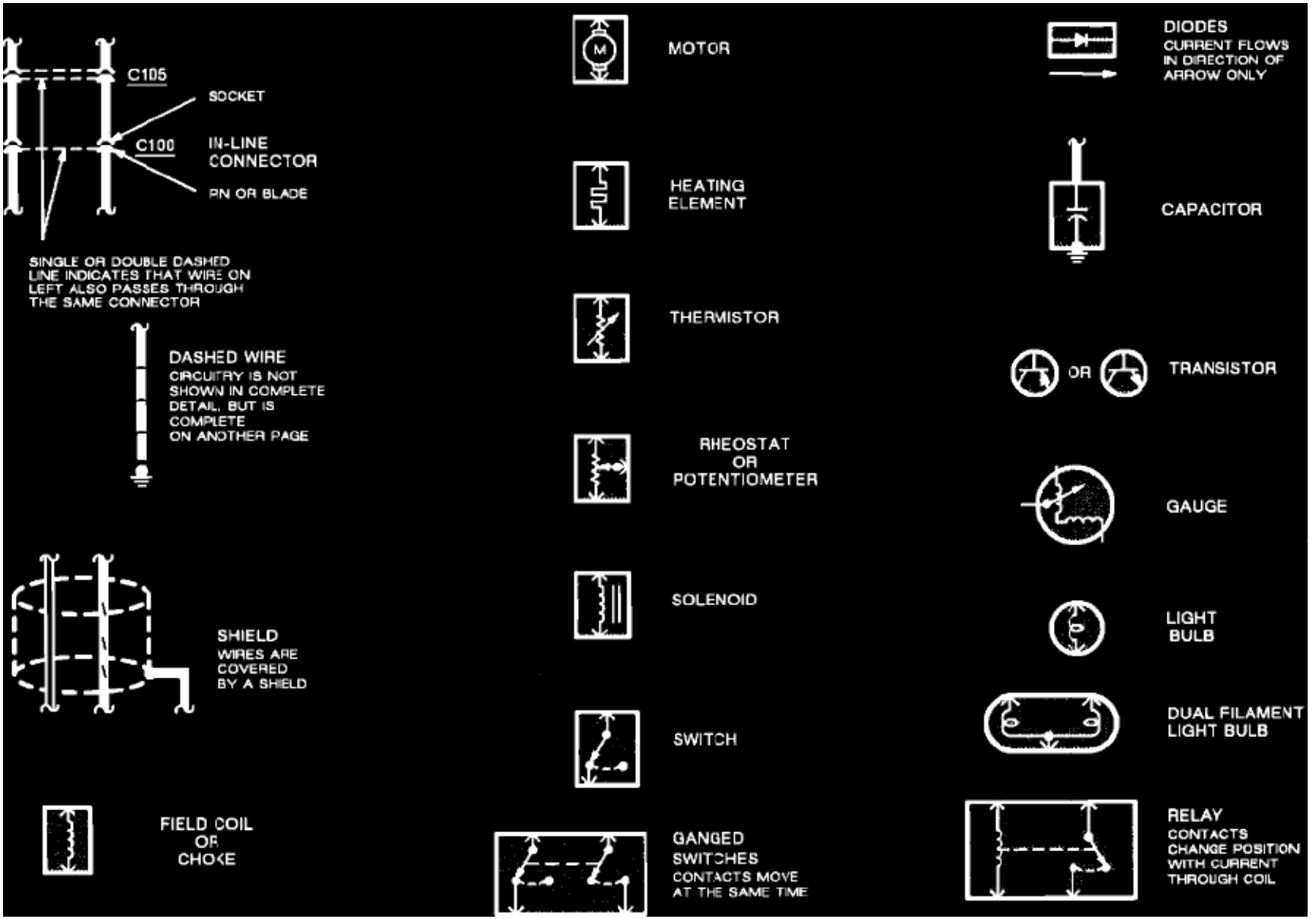
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

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Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

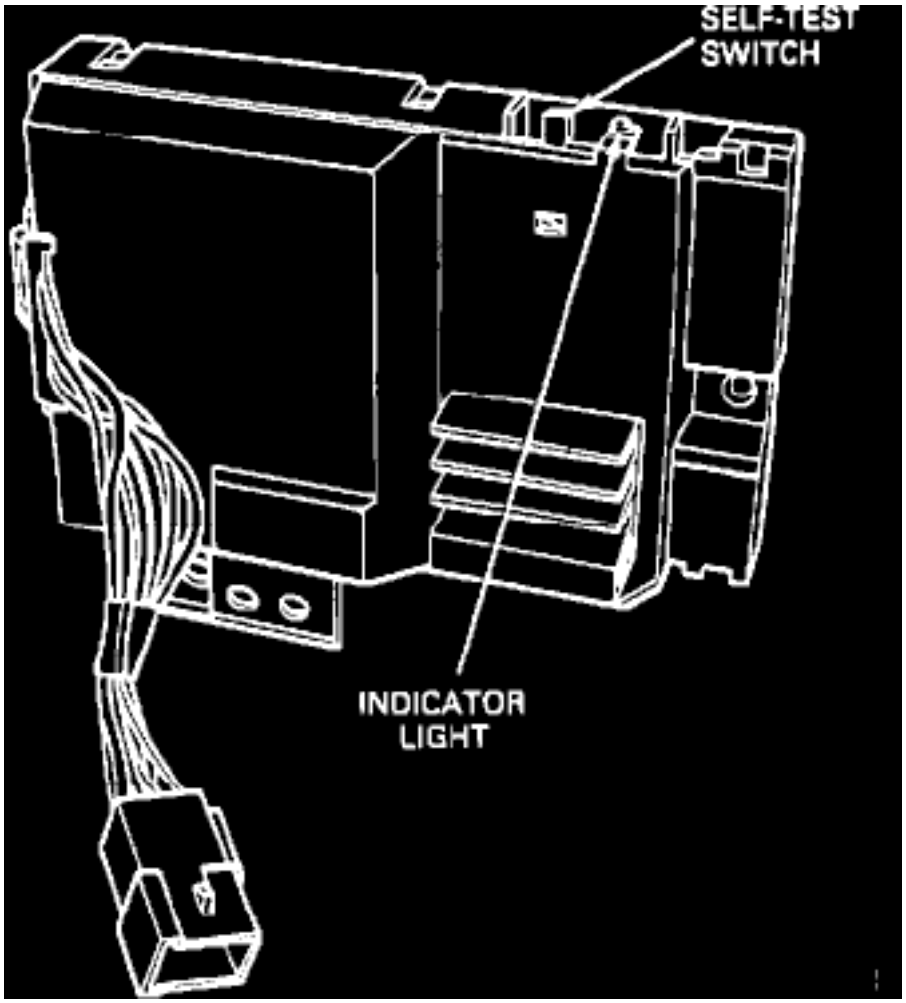
V: Violet

W: White

Y: Yellow

Electronic Shift Control Module: Description and Operation

The electronic control module conducts transfer case operation in response to inputs from the vehicle speed sensor, neutral start switch and clutch interlock switch and push-button actuation made by the operator.



Electronic Shift Control Module: Testing and Inspection

The electronic control module has a diagnostic capability of its internal circuitry. Self test procedure is as follows:

1. Disconnect five-wire and eight wire connectors from electronic control module.

2. Turn ignition switch to the RUN position.

3. Activate the self test switch and note result:

Control Module Self Test

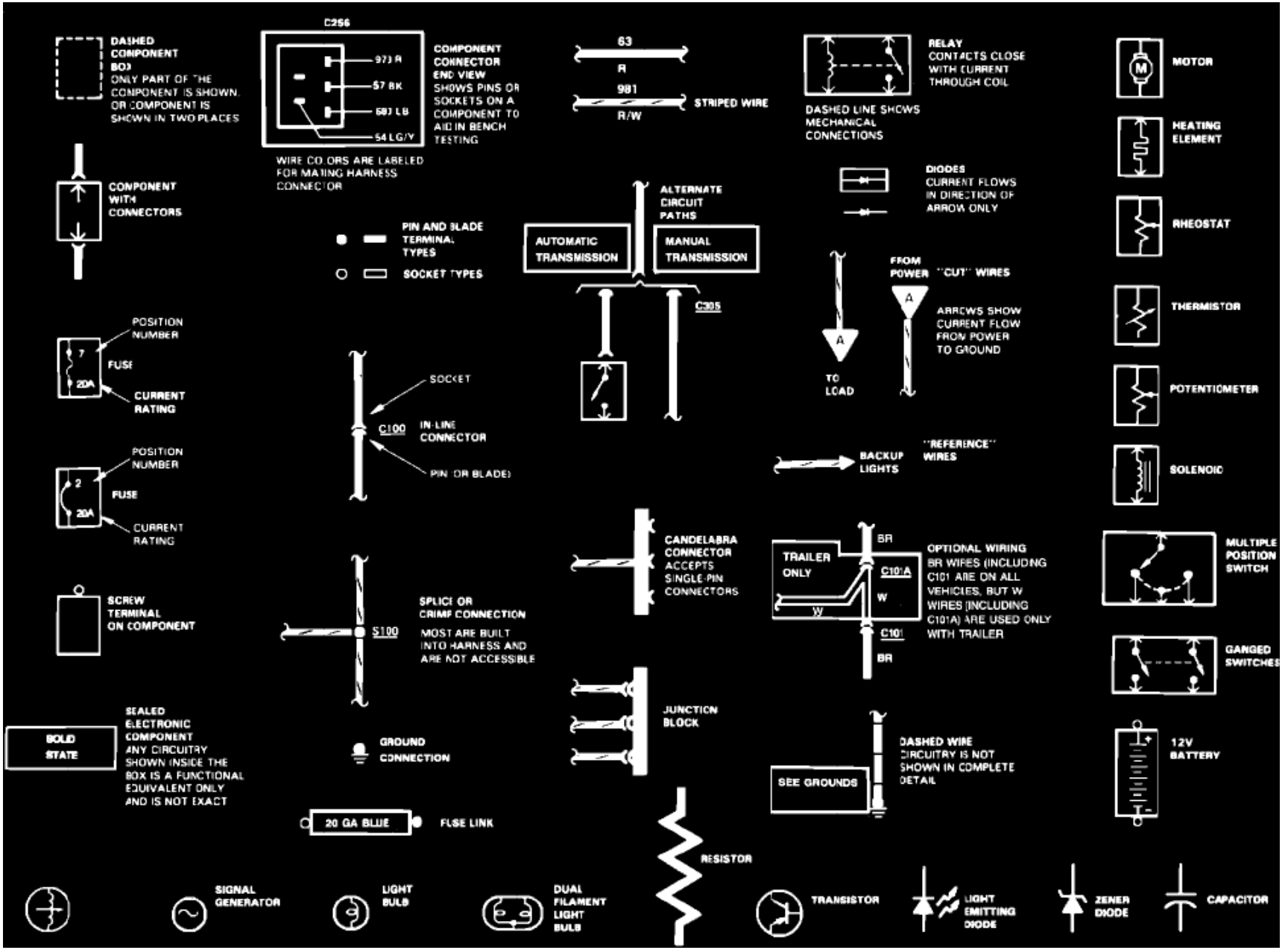
NOTE: The self test switch and indicator light is located on the Electronic Control Module.

A FLASHING INDICATOR LAMP, (approximately one flash per second), indicates control module is functioning properly.

A STEADY INDICATOR LIGHT, indicates that control module is inoperative and must be replaced.

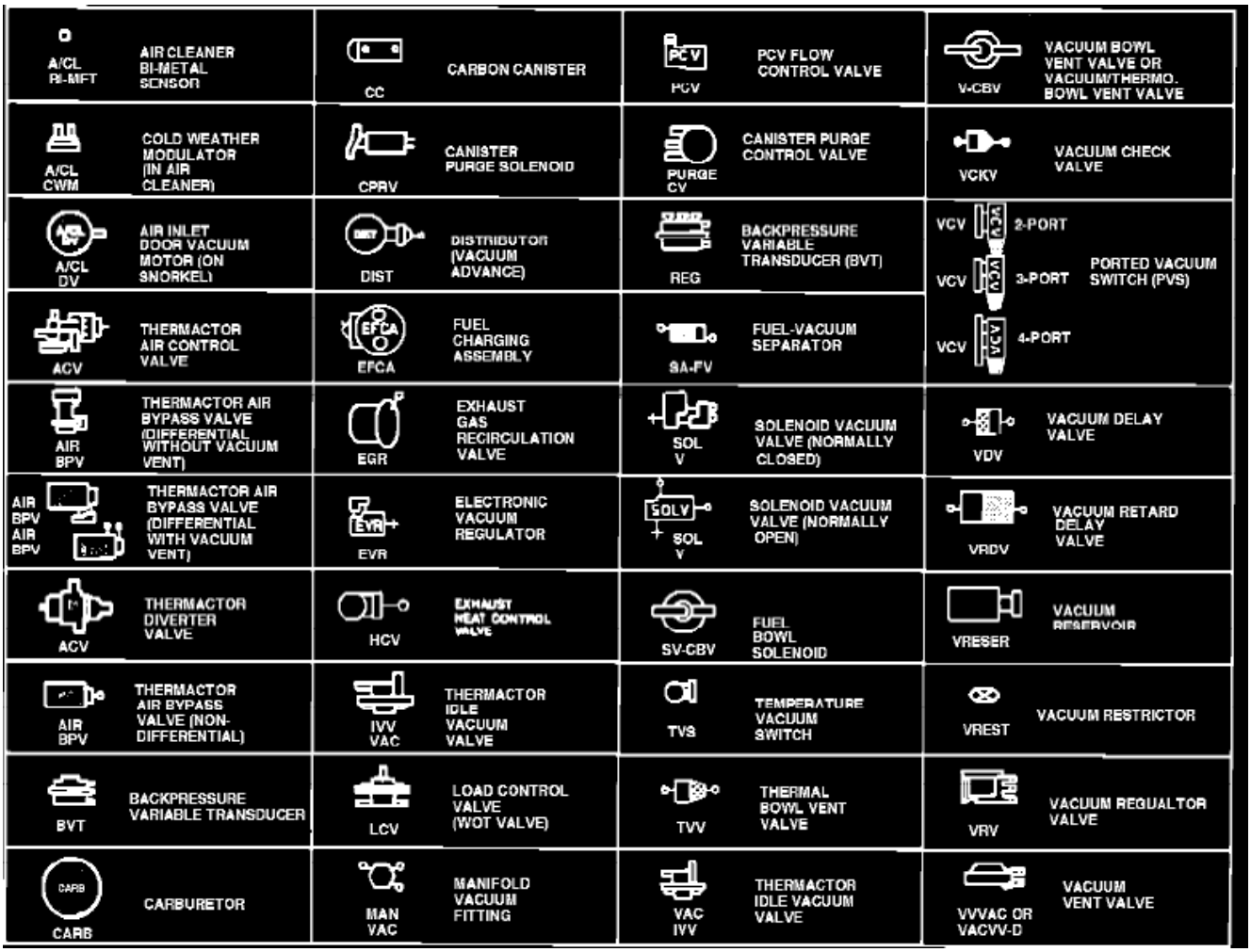
Transmission Temperature Sensor/Switch: Testing and Inspection

Pinpoint testing procedures for this component are located in the system level Testing and Inspection.

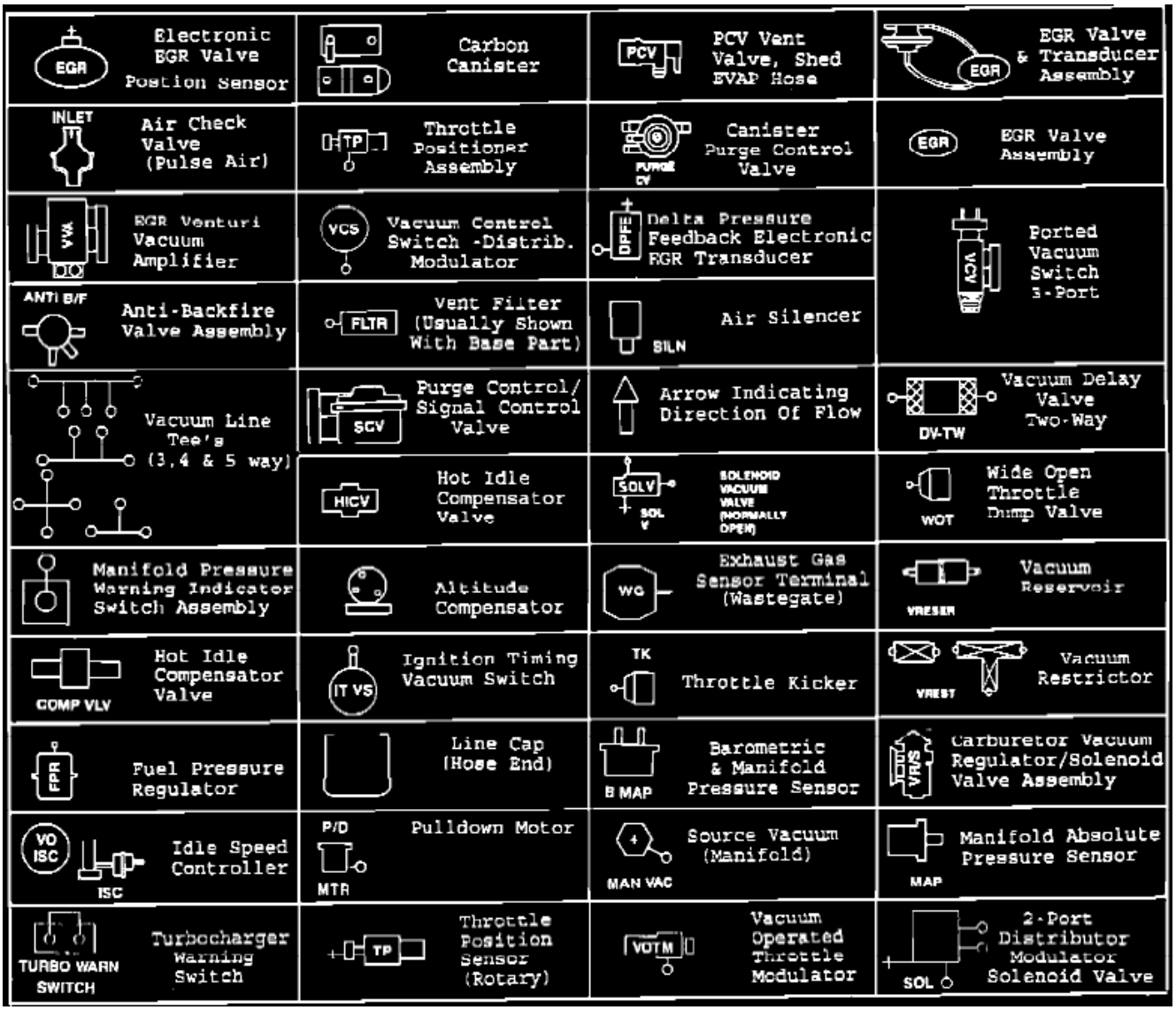


Four Wheel Drive Selector Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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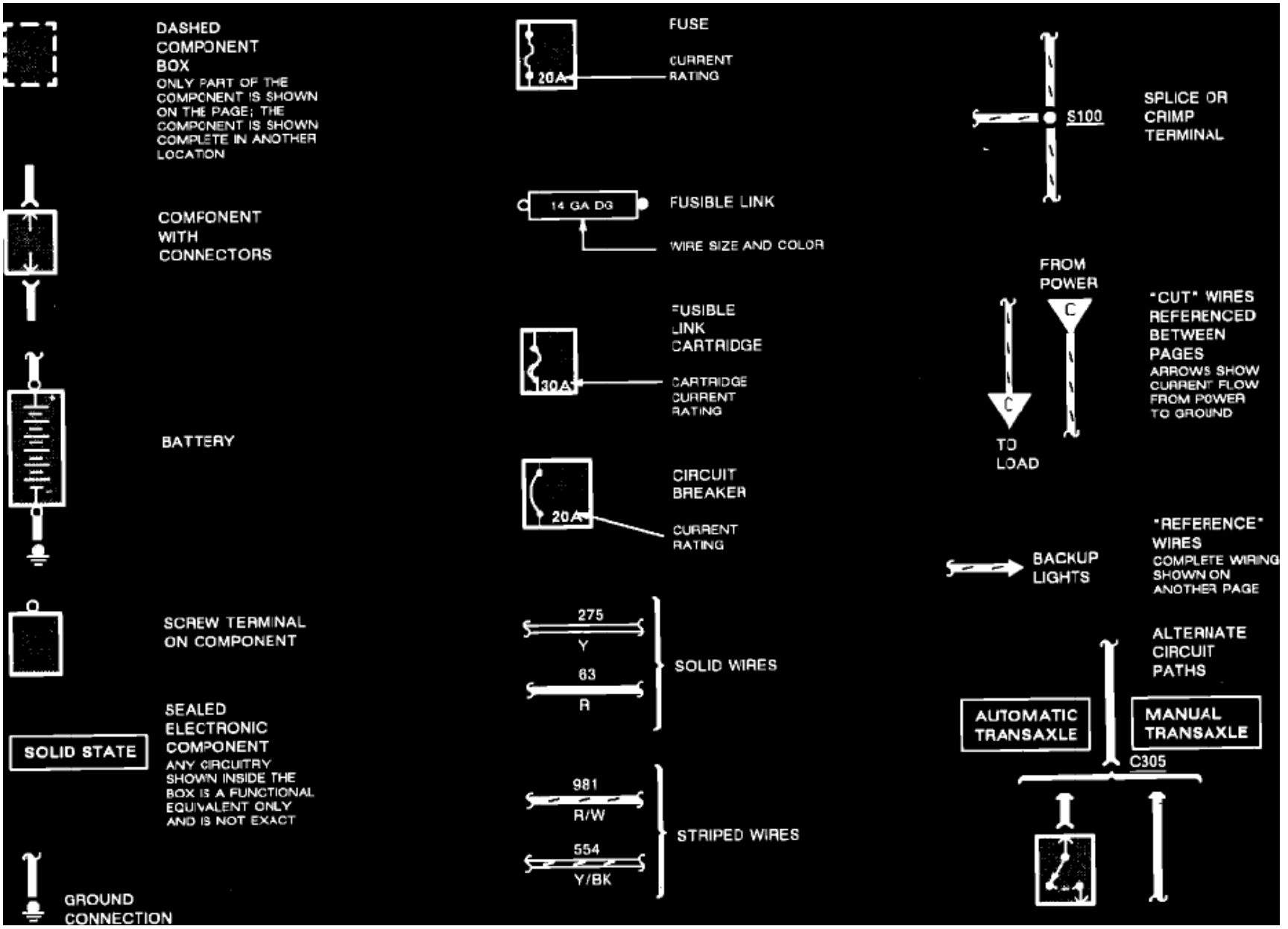
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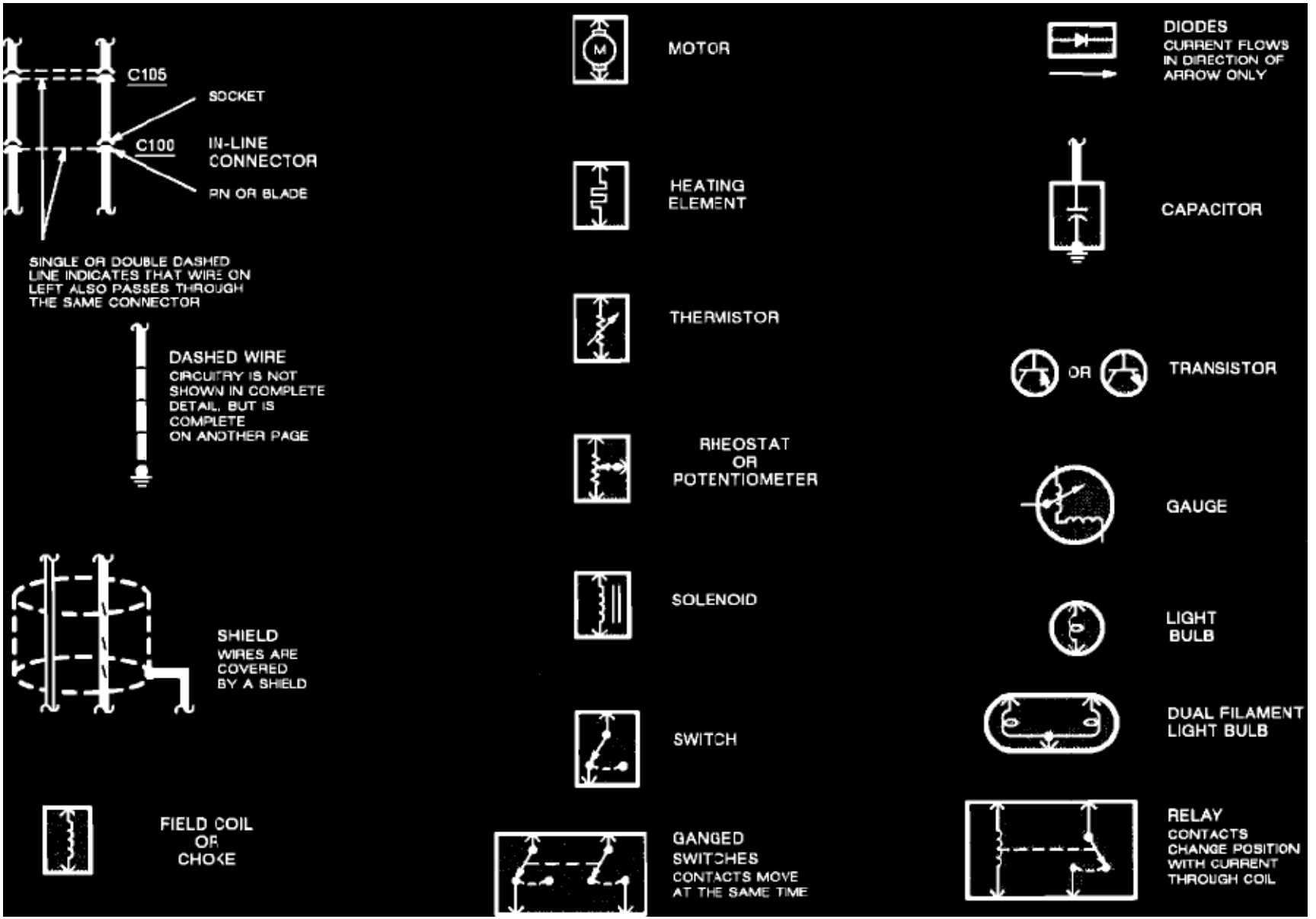

Electrical Symbols

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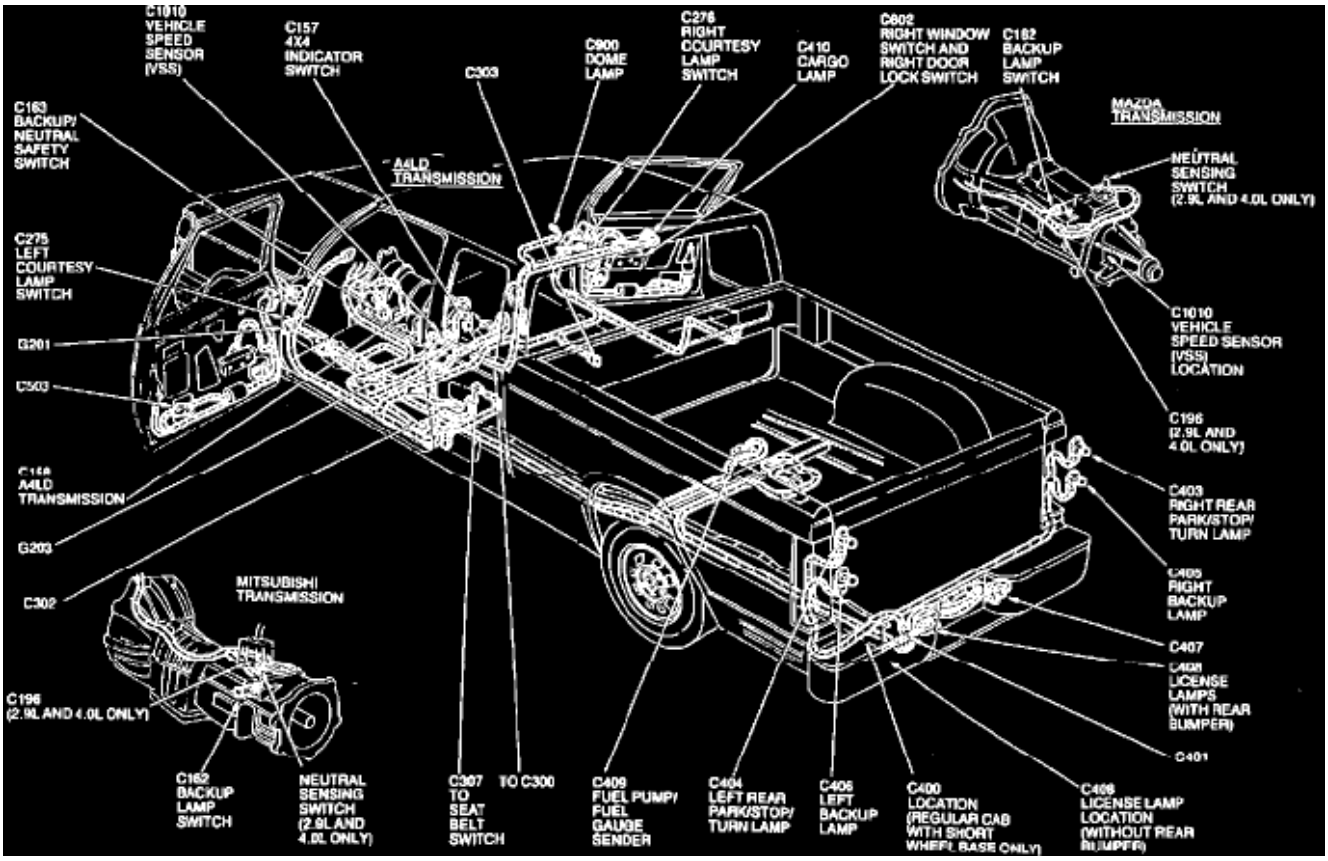
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Powertrain Management > Transmission Control Systems > Sensors and Switches - Transmission and Drivetrain > Sensors and Switches - Transfer Case > 4 X 4 Indicator Switch <--> [Gear Sensor/Switch, Transfer Case] > Component Information > Locations



4 X 4 Indicator Switch: Locations

Body Components

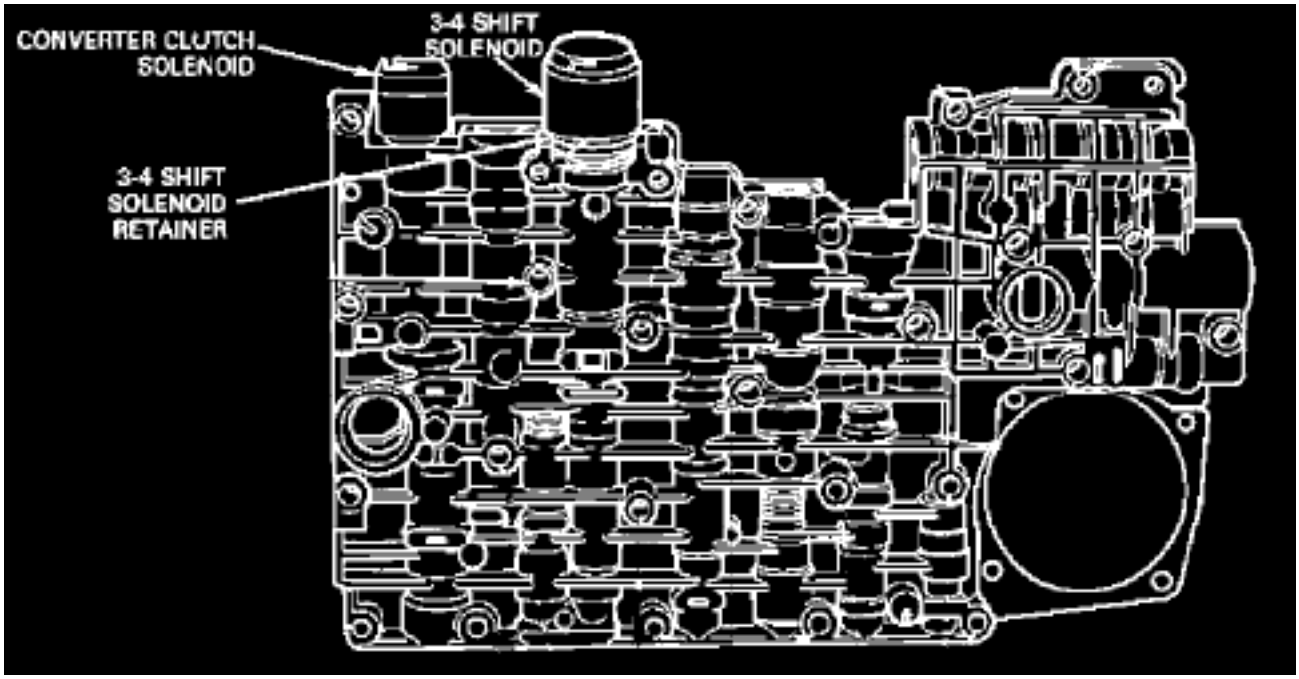
Top Front Of Transfer Case

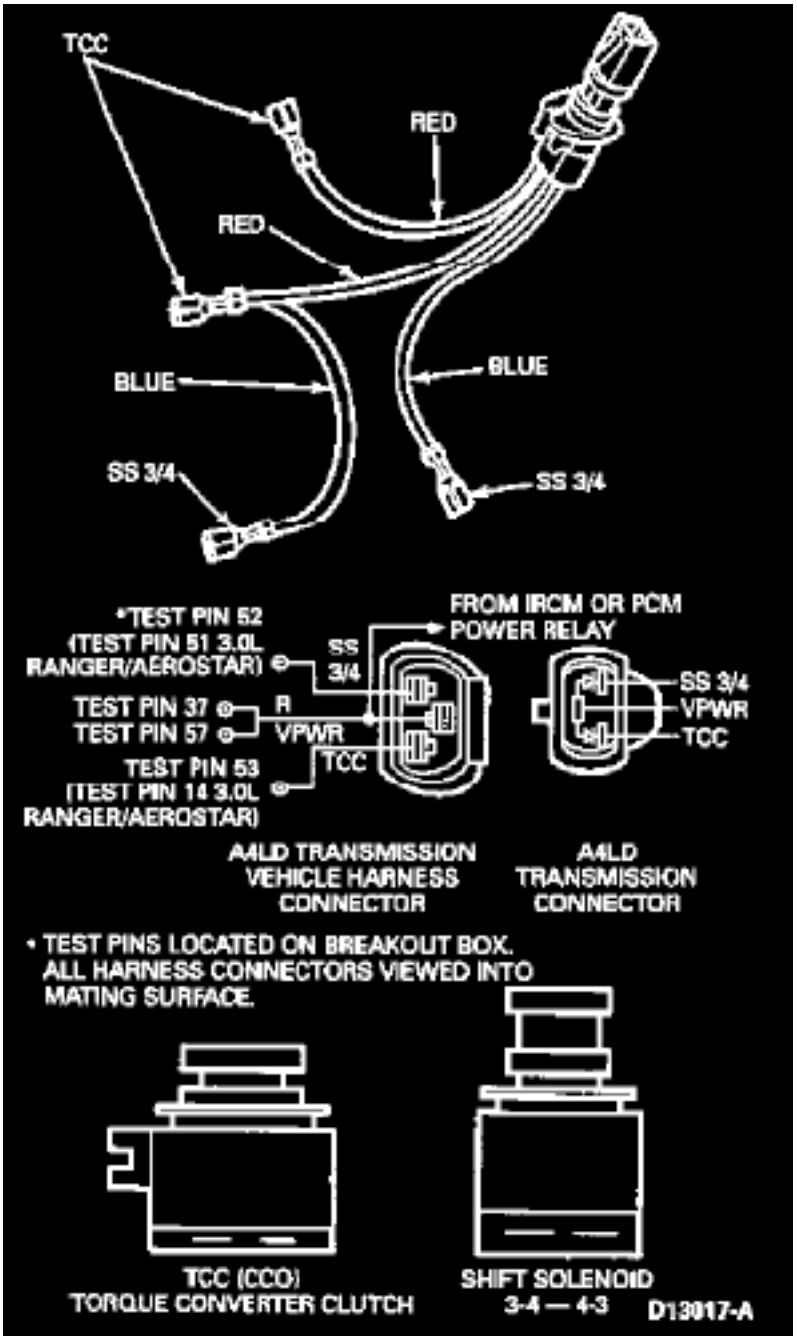
4 X 4 Indicator Switch: Description and Operation

The shift position sensor is an integral component of the electronic shift motor. The sensor inputs shift position of the transfer case to the electronic control module.

Speed Sensor: Description and Operation

The speed sensor information to the electronic control module verifies the proper speed to allow range shifts (in or out of 4-Low) to occur.


CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

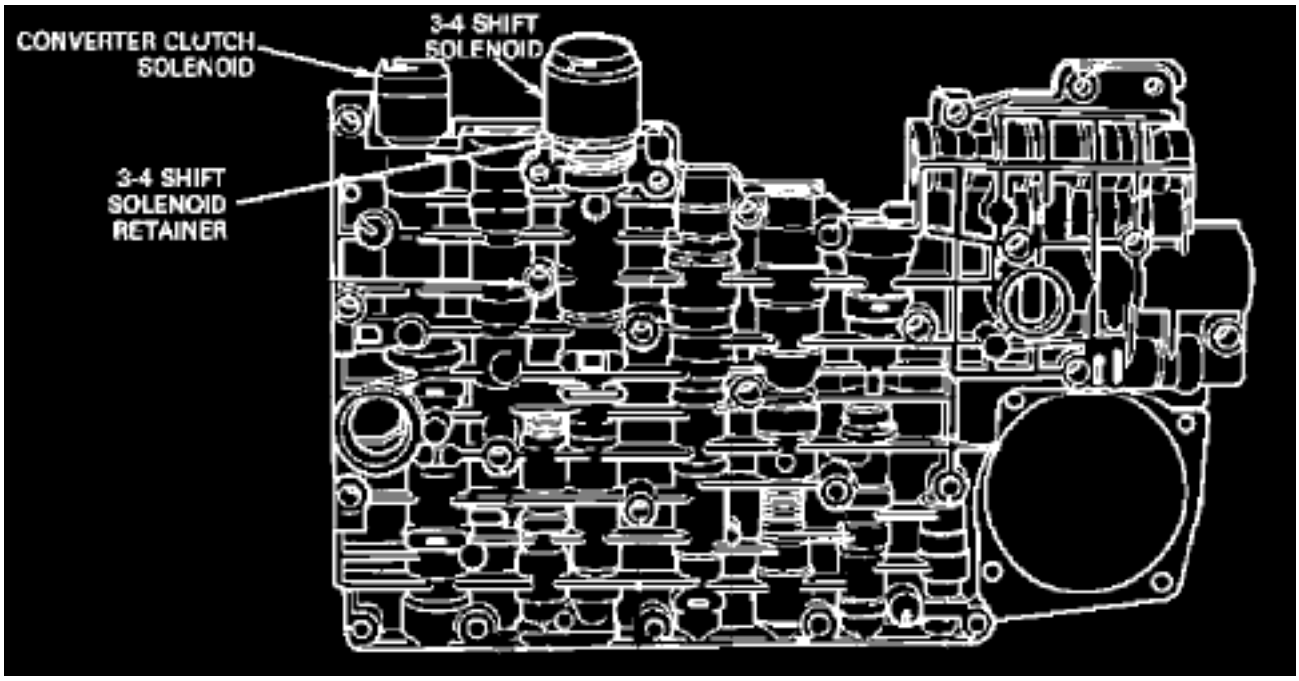


Shift Solenoid: Description and Operation

Shift Solenoid 3-4 (SS 3-4)

The 3-4 shift solenoid is used to control the 3-4/4-3 shift valve.

Transmission Function: Used to shift from third gear to fourth gear, and fourth gear to third gear.

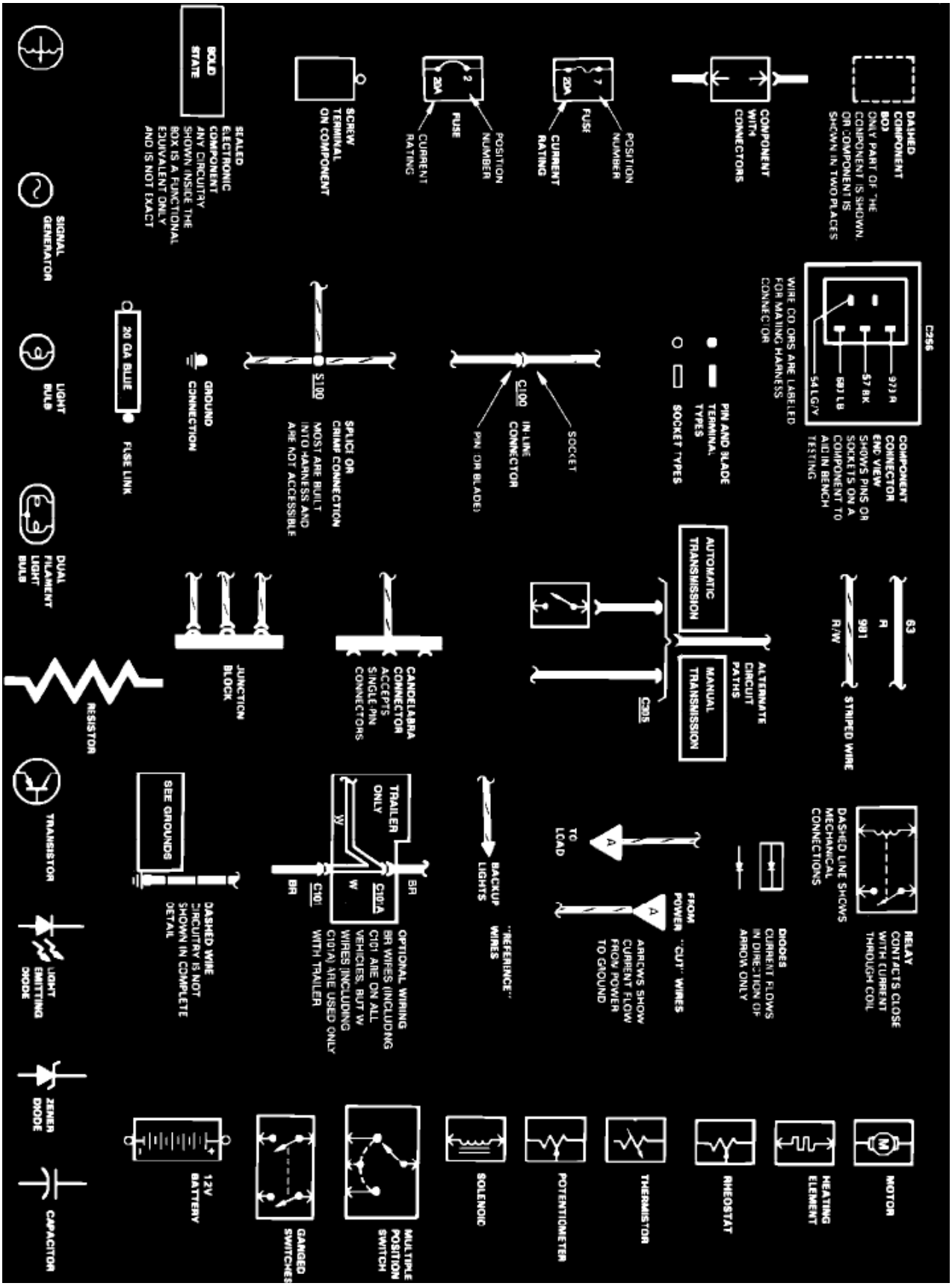

CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

Converter Clutch Override Solenoid: Description and Operation

Torque Converter Clutch Solenoid (TCC)

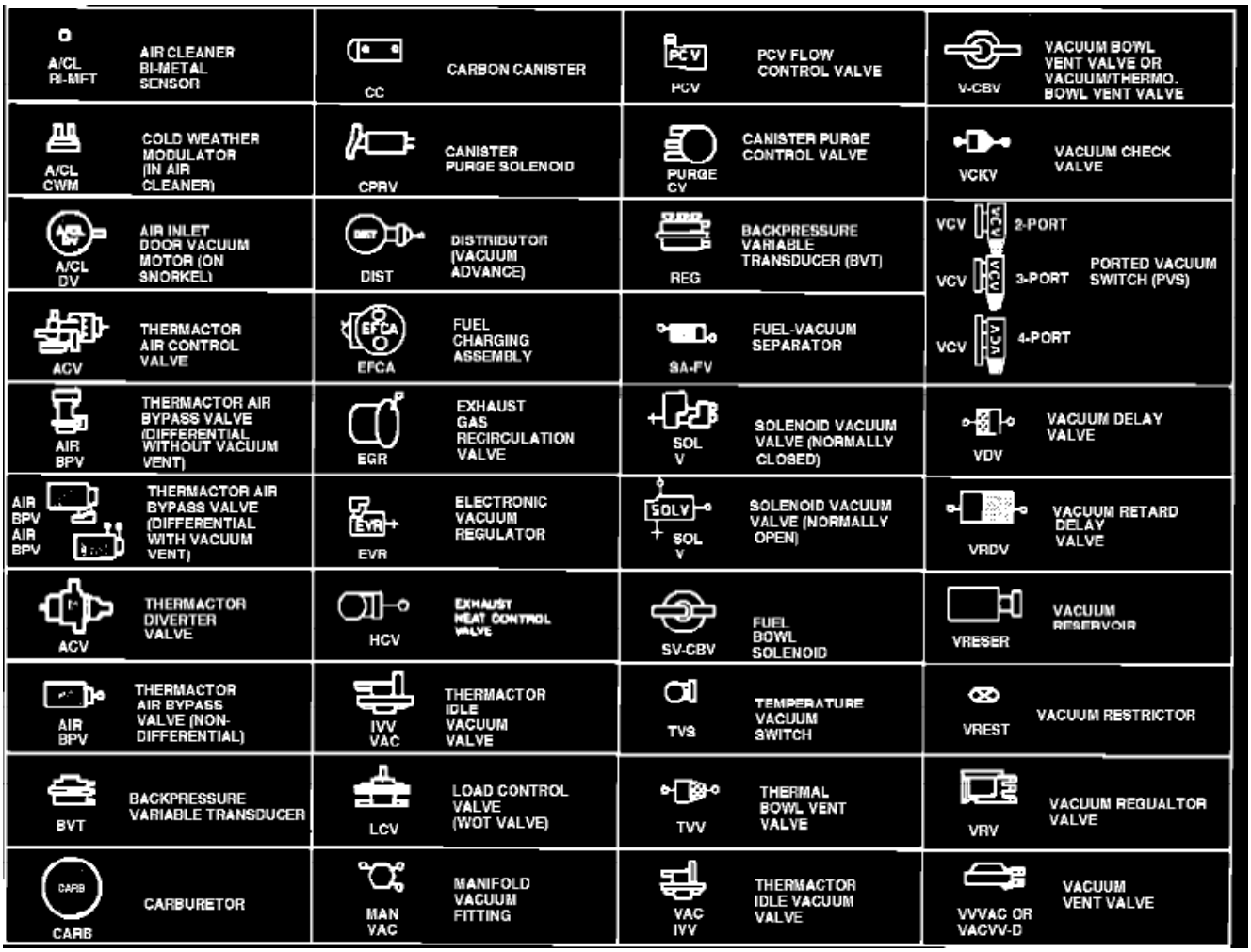
The torque torque converter clutch solenoid (TCC) is used to control the apply and release of the torque converter clutch.

Transmission Function: Used to engage the torque converter clutch.

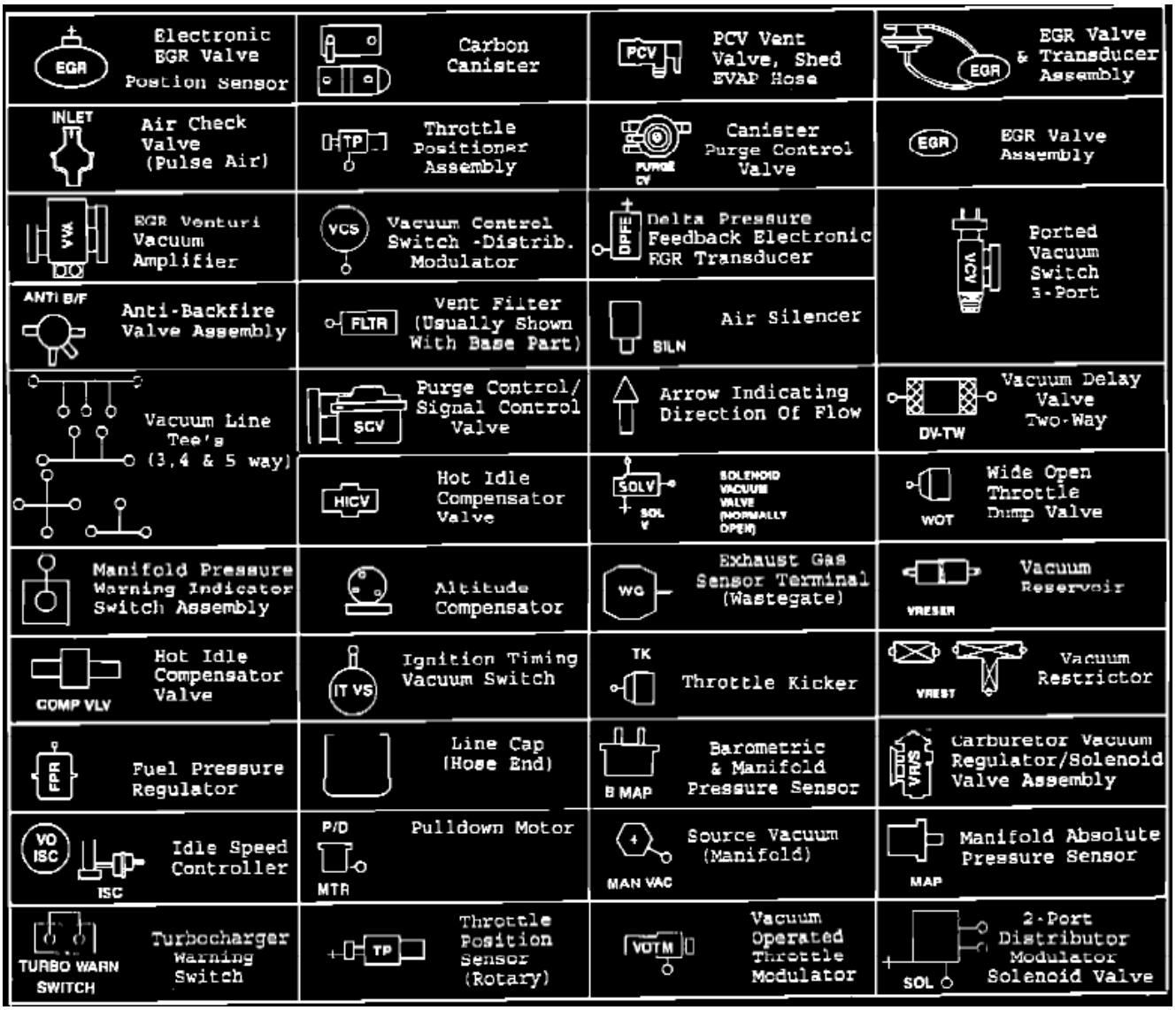


Transfer Case Actuator: Diagram Information and Instructions

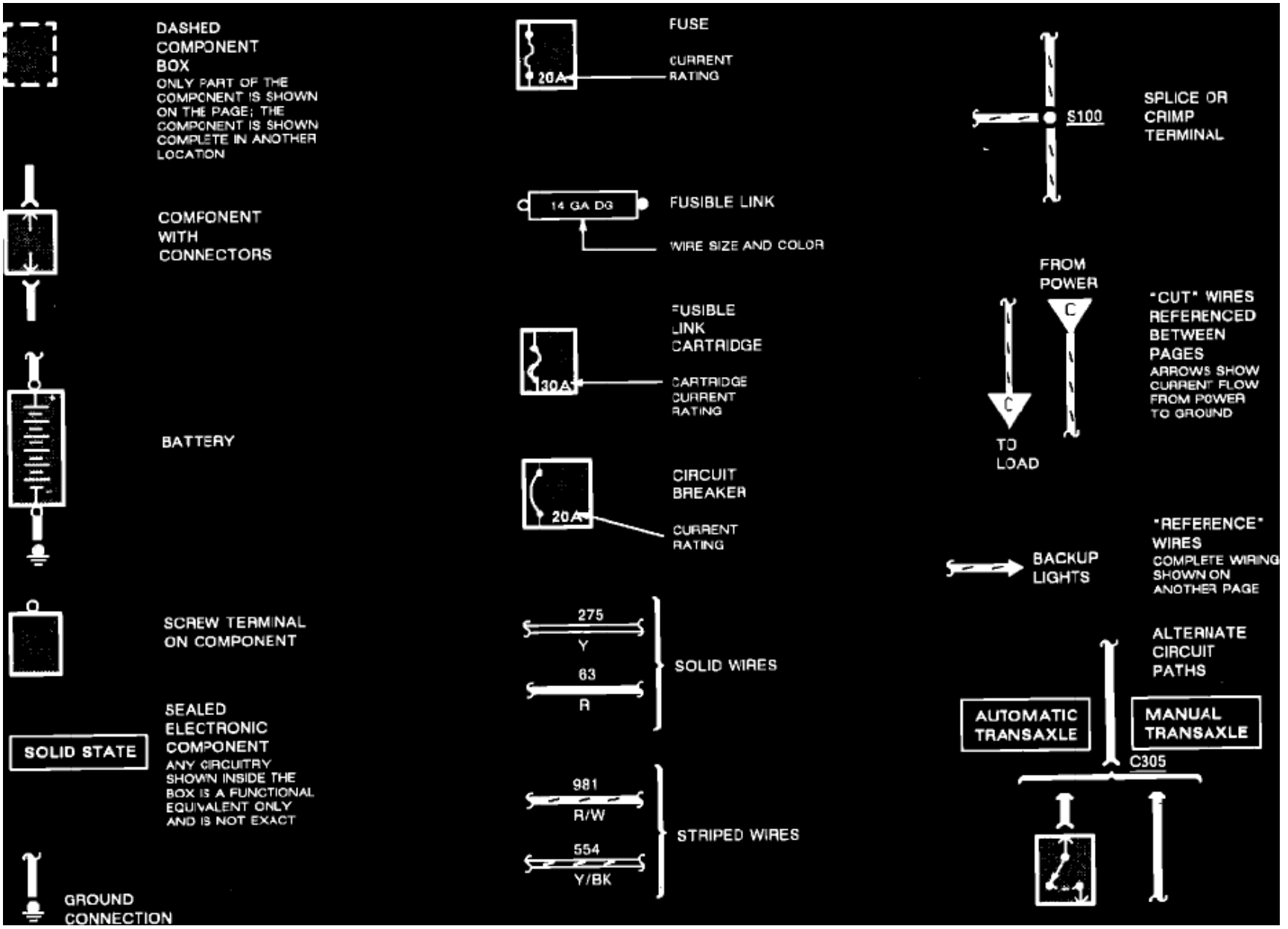
Symbol Identification

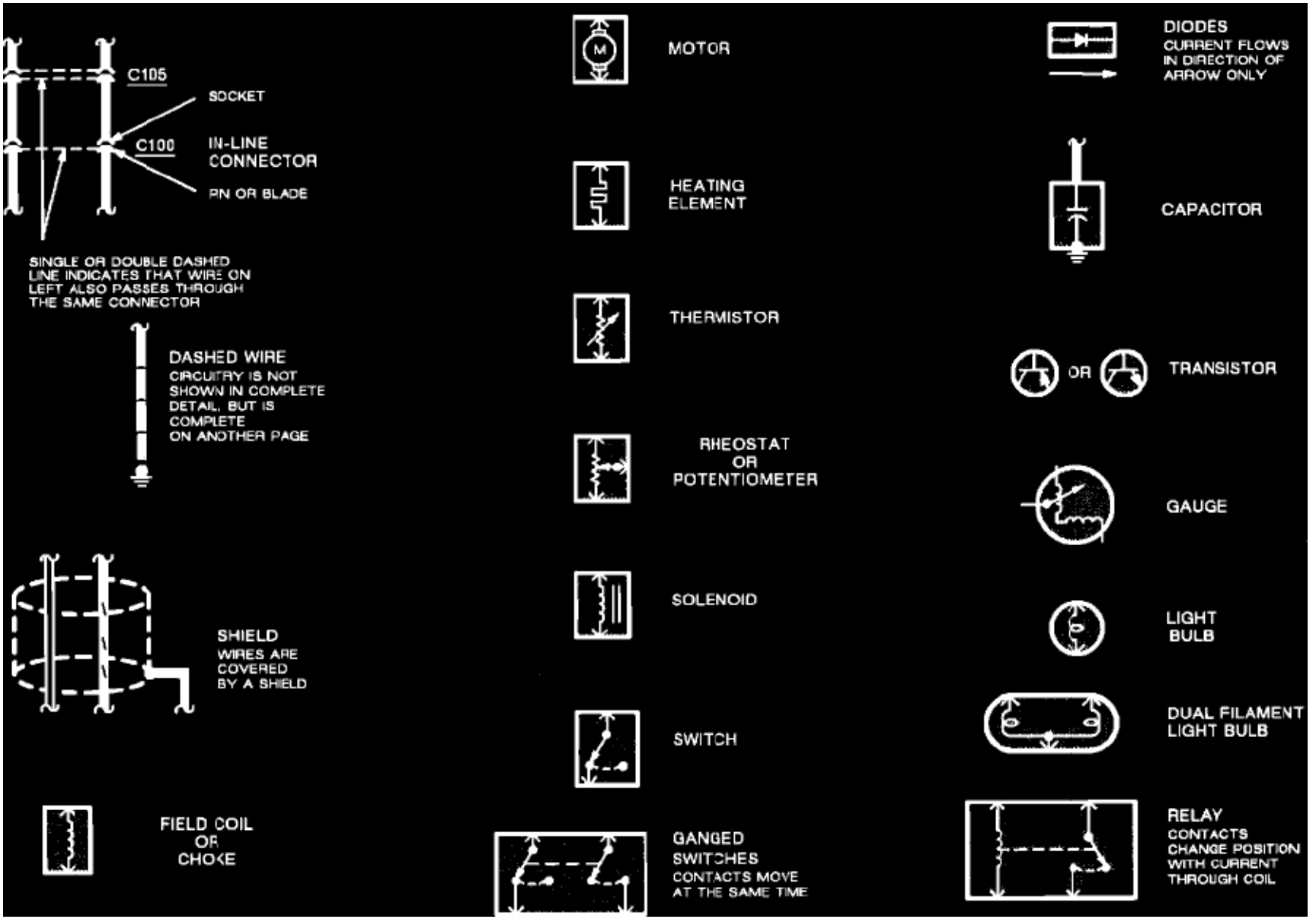


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

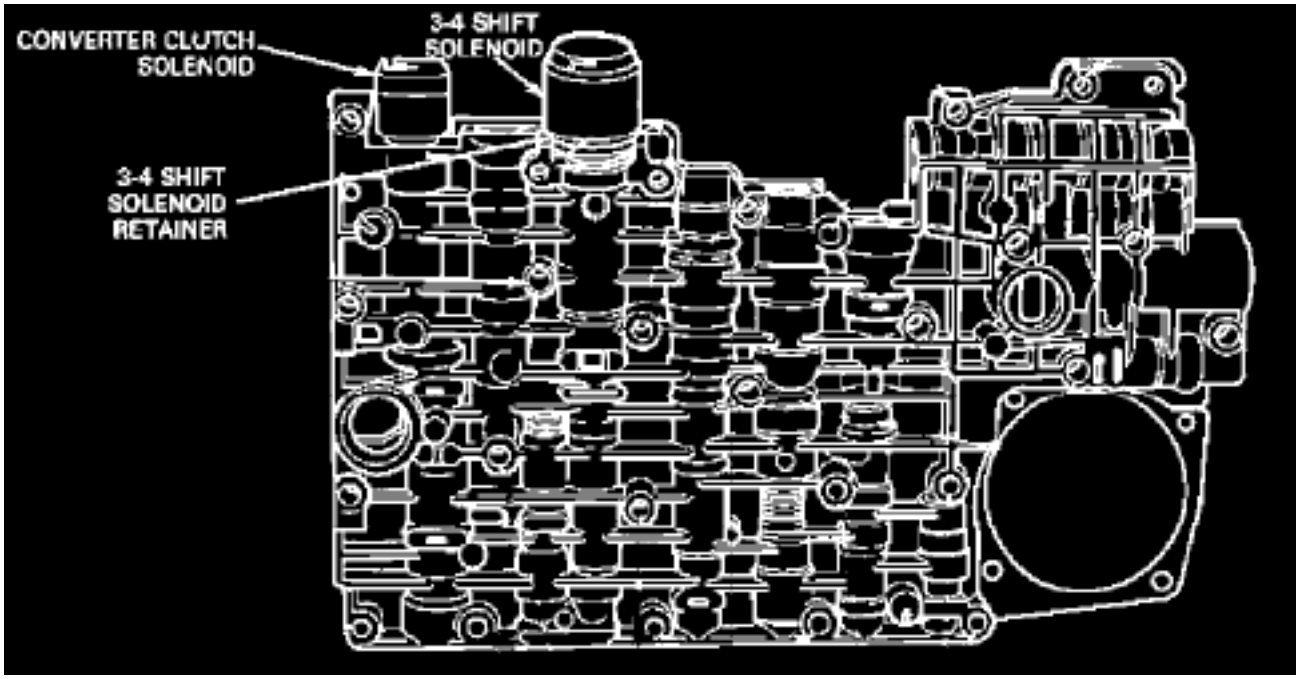
V: Violet

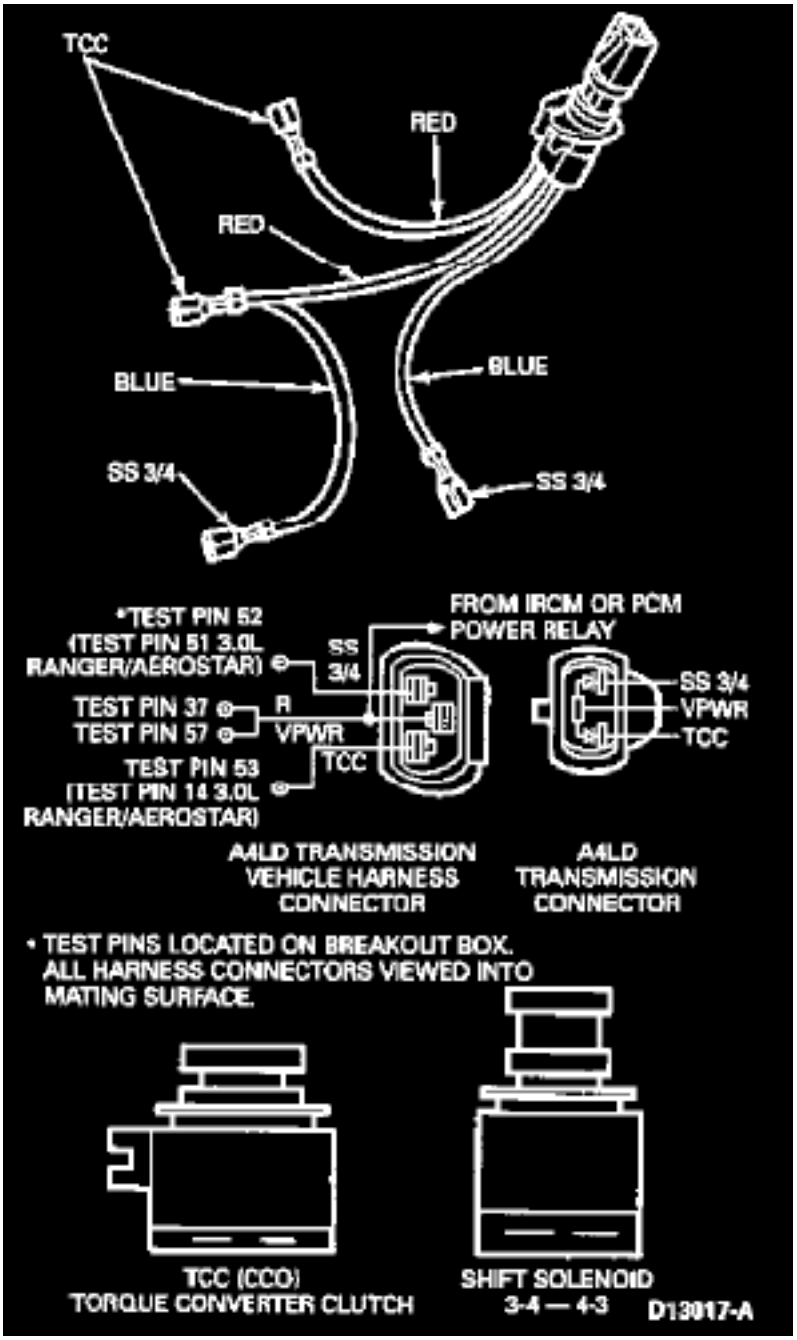
W: White

Y: Yellow

Transfer Case Actuator: Description and Operation

The electronic shift motor prompts a rotary helical cam to move the 2W-4W shift fork and 4H-4L reduction shift fork to the selected vehicle drive postion.


CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

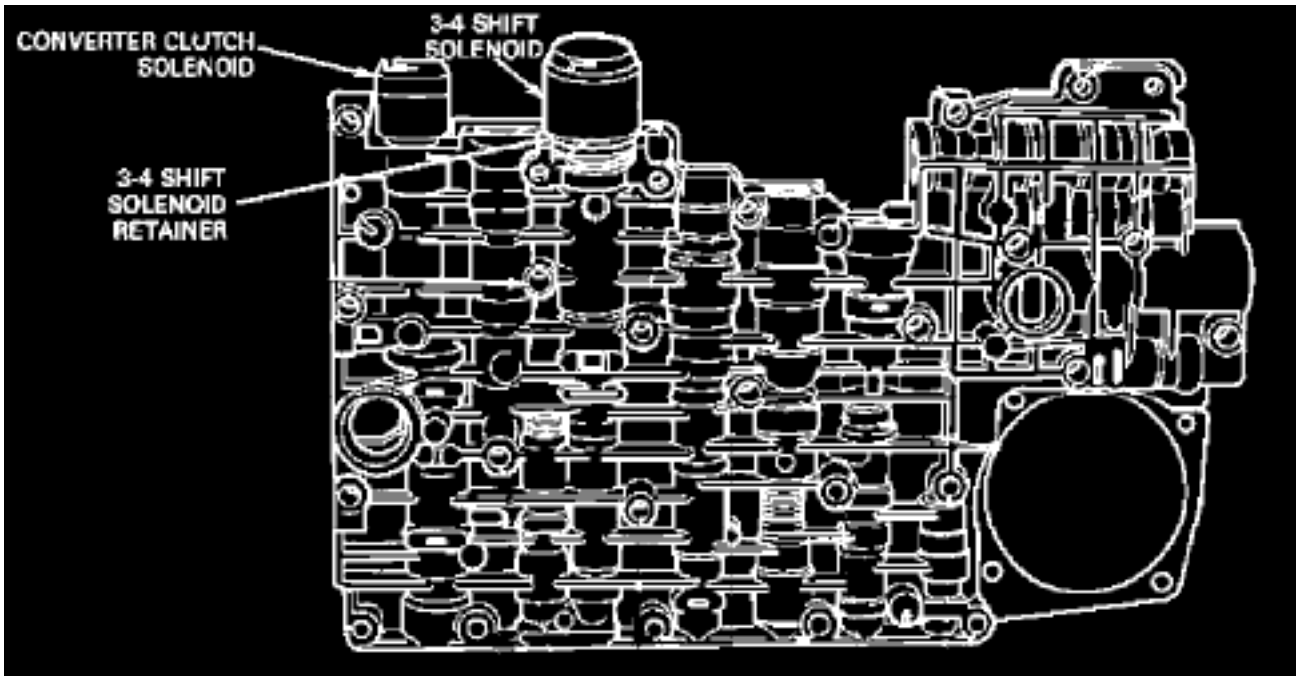


Shift Solenoid: Description and Operation

Shift Solenoid 3-4 (SS 3-4)

The 3-4 shift solenoid is used to control the 3-4/4-3 shift valve.

Transmission Function: Used to shift from third gear to fourth gear, and fourth gear to third gear.


CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

Converter Clutch Override Solenoid: Description and Operation

Torque Converter Clutch Solenoid (TCC)

The torque torque converter clutch solenoid (TCC) is used to control the apply and release of the torque converter clutch.

Transmission Function: Used to engage the torque converter clutch.

Band Apply Servo: Technical Service Bulletins A/T - A4LD Servo Cover Heat Shield

Article No. 94-6-16 Date: March 23, 1994

TRANSMISSION - A4LD-SERVO COVER HEAT SHIELD REQUIRED TO AVOID DAMAGING OVERDRIVE AND INTERMEDIATE SERVOS - VEHICLES WITH 4.0L ENGINE

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Damage to overdrive and intermediate servos may occur if the servo heat shield is not reinstalled after servicing A4LD transmissions with 4.0L engines.

ACTION: When servicing A4LD transmissions with 4.0L engines that require servo cover heat shield removal, it is necessary that this heat shield be reinstalled to deflect heat generated by the catalytic converter away from the transmission. Failure to do so may result in premature failure of the overdrive, intermediate servos and transmission.

PART NUMBER PART NAME CLASS

FOTZ-7FO13-A Servo Cover Heat Shield C

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 604000

Band Apply Servo: Service and Repair Low/Reverse Servo - With A4LD

REMOVAL

1. Raise and support vehicle. 2. Loosen oil pan attaching bolts and allow transmission fluid to drain. 3. Remove oil pan attaching bolts and oil pan. 4. Remove oil filter screen and gasket. 5. Remove low-reverse servo cover retaining screws, then the cover, servo piston, spring, and gasket.

INSTALLATION

1. Reverse procedure to install. 2. Torque oil pan attaching bolts to 98-115 in lbs.

Band Apply Servo: Service and Repair Rear Servo

1. Disconnect battery ground cable.
2. Starting from rear of pan and working toward front, loosen bolts and allow fluid to drain.
3. Remove all pan attaching bolts and pan.
4. Remove oil filter screen and gasket.
5. Remove rear servo cover, piston, spring and gasket.
6. Reverse procedure to install.

PART NUMBER	PART NAME
F5TZ-7A130-B	Center Support
F77Z-7A130-CB	Center Support
F3TZ-7L326-A	Thrust Bearing
F5TZ-7L326-A	Thrust Bearing
F5TZ-7L326-B	Thrust Bearing
F5TZ-7L326-C	Thrust Bearing
F77Z-7D014-GA	Thrust Bearing
F77Z-7D014-HA	Thrust Bearing
F77Z-7D014-KA	Thrust Bearing
F77Z-7D014-LA	Thrust Bearing

Clutch: Technical Service Bulletins A/T - A4LD/4R44E/5R55E New Center Support

Article No. 01/19/98

98-1-12

^ TRANSMISSION - 4R44E/5R55E - NEW SERVICE PART - CENTER SUPPORT - SERVICE TIP

^ TRANSMISSION - A4LD - NEW SERVICE PART - CENTER SUPPORT - SERVICE TIP

FORD: 1985-93 MUSTANG 1987-88 THUNDERBIRD

LINCOLN-MERCURY: 1987 COUGAR

LIGHT TRUCK: 1985-90 BRONCO II 1985-97 RANGER 1988-97 AEROSTAR 1991-97 EXPLORER

ISSUE: A new service Center Support that uses a thrust bearing (# 3 and # 4) in place of thrust washers has been released. The procedure used in determining rear end play and selecting the new Number 4 Thrust Bearing has been revised.

ACTION: Use the Instruction Sheet packed with the new thrust bearing center supports to determine rear end play and the correct Number 4 Thrust Bearing.

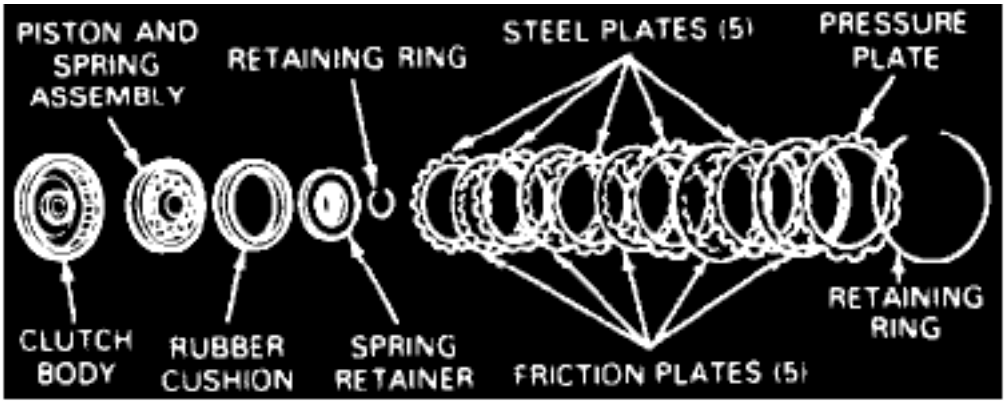
NOTE:

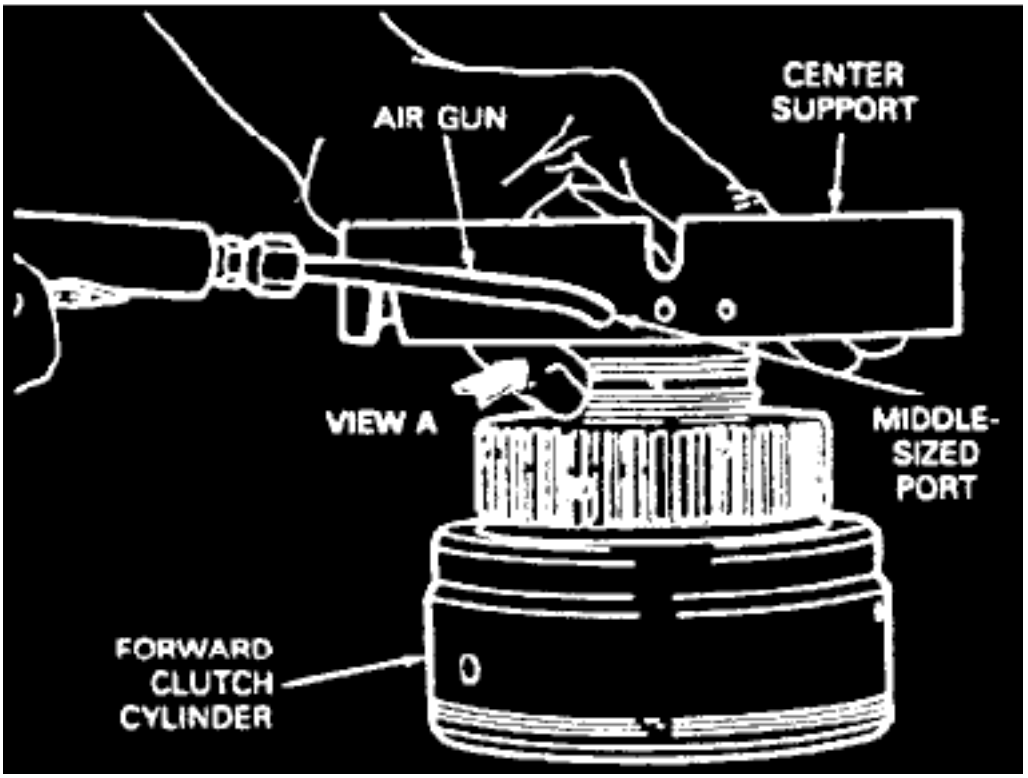
REFER TO THE LATEST VERSION SERVICE MANUAL PROCEDURE FOR DISASSEMBLY AND REASSEMBLY OF THE TRANSMISSION AS LISTED IN THE APPROPRIATE MODEL/YEAR SERVICE MANUAL.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 503000, 504000, 590000





Clutch: Service and Repair Forward Clutch

DISASSEMBLE

Exploded View Of Forward Clutch

1. Remove pressure plate retainer ring, then the plate pack. 2. Inspect steel clutch plates and clutch lining plates for wear, damage, or effects of overheating, replacing entire set if necessary.

NOTE: If new plates are to be used, immerse them in transmission fluid for 30 minutes before assembly.

Removing Forward Clutch Piston Or Air Testing Assembled Forward Clutch

3. Install center support on forward clutch cylinder, then apply no more than 20 psi air pressure to left port in center support to force piston assembly

from clutch cylinder.

Assemble

1. Install new seal rings on clutch piston. 2. Carefully install clutch piston into clutch body, a rubber cushion spring is used between the piston and steel plate. 3. Install compression spring and spring retainer, compress springs using clutch spring compressor and install retaining ring. 4. Install clutch plates beginning with a steel plate, then alternate friction and steel plates, there are five steel and five friction plates used. 5. Using feeler gauge, check clearance between retaining ring and pressure plate, pushing downward on plates while checking clearance. 6. If clearance is not 0.055-0.083 inch install corrective selective retaining ring. Retaining rings are available in thicknesses of 0.0539, 0.0681,

0.0819, and 0.0961 inch.

7. Install center support on forward clutch cylinder, then apply no more than 20 psi air pressure to left port in center support to check piston

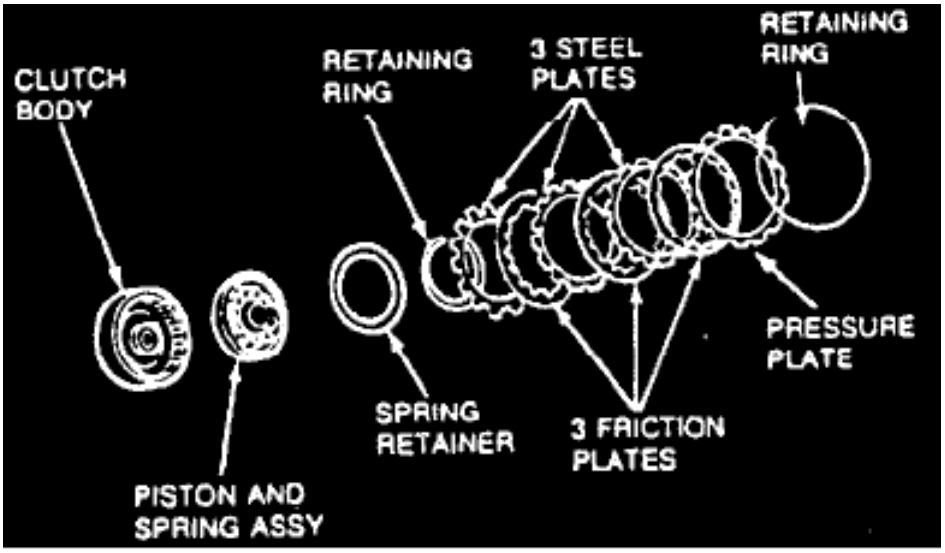
application. Piston must apply when pressurized and release when air is removed.

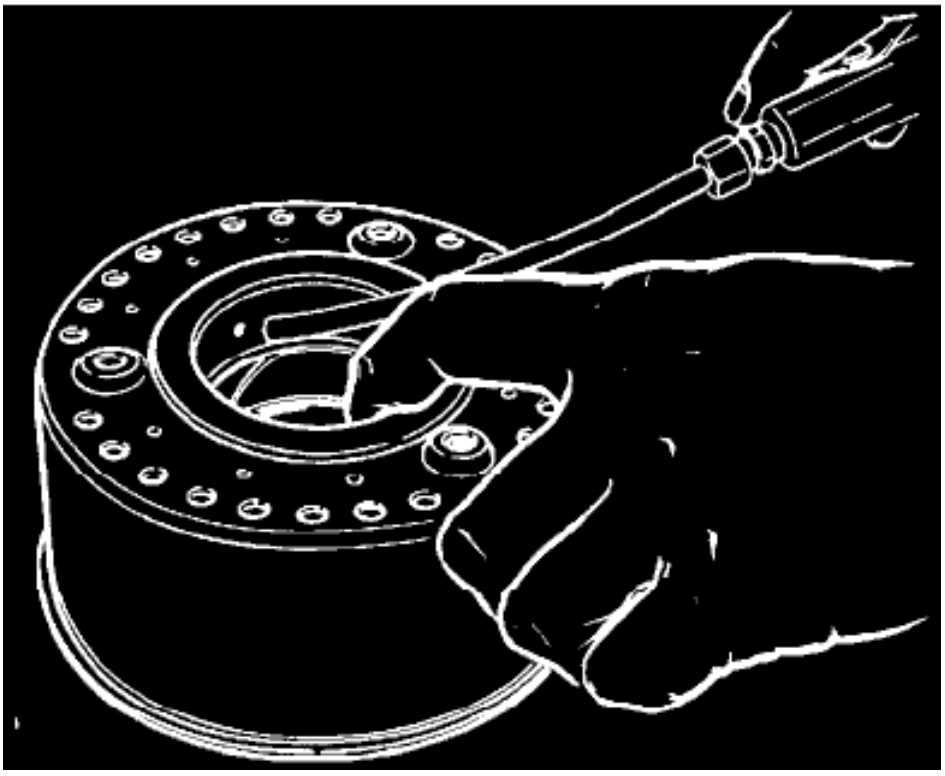
Clutch: Service and Repair One-Way Clutch, A/T

ASSEMBLE

CAUTION: Models with 4.0L engines use a sprag type one-way clutch that should not be disassembled.

1. Remove snap ring using a screwdriver, then lift out cage with springs and bearing as an assembly. 2. Inspect inner and outer races for scores or damaged surfaces where rollers contact races. 3. Inspect rollers and springs for excessive wear or damage, then the spring and roller cage for bent or damaged spring retainers. 4. Install cage with springs, then insert bearing rollers one by one and install snap ring.


CLUTCH BODY
RETAINING RING
3 STEEL PLATES
RETAINING RING
PRESSURE PLATE
SPRING RETAINER
3 FRICTION PLATES
PISTON AND SPRING ASSY



Clutch: Service and Repair Overdrive Clutch

WITH A4LD

DISASSEMBLE

Exploded View Of Overdrive Clutch

1. Remove pressure plate retainer ring, then the plate pack. 2. Inspect steel clutch plates and clutch lining plates for wear, damage, or effects of overheating, replacing entire set if necessary.

NOTE: If new plates are to be used, immerse them in transmission fluid for 30 minutes before assembly.

3. Using clutch spring compressor T65L-77515-A or equivalent, compress clutch compression springs, remove retaining ring, and carefully release

pressure on spring, then remove spring and compression spring retainer.

Removing Overdrive Clutch Piston Or Air Testing Assembled Overdrive Clutch

4. Apply no more than 20 psi air pressure to blow out clutch piston as shown in the Removing Overdrive Clutch Piston Or Air Testing Assembled

Overdrive Clutch image, using finger to close off opposite hole.

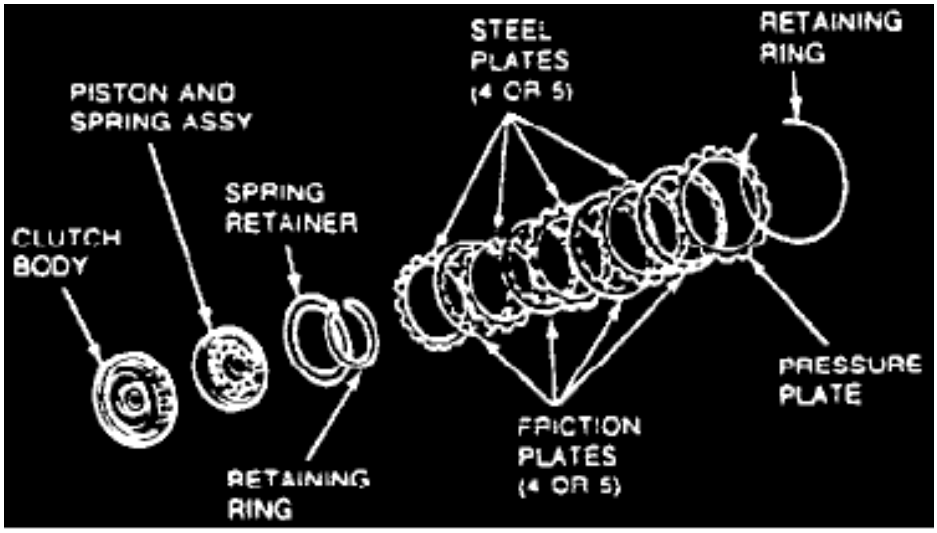
ASSEMBLE

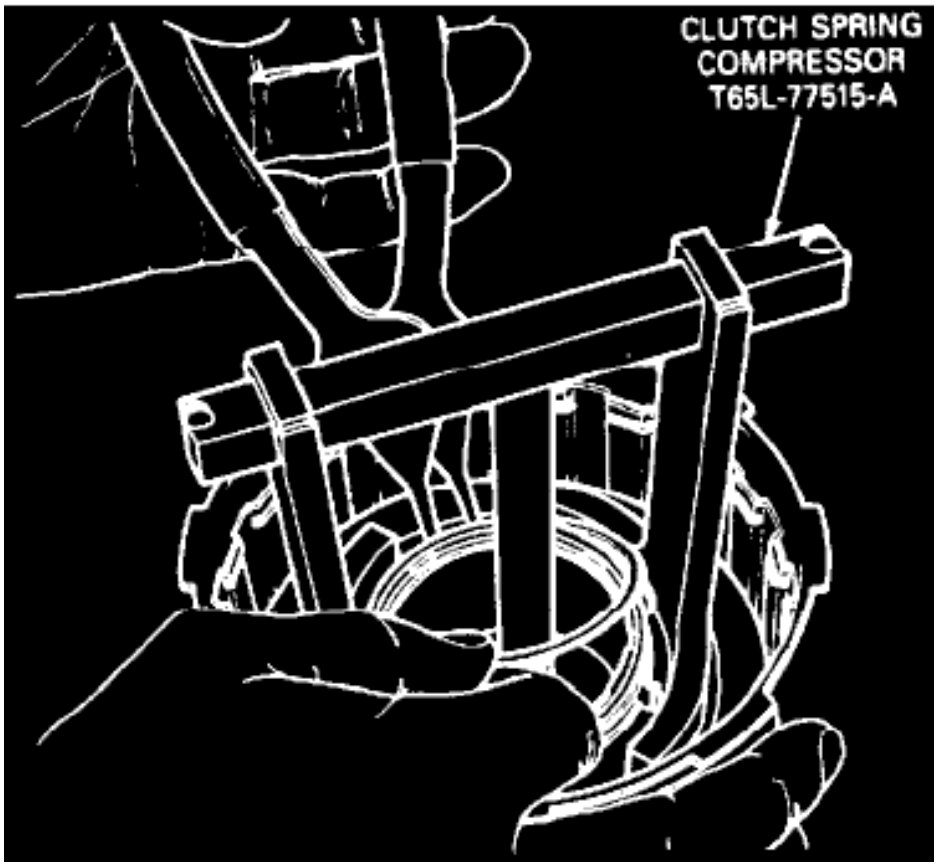
1. Install new seal rings on clutch piston. 2. Carefully install clutch piston into clutch body. 3. Install compression spring and spring retainer, compress springs using clutch spring compressor and install retaining ring. 4. Install clutch plates beginning with a steel plate, then alternate friction and steel plates. 5. Install pressure plate and secure with retaining ring. 6. Using feeler gauge, check clearance between retaining ring and pressure plate, pushing downward on plates while checking clearance. 7. If clearance is not 0.039-0.067 inch on 1988 models or 0.055-0.083 inch on 1989-1991 models, install corrective Selective retaining ring.

Retaining rings are available in thicknesses of 0.0539, 0.0681, 0.0819, and 0.0961 inch.

8. Block hole with finger to prevent air leakage, then ensure piston applies when pressurized and releases when air is stopped, as shown in the

Removing Overdrive Clutch Piston Or Air Testing Assembled Overdrive Clutch image.


STEEL PLATES (4 OR 5)
RETAINING RING
PISTON AND SPRING ASSY
SPRING RETAINER
CLUTCH BODY
PRESSURE PLATE
FRICTION PLATES (4 OR 5)
RETAINING RING


CLUTCH SPRING COMPRESSOR T65L-77515-A

Clutch: Service and Repair Reverse Clutch

DISASSEMBLE

Exploded View Of Reverse High Clutch

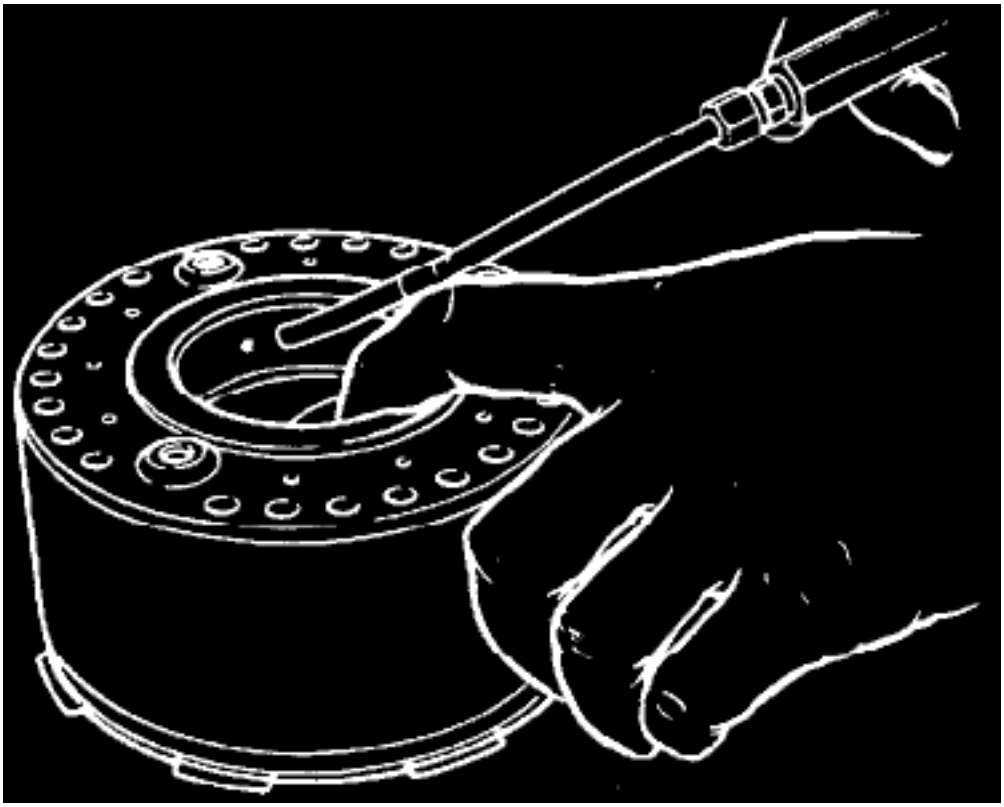
1. Remove pressure plate retainer ring, then the plate pack. 2. Inspect steel clutch plates and clutch lining plates for wear, damage, or effects of overheating, replacing entire set if necessary.

NOTE: If new plates are to be used, immerse them in transmission fluid for 30 minutes before assembly.

Removing Or Installing Reverse High Clutch Spring And Compression Spring Retainer

3. Using clutch spring compressor T65L-77515-A or equivalent, compress clutch compression springs, remove retaining ring, and carefully release

pressure on spring, then remove spring and compression spring retainer.



Removing Reverse/High Clutch Piston Or Air Testing Assembled Reverse/High Clutch

4. Apply no more than 20 psi air pressure to blow out clutch piston as shown in the Removing Reverse/High Clutch Piston Or Air Testing Assembled

Reverse/High Clutch image, using finger to close off opposite hole.

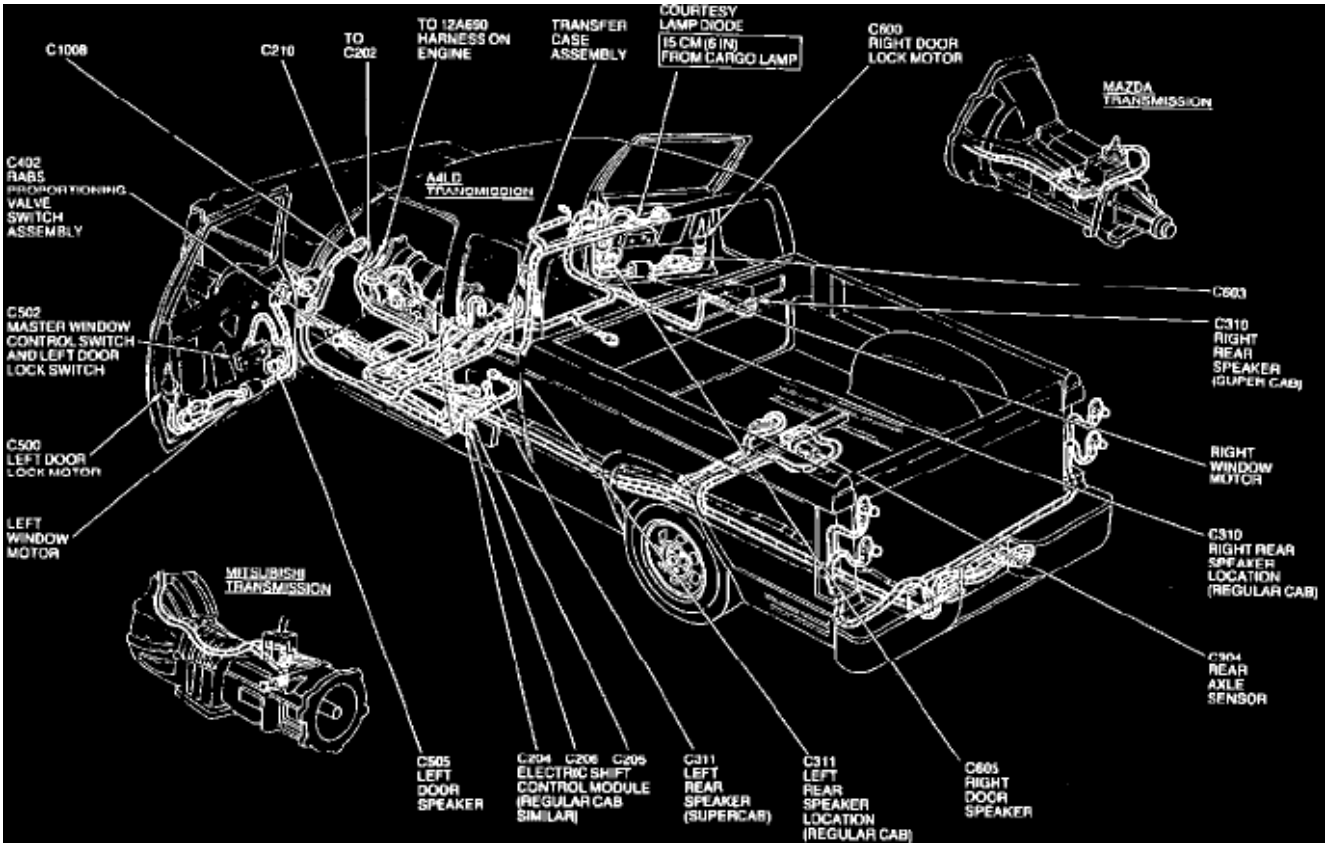
ASSEMBLE

1. Install new seal rings on clutch piston. 2. Carefully install clutch piston into clutch body. 3. Install compression spring and spring retainer, compress springs using clutch spring compressor and install retaining ring. 4. Install clutch plates beginning with a steel plate, then alternate friction and steel plates. 5. Install pressure plate and secure with retaining ring. 6. Using feeler gauge, check clearance between retaining ring and pressure plate, pushing downward on plates while checking clearance. 7. If clearance is not 0.051-0.079 inch, install corrective selective retaining ring. Retaining rings are available in thicknesses of 0.0539, 0.0681,

0.0819, and 0.0961 inch.

8. Block hole with finger to prevent air leakage, then ensure piston applies when pressurized and releases when air is stopped, as shown in the

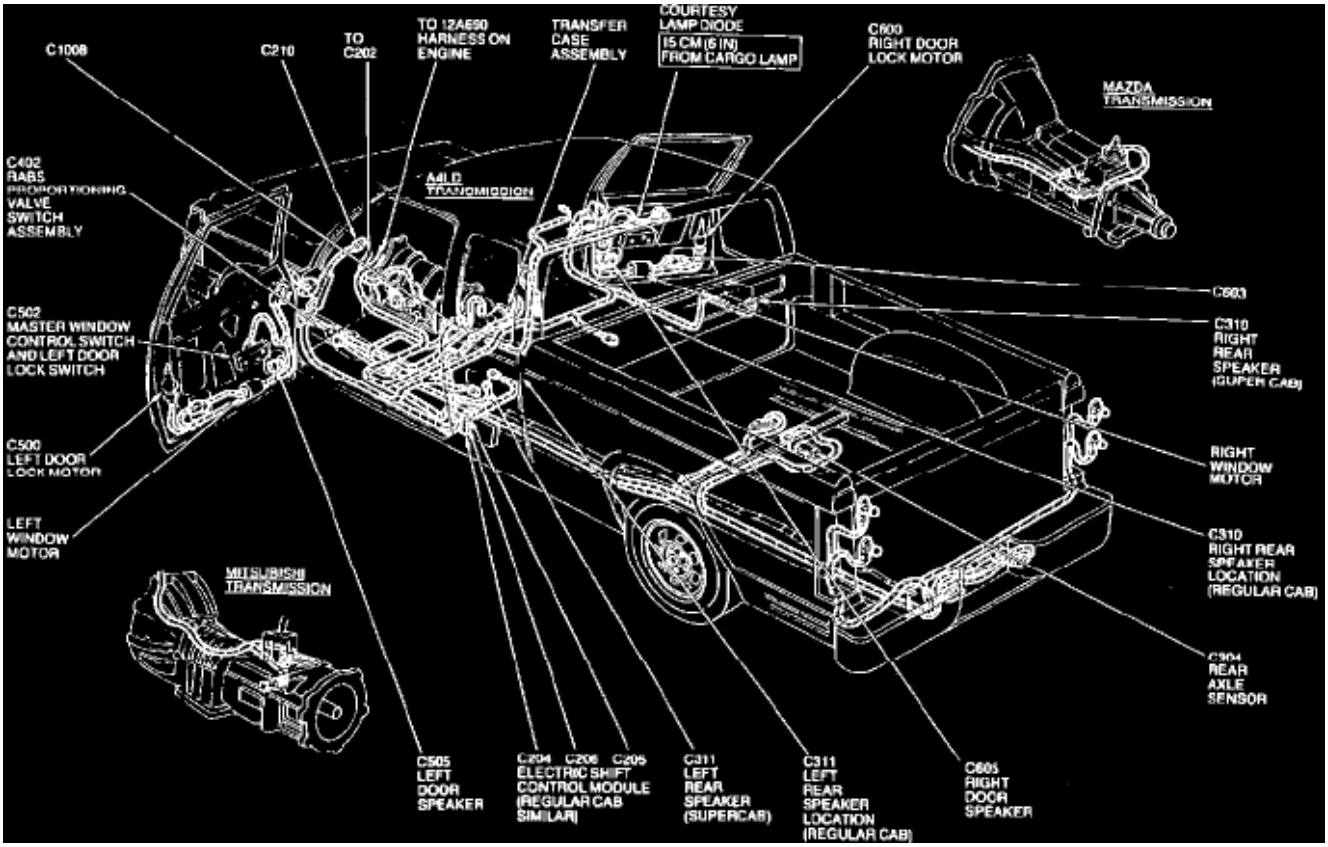
Removing Reverse/High Clutch Piston Or Air Testing Assembled Reverse/High Clutch image.



Control Module: Locations Regular Cab

Body Components

Lower LH Rear Corner Of Cab



Control Module: Locations Supercab

Body Components

Between Bottom Of LH ``B'' Pillar & Rear Of Cab

Extension Housing: Service and Repair

REMOVAL

1. Raise and support vehicle. 2. Install scribe marks on propeller shaft end yoke and rear axle companion flange, then remove propeller shaft. 3. Support transmission with suitable jack. 4. Remove speedometer cable from extension housing. 5. Remove bolts or nuts attaching rear support to crossmember. 6. Raise transmission slightly and remove rear support from extension housing. 7. Loosen extension housing attaching bolts and allow transmission to drain. 8. Remove bolts and the extension housing.

INSTALLATION

1. Reverse procedure to install, noting the following:

a. Use new extension housing gasket. b. Ensure parking pawl actuating rod is correctly seated in guide cup bore. c. Torque attaching bolts to 27-39 ft lbs.

Fluid - A/T: Technical Service Bulletins A/T - Mercon V ATF Usage

TSB 06-14-4

07/24/06

MERCON ATF IS BEING REPLACED BY MERCON V ATF AS A SERVICE FLUID.

FORD: 1980-1997 Crown Victoria 1981-1997 Mustang, Thunderbird 1981-2003 Escort 1986-1993 Festiva 1986-1997 Taurus 1989-1997 Probe 1994-1997 Aspire 1995-2000 Contour 1980-1996 Bronco 1981-2003 F-150 1981-2004 E-Series, F-Super Duty 1983-1996 Ranger 1986-1996 Aerostar 1991-1997 Explorer 1993-2004 F-53 Motorhome Chassis 1995-1998 Windstar 1997-2004 Expedition 2000-2005 Excursion 2001-2007 Escape 1987-2000 F-B-Series 2000-2007 F-650, F-750

LINCOLN: 1980-1997 Town Car 1981-1997 Continental 1993-1997 Mark VIII 1998-2004 Navigator 2002-2003 Blackwood

MERCURY: 1980-1997 Grand Marquis 1981-1997 Cougar 1986-1997 Sable 1987-1999 Tracer 1995-2000 Mystique 1999-2002 Cougar 1993-2002 Villager 1997 Mountaineer 2005-2007 Mariner

MERKUR: 1985-1989 XR4TI

This article supersedes TSB 01-15-7 to update the vehicle application chart.

ISSUE MERCON(R) Automatic Transmission Fluid is being replaced by MERCON(R) V as a service fluid.

ACTION Beginning immediately all automatic transmission / transaxle applications requiring MERCON(R) can now be serviced using MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON(R) / MERCON(R) V. After July 1, 2007, MERCON(R) Automatic Transmission Fluid will no longer be manufactured, therefore, availability of this fluid will only continue for however long it takes to deplete what remains in inventory.

SERVICE PROCEDURE

AUTOMATIC TRANSMISSION FLUID CHART

Specific service fluids (listed to the right) are called for depending on the type of transmisson and the year the transmission was built. It is important to use the correct fluid, each fluid exhibits different properties and should be used only in the transmisson for which they were designed. The vehicle owner or rebuilder should use the type of fluid printed in the owners guide or on the automatic transmission fluid level indicator. Refer to your scheduled maintenance guide to determine the correct service interval. Failure to use the recommended fluid may affect transmisson performance and durability.

CAUTION:
DO NOT USE SUPPLEMENTAL TRANSMISSION FLUID ADDITIVES, TREATMENTS OR CLEANING AGENTS. The use of these materials may affect transmission operation and result in damage to internal transmission components.

CAUTION:
MERCON® SP, Motorcraft® Premium Automatic Transmission Fluid and Motorcraft® M5 ATF's are unique fluids and MUST be used in applications recommending that particular fluid. Use of any other fluid may cause reduced functionality or transmission damage.

CAUTION:
The functional characteristics of fluids for the CVT transmissions are very different than those of other ATF's. Use of a fluid other than Motorcraft® Continuously Variable Chain Type Transmission Fluid or one labeled as meeting MERCON® C may cause severe transmission damage.

FAILURE TO USE RECOMMENDED FLUID WILL AFFECT TRANSMISSION PERFORMANCE. REFER TO OWNERS MANUAL AND/OR FLUID LEVEL INDICATOR FOR PROPER FLUID TYPE.

V **MERCON® V**
- Part number XT-5-QM (Quarts) and XT-5-DM (55 Gallon Drum) Ford Specification is MERCON® V.

NOTE: AUTOMATIC TRANSMISSIONS REQUIRING MERCON® V SHOULD ONLY BE SERVICED WITH MERCON® V, OR FLUID FROM A CONTAINER THAT IS SPECIFIED AS A DUAL USAGE FLUID: MERCON®/MERCON®V.

SP **MERCON® SP**
- Part number XT-6-QSP (Quarts) and XT-6-DSP (55 Gallon Drum) Ford Specification is MERCON® SP.

CVT **CONTINUOUSLY VARIABLE CHAIN TYPE**
- Part number XT-7-QCFT (Quarts)

P **PREMIUM AUTOMATIC TRANSMISSION FLUID**
- Part number XT-8-QAW.

M5 **MAZDA SPECIFIC FLUID**
- Part number XT-9-QMM5.

V M **MERCON® - Part number XT-2-QDX (Quarts) and XT-2-DDX (55 Gallon Drum) or,**
MERCON® V - Part number XT-5-QM (Quarts) and XT-5-DM (55 Gallon Drum)
NOTE: AUTOMATIC TRANSMISSIONS REQUIRING MERCON® CAN NOW BE SERVICED WITH MERCON®, MERCON® V, CR, DUAL USAGE FLUIDS LABELED MERCON®/MERCON®V.

TB-8592-D

Figure 1

Service automatic transmissions requiring MERCON(R) with MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON(R) / MERCON(R) V

For proper fluid application on current and past model vehicles equipped with automatic transmissions I transaxles refer to the fluid usage chart. (Figure 1)

CAUTION

AUTOMATIC TRANSMISSIONS / TRANSAXLES THAT REQUIRE MERCON® V SHOULD STILL ONLY USE MERCON(R) V OR DUAL USAGE FLUID LABELED MERCON(R) / MERCON(R) V.

PART NUMBER	PART NAME
XT-2-QDX	MERCON® (Quart)
XT-2-DDX	MERCON® (55 Gal. Drum)
XT-5-QM	MERCON® V (Quart)
XT-5-DM	MERCON® V (55 Gal. Drum)

NOTE: The information in Technical Service Bulletins is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. It informs these technicians of conditions that may occur on some vehicles, or provides information that could assist in proper vehicle service. The procedures should not be performed by "do-it-yourselfers". Do not assume that a condition described affects your car or truck. Contact a Ford, Lincoln, or Mercury dealership to determine whether the Bulletin applies to your vehicle.

CAUTION

MERCON(R) SP, MOTORCRAFT PREMIUM AUTOMATIC TRANSMISSION FLUID AND MOTORCRAFT M5 ATFS ARE UNIQUE FLUIDS AND MUST BE USED IN APPLICATIONS RECOMMENDING THAT PARTICULAR FLUID.

USE OF ANY OTHER FLUID MAY CAUSE REDUCED FUNCTIONALITY OR TRANSMISSION DAMAGE.

CAUTION

THE FUNCTIONAL CHARACTERISTICS OF FLUIDS FOR CVT TRANSMISSIONS ARE VERY DIFFERENT THAN THOSE OF OTHER AUTOMATIC TRANSMISSION FLUIDS (ATFS).

USE OF A FLUID OTHER THAN MOTORCRAFT CONTINUOUSLY VARIABLE CHAIN TYPE TRANSMISSION FLUID OR ONE LABELED AS MEETING MERCON(R) C WILL CAUSE FUNCTIONALITY CONCERNS AND INTERNAL TRANSMISSION DAMAGE.

CAUTION

DO NOT USE AUTOMATIC TRANSMISSION FLUID SUPPLEMENTS, ADDITIVES, TREATMENTS OR CLEANING AGENTS.

Parts Block

WARRANTY STATUS: Information Only

Disclaimer

Fluid - A/T: Specifications

TYPE MA

CAPACITY, Initial Refill*: C-6 (shallow pan) 5.0 qt (US)

With the engine at operating temperature, shift

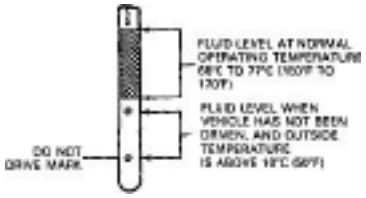
transmission through all gears. Check fluid level in PARK

and add fluid as needed

C-6 (deep pan) 6.0 qt (US)

E40D 8.5 qt (US)

Others 3.0 qt (US)



Fluid - A/T: Testing and Inspection Fluid Level Check

CHECKING OIL LEVEL

1. With transmission in Park, engine at curb idle RPM, foot brakes applied, and vehicle on a level surface, move transmission selector lever through

each range. Allow time in each range for transmission to engage, then return to Park and apply parking brake fully.

NOTE: If vehicle has been operated for an extended period at high speed, in city traffic during hot weather, or pulling a trailer, the vehicle should be turned off for about 30 minutes to allow the fluid to cool before checking.

NOTE: Vehicles equipped with 4X4 applications must have the 4X4 shift selector in any position other than neutral.

CAUTION: Your vehicle should not be driven if the fluid level is below the bottom hole on the dipstick and outside temperatures are above 10°C (50°F).

2. Clean all dirt from transmission dipstick cap. 3. Pull dipstick out of filler tube, wipe clean, and push dipstick back all the way into the filler tube, ensuring it is full seated. 4. Pull dipstick out of tube again and check fluid level as follows:

a. With transmission at operating temperature, 150° F-170° F, fluid level should be within the cross hatched area. b. With transmission at room temperature, 70° F-95° F, fluid should be between middle and top holes.

5. If it is necessary to add fluid, use only Dexron II or equivalent.

CAUTION: The use of fluid other than that specified could result in transmission malfunction and/or failure.

6. Install dipstick, ensuring it is fully seated in tube.

Adding Fluid

1. The fluid type is stamped on the dipstick. Before adding any fluid, be sure that the correct type will be used. 2. Add fluid in .25L (1/2 pint) increments through the filler tube to bring the level to the correct area on the dipstick. If an overfill occurs, excess

fluid should be removed.

Overfill can cause the fluid to foam and spill out through the transmission vent resulting in a transmission malfunction.

Undertill can result in transmission loss of engagement or slipping. This condition is most evident in cold weather or when the vehicle is parked or being driven on a hill.

If the transmission fluid level is checked when the fluid is at room temperature the dipstick could indicate that fluid should be added if the dipstick is misread. If fluid is added at this time, an overfill condition could result when the fluid reaches operating temperatures of 66° C-77°C (150°F-170°F) (dipstick hot to touch).

Fluid - A/T: Testing and Inspection Transaxle Fluid Cooler Flow Test

TRANSMISSION FLUID COOLER CHECK

1. Ensure linkage is properly adjusted and fluid level and control pressure are within specifications. 2. Remove transmission dipstick from filler tube and insert funnel in tube. 3. Raise and support vehicle. 4. Remove cooler return line from its fitting in the case, attach a hose to cooler return line and fasten free end of hose in funnel installed in filler tube. 5. Start engine and set idle at 1,000 RPM with transmission in Neutral. 6. Observe fluid flow at funnel. When flow is constant, it should be liberal. If there is not a liberal flow at 1,000 RPM in Neutral, low pump capacity,

main circuit system leakage, stuck converter charge relief valve, or cooler system restriction is indicated.

7. To separate transmission trouble from cooler system trouble, observe flow at transmission case converter-out fitting.

Fluid - A/T: Testing and Inspection Transmission Fluid Cooler Check

TRANSMISSION FLUID COOLER CHECK

1. Ensure linkage is properly adjusted and fluid level and control pressure are within specifications. 2. Remove transmission dipstick from filler tube and insert funnel in tube. 3. Raise and support vehicle. 4. Remove cooler return line from its fitting in the case, attach a hose to cooler return line and fasten free end of hose in funnel installed in filler tube. 5. Start engine and set idle at 1,000 RPM with transmission in Neutral. 6. Observe fluid flow at funnel. When flow is constant, it should be liberal. If there is not a liberal flow at 1,000 RPM in Neutral, low pump capacity,

main circuit system leakage, stuck converter charge relief valve, or cooler system restriction is indicated.

Fluid - A/T: Service and Repair

DRAIN AND REFILL

CAUTION: Normal maintenance and lubrication requirements do not necessitate periodic fluid changes. If a major failure has occurred in the transmission, it will have to be removed for service. At that time the converter, transmission cooler, and cooler lines must be flushed to remove any dirt. If vehicle accumulates 5,000 or more miles per month or is used in continuous stop and go service, change fluid every 30,000 miles as described.

NOTE: When filling a dry transmission and converter, approximate refill capacity is 9 quarts. Make final check using room temperature checking procedures. Procedures for partial drain and refill, due to in-vehicle service operation, are as follows:

1. Loosen pan attaching bolts and drain fluid. 2. Remove and thoroughly clean pan screen, discarding pan gasket. 3. Place new gasket on pan and install pan on transmission. 4. Add 3 quarts of fluid to transmission through filler tube. 5. Check fluid level following room temperature checking procedures.

Technical Service Bulletin # 962612 Date: 961216

Torque Converter - Cleaning and Replacement Guidelines

Article No. 96-26-12

12/16/96

^ TRANSAXLE - TORQUE CONVERTER REPLACEMENT GUIDELINES AND TORQUE CONVERTER/TRANSAXLE COOLING SYSTEM CLEANING PROCEDURES - SERVICE TIP

^ TRANSMISSION - TORQUE CONVERTER REPLACEMENT GUIDELINES AND TORQUE CONVERTER/TRANSMISSION COOLING SYSTEM CLEANING PROCEDURES - SERVICE TIP

FORD: 1985-86 LTD 1985-88 EXP 1985-94 TEMPO 1985-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

LINCOLN-MERCURY: 1985-86 MARQUIS 1985-87 LN7, LYNX 1985-92 MARK VII 1985-94 TOPAZ 1985-97 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1986-97 SABLE 1987-89 TRACER 1991-94 CAPRI 1991-97 TRACER 1993-97 MARK VIII 1995-97 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-96 BRONCO 1985-97 ECONOLINE, F-150-350 SERIES, RANGER 1986-97 AEROSTAR 1988-97 F SUPER DUTY 1991-97 EXPLORER 1993-97 VILLAGER 1995-97 WINDSTAR 1997 EXPEDITION, MOUNTAINEER

ISSUE: Torque converter replacement guidelines and torque converter/transmission (or transaxle) cooling-system cleaning procedures are now available to reduce repeat repairs.

ACTION: Refer to the following guideline to properly diagnose and service torque converters and to properly clean the torque converter and transmission cooling system using forward flushing/backflushing. For diagnosis, service and cleaning, refer to to the appropriate model/year Service Manual, Sections 07-01, 07-02, 03-03, 307-01, 307-02, or 303-03.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 503000, 504000

Diagnostic Procedure

Prior to torque converter replacement, all diagnostic procedures must be followed. This is to prevent the unnecessary replacement of good torque converters. Only after a complete diagnostic evaluation can the decision be made to replace the torque converter.

The normal diagnostic procedure is as follows:

1. Preliminary inspection.

2. Know and understand the customers concern.

3. Verify the concern:

- Perform the Torque Converter Clutch Operation Test

4. Perform diagnostic procedures:

a. Run On-Board Diagnostics

- Repair all non-transmission-related Diagnostic

Trouble Codes (DTCs) first.

- Repair all transmission DTCs.

- Rerun On-Board Diagnostic to verify repair.

b. Perform Line Pressure Test

c. Perform Stall Speed Test

d. Diagnosis by Symptom Routines - Use the index to locate the appropriate routine that best describes the symptom(s). The routine will list all possible components that may cause or contribute to the symptom. Check each component listed, diagnose and service as required, before servicing the torque converter.

Replacement

The torque converter must be replaced if one or more of the following statements are true:

^ A torque converter malfunction has been determined based on completed diagnostic procedures

^ A converter stud(s), impeller hub or bushing is damaged

^ If there is discoloration of the torque converter (due to overheating)

^ The torque converter is found to be out of specification when performing the following checks (as applicable):

1. Torque Converter One-way Clutch Check

2. End Play Check

3. Stator-to-Turbine Interference Check

4. Converter Leakage Check

5. Stator-to-Impeller Interference Check

^ If there is evidence of transmission assembly or fluid contamination due to the following failure modes:

Torque converter Replacement Policy Failure Modes Major metallic failure

Multiple clutches or clutch plate failures

Sufficient component wear which results in metallic contamination

Torque Converter & Transmission Cooling System Cleaning

REQUIRED TOOLS	
Tool Number	Description
014-00028	Rotunda Converter/Oil Cooler Cleaner
014-00752	Rotunda Oil Cooler Flusher Kit
T77L-7902-R	Converter Clutch Holding Tool
T76L-7902-C	Converter Clutch Torquing Tool
TOOL-4210-C	Dial Indicator With Bracketry
T80L-7902-A	End Play Checking Tool
014-R1075	Torque Converter Leak Check Tool And Gasket
007-00500	New Generation Star (NGS) Tester
007-00085D	Rotunda Transmission Tester Kit - includes all cables and overlays required for transmission/transaxle diagnosis. Refer to the Service Manual for the correct cable/overlay combination to use. Individual cables/overlays and the tester may be ordered separately from Rotunda.

When the torque converter is replaced, the following actions must take place:

1. All cooler lines must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

2. All coolers (in-tank and auxiliary) must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

3. All Cooler By-Pass Valves (CBV), it equipped, must be removed and thoroughly cleaned using Service Manual procedures. Replace rubber coated sealing washers prior to reinstalling CBV. Replace CBV if damaged or plugged.

4. Perform Transmission Cooler Flow Test - If the Transmission Cooling System fails the Flow Test, the coolers, CBVs or lines must be replaced. If the coolers are to be replaced, use only factory approved service parts.

If the torque converter is not being replaced, the following actions must take place:

1. The torque convener must be thoroughly cleaned:

a. Torque converters with drain plugs can be cleaned using the Rotunda Torque Converter Cleaner Follow the instructions included with the equipment.

b. Torque converters without drain plugs can be cleaned by hand. Partially fill the converter using clean transmission fluid (as recommended for the particular transmission). Hand agitate the converter and then thoroughly drain the fluid. Refill with new fluid, specified for the transmission, and reinstall.

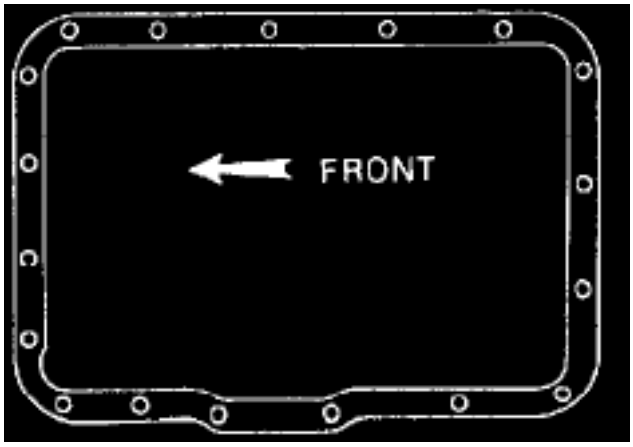
2. All cooler lines must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

3. All coolers (in-tank and auxiliary) must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

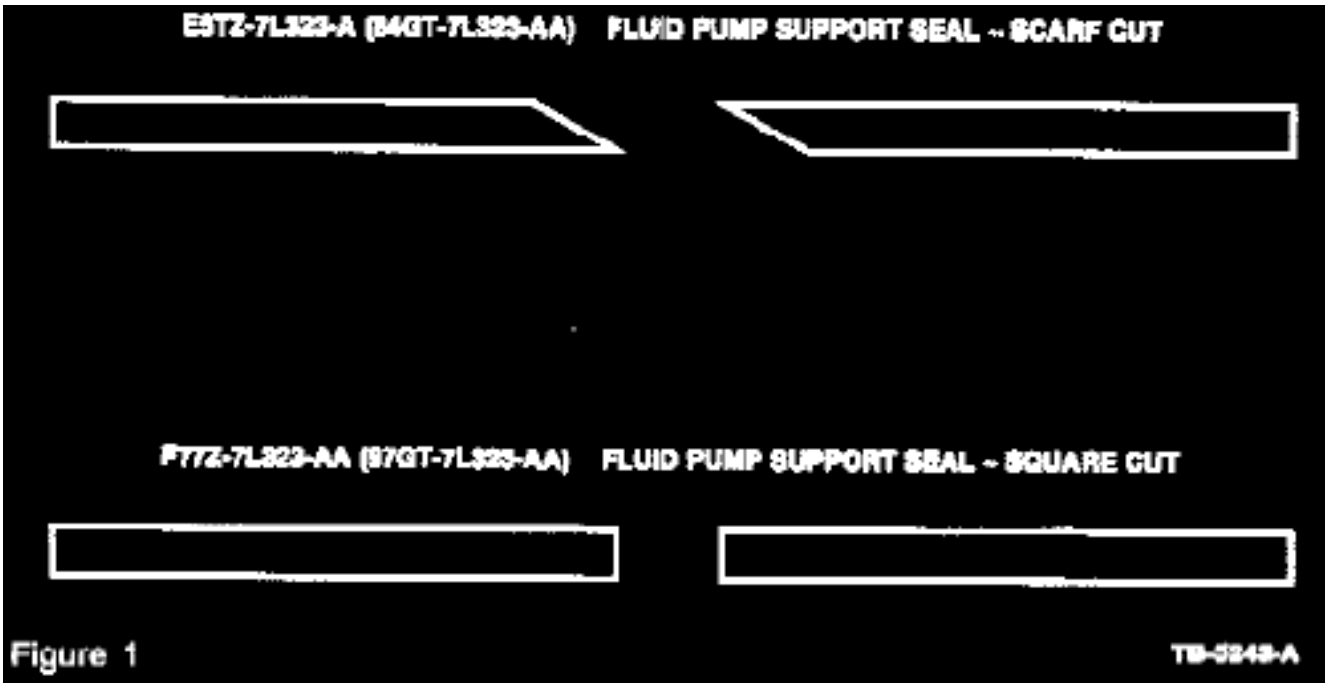
4. All Cooler By-Pass Valves (CBV), if equipped, must be removed and thoroughly cleaned using Service Manual procedures. Replace rubber coated sealing washers prior to reinstalling CBV. Replace CBV if damaged or plugged.

5. Perform Transmission Cooler Flow Test - If the Transmission Cooling System fails the Flow Test, the coolers, CBVs or lines must be replaced. If the coolers are to be replaced, use only factory approved service parts.

Required Tools



Ford A4LD Transmission



Fluid Pump: Customer Interest A/T - Torque Converter Slip/DTC 628/P0741 Set

Article No. 97-22-4

10/27/97

TRANSMISSION - A4LD, 4R44E/4R55E, 5R55E - TORQUE CONVERTER SLIP - DIAGNOSTIC TROUBLE CODE (DTC) 628 OR P0741 STORED IN MEMORY

FORD: 1985-93 MUSTANG 1987-88 THUNDERBIRD

LINCOLN-MERCURY: 1988 COUGAR

LIGHT TRUCK: 1985-90 BRONCO II 1985-97 RANGER 1987-97 AEROSTAR 1991-97 EXPLORER

ISSUE: Some vehicles may experience excessive torque converter slippage, torque converter not engaging, or Diagnostic Trouble Code (DTC) 628 or P0741 stored in memory. This may be caused by damage to the fluid pump support seal and/or to the groove on the pump where the seal is located.

ACTION: Inspect the fluid pump seal for damage. Refer to the following Service Procedure for details.

SERVICE PROCEDURE

1. Follow normal diagnostic procedures as listed in the appropriate Service Manual.

2. Inspect the fluid pump support for damage. If damaged, also inspect the fluid pump support seal groove on the pump.

3. If the groove is damaged, replace the pump.

4. If the groove is not damaged, replace the fluid pump support seal with a redesigned Seal (F77Z-7L323-AA). Refer to Figure 1.

5. Do not replace the torque converter unless it is damaged or fails the criteria listed in the appropriate Service Manual and/or refer to TSB 96-26-12.

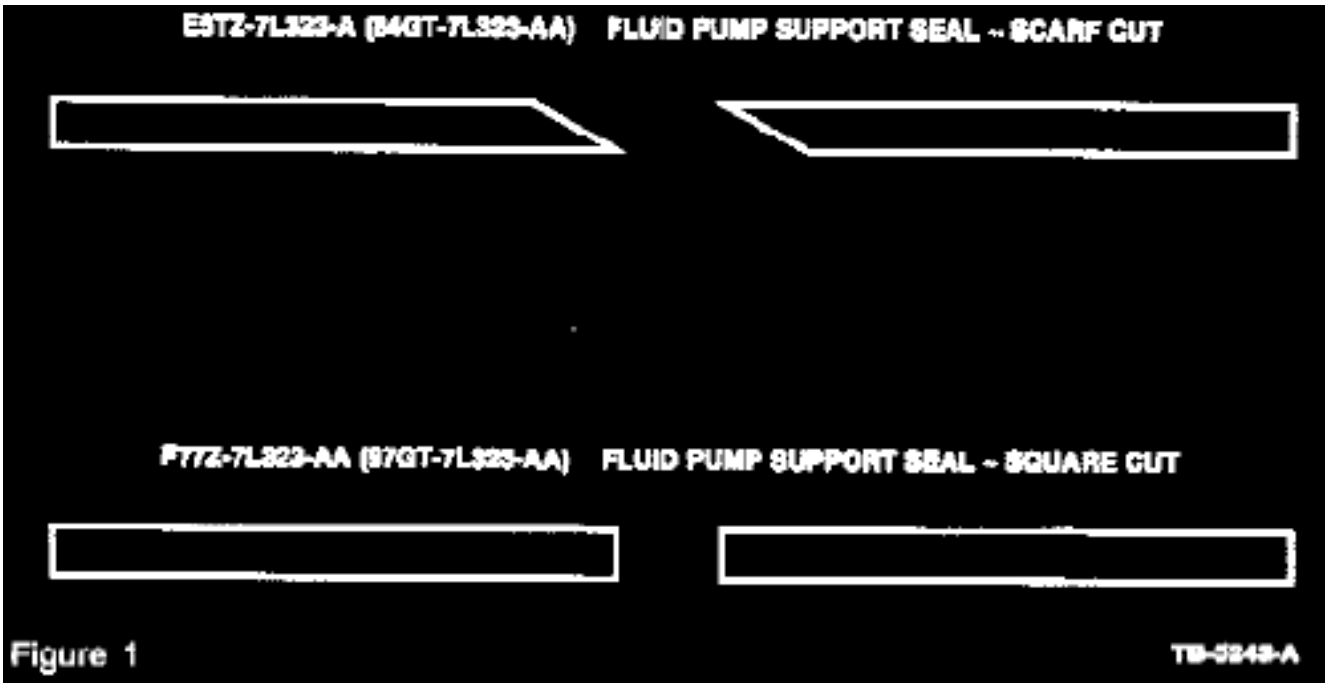
PART NUMBER PART NAME

F77Z-7L323-AA Fluid Pump Support Seal

OTHER APPLICABLE ARTICLES: 96-26-12

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 504000



Fluid Pump: All Technical Service Bulletins A/T - Torque Converter Slip/DTC 628/P0741 Set

Article No. 97-22-4

10/27/97

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PART NUMBER PART NAME

F77Z-7L323-AA Fluid Pump Support Seal

OTHER APPLICABLE ARTICLES: 96-26-12

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 504000

Governor: Testing and Inspection

GOVERNOR TEST

NOTE: The governor can be checked at the same time as the Control Pressure Test is performed and in the same manner.

1. Raise and support rear of vehicle, then disconnect and plug the vacuum line to the vacuum diaphragm unit. 2. Connect the line from the distributor tester to the vacuum diaphragm unit and install automatic transmission tester.

CAUTION: Never exceed 60 MPH speedometer speed.

3. Place transmission in D2, with no load on engine, and apply 10 inches of vacuum to vacuum diaphragm unit. 4. Increase speed slowly and watch speedometer, noting speed at which control pressure cutback occurs. It should occur between 8 and 12 mph. 5. Decrease vacuum at vacuum diaphragm to 0.0-2.0 inches. Control pressure cutback should occur between 10 and 14 mph.

NOTE: After each test, move selector to N and run engine at 1,000 RPM to cool transmission.

6. The governor is good if cutback occurs within specifications. If cutback does not occur within specifications, check shift speed to verify that it is

the governor and not a stuck cutback valve, then repair or replace governor as necessary.

Governor: Service and Repair Removal and Installation

REMOVAL

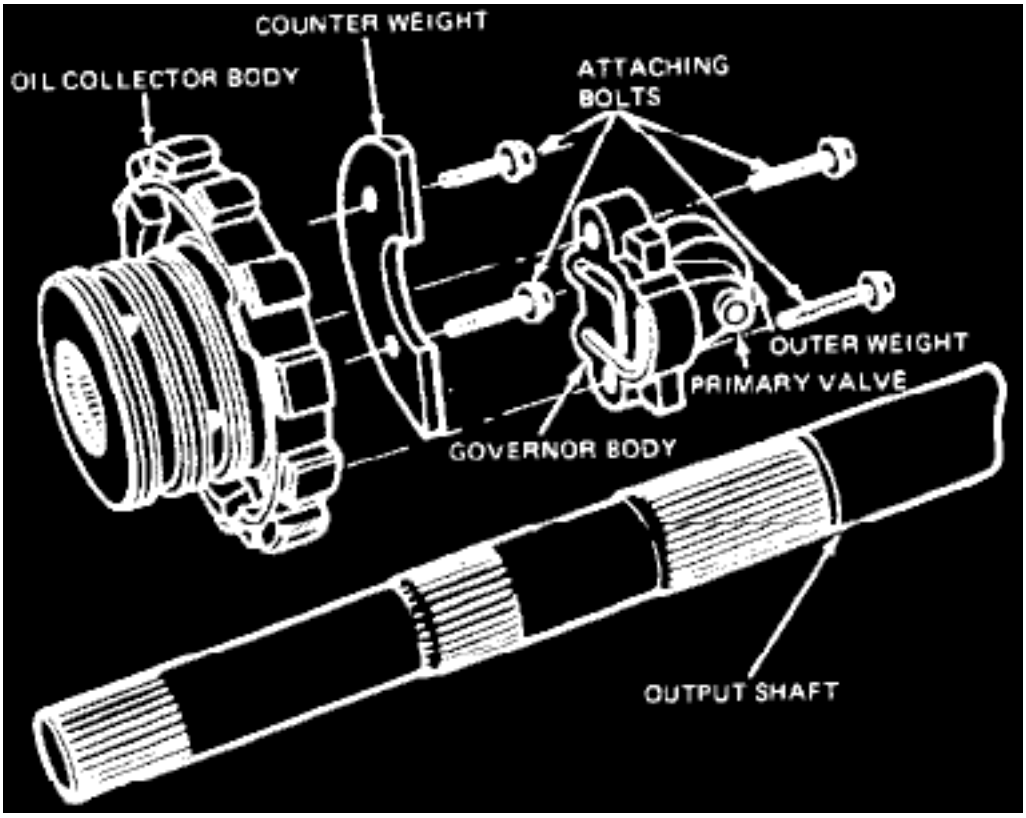
NOTE: Refer to Technical Service Bulletins (TSB) for governor seal ring replacement information.

1. Remove extension housing. 2. Remove governor body to oil collector body attaching bolts. 3. Remove governor body, valve, spring, and weight from collector body.

NOTE: Components are not retained once governor body to oil collector body attaching bolts have been removed. It is therefore necessary to hold the governor body and components while removing or installing.

INSTALLATION

1. Reverse procedure to install.



Governor: Service and Repair Disassembly and Assembly

DISASSEMBLE

NOTE: Refer to Technical Service Bulletins (TSB) for governor seal ring replacement information.

Exploded View Of Oil Collector And Governor Bodies

1. Remove governor body to oil collector body attaching bolts.

NOTE: When governor body attaching bolts are removed, the governor components are no longer retained in position to the governor body. Care must be taken not to drop the governor body and components when the attaching bolts are removed.

2. Remove governor components from governor body. 3. Remove counterweight. 4. Clean all parts, replacing any that are worn or damaged.

ASSEMBLE

1. Assemble outer weight spring and primary valve in governor body. 2. Assemble governor body and counterweight to oil collector body.

Recall - A/T A4LD Park Pawl Spring Update

RECALL NUMBER 91S41-S1

Date May, 1992

PARTS AVAILABILITY At Dealers By as Req'd 0% of Parts Direct Shipped to Dealers At PDC By Now Date in Owner Letter June, 1992

PLEASE PROVIDE COPIES OF THIS BULLETIN TO THE PARTS MANAGER AND TO THE SERVICE MANAGER

TO: All Ford Dealers

Reference: Safety Recall Bulletin 91S41, dated February 21, 1992

Subject: Safety Recall 91S41 Supplement # 1 - Additional Units

The purpose of this bulletin is to advise you that some additional trucks have been added to the population of the referenced recall. According to our records, the additional involved vehicle(s) shown on the enclosed listing have been delivered to your dealership.

NOTIFICATION OF OWNERS

Vehicle owners whose names and addresses are shown on the enclosed listing are being notified by First: Class Mail. If the owner of any vehicle cannot be contacted or does not make an appointment to have his vehicle corrected, advise your FPSD District Office of the owner's name and address so that we can handle further notification.

AFFECTED VEHICLES

All 1990 Bronco II and 1991 Rangers with standard A4LD transmissions. Certain 1989 Aerostars built from July 21, 1989 through end of 1989 model year with 1990 model Western Region (California, Oregon, Washington, Alaska and Hawaii) A4LD transmissions.

NOTE: Approximately 2,300 1990 model year transmissions were installed in late built 1989 Aerostars. For 1989 Aerostar vehicles, dealers need to check the model year of the transmission on the identification tag.

If the transmission model is 90GT-XXX, perform the recall.

If the transmission model is 89GT-XXX, the vehicle does NOT require the modification.

Two copies of a listing identifying affected dealers and involved vehicles in your district are enclosed with this mailing.

Please inform district personnel of these additional units in the recall. If you have any questions, call the FPSD Safety Recall Office.

ATTACHMENT 1

LABOR ALLOWANCES

Inspect 1989 Aerostar
Transmission Identification
Tag For Transmission
Model Year.....0.2 Hrs. - Insert in Box "A" on Form 1864

Replace park pawl Spring and install a spring on transmission shift cable.
(Includes Inspect Above)

1989 Aerostar
(2WD).....1.6 Hrs. - Insert in Box "B" on Form 1864

1991 Ranger
(4x2).....1.6 Hrs. - Insert in Box "B" on Form 1864

1991 Ranger
(4x4).....2.6 Hrs. - Insert in Box "B" on Form 1864

1990 Bronco II
(4x2).....1.9 Hrs. - Insert in Box "B" on Form 1864

1990 Bronco II
(4x4).....2.9 Hrs. - Insert in Box "B" on Form 1864

Administrative Allowance.....0.1 Hrs.

NOTE: Add 0.1 hour Administrative Allowance to the total repair time.

PARTS REQUIREMENTS

PART NUMBER	DESCRIPTION	KIT CODE	QUANTITY	CLASS	DEALER PRICE
F1TZ-7331-A 1990 Bronco II (4x2) and 1991 Ranger (4x2)	Kit-Park Pawl	GG	1	AG	$1.52
F1TZ-7331-B 1991 Ranger (4x4) and 1990 Bronco II (4x4)	Kit-Park Pawl	HH	1	AG	$2.14
F1TZ-7331-C 1989 Aerostar (2WD)	Kit-Park Pawl	AA	1	AG	$2.01

Serial Number: 12345678901234567 91S41

June, 1992

Mr. John Sample 123 Main Street Anywhere, USA 12345

This notice is sent to you in accordance with the requirements of the National Traffic and Motor Vehicle Safety Act.

Ford Motor Company has determined that a defect which relates to motor vehicle safety exists in certain 1990 Bronco II, 1991 Rangers and 1989 Aerostars equipped with an automatic transmission.

Safety Defect

WARNING: The automatic transmission park mechanism sometimes may not prevent your vehicle from freely rolling even if the transmission shift lever is firmly placed in the "PARK" position.

WARNING IF YOU PARK YOUR VEHICLE WITHOUT SETTING THE PARKING BRAKE, IT COULD ROLL FREELY CREATING THE POSSIBILITY OF A CRASH OR PERSONAL INJURY.

The automatic transmission park mechanism sometimes may not hold your vehicle in a parked position. Parking on a slope such as a driveway, inclined parking lot or any non-level parking area without firmly setting the parking brake, may result in your vehicle freely rolling down the incline or slope without warning.

Repairs At no cost to you, your dealer will inspect your vehicle and, if necessary, replace the park pawl spring in the transmission and install a spring on the transmission shift cable.

How long will it take? The time needed to repair your vehicle is less than three hours. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call your dealer Call your dealer without delay. Ask for a service date and whether parts are in stock.

If your dealer does not have the parts in stock, they can be ordered before scheduling your service date. Parts would be expected to arrive in approximately one week.

When you bring your vehicle in, give the dealer this letter.

If you misplace this letter, your dealer will still do the work, free of charge.

Changed address or sold the vehicle? If you have, please fill out enclosed prepaid postcard and mail it to us.

If the dealer doesn't make the repair promptly and without charge, you may contact the Ford Customer Assistance Center, 300 Renaissance Center, P.O. Box 43360, Detroit, MI., 48234. You also may send a complaint to the Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, DC 20590 or call the toll free Auto Safety Hotline 1-800-424-9393 (Washington DC area residents may call 366-0123).

We regret the inconvenience this service may cause you, but we want you to have the work done for your safety and satisfaction with your Ford-built vehicle.

Dealer Letter

June, 1992

To: All NAAO Export Sales North American Ford Product Dealers in U.S. Federalized Markets and Involved Dealers in Non-Federalized Locations

All NAAO Export Sales District Offices All Affiliated Ford Motor Companies - Service Managers

Subject: Safety Recall 91S41 Supplement # 1 - Additional Units

AFFECTED VEHICLES All 1990 Bronco II and 1991 Rangers with standard A4LD transmissions. Certain 1989 Aerostars built from July 21, 1989 through the end of 1989 model year with 1990 model Western Region (California, Oregon, Washington, Alaska and Hawaii) A4LD transmissions.

Enclosed are copies of FPSD's Safety Recall 91S41-S1 bulletin applicable to the above stated North American Ford-built vehicles. A sample copy of NAAO Export Sales' owner notification letter is included. If your dealership/location is involved, the applicable VIN listing is included. If not, use the bulletin as information only.

Please note that some details in the enclosed bulletin such as parts ordering and claim submission procedures are applicable to U.S. dealers only. Therefore, please observe the following administrative procedures:

1. Parts Order

Order the parts directly from FPSD-IDO, Windsor, Canada, using conventional parts ordering procedures. Parts will be reimbursed by submission of recall claim Form(s) 1864.

2. Reimbursement

Only the Form 1864 will be accepted for reimbursement under this Recall. Upon completion of the required service, the Form 1864 must be completely filled out and signed by authorized dealer personnel. Dealers having Direct Warranty Entry (DWE) are to use that method of claims submission.

PLEASE ENSURE THAT COPIES OF THIS RECALL ANNOUNCEMENT ARE ROUTED TO YOUR PARTS AND SERVICE PERSONNEL

June, 1992 Serial Number: 91S41

This notice is sent to you in accordance with the requirements of the U.S. National Traffic and Motor Vehicle Safety Act.

Ford Motor Company has determined that a defect which relates to motor vehicle safety exists in certain 1990 Bronco II, 1991 Rangers and 1989 Aerostars equipped with an automatic transmission.

Safety Defect The automatic transmission park mechanism sometimes may not prevent your vehicle from freely rolling even if the transmission shift lever is firmly placed in the "PARK" position.

WARNING IF YOU PARK YOUR VEHICLE WITHOUT SETTING THE PARKING BRAKE, IT COULD ROLL FREELY CREATING THE POSSIBILITY OF A CRASH OR PERSONAL INJURY.

The automatic transmission park mechanism sometimes may not hold your vehicle in a parked position. Parking on a slope such as a driveway, inclined parking lot or any non-level parking area without firmly setting the parking brake, may result in your vehicle freely rolling down the incline or slope without warning.

Repairs At no cost to you, your dealer will inspect your vehicle and, if necessary replace the park pawl spring in the transmission and install a spring on the transmission shift cable.

Call Your Dealer Call your dealer without delay. Ask for a service date and if parts are in stock. If your dealer does not have the parts in stock, they can be ordered before scheduling your service date.

When you bring your car in, give the dealer the enclosed form. If you misplace the form, your dealer will still do the work, free of charge.

Changed Address or Sold the Vehicle? If you have, please fill out Section 1 of the prepaid postcard and mail it to us.

If the dealer does not make the repair promptly and without charge, please fill out section 3 of the prepaid postcard and mail it to us. You also may send a complaint to the Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, DC 20590 or call the toll free Auto Safety Hotline 800-424-9393.

We regret the inconvenience this service may cause you, but we want you to have the work done for your safety and satisfaction with your Ford-built vehicle.

Parking Pawl: Recalls Recall 91V189000: Park Pawl Defect

WHEN THE AUTOMATIC TRANSMISSION SHIFT LEVER IS PLACED IN THE PARK POSITION, THE PARK PAWL DOES NOT ALWAYS ABUT OR ENGAGE THE PARK GEAR. DRIVER MAY BELIEVE THE VEHICLE IS SAFELY ENGAGED IN PARK WHEN THE GEAR IS NOT TRULY ENGAGED. THIS CAN LEAD TO THE VEHICLE JUMPING OUT OF GEAR UNINTENTIONALLY, VEHICLE ROLLAWAY WHEN PARKED ON A SLOPED SURFACE, AND INADVERTENT MOTION WHEN THE VEHICLE IS STARTED. ALL OF THESE CONDITIONS CAN RESULT IN A VEHICLE ACCIDENT. REPAIR THE TRANSMISSION WITH A NEW PARK PAWL.

SYSTEM: TRANSMISSION.

VEHICLE DESCRIPTION: PICKUP TRUCKS, VANS, AND MULTI-PURPOSE VEHICLES EQUIPPED WITH A 4LD AUTOMATIC TRANSMISSIONS.

1989 FORD TRUCK AEROSTAR 1990 FORD TRUCK AEROSTAR 1990 FORD TRUCK BRONCO II 1990 FORD TRUCK RANGER 1991 FORD TRUCK AEROSTAR 1991 FORD TRUCK EXPLORER 1991 FORD TRUCK RANGER

Recall - A/T A4LD Park Pawl Spring Update

RECALL NUMBER 91S41-S1

Date May, 1992

PARTS AVAILABILITY At Dealers By as Req'd 0% of Parts Direct Shipped to Dealers At PDC By Now Date in Owner Letter June, 1992

PLEASE PROVIDE COPIES OF THIS BULLETIN TO THE PARTS MANAGER AND TO THE SERVICE MANAGER

TO: All Ford Dealers

Reference: Safety Recall Bulletin 91S41, dated February 21, 1992

Subject: Safety Recall 91S41 Supplement # 1 - Additional Units

The purpose of this bulletin is to advise you that some additional trucks have been added to the population of the referenced recall. According to our records, the additional involved vehicle(s) shown on the enclosed listing have been delivered to your dealership.

NOTIFICATION OF OWNERS

Vehicle owners whose names and addresses are shown on the enclosed listing are being notified by First: Class Mail. If the owner of any vehicle cannot be contacted or does not make an appointment to have his vehicle corrected, advise your FPSD District Office of the owner's name and address so that we can handle further notification.

AFFECTED VEHICLES

All 1990 Bronco II and 1991 Rangers with standard A4LD transmissions. Certain 1989 Aerostars built from July 21, 1989 through end of 1989 model year with 1990 model Western Region (California, Oregon, Washington, Alaska and Hawaii) A4LD transmissions.

NOTE: Approximately 2,300 1990 model year transmissions were installed in late built 1989 Aerostars. For 1989 Aerostar vehicles, dealers need to check the model year of the transmission on the identification tag.

If the transmission model is 90GT-XXX, perform the recall.

If the transmission model is 89GT-XXX, the vehicle does NOT require the modification.

Two copies of a listing identifying affected dealers and involved vehicles in your district are enclosed with this mailing.

Please inform district personnel of these additional units in the recall. If you have any questions, call the FPSD Safety Recall Office.

ATTACHMENT 1

LABOR ALLOWANCES

Inspect 1989 Aerostar
Transmission Identification
Tag For Transmission
Model Year.....0.2 Hrs. - Insert in Box "A" on Form 1864

Replace park pawl Spring and install a spring on transmission shift cable.
(Includes Inspect Above)

1989 Aerostar
(2WD).....1.6 Hrs. - Insert in Box "B" on Form 1864

1991 Ranger
(4x2).....1.6 Hrs. - Insert in Box "B" on Form 1864

1991 Ranger
(4x4).....2.6 Hrs. - Insert in Box "B" on Form 1864

1990 Bronco II
(4x2).....1.9 Hrs. - Insert in Box "B" on Form 1864

1990 Bronco II
(4x4).....2.9 Hrs. - Insert in Box "B" on Form 1864

Administrative Allowance.....0.1 Hrs.

NOTE: Add 0.1 hour Administrative Allowance to the total repair time.

PARTS REQUIREMENTS

PART NUMBER	DESCRIPTION	KIT CODE	QUANTITY	CLASS	DEALER PRICE
F1TZ-7331-A 1990 Bronco II (4x2) and 1991 Ranger (4x2)	Kit-Park Pawl	GG	1	AG	$1.52
F1TZ-7331-B 1991 Ranger (4x4) and 1990 Bronco II (4x4)	Kit-Park Pawl	HH	1	AG	$2.14
F1TZ-7331-C 1989 Aerostar (2WD)	Kit-Park Pawl	AA	1	AG	$2.01

Serial Number: 12345678901234567 91S41

June, 1992

Mr. John Sample 123 Main Street Anywhere, USA 12345

This notice is sent to you in accordance with the requirements of the National Traffic and Motor Vehicle Safety Act.

Ford Motor Company has determined that a defect which relates to motor vehicle safety exists in certain 1990 Bronco II, 1991 Rangers and 1989 Aerostars equipped with an automatic transmission.

Safety Defect

WARNING: The automatic transmission park mechanism sometimes may not prevent your vehicle from freely rolling even if the transmission shift lever is firmly placed in the "PARK" position.

WARNING IF YOU PARK YOUR VEHICLE WITHOUT SETTING THE PARKING BRAKE, IT COULD ROLL FREELY CREATING THE POSSIBILITY OF A CRASH OR PERSONAL INJURY.

The automatic transmission park mechanism sometimes may not hold your vehicle in a parked position. Parking on a slope such as a driveway, inclined parking lot or any non-level parking area without firmly setting the parking brake, may result in your vehicle freely rolling down the incline or slope without warning.

Repairs At no cost to you, your dealer will inspect your vehicle and, if necessary, replace the park pawl spring in the transmission and install a spring on the transmission shift cable.

How long will it take? The time needed to repair your vehicle is less than three hours. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call your dealer Call your dealer without delay. Ask for a service date and whether parts are in stock.

If your dealer does not have the parts in stock, they can be ordered before scheduling your service date. Parts would be expected to arrive in approximately one week.

When you bring your vehicle in, give the dealer this letter.

If you misplace this letter, your dealer will still do the work, free of charge.

Changed address or sold the vehicle? If you have, please fill out enclosed prepaid postcard and mail it to us.

If the dealer doesn't make the repair promptly and without charge, you may contact the Ford Customer Assistance Center, 300 Renaissance Center, P.O. Box 43360, Detroit, MI., 48234. You also may send a complaint to the Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, DC 20590 or call the toll free Auto Safety Hotline 1-800-424-9393 (Washington DC area residents may call 366-0123).

We regret the inconvenience this service may cause you, but we want you to have the work done for your safety and satisfaction with your Ford-built vehicle.

Dealer Letter

June, 1992

To: All NAAO Export Sales North American Ford Product Dealers in U.S. Federalized Markets and Involved Dealers in Non-Federalized Locations

All NAAO Export Sales District Offices All Affiliated Ford Motor Companies - Service Managers

Subject: Safety Recall 91S41 Supplement # 1 - Additional Units

AFFECTED VEHICLES All 1990 Bronco II and 1991 Rangers with standard A4LD transmissions. Certain 1989 Aerostars built from July 21, 1989 through the end of 1989 model year with 1990 model Western Region (California, Oregon, Washington, Alaska and Hawaii) A4LD transmissions.

Enclosed are copies of FPSD's Safety Recall 91S41-S1 bulletin applicable to the above stated North American Ford-built vehicles. A sample copy of NAAO Export Sales' owner notification letter is included. If your dealership/location is involved, the applicable VIN listing is included. If not, use the bulletin as information only.

Please note that some details in the enclosed bulletin such as parts ordering and claim submission procedures are applicable to U.S. dealers only. Therefore, please observe the following administrative procedures:

1. Parts Order

Order the parts directly from FPSD-IDO, Windsor, Canada, using conventional parts ordering procedures. Parts will be reimbursed by submission of recall claim Form(s) 1864.

2. Reimbursement

Only the Form 1864 will be accepted for reimbursement under this Recall. Upon completion of the required service, the Form 1864 must be completely filled out and signed by authorized dealer personnel. Dealers having Direct Warranty Entry (DWE) are to use that method of claims submission.

PLEASE ENSURE THAT COPIES OF THIS RECALL ANNOUNCEMENT ARE ROUTED TO YOUR PARTS AND SERVICE PERSONNEL

June, 1992 Serial Number: 91S41

This notice is sent to you in accordance with the requirements of the U.S. National Traffic and Motor Vehicle Safety Act.

Ford Motor Company has determined that a defect which relates to motor vehicle safety exists in certain 1990 Bronco II, 1991 Rangers and 1989 Aerostars equipped with an automatic transmission.

Safety Defect The automatic transmission park mechanism sometimes may not prevent your vehicle from freely rolling even if the transmission shift lever is firmly placed in the "PARK" position.

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The automatic transmission park mechanism sometimes may not hold your vehicle in a parked position. Parking on a slope such as a driveway, inclined parking lot or any non-level parking area without firmly setting the parking brake, may result in your vehicle freely rolling down the incline or slope without warning.

Repairs At no cost to you, your dealer will inspect your vehicle and, if necessary replace the park pawl spring in the transmission and install a spring on the transmission shift cable.

Call Your Dealer Call your dealer without delay. Ask for a service date and if parts are in stock. If your dealer does not have the parts in stock, they can be ordered before scheduling your service date.

When you bring your car in, give the dealer the enclosed form. If you misplace the form, your dealer will still do the work, free of charge.

Changed Address or Sold the Vehicle? If you have, please fill out Section 1 of the prepaid postcard and mail it to us.

If the dealer does not make the repair promptly and without charge, please fill out section 3 of the prepaid postcard and mail it to us. You also may send a complaint to the Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, DC 20590 or call the toll free Auto Safety Hotline 800-424-9393.

We regret the inconvenience this service may cause you, but we want you to have the work done for your safety and satisfaction with your Ford-built vehicle.

Parking Pawl: All Technical Service Bulletins Recall 91V189000: Park Pawl Defect

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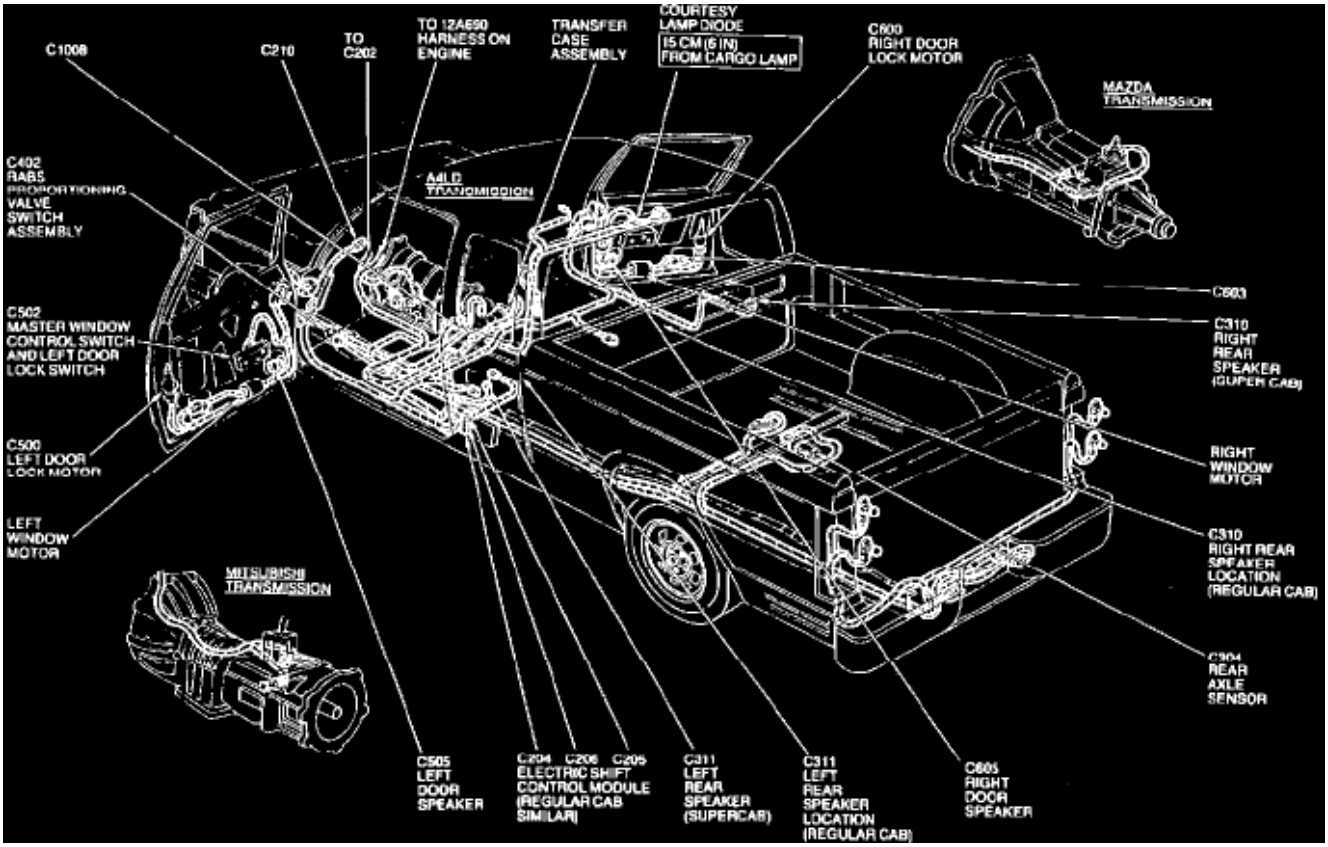
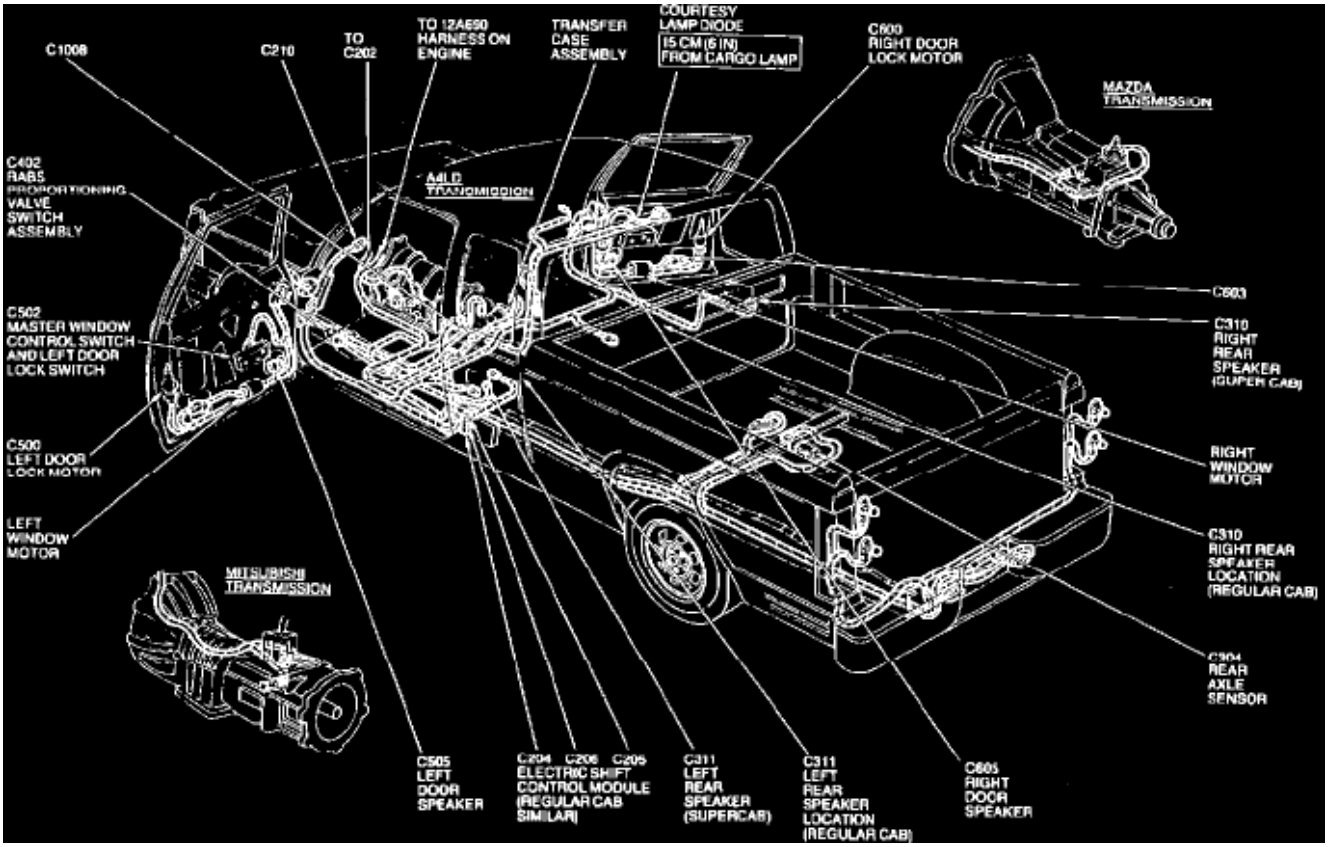


Control Module: Locations Regular Cab

Body Components

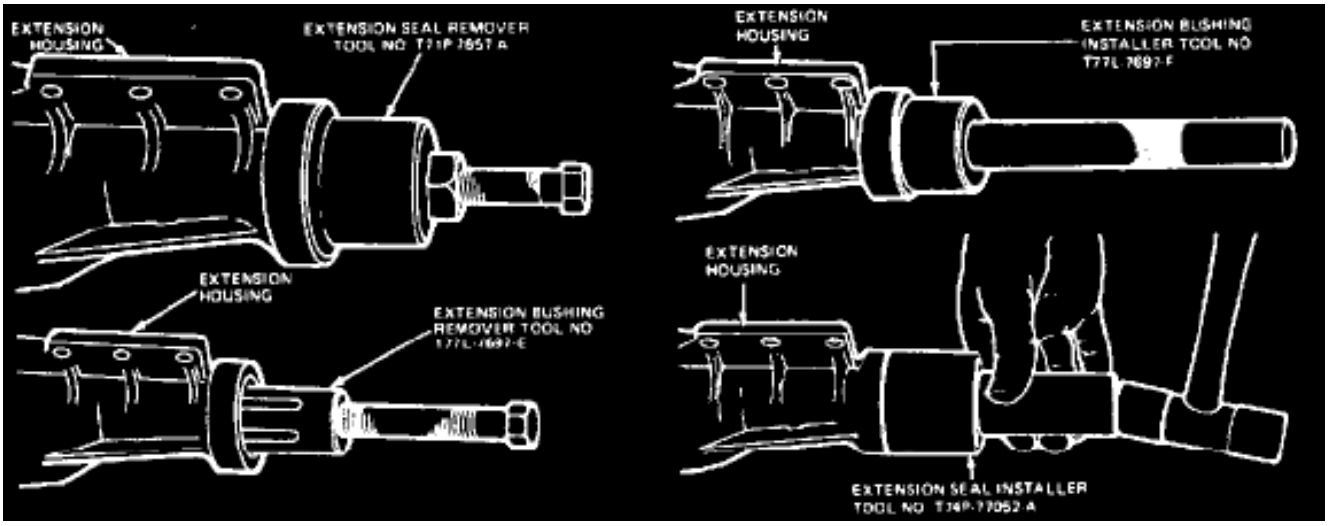
Lower LH Rear Corner Of Cab



Control Module: Locations Supercab

Body Components

Between Bottom Of LH ``B'' Pillar & Rear Of Cab



Seals and Gaskets: Service and Repair

REMOVAL

1. Raise and support vehicle. 2. Install scribe marks on propeller shaft end yoke and rear axle companion flange, then remove propeller shaft.

Replacing Extension Housing Rear Seal And Bushing

3. Using extension housing seal remover tool No. T71P-7657-A or equivalent, remove oil seal. 4. Using extension housing bushing remover tool No. T77L-7697-E or equivalent, remove extension housing bushing.

INSTALLATION

1. Using extension housing bushing replacer tool No. T77L-7697-F or equivalent, install new extension housing bushing. 2. Inspect sealing surface of universal joint yoke for scoring, replacing yoke as necessary. 3. Inspect counterbore of housing for burrs, removing as necessary. 4. Using extension housing seal replacer tool No. T74P-77052-A or equivalent, install new oil seal. Coat inside diameter at end of rubber boot

portion of seal and the front universal joint spline with suitable lubricant.

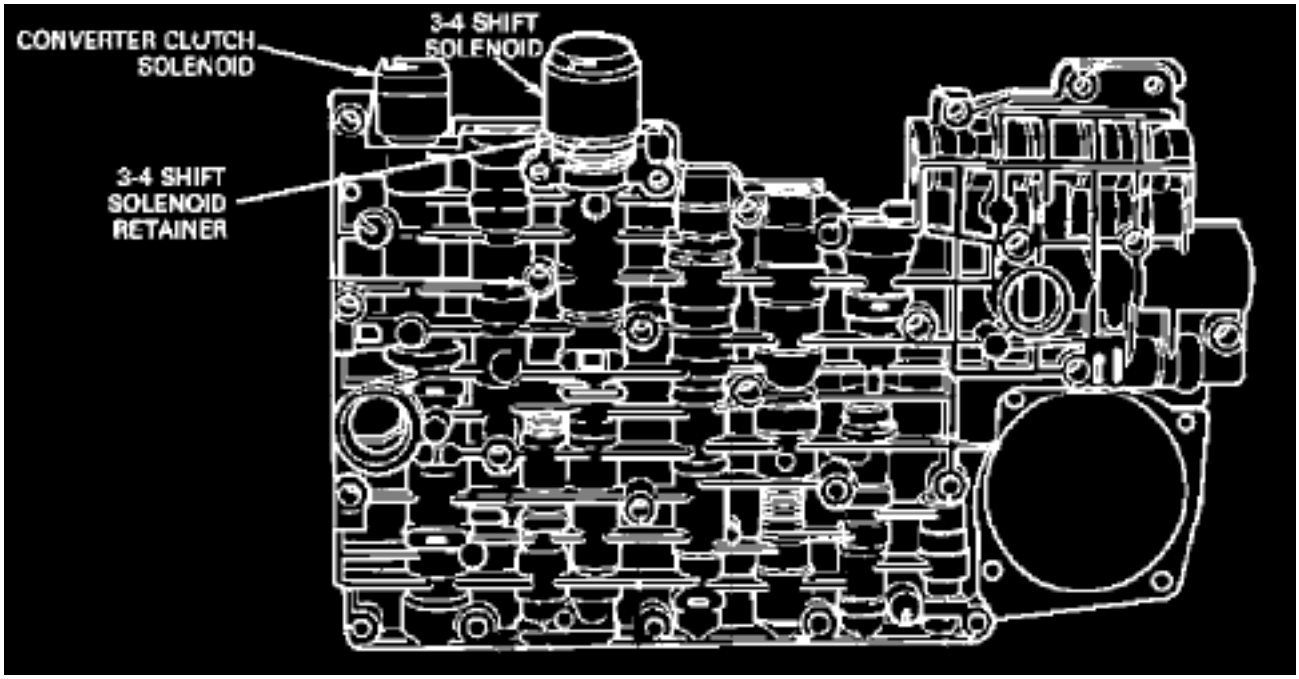
5. Install propeller shaft, aligning scribe marks, then lower vehicle and check transmission fluid level, adding fluid as necessary.

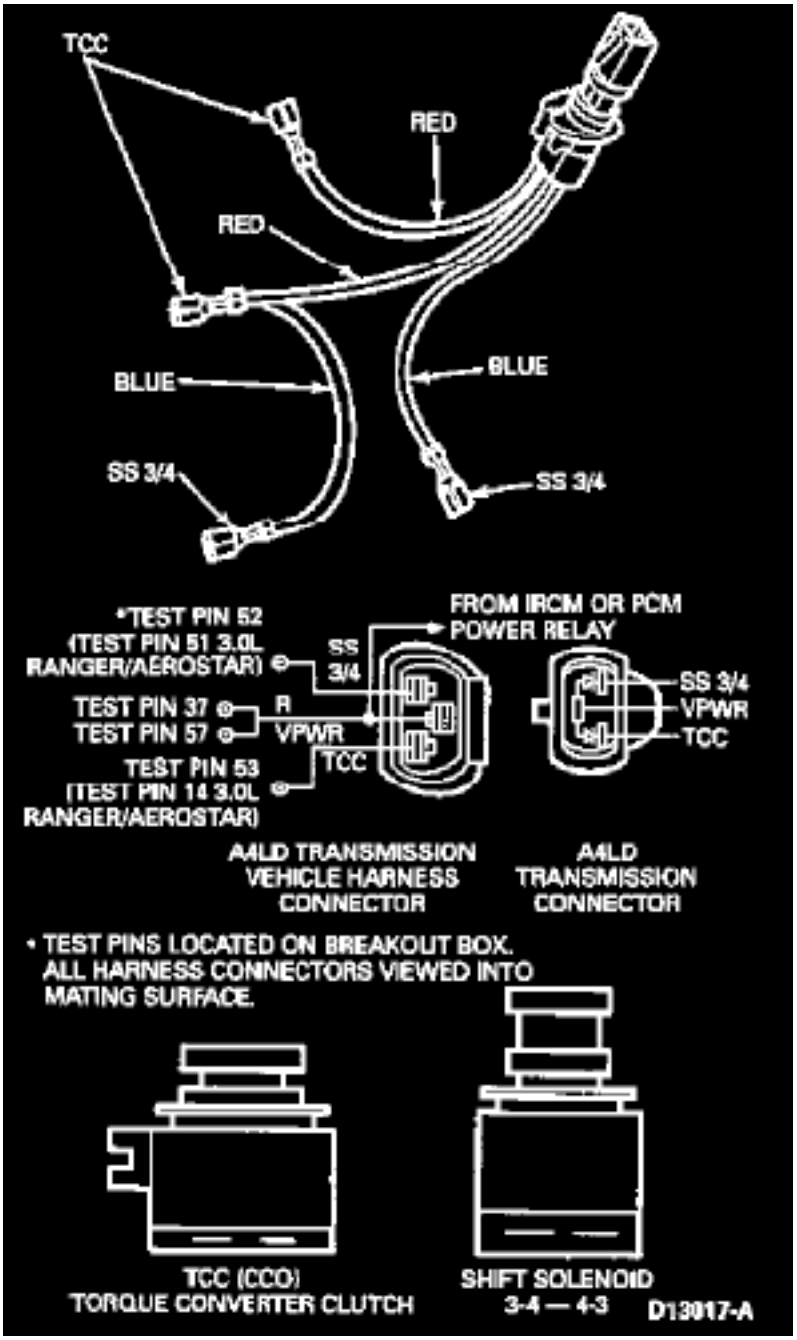
Transmission Temperature Sensor/Switch: Testing and Inspection

Pinpoint testing procedures for this component are located in the system level Testing and Inspection.

CONDITION	POSSIBLE CAUSE	ACTION
• Shift Lock allows shifting out of park with ignition in RUN and brake pedal not depressed.	• No power to Shift Lock Actuator.	• Check Fuse 1. • With Ignition Switch in RUN, check for battery voltage on 298 (P/O) wire at Shift Lock Actuator.
	• Open ground.	• Check continuity of 57 (BK) wire to ground G200.
	• Inoperative solenoid/cable assembly.	• With solenoid energized, check cable at shifter for no play. • With solenoid deenergized, check cable at shifter for free play.
• Shift Lock does not allow shifting with ignition in RUN and brake pedal depressed.	• Inoperative Stop Lamp Switch.	• Check for battery voltage on 10 (LG/R) wire at Stop Lamp Switch. • Connect a jumper wire across the Stop Lamp Switch with the Ignition Switch in RUN. If Actuator unlocks, replace Stop Lamp Switch. If Actuator remains locked, check continuity of 810 (R/LG) wire from Stop Lamp Switch to Shift Lock Actuator.
	• Inoperative solenoid/cable assembly.	• With solenoid energized, check cable at shifter for no play. • With solenoid deenergized, check cable at shifter for free play.

Troubleshooting Hints


CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER



Shift Solenoid: Description and Operation

Shift Solenoid 3-4 (SS 3-4)

The 3-4 shift solenoid is used to control the 3-4/4-3 shift valve.

Transmission Function: Used to shift from third gear to fourth gear, and fourth gear to third gear.

Shifter A/T: Description and Operation

SELECTOR SHIFT PATTERNS

NOTE: The A4LD uses a seven position, Select Shift control. It is linked to the manual lever on the transmission to select the desired operating position.

1. In the (Park) position the transmission is in neutral. The output shaft is locked to the case by engaging a parking pawl within the paring gear. The

engine can be started in this selector position. This is the only position in which the ignition key can be removed.

2. In the R (Reverse) position the transmission is in reverse at a reduced ratio. 3. In the N (Neutral) position the transmission is in neutral but the output shaft is not locked to the case. The engine can be started, and the parking

brake applied, since the rear wheels are free to turn.

4. The OD (Overdrive) position is the normal driving position. Selection of this position provides all automatic shifts including the application and

release of the converter clutch. The transmission may also be shifted manually between all forward ranges.

5. The D (Drive) position provides all automatic shifts, including the application and release of the converter clutch, except the shift into overdrive.

This position can be used when overdrive is not wanted such as hilly/mountainous terrain or trailer towing.

6. The 2 (Manual Second) position provides only 2nd gear operation regardless of vehicle speed. It is useful for start-up on slippery surfaces or to

provide engine braking on downgrades.

7. The Manual Low) position, when Selected at start-up, provides only 1st gear operation. Selection of this position at higher speeds results in a

downshift to second gear. An automatic downshift to low will occur only after vehicle speed decreases to approximately 30 mph, dependent on axle ratio and tire size. Once in low, the transmission will stay in low until the selector lever is moved to another position.

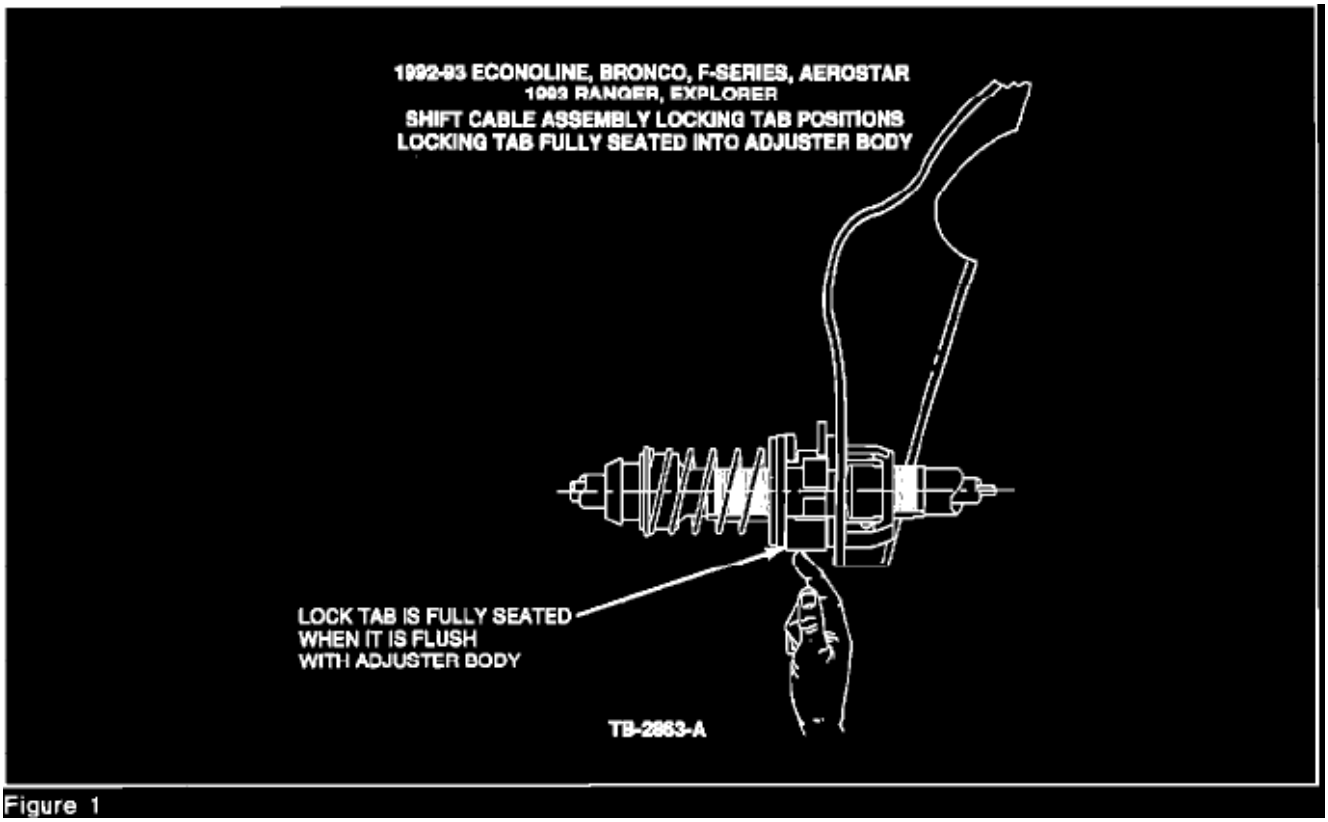


Figure 1

Shift Cable: Customer Interest A/T - Shift Selector Indicates Incorrect Gear

Article No. 93-5-14

March 3, 1993

TRANSMISSION - SHIFT LEVER PRNDL POSITION MAY NOT MATCH THE TRANSMISSION GEAR

LIGHT TRUCK: 1989-90 BRONCO II 1989-93 RANGER 1991-93 EXPLORER 1992-93 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, F-47

This TSB article is being republished in its entirety to include other transmissions in addition to the A4LD.

ISSUE: The position of the shift lever, shown on the PRNDL, may not always show the proper gear in the transmission. This could be caused by the transmission control cable assembly locking tab not being fully seated or secure in the cable body.

ACTION:

Inspect the position of the shift lever on the PRNDL. If it appears to be misadjusted, check the locking tab to be sure that it is fully seated in the cable body, Figure 1. The locking tab is available as a service part. It is not necessary to replace the shift cable assembly. Refer to the following procedure for service, details.

If the locking tab is not seated flush with the cable adjustor body, proceed as follows:

1. Remove the tab from the adjustor body with a pair of pliers.

NOTE:

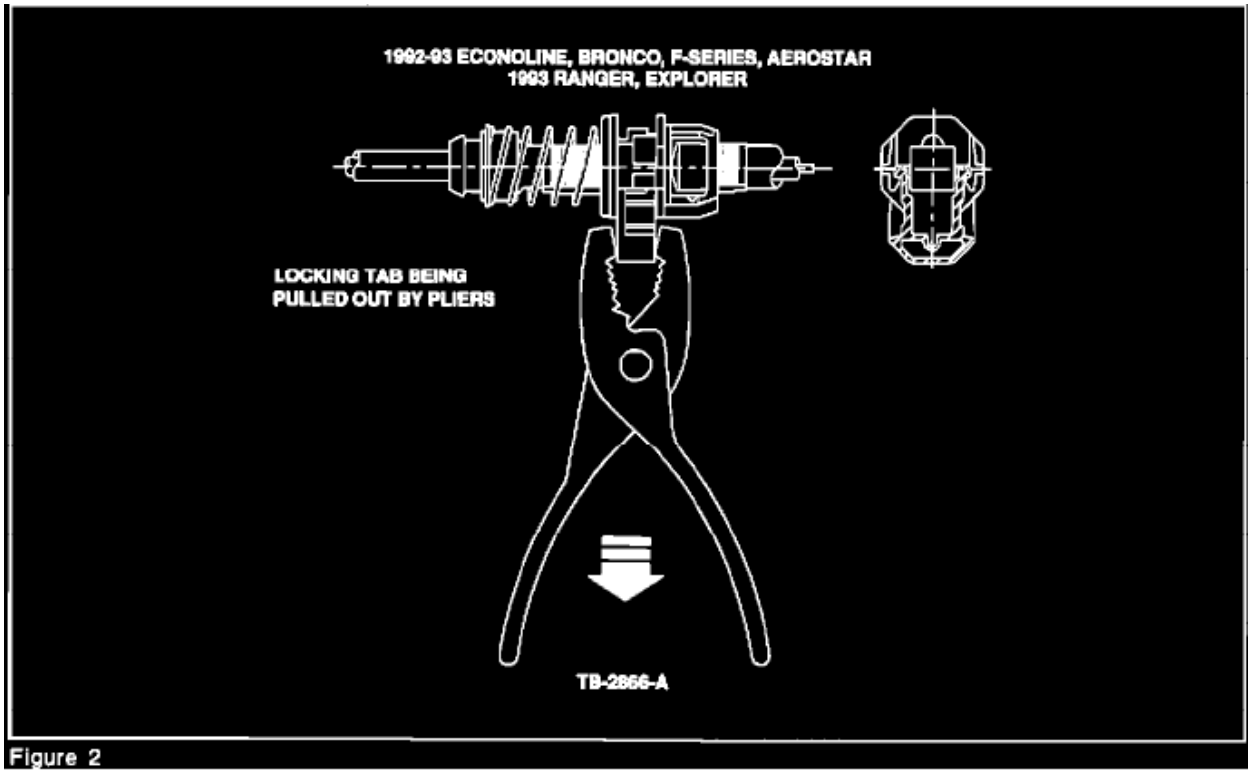


Figure 2

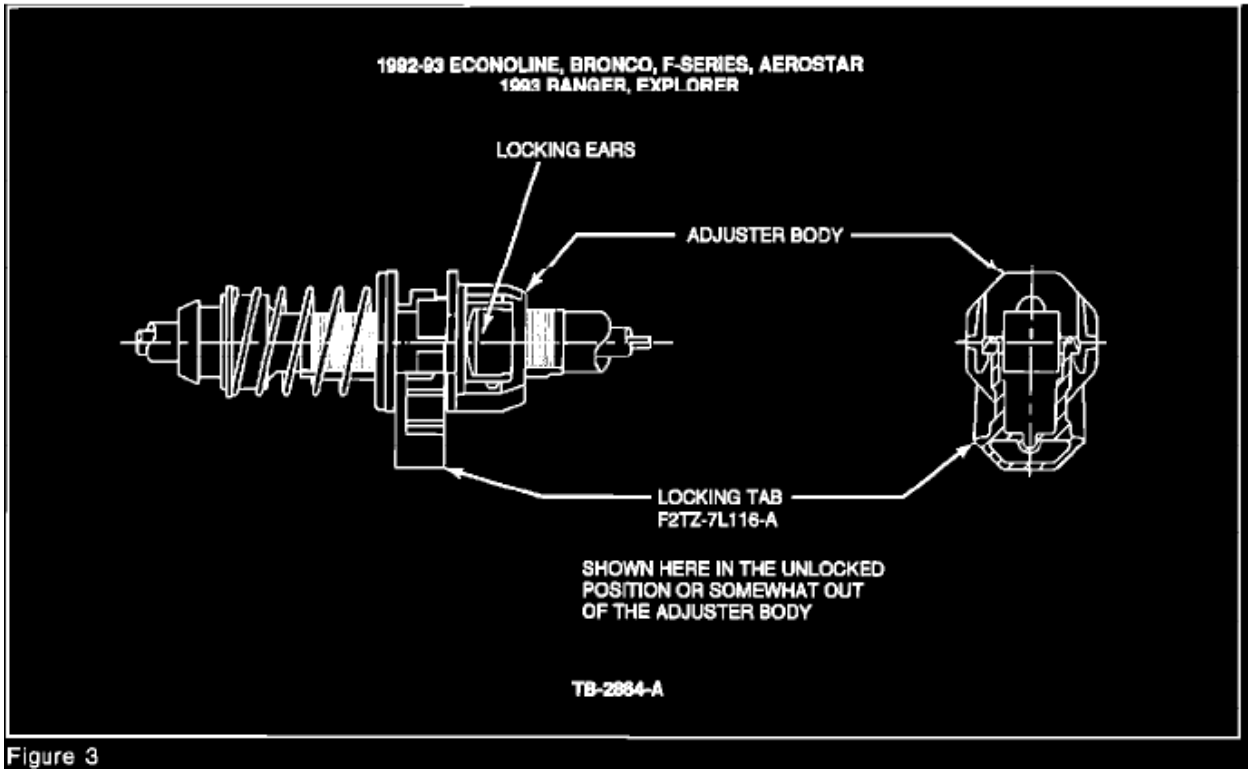


Figure 3

TO PREVENT REMOVING THE CABLE BODY FROM THE TRANSMISSION BRACKET, HOLD THE CABLE WITH THE OTHER HAND WHILE PULLING OUT THE TAB. APPLY A FORCE OF

ABOUT 15 TO 20 LBS., REFER TO FIGURE 2.

2. Replace the existing locking tab with a new locking tab. Refer to the Parts Block for correct parts usage.

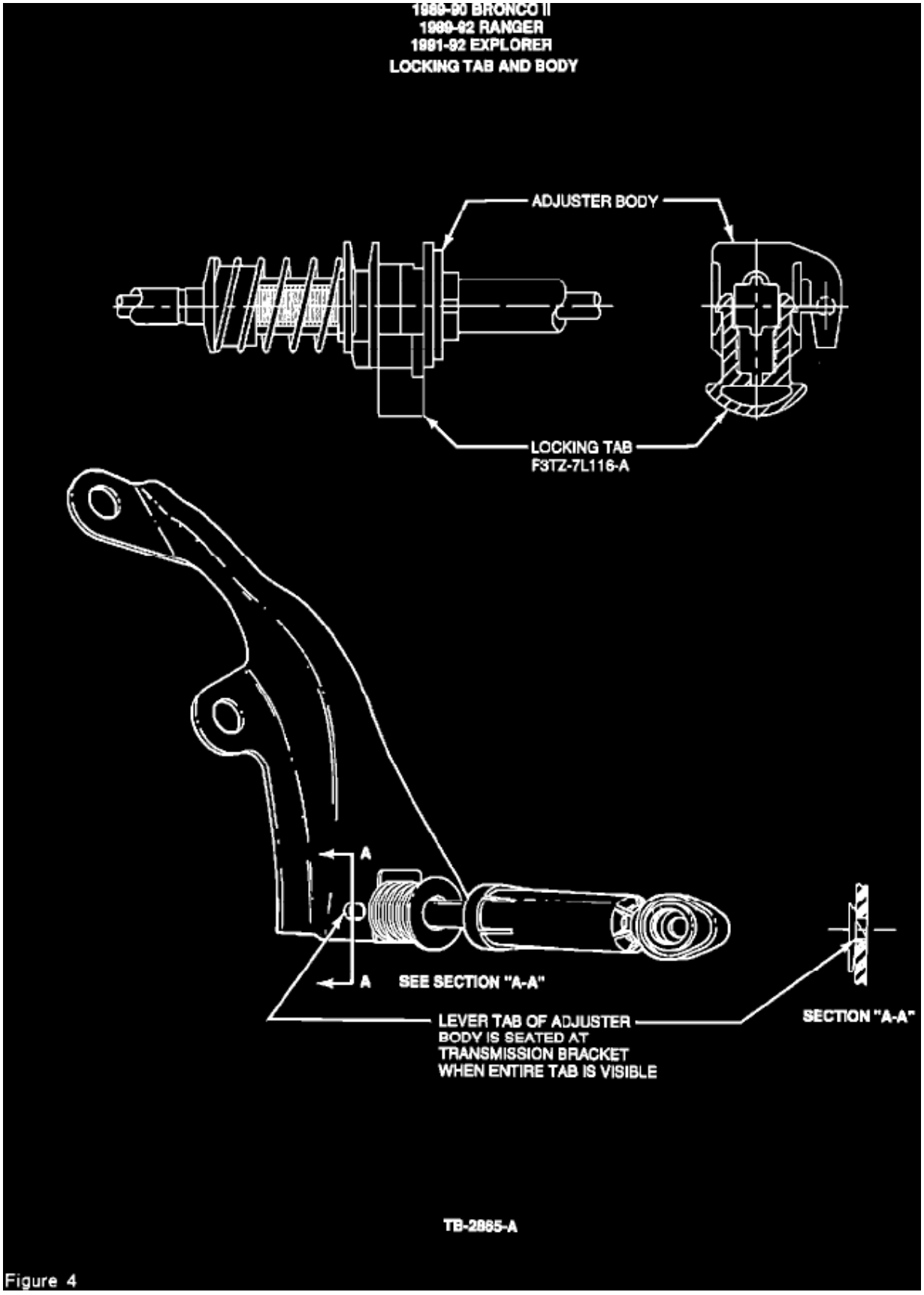


Figure 4

3. Push the new lock tab into the cable adjustor only half way, Figures 3 and 4.

4. Adjust the shift system according to the service manual before fully seating the new locking tab.

NOTE: BE SURE THE CABLE BODY IS SECURE IN THE TRANSMISSION BRACKET AFTER SERVICE IS COMPLETE. SEE FIGURE 4.

CAUTION: IF THE LOCKING TAB WAS NOT FULLY SEATED, IT MAY HAVE TAKEN A PERMANENT SET. THEREFORE, DO NOT REUSE THE LOCKING TAB.

PART NUMBER PART NAME CLASS

F2TZ-7L116-A Locking Tab (1993 Ranger, C

Explorer; 1992-93 Bronco, Aerostar, Econoline, F-150-350, F-47)

F3TZ-7L116-A Locking Tab Cable (1989-92 C

Ranger, 1991-92 Explorer, 1989-90 Bronco II)

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 93-2-12

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992/93 Models, Basic Warranty For All Other Models

OPERATION DESCRIPTION TIME

930514A Replace Lock Tab, Adjust 0.3 Hr.

Cable

DEALER CODING BASIC PART NO.

CONDITION CODE

7L116 33

OASIS CODES: 503300

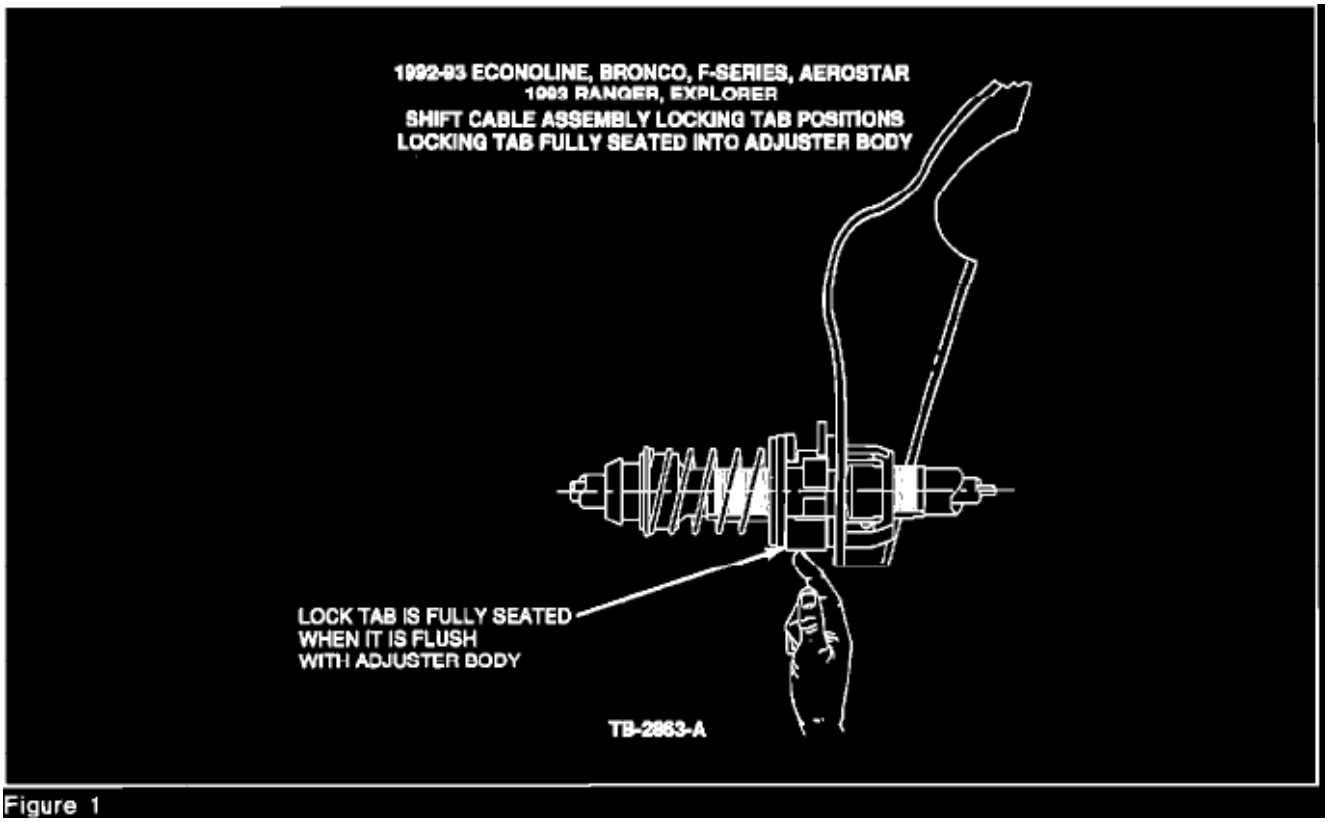


Figure 1

Shift Cable: All Technical Service Bulletins A/T - Shift Selector Indicates Incorrect Gear

Article No. 93-5-14

March 3, 1993

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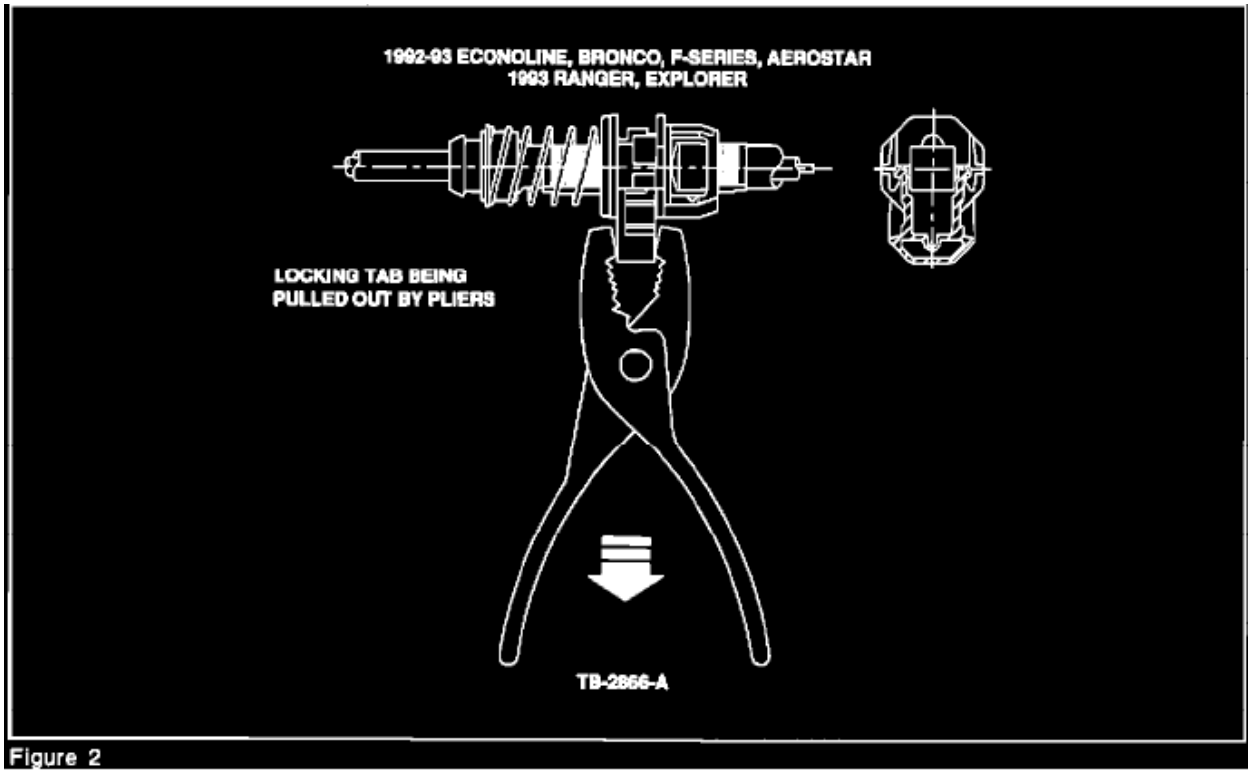

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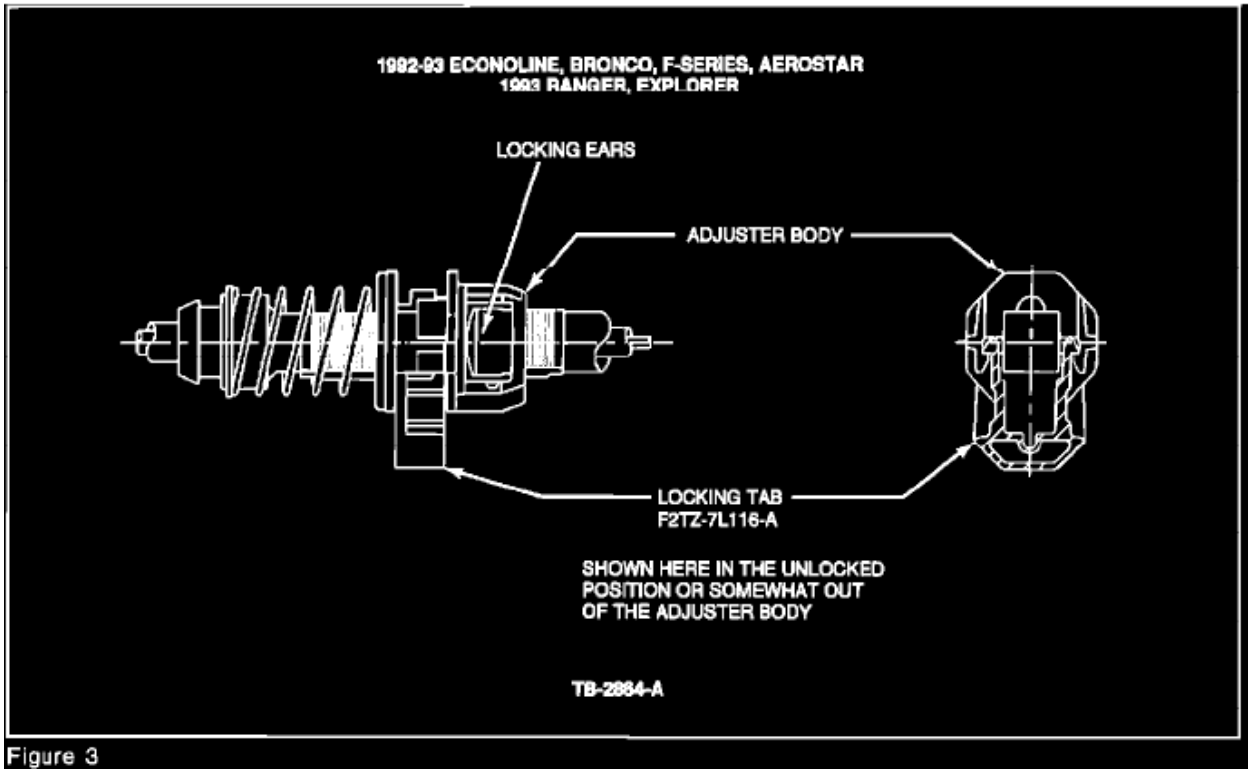

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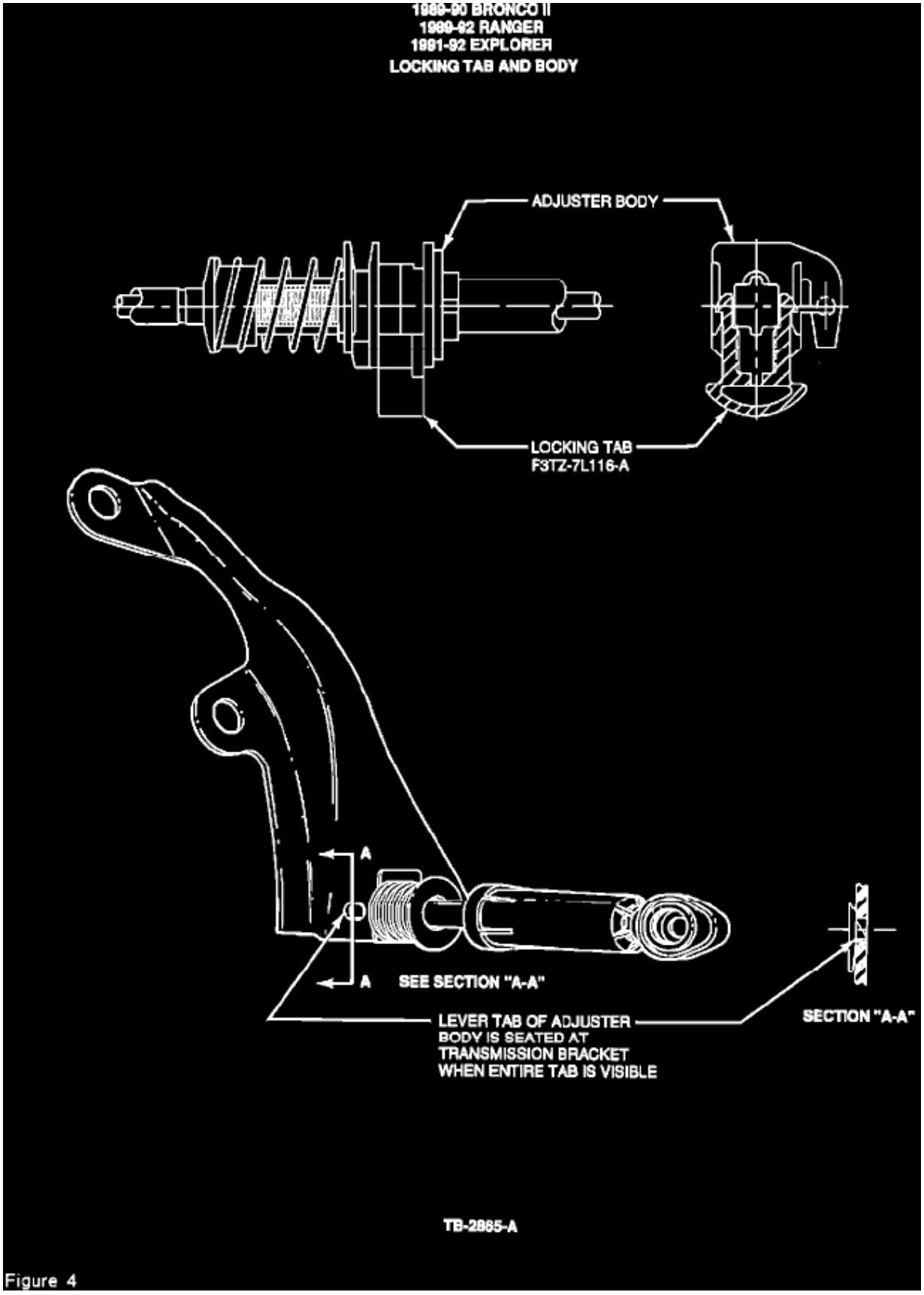

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OTHER APPLICABLE ARTICLES: NONE

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WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992/93 Models, Basic Warranty For All Other Models

OPERATION DESCRIPTION TIME

930514A Replace Lock Tab, Adjust 0.3 Hr.

Cable

DEALER CODING BASIC PART NO.

CONDITION CODE

7L116 33

OASIS CODES: 503300

Shift Cable: Adjustments

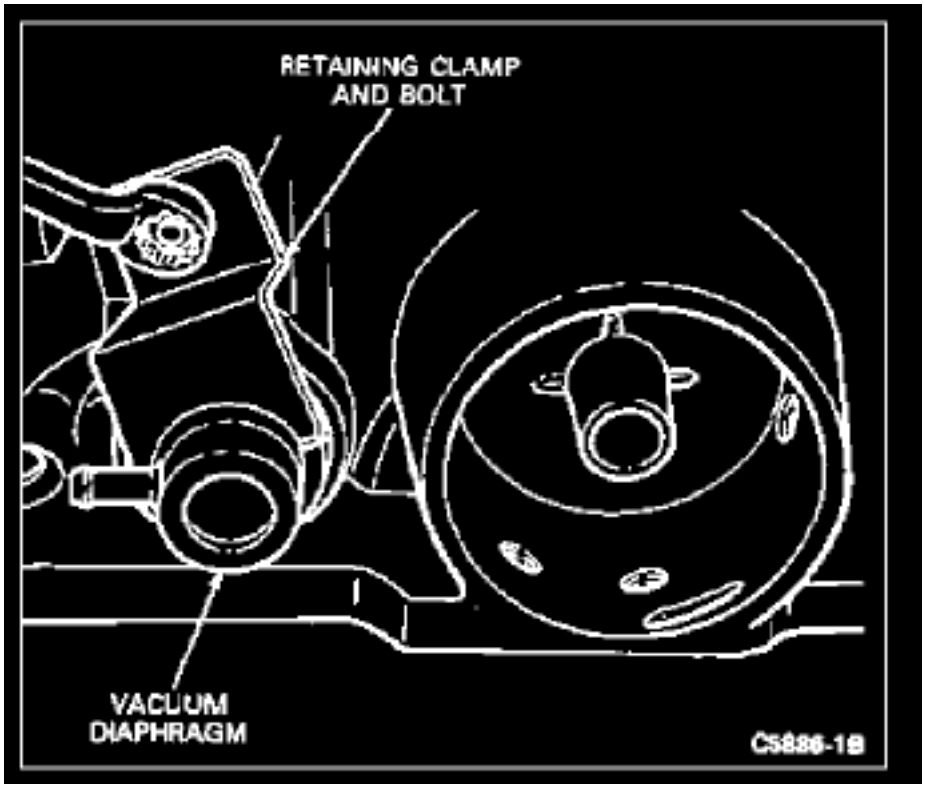
KICKDOWN CABLE ADJUST

NOTE: The kickdown cable is self-adjusting.

1. The cable automatically adjusts to proper length after installation by depressing accelerator pedal to floor. 2. If the kickdown cable requires readjustment after installation, reset the cable by depressing the D-flat while pulling the conduit back from cable

body.

3. The cable will automatically readjust to the proper length when accelerator pedal is depressed to the floor.



Shift Modulator: Service and Repair

Vacuum Diaphragm

Removal and Installation

1. On 4.0L and 2.9L 4x4 vehicles, remove nut from studded bolt and remove heat shield from studded bolt and clips on frame.

2. Disconnect hose from vacuum diaphragm.

3. Remove bolt or studded bolt and remove clamp.Do not pry or bend clamp. Pull vacuum diaphragm from transmission case.

4. Remove the vacuum diaphragm control rod from transmission case.

5. Install vacuum diaphragm control rod in transmission case.

6. Push vacuum diaphragm into case and secure with retaining clamp and bolt or studded bolt. Tighten bolt to 9-12 N-m (80-106 in-lb). On 2.9L

and 4.0L 4x4 vehicles, tighten studded bolt to 8-11 N-m 70-98 in-lb).

7. Install vacuum diaphragm hose to vacuum diaphragm.

8. Install heat shield on studded bolt and push retaining clips on pan rail. Tighten nut on studded bolt to 8-11 N-m (70-98 in-lb).

Throttle Valve Cable/Linkage: Adjustments

The kickdown cable is self-adjusting and automatically adjusts to a tolerance range of 1 inch during normal operation. However, if the cable requires readjustment, depress the semi-circular metal tab on the self-adjuster, while pulling the cable toward the front of vehicle. The cable will now automatically adjust to proper length during kickdown operation.

Torque Converter: Technical Service Bulletins A/T Torque Converter - Leak Test Procedure

Article No. 96-24-9

11/18/96

TORQUE CONVERTER - LEAK TEST PROCEDURE - SERVICE TIP

FORD: 1984-94 TEMPO 1984-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

LINCOLN-MERCURY: 1984-92 MARK VII 1984-94 TOPAZ 1984-97 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1986-97 SABLE 1991-94 CAPRI 1991-97 TRACER 1993-97 MARK VIII 1995-97 MYSTIQUE

LIGHT TRUCK: 1984-90 BRONCO II 1984-96 BRONCO 1984-97 ECONOLINE, F-150-350 SERIES, RANGER 1986-97 AEROSTAR 1988-97 F SUPER DUTY 1991-97 EXPLORER 1993-97 VILLAGER 1995-97 WINDSTAR 1997 EXPEDITION, MOUNTAINEER

ISSUE: A new torque converter leak test tool has been released. The current leak test tool has been discontinued by the manufacturer. The new tool will be available to all dealers in 1997.

ACTION: When using the new leak test tool, a new procedure must be followed. Refer to the following Service Procedure and/or the 1997 Service/Workshop Manuals when using the new leak test tool.

NEW TOOL NUMBER

Description Tool Number

Torque converter Leak Test Tool and Gasket 014-R1075

SERVICE PROCEDURE

1. Clean the outside surface of the torque converter.

CAUTION:

BE CAREFUL NOT TO DAMAGE THE CONVERTER HUB FINISH WHEN INSTALLING THE TOOL.

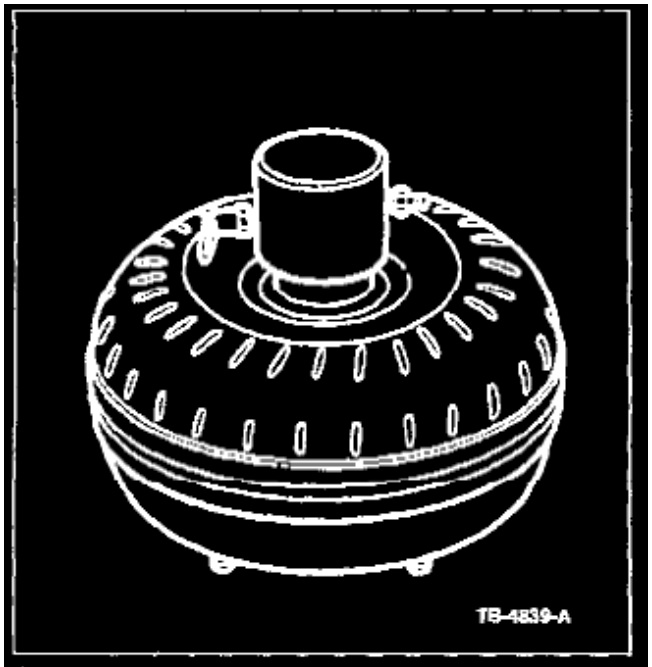


Figure 1

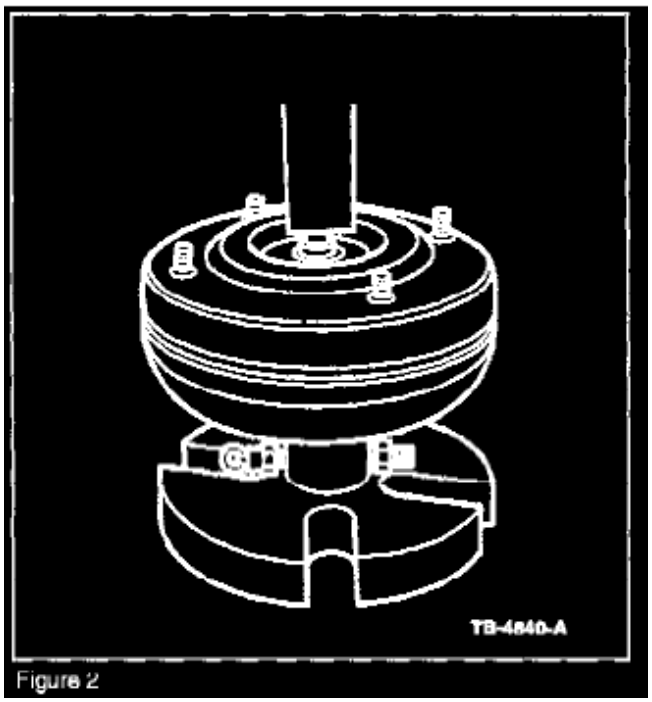


Figure 2

2. Install the Torque Converter Leak Test Tool and Gasket (O14-R1075) into the converter hub. Figure 1.

WARNING:

ALWAYS USE PROPER SAFETY PROCEDURES WHILE USING PRESS.

CAUTION:

DO NOT DAMAGE THE CONVERTER BY APPLYING EXCESSIVE FORCE FROM THE PRESS. USE ONLY ENOUGH FORCE TO SEAL TOOL INTO THE CONVERTER.

3. Place the torque converter with the tool installed into press and apply enough force to seal tool into the converter. Figure 2.

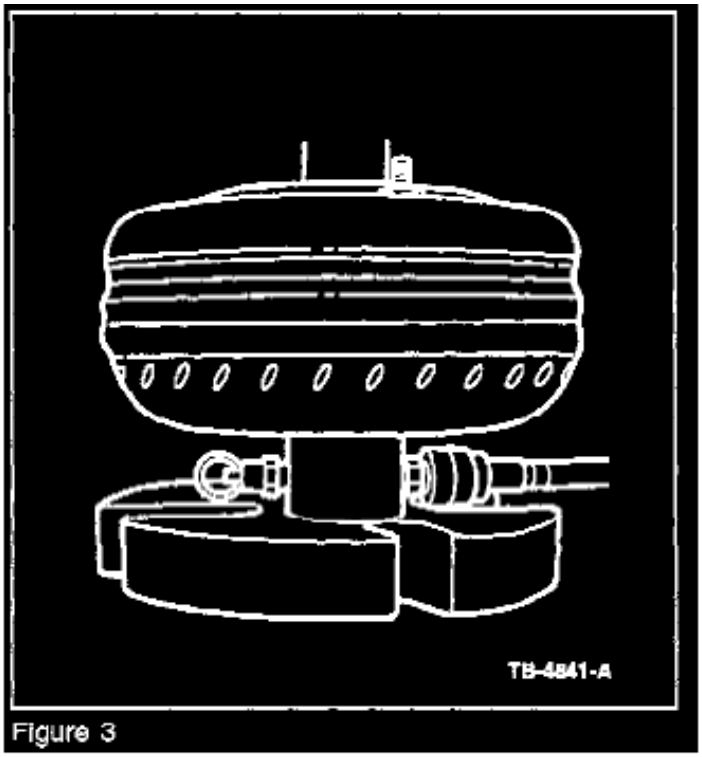


Figure 3

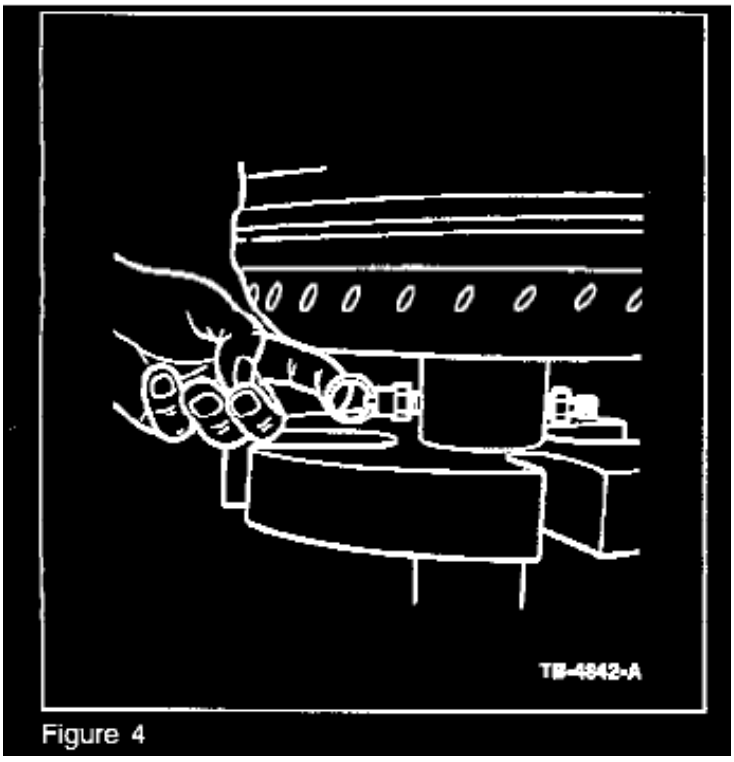


Figure 4

4. Using clean, dry shop air only, apply air pressure of 552 kPa (80 psi) maximum to the valve on the tool. Refer to Figure 3.

5. With air pressure applied to the valve, inspect for any air leaks at the studs, seams and pilot hub. A soap bubble solution may be applied around those areas to aid in diagnosis. If any leaks are present, replace the converter.

6. Disconnect the air line and release the air pressure from the tool by pulling on the release ring and then slowly releasing the press. Refer to Figure 4.

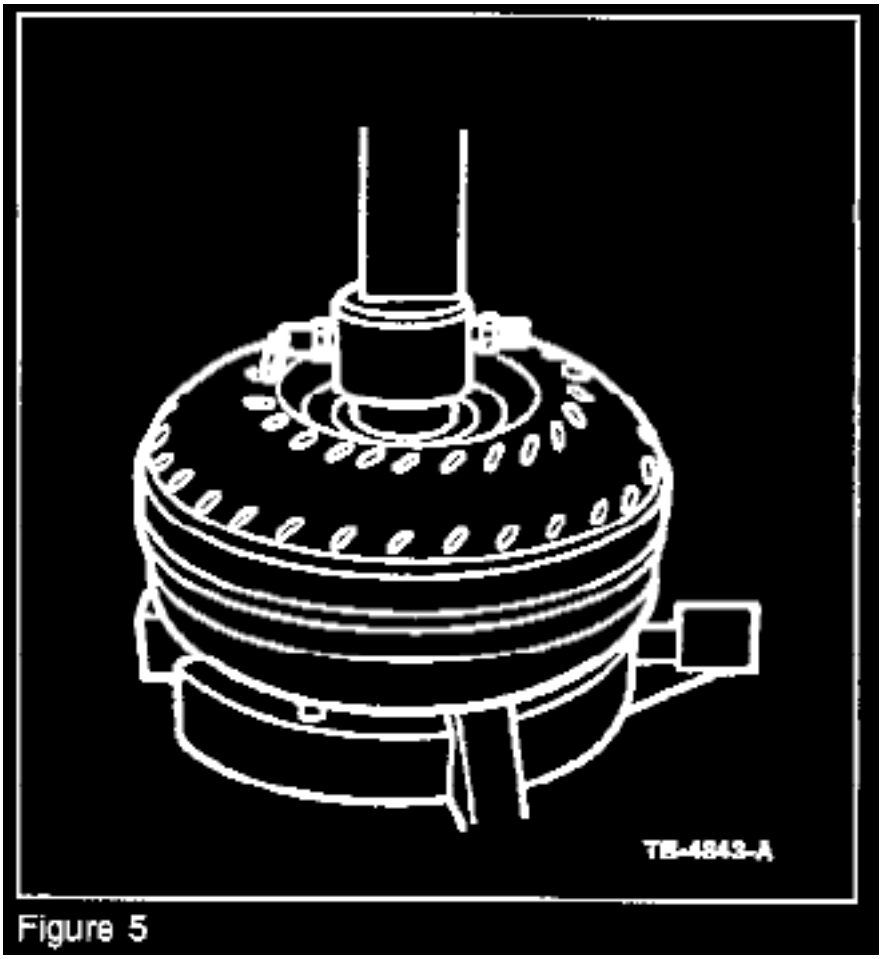


Figure 5

7. Turn the torque converter and tool upside down and reinstall into the press. Repeat Steps 2-6 to check for leaks on the opposite side. Refer to Figure 5.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 504000, 510000

Technical Service Bulletin # 962612 Date: 961216

Torque Converter - Cleaning and Replacement Guidelines

Article No. 96-26-12

12/16/96

^ TRANSAXLE - TORQUE CONVERTER REPLACEMENT GUIDELINES AND TORQUE CONVERTER/TRANSAXLE COOLING SYSTEM CLEANING PROCEDURES - SERVICE TIP

^ TRANSMISSION - TORQUE CONVERTER REPLACEMENT GUIDELINES AND TORQUE CONVERTER/TRANSMISSION COOLING SYSTEM CLEANING PROCEDURES - SERVICE TIP

FORD: 1985-86 LTD 1985-88 EXP 1985-94 TEMPO 1985-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

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MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

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ISSUE: Torque converter replacement guidelines and torque converter/transmission (or transaxle) cooling-system cleaning procedures are now available to reduce repeat repairs.

ACTION: Refer to the following guideline to properly diagnose and service torque converters and to properly clean the torque converter and transmission cooling system using forward flushing/backflushing. For diagnosis, service and cleaning, refer to to the appropriate model/year Service Manual, Sections 07-01, 07-02, 03-03, 307-01, 307-02, or 303-03.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 503000, 504000

Diagnostic Procedure

Prior to torque converter replacement, all diagnostic procedures must be followed. This is to prevent the unnecessary replacement of good torque converters. Only after a complete diagnostic evaluation can the decision be made to replace the torque converter.

The normal diagnostic procedure is as follows:

1. Preliminary inspection.

2. Know and understand the customers concern.

3. Verify the concern:

- Perform the Torque Converter Clutch Operation Test

4. Perform diagnostic procedures:

a. Run On-Board Diagnostics

- Repair all non-transmission-related Diagnostic

Trouble Codes (DTCs) first.

- Repair all transmission DTCs.

- Rerun On-Board Diagnostic to verify repair.

b. Perform Line Pressure Test

c. Perform Stall Speed Test

d. Diagnosis by Symptom Routines - Use the index to locate the appropriate routine that best describes the symptom(s). The routine will list all possible components that may cause or contribute to the symptom. Check each component listed, diagnose and service as required, before servicing the torque converter.

Replacement

The torque converter must be replaced if one or more of the following statements are true:

^ A torque converter malfunction has been determined based on completed diagnostic procedures

^ A converter stud(s), impeller hub or bushing is damaged

^ If there is discoloration of the torque converter (due to overheating)

^ The torque converter is found to be out of specification when performing the following checks (as applicable):

1. Torque Converter One-way Clutch Check

2. End Play Check

3. Stator-to-Turbine Interference Check

4. Converter Leakage Check

5. Stator-to-Impeller Interference Check

^ If there is evidence of transmission assembly or fluid contamination due to the following failure modes:

Torque converter Replacement Policy Failure Modes Major metallic failure

Multiple clutches or clutch plate failures

Sufficient component wear which results in metallic contamination

Torque Converter & Transmission Cooling System Cleaning

REQUIRED TOOLS	
Tool Number	Description
014-00028	Rotunda Converter/Oil Cooler Cleaner
014-00752	Rotunda Oil Cooler Flusher Kit
T77L-7902-R	Converter Clutch Holding Tool
T76L-7902-C	Converter Clutch Torquing Tool
TOOL-4210-C	Dial Indicator With Bracketry
T80L-7902-A	End Play Checking Tool
014-R1075	Torque Converter Leak Check Tool And Gasket
007-00500	New Generation Star (NGS) Tester
007-00095D	Rotunda Transmission Tester Kit - includes all cables and overlays required for transmission/transaxle diagnosis. Refer to the Service Manual for the correct cable/overlay combination to use. Individual cables/overlays and the tester may be ordered separately from Rotunda.

When the torque converter is replaced, the following actions must take place:

1. All cooler lines must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

2. All coolers (in-tank and auxiliary) must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

3. All Cooler By-Pass Valves (CBV), it equipped, must be removed and thoroughly cleaned using Service Manual procedures. Replace rubber coated sealing washers prior to reinstalling CBV. Replace CBV if damaged or plugged.

4. Perform Transmission Cooler Flow Test - If the Transmission Cooling System fails the Flow Test, the coolers, CBVs or lines must be replaced. If the coolers are to be replaced, use only factory approved service parts.

If the torque converter is not being replaced, the following actions must take place:

1. The torque convener must be thoroughly cleaned:

a. Torque converters with drain plugs can be cleaned using the Rotunda Torque Converter Cleaner Follow the instructions included with the equipment.

b. Torque converters without drain plugs can be cleaned by hand. Partially fill the converter using clean transmission fluid (as recommended for the particular transmission). Hand agitate the

converter and then thoroughly drain the fluid. Refill with new fluid, specified for the transmission, and reinstall.

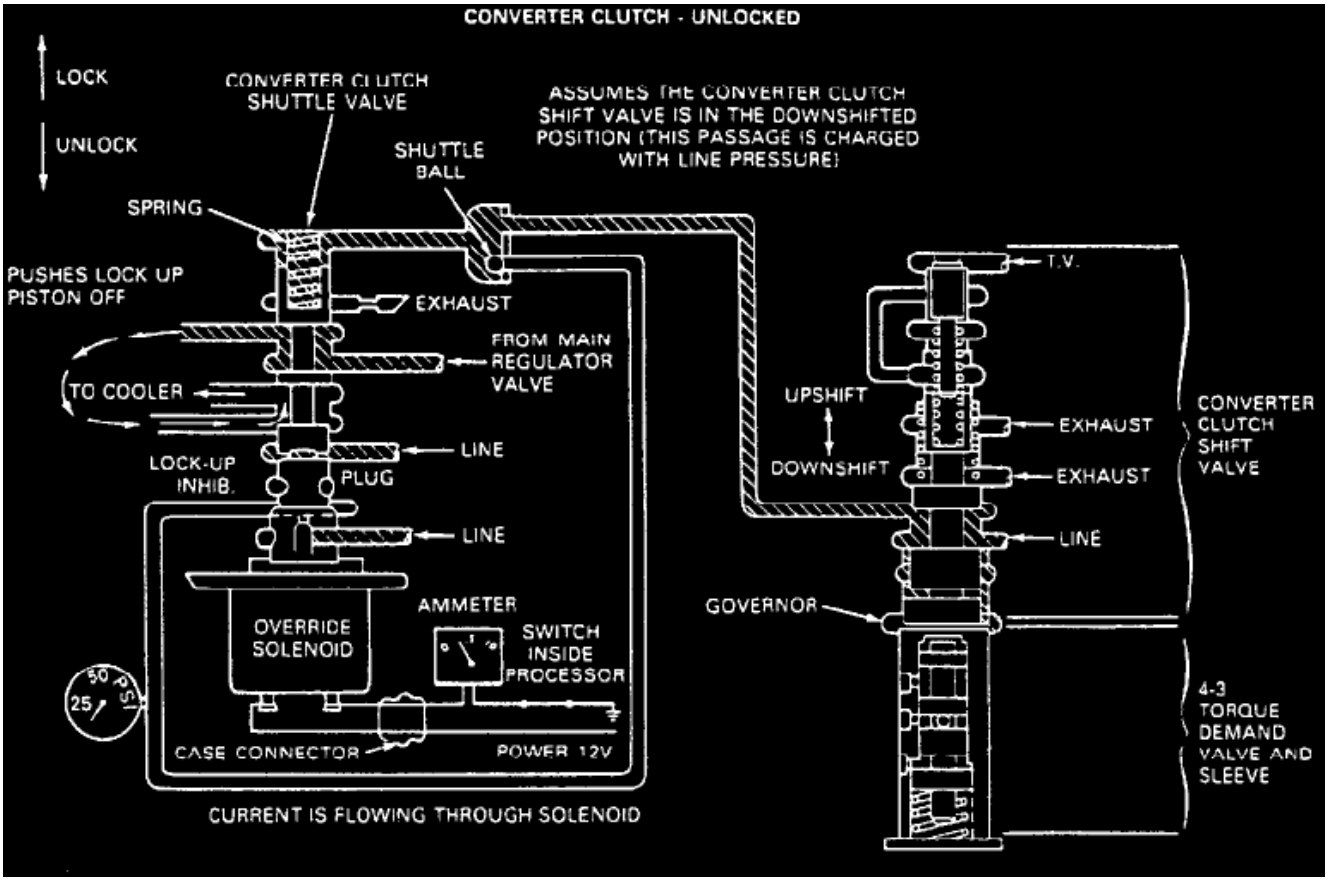
2. All cooler lines must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

3. All coolers (in-tank and auxiliary) must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

4. All Cooler By-Pass Valves (CBV), if equipped, must be removed and thoroughly cleaned using Service Manual procedures. Replace rubber coated sealing washers prior to reinstalling CBV. Replace CBV if damaged or plugged.

5. Perform Transmission Cooler Flow Test - If the Transmission Cooling System fails the Flow Test, the coolers, CBVs or lines must be replaced. If the coolers are to be replaced, use only factory approved service parts.

Required Tools



Torque Converter: Description and Operation

DESCRIPTION The torque converter provides fluid coupling and torque multiplication and acts as a shock absorber. It couples the engine to the gear train as a fluid coupling or fluid clutch, providing hydraulic drive or coupling between engine and gear train. In certain operating conditions, it multiplies torque, providing extra reduction to match engine output to the driveshaft. It also absorbs the shock of gear shifting in the drive train.

CONSTRUCTION The A4LD 10-1/4 inch converter resembles other converters, but has a hydraulic piston plate added. This feature changes the hydraulic coupling to a more efficient mechanical coupling.

OPERATION

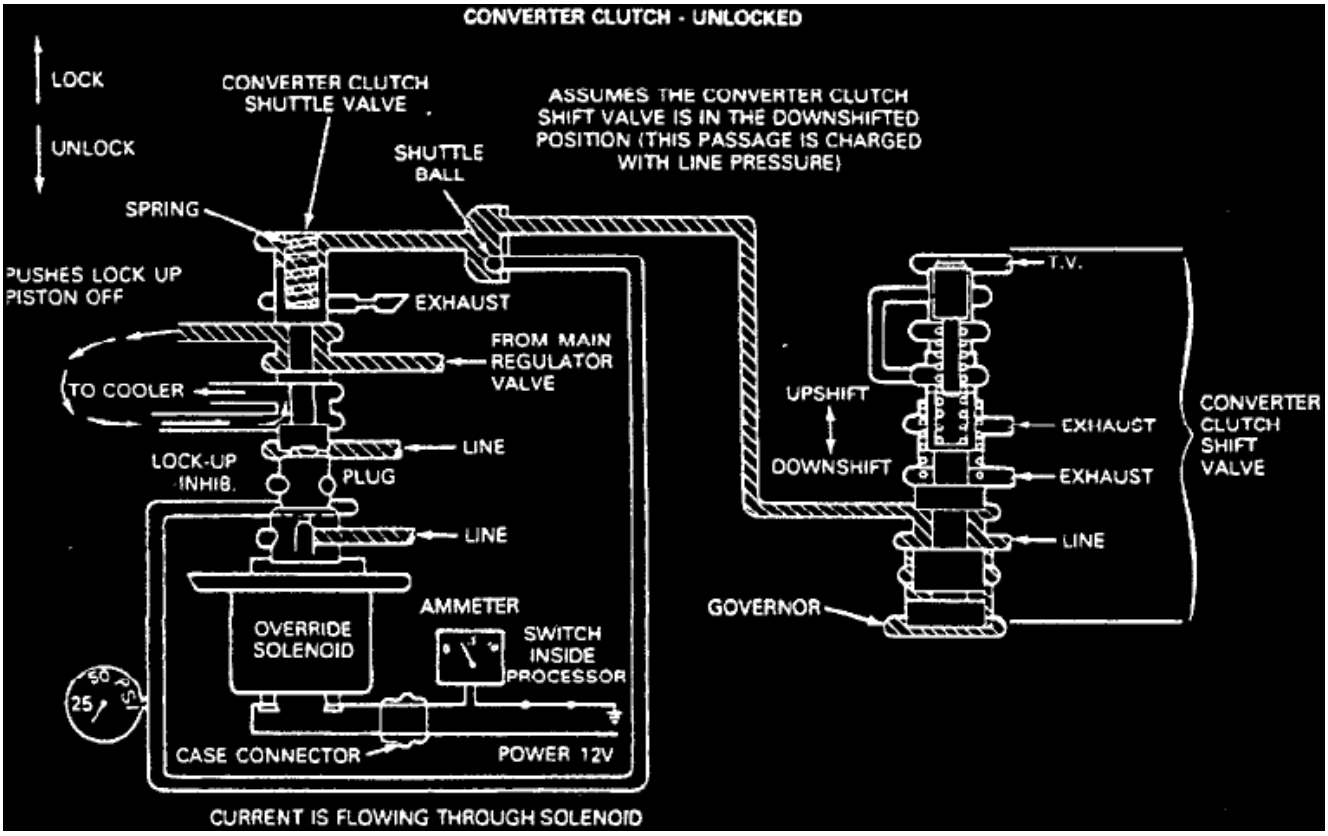
1. Converter clutch application is based on both engine speed and vehicle speed by combined transmission hydraulics and on-board computer

electronic controls. When this clutch engages there is a mechanical connection between the engine and rear wheels. This feature is provided to improve both driveline efficiency and fuel economy. Whenever the clutch is engaged, the vehicle may respond in ways similar to driving with a manual transmission. This is normal and should not be considered as adverse or indicating need for servicing.

2. Converter clutch engagements and disengagements are scheduled hydraulically but can be overridden electronically. The converter clutch is

inhibited from engaging when engine coolant temperature is below 128° F or above 24O° F, during heavy brake application, at closed throttle, during heavy or wide open throttle acceleration, during quick tip-ins or tip-outs, or when actual engine speed is below a certain value at lower vacuums. During these modes, no current flows through the solenoid.

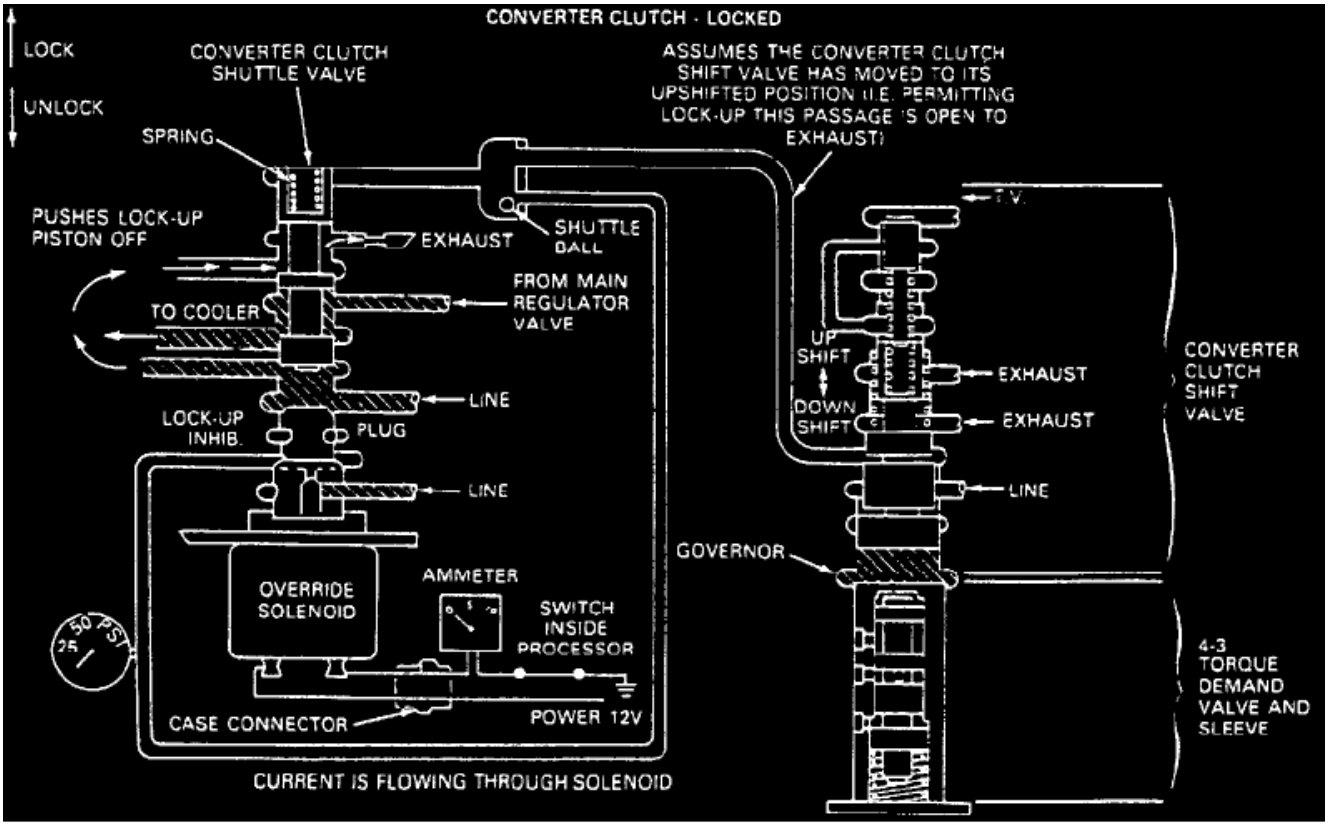
Hydraulics With Converter Clutch Unlocked, 1988 Thunderbird And 1988-1989 Mustang

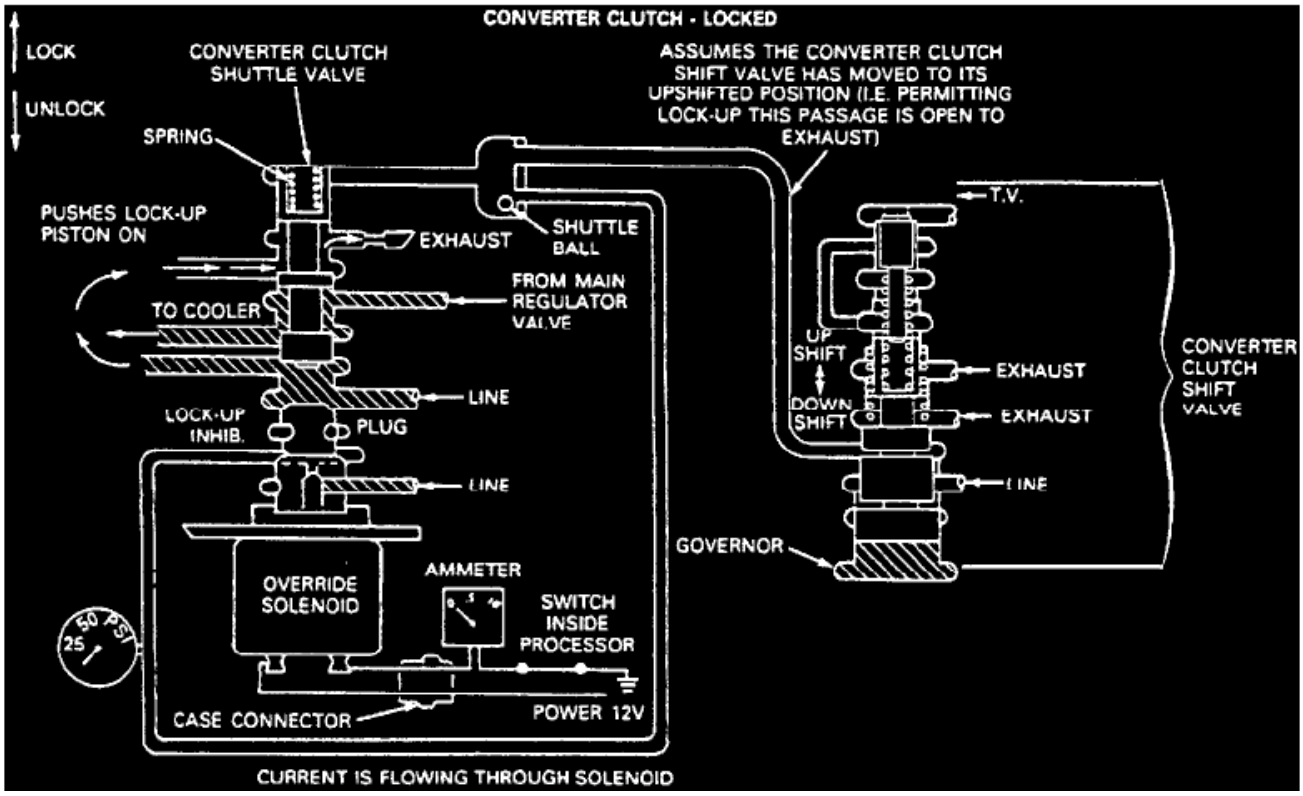


Hydraulics with converter clutch unlocked, (1988-1990 Bronco II, 1988-1991 Aerostar And Ranger, 1990-1991 Mustang, And 1991 Explorer)

3. When the converter clutch shuttle valve is resting on the plug, line pressure is directed through the shuttle valve and to the torque converter in a

flow path that pushes the lockup piston off. When line pressure on the spring end of the converter clutch shuttle valve is exhausted, line pressure on the plug end of the valve forces the valve to move and compress the spring. Governor pressure acting on the converter clutch shift valve has not yet moved the valve to the upshifted position. Line pressure is therefore acting on the spring end of the converter clutch shuttle valve. The torque converter is therefore unlocked.


CONVERTER CLUTCH - LOCKED
LOCK
UNLOCK
CONVERTER CLUTCH SHUTTLE VALVE
SPRING
ASSUMES THE CONVERTER CLUTCH SHIFT VALVE HAS MOVED TO ITS UPSHIFTED POSITION (I.E. PERMITTING LOCK-UP THIS PASSAGE IS OPEN TO EXHAUST)
PUSHES LOCK-UP PISTON OFF
EXHAUST
SHUTTLE BALL
T.V.
FROM MAIN REGULATOR VALVE
TO COOLER
UP SHIFT
EXHAUST
CONVERTER CLUTCH SHIFT VALVE
DOWN SHIFT
EXHAUST
LINE
LOCK-UP INHIB.
PLUG
LINE
LINE
GOVERNOR
OVERRIDE SOLENOID
AMMETER
SWITCH INSIDE PROCESSOR
50 PSI
25
4-3 TORQUE DEMAND VALVE AND SLEEVE
CASE CONNECTOR
POWER 12V
CURRENT IS FLOWING THROUGH SOLENOID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50 PSI
25
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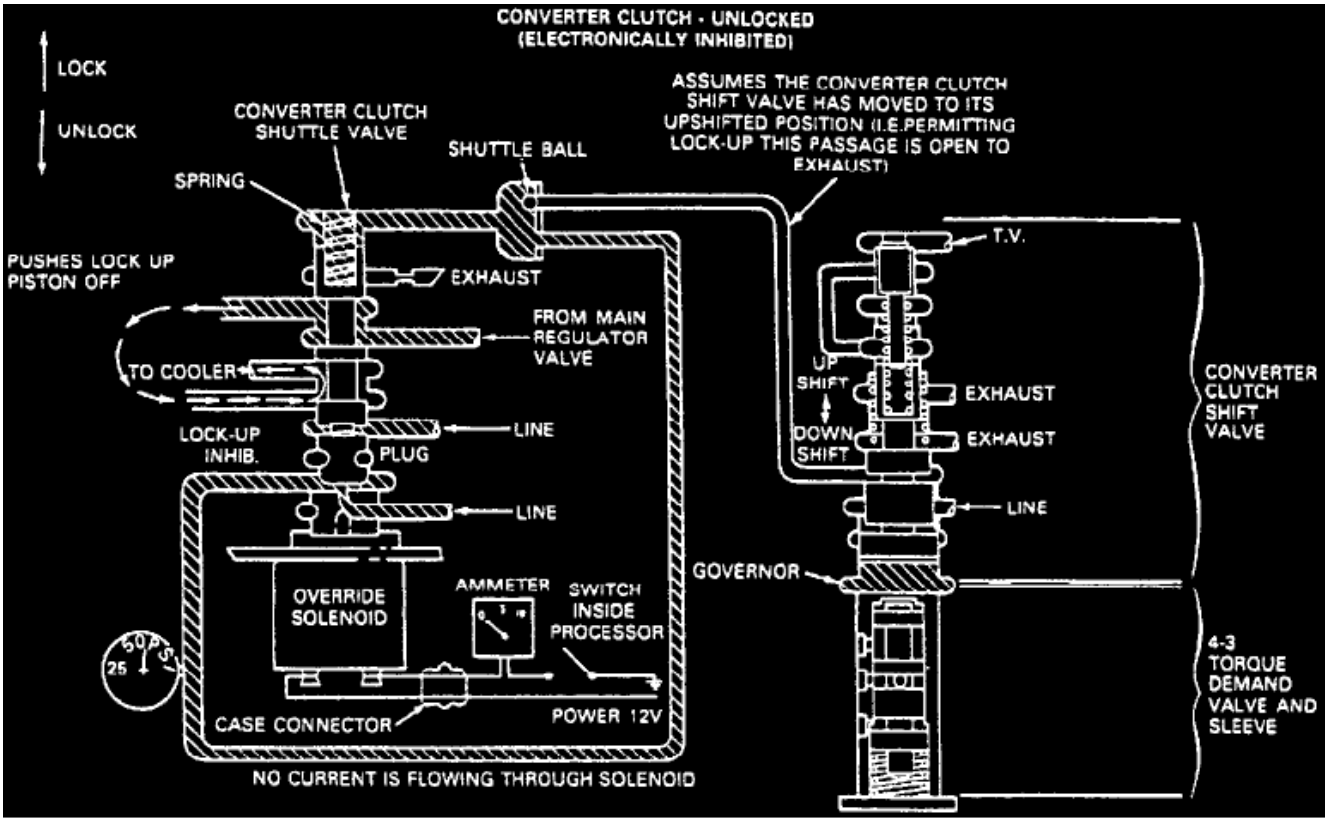
CURRENT IS FLOWING THROUGH SOLENOID

Hydraulics With Converter Clutch Locked, (1988 Thunderbird And 1988-1989 Mustang)

Hydraulics With Converter Clutch Locked. (1988-1990 Bronco II, 1988-1991 Aerostar And Ranger, 1990-1991 Mustang, And 1991 Explorer)

4. As vehicle speed increases, governor pressure increases and the converter clutch shift valve moves to the upshifted position. Oil on the spring end

of the converter clutch shuttle valve now drains to exhaust at the converter clutch shift valve. Line pressure is now directed through the shuttle valve to the converter in a flow path that pushes the piston on.


CONVERTER CLUTCH - UNLOCKED
(ELECTRONICALLY INHIBITED)
LOCK
UNLOCK
CONVERTER CLUTCH SHUTTLE VALVE
SHUTTLE BALL
SPRING
ASSUMES THE CONVERTER CLUTCH SHIFT VALVE HAS MOVED TO ITS UPSHIFTED POSITION (I.E.PERMITTING LOCK-UP THIS PASSAGE IS OPEN TO EXHAUST)
T.V.
PUSHES LOCK UP PISTON OFF
EXHAUST
FROM MAIN REGULATOR VALVE
TO COOLER
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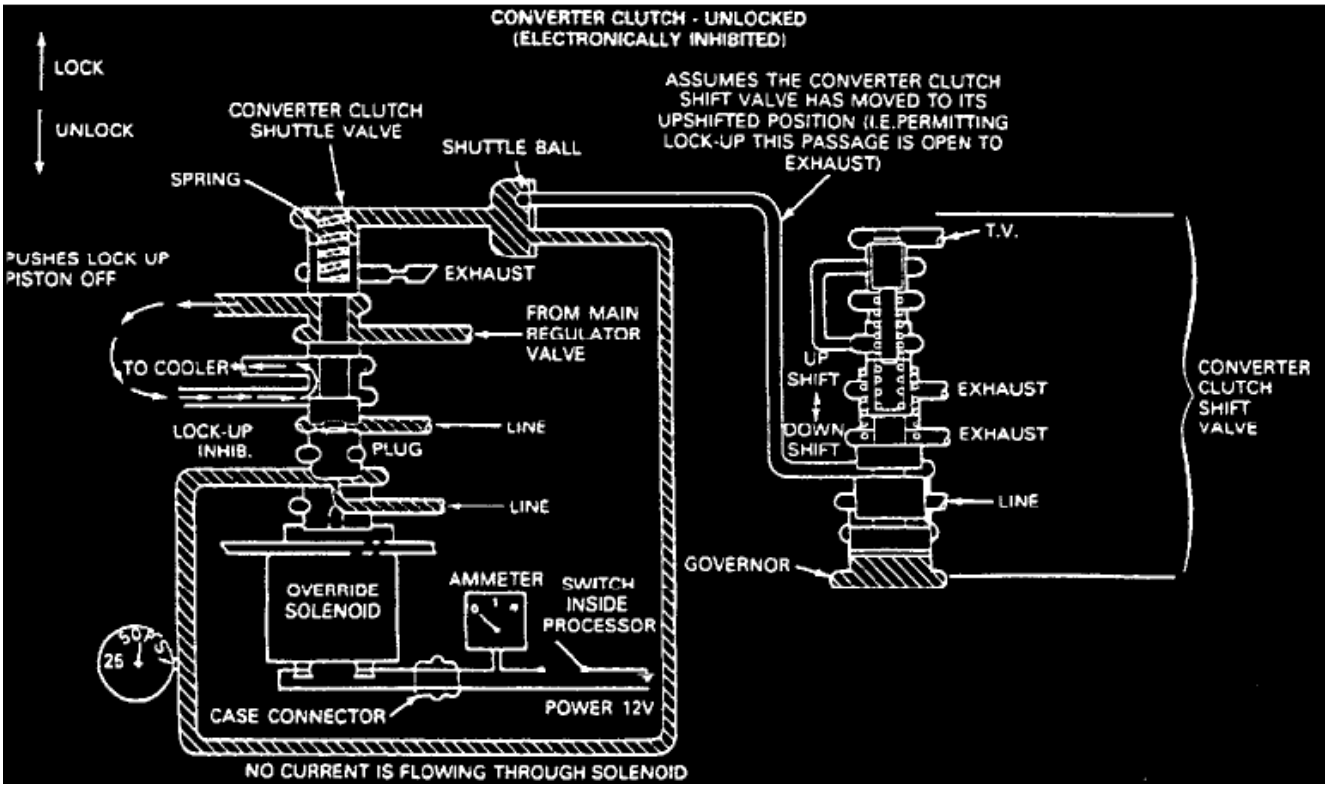
DOWN SHIFT
EXHAUST
EXHAUST
CONVERTER CLUTCH SHIFT VALVE
LOCK-UP INHIB.
PLUG
LINE
LINE
LINE
GOVERNOR
OVERRIDE SOLENOID
AMMETER
SWITCH INSIDE PROCESSOR
50 PSI
25
4-3 TORQUE DEMAND VALVE AND SLEEVE
CASE CONNECTOR
POWER 12V
NO CURRENT IS FLOWING THROUGH SOLENOID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PLUG
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LINE
LINE
GOVERNOR
OVERRIDE SOLENOID
AMMETER
SWITCH INSIDE PROCESSOR
50 PSI
25
CASE CONNECTOR
POWER 12V
NO CURRENT IS FLOWING THROUGH SOLENOID

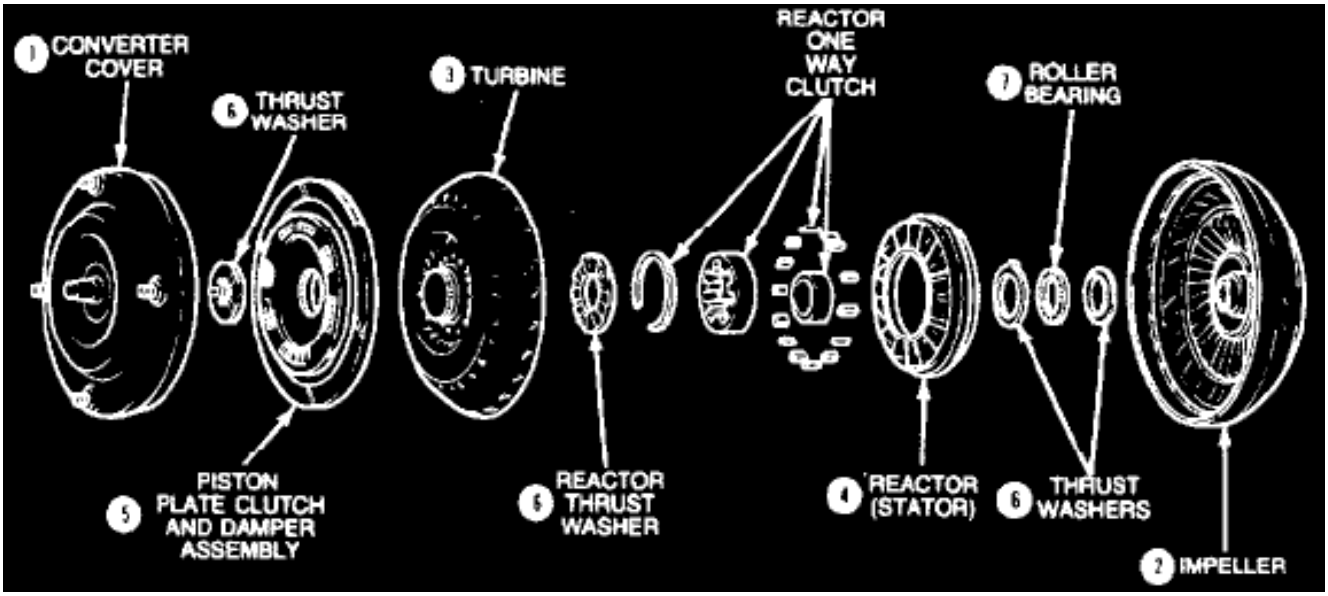
5. If the brakes are now applied, or the vehicle is operated in any of the other inhibit modes, current will not flow through the solenoid.

Hydraulics With Converter Clutch Unlocked But Electronically Inhibited, (1988 Thunderbird And 1988-1989 Mustang)

Hydraulics With Converter Clutch Unlocked But Electronically Inhibited, (1988-1990 Bronco II, 1988-1991 Aerostar And Ranger, 1990-1991 Mustang, And 1991 Explorer)

6. With no current to the solenoid, line pressure can flow through the solenoid valving and enter the lockup inhibition passage. Line pressure in the

inhibition passage forces the shuttle ball to take its position. The shuttle valve moves against the plug and the converter unlocks. Since this is a hybrid system, it will often be necessary to check both the hydraulic and electronic portions of the system.



Component Functions

Exploded View Of Locking Torque Converter

1 The converter cover (1) is bolted to the engine flywheel and is driven at engine speed. It has a hub that pivots in the crankshaft. Thus the cover transmits engine power into the converter.

2. The impeller (2) is the pumping member for fluid coupling and torque multiplication. It is welded to and driven by the cover. Its rear hub

drives the transmission oil pump.

3. The turbine (3) is the driven member of the converter. It is driven by fluid from the impeller and is splined to the input shaft. 4. The reactor (4), also called the stator, causes hydraulic reaction during torque multiplication. It includes a one-way clutch to hold it

stationary only when reaction is required.

5. The piston plate clutch and damper assembly (5) has friction material on the outer portion of the plate and a spring cushioned damper

assembly. It transmits engine power to the turbine from the converter cover.

6. The thrust washers (6) and roller bearing (7) provide bearing surfaces for the converter components that turn against each other.

Torque Multiplication

1. Torque multiplication occurs from stall (engine turning but turbine stopped) up to engagement of the converter clutch. 2. The impeller is driven at engine speed. Fluid is supplied from the valve body to the spaces between the vanes. Centrifugal force causes the

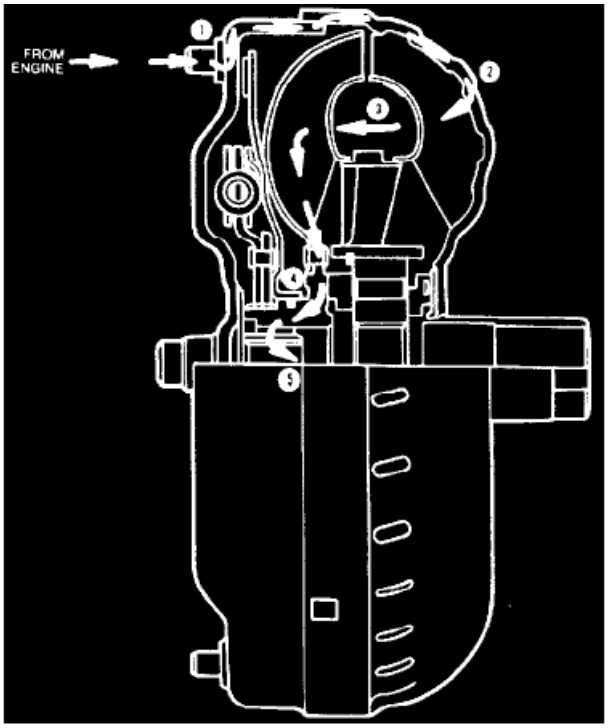
fluid to be set in motion and forced out of the openings around the inner ring. The fluid is directed toward the turbine vanes. Striking the turbine vanes, the fluid causes it to turn in the same direction as the impeller. The fluid flows around the turbines' inner ring and is directed to the reactor. The

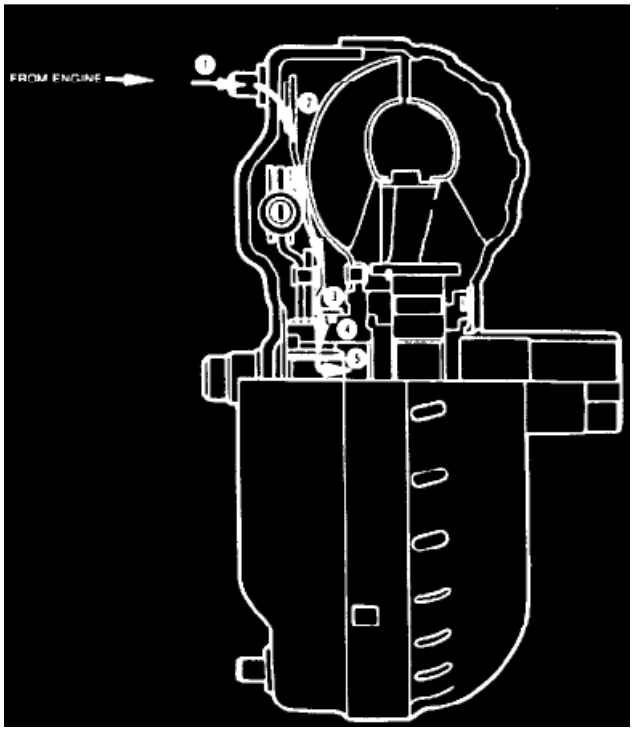
reactor is held stationary by its one-way clutch. Its vanes direct the fluid back to the impeller in a direction that assists the impeller. The impeller again accelerates the fluid and returns it to the turbine with increased energy.

3. Torque multiplication comes from a reduced turbine speed and reuse of the velocity of the fluid returning from the reactor to the impeller.

As turbine speed increases in relation to the impeller, there is less energy in the returning fluid, and therefore less torque multiplication.

Operation And Power Flow


FROM ENGINE


FROM ENGINE

Torque Converter Power Flow With Hydraulic Input

1. Power flow through the torque converter when the clutch is not active is as shown in the Torque Converter Power Flow With Hydraulic

Input image. The engine drives the converter cover (1).

2. The converter cover drives the impeller (2). 3. The impeller drives the turbine hydraulically (3). 4. The turbine drives the input shaft (4). 5. The input shaft transmits power into the gear train (5).

Torque Converter Power Flow With Mechanical Input

6. Power flow through the torque converter when piston plate clutch is engaged is as shown in the Torque Converter Power Flow With

Mechanical Input image. The clutch is engaged when hydraulic pressure from the valve body is applied to the clutch plate from the turbine side of the plate.

7. The engine drives the converter cover (1). 8. The converter cover drives the piston plate clutch (2). 9. The clutch drives the turbine (3).

10. The turbine drives the input shaft (4). 11. The input shaft transmits power into the gear train (5).

Torque Converter: Testing and Inspection

TORQUE CONVERTER CLUTCH TEST

NOTE: This test should be performed on the road. If performed on the hoist the technician may not feel the torque converter clutch solenoid engage.

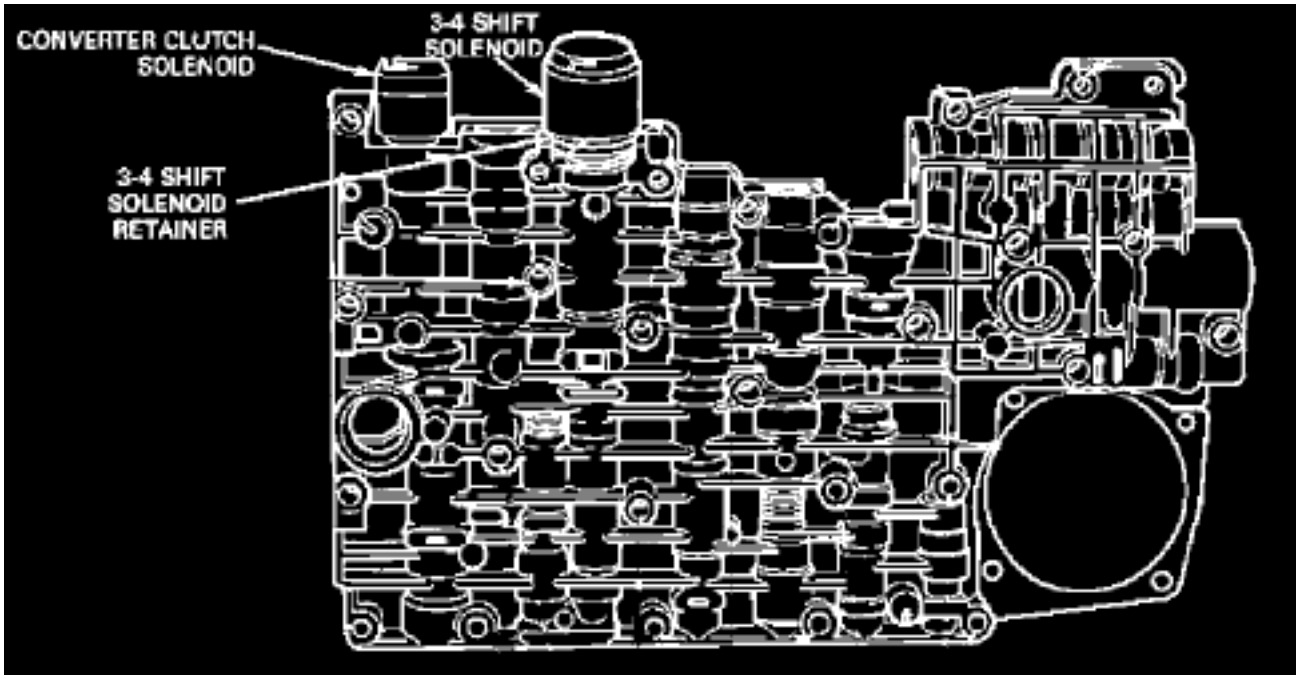
NOTE: The torque converter clutch solenoid is labeled "CCO" on the transmission tester overlay.

CAUTION: Do not depress torque converter clutch switch with transmission in gear and the vehicle at a stop. Damage to torque converter clutch may result.

NOTE: Engine coolant temperature must be above 128° and below 240° F. This temperature can be obtained after approximately 15 minutes of highway driving. Since most converter clutch shifts are difficult to feel, a tachometer and/or vacuum gauge must be connected to engine.

1. Accelerate vehicle to 88km/h (55 mph) and allow vehicle to upshift into third gear. Hold speed steady and depress the torque converter clutch

switch. Does the torque converter (7902) engage? Does the engine rpm drop? Did the torque converter clutch solenoid activate/deactivate?


CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

Converter Clutch Override Solenoid: Description and Operation

Torque Converter Clutch Solenoid (TCC)

The torque torque converter clutch solenoid (TCC) is used to control the apply and release of the torque converter clutch.

Transmission Function: Used to engage the torque converter clutch.

Technical Service Bulletin # 962612 Date: 961216

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OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 501000, 502000, 503000, 504000

Diagnostic Procedure

Prior to torque converter replacement, all diagnostic procedures must be followed. This is to prevent the unnecessary replacement of good torque converters. Only after a complete diagnostic evaluation can the decision be made to replace the torque converter.

The normal diagnostic procedure is as follows:

1. Preliminary inspection.

2. Know and understand the customers concern.

3. Verify the concern:

- Perform the Torque Converter Clutch Operation Test

4. Perform diagnostic procedures:

a. Run On-Board Diagnostics

- Repair all non-transmission-related Diagnostic

Trouble Codes (DTCs) first.

- Repair all transmission DTCs.

- Rerun On-Board Diagnostic to verify repair.

b. Perform Line Pressure Test

c. Perform Stall Speed Test

d. Diagnosis by Symptom Routines - Use the index to locate the appropriate routine that best describes the symptom(s). The routine will list all possible components that may cause or contribute to the symptom. Check each component listed, diagnose and service as required, before servicing the torque converter.

Replacement

The torque converter must be replaced if one or more of the following statements are true:

^ A torque converter malfunction has been determined based on completed diagnostic procedures

^ A converter stud(s), impeller hub or bushing is damaged

^ If there is discoloration of the torque converter (due to overheating)

^ The torque converter is found to be out of specification when performing the following checks (as applicable):

1. Torque Converter One-way Clutch Check

2. End Play Check

3. Stator-to-Turbine Interference Check

4. Converter Leakage Check

5. Stator-to-Impeller Interference Check

^ If there is evidence of transmission assembly or fluid contamination due to the following failure modes:

Torque converter Replacement Policy Failure Modes Major metallic failure

Multiple clutches or clutch plate failures

Sufficient component wear which results in metallic contamination

Torque Converter & Transmission Cooling System Cleaning

REQUIRED TOOLS	
Tool Number	Description
014-00028	Rotunda Converter/Oil Cooler Cleaner
014-00752	Rotunda Oil Cooler Flusher Kit
T77L-7902-R	Converter Clutch Holding Tool
T76L-7902-C	Converter Clutch Torquing Tool
TOOL-4210-C	Dial Indicator With Bracketry
T80L-7902-A	End Play Checking Tool
014-R1075	Torque Converter Leak Check Tool And Gasket
007-00500	New Generation Star (NGS) Tester
007-00085D	Rotunda Transmission Tester Kit - includes all cables and overlays required for transmission/transaxle diagnosis. Refer to the Service Manual for the correct cable/overlay combination to use. Individual cables/overlays and the tester may be ordered separately from Rotunda.

When the torque converter is replaced, the following actions must take place:

1. All cooler lines must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

2. All coolers (in-tank and auxiliary) must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

3. All Cooler By-Pass Valves (CBV), it equipped, must be removed and thoroughly cleaned using Service Manual procedures. Replace rubber coated sealing washers prior to reinstalling CBV. Replace CBV if damaged or plugged.

4. Perform Transmission Cooler Flow Test - If the Transmission Cooling System fails the Flow Test, the coolers, CBVs or lines must be replaced. If the coolers are to be replaced, use only factory approved service parts.

If the torque converter is not being replaced, the following actions must take place:

1. The torque convener must be thoroughly cleaned:

a. Torque converters with drain plugs can be cleaned using the Rotunda Torque Converter Cleaner Follow the instructions included with the equipment.

b. Torque converters without drain plugs can be cleaned by hand. Partially fill the converter using clean transmission fluid (as recommended for the particular transmission). Hand agitate the converter and then thoroughly drain the fluid. Refill with new fluid, specified for the transmission, and reinstall.

2. All cooler lines must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

3. All coolers (in-tank and auxiliary) must be thoroughly cleaned by Back and Forward Flushing using Service Manual procedure.

4. All Cooler By-Pass Valves (CBV), if equipped, must be removed and thoroughly cleaned using Service Manual procedures. Replace rubber coated sealing washers prior to reinstalling CBV. Replace CBV if damaged or plugged.

5. Perform Transmission Cooler Flow Test - If the Transmission Cooling System fails the Flow Test, the coolers, CBVs or lines must be replaced. If the coolers are to be replaced, use only factory approved service parts.

Required Tools

Transmission Cooler: Testing and Inspection

TRANSMISSION FLUID COOLER CHECK

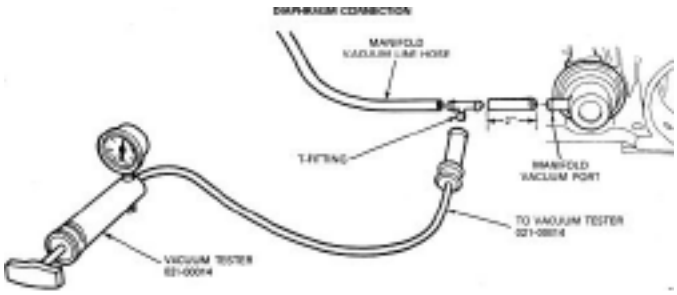
1. Ensure linkage is properly adjusted and fluid level and control pressure are within specifications. 2. Remove transmission dipstick from filler tube and insert funnel in tube. 3. Raise and support vehicle. 4. Remove cooler return line from its fitting in the case, attach a hose to cooler return line and fasten free end of hose in funnel installed in filler tube. 5. Start engine and set idle at 1,000 RPM with transmission in Neutral. 6. Observe fluid flow at funnel. When flow is constant, it should be liberal. If there is not a liberal flow at 1,000 RPM in Neutral, low pump capacity,

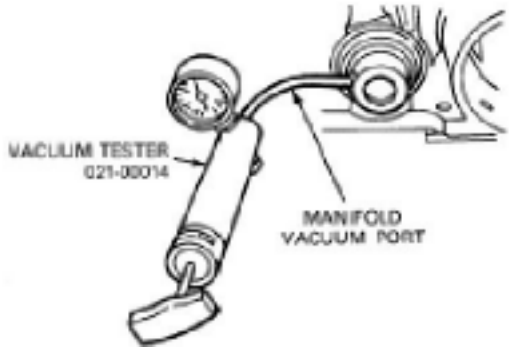
main circuit system leakage, stuck converter charge relief valve, or cooler system restriction is indicated.

7. To separate transmission trouble from cooler system trouble, observe flow at transmission case converter-out fitting.

Transmission Temperature Sensor/Switch: Testing and Inspection

Pinpoint testing procedures for this component are located in the system level Testing and Inspection.





Vacuum Diaphragm: Testing and Inspection

OFF VEHICLE TEST

1. Remove unit from transmission and, using suitable vacuum tester, adjust tester until vacuum gauge reads 18 inches with end of vacuum hose

blocked off.

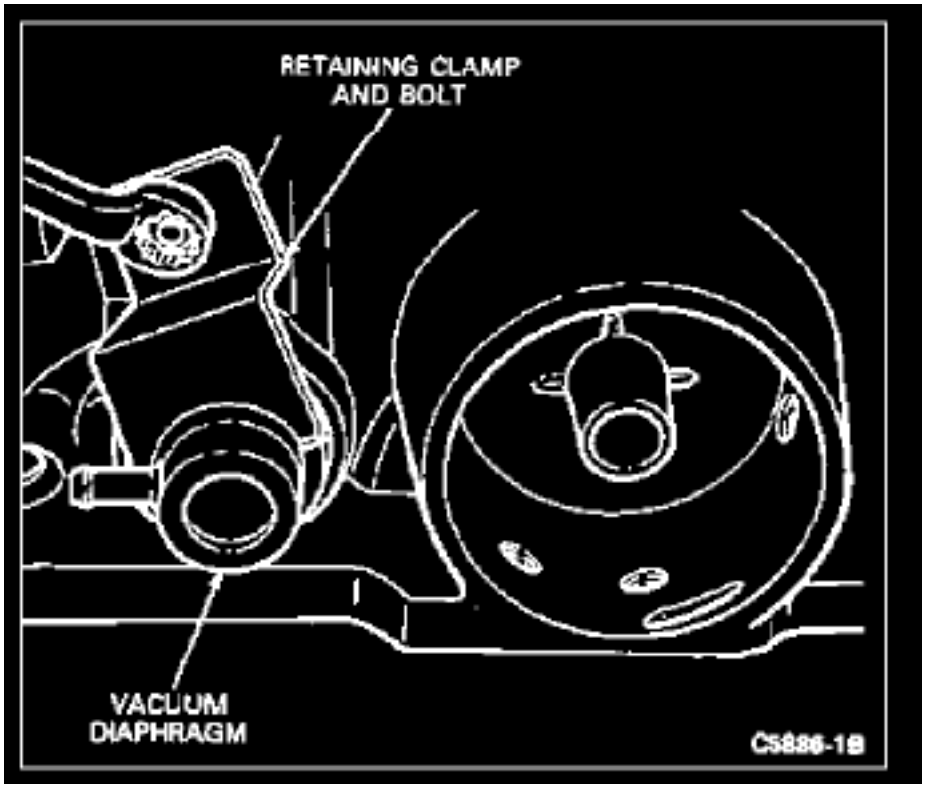
2. Connect vacuum hose to manifold vacuum port. 3. If gauge still reads 18 inches, vacuum unit diaphragm is not leaking. 4. A second leakage check can be made as the hose is removed from the transmission vacuum unit. 5. Hold a finger over the end of the vacuum control rod. 6. When the hose is removed the internal spring of the vacuum unit should push the control rod outward. 7. If the vacuum diaphragm needs replacing, install a new unit that has been released for service.

ON VEHICLE TEST

1. Start the vacuum pump and set the regulator knob so that the vacuum gauge reads 18 inches with the end of the vacuum hose blocked off, then

connect the vacuum hose to the diaphragm unit.

2. If the gauge still reads 18 inches, the vacuum diaphragm unit is not leaking.



Vacuum Diaphragm: Service and Repair

Vacuum Diaphragm

Removal and Installation

1. On 4.0L and 2.9L 4x4 vehicles, remove nut from studded bolt and remove heat shield from studded bolt and clips on frame.

2. Disconnect hose from vacuum diaphragm.

3. Remove bolt or studded bolt and remove clamp.Do not pry or bend clamp. Pull vacuum diaphragm from transmission case.

4. Remove the vacuum diaphragm control rod from transmission case.

5. Install vacuum diaphragm control rod in transmission case.

6. Push vacuum diaphragm into case and secure with retaining clamp and bolt or studded bolt. Tighten bolt to 9-12 N-m (80-106 in-lb). On 2.9L

and 4.0L 4x4 vehicles, tighten studded bolt to 8-11 N-m 70-98 in-lb).

7. Install vacuum diaphragm hose to vacuum diaphragm.

8. Install heat shield on studded bolt and push retaining clips on pan rail. Tighten nut on studded bolt to 8-11 N-m (70-98 in-lb).

Valve Body: Customer Interest A/T - A4LD Harsh 2nd - 3rd Gear Backout Upshift

Article No. 93-16-15

08/04/93

TRANSMISSION - A4LD - HARSH 2-3 BACKOUT UPSHIFT DURING ALTITUDE OPERATION - ALTITUDE CALIBRATIONS ONLY - VEHICLES BUILT BEFORE 6/21/93

LIGHT TRUCK: 1990-93 AEROSTAR, EXPLORER, RANGER

This TSB Article is being republished in its entirety to include a model applications chart and an illustration showing the location of the 2-3 backout spring.

ISSUE: Some high altitude calibration units may exhibit a harsh 2-3 backout upshift during altitude operating conditions. This may be caused by the calibration of the 2-3 backout spring in bore 211 of the main control assembly.

ACTION:

1990-1993 4.0L ALTITUDE APPLICATIONS
TRANSMISSIONS BUILT BEFORE BUILD DATE CODE (03-F-21)

TRANSMISSION MODEL	DESCRIPTION
1990 MODELS	
90GT-FAA	AEROSTAR RWD (VAN)
90GT-FBA	AEROSTAR RWD (WAGON)
90GT-AEA	AEROSTAR AWD (VAN)
90GT-AEE	AEROSTAR AWD (WAGON)
90GT-DAA	RANGER 4X2
90GT-BAA	RANGER 4X4
1991 MODELS	
91GT-HAA	AEROSTAR RWD (VAN)
91GT-SBA	AEROSTAR RWD (WAGON)
91GT-SDA	AEROSTAR AWD (VAN)
91GT-SFA	AEROSTAR AWD (WAGON)
91GT-LAA	RANGER 4X2
91GT-NAA	RANGER 4X4
91GT-BAB	EXPLORER 4X2
91GT-EAB	EXPLORER 4X4
1992 MODELS	
92GT-AKA	AEROSTAR RWD (VAN)
92GT-AMA	AEROSTAR RWD (WAGON)
92GT-ARA	AEROSTAR AWD (VAN)
92GT-ATA	AEROSTAR AWD (WAGON)
92GT-CDA	EXPLORER 4X2
92GT-CFA	EXPLORER 4X4
92GT-DCA	RANGER 4X2
92GT-DEA	RANGER 4X4
1993 MODELS	
TRANSMISSIONS BUILT BEFORE 1993-JUNE-21	
93GT-CBA	AEROSTAR RWD (VAN)
93GT-KBA	AEROSTAR RWD (WAGON)
93GT-EDA	AEROSTAR AWD (VAN)
93GT-NBA	AEROSTAR AWD (WAGON)
93GT-HAA	EXPLORER 4X2
93GT-NAA	EXPLORER 4X4
93GT-LAA	RANGER 4X2 (ALT)
93GT-LBA	RANGER 4X2 (CAL)
93GT-SAA	RANGER 4X4 (ALT)
93GT-SBB	RANGER 4X4 (CAL)

YEAR CODES	MONTH CODES		
1990-00	JAN-A	MAY-E	SEP-J
1991-01	FEB-B	JUN-F	OCT-K
1992-02	MAR-C	JUL-G	NOV-L
1993-03	APR-D	AUG-H	DEC-M

AUTOMATIC TRANSMISSION MODEL IDENTIFICATION

MODELS ARE IDENTIFIED BY A SERVICE IDENTIFICATION TAG AFFIXED TO THE ASSEMBLY. TAGS ARE LOCATED AND CONTAIN INFORMATION AS FOLLOWS:

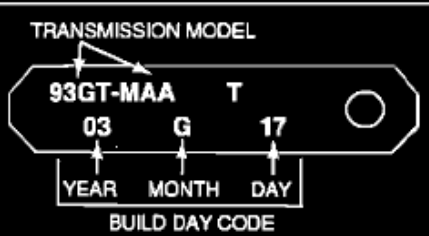
A4LD	ATTACHED TO THE LOWER LEFT HAND EXTENSION ATTACHING BOLT	

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Figure 1

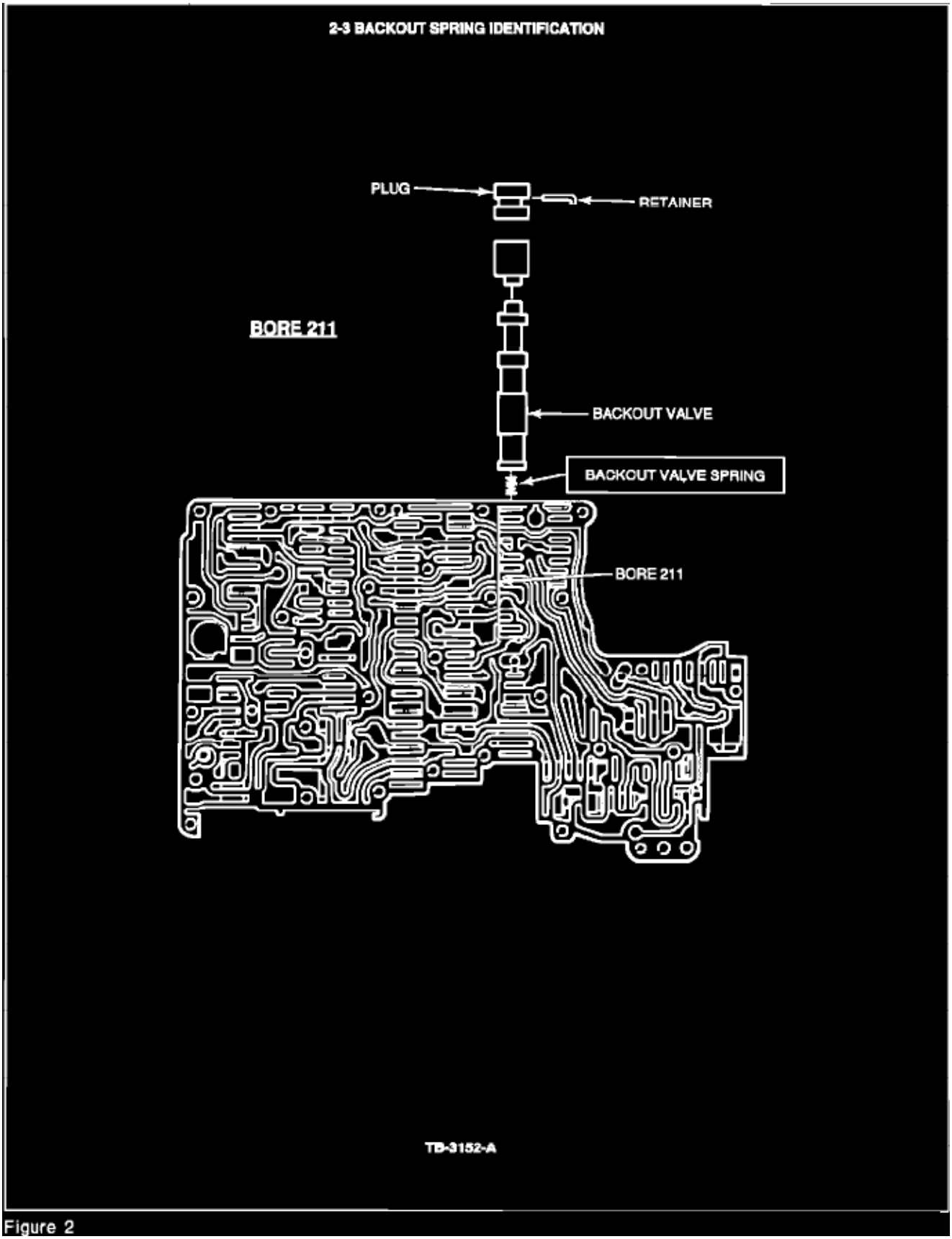


Figure 2

Refer to the attached transmission model chart and build date code (Figure 1). If the transmission model is listed and the transmission was built before 6/21/93, replace the 2-3 backout spring with a

LIGHT BLUE (revised calibration) spring (F3TZ-7D230-B). Refer to Figure 2 for the 2-3 backout spring location, and refer to the Aerostar/Ranger/Explorer Service Manual, section 07-01A for service details.

CAUTION: PERFORMING THIS TSB ON A UNIT NOT SHOWN IN THE CALIBRATION LIST MAY RESULT IN DAMAGE TO THE TRANSMISSION ASSEMBLY.

PART NUMBER PART NAME CLASS

F3TZ-7D230-B 2-3 Backout Spring B

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-6-14

WARRANTY STATUS: Eligible Under Basic Warranty Coverage And Powertrain Warranty Coverage For 1990/91 Models, Eligible Under Bumper To Bumper Warranty Coverage For 1992/93 Models

OPERATION DESCRIPTION TIME

931615A Replace 2-3 Backout Spring 1.3 Hrs.

DEALER CODING

BASIC PART NO. CONDITION CODE

7D230 11

OASIS CODES: 501000

Valve Body: Customer Interest A/T - Increase In RPM During Light Throttle 2-3 Upshifts

Article No. 93-14-21

07/07/93

TRANSMISSION - A4LD - SLIGHT INCREASE OF ENGINE RPM ABOVE EXPECTED LEVELS DURING LIGHT THROTTLE 2-3 UPSHIFTS - NON ALTITUDE VEHICLES WITH 4.0L ENGINES

LIGHT TRUCK: 1990-92 AEROSTAR, RANGER 1991-92 EXPLORER

This TSB Article is being republished in its entirety to include a model applications chart and an illustration showing the location of the 2-3 backout spring.

ISSUE: A slight increase of engine RPM, above normally expected levels, during light throttle 2-3 upshifts may be experienced. This is caused by the calibration of the 2-3 backout spring in bore 211 of the Main Control Assembly.

ACTION:

1990-1992 4.0L 49 STATE AND CANADA (NON-ALTITUDE)
TRANSMISSION BUILD DATE CODES

TRANSMISSION MODEL	DESCRIPTION
1990 MODELS	
90GT-EAA	AEROSTAR RWD (VAN)
90GT-EBA	AEROSTAR RWD (WAGON)
90GT-ADA	AEROSTAR AWD (VAN)
90GT-ADD	AEROSTAR AWD (WAGON)
90GT-CAA	RANGER 4X2
90GT-AAA	RANGER 4X4
1991 MODELS	
91GT-GAA	AEROSTAR RWD (VAN)
91GT-SAA	AEROSTAR RWD (WAGON)
91GT-SCA	AEROSTAR AWD (VAN)
91GT-SEA	AEROSTAR AWD (WAGON)
91GT-KAA	RANGER 4X2
91GT-MAA	RANGER 4X4
91GT-AAA	EXPLORER 4X2
91GT-AAB	EXPLORER 4X2
91GT-DAA	EXPLORER 4X4
91GT-DAB	EXPLORER 4X4
1992 MODELS	
92GT-AHA	AEROSTAR RWD (VAN)
92GT-ALA	AEROSTAR RWD (WAGON)
92GT-ANA	AEROSTAR AWD (VAN)
92GT-ASA	AEROSTAR AWD (WAGON)
92GT-CBA	EXPLORER 4X2
92GT-CEA	EXPLORER 4X4
92GT-DBA	RANGER 4X2
92GT-DDA	RANGER 4X4

YEAR CODES	MONTH CODES		
1990-00	JAN-A	MAY-E	SEP-J
1991-01	FEB-B	JUN-F	OCT-K
1992-02	MAR-C	JUL-G	NOV-L
	APR-D	AUG-H	DEC-M

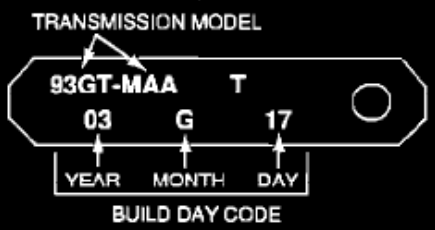
AUTOMATIC TRANSMISSION MODEL IDENTIFICATION		
MODELS ARE IDENTIFIED BY A SERVICE IDENTIFICATION TAG AFFIXED TO THE ASSEMBLY. TAGS ARE LOCATED AND CONTAIN INFORMATION AS FOLLOWS:		
A4LD	ATTACHED TO THE LOWER LEFT HAND EXTENSION ATTACHING BOLT	

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Figure 1

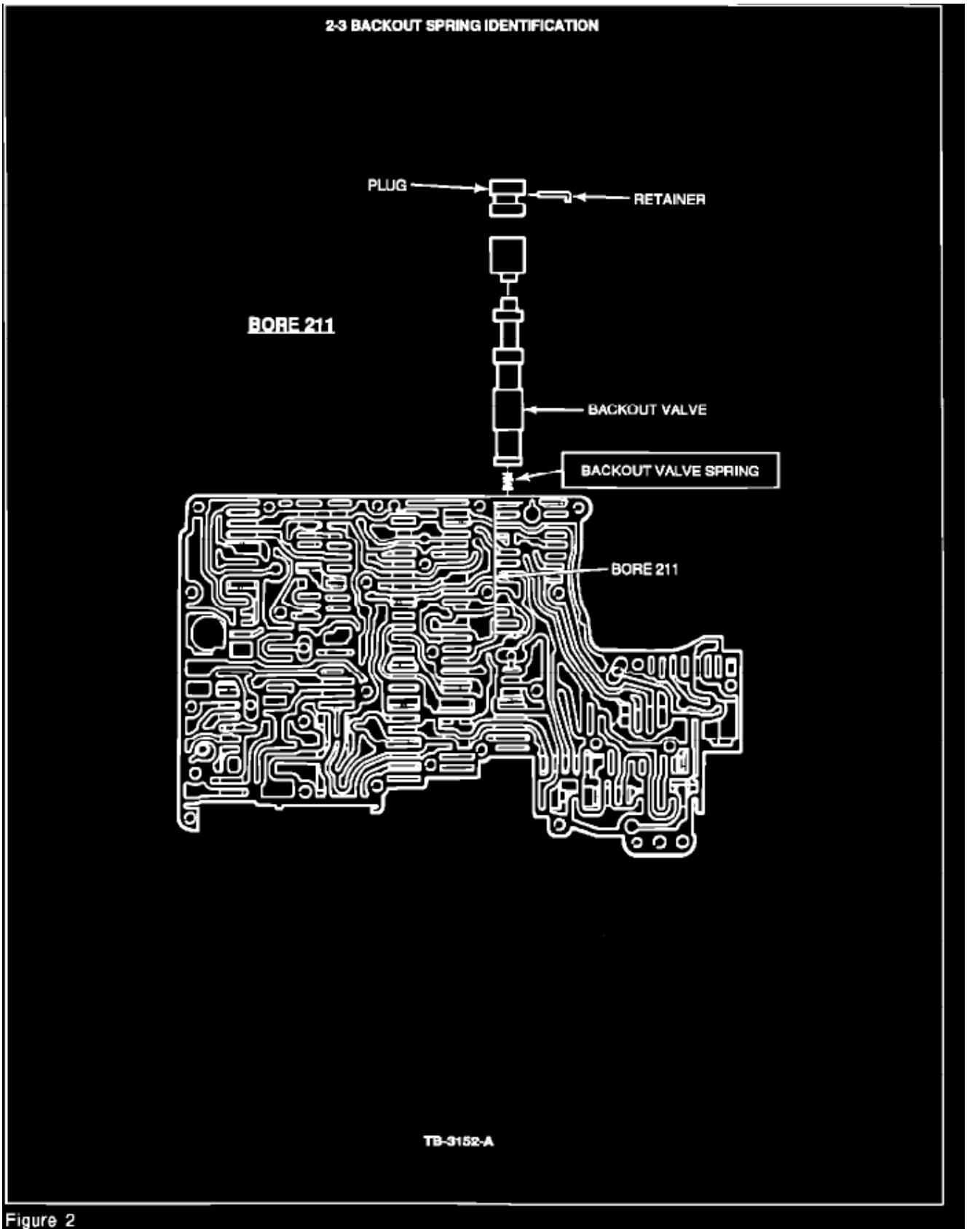

2-3 BACKOUT SPRING IDENTIFICATION
PLUG
RETAINER
BORE 211
BACKOUT VALVE
BACKOUT VALVE SPRING
BORE 211
TB-3152-A

Figure 2

Refer to the attached transmission model chart and build date code, Figure 1. If the transmission model is listed, replace the existing 2-3 backout spring in bore 211 of the Main Control Assembly with a WHITE revised calibrated spring, part # F3TZ-7D230-A. Refer to Figure 2 for the 2-3 backout spring location, and refer to the 1992 Ranger/Explorer/Aerostar Service Manual, Section 07-01A, for service details.

CAUTION: PERFORMING THIS TSB ON A UNIT NOT SHOWN IN THE CALIBRATION LIST MAY RESULT IN DAMAGE TO THE TRANSMISSION ASSEMBLY.

PART NUMBER PART NAME CLASS

F3TZ-7D230-A 2-3 Backout Spring B

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 93-5-15

WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Model Vehicles, Basic Warranty Coverage And Powertrain Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

931421A Replace 2-3 Backout Spring 1.3 Hrs.

DEALER CODING

BASIC PART NO. CONDITION CODE

7D230 11

OASIS CODES: 501000, 504000, 590000

Valve Body: All Technical Service Bulletins A/T - A4LD Harsh 2nd - 3rd Gear Backout Upshift

Article No. 93-16-15

08/04/93

TRANSMISSION - A4LD - HARSH 2-3 BACKOUT UPSHIFT DURING ALTITUDE OPERATION - ALTITUDE CALIBRATIONS ONLY - VEHICLES BUILT BEFORE 6/21/93

LIGHT TRUCK: 1990-93 AEROSTAR, EXPLORER, RANGER

This TSB Article is being republished in its entirety to include a model applications chart and an illustration showing the location of the 2-3 backout spring.

ISSUE: Some high altitude calibration units may exhibit a harsh 2-3 backout upshift during altitude operating conditions. This may be caused by the calibration of the 2-3 backout spring in bore 211 of the main control assembly.

ACTION:

1990-1993 4.0L ALTITUDE APPLICATIONS
TRANSMISSIONS BUILT BEFORE BUILD DATE CODE (03-F-21)

TRANSMISSION MODEL	DESCRIPTION
1990 MODELS	
90GT-FAA	AEROSTAR RWD (VAN)
90GT-FBA	AEROSTAR RWD (WAGON)
90GT-AEA	AEROSTAR AWD (VAN)
90GT-AEE	AEROSTAR AWD (WAGON)
90GT-DAA	RANGER 4X2
90GT-BAA	RANGER 4X4
1991 MODELS	
91GT-HAA	AEROSTAR RWD (VAN)
91GT-SBA	AEROSTAR RWD (WAGON)
91GT-SDA	AEROSTAR AWD (VAN)
91GT-SFA	AEROSTAR AWD (WAGON)
91GT-LAA	RANGER 4X2
91GT-NAA	RANGER 4X4
91GT-BAB	EXPLORER 4X2
91GT-EAB	EXPLORER 4X4
1992 MODELS	
92GT-AKA	AEROSTAR RWD (VAN)
92GT-AMA	AEROSTAR RWD (WAGON)
92GT-ARA	AEROSTAR AWD (VAN)
92GT-ATA	AEROSTAR AWD (WAGON)
92GT-CDA	EXPLORER 4X2
92GT-CFA	EXPLORER 4X4
92GT-DCA	RANGER 4X2
92GT-DEA	RANGER 4X4
1993 MODELS	
TRANSMISSIONS BUILT BEFORE 1993-JUNE-21	
93GT-CBA	AEROSTAR RWD (VAN)
93GT-KBA	AEROSTAR RWD (WAGON)
93GT-EDA	AEROSTAR AWD (VAN)
93GT-NBA	AEROSTAR AWD (WAGON)
93GT-HAA	EXPLORER 4X2
93GT-NAA	EXPLORER 4X4
93GT-LAA	RANGER 4X2 (ALT)
93GT-LBA	RANGER 4X2 (CAL)
93GT-SAA	RANGER 4X4 (ALT)
93GT-SBB	RANGER 4X4 (CAL)

YEAR CODES	MONTH CODES		
1990-00	JAN-A	MAY-E	SEP-J
1991-01	FEB-B	JUN-F	OCT-K
1992-02	MAR-C	JUL-G	NOV-L
1993-03	APR-D	AUG-H	DEC-M

AUTOMATIC TRANSMISSION MODEL IDENTIFICATION

MODELS ARE IDENTIFIED BY A SERVICE IDENTIFICATION TAG AFFIXED TO THE ASSEMBLY. TAGS ARE LOCATED AND CONTAIN INFORMATION AS FOLLOWS:

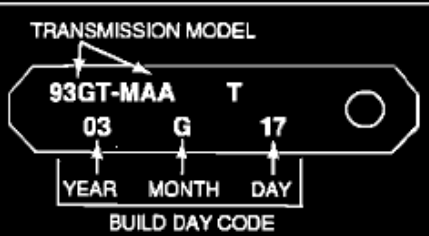
A4LD	ATTACHED TO THE LOWER LEFT HAND EXTENSION ATTACHING BOLT	

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Figure 1

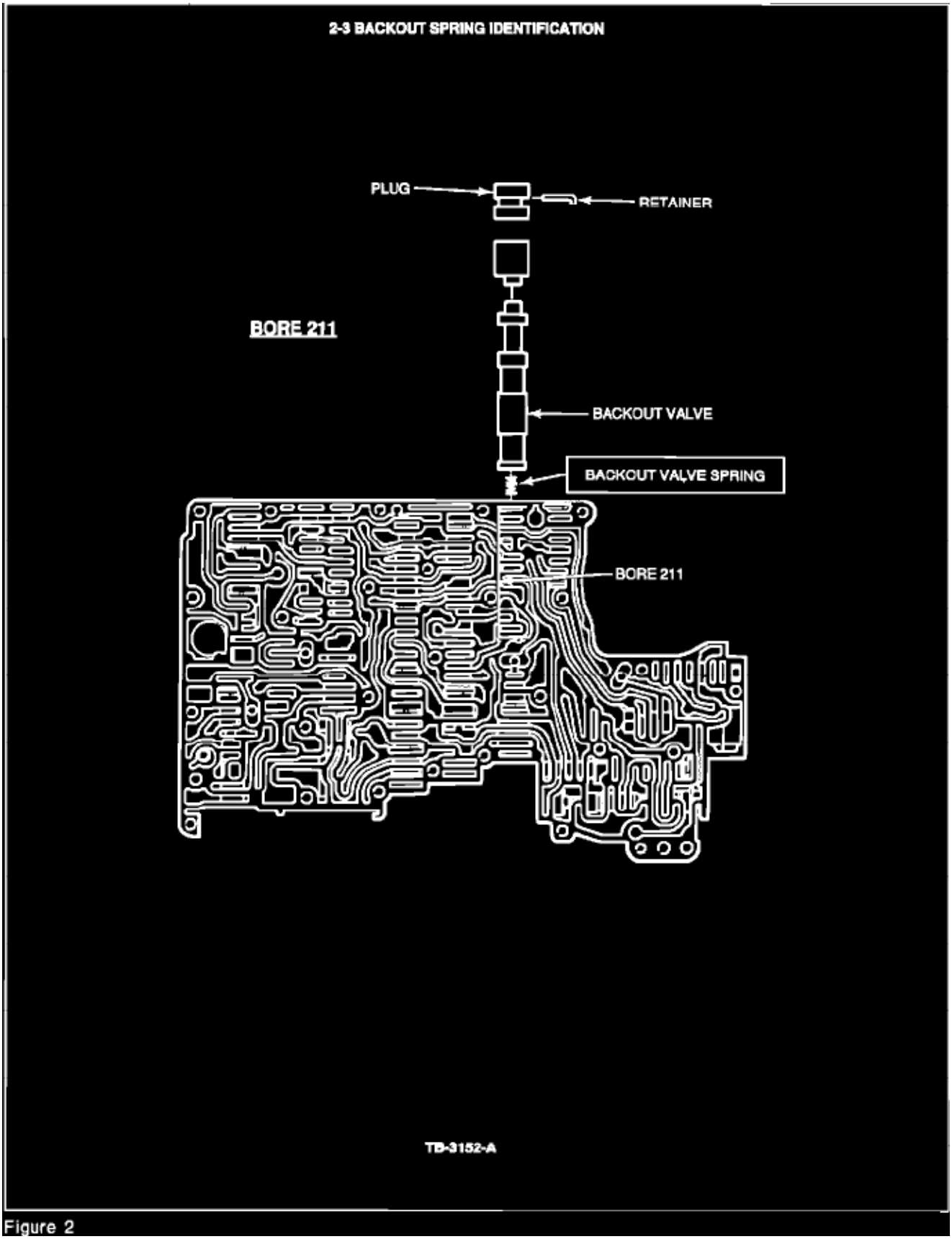


Figure 2

Refer to the attached transmission model chart and build date code (Figure 1). If the transmission model is listed and the transmission was built before 6/21/93, replace the 2-3 backout spring with a

LIGHT BLUE (revised calibration) spring (F3TZ-7D230-B). Refer to Figure 2 for the 2-3 backout spring location, and refer to the Aerostar/Ranger/Explorer Service Manual, section 07-01A for service details.

CAUTION: PERFORMING THIS TSB ON A UNIT NOT SHOWN IN THE CALIBRATION LIST MAY RESULT IN DAMAGE TO THE TRANSMISSION ASSEMBLY.

PART NUMBER PART NAME CLASS

F3TZ-7D230-B 2-3 Backout Spring B

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-6-14

WARRANTY STATUS: Eligible Under Basic Warranty Coverage And Powertrain Warranty Coverage For 1990/91 Models, Eligible Under Bumper To Bumper Warranty Coverage For 1992/93 Models

OPERATION DESCRIPTION TIME

931615A Replace 2-3 Backout Spring 1.3 Hrs.

DEALER CODING

BASIC PART NO. CONDITION CODE

7D230 11

OASIS CODES: 501000

Valve Body: All Technical Service Bulletins A/T - Increase In RPM During Light Throttle 2-3 Upshifts

Article No. 93-14-21

07/07/93

TRANSMISSION - A4LD - SLIGHT INCREASE OF ENGINE RPM ABOVE EXPECTED LEVELS DURING LIGHT THROTTLE 2-3 UPSHIFTS - NON ALTITUDE VEHICLES WITH 4.0L ENGINES

LIGHT TRUCK: 1990-92 AEROSTAR, RANGER 1991-92 EXPLORER

This TSB Article is being republished in its entirety to include a model applications chart and an illustration showing the location of the 2-3 backout spring.

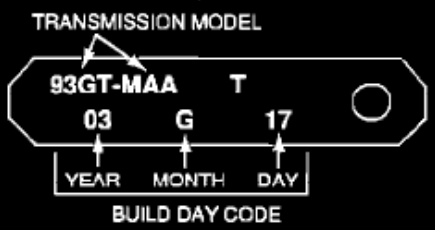
ISSUE: A slight increase of engine RPM, above normally expected levels, during light throttle 2-3 upshifts may be experienced. This is caused by the calibration of the 2-3 backout spring in bore 211 of the Main Control Assembly.

ACTION:

1990-1992 4.0L 49 STATE AND CANADA (NON-ALTITUDE)
TRANSMISSION BUILD DATE CODES

TRANSMISSION MODEL	DESCRIPTION
1990 MODELS	
90GT-EAA	AEROSTAR RWD (VAN)
90GT-EBA	AEROSTAR RWD (WAGON)
90GT-ADA	AEROSTAR AWD (VAN)
90GT-ADD	AEROSTAR AWD (WAGON)
90GT-CAA	RANGER 4X2
90GT-AAA	RANGER 4X4
1991 MODELS	
91GT-GAA	AEROSTAR RWD (VAN)
91GT-SAA	AEROSTAR RWD (WAGON)
91GT-SCA	AEROSTAR AWD (VAN)
91GT-SEA	AEROSTAR AWD (WAGON)
91GT-KAA	RANGER 4X2
91GT-MAA	RANGER 4X4
91GT-AAA	EXPLORER 4X2
91GT-AAB	EXPLORER 4X2
91GT-DAA	EXPLORER 4X4
91GT-DAB	EXPLORER 4X4
1992 MODELS	
92GT-AHA	AEROSTAR RWD (VAN)
92GT-ALA	AEROSTAR RWD (WAGON)
92GT-ANA	AEROSTAR AWD (VAN)
92GT-ASA	AEROSTAR AWD (WAGON)
92GT-CBA	EXPLORER 4X2
92GT-CEA	EXPLORER 4X4
92GT-DBA	RANGER 4X2
92GT-DDA	RANGER 4X4

YEAR CODES	MONTH CODES		
1990-00	JAN-A	MAY-E	SEP-J
1991-01	FEB-B	JUN-F	OCT-K
1992-02	MAR-C	JUL-G	NOV-L
	APR-D	AUG-H	DEC-M

AUTOMATIC TRANSMISSION MODEL IDENTIFICATION		
MODELS ARE IDENTIFIED BY A SERVICE IDENTIFICATION TAG AFFIXED TO THE ASSEMBLY. TAGS ARE LOCATED AND CONTAIN INFORMATION AS FOLLOWS:		
A4LD	ATTACHED TO THE LOWER LEFT HAND EXTENSION ATTACHING BOLT	

TB-3151-A

Figure 1

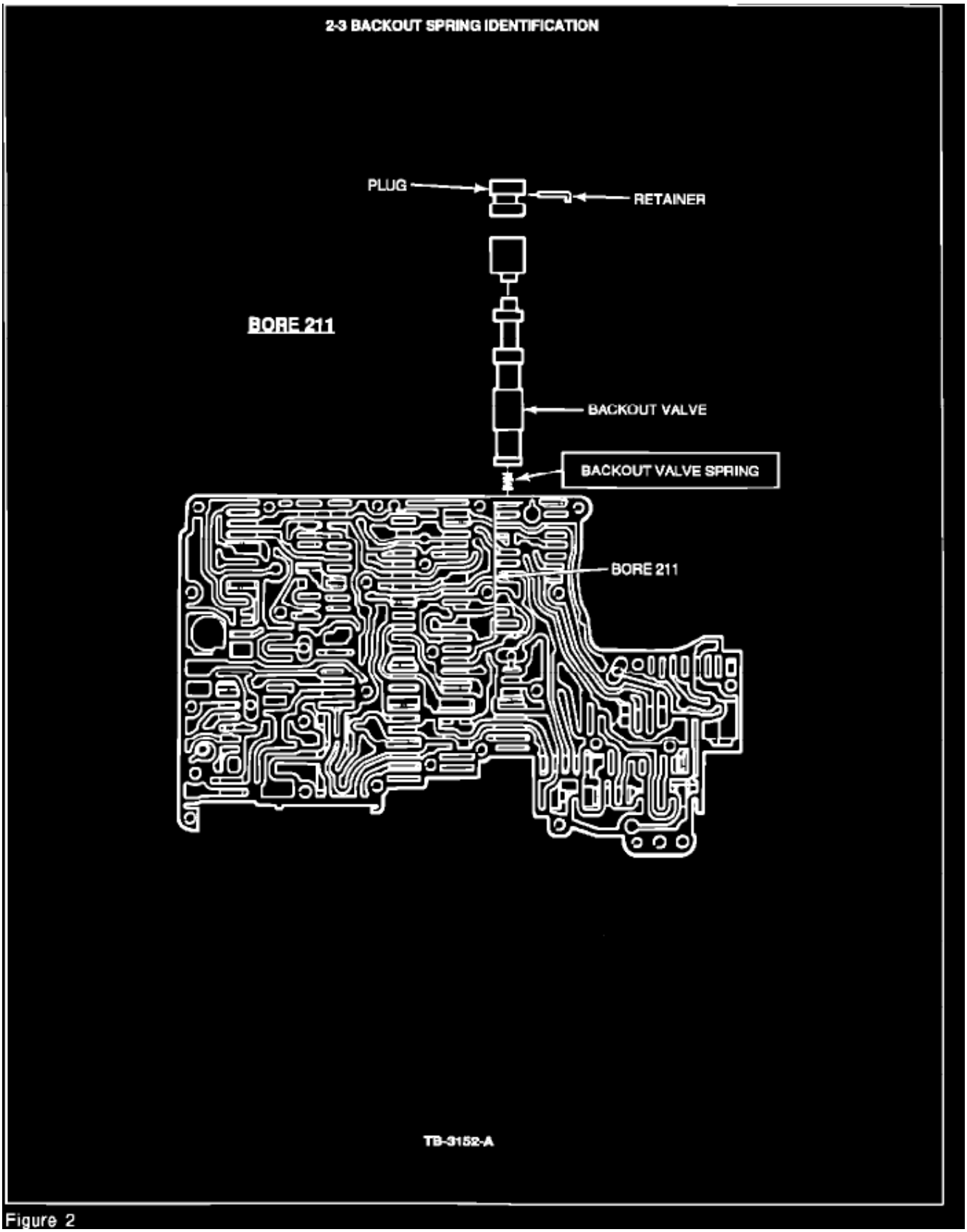

2-3 BACKOUT SPRING IDENTIFICATION
PLUG
RETAINER
BORE 211
BACKOUT VALVE
BACKOUT VALVE SPRING
BORE 211
TB-3152-A

Figure 2

Refer to the attached transmission model chart and build date code, Figure 1. If the transmission model is listed, replace the existing 2-3 backout spring in bore 211 of the Main Control Assembly with a WHITE revised calibrated spring, part # F3TZ-7D230-A. Refer to Figure 2 for the 2-3 backout spring location, and refer to the 1992 Ranger/Explorer/Aerostar Service Manual, Section 07-01A, for service details.

CAUTION: PERFORMING THIS TSB ON A UNIT NOT SHOWN IN THE CALIBRATION LIST MAY RESULT IN DAMAGE TO THE TRANSMISSION ASSEMBLY.

PART NUMBER PART NAME CLASS

F3TZ-7D230-A 2-3 Backout Spring B

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 93-5-15

WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Model Vehicles, Basic Warranty Coverage And Powertrain Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

931421A Replace 2-3 Backout Spring 1.3 Hrs.

DEALER CODING

BASIC PART NO. CONDITION CODE

7D230 11

OASIS CODES: 501000, 504000, 590000

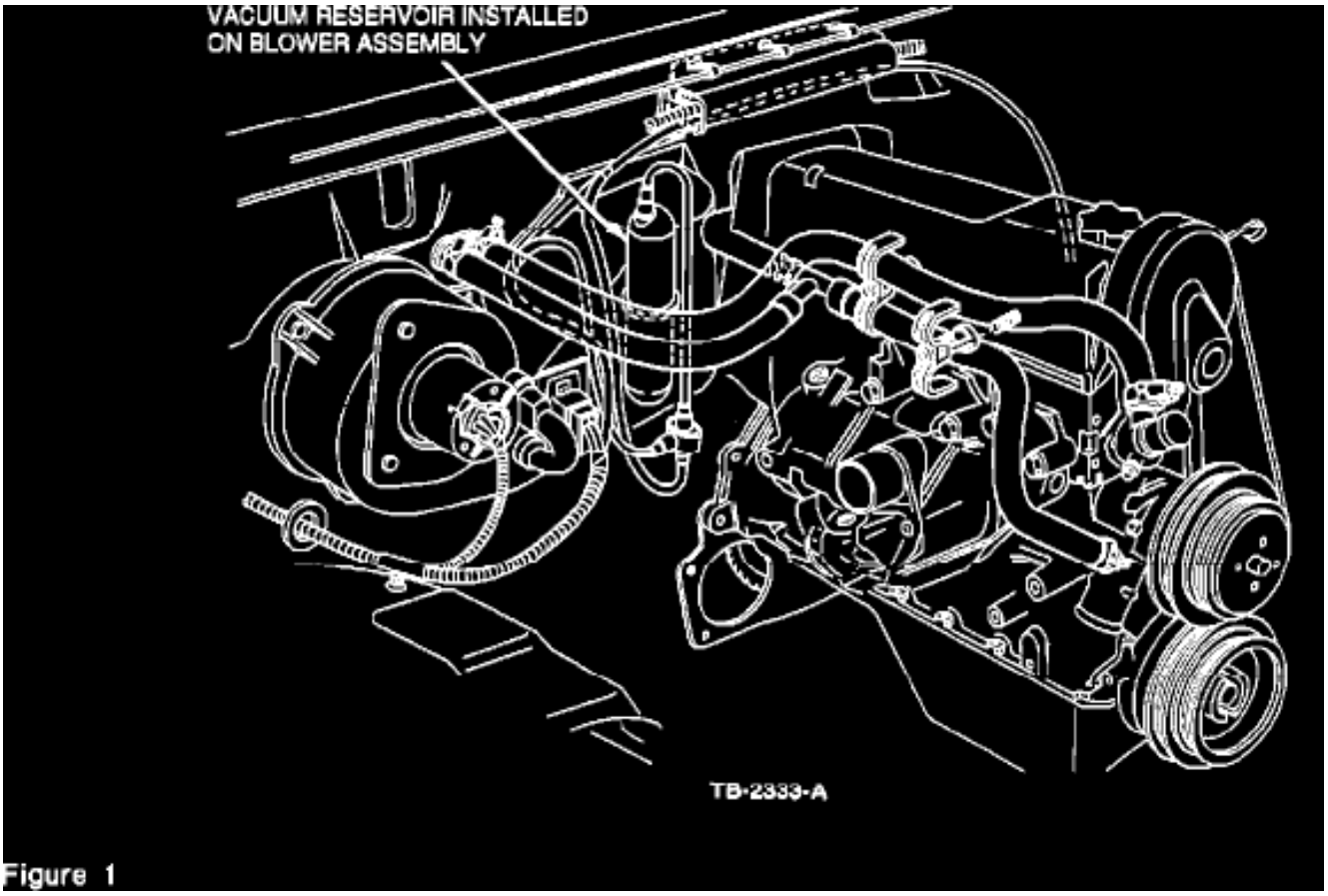


Figure 1

Vacuum Tank: All Technical Service Bulletins Heater - Air Flow From Panel During Heavy Acceleration

Article No. 94-4-11

02/23/94

HEATER - OBJECTIONABLE AIRFLOW FROM PANEL REGISTERS DURING HEAVY ACCELERATION - NON A/C VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

This TSB article is being republished in its entirety to include 1992 Model vehicles.

ISSUE: Objectionable airflow from the heater system panel registers may occur when the system is in the OFF mode and the vehicle is under heavy acceleration. This condition is caused by movement of the fresh air door when the vacuum to the door actuator is lost during heavy acceleration.

ACTION: Installation of a vacuum hose/reservoir/check valve assembly will provide sufficient vacuum level to maintain proper operation of the heater system in the OFF mode. Refer to the following procedure for service details.

SERVICE PROCEDURE

1. Remove the blower assembly from the vehicle.

2. Drill two holes in the blower assembly, in a vertical position, to allow for installation of the vacuum reservoir. Refer to Figure 1.

3. Using two screws, mount the vacuum reservoir as shown in Figure 1.

4. Disconnect the existing vacuum check valve.

5. Remove the vacuum line which sourced the heater system check valve and attached to an engine vacuum port. Refer to Figure 1.

6. Discard the check valve and vacuum line.

7. Reinstall the blower assembly in the vehicle.

8. Route the new vacuum line and check valve (attached to the reservoir) as the original vacuum line was routed and attach to the original vacuum port.

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

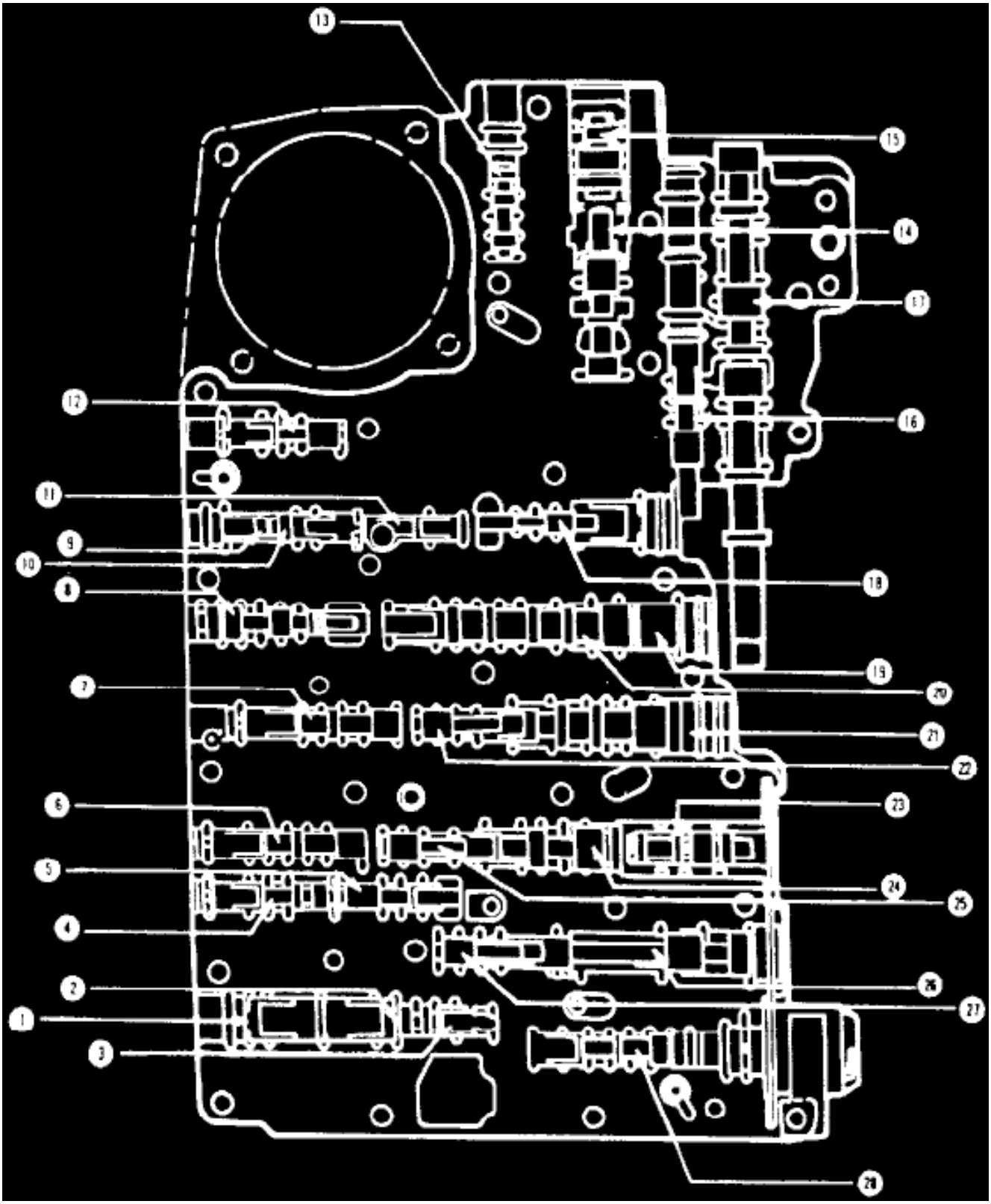
940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300



Valve Body: Description and Operation

MAIN CONTROL VALVE BODY FUNCTION

Main Control Valve Body Component Identification

1. The intermediate servo accumulator (1) controls band capacity on 1-2 shift 2. The overdrive servo accumulator (2) controls overdrive band capacity on 3-4 upshifts. 3. The 3-4 backout valve (3) controls the rate at which overdrive servo release oil exhausts on 3-4 backout shifts. 4. The 3-2 high clutch release valve (4) controls the rate at which high clutch oil exhausts on higher speed 3-2 downshifts. 5. The 3-2 intermediate servo release valve (5) controls the rate at which intermediate servo release oil exhausts on higher speed 3-2 downshifts. 6. The 3-2 kickdown timing valve (6) sends intermediate servo release and high clutch oil to the torque demand valve during 3-2 downshifts at lower

speeds. At higher speed, this valve moves down and intermediate servo release and high clutch oil drains through the 3-2 intermediate servo release kickdown control and 3-2 high clutch kickdown control valves.

7. The 3-2 coast control valve (7) controls the rate at which intermediate servo release and high clutch oil exhaust on 3-2 coasting downshifts. 8. The throttle pressure booster valve (8) increases throttle pressure output for shift delay at lower engine manifold vacuum levels. 9. The 1-2 transition valve (9), along with the 2-3 backout valve, will prevent an intermediate to reverse band tie-up on a manual 1-2 shift.

10. The 2-3 backout valve (10) prevents tie-up if driver backs off accelerator during 2-3 upshift. 11. The engagement control valve (11) feeds the forward clutch through a small orifice at low Throttle Valve (TV) pressures, or through a larger

orifice at higher TV pressures.

12. The torque demand control valve (12) controls the rate at which high clutch and intermediate servo release oil exhausts at lower speed 3-2

downshifts.

13. The cut back valve (13) reduces control pressure as road speed increases. 14. The oil pressure regulator valve (14) regulates main control pressure. 15. The main oil pressure booster valve (15) increases or decreases main control pressure in relation to throttle pressure, and provides higher line

pressure in reverse.

16. The throttle downshift valve (16) reroutes line pressure to override the normal automatic upshift schedule and provide forced downshifts. 17. The manual control valve (17) moves with shift selector and directs control pressure to various passages to provide automatic function. 18. The 2-Low range coasting boost valve (18) boosts pressure in selector positions 1 and 2 at closed or nearly closed throttle. 19. The 1-2 shift valve (19) controls upshift from 1st to second and downshift from 2nd to 1st. 20. The D2 shift valve (20) is used in combination with the 1-2 shift valve to provide a 2nd gear start in 2 range. 21. The 2-3 shift valve (21) controls upshift from 2nd to high and downshift from high to 2nd. 22. The 2-3 throttle pressure modulator valve (22) provides a modulated pressure to the 2-3 shift valve at higher TV pressures. This modulated

pressure helps to delay 2-3 shifts at higher TV pressures.

23. The 4-3 torque demand valve (23) routes high clutch oil to the 3-4 shift valve at lower vacuums. This provides for a higher road speed 4-3 torque

demands at lower vacuum.

24. The converter clutch shift valve (24), along with the converter clutch shuttle valve and solenoid, controls converter clutch engagements and

disengagements.

25. The converter clutch throttle pressure modulator valve (25) sends a modulated pressure to the converter clutch shift valve at higher TV pressures.

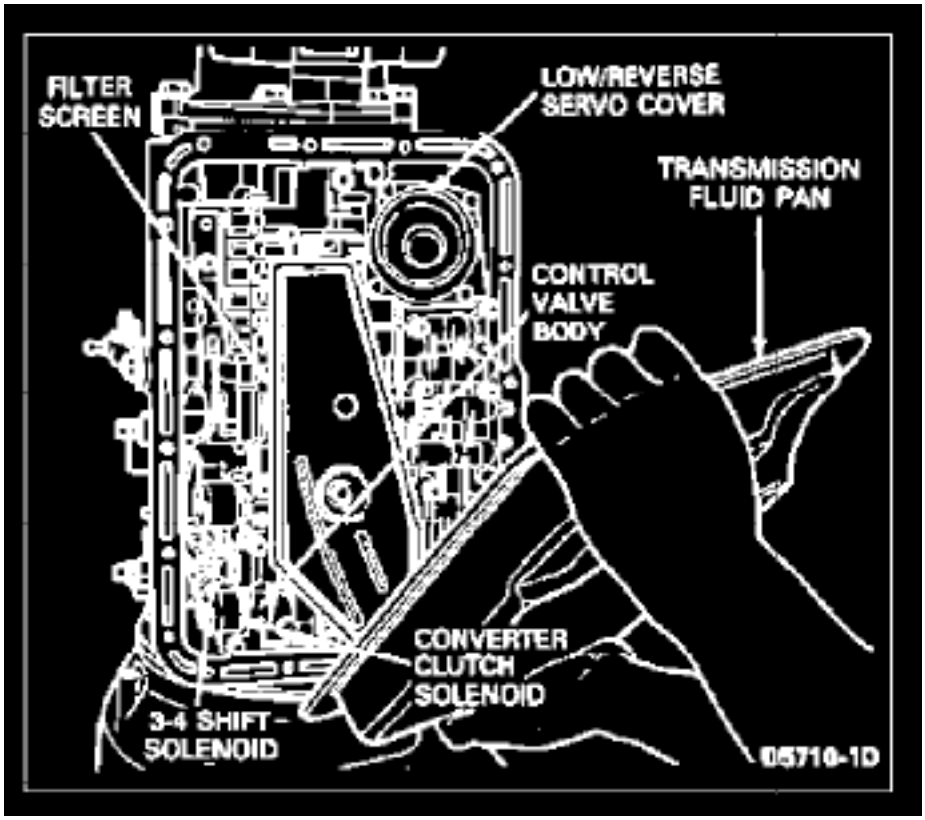
This modulated pressure helps to delay converter clutch upshifts at higher TV pressures.

26. The 3-4 shift valve (26) controls the scheduling for 3-4 upshifts and 4-3 downshifts. 27. The 3-4 throttle pressure modulator valve (27) provides a modulated pressure on the 3-4 shift valve at high TV pressures. This modulated pressure

helps to delay 3-4 upshifts at higher TV pressures.

28. The converter clutch shuttle valve (28), when bottomed against the plug, directs flow so the converter clutch will be disengaged. When the valve

compresses the spring, flow is directed so the converter clutch engages. The solenoid also controls the position of this valve.



Valve Body: Service and Repair Removal and Installation

Removal

1. Raise vehicle on a hoist so transmission and pan is accessible. Position suitable safety stands under vehicle.

2. Loosen pan attaching bolts and drain fluid from transmission. If the same fluid is to be used again, filter through a 100 mesh screen. Re-use fluid

only if it is in good condition.

3. Remove transmission fluid pan attaching bolts, pan and gasket.

4. Remove filter screen and O-rings.

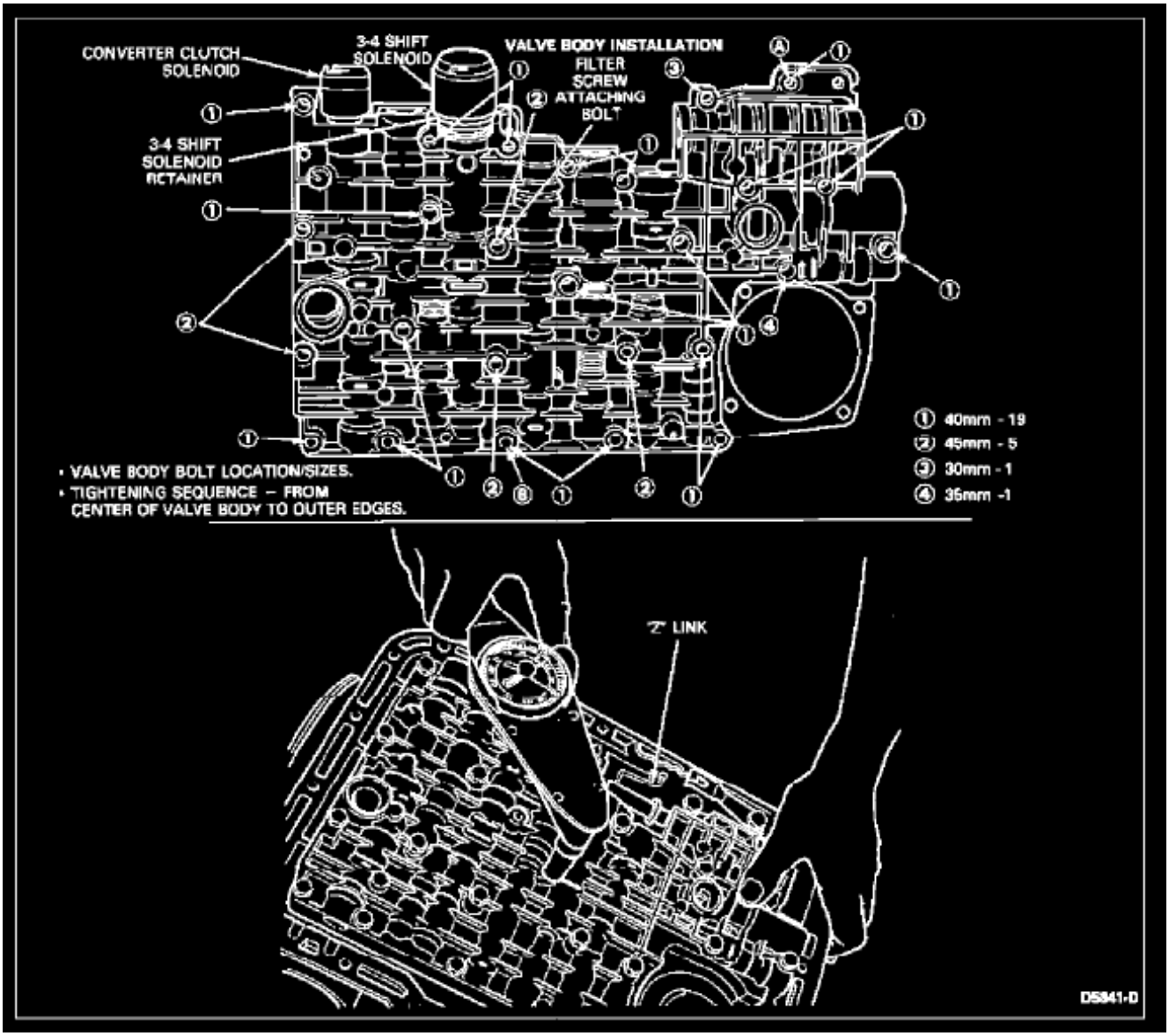
5. Remove low-reverse servo cover, piston, spring and gasket.

6. Disconnect two wires at the converter clutch solenoid and the two wires at the 3-4 shift solenoid.

7. Remove bolts from the control valve body. Note that the bolts are of different lengths and their locations are different from the bolt locations on

other automatic transmissions. Carefully ease the body from the case while unlocking and detaching the selector lever connecting rod.

Installation



1. Clean and inspect the valve body prior to installation as detailed in this section.

2. Attach and lock the selector lever connecting rod (Z-Link) to the manual valve and ease control body into the case.

CAUTION: Use care not to bend selector lever connecting rod (Z-Link).

3. Insert correct length bolts, finger-tight, in holes A and B to position control body to case.

4. Insert all remaining bolts and 3-4 shift solenoid retainer (correct length) except filter screen bolt and tighten to 8-11 N-m (71-97 in-lb).

NOTE: 3-4 shift solenoid retainer must be on outside of metal inner retainer.

5. Remove the bolt from hole A and install detent spring to bolt, then reassemble and tighten A and B locations to 8-11 N-m (71-97 in-lb).

6. Install low-reverse servo cover, piston, spring and gasket.

7. Connect the converter clutch solenoid wires.

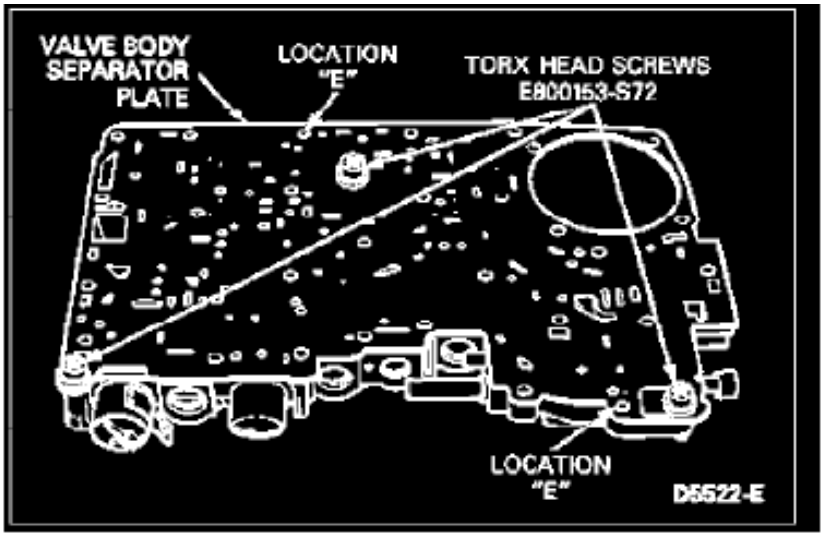
8. Clean filter screen with solvent. Then install filter screen O-ring and filter screen.

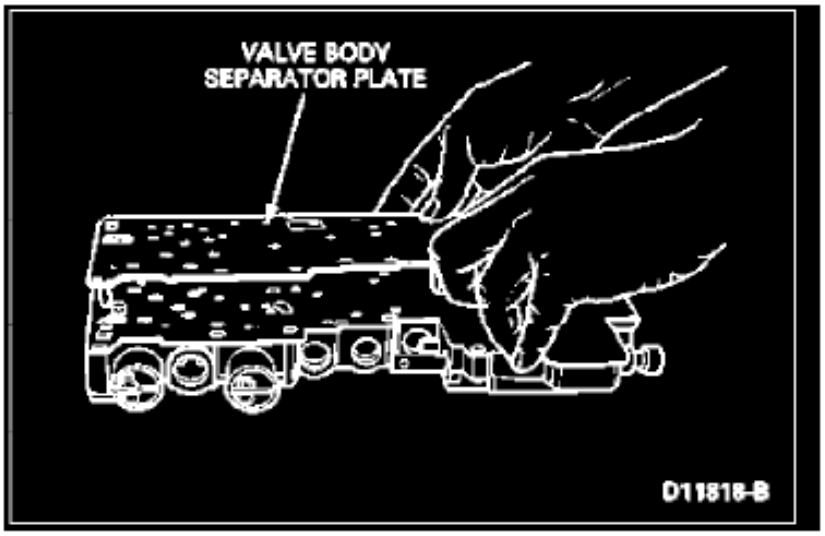
9. Using a new gasket, install fluid pan. Tighten retaining bolts to 11-13 N-m (97-115 in-lb).

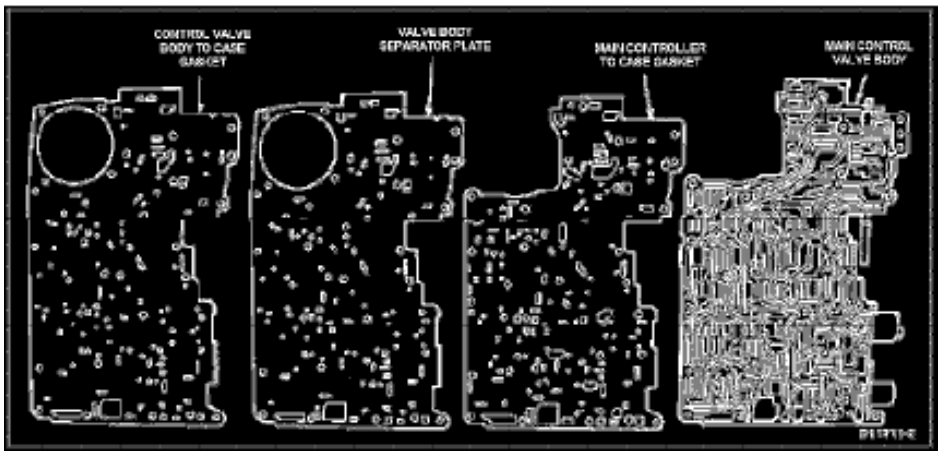
10. Remove safety stands and lower vehicle. Fill transmission with proper grade and quantity of fluid.

Pour in 2.8L (3 quarts) of fluid. Run engine and add fluid as required.

11. Operate vehicle and check for leaks.


VALVE BODY SEPARATOR PLATE
LOCATION "E"
TORX HEAD SCREWS E800153-S72
LOCATION "E"
D5522-E


VALVE BODY SEPARATOR PLATE
D11818-B


CONTROL VALVE BODY TO CASE GASKET
VALVE BODY SEPARATOR PLATE
MAIN CONTROLLER TO CASE GASKET
MAIN CONTROL VALVE BODY

Valve Body: Service and Repair Disassembly and Assembly

Main Control Valve Body Disassembly

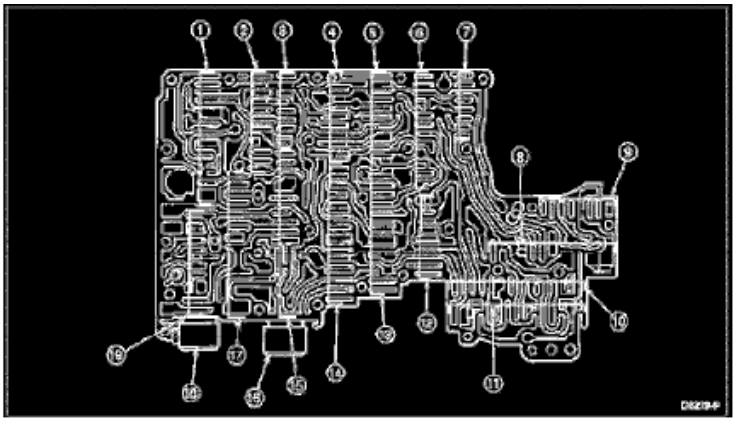
1. Remove three Torx head screws retaining valve body separating plate and control valve body to case gasket to valve body.

2. Remove the valve body separating plate. This plate is not serviced separately.

Valve Body, Gasket, Separator Plate

3. Remove the main control to case gasket and separator to main control gasket. Replace with new main control to case gasket and separator to main

control gasket.



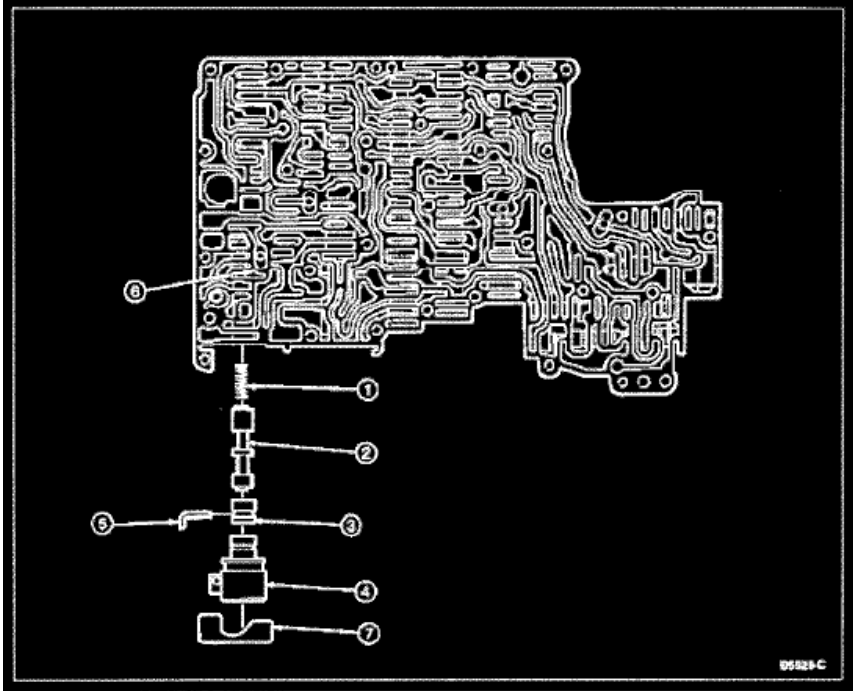
Item	Part Number	Description
1	—	Bore 216, Intermediate Servo Accumulator Valve; Overdrive Servo Accumulator Valve; 3-4 Backout Valve (Part of 7A100)
2	—	Bore 215, 3-2 High Clutch Kickdown Control Valve; 3-2 Intermediate Servo Release Kickdown Control Valve (Part of 7A100)
3	—	Bore 214, 3-2 Kickdown Timing (Part of 7A100)
4	—	Bore 213, 3-2 Coast Control Valve (Part of 7A100)
5	—	Bore 212, Throttle Valve Pressure Boost Valve (Part of 7A100)
6	—	Bore 211, 1-2 Transition Valve; 2-3 Backout Valve (Part of 7A100)
7	—	Bore 210, Torque Demand Control Valve (Part of 7A100)
8	—	Bore 208, Main Oil Pressure Booster Valve; Main Oil Pressure Regulator Valve (Part of 7A100)
9	—	Bore 209, Cutback Valve (Part of 7A100)
10	—	Bore 207, Throttle Downshift Valve (Kickdown) (Part of 7A100)
11	—	Bore 206, Manual Shift Valve (Part of 7A100)
12	—	Bore 205, Governor Coast Boost Valve; Line Pressure Coast Boost Valve (2 and Low) (Part of 7A100)
13	—	Bore 204, 1-2 Shift Valve; D-2 Shift Valve (Part of 7A100)
14	—	Bore 203, 2-3 Shift Valve; 2-3 Throttle Valve Modulator Valve (Part of 7A100)
15	—	Bore 202, 3-4 Shift Solenoid and Torque Converter Clutch; Modulator Valve (Part of 7A100)
16	—	Overdrive 3-4 Shift Solenoid (Part of 7A100)
17	—	Bore 201, 3-4 Shift Valve (Part of 7A100)
18	—	Torque Converter Clutch Solenoid (Part of 7A100)
19	—	Bore 200, Torque Converter Clutch Shift Solenoid; Torque Converter Clutch Shuttle Valve (Part of 7A100)

Bore Location, Main Control Valve Body (Part 1 Of 2)

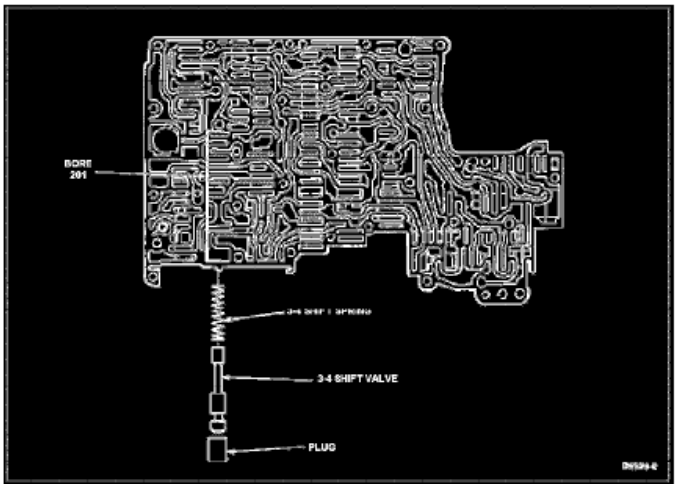
Bore Location, Main Control Valve Body (Part 2 Of 2)

4. Clean and inspect valve body.

Bore 200

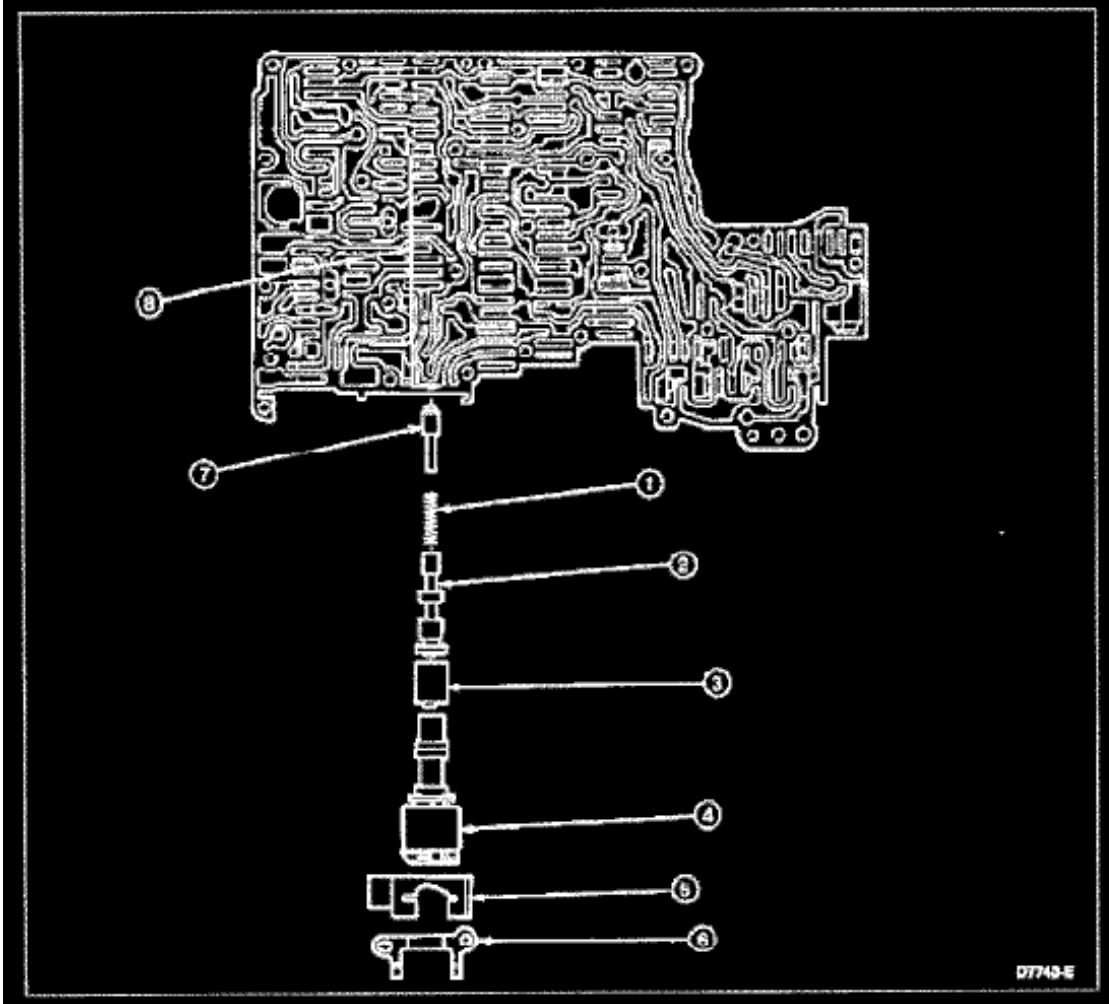


Item	Part Number	Description
1	—	Torque Converter Clutch Shuttle Spring (Part of 7A100)
2	—	Torque Converter Clutch Shuttle Valve (Part of 7A100)
3	—	Plug (Part of 7A100)
4	7F037	Torque Converter Clutch Solenoid (Also Part of 7A100)
5	—	Plug Retainer (Part of 7A100)
6	—	Bore 200 (Part of 7A100)
7	—	Solenoid Retainer (Part of 7A100)



Bore 200

Bore 202

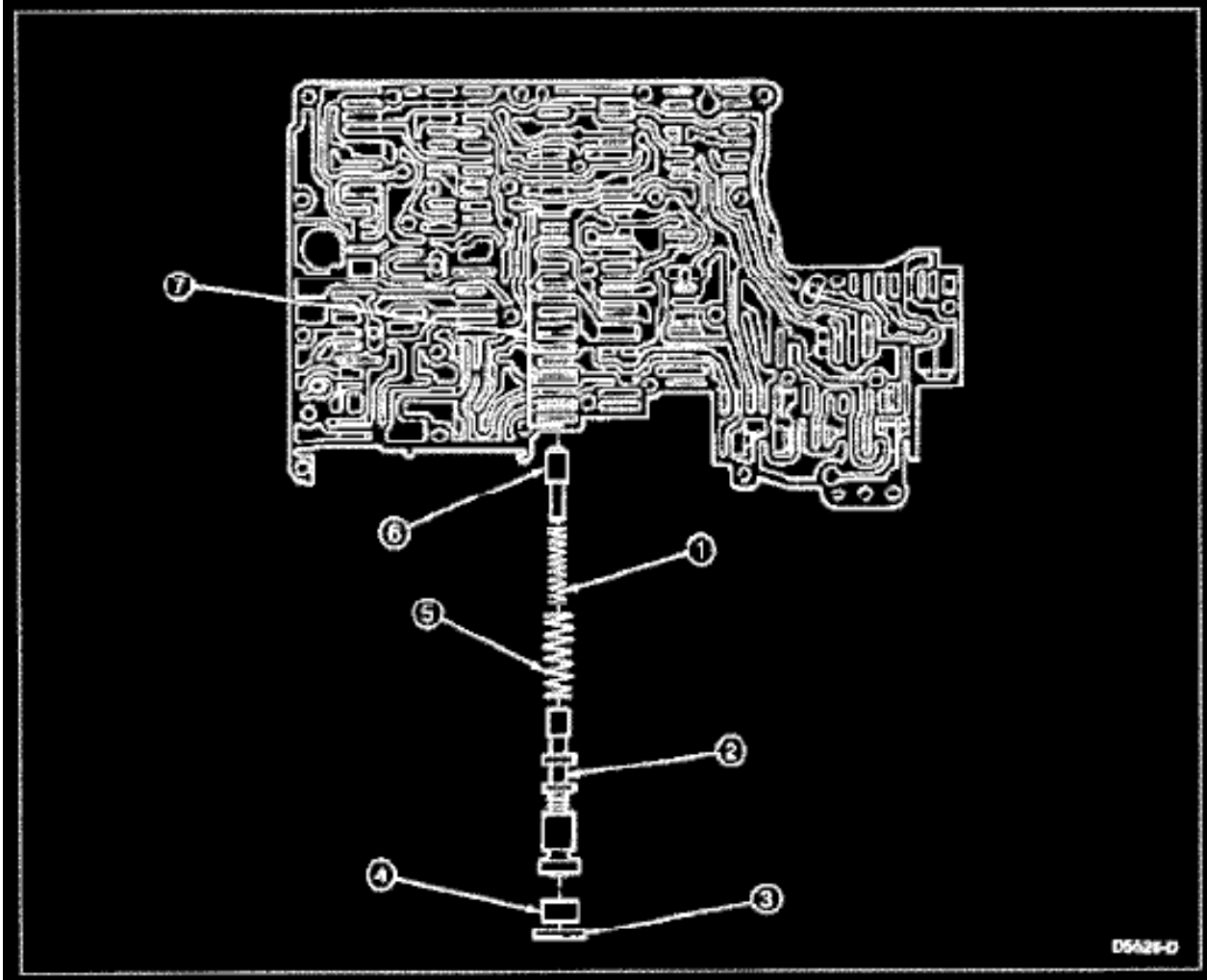


Item	Part Number	Description
1	—	Torque Converter Clutch Throttle Valve Modulator Spring (Part of 7A100)
2	—	Torque Converter Clutch Shift Valve (Part of 7A100)
3	—	Spacer Valve (Must Be Installed with Tip on Outside Toward 3-4 Shift Solenoid Surface) (Part of 7A100)
4	7M107	3-4 Shift Solenoid (Also Part of 7A100)
5	—	Inner Solenoid Retainer (Part of 7A100)
6	—	Outer Solenoid Retainer (Part of 7A100)
7	—	Torque Converter Clutch Throttle Valve Modulator Valve (Used for Spring Seat and Valve Stop Only) (Part of 7A100)
8	—	Bore 202 (Part of 7A100)

Bore 201

Bore 202

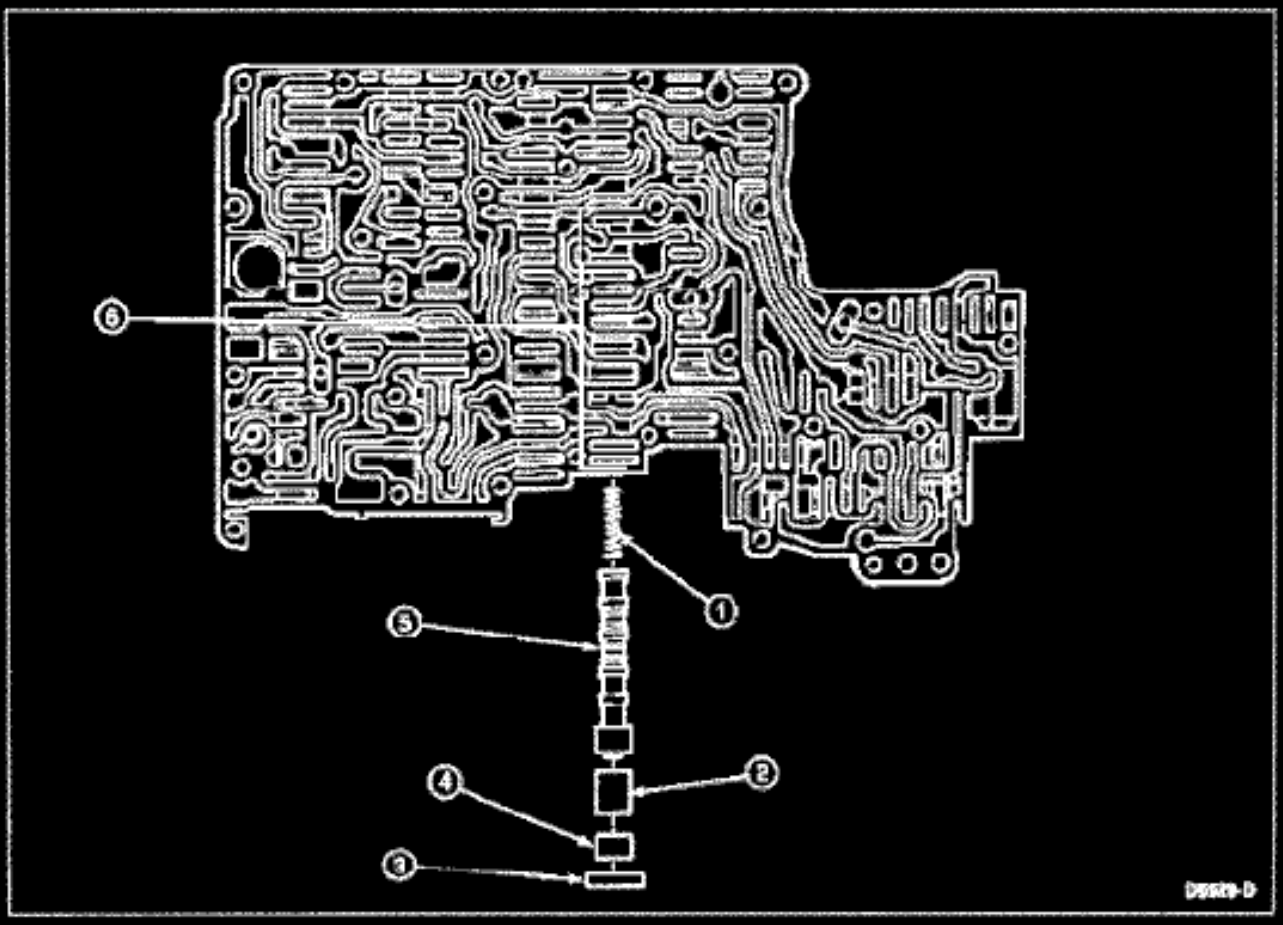
Bore 203



Item	Part Number	Description
1	—	2-3 Throttle Pressure Modulator Spring (Part of 7A100)
2	—	2-3 Shift Valve (Part of 7A100)
3	—	Retaining Plate (Part of 7A100)
4	—	Plug (Part of 7A100)
5	—	2-3 Shift Spring (Part of 7A100)
6	—	2-3 Throttle Pressure Modulator Valve (Part of 7A100)
7	—	Bore 203 (Part of 7A100)

Bore 203

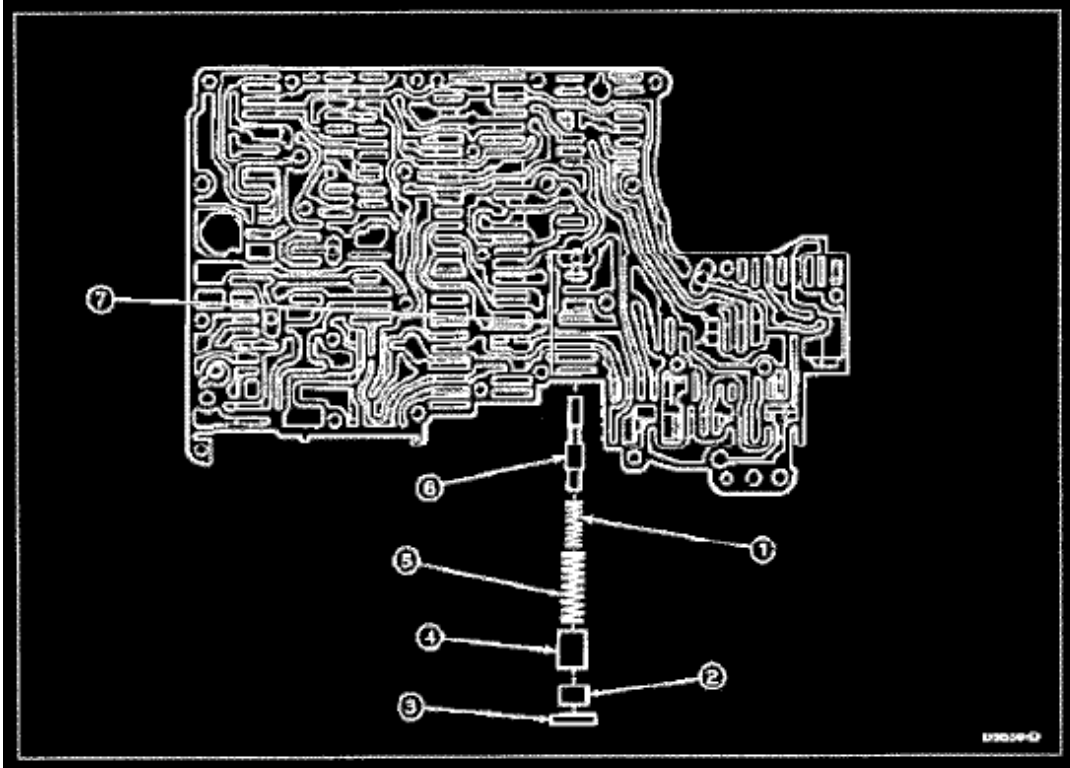
Bore 204



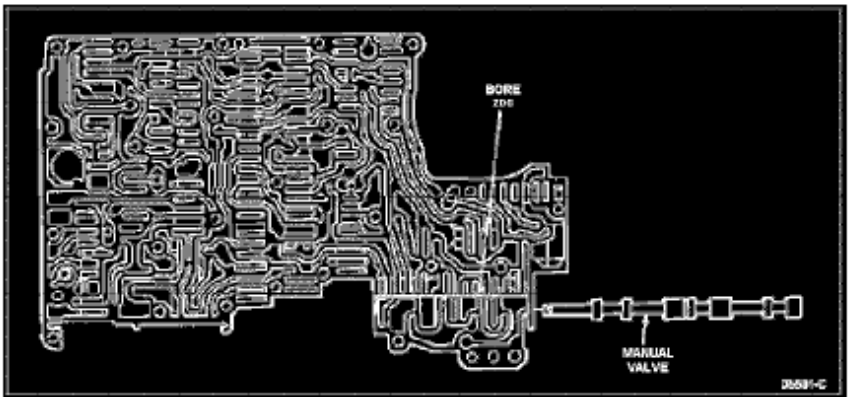
Item	Part Number	Description
1	—	1-2 Shift Spring (Part of 7A100)
2	—	1-2 Shift Valve (Part of 7A100)
3	—	Retaining Plate (Part of 7A100)
4	—	Plug (Part of 7A100)
5	—	D2 Shift Valve (Part of 7A100)
6	—	Bore 204 (Part of 7A100)

Bore 204

Bore 205



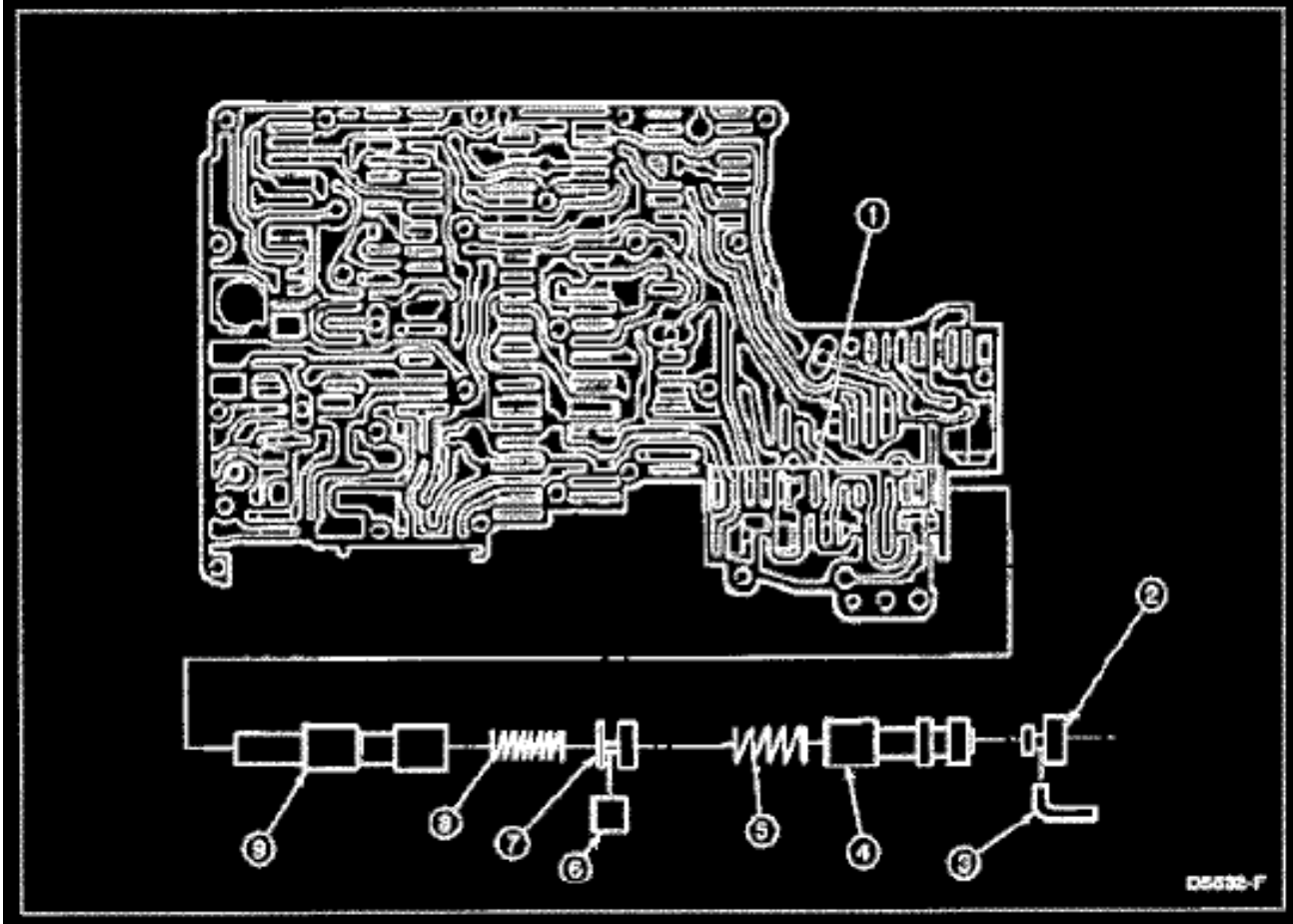
Item	Part Number	Description
1	—	Inner Spring (Part of 7A100)
2	—	Plug (Part of 7A100)
3	—	Retaining Plate (Part of 7A100)
4	—	Governor Coast Boost Valve (Part of 7A100)
5	—	Outer Spring (Part of 7A100)
6	—	Coast Boost Valve (2 and Low) (Part of 7A100)
7	—	Bore 205 (Part of 7A100)



Bore 205

Bore 206

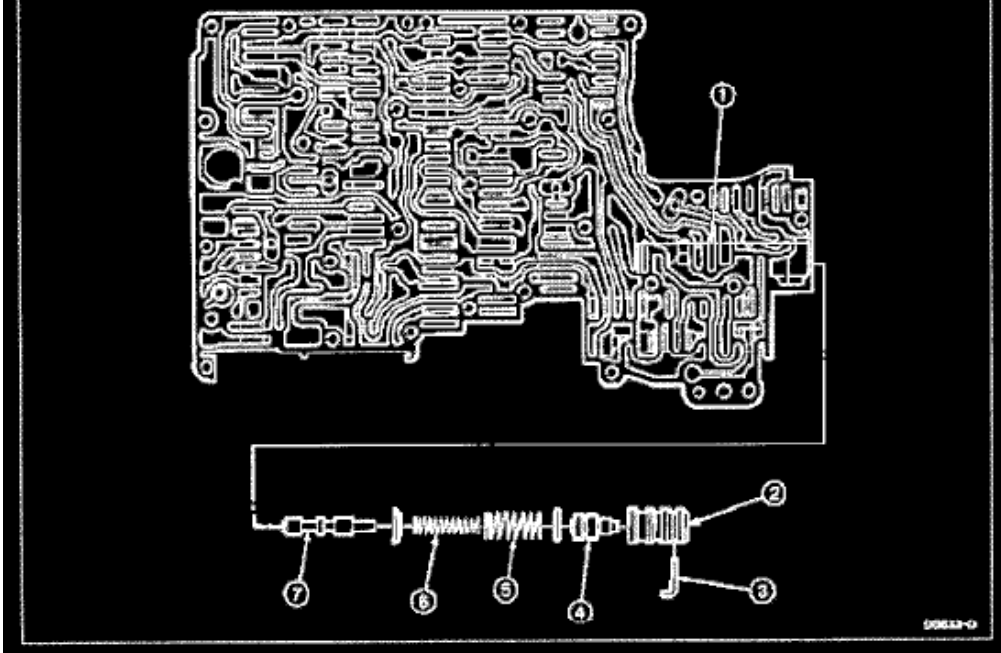
Bore 207



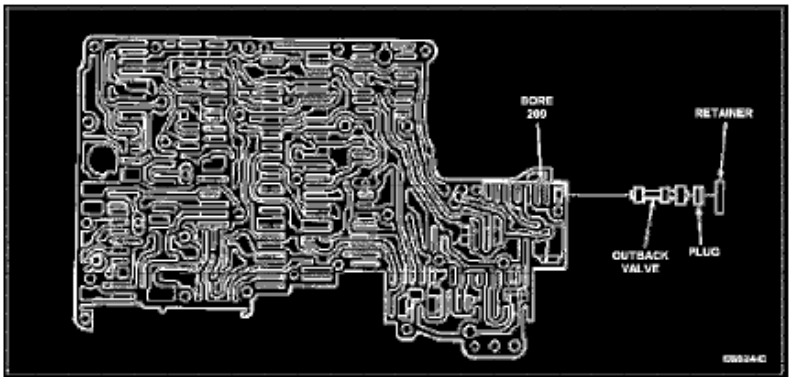
Item	Part Number	Description
1	—	Bore 207 (Part of 7A100)
2	—	Plug (Part of 7A100)
3	—	Retainer (Part of 7A100)
4	—	Reverse Engagement Control Valve (Part of 7A100)
5	—	Spring (Part of 7A100)
6	—	Retainer (Part of 7A100)
7	—	Plug (Part of 7A100)
8	—	Kickdown Spring (Part of 7A100)
9	—	Kickdown Valve (Part of 7A100)

Bore 207

Bore 208

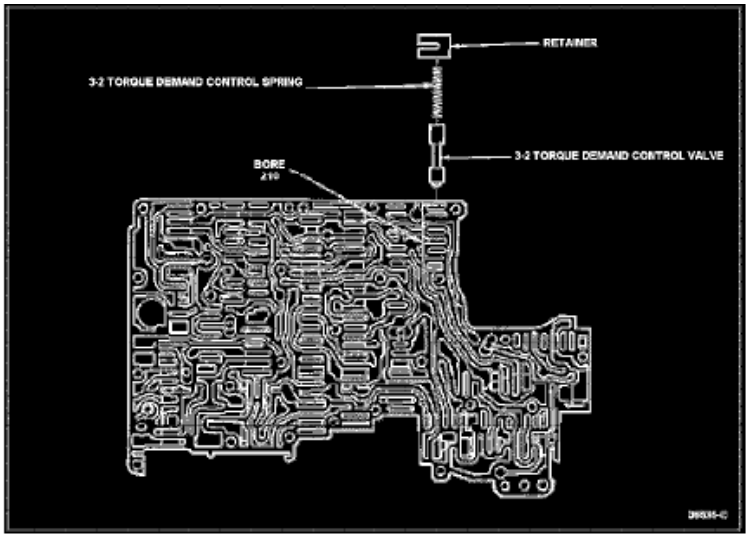


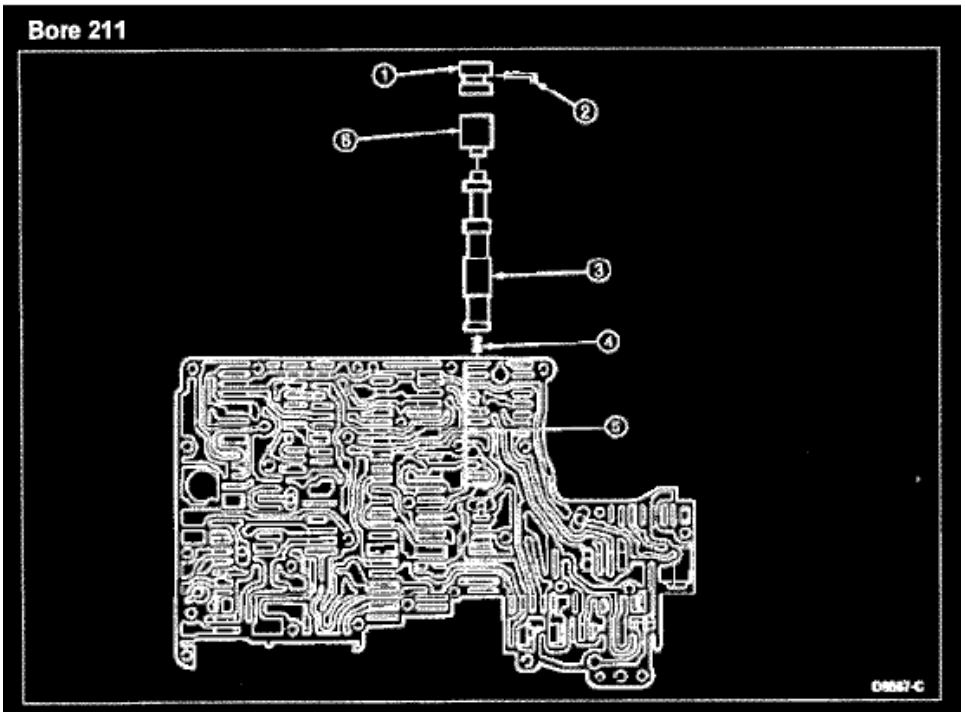
Item	Part Number	Description
1	—	Bore 208 (Part of 7A100)
2	—	Booster Valve Sleeve (Part of 7A100)
3	—	Retainer (Part of 7A100)
4	—	Main Oil Pressure Booster Valve (Part of 7A100)
5	—	Main Regulator Spring (Part of 7A100)
6	—	Booster Spring (Part of 7A100)
7	—	Main Regulator Valve (Part of 7A100)



Bore 208

Bore 209



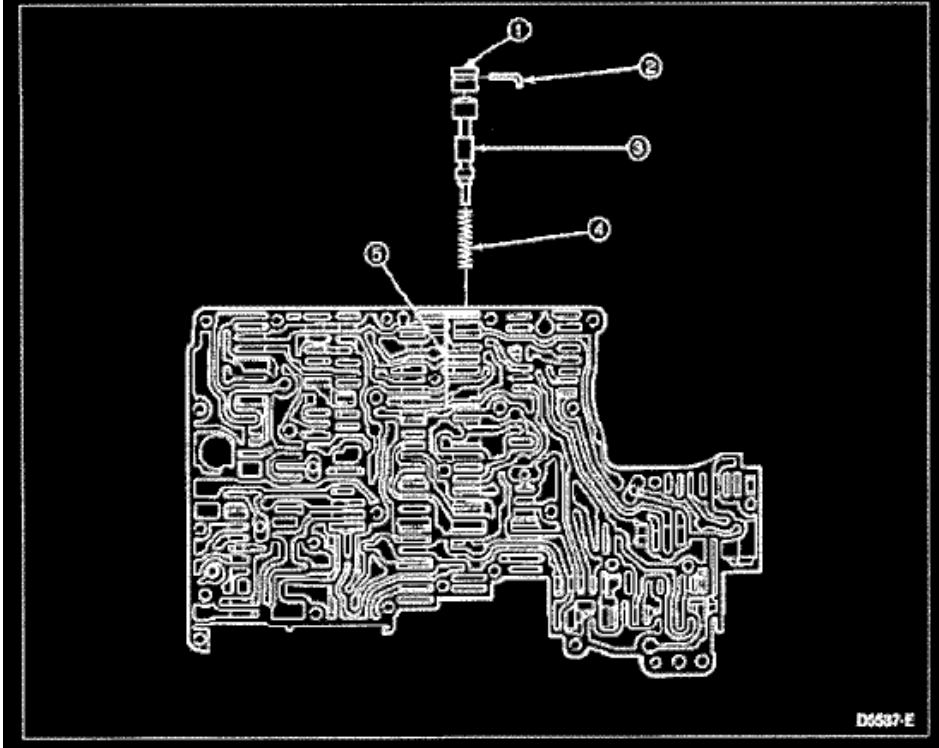


Item	Part Number	Description
1	—	Plug (Part of 7A100)
2	—	Retainer (Part of 7A100)
3	—	Backout Valve (Part of 7A100)
4	—	Backout Valve Spring (Part of 7A100)
5	—	Bore 211 (Part of 7A100)
6	—	1-2 Transition Valve (Part of 7A100)

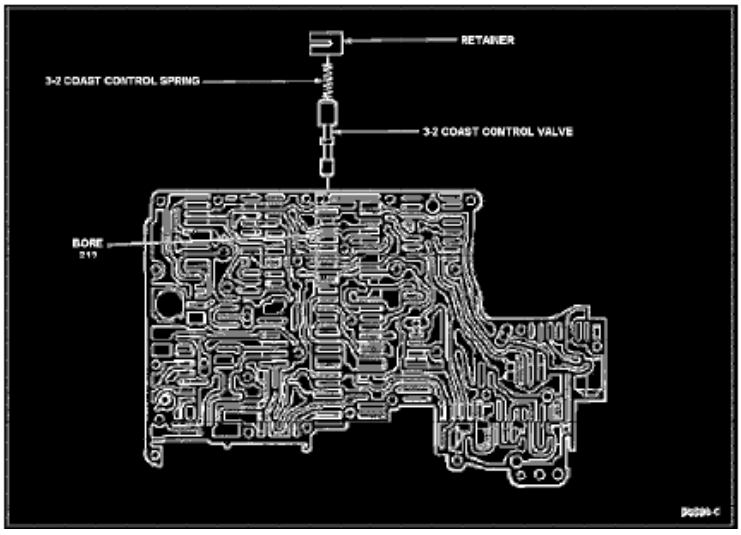
Bore 210

Bore 211

Bore 212



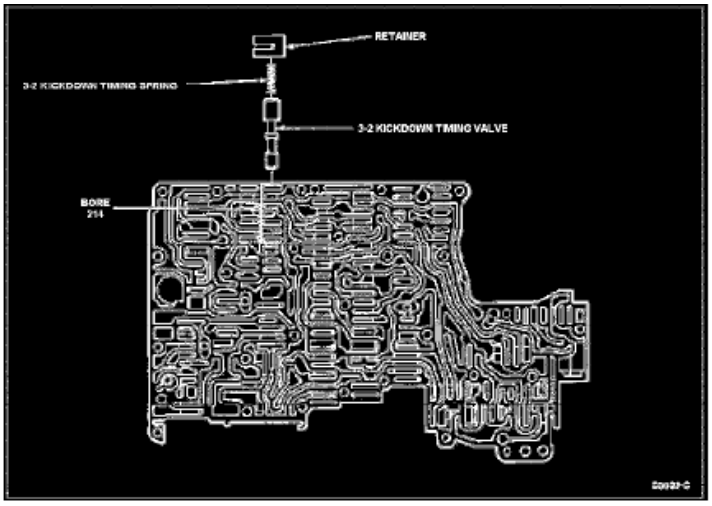
Item	Part Number	Description
1	—	Plug (Part of 7A100)
2	—	Retainer (Part of 7A100)
3	—	T.V. Boost Valve (Part of 7A100)
4	—	T.V. Boost Valve Spring (Part of 7A100)
5	—	Bore 212 (Part of 7A100)

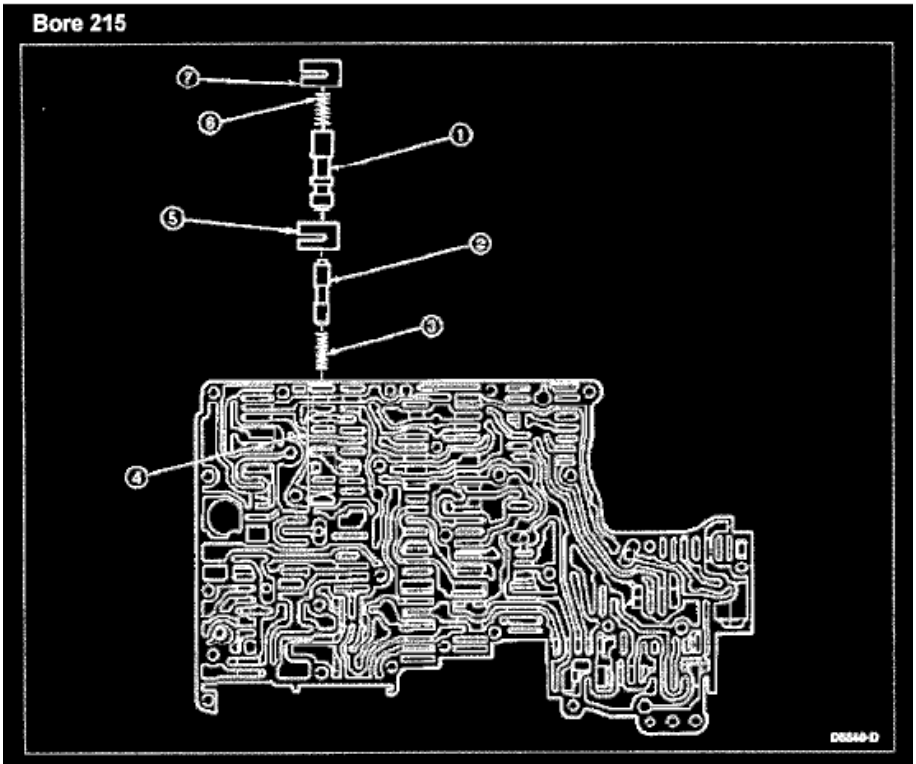


Bore 212

Bore 213

NOTE: Throttle Valve boost valve and spring are calibration dependent. With longer valve (approximately .015 inch), spring is omitted.



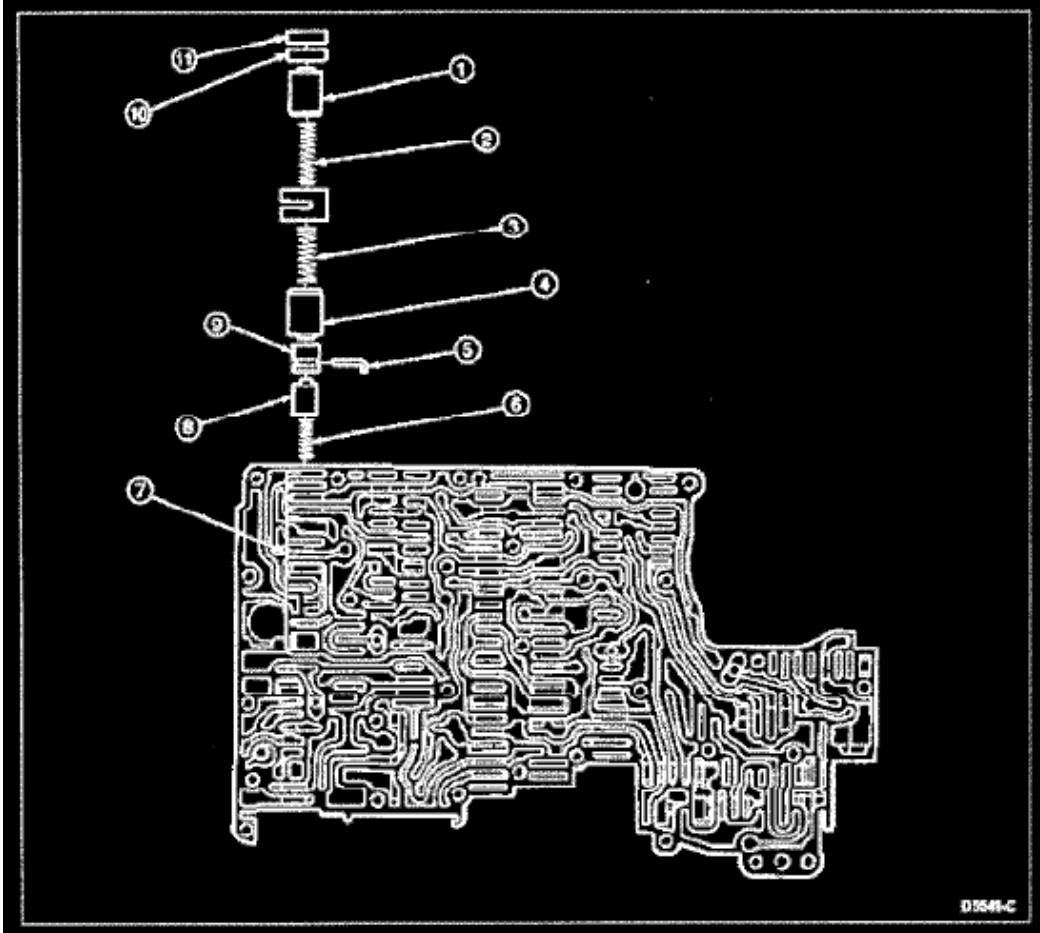


Item	Part Number	Description
1	—	3-2 High Clutch Kickdown Control Valve (Part of 7A100)
2	—	3-2 Intermediate Servo Kickdown Control Valve (Part of 7A100)
3	—	3-2 Intermediate Servo Kickdown Control Spring (Part of 7A100)
4	—	Bore 215 (Part of 7A100)
5	—	Retainer (Part of 7A100)
6	—	3-2 High Clutch Kickdown Control Spring (Part of 7A100)
7	—	Retainer (Part of 7A100)

Bore 214

Bore 215

Bore 216

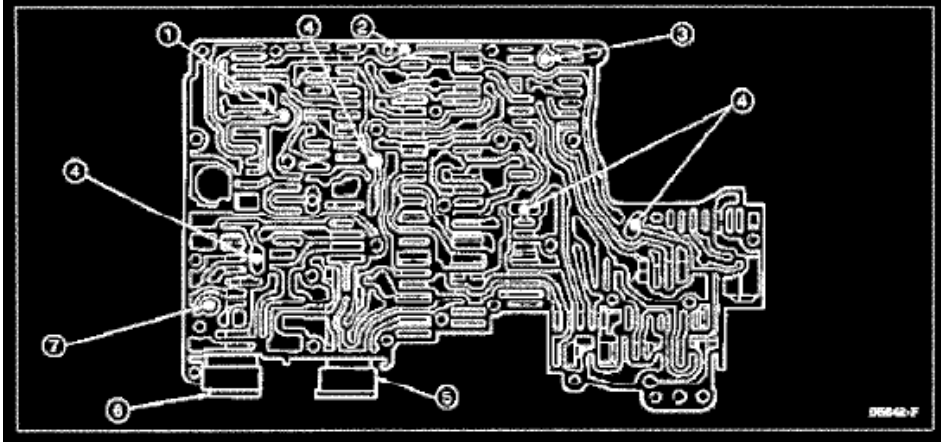


Item	Part Number	Description
1	—	Intermediate Servo Release Accumulator Valve (Part of 7A100)
2	—	Intermediate Servo Release Accumulator Spring (Part of 7A100)
3	—	Overdrive Servo Release Accumulator Spring (Part of 7A100)
4	—	Overdrive Servo Release Accumulator Valve (Part of 7A100)
5	—	Retainer (Part of 7A100)
6	—	3-4 Backout Valve Spring (Part of 7A100)
7	—	Bore 216 (Part of 7A100)
8	—	3-4 Backout Valve (Part of 7A100)
9	—	Plug (Part of 7A100)
10	—	Plug (Part of 7A100)
11	—	Retaining Plate (Part of 7A100)

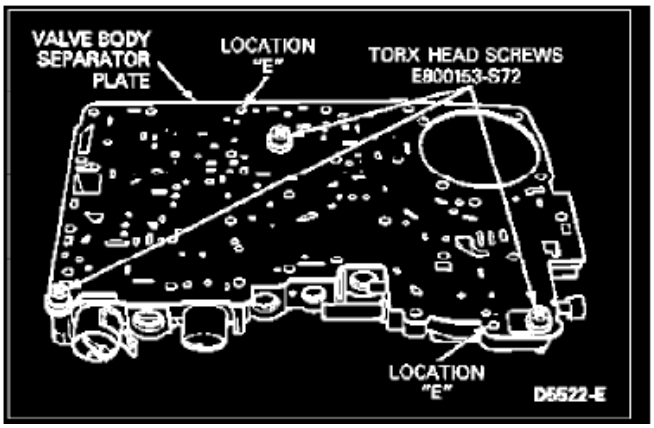
Bore 216

Assembly

Main Control Valve Body



Item	Part Number	Description
1	—	Overdrive Servo Release Accumulator Check Valve (Part of 7A100)
2	—	Intermediate Servo Release Accumulator Check Valve (Part of 7A100)
3	—	Throttle Valve Pressure Relief Valve (Part of 7A100)
4	—	Check Balls (Part of 7A100)
5	—	3-4 Shift Solenoid (Part of 7A100)
6	—	Torque Converter Clutch Solenoid (Part of 7A100)
7	—	Converter Pressure Relief Valve (Part of 7A100)



Main Control Valve Body

1. CAUTION: Make sure all holes in gasket line up with holes in separator plate.

Make sure all check balls, retainers, springs and valves are installed properly.

2. NOTE: Petroleum jelly can be used to hold gasket in place.

Install a new valve body-to-separator plate gasket.

3. Install the separator plate using two tapered punches at locations "E" to align gasket and separator plate-to-valve body. Install three Torx head

screws to retain separator plate and gasket to valve body. Tighten screw to 6-8 Nm (53-71 lb-in).

4. Remove alignment punches.

5. NOTE: Use petroleum jelly to hold the gasket in place.

Install and align (upper) separator plate to case gasket.

Clutch Disc: Service and Repair

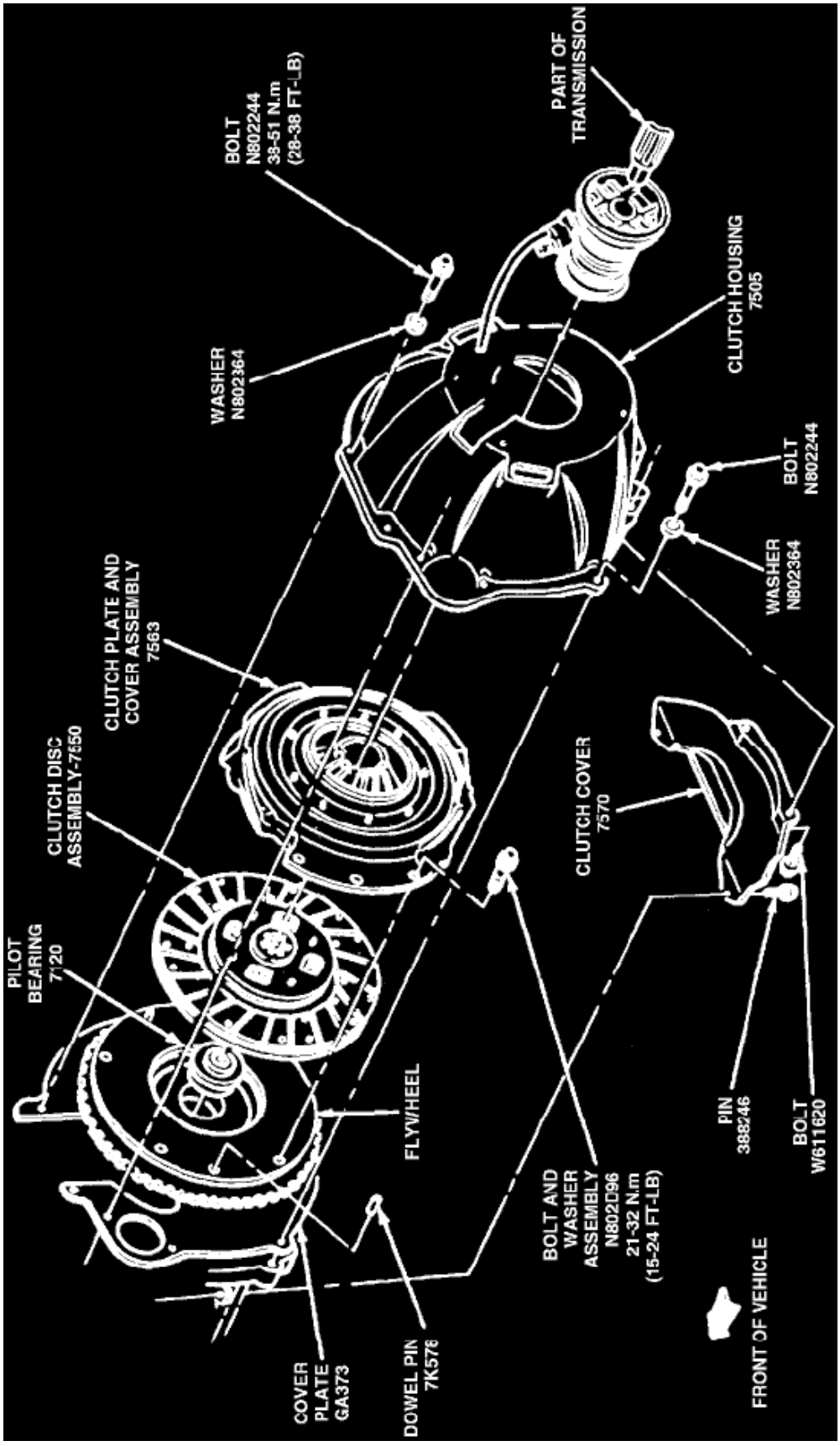
REMOVAL

1. Disconnect clutch hydraulic system master cylinder from clutch pedal and dash panel. 2. Raise and support vehicle. 3. Remove starter motor from engine. 4. Remove hydraulic hose to slave cylinder retaining clip, then disconnect hose from save cylinder. Clean area around hose and slave cylinder to

prevent fluid contamination.

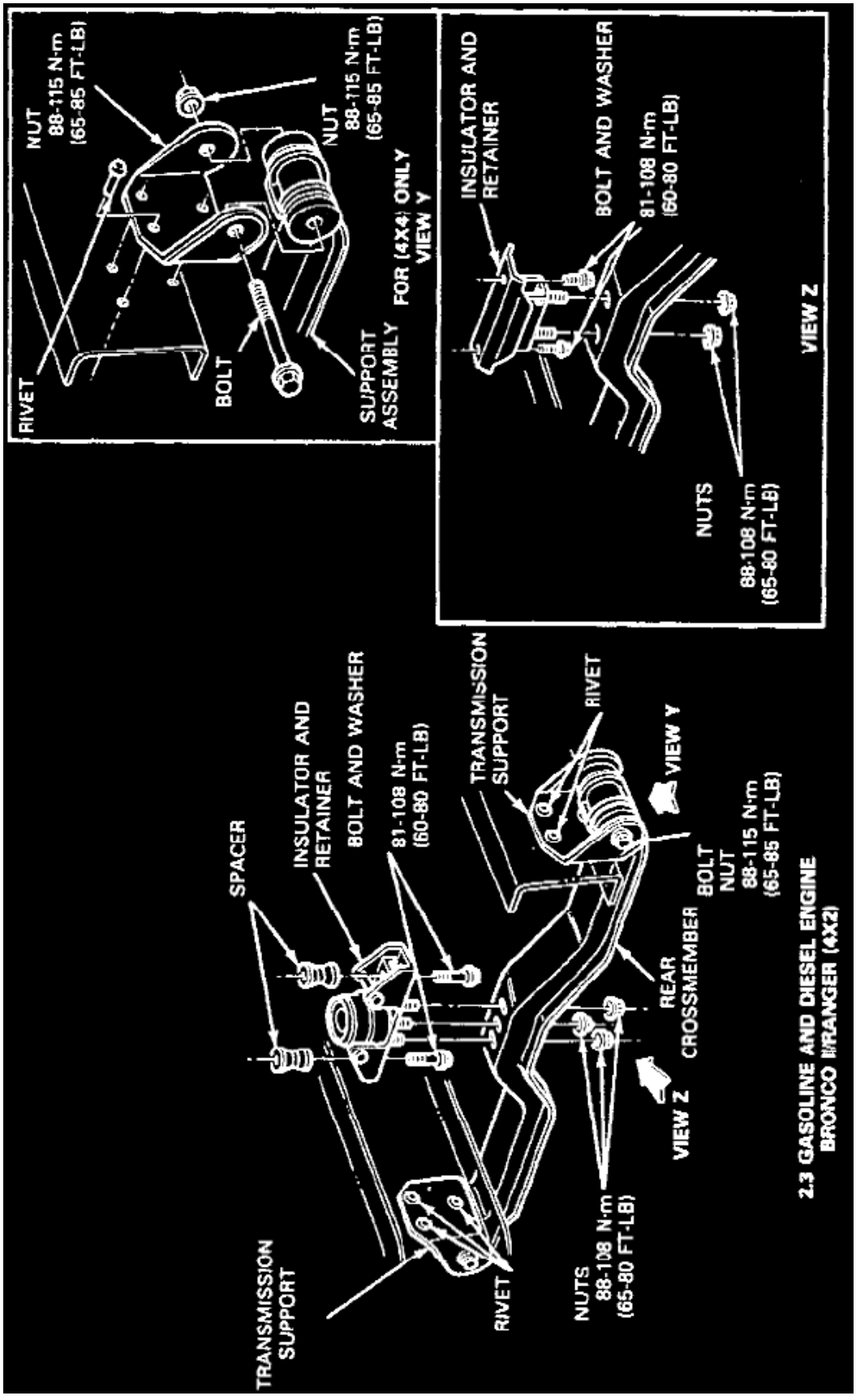
5. Disconnect the hydraulic coupling at transmission with coupling disconnect tool No. T88T-70522-A or equivalent by sliding the white plastic

sleeve toward slave cylinder and applying a slight tug on tube.


BOLT
N802244
38-51 N.m
(28-38 FT-LB)
PART OF
TRANSMISSION
WASHER
N802364
CLUTCH HOUSING
7505
BOLT
N802244
WASHER
N802364
CLUTCH PLATE AND
COVER ASSEMBLY
7563
CLUTCH DISC
ASSEMBLY-7550
PILOT
BEARING
7120
CLUTCH COVER
7570
FLYWHEEL
BOLT AND
WASHER
ASSEMBLY
N802D96
21-32 N.m
(15-24 FT-LB)
PIN
388246
BOLT
W611620
COVER
PLATE
GA373
DOWEL PIN
7K576
FRONT OF VEHICLE

Clutch Housing

6. Remove clutch housing to engine block attaching bolts. Note direction in which the bolts are installed. 7. Mark driveshaft and companion flange for installation, then remove driveshaft.


RIVET
NUT
88-115 N·m
(65-85 FT-LB)
BOLT
SUPPORT ASSEMBLY
FOR (4X4) ONLY
VIEW Y
INSULATOR AND RETAINER
BOLT AND WASHER
81-108 N·m
(60-80 FT-LB)
NUTS
88-108 N·m
(65-80 FT-LB)
VIEW Z
SPACER
TRANSMISSION SUPPORT
REAR CROSSMEMBER
BOLT
2.3 GASOLINE AND DIESEL ENGINE
BRONCO II/RANGER (4X2)

Transmission Rear Support

8. Remove nuts attaching transmission and insulator to No. 2 crossmember support. 9. Raise transmission slightly, then remove No. 2 crossmember support.

10. Lower transmission and clutch housing. 11. Mark assembled position of pressure plate and cover to the flywheel for installation. 12. Loosen pressure plate and cover attaching bolts evenly until pressure plate springs are completely expanded, then remove attaching bolts.

13. Remove pressure plate, cover assembly and clutch disc from flywheel. These parts can be removed through the opening in the bottom of the clutch

housing on models equipped with a dust cover.

14. Remove pilot bearing, if required.

INSTALLATION

1. Install pilot bearing, if removed. 2. Install clutch disc onto flywheel, then insert clutch alignment tool No. T74P-7137-K or equivalent into clutch pilot bearing hole. Ensure clutch

disc is properly aligned on flywheel.

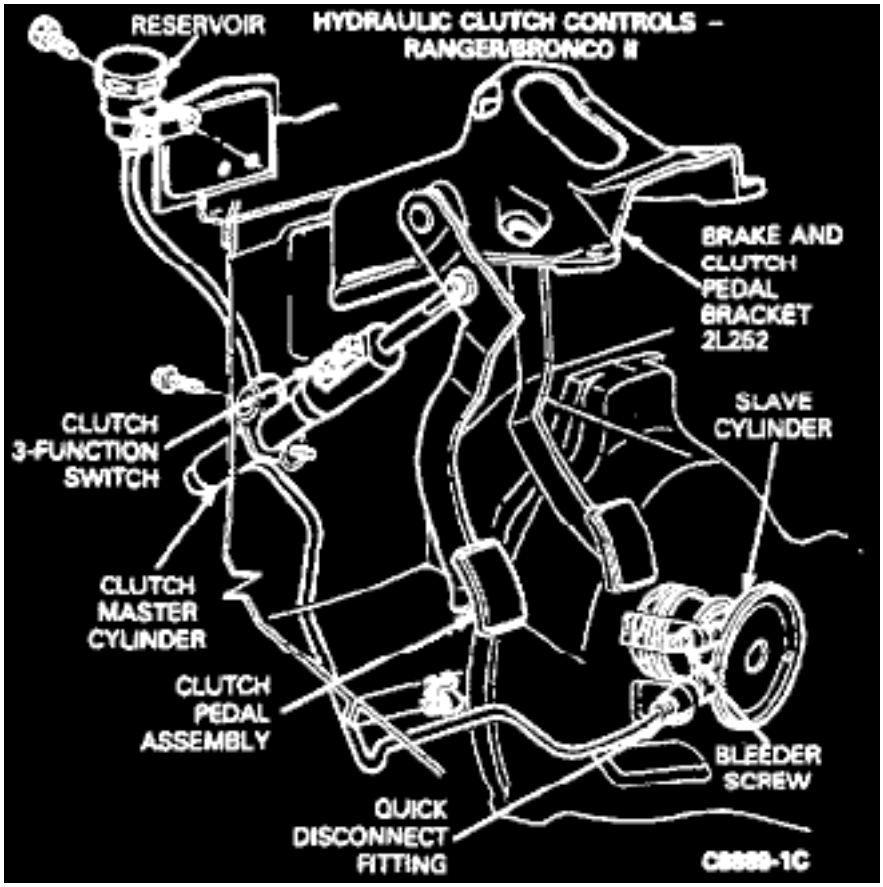
3. If installing original pressure plate and cover assembly, align marks made during removal and position pressure plate and cover assembly onto

flywheel.

4. Install pressure plate attaching bolts and torque bolts to 15-25 ft lbs. 5. Remove clutch disc alignment tool. 6. Raise transmission an clutch housing assembly into position, then install No. 2 crossmember support on to frame. 7. Lower transmission and insulator into crossmember support, and tighten attaching nuts. 8. Remove transmission jack. 9. Install driveshaft. Ensure marks made on driveshaft align properly with mark on companion flange. Torque attaching nuts and bolts to 70-95 ft lbs.

10. Install housing to engine block attaching bolts in correct position as removed. Torque attaching bolts to 28-38 ft lbs. 11. Install slave cylinder hydraulic hose, then the hose to slave cylinder retaining clip. 12. Install starter motor on to end line. 13. Lower vehicle and connect clutch hydraulic system master cylinder to the clutch pedal and to the dash panel assembly. Check clutch for proper

operation.



Clutch Master Cylinder: Service and Repair

Hydraulic Clutch Controls

CAUTION: Prior to any vehicle service that requires removal of the slave cylinder, (i.e.; transmission and clutch housing removal), the master cylinder push rod must be disconnected from the clutch pedal. If not disconnected, permanent damage to the master cylinder assembly will occur if the clutch pedal is depressed while the slave cylinder is disconnected.

REMOVAL

1. Disconnect the clutch master cylinder push rod from the clutch pedal by prying the retainer bushing and push rod off the pedal pin. 2. Remove the switch from the master cylinder assembly. 3. Remove the screw retaining the fluid reservoir to the cowl access cover. 4. Uncouple the tube from the slave cylinder, depress the white retainer bushing with T88T-70522-A, or equivalent, while pulling on the line. 5. Remove the bolts retaining the clutch master cylinder to the dash panel and remove the clutch master cylinder assembly.

INSTALLATION

1. Install the push rod through the hole in the engine compartment. Be sure it is located on the correct side of the clutch pedal. Place the master

cylinder assembly in position. Install the bolts and tighten to 11-16 Nm (8-12 ft-lb).

2. Insert the coupling end into the slave cylinder and install tube into clip(s).

NOTE: Minimal loss of fluid should occur during removal and installation, and bleeding should not normally be required unless the vehicle shows signs of lack of clutch reserve.

3. Position the fluid reservoir on the cowl access cover, and install the retaining screws. 4. Replace the retainer bushing in the clutch master cylinder push rod if worn or damaged. Install the retainer and push rod on the clutch pedal pin.

Be sure the bushing is oriented correctly (with the flange of the bushing against the pedal blade). Install the three function clutch interlock switch or clutch pedal position switch.

5. Bleed the system only if required.

Clutch Slave Cylinder: Customer Interest M/T Clutch Housing - Fluid Inside

Article No. 91-18-14 09/05/91

^ CLUTCH-SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

^ LEAKS-CLUTCH SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

LIGHT TRUCK: 1988-89 ECONOLINE 1988-91 AEROSTAR, BRONCO, F-150-350 SERIES, RANGER 1989-90 BRONCO II 1991 EXPLORER

ISSUE: Fluid detected inside the clutch housing may be caused by a leaking clutch slave cylinder. This may occur when vehicles are driven in severely muddy or dusty environments or when operated with extensive idle time. Vehicles include...

^ 1988-1991 Ranger, 1988-1990 Bronco II, 1988-1991 Aerostar and 1991 Explorer with manual transmissions.

^ 1988-1991 Bronco, F-150-350, and 1988-1989 Econoline with 5-Speed Manual Transmissions, except 7.3L Diesel and 7.5L engines.

ACTION: Replace the clutch slave cylinder if inspection confirms the cylinder is leaking. The new clutch slave cylinder contains a guide seal which improves durability and resistance to dirt entry. Refer to the following procedures for service details.

INSPECTION PROCEDURE:

1. If the vehicle is a Bronco or F-150, the repair will only involve 5 speed manual transmissions. Other vehicles described include all manual transmissions.

This slave cylinder is the internal "Concentric" and not the external style. Inspect vehicle to visually verify the style of slave cylinder installed.

2. Determine if the slave cylinder is leaking by checking for a fluid trace inside the bottom of the clutch housing.

REPAIR PROCEDURE

1. Remove the clutch slave cylinder. Refer to the appropriate Light Truck Shop Manual for service details.

2. Replace the clutch slave cylinder with a new slave cylinder (F1TZ-7A564-A). Refer to the appropriate Light Truck Shop Manual for service details.

PART NUMBER PART NAME CLASS

F1TZ-7A564-A Slave Cylinder B

NOTE: APPPROPRIATE SUPPLIMENT OPERATIONS SHOULD BE USED WITH THE LABOR OPERATIONS LISTED.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911814A Inspect For Fluid Leak - All 0.3 Hr.

Vehicles

911814B Replace Clutch Slave 1.8 Hr.

Cylinder - Ranger 4X2 With 2.3L

911814C Replace Clutch Slave 3.2 Hr.

Cylinder - Ranger 4X4 With

2.3L And F-Series 4X2 With 5.8L

911814D Replace Clutch Slave 2.0 Hr.

Cylinder - Ranger 4X2 With 2.9L Or 3.0L And Aerostar With 3.0L

911814E Replace Clutch Slave 2.6 Hr.

Cylinder - Bronco II With 2.9L

911814F Replace Clutch Slave 3.5 Hr.

Cylinder - Ranger 4X4 And Bronco II 4X4 With 2.9L And F-Series 4X4 And Bronco With 5.0L

911814G Replace Clutch Slave 2.9 Hr.

Cylinder - Ranger 4X2 And Explorer 4X2 With 4.0L

911814H Replace Clutch Slave 3.7 Hr.

Cylinder - Ranger 4X4 And

911814I Replace Clutch Slave 2.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And Mazda Transmission

911814J Replace Clutch Slave 2.3 Hr.

Cylinder - F-Series 4X2 With 5.0L

911814K Replace Clutch Slave 3.3 Hr.

Cylinder - F-Series 4X4 And Bronco With 4.9L And Mazda Transmission

911814L Replace Clutch Slave 3.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And ZF Transmission

911814M Replace Clutch Slave 4.1 Hr.

Cylinder - F-Series 4X4 With 4.9L And ZF Transmission

911814N Replace Clutch Slave 4.3 Hr.

Cylinder - F-Series 4X4 With 5.8L

911814O Replace Clutch Slave 2.8 Hr.

Cylinder - Econoline

DEALER CODING

BASIC PART NO. CONDITION CODE

7A564 77

OASIS CODES: 505000

Clutch Slave Cylinder: All Technical Service Bulletins M/T Clutch Housing - Fluid Inside

Article No. 91-18-14 09/05/91

^ CLUTCH-SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

^ LEAKS-CLUTCH SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

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This slave cylinder is the internal "Concentric" and not the external style. Inspect vehicle to visually verify the style of slave cylinder installed.

2. Determine if the slave cylinder is leaking by checking for a fluid trace inside the bottom of the clutch housing.

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2. Replace the clutch slave cylinder with a new slave cylinder (F1TZ-7A564-A). Refer to the appropriate Light Truck Shop Manual for service details.

PART NUMBER PART NAME CLASS

F1TZ-7A564-A Slave Cylinder B

NOTE: APPPROPRIATE SUPPLIMENT OPERATIONS SHOULD BE USED WITH THE LABOR OPERATIONS LISTED.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911814A Inspect For Fluid Leak - All 0.3 Hr.

Vehicles

911814B Replace Clutch Slave 1.8 Hr.

Cylinder - Ranger 4X2 With 2.3L

911814C Replace Clutch Slave 3.2 Hr.

Cylinder - Ranger 4X4 With

2.3L And F-Series 4X2 With 5.8L

911814D Replace Clutch Slave 2.0 Hr.

Cylinder - Ranger 4X2 With 2.9L Or 3.0L And Aerostar With 3.0L

911814E Replace Clutch Slave 2.6 Hr.

Cylinder - Bronco II With 2.9L

911814F Replace Clutch Slave 3.5 Hr.

Cylinder - Ranger 4X4 And Bronco II 4X4 With 2.9L And F-Series 4X4 And Bronco With 5.0L

911814G Replace Clutch Slave 2.9 Hr.

Cylinder - Ranger 4X2 And Explorer 4X2 With 4.0L

911814H Replace Clutch Slave 3.7 Hr.

Cylinder - Ranger 4X4 And

911814I Replace Clutch Slave 2.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And Mazda Transmission

911814J Replace Clutch Slave 2.3 Hr.

Cylinder - F-Series 4X2 With 5.0L

911814K Replace Clutch Slave 3.3 Hr.

Cylinder - F-Series 4X4 And Bronco With 4.9L And Mazda Transmission

911814L Replace Clutch Slave 3.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And ZF Transmission

911814M Replace Clutch Slave 4.1 Hr.

Cylinder - F-Series 4X4 With 4.9L And ZF Transmission

911814N Replace Clutch Slave 4.3 Hr.

Cylinder - F-Series 4X4 With 5.8L

911814O Replace Clutch Slave 2.8 Hr.

Cylinder - Econoline

DEALER CODING

BASIC PART NO. CONDITION CODE

7A564 77

OASIS CODES: 505000

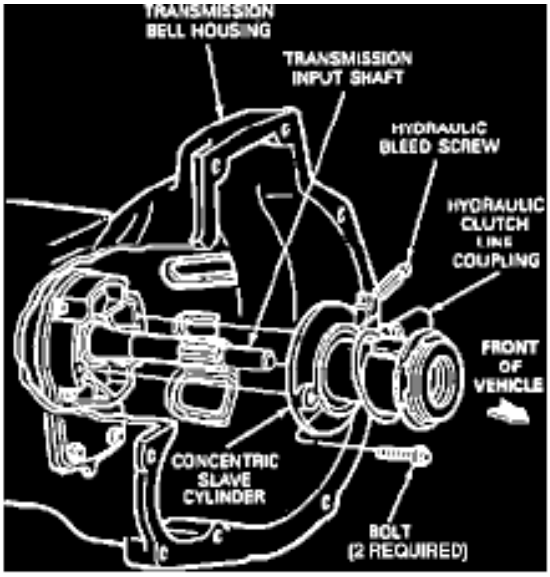
Clutch Slave Cylinder: Service and Repair Bleeding Procedure

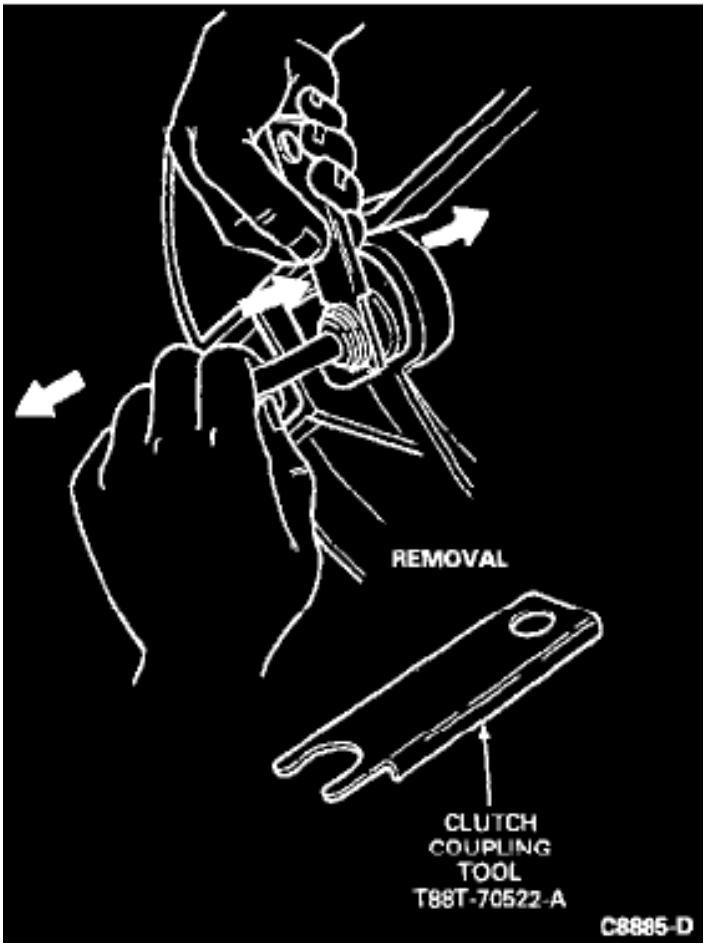
NOTE: On vehicles equipped with quick-connect clutch tube, the manufacturer recommends replacing the tube when ever hydraulic system service is necessary, because the quick-connect feature tends to trap air in the system and prevents complete bleeding of the system. The replacement tube does not include the quick-connect feature.

1. Clean area around fluid reservoir cap, then remove cap and fill reservoir with suitable DOT 3 brake fluid. 2. Loosen bleed screw on slave cylinder and wait until a steady stream of fluid is expelled, then tighten screw. 3. Depress clutch pedal to floor, wait 1-2 seconds, then release pedal as rapidly as possible. Repeat approximately 10 times. 4. Check fluid level in reservoir and fill as required. 5. Repeat steps 3 and 4, then reinstall reservoir cap. 6. Hold clutch pedal to floor, crack open bleed screw to allow any additional air to escape, then close screw and release clutch pedal. Check fluid

level and adjust as necessary.

7. Start engine, then depress clutch pedal and shift transmission into reverse gear. If gear clash occurs, repeat steps 3 through 6.


TRANSMISSION BELL HOUSING
TRANSMISSION INPUT SHAFT
HYDRAULIC BLEED SCREW
HYDRAULIC CLUTCH LINE COUPLING
FRONT OF VEHICLE
CONCENTRIC SLAVE CYLINDER
BOLT (2 REQUIRED)


REMOVAL
CLUTCH COUPLING TOOL T88T-70522-A
C8885-D

Clutch Slave Cylinder: Service and Repair Removal and Installation

Slave Cylinder Removal

REMOVAL

Clutch Coupling Tool T88T-70522-A

1. Using coupling disconnect tool No. T88T-70522-A or equivalent, disconnect hydraulic coupling at transmission by sliding white plastic sleeve

toward clutch slave cylinder while tugging on tube.

2. Remove transmission. 3. Remove clutch housing to transmission attaching bolts, then separate clutch housing from transmission. 4. Remove slave cylinder from transmission input shaft.

INSTALLATION

1. Reverse procedure to install, noting the following:

a. Position slave cylinder over transmission input shaft with bleed screw and coupling facing left side of transmission. b. Torque slave cylinder retaining bolts to 14-19 ft lbs. c. Bleed system if required.

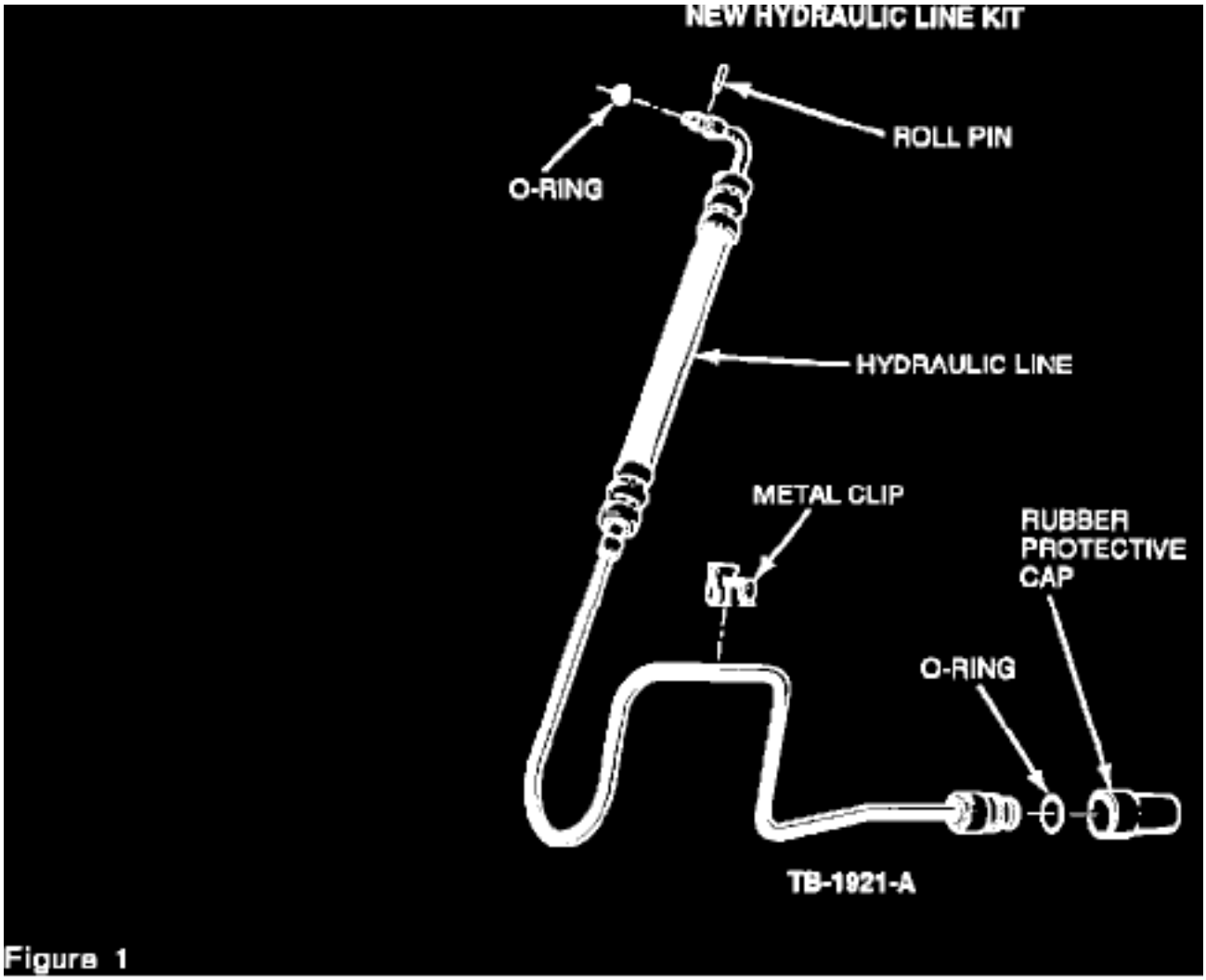


Figure 1

PART NUMBER	PART NAME	CLASS
F1TZ-7A512-A	Hydraulic Line Service Kit (1986-90 Bronco II And 1988-91 Ranger)	B
F2TZ-7A512-B	Hydraulic Line Service Kit (1992 Ranger)	B
F2TZ-7A512-G	Hydraulic Line Service Kit (1993 Ranger)	B

Technical Service Bulletin # 941317 Date: 940629

M/T Clutch - Growling/Clicking Noise

Article No. 94-13-17

06/29/94

^ NOISE - "GROWL/CLICKING" - WHEN CLUTCH PEDAL IS DEPRESSED - 2.3L & 2.9L ENGINES

^ VIBRATION - CLUTCH PEDAL - 2.3L & 2.9L ENGINES

^ CLUTCH - "GROWL/CLICKING" NOISE WHEN PEDAL IS DEPRESSED - 2.3L & 2.9L ENGINES

LIGHT TRUCK: 1988-90 BRONCO II 1988-93 RANGER

This article is being republished in its entirety to add new procedures and parts for 1992/93 model year Ranger.

ISSUE: A "growling/clicking" noise may occur when the clutch pedal is depressed during shifting. The noise worsens with increasing engine speed. A vibration in the clutch pedal may also be felt. This condition is caused by engine vibrations being transmitted by the hydraulic line assembly.

ACTION: Inspect the vehicle and, if necessary, install a new hydraulic line service kit with a rubber damper section in the hydraulic line assembly. Refer to the following procedure for service details. Refer to Figure 1.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-12-12 WARRANTY STATUS:

Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Ranger, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

941317A Install New Clutch Hydraulic 0.6 Hr.

Line And Bleed System - 1992 And Prior Models

941317B Install New Clutch Hydraulic 1.1 Hrs.

Line And Bleed System - 1993 Ranger With 2.3L Engine

DEALER CODING

BASIC PART NO. CONDITION CODE

7A512 56

OASIS CODES: 506000, 702000

Inspection Procedure

INSPECTION PROCEDURE

1. Put the transmission in neutral.

2. Bring the engine speed to 3000 rpm or higher.

3. Press the clutch pedal slowly down and up.

4. If the audible growl is not present, try higher engine speeds and repeat Steps 1-3.

5. Listen to see if the growl occurs.

^ If it doesn't occur, the noise is not controlled strictly by the clutch pedal actuation. This "fix" is not appropriate and will not solve the concern.

^ If it does occur, proceed with the hydraulic line replacement procedure.

1992 and Prior Models - Hydraulic Line Replacement

HYDRAULIC LINE REPLACEMENT PROCEDURE - LOWER END (SLAVE CYLINDER END)

1. Raise the vehicle on a hoist.

2. If the vehicle is equipped with a metal clip connected to the floor flange, unclip the hydraulic line.

3. Uncouple the lower end of the hydraulic line from the slave cylinder using Clutch Coupling Tool T88T-70522-A.

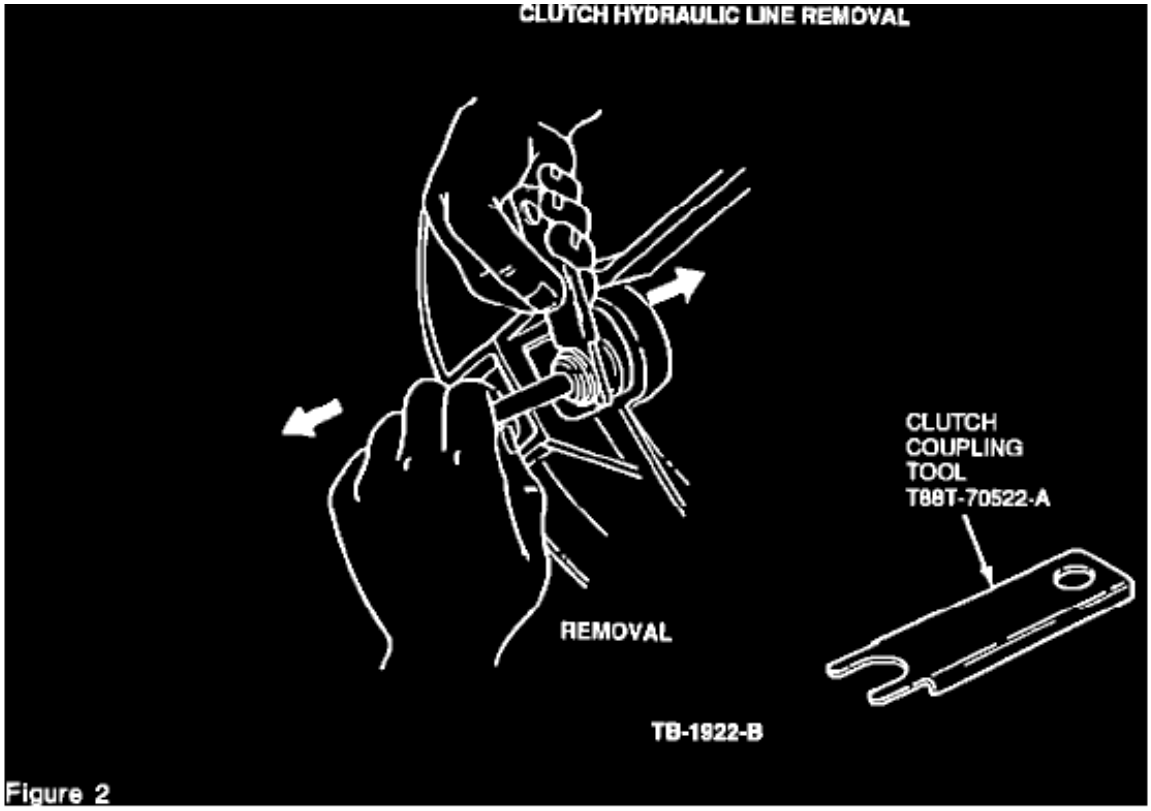


Figure 2

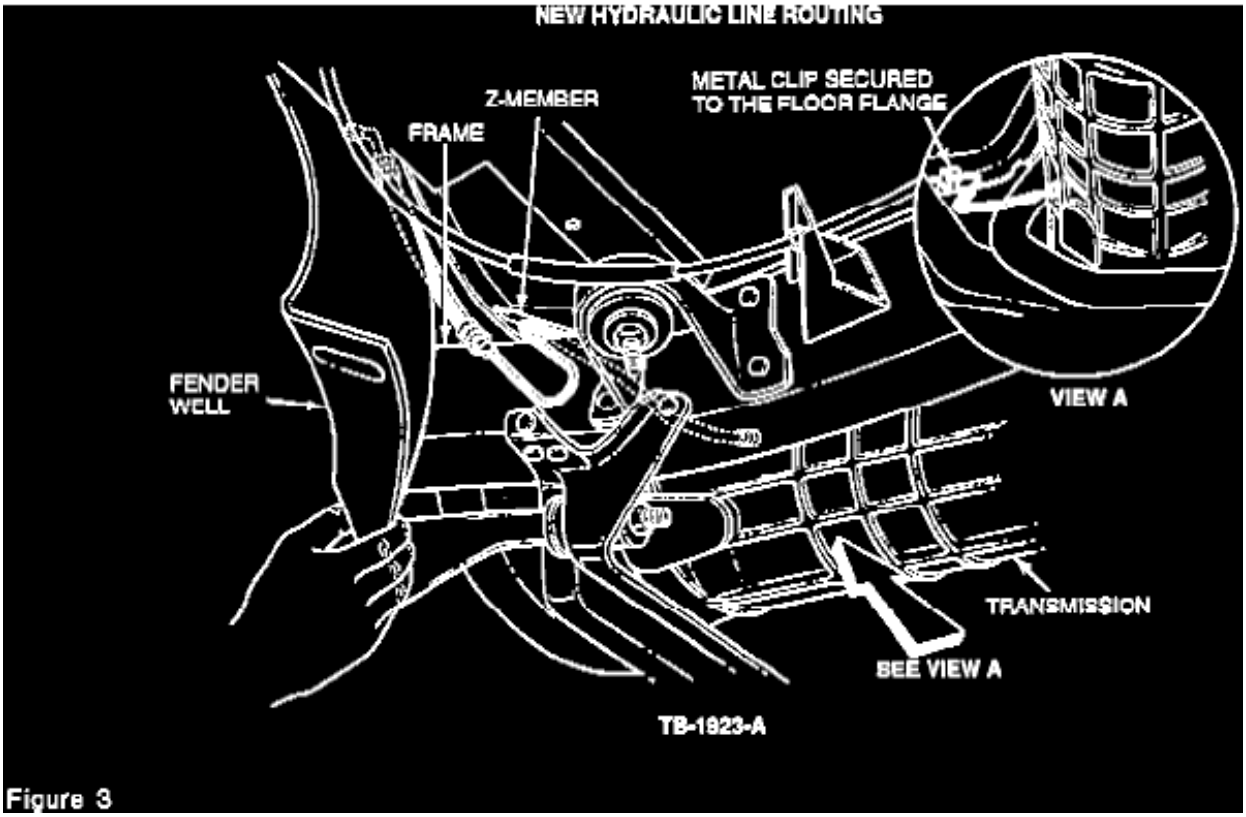


Figure 3

4. Slide the white plastic sleeve toward the slave cylinder while pulling the line away from the slave cylinder, Figure 2.

5. Route the new hydraulic line between the Z-member and frame as shown in Figure 3.

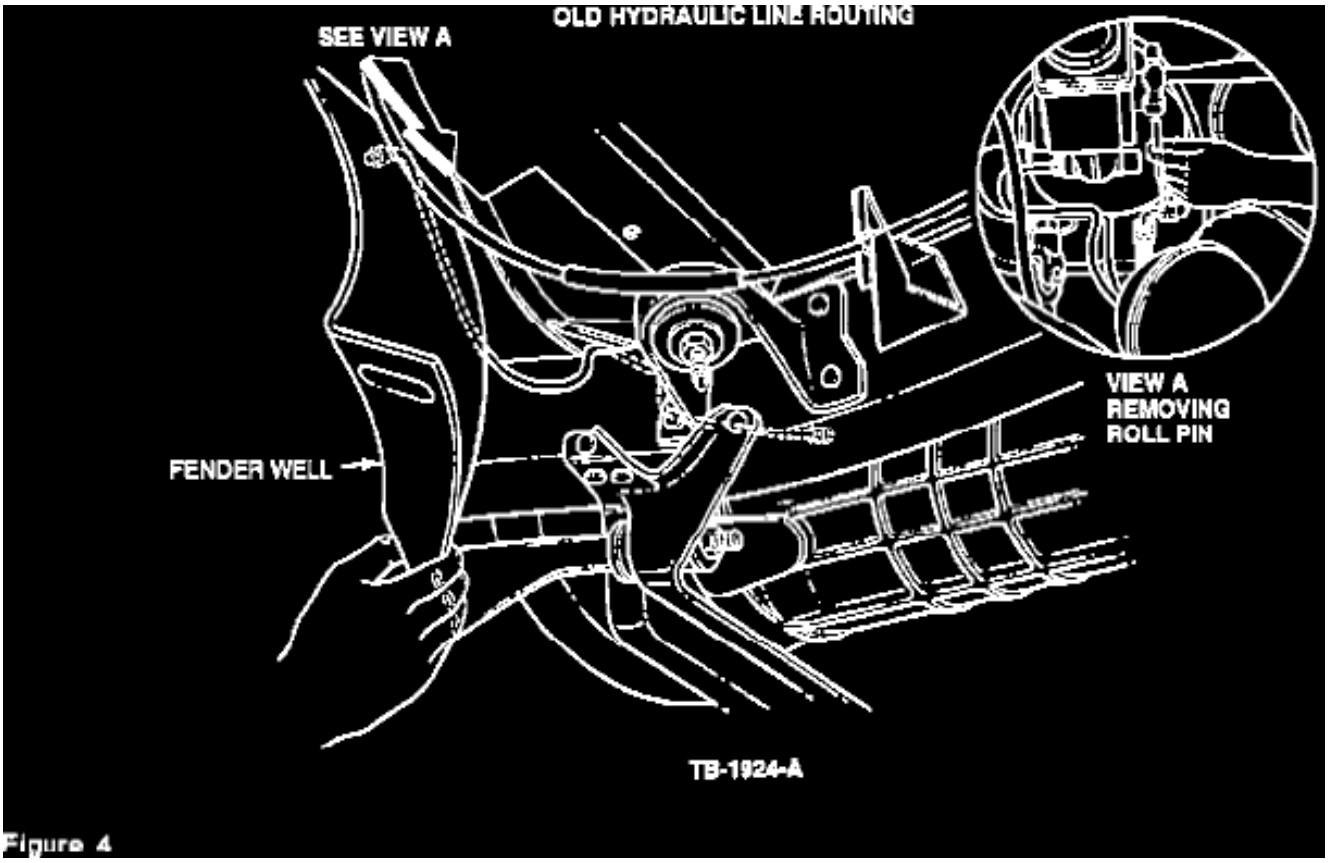


Figure 4

NOTE:

THIS ROUTING IS DIFFERENT THAN THE PRIOR HYDRAULIC LINE ROUTING WHICH IS SHOWN IN FIGURE 4 FOR REFERENCE.

6. Make sure that the heat shield is at the lower end of the hydraulic line (opposite end of rubber damper), Figure 3, View A.

7. Remove the red rubber protective cap from the lower end of the hydraulic line, a. Check to be sure that the O-ring is in place.

b. Insert the male coupling into the female coupling on the slave cylinder.

c. After the couplings are connected, pull on the line (away from the slave cylinder) to be sure that the connection is secure.

8. Connect the new hydraulic line to the metal retainer clip as follows:

a. If the vehicle is equipped with a metal retaining clip, the clip may be reused on the new hydraulic line. Secure the line to the metal retainer clip.

b. If the vehicle is not equipped with a retainer clip, use the new clip provided in the service kit. Insert the new clip to the floor flange and secure the line as shown in Figure 3, View A.

9. Lower the vehicle from the hoist.

HYDRAULIC LINE REPLACEMENT - UPPER END (MASTER CYLINDER END)

1. Raise the hood.

2. Remove and discard the roll pin.

a. Locate the roll pin on the clutch master cylinder, Figure 4, View A.

b. Use a fine punch and a hammer to knock the roll pin out of its hole.

3. Disconnect the hydraulic line from the clutch master cylinder.

a. Apply a slight tug on the hydraulic line away from the master cylinder outlet port.

b. Remove the hydraulic line from the vehicle.

4. Check to see that the O-ring is inside the clutch master cylinder outlet port.

^ If the existing O-ring is inside the clutch master cylinder outlet port, it may be reused.

^ If the O-ring is missing, install the new O-ring provided in the service kit.

5. Remove the plastic protective cover bag from the upper end of the new hydraulic line. Insert the hydraulic line into the clutch master cylinder outlet port.

6. Insert the new roll pin into the roll pin hole in the clutch master cylinder to retain the hydraulic line. Check to see that this connection is secured by pulling on the line away from the clutch master cylinder outlet port.

7. Bleed the clutch hydraulic system. Refer to the appropriate model year Ranger/Bronco II Shop Manual, Section 08-02, for bleeding procedure.

1993 Ranger With 2.3L - Hydraulic Line Replacement

HYDRAULIC LINE REPLACEMENT

1. Remove the clutch master cylinder, tube and reservoir assembly from vehicle. Refer to the 1993 Ranger Service Manual, Page 08-02-03.

2. Remove and discard the roll pin.

a. Locate the roll pin on the clutch master cylinder.

b. Use a fine punch and a hammer to knock the roll pin out of its hole.

3. Disconnect the hydraulic line from the clutch master cylinder. Apply a slight tug on the hydraulic line away from the master cylinder outlet port.

4. Check to see that the O-ring is inside the clutch master cylinder outlet port.

^ If the existing O-ring is inside the clutch master cylinder outlet port, it may be reused.

^ If the O-ring is missing, install the new O-ring provided in the service kit.

5. Remove the plastic protective cover bag from the upper end of the new hydraulic line. Insert the hydraulic line into the clutch master cylinder outlet port.

6. Insert the new roll pin into the roll pin hole in the clutch master cylinder to retain the hydraulic line. Check to see that this connection is secured by pulling on the line away from the clutch master cylinder outlet port.

7. Bleed system per the following bench bleed procedure.

Bench Bleed Procedure

BENCH BLEED PROCEDURE

1. Remove master cylinder, line and reservoir from vehicle and assemble with replacement parts required based on initial concern.

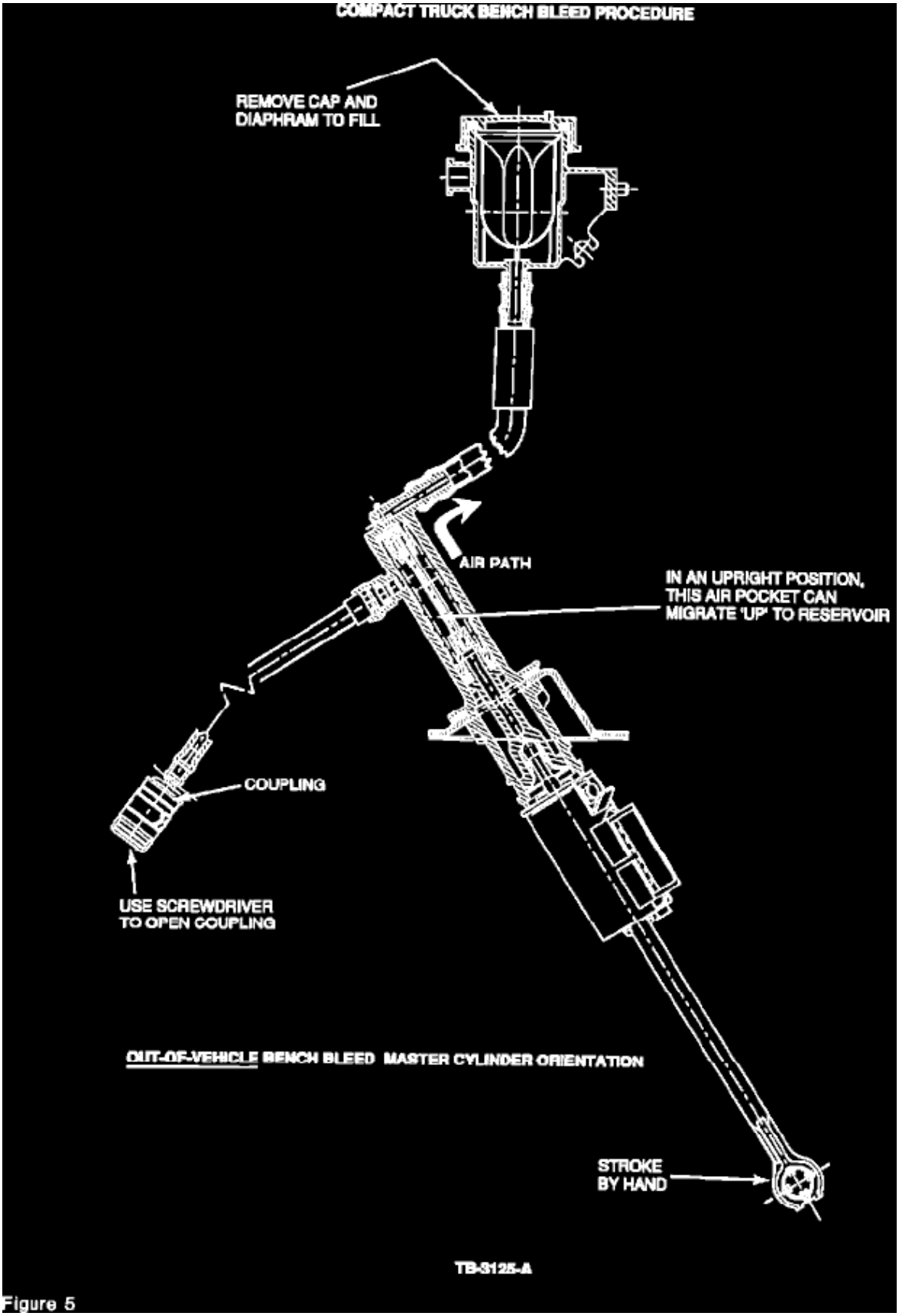


Figure 5

2. Hold the master cylinder vertically with the reservoir feed hose in the highest position on the body, Figure 5.

3. Fill the reservoir and extend above the master cylinder and assure the quick-connect on the clutch line is below the master cylinder. (Lightly clamp reservoir in a vise).

4. Using a small screwdriver, depress the internal mechanism of the male quick-connect coupling to open the valve, Figure 5.

5. Stroke and hold master cylinder pushrod.

6. Close quick-connect valve.

7. Release master cylinder pushrod.

8. Fill reservoir.

9. Repeat Steps 4 through 8 four more times.

10. With the master cylinder still being held with the outlet tube and reservoir feed tube ends high, quick-connect closed and the reservoir full, proceed as follows:

a. Push the pushrod into the body several times quickly to expel any remaining air.

b. If it is a remote reservoir, pinch the supply hose with your fingers two or three times to help move air into reservoir.

11. When the movement of the pushrod is .1601, (4 mm) or less when stroked in Step 10, reinstall the master cylinder into the vehicle and couple it to the slave cylinder per 1993 Ranger Service Manual Procedure, Page 08-02-03.

Final Inspection

1. Confirm that the audible growl is no longer present.

2. Inspect the vehicle for leaks and proper clutch operation.

^ If the hydraulic system leaks, check for a missing O-ring and any loose connections at either end of the hydraulic line.

^ If the clutch pedal feels effortless, actuate the clutch pedal several times at full stroke.

^ If the pedal still feels effortless, then the hydraulic system is probably not fully bled. Therefore, rebleed the hydraulic system.

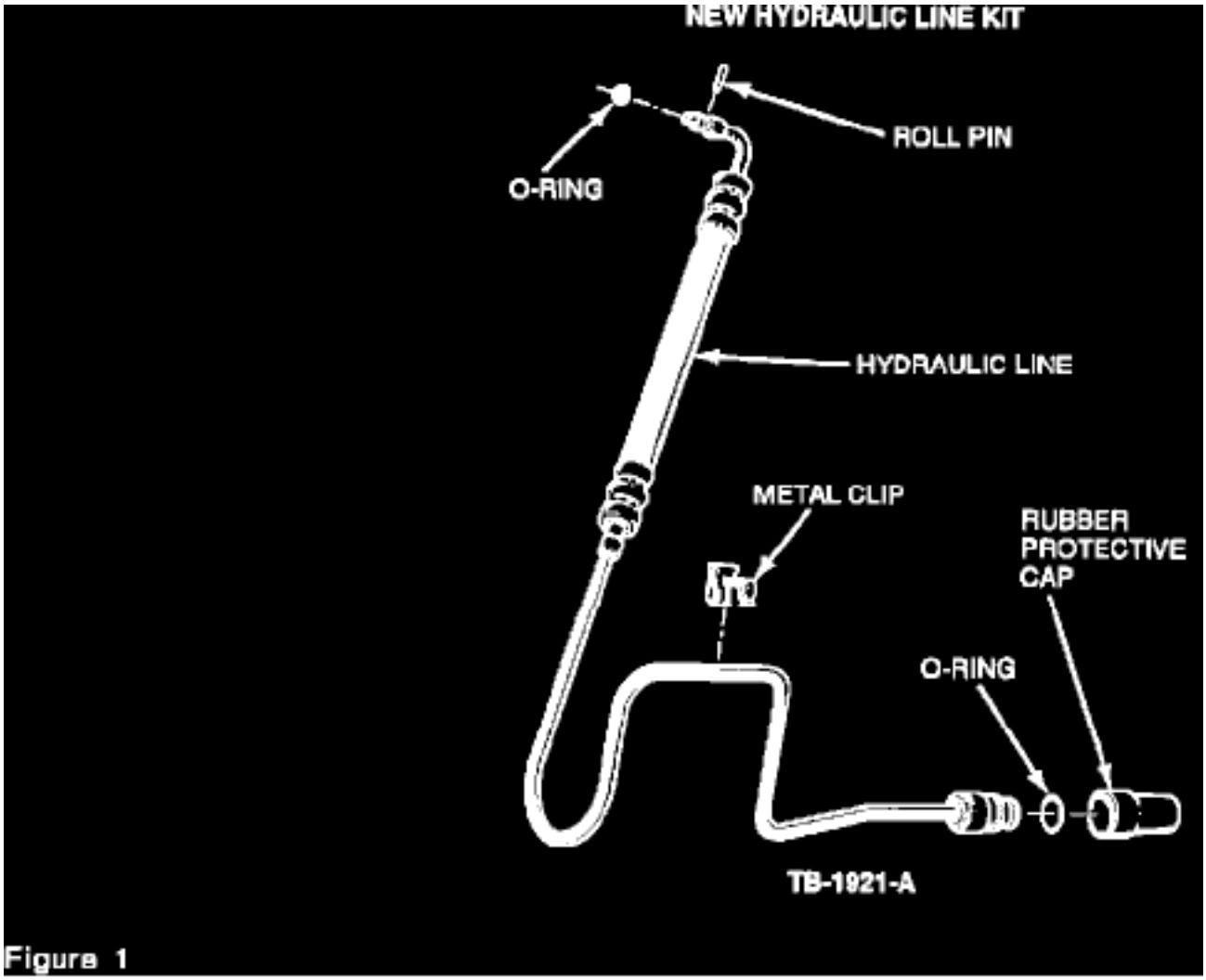


Figure 1

PART NUMBER	PART NAME	CLASS
F1TZ-7A512-A	Hydraulic Line Service Kit (1986-90 Bronco II And 1988-91 Ranger)	B
F2TZ-7A512-B	Hydraulic Line Service Kit (1992 Ranger)	B
F2TZ-7A512-G	Hydraulic Line Service Kit (1993 Ranger)	B

Technical Service Bulletin # 941317 Date: 940629

M/T Clutch - Growling/Clicking Noise

Article No. 94-13-17

06/29/94

^ NOISE - "GROWL/CLICKING" - WHEN CLUTCH PEDAL IS DEPRESSED - 2.3L & 2.9L ENGINES

^ VIBRATION - CLUTCH PEDAL - 2.3L & 2.9L ENGINES

^ CLUTCH - "GROWL/CLICKING" NOISE WHEN PEDAL IS DEPRESSED - 2.3L & 2.9L ENGINES

LIGHT TRUCK: 1988-90 BRONCO II 1988-93 RANGER

This article is being republished in its entirety to add new procedures and parts for 1992/93 model year Ranger.

ISSUE: A "growling/clicking" noise may occur when the clutch pedal is depressed during shifting. The noise worsens with increasing engine speed. A vibration in the clutch pedal may also be felt. This condition is caused by engine vibrations being transmitted by the hydraulic line assembly.

ACTION: Inspect the vehicle and, if necessary, install a new hydraulic line service kit with a rubber damper section in the hydraulic line assembly. Refer to the following procedure for service details. Refer to Figure 1.

Parts Block

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-12-12 WARRANTY STATUS:

Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992/93 Ranger, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

941317A Install New Clutch Hydraulic 0.6 Hr.

Line And Bleed System - 1992 And Prior Models

941317B Install New Clutch Hydraulic 1.1 Hrs.

Line And Bleed System - 1993 Ranger With 2.3L Engine

DEALER CODING

BASIC PART NO. CONDITION CODE

7A512 56

OASIS CODES: 506000, 702000

Inspection Procedure

INSPECTION PROCEDURE

1. Put the transmission in neutral.

2. Bring the engine speed to 3000 rpm or higher.

3. Press the clutch pedal slowly down and up.

4. If the audible growl is not present, try higher engine speeds and repeat Steps 1-3.

5. Listen to see if the growl occurs.

^ If it doesn't occur, the noise is not controlled strictly by the clutch pedal actuation. This "fix" is not appropriate and will not solve the concern.

^ If it does occur, proceed with the hydraulic line replacement procedure.

1992 and Prior Models - Hydraulic Line Replacement

HYDRAULIC LINE REPLACEMENT PROCEDURE - LOWER END (SLAVE CYLINDER END)

1. Raise the vehicle on a hoist.

2. If the vehicle is equipped with a metal clip connected to the floor flange, unclip the hydraulic line.

3. Uncouple the lower end of the hydraulic line from the slave cylinder using Clutch Coupling Tool T88T-70522-A.

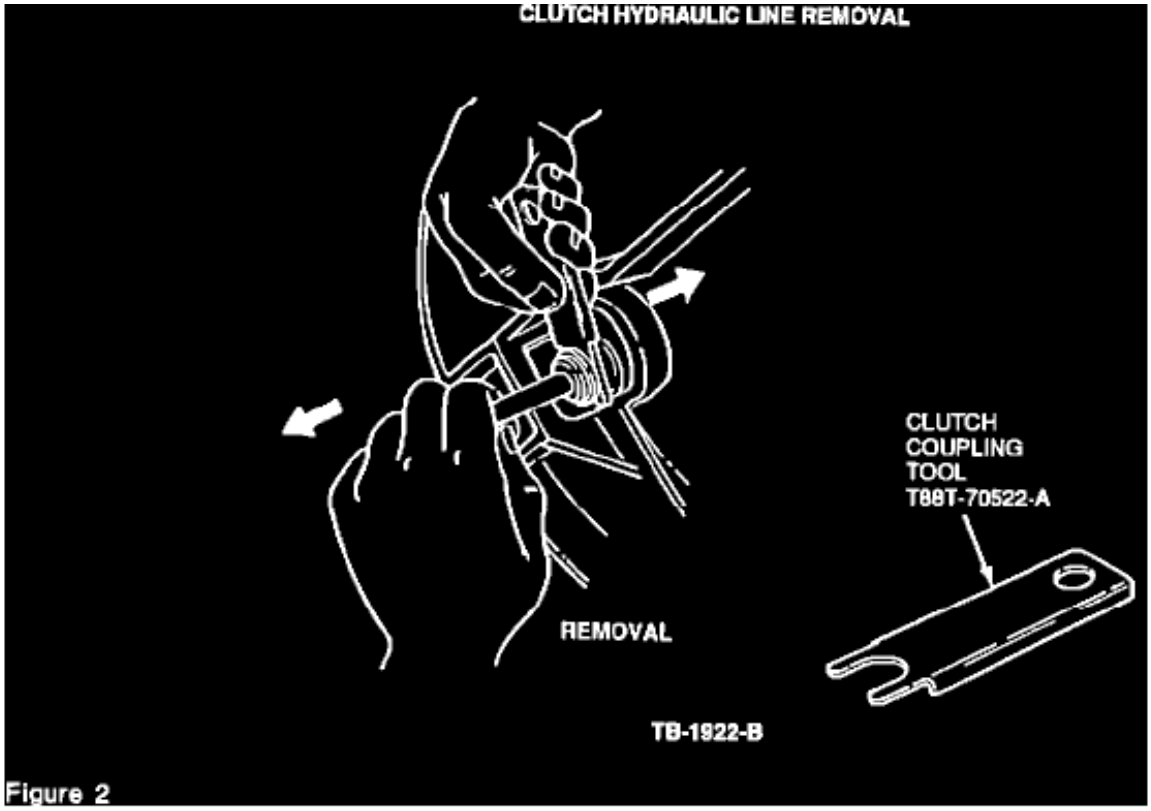


Figure 2

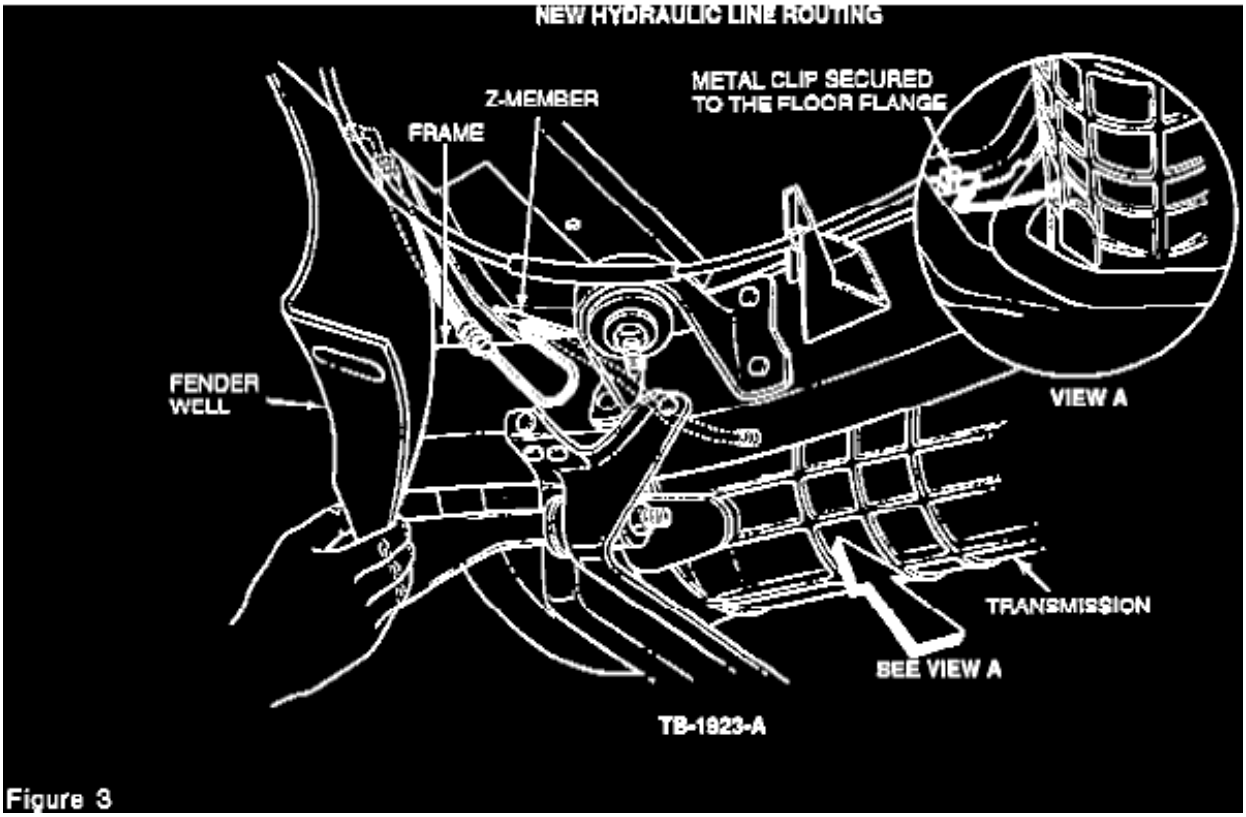


Figure 3

4. Slide the white plastic sleeve toward the slave cylinder while pulling the line away from the slave cylinder, Figure 2.

5. Route the new hydraulic line between the Z-member and frame as shown in Figure 3.

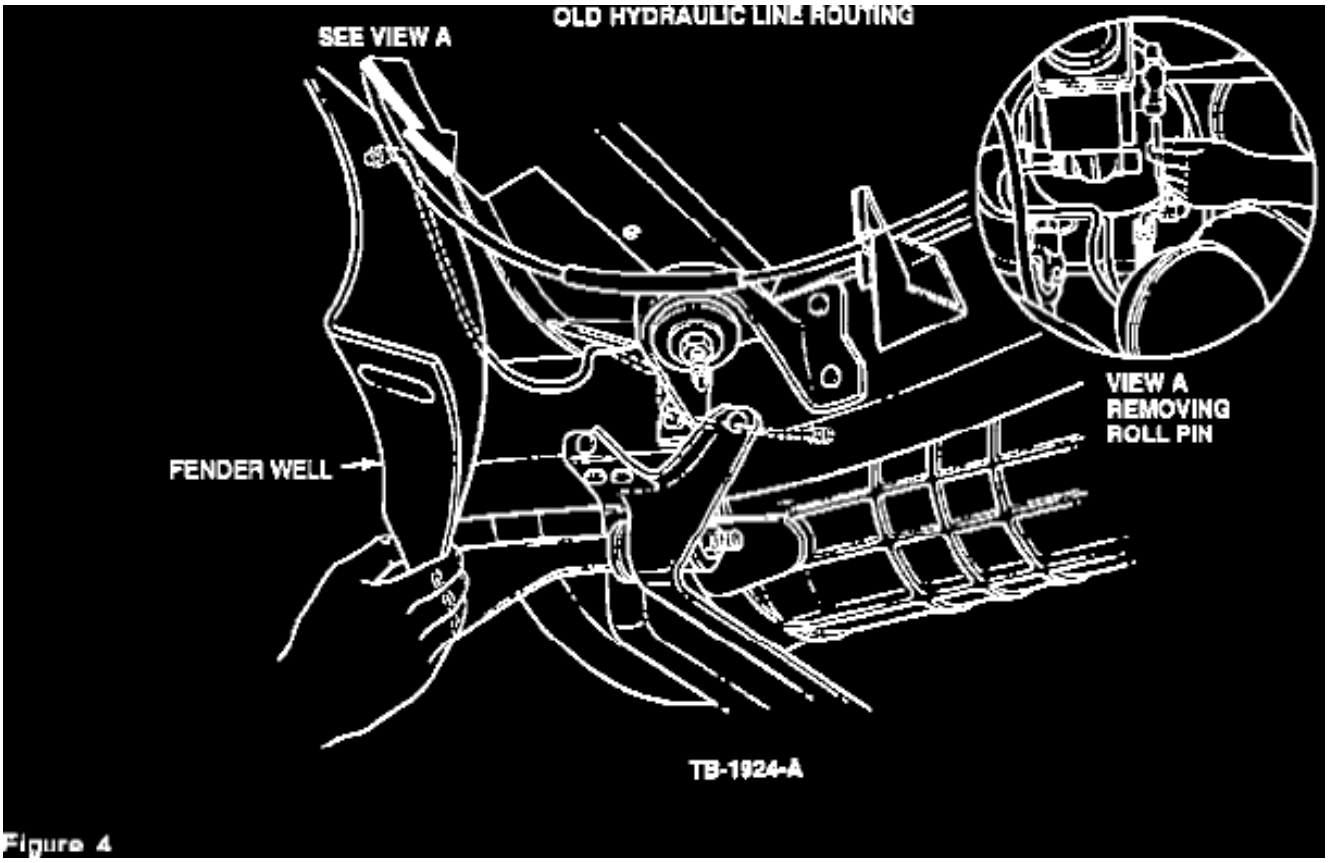


Figure 4

NOTE:

THIS ROUTING IS DIFFERENT THAN THE PRIOR HYDRAULIC LINE ROUTING WHICH IS SHOWN IN FIGURE 4 FOR REFERENCE.

6. Make sure that the heat shield is at the lower end of the hydraulic line (opposite end of rubber damper), Figure 3, View A.

7. Remove the red rubber protective cap from the lower end of the hydraulic line, a. Check to be sure that the O-ring is in place.

b. Insert the male coupling into the female coupling on the slave cylinder.

c. After the couplings are connected, pull on the line (away from the slave cylinder) to be sure that the connection is secure.

8. Connect the new hydraulic line to the metal retainer clip as follows:

a. If the vehicle is equipped with a metal retaining clip, the clip may be reused on the new hydraulic line. Secure the line to the metal retainer clip.

b. If the vehicle is not equipped with a retainer clip, use the new clip provided in the service kit. Insert the new clip to the floor flange and secure the line as shown in Figure 3, View A.

9. Lower the vehicle from the hoist.

HYDRAULIC LINE REPLACEMENT - UPPER END (MASTER CYLINDER END)

1. Raise the hood.

2. Remove and discard the roll pin.

a. Locate the roll pin on the clutch master cylinder, Figure 4, View A.

b. Use a fine punch and a hammer to knock the roll pin out of its hole.

3. Disconnect the hydraulic line from the clutch master cylinder.

a. Apply a slight tug on the hydraulic line away from the master cylinder outlet port.

b. Remove the hydraulic line from the vehicle.

4. Check to see that the O-ring is inside the clutch master cylinder outlet port.

^ If the existing O-ring is inside the clutch master cylinder outlet port, it may be reused.

^ If the O-ring is missing, install the new O-ring provided in the service kit.

5. Remove the plastic protective cover bag from the upper end of the new hydraulic line. Insert the hydraulic line into the clutch master cylinder outlet port.

6. Insert the new roll pin into the roll pin hole in the clutch master cylinder to retain the hydraulic line. Check to see that this connection is secured by pulling on the line away from the clutch master cylinder outlet port.

7. Bleed the clutch hydraulic system. Refer to the appropriate model year Ranger/Bronco II Shop Manual, Section 08-02, for bleeding procedure.

1993 Ranger With 2.3L - Hydraulic Line Replacement

HYDRAULIC LINE REPLACEMENT

1. Remove the clutch master cylinder, tube and reservoir assembly from vehicle. Refer to the 1993 Ranger Service Manual, Page 08-02-03.

2. Remove and discard the roll pin.

a. Locate the roll pin on the clutch master cylinder.

b. Use a fine punch and a hammer to knock the roll pin out of its hole.

3. Disconnect the hydraulic line from the clutch master cylinder. Apply a slight tug on the hydraulic line away from the master cylinder outlet port.

4. Check to see that the O-ring is inside the clutch master cylinder outlet port.

^ If the existing O-ring is inside the clutch master cylinder outlet port, it may be reused.

^ If the O-ring is missing, install the new O-ring provided in the service kit.

5. Remove the plastic protective cover bag from the upper end of the new hydraulic line. Insert the hydraulic line into the clutch master cylinder outlet port.

6. Insert the new roll pin into the roll pin hole in the clutch master cylinder to retain the hydraulic line. Check to see that this connection is secured by pulling on the line away from the clutch master cylinder outlet port.

7. Bleed system per the following bench bleed procedure.

Bench Bleed Procedure

BENCH BLEED PROCEDURE

1. Remove master cylinder, line and reservoir from vehicle and assemble with replacement parts required based on initial concern.

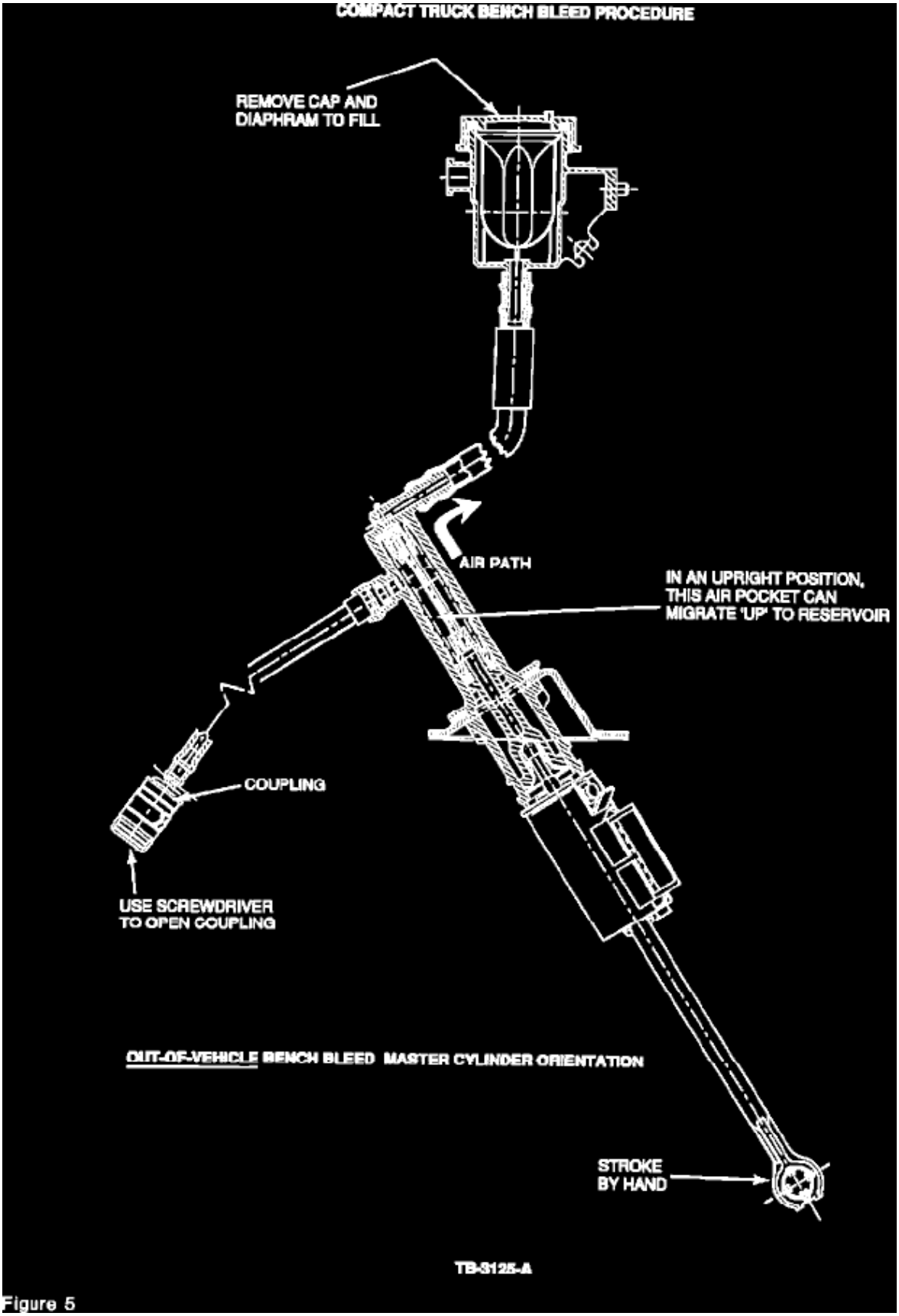


Figure 5

2. Hold the master cylinder vertically with the reservoir feed hose in the highest position on the body, Figure 5.

3. Fill the reservoir and extend above the master cylinder and assure the quick-connect on the clutch line is below the master cylinder. (Lightly clamp reservoir in a vise).

4. Using a small screwdriver, depress the internal mechanism of the male quick-connect coupling to open the valve, Figure 5.

5. Stroke and hold master cylinder pushrod.

6. Close quick-connect valve.

7. Release master cylinder pushrod.

8. Fill reservoir.

9. Repeat Steps 4 through 8 four more times.

10. With the master cylinder still being held with the outlet tube and reservoir feed tube ends high, quick-connect closed and the reservoir full, proceed as follows:

a. Push the pushrod into the body several times quickly to expel any remaining air.

b. If it is a remote reservoir, pinch the supply hose with your fingers two or three times to help move air into reservoir.

11. When the movement of the pushrod is .1601, (4 mm) or less when stroked in Step 10, reinstall the master cylinder into the vehicle and couple it to the slave cylinder per 1993 Ranger Service Manual Procedure, Page 08-02-03.

Final Inspection

1. Confirm that the audible growl is no longer present.

2. Inspect the vehicle for leaks and proper clutch operation.

^ If the hydraulic system leaks, check for a missing O-ring and any loose connections at either end of the hydraulic line.

^ If the clutch pedal feels effortless, actuate the clutch pedal several times at full stroke.

^ If the pedal still feels effortless, then the hydraulic system is probably not fully bled. Therefore, rebleed the hydraulic system.

Hydraulic Hose: Tools and Equipment

Clutch Line Fork

AST tool# 8008

Used for the R and R of the hydraulic clutch line from the internally mounted slave cylinder. This tool is applicable to the following Ford vehicles with manual transmissions: 1989 and later Ford Aerostar, Bronco II, Explorer, F150 and Ranger.

- For R and R of Hydraulic Clutch Lines

- Applicable to Ford Models with Manual Transmissions

- Steel Construction

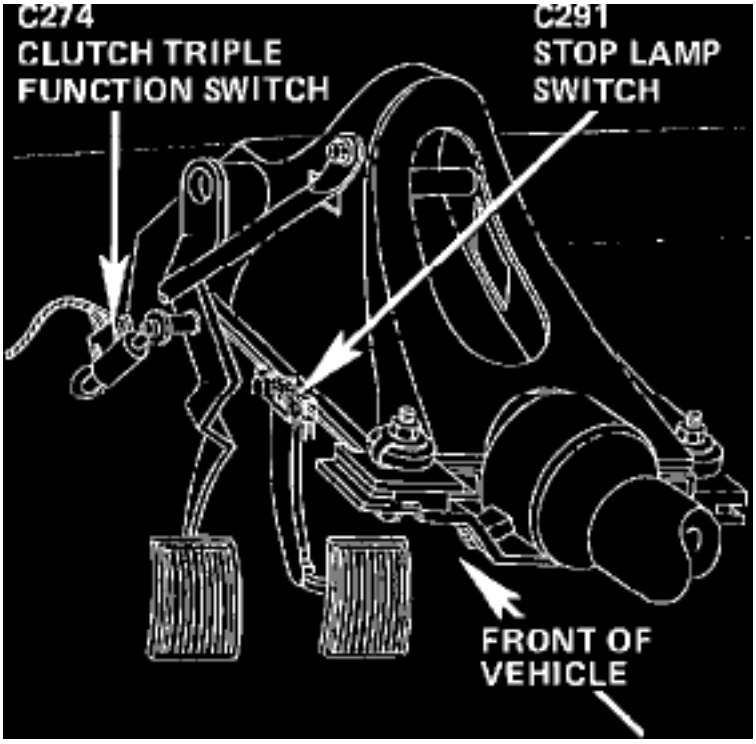
- Black-Oxide Finish

Contact AST for pricing.

Assenmacher Specialty Tools 1-800-525-2943

Clutch Pedal Assembly: Adjustments

These models are equipped with a hydraulic clutch system. No clutch linkage or pedal travel adjustments are required, since these adjustments are automatically taken up by the system.



Brake And Clutch Switches

Clutch Pedal Position Switch: Testing and Inspection

This switch functions magnetically. Do not use magnetized tools near this switch.

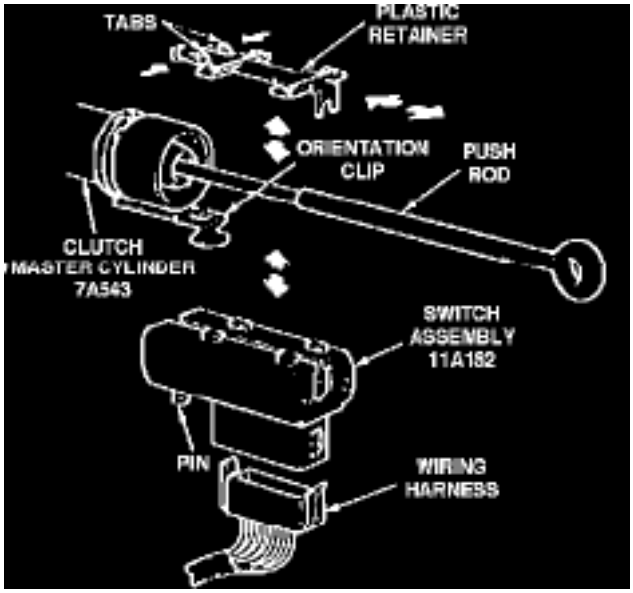
1. If the switch is open when the clutch pedal is released, speed control will not operate. This must be corrected before making any other tests. Use only a multimeter of 5000 ohm/volt rating or higher when performing the clutch switch test.

2. On all except 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, disconnect switch pigtail connector from speed control harness connector and connect an ohmmeter to the two switch connector terminals.

3. On all 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, connect suitable ohmmeter between two middle switch connector terminals.

4. On all models, with clutch pedal in the fully released position, the resistance should be less than 5 ohms. With clutch pedal fully depressed, the circuit should be open.

5. If switch does not function as described, remove and replace switch.



Clutch Pedal Position Switch: Service and Repair

Fig. 8 Clutch Interlock 3-way Switch

REMOVAL

1. Disconnect electrical connector from switch located on clutch master cylinder push rod, Fig. 8.

2. Pull orientation clip away from switch to separate pin, then rotate switch to expose plastic retainer.

3. Push tabs together to allow retainer to slide rearward and separate from switch.

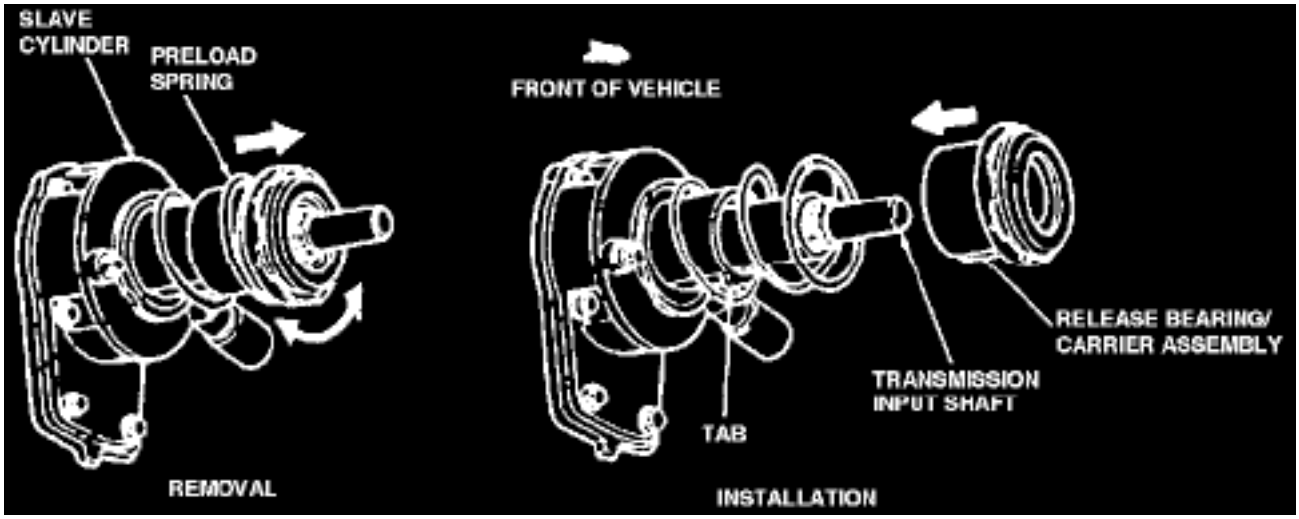
4. Remove switch from push rod.

INSTALLATION

1. Install switch onto master cylinder push rod, ensuring that switch is properly seated.

2. Install plastic retainer, then rotate switch into position and attach orientation clip.

3. Connect electrical connector.



Clutch Release Bearing: Service and Repair

Clutch Slave Cylinder

Removal

1. Remove transmission. 2. TWIST the release bearing and carrier assembly until resistance is felt. Turning the assembly further will allow the preload spring to push the

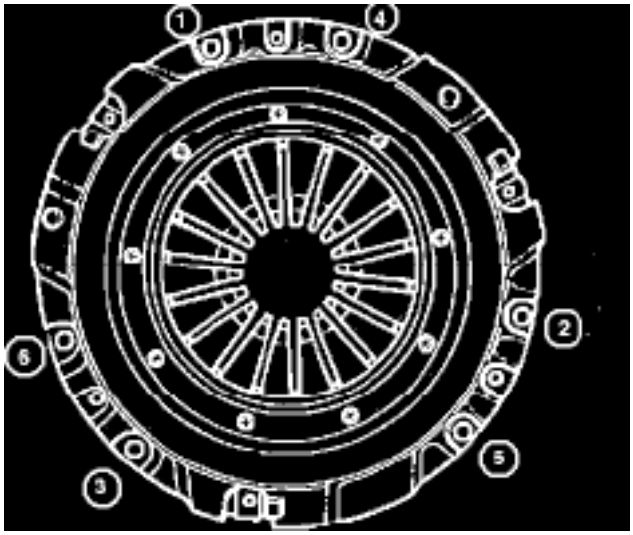
bearing assembly off the slave cylinder.

Installation

NOTE: Prior to installation, lubricate the bore of the bearing and bearing carrier with Premium Long-Life Grease or equivalent.

CAUTION: DO NOT use Petroleum base lubricants.

1. Install the release bearing assembly to the clutch slave cylinder by pushing into place. 2. Install transmission.



Pressure Plate: Service and Repair

1. Disconnect battery ground cable from battery. 2. Disconnect clutch hydraulic system master cylinder push rod from the clutch pedal. 3. Raise and support vehicle, then position safety stands under vehicle. 4. Remove starter motor from engine. 5. Using Coupling Disconnect Tool No. T88T-70522-A or equivalent, disconnect the hydraulic coupling at the transmission. 6. Remove transmission. 7. Mark the assembled position of the pressure plate and the cover to the flywheel (if original components are to be reinstalled). 8. Loosen the pressure plate retaining bolts evenly until the pressure plate diaphragm spring is expanded. 9. Remove bolts, pressure plate and clutch disc from the flywheel.

10. Using Puller tool No. T58L-101-B or equivalent, remove pilot bearing. If required. 11. Coat the pilot bore in the crankshaft with a small amount of Premium Long Life Grease part No. XG-1-C or equivalent. 12. Using Clutch Driver Tool No. T71P-7137-H or equivalent, install the pilot bearing with the seal facing the transmission. 13. Clean the pressure plate and flywheel surfaces with a commercial alcohol base solvent to ensure that surfaces are free from any oil film. 14. Install clutch disc onto flywheel, then insert clutch alignment tool No. T74P-7137-K or equivalent into clutch pilot bearing hole. Ensure clutch

disc is properly aligned on flywheel.

15. If installing original pressure plate and cover assembly, align marks made during removal and position pressure plate and cover assembly onto

flywheel.

16. Install pressure plate attaching bolts, then tighten bolts evenly one or two turns at a time until seated.

Pressure Plate Tightening Sequence

17. Torque retaining bolts to 15-24 ft. lbs in the sequence shown in example. 18. Remove clutch disc alignment tool. 19. Install transmission.

NOTE: Reuse the aluminum washers under the retaining bolts to prevent galvanic corrosion (2.9L/V6-179 engine only).

20. Connect the hydraulic line to the slave cylinder by pushing the male coupling into the female coupling on the slave cylinder. 21. Connect the master cylinder push rod to clutch pedal, then connect battery ground cable.

NOTE: On vehicles equipped with EEC, some abnormal drive conditions may occur while the EEC processor relearns its adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn that strategy.

22. Bleed the clutch system (only if required).

Carrier Bearings: Testing and Inspection Bearing Cups

Check bearing cups for rings, galling or erratic wear patterns. The bearing cups must be solidly seated. Check by attempting to insert .0015 inch feeler gauge between cups and bottoms of bores.

Carrier Bearings: Testing and Inspection Cone & Roller Assemblies

When operated in the cups, the cone and roller assemblies must turn without any roughness. Examine roller ends for wear.

Carrier Bearings: Testing and Inspection Differential Bearing Adjusters

Test fit of bearing adjusters in their threads with bearing caps installed. Ensure that bearing caps are on sides that they were machined to fit. The faces of the adjusters that contact the bearing cups must be smooth and square. Examine threads in carrier if their fit is not proper and replace any adjuster with a damaged face or threads.

Carrier Bearings: Adjustments

1. Remove adjusting nut locks and loosen differential bearing cap bolts, then torque cap bolts to approximately 20 ft. lbs. Left adjusting nut is on ring gear side of carrier and right adjusting nut is on pinion side.

2. Loosen right nut until it is away from cup and tighten left nut until ring gear is just forced into position with zero backlash, then rotate pinion several revolutions to ensure that no binding is evident.

3. Check right nut to ensure that it is still loose, then install dial indicator.

4. Tighten right nut until it just contacts bearing cup, then set dial indicator to zero and apply pressure to bearings by tightening right nut until indicator reads .008-.012 inch.

5. Turn pinion gear several times in each direction to seat bearings in cups and ensure that no binding is evident, then torque bearing caps to specifications.

6. Measure backlash on several teeth around ring gear.

7. If backlash varies by more than .004 inch between any two teeth, loosen one adjusting nut and tighten opposite nut an equal amount to move ring gear away from or toward pinion. Tightening left nut moves ring gear into pinion to decrease backlash while tightening right nut moves ring gear away. When moving adjusting nuts, final movement should always be made in a tightening direction. Assuming left nut had to be loosened one notch, loosen nut two notches, then tighten one notch.

8. Ensure that case spread remains within specifications.

9. Perform teeth pattern check. If backlash is correct and gross pattern error results, recheck pinion shim selection.

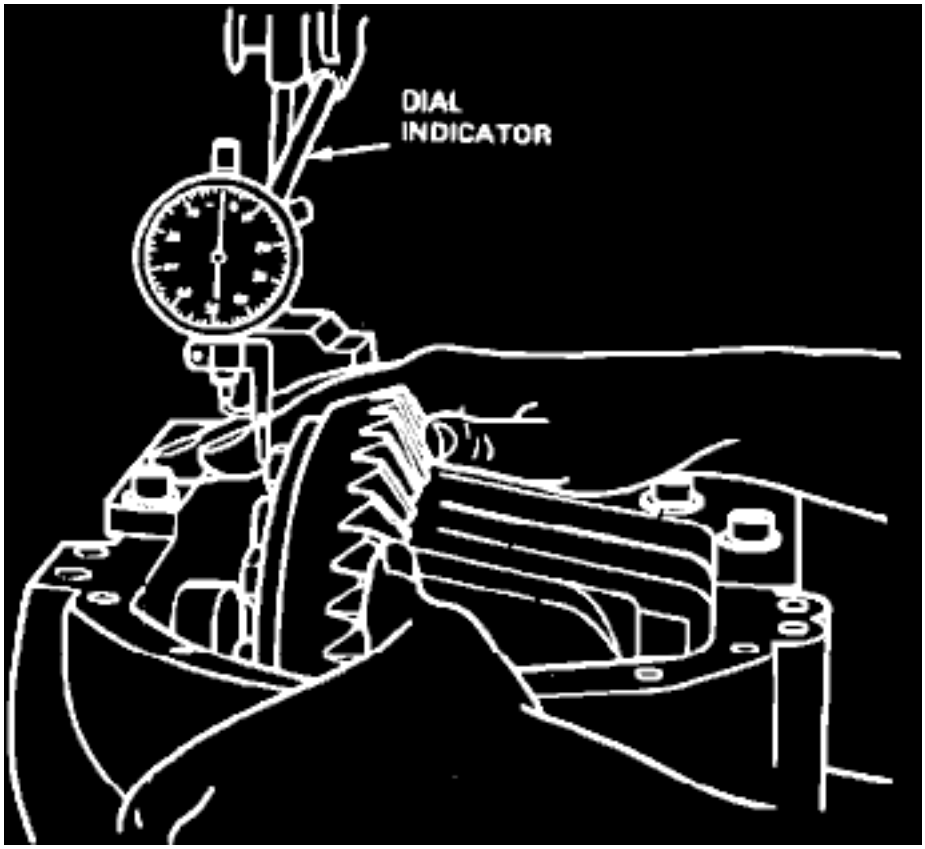
Carrier Side Gears: Testing and Inspection

Examine drive pinion and ring gear teeth for scoring or signs of excessive wear. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring and flaking are the result of excessive shock loading or the use of improper lubricant. Scored gears cannot be reused.

Examine teeth and thrust surfaces of differential gears. Wear on hub of differential side gears may cause a chucking noise known as chuckle, when the vehicle is operated at low speeds. Wear of splines, thrust surfaces or thrust washers may contribute to excessive drive line backlash.

Differential Case: Testing and Inspection

Ensure that hubs where bearings mount are smooth. Check fit of differential gears in the counterbores. Carefully examine thrust washers, which may be damaged when bearings are removed. If differential bearing assemblies do not seat firmly on hubs, failure is certain. Ensure that mating surfaces of the two parts of case and the face of the ring gear attaching flange are smooth and free from nicks and burrs.



Differential Case: Adjustments

Fig. 4 Total Differential Case Endplay Check

1. Attach ring gear to differential case using new bolts, then torque bolts alternately and evenly to specifications.

2. Clean trunnions on differential and install bearings onto differential case. Remove all burrs and nicks from hubs so bearings rotate freely.

3. Place differential case into carrier (without pinion). Differential case should move freely in carrier assembly. Position a suitable dial indicator against differential case flanges. Locate tip of indicator on flat surface of one ring gear bolt, Fig. 4. Force differential case toward dial indicator as far as possible and zero dial indicator with force still applied. Dial indicator should have a minimum of .200 inch travel on models except 35-IFS or .350 inch on model 35-IFS. Force differential case away from dial indicator as far as it will go. Repeat this procedure until same reading is obtained. Record dial indicator reading as measurement ``A'' on a worksheet for calculating ring gear backlash and differential bearing preload shims. This reading indicates amount of shims needed behind differential side bearings to take up total clearance between differential bearing cup and carrier. This reading will be used during ``Pinion & Ring Gear Backlash'' described under ``Carrier Assembly.''

4. Remove differential case from carrier. Do not remove differential case bearings at this time.

Differential Case: Service and Repair Model 28-2, 28-IFS & 35 IFS

Disassembly

1. Place differential case in a suitable vise, then drive out lockpin that retains pinion mate shaft to case.

2. Remove pinion mate shaft using a suitable drift, then rotate pinion mate gears and side gears until pinion mate gears turn to opening of case.

3. Remove pinion mate gears and spherical washers behind gears, then lift out side gears and thrust washers.

4. Inspect all parts and machined surfaces of case. If excessive wear is visible on all parts, it is suggested that complete differential case assembly be replaced. If any one of gears is to be replaced, the gears must be replaced as a set.

Assembly

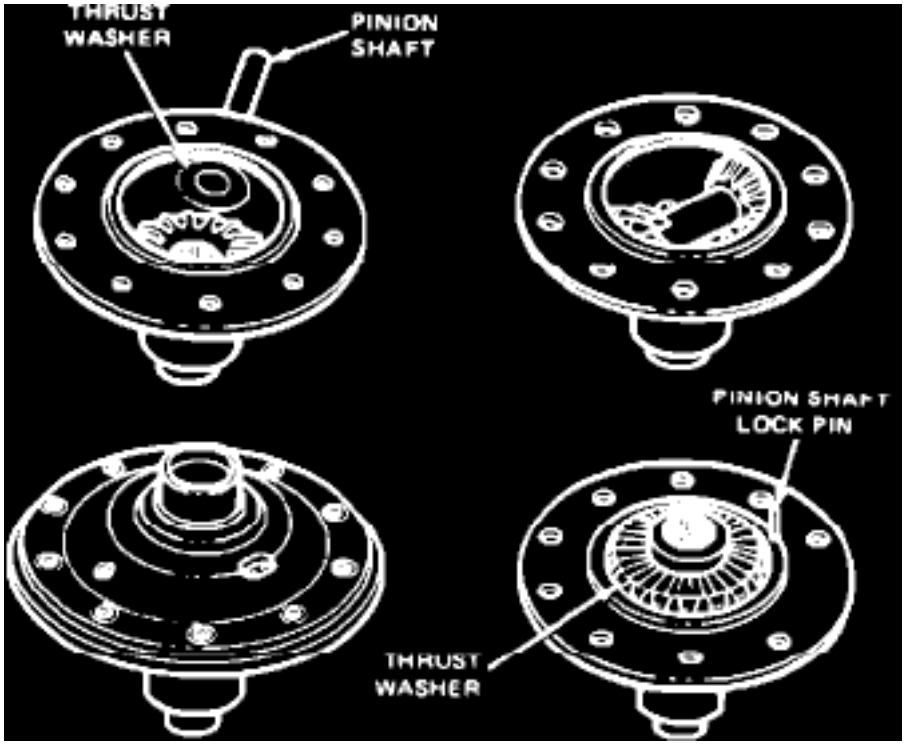
1. Apply a suitable multi-purpose long-life lubricant to side gear thrust washers, hub, thrust face of side gears, pinion mate gears and spherical washers.

2. Hold side gears in place in case, then install pinion mate gears and spherical washers.

3. Rotate side gears and pinion mate gears until holes in washers and pinion mate gears align with holes in case.

4. Insert pinion mate shaft into case, ensuring lockpin hole in shaft aligns with lockpin holes in case.

5. Insert lockpin, then peen some metal of case over pin to lock it into place.



Differential Case: Service and Repair Standard Differential

Fig. 10 Assembling Differential Case

1. Place side gear thrust washer and side gear in differential case bore, Fig. 10. Liberally lubricate all differential components with suitable lubricant during assembly.

2. Using soft faced hammer, drive differential pinion shaft into case only far enough to retain pinion thrust washer and pinion gear.

3. Place second differential pinion and thrust washer in position and drive pinion shaft into place, carefully aligning pinion shaft lockpin holes.

4. Place second side gear and thrust washer in position and install pinion shaft lockpin and the cover on differential case then insert axle shaft spline in side gear spline to check for free rotation of differential gears.

5. Using suitable solvent, clean tapped holes in ring gear.

6. Insert two 7/16 N.F. bolts two inches long through differential case flange and thread them three or four turns into ring gear as a guide for aligning ring gear bolts, then press or tap ring gear into position. If new bolts show a green or yellow coating of at least 1/2 inch on threaded area, use as is. If bolts are not coated, apply small amount of suitable sealant to threads. Torque bolts to specifications. Never install used bolts.

7. If differential bearings were removed, press them on using Bearing Cone Installation tool No. T57L-4221-A2 or equivalent.

8. Wipe thin coating of suitable lubricant on carrier differential bearing bores, then place cups on bearings and set differential case assembly in carrier.

9. Assemble differential case and ring gear assembly in carrier so that marked tooth on drive pinion indexes between marked teeth on ring gear.

10. Slide assembly along bores until a slight amount of backlash is felt between gear teeth.

11. Set adjusting nuts in bores so that they just contact bearing cups, engaging nuts approximately the same number of threads on both sides.

12. Carefully position differential bearing caps on carrier, matching alignment marks.

13. Ensure that adjuster nuts are properly threaded in cap and carrier and that they turn freely, then install bearing caps and alternately torque them to specifications.

14. If adjusting nuts do not turn freely as cap bolts are tightened, remove differential bearing caps and inspect for damaged threads or incorrectly positioned caps.

15. Adjust backlash and differential bearing preload.

Feeler Gauge Reading (Inches) (1)	Remove Shim(s) From Normal	Total Req'd Shim Pack Thickness (Inches) (2)	Feeler Gauge Reading (Inches) (1)	Remove Shim(s) From Nominal	Total Req'd Shim Pack Thickness (Inches) (2)
0.001-0.002	None	0.050	0.028-0.032	0.030	0.020
0.003-0.007	0.005	0.0045	0.033-0.037	0.035	0.015
0.008-0.012	0.010-	0.040	0.038-0.042	0.040	0.010
0.013-0.017	0.015	0.035	0.043-0.047	0.045	0.005
0.018-0.022	0.020	0.030	0.048-0.050	0.050	0.000
0.023-0.027	0.025	0.025			

(1) With clutch hub, shims and clutch plates compressed 10-15 ft. lb.
(2) Service shims are available in 0.010 inch and 0.005 inch thicknesses.

Differential Case: Service and Repair Traction-LOC Differential

When new clutch plates are used, soak plates in suitable hypoid lubricant for approximately 30 minutes before installation. Lubricate all parts with suitable hypoid lubricant during assembly.

1. Mount differential case in suitable vise and place side gear thrust washer and side gear in counterbore of case.

2. Install differential pinion thrust washers and place pinion gears on side gear, aligning holes in washers and gears with holes in case.

3. Install center block so that shaft holes are aligned with holes in pinion gears and case.

4. Using brass drift, drive in long differential pinion shaft from outside of case, aligning lockpin holes in shaft with lockpin holes in case.

5. Position center block so that long shaft is driven through rough side and short shaft is driven through machined side.

6. Using suitable drift, install shaft lockpins, ensuring that differential pinion and side gears move freely.

7. Place four preload pins in holes provided in center block.

8. Position preload plate over four springs, ensuring that springs are properly seated. The preload plate straddles the center block over its narrower machined width.

9. Mount differential cover in suitable vise.

10. Insert shims .050 inch total thickness, in cover cavity.

11. Install composite plate on back side of clutch hub with friction material against hub, then install, in order, a friction plate, steel plate, friction plate, steel plate, friction plate and steel plate.

12. Place clutch hub with clutch plates into clutch gear cavities in differential cover, ensuring that splines on last friction plate are engaged on hub.

13. Obtain locally a 5/8 inch by 2 1/2 inch or 9/16 inch by 2 1/2 inch bolt, nut, and two 1 1/2 inch O.D. flat washers approximately 1/8 inch in thickness. Install flat washer on bolt and place bolt through clutch hub. Hold bolt in place and turn cover over. Plate flat washer and bolt and install nut, torquing nut to 10-15 ft. lbs. while ensuring that washers remain centered.

SFig. 11 Shim Pack Thickness Chart

14. Place shim template tool in clutch hub. Some clearance should be observed between shim tool and cover to case mating surface. Determine exact amount of clearance using feeler gauge. The shim pack thickness chart, Fig. 11, will indicate correct amount of shims to subtract from .050 inch shims originally installed.

15. Remove bolt, nut and flat washers. Remove clutch hub and clutch plates as necessary to alter shim thickness.

16. Install selected shims in cover cavity, then reinstall components as described in steps 11 and 12.

17. Install four steel clutch ear guides and side gears.

18. Place both assemblies in press and press two halves together, then install two Allen head or Phillips head screws and tighten evenly until tight.

19. Install ring gear and ring gear bolts and washers. Torque bolts evenly and alternately across diameter of ring gear to specifications.

20. Using currently released locker tools, check torque required to rotate one side gear while other is held stationary. The initial breakaway torque may exceed 250 ft. lbs. The rotating torque required to keep the side gear turning with new clutch plates is 100-250 ft. lbs. With reused clutch plates, the minimum torque required is 40 ft. lbs. (Torque may fluctuate 10-40 ft. lbs.)

Differential Clutch: Customer Interest Differential - Chatter On Turns

Article No. 96-12-9

06/03/96

^ NOISE - "CHATTER" DURING TIGHT TURNS OR TURNS AFTER AN EXTENDED PERIOD OF HIGHWAY DRIVING - TRACTION-LOK DIFFERENTIAL - 7.5 AND 8.8 INCH RING GEAR REAR AXLES

^ AXLE - NEW SERVICE KIT AVAILABLE FOR TRACTION-LOK DIFFERENTIAL - 7.5 AND 8.8 INCH RING GEAR

^ AXLE - TRACTION-LOK DIFFERENTIAL - 7.5 AND 8.8 INCH RING GEAR - "CHATTER" NOISE DURING TIGHT TURNS OR TURNS AFTER AN EXTENDED PERIOD OF HIGHWAY DRIVING

FORD: 1989-96 CROWN VICTORIA, MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1989-96 COUGAR, GRAND MARQUIS, TOWN CAR

LIGHT TRUCK: 1989-96 AEROSTAR, BRONCO, E-150, RANGER 1989-97 F-150 1991-96 EXPLORER

ISSUE: A "chatter" noise can be felt and/or heard during tight turns or turns after an extended period of highway driving. This is due to insufficient specified friction modifier, or over-shimming of the clutch packs within Traction-Lok differentials.

ACTION: Install revised Clutch Pack Replacement Kit (F5ZZ-4947-BA for 7.5" ring gear and F5AZ-4947-BA for 8.8" ring gear), with improved friction material, in the differential after confirming the "chatter" concern with a road test of the vehicle. Refer to the Instruction Sheet within the kit for details.

NOTE:

THE CLUTCH PACK REPLACEMENT KIT INCLUDES SELECTED SHIMS. IT WILL NOT REQUIRE THE ORDERING OF INDIVIDUAL SHIMS BASED UPON TEARDOWN MEASUREMENTS.

REAR AXLE ASSEMBLY IDENTIFICATION

See metal Service Identification tag for rear axle ring gear size and differential type. The identification tag is attached to the rear axle cover by means of a cover bolt.

The Clutch Pack Replacement kit (F5ZZ-4947-BA) for the 7.5" ring gear traction-lok rear axle contains the following:

^ Two (2) Clutch Packs

^ One (1) Pinion Shaft Lockbolt

^ One (1) 4 oz. bottle of Friction Modifier

^ Two (2) Shims - 0.025" thick

^ Two (2) Shims - 0.030" thick

^ Two (2) Shims - 0.035" thick

^ Two (2) Shims - 0.040" thick

^ Two (2) Shims - 0.045" thick

^ One (1) Instruction Sheet (I.S. # 7145)

The Clutch Pack Replacement Kit (F5AZ-4947-BA) for the 8.8" ring gear traction-lok rear axle contains the following:

^ Two (2) Clutch Packs

PART NUMBER	PART NAME
F5ZZ-4947-BA	Clutch Pack Replacement Kit - 7.5" Ring Gear Traction Lok Differential
F5AZ-4947-BA	Clutch Pack Replacement Kit - 8.8" Ring Gear Traction-Lok Differential
EOAZ-19554-AA	242 Loctite Threadlocker
F1TZ-19580-B	High Performance Rear Axle Lubricant (For 8.8" Ring Gear Traction-Lok Differential - 1996 Explorer With 5.0L And 1993-94 Light Trucks With 4.10:1 Ratio)

^ One (1) Pinion Shaft Lockbolt

^ One (1) 4 oz. bottle of Friction Modifier

^ Two (2) Shims - 0.025" thick

^ Two (2) Shims - 0.030" thick

^ Two (2) Shims - 0.035" thick

^ Two (2) Shims - 0.040" thick

^ Two (2) Shims - 0.045" thick

^ One (1) Instruction Sheet (I.S. # 7146)

Parts Block

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-96 Vehicles And Basic Warranty Coverage For All Other Vehicles

OPERATION DESCRIPTION TIME

961209A Replace Traction-Lok 1.4 Hrs.

Differential Clutch Packs - Crown Victoria/Grand Marquis, Mustang, Town Car, E/F-150, Bronco, Aerostar, Explorer, Ranger

961209B Replace Traction-Lok 2.9 Hrs.

Differential Clutch Packs - Thunderbird/Cougar

DEALER CODING

CONDITION

BASIC PART NO. CODE

4001 56

OASIS CODES: 509000, 597997, 702200, 702300

Differential Clutch: All Technical Service Bulletins Differential - Chatter On Turns

Article No. 96-12-9

06/03/96

^ NOISE - "CHATTER" DURING TIGHT TURNS OR TURNS AFTER AN EXTENDED PERIOD OF HIGHWAY DRIVING - TRACTION-LOK DIFFERENTIAL - 7.5 AND 8.8 INCH RING GEAR REAR AXLES

^ AXLE - NEW SERVICE KIT AVAILABLE FOR TRACTION-LOK DIFFERENTIAL - 7.5 AND 8.8 INCH RING GEAR

^ AXLE - TRACTION-LOK DIFFERENTIAL - 7.5 AND 8.8 INCH RING GEAR - "CHATTER" NOISE DURING TIGHT TURNS OR TURNS AFTER AN EXTENDED PERIOD OF HIGHWAY DRIVING

FORD: 1989-96 CROWN VICTORIA, MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1989-96 COUGAR, GRAND MARQUIS, TOWN CAR

LIGHT TRUCK: 1989-96 AEROSTAR, BRONCO, E-150, RANGER 1989-97 F-150 1991-96 EXPLORER

ISSUE: A "chatter" noise can be felt and/or heard during tight turns or turns after an extended period of highway driving. This is due to insufficient specified friction modifier, or over-shimming of the clutch packs within Traction-Lok differentials.

ACTION: Install revised Clutch Pack Replacement Kit (F5ZZ-4947-BA for 7.5" ring gear and F5AZ-4947-BA for 8.8" ring gear), with improved friction material, in the differential after confirming the "chatter" concern with a road test of the vehicle. Refer to the Instruction Sheet within the kit for details.

NOTE:

THE CLUTCH PACK REPLACEMENT KIT INCLUDES SELECTED SHIMS. IT WILL NOT REQUIRE THE ORDERING OF INDIVIDUAL SHIMS BASED UPON TEARDOWN MEASUREMENTS.

REAR AXLE ASSEMBLY IDENTIFICATION

See metal Service Identification tag for rear axle ring gear size and differential type. The identification tag is attached to the rear axle cover by means of a cover bolt.

The Clutch Pack Replacement kit (F5ZZ-4947-BA) for the 7.5" ring gear traction-lok rear axle contains the following:

^ Two (2) Clutch Packs

^ One (1) Pinion Shaft Lockbolt

^ One (1) 4 oz. bottle of Friction Modifier

^ Two (2) Shims - 0.025" thick

^ Two (2) Shims - 0.030" thick

^ Two (2) Shims - 0.035" thick

^ Two (2) Shims - 0.040" thick

^ Two (2) Shims - 0.045" thick

^ One (1) Instruction Sheet (I.S. # 7145)

The Clutch Pack Replacement Kit (F5AZ-4947-BA) for the 8.8" ring gear traction-lok rear axle contains the following:

^ Two (2) Clutch Packs

PART NUMBER	PART NAME
F5ZZ-4947-BA	Clutch Pack Replacement Kit - 7.5" Ring Gear Traction Lok Differential
F5AZ-4947-BA	Clutch Pack Replacement Kit - 8.8" Ring Gear Traction-Lok Differential
EOAZ-19554-AA	242 Loctite Threadlocker
F1TZ-19580-B	High Performance Rear Axle Lubricant (For 8.8" Ring Gear Traction-Lok Differential - 1996 Explorer With 5.0L And 1993-94 Light Trucks With 4.10:1 Ratio)

^ One (1) Pinion Shaft Lockbolt

^ One (1) 4 oz. bottle of Friction Modifier

^ Two (2) Shims - 0.025" thick

^ Two (2) Shims - 0.030" thick

^ Two (2) Shims - 0.035" thick

^ Two (2) Shims - 0.040" thick

^ Two (2) Shims - 0.045" thick

^ One (1) Instruction Sheet (I.S. # 7146)

Parts Block

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-96 Vehicles And Basic Warranty Coverage For All Other Vehicles

OPERATION DESCRIPTION TIME

961209A Replace Traction-Lok 1.4 Hrs.

Differential Clutch Packs - Crown Victoria/Grand Marquis, Mustang, Town Car, E/F-150, Bronco, Aerostar, Explorer, Ranger

961209B Replace Traction-Lok 2.9 Hrs.

Differential Clutch Packs - Thunderbird/Cougar

DEALER CODING

CONDITION

BASIC PART NO. CODE

4001 56

OASIS CODES: 509000, 597997, 702200, 702300

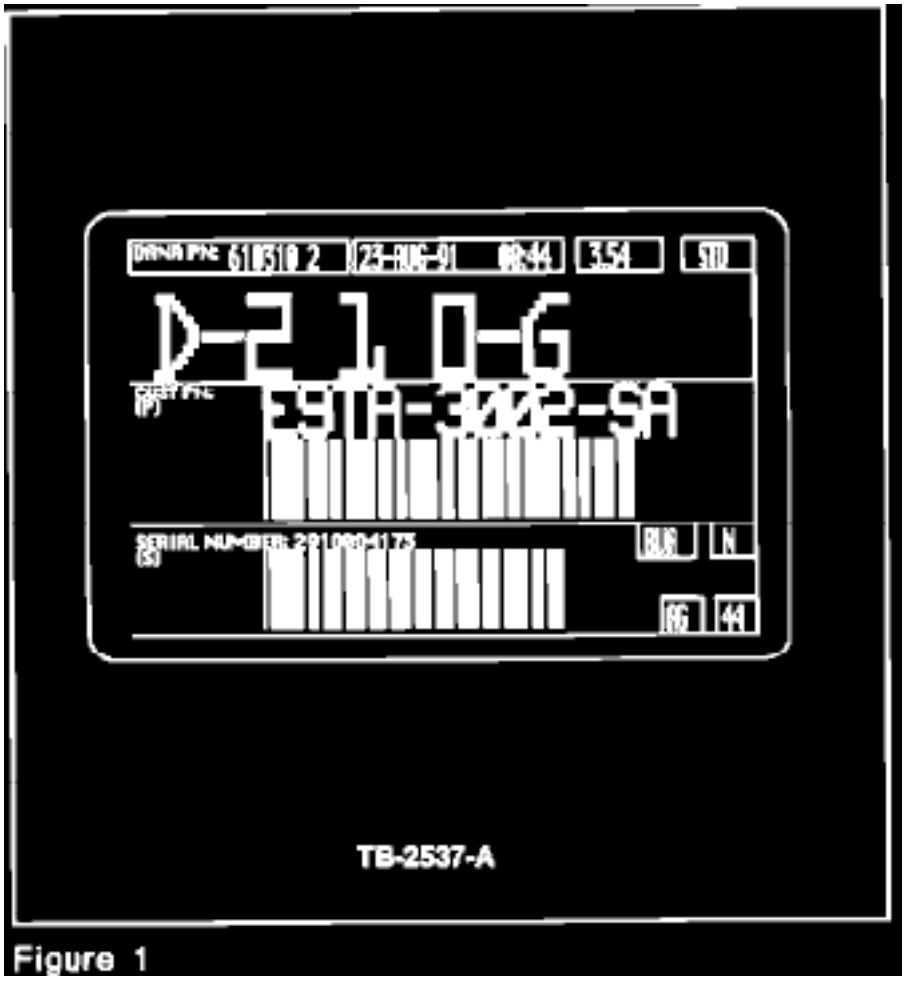


Figure 1

Differential Axle Housing: Technical Service Bulletins Front Drive Axle - Identification Tags

Article No. 92-5-14

February 26, 1992

AXLE - FRONT DRIVE AXLE IDENTIFICATION TAGS - 4X4 MODELS

LIGHT TRUCK: 1985-90 BRONCO II 1985-92 BRONCO, F-150-350 SERIES, RANGER 1991-92 EXPLORER

ISSUE: The 1991 and prior model front drive axles had identification information in the following three (3) places...

^ It was on a metal tag attached to a carrier cover mounting bolt.

^ It was stamped into the left side axle arm (tube) front face inboard of the U-Joint.

^ It was on a paper tape tag wrapped around the axle arm (tube).

The 1992 model year axles use a glue-on label that replaces all three of the prior identification markings, Figure 1. The new label is on the rear face of the right hand arm (tube).

ACTION: Since this glue-on label, Figure 1, is the only identification, be sure that the information on the label is recorded in a retrievable place before any service actions are taken which will damage/destroy or remove the label.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

509000

Differential Axle Housing: Service and Repair

1. Raise vehicle and support at rear frame members.
2. Remove rear wheels and brake drums.
3. Drain rear axle lubricant by removing housing cover.
4. Remove axle shafts.
5. Remove 4 retaining nuts from each backing plate and wire the plates aside.
6. Disconnect rear axle housing vent.
7. Disconnect brake line from retaining clips on axle housing.
8. Remove hydraulic brake T-fitting from axle housing.
9. Mark driveshaft and axle flange for assembly reference, then disconnect shaft from flange.
10. Support axle with a suitable jack, then remove U-bolt nuts, U-bolts and plates.
11. Disconnect lower shock absorber studs from axle housing mounting brackets.
12. Lower axle housing and remove from vehicle.
13. Reverse procedure to install.

1992-93 F150, F250, front GLS - Gear Lubricant, Special

1990-93 Bronco II, Explorer, GLS - Gear Lubricant, Special

Ranger,front*

8.8" & 10 1/4" has removable cover, 9.0"

does not

All others: Standard 90 HP

Limited-Slip 90 HP*

CAPACITY, Refill: Front: Dana 28 Ranger, Bronco II 1.0 pt (US)

LIMITED-SLIP OR TRACTION-LOK

IDENTIFICATION: Label on door lock pillar

has letter and number

Dana 28-2 Aerostar 2.2 pt (US)

Dana 35 Ranger, Bronco II 3.5 pt (US)

Dana 44 3.6 pt (US)

Dana 50 3.8 pt (US)

Dana 60 5.8 pt (US)

Rear: Aerostar w/Ford 7.5" ring gear 3.5 pt (US)

Fill no higher than 3/8" below fill plug

Aerostar w/Ford 8.8" ring gear 5.3 pt (US)

Aerostar w/Dana 2.5 pt (US)

Bronco II 5.5 pt (US)

Ranger w/7.5" ring gear 5.0 pt (US)

Ranger w/8.8" ring gear 5.5 pt (US)

Other Ford w/8.8' ring gear* 5.5 pt (US)

8.8" & 10 1/4" has removable cover, 9.0"

does not

w/10 1/4" ring gear* 6.5 pt (US)

8.8" & 10 1/4" has removable cover, 9.0"

does not

Dana 60 & 61 ex. 60-IU 6.3 pt (US)

Dana 60-IU 1990 6.3 pt (US)

Dana 70 ex. HD 6.5 pt (US)

70 HD 7.4 pt (US)

Dana 80 8.3 pt (US)

Fluid - Differential: Fluid Type Specifications

BL Self-adjusting Brake Lubricant

EC Ethylene Glycol Coolant

Mix 50/50 with water or at least to -20°F (-29°C) protection

EP Extreme Pressure Gear Lubricant

Ford Part No. D8DZ-19C547-A

FA Automatic Transmission Fluid, Type F

HBH Hydraulic Brake Fluid, Extra

Heavy-Duty

HP Hypoid Gear Oil

Ford Part No. E0AZ-19580-A

HP* Hypoid Gear Oil for Limited-Slip

or Traction-Lok Differential

LM Lithium Grease, with Polyethylene

LS Steering Gear Lubricant

MA MERCON Automatic Transmission

Fluid

MH Manifold Heat Valve Solvent

SG Motor Oil, API Service SG

Pinion Bearing: Testing and Inspection Bearing Cups

Check bearing cups for rings, galling or erratic wear patterns. The bearing cups must be solidly seated. Check by attempting to insert .0015 inch feeler gauge between cups and bottoms of bores.

Pinion Bearing: Testing and Inspection Cone & Roller Assemblies

When operated in the cups, the cone and roller assemblies must turn without any roughness. Examine roller ends for wear.

Pinion Bearing: Adjustments

1. Install pinion into carrier, then a new collapsible spacer.

2. Install outer pinion bearing and thrust washer or oil slinger.

3. Coat drive pinion oil seal with suitable hypoid gear lubricant or equivalent, then install drive pinion oil seal using suitable oil seal replacer. After installation, ensure garter spring did not pop out. If garter spring pops out, remove and replace seal.

4. On model 28-IFS, install yoke using Companion Flange Replacer tool No. T83T-4851-A or equivalent, then install washer and nut. Torque nut to 175 ft. lbs.

5. Place an inch pound torque wrench on pinion nut and check pinion rotational torque. Rotational torque should be 15-35 inch lbs.

6. If reading is less than 15 inch lbs., tighten pinion nut in small increments until rotational torque specification is obtained. Do not torque nut to more than 225 ft. lbs, or collapsible spacer will be compressed too far.

7. If reading is greater than 35 inch lbs., collapsible spacer has been compressed too far and must be removed and replaced with a new spacer.

8. On model 28-2, install companion flange using Companion Flange Replacer tool No. T83T-4851-A or equivalent, then install washer and nut and torque to 140 ft. lbs.

9. Place an inch-pound torque wrench on pinion nut and check pinion rotational torque. Rotational torque should be 15-35 inch lbs.

10. If reading is less than 15 inch lbs., tighten pinion nut in small increments until rotational torque specification is obtained. Do not torque nut to more than 275 ft. lbs, or collapsible spacer will be compressed too far.

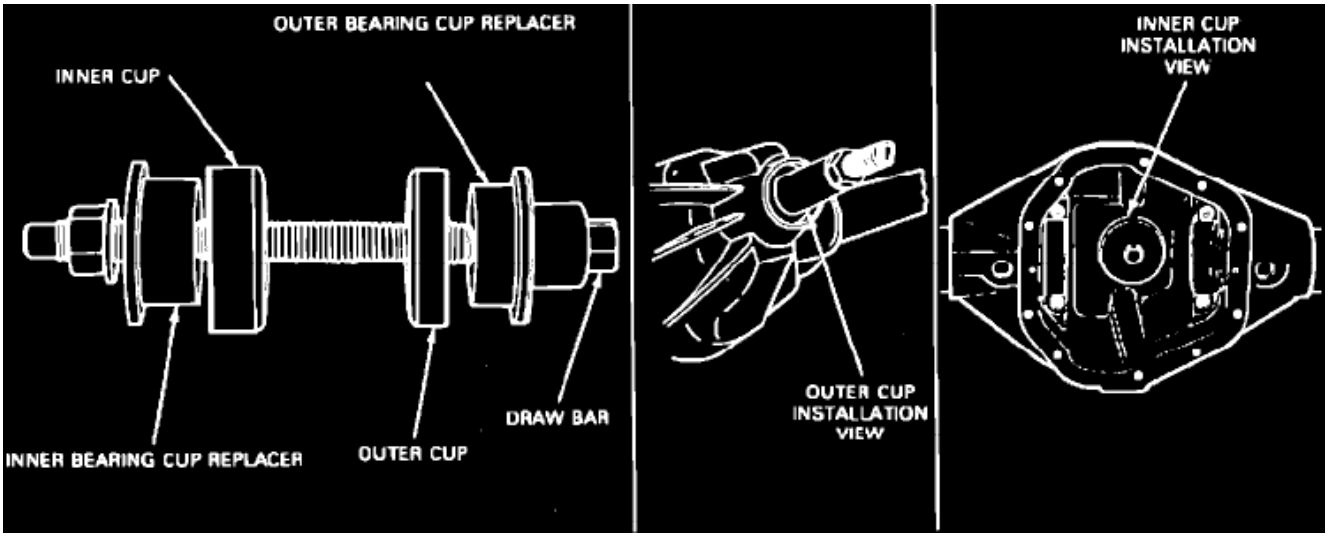
11. If reading is greater than 35 inch lbs., collapsible spacer has been compressed too far and must be removed and replaced with a new spacer.

12. On model 35-IFS, install yoke using Companion Flange Replacer tool No. T85T-4851-AH or equivalent, then install washer and nut and torque to 200 ft. lbs.

13. Place an inch-pound torque wrench on pinion nut and check pinion rotational torque. Rotational torque should be 15-25 inch lbs.

14. If reading is less than 15 inch lbs., tighten pinion nut in small increments until rotational torque specification is obtained. Do not torque nut to more than 350 ft. lbs, or collapsible spacer will be compressed too far.

15. If reading is greater than 25 inch lbs., collapsible spacer has been compressed too far and must be removed and replaced with a new spacer.



Pinion Bearing: Service and Repair Pinion Bearing Cup Installation

Fig. 11 Inner And Outer Pinion Cup Installation Tools

1. Place inner and outer pinion bearing cups into carrier bore.

2. Place suitable inner and outer bearing cup replacer tools on their respective cups, Fig. 11.

3. Install a suitable threaded draw bar into replacer tools and tighten drawbar to install cups in their bores.

Pinion Bearing: Service and Repair Pinion Bearing Cups

Do not remove drive pinion bearing cups from the retainer unless cups are worn or damaged.

1. Using suitable puller, remove bearing cups.

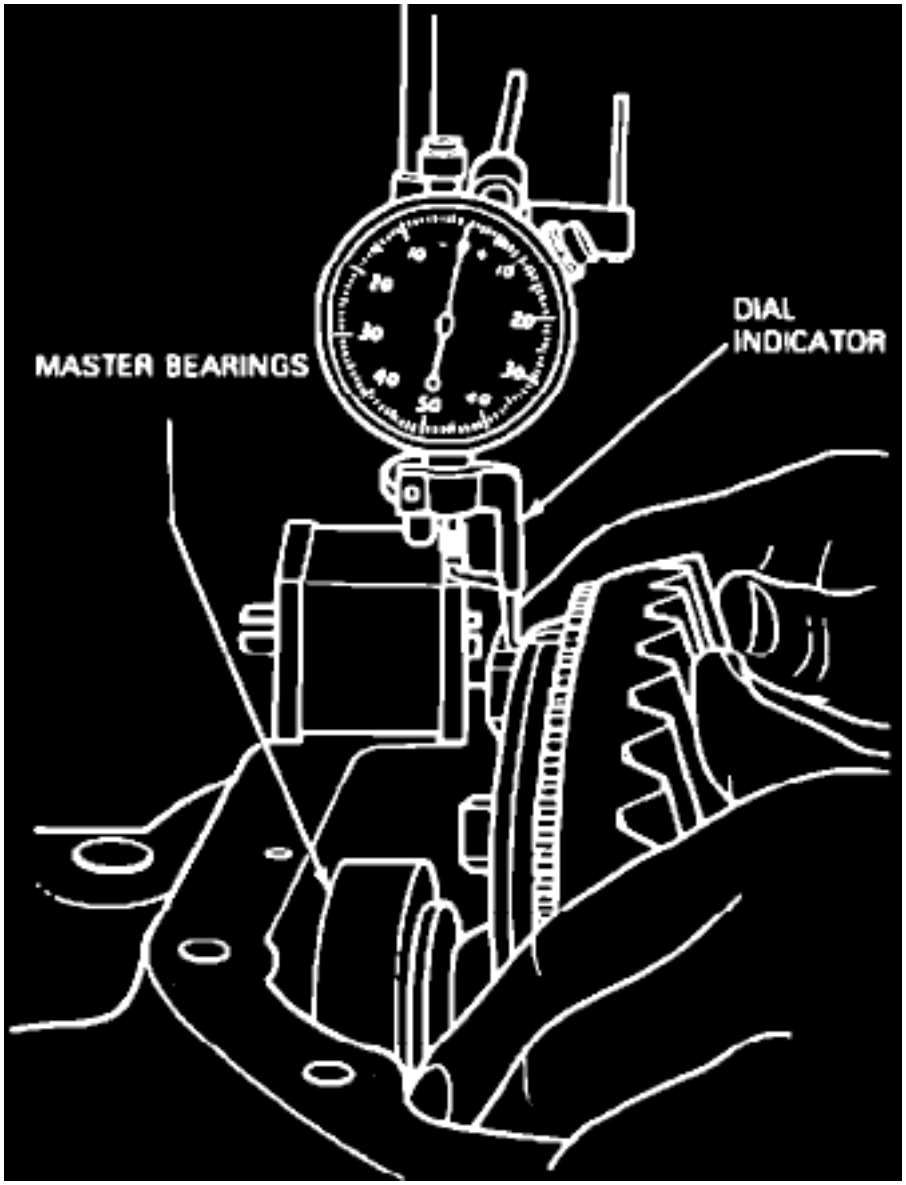
2. Using Bearing Cup Installation tool No. T71P-4616-A or equivalent, install new bearing cups.

3. Check seating of cups by attempting to insert a .0015 inch feeler gauge between cup and bottom of bore. Cone and roller assemblies should be replaced whenever cups are replaced.

Pinion Gear: Testing and Inspection

Examine drive pinion and ring gear teeth for scoring or signs of excessive wear. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring and flaking are the result of excessive shock loading or the use of improper lubricant. Scored gears cannot be reused.

Examine teeth and thrust surfaces of differential gears. Wear on hub of differential side gears may cause a chucking noise known as chuckle, when the vehicle is operated at low speeds. Wear of splines, thrust surfaces or thrust washers may contribute to excessive drive line backlash.



Pinion Gear: Adjustments Backlash

Fig. 7 Total Differential Case Endplay Check

1. Place differential case into position in carrier (differential case bearings should still be installed).

2. Force differential case away from drive pinion gear, until it is completely seated against cross bore face of carrier. Position a dial indicator so indicator tip rests on a ring gear bolt head, Fig. 7. Zero dial indicator.

3. Force ring gear against pinion gear. Rock ring gear slightly to ensure gear teeth are in contact, then force ring gear away from pinion gear, ensuring dial indicator returns to zero. Repeat this procedure until dial indicator reading is the same. This reading should be recorded as measurement ``B'' and reveals amount of shims necessary between differential case and differential bearing on ring gear side.

4. Assemble shim pack for ring gear side to measurement ``B.''

5. Subtract measurement ``B'' from measurement ``A'' obtained in step 3 under ``Total Differential Case Endplay'' as previously described to obtain measurement ``C.'' Measurement ``C'' equals amount of shims required between differential case and bearing on side opposite of ring gear.

6. Assemble shim pack for side opposite of ring gear to measurement ``C'' plus (+) .015 inch.

7. Remove differential case from carrier, then the bearings from case.

8. Place required amount of shims on hub of ring gear side of differential case, then install bearing and drive bearing onto hub using a suitable differential side bearing replacer.

9. Place required amount of shims on hub of differential case opposite of ring gear side, then install bearing. Place a suitable step plate on ring gear side bearing to protect bearing, then drive bearing opposite of ring gear side onto hub using differential side bearing replacer.

10. Install differential bearing cups onto bearings.

11. Mount Spreader tool No. TOOL-4000-E and Spreader Adapter tool No. T80T-4000-B or their equivalents onto carrier assembly.

12. Position a dial indicator onto carrier, then spread housing. Do not spread housing more than .015 inch.

13. Install differential case into carrier. If necessary, use a rawhide or plastic hammer to seat case in carrier bore. With partial and non-hunting/partial ring gear and pinion sets, align marks on ring gear and drive pinion, if applicable. Use care not to nick teeth of ring gear or pinion.

14. Remove spreader and dial indicator.

15. Install bearing caps and bolts, ensuring letters or numbers stamped on caps correspond in both position and direction with letters or numbers stamped into carrier, then torque bolts to specifications.

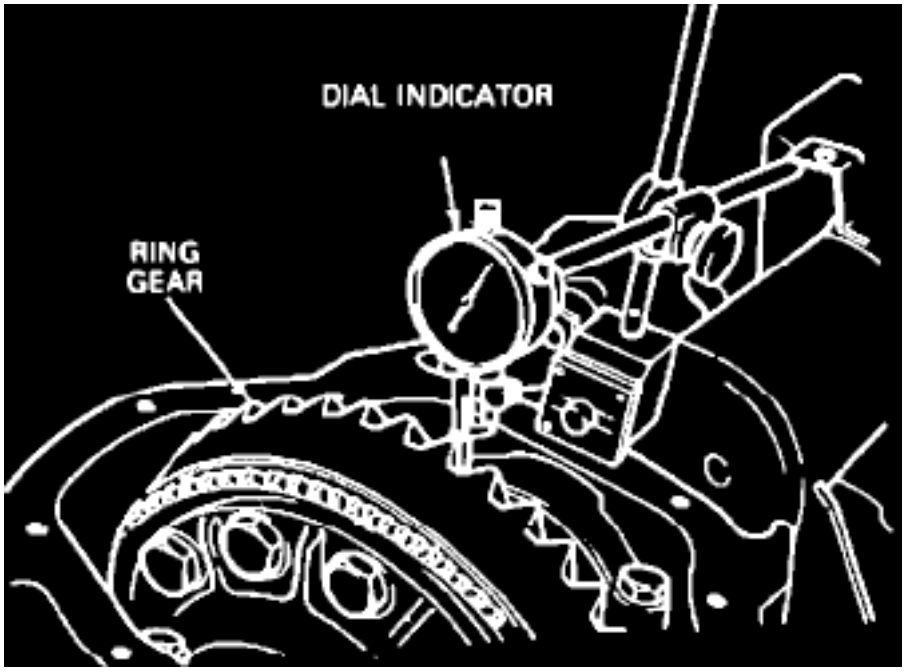


Fig. 16 Ring And Pinion Backlash Check

16. Install dial indicator on case, Fig. 16.

17. Check ring gear and pinion backlash at three equally spaced points on ring gear. Back lash tolerance is .005-.009 inch and cannot vary more than .003 inch between the three points.

18. If backlash is high, ring gear must be moved closer to pinion by moving shims to ring gear side from opposite side.

19. If backlash is low, ring gear must be moved away from pinion by moving shims from ring gear side to opposite side.

20. Install new cover gasket and cover plate, then the mounting bolts and torque to specifications.

Pinion Gear: Adjustments Backlash & Differential Bearing Preload Adjustment

1. Remove adjusting nut locks and loosen differential bearing cap bolts, then torque cap bolts to approximately 20 ft. lbs. Left adjusting nut is on ring gear side of carrier and right adjusting nut is on pinion side.

2. Loosen right nut until it is away from cup and tighten left nut until ring gear is just forced into position with zero backlash, then rotate pinion several revolutions to ensure that no binding is evident.

3. Check right nut to ensure that it is still loose, then install dial indicator.

4. Tighten right nut until it just contacts bearing cup, then set dial indicator to zero and apply pressure to bearings by tightening right nut until indicator reads .008-.012 inch.

5. Turn pinion gear several times in each direction to seat bearings in cups and ensure that no binding is evident, then torque bearing caps to specifications.

6. Measure backlash on several teeth around ring gear.

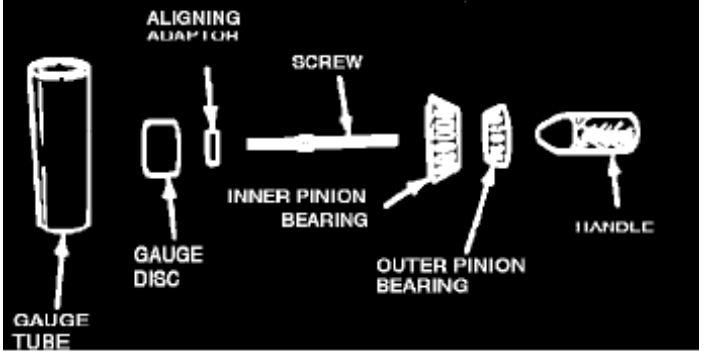
7. If backlash varies by more than .004 inch between any two teeth, loosen one adjusting nut and tighten opposite nut an equal amount to move ring gear away from or toward pinion. Tightening left nut moves ring gear into pinion to decrease backlash while tightening right nut moves ring gear away. When moving adjusting nuts, final movement should always be made in a tightening direction. Assuming left nut had to be loosened one notch, loosen nut two notches, then tighten one notch.

8. Ensure that case spread remains within specifications.

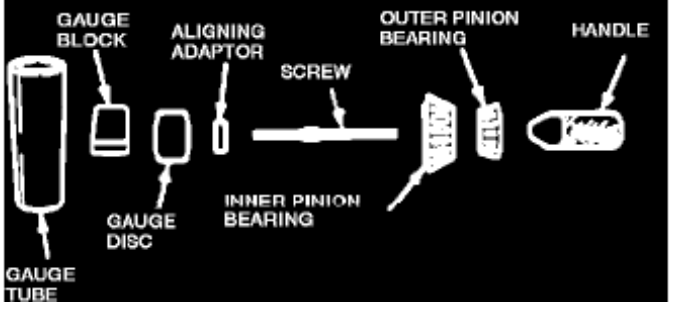
9. Perform teeth pattern check. If backlash is correct and gross pattern error results, recheck pinion shim selection.

TOOL	NUMBER
GAUGE TUBE	T76P-4020-A7
GAUGE BLOCK	T76P-4020- A10
GAUGE DISC	T83T-4020-F57
ALIGNING ADAPTER	T76P-4020-A1
SCREW	T76P-4020-A9
HANDLE	T76P-4020-A11
FINAL CHECK GAUGE BLOCK	T83T-4020-F58

TOOL	NUMBER
GAUGE TUBE	T76P-4020-A7
GAUGE DISC BLOCK	T90T-4020-A
ALIGNING ADAPTOR	T76P-4020-A1
SCREW	T76P-4020-A9
HANDLE	T76P-4020-A11



TOOL	NUMBER
GAUGE TUBE	D80T-4020-F49
GAUGE BLOCK	T76P-4020-A10
GAUGE DISC	PS88B878-1
ALIGNING ADAPTOR	T75P-4020-A2
SCREW	T76P-4020-A9
HANDLE	T76P-4020-A11



Pinion Gear: Adjustments Depth Gauge Check

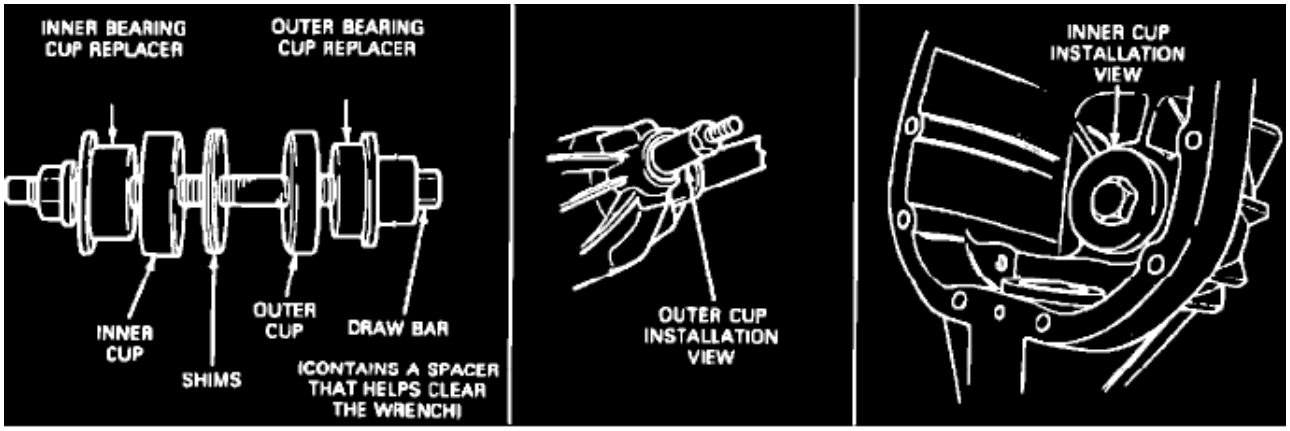
Fig. 9 Depth Gauge Tool Selection

Fig. 10 Depth Gauge Tool Selection

Fig. 11 Depth Gauge Tool Selection

1. Refer to Figs. 9 through 11 for correct tool for particular axle assemblies. If any gauge surfaces become nicked, high spots must be removed with a medium India oilstone to ensure no erroneous readings are obtained.

2. Install oil baffle into inner bearing cup bore in carrier.


INNER BEARING CUP REPLACER
OUTER BEARING CUP REPLACER
INNER CUP
SHIMS
OUTER CUP
DRAW BAR
(CONTAINS A SPACER THAT HELPS CLEAR THE WRENCH)
OUTER CUP INSTALLATION VIEW
INNER CUP INSTALLATION VIEW

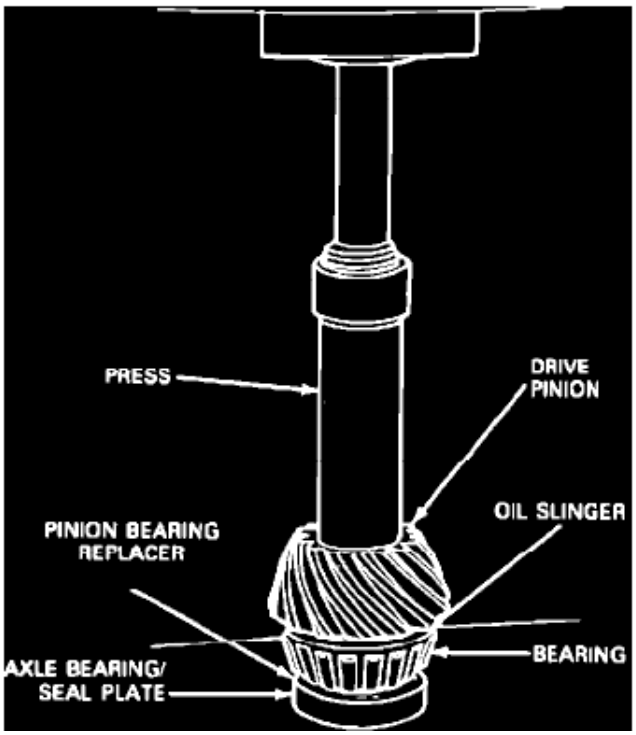

PRESS
DRIVE PINION
OIL SLINGER
PINION BEARING REPLACER
BEARING
AXLE BEARING/ SEAL PLATE

Fig. 12 Inner And Outer Pinion Cup Installation Tools

3. Install inner and outer pinion cups using suitable tools, Fig. 12. Prior to installing pinion bearing cups into aluminum or magnesium housings, apply Lubrikote type A-1040 CR graphite lubricant or equivalent to bearing cup bore to prevent metal particles from being picked up as cup is pressed into bore.

4. Place a new inner pinion bearing over proper aligning adapter and insert into pinion bearing retainer assembly. Place outer pinion bearing into bearing cup in carrier and assemble handle onto screw and hand tighten. Note 3/8 inch square drive in handle to be used for obtaining proper pinion bearing preload.

5. Center proper gauge tube into differential bearing bore, install bearing caps and torque to specifications. To preload bearings, torque handle to 20-40 inch lbs.

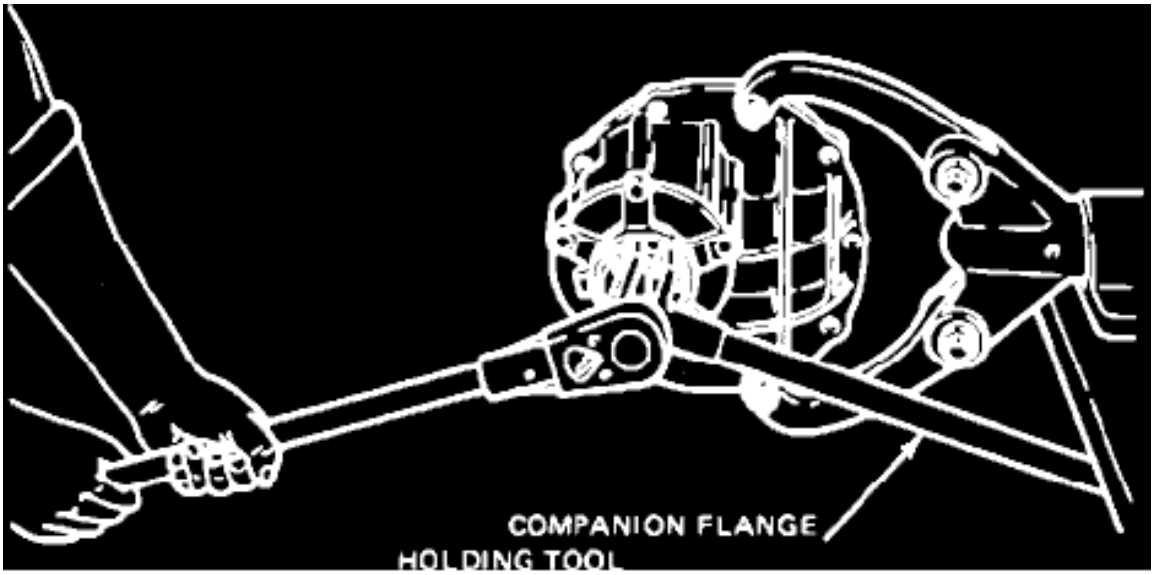
6. Using suitable feeler gauges, select thickest feeler gauge that will enter between gauge tube and gauge block. Insert feeler gauge directly along gauge block to ensure a correct reading. Feeler gauge fit between gauge tube and gauge block should be a slight drag-type feeling.

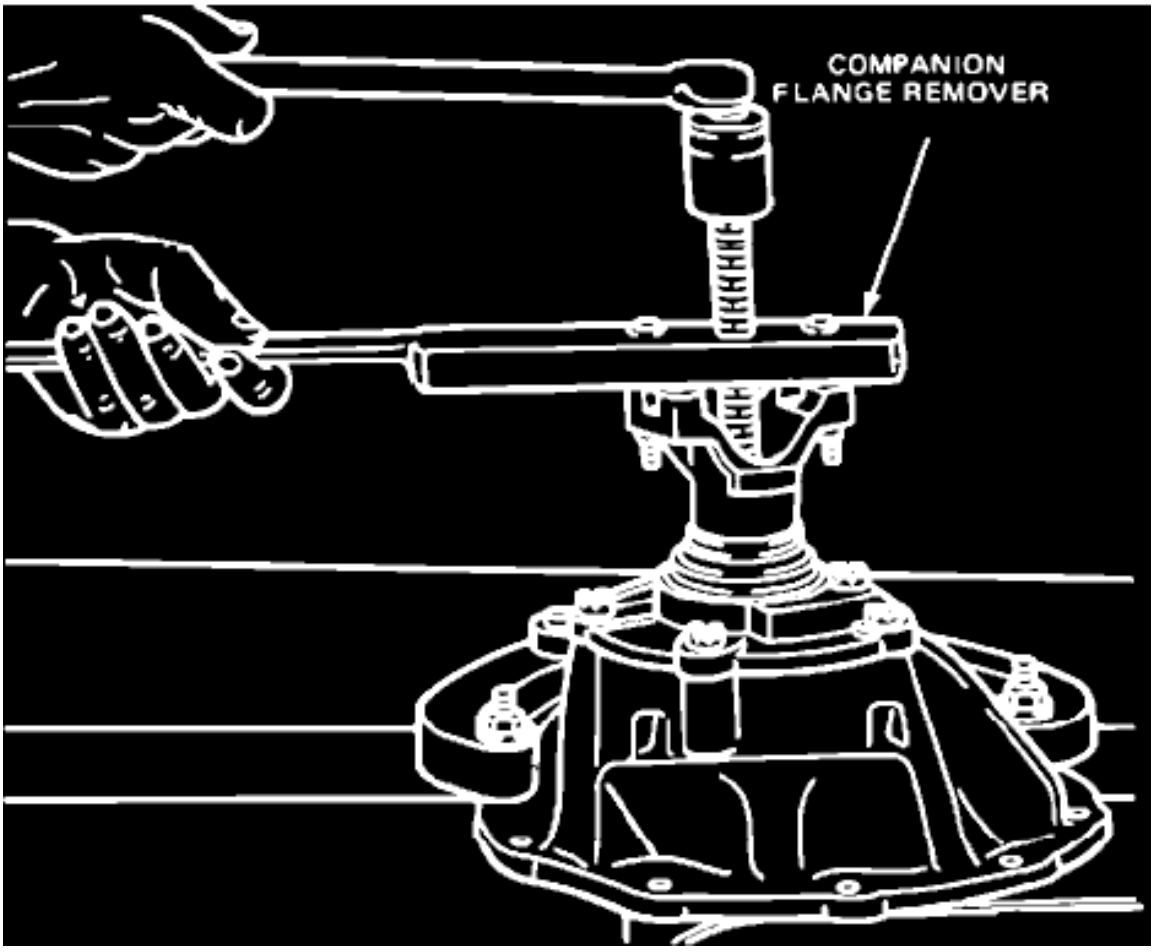
7. After correct feeler gauge feel is obtained, obtain oil slinger of same thickness as feeler gauge, provided new pinion gear is marked with a zero (0). If new pinion gear is marked with a plus (+) reading, the plus (+) amount stamped on pinion gear must be subtracted from thickness dimension obtained in step 6. If new pinion gear is marked with a minus (-) reading, the minus (-) amount stamped on pinion gear must be added to thickness dimension obtained in step 6. Also, you must use exact same new inner pinion bearing that was used to obtain this dimension.

Fig. 13 Pressing Bearing Onto Drive Pinion

8. Measure oil slinger with a micrometer to verify size, then place oil slinger onto pinion and press bearing on as shown in Fig. 13.

9. Lubricate ends of outer pinion bearing rollers with a suitable high-temperature lubricant.


COMPANION FLANGE
HOLDING TOOL


COMPANION
FLANGE REMOVER

Pinion Gear: Service and Repair Drive Pinion and Bearing Retainer

Fig. 3 Removing Pinion Shaft Nut

1. Remove drive pinion shaft nut, Fig. 3.

Fig. 4 Removing Companion Flange

2. Remove companion flange from drive pinion shaft, Fig. 4.

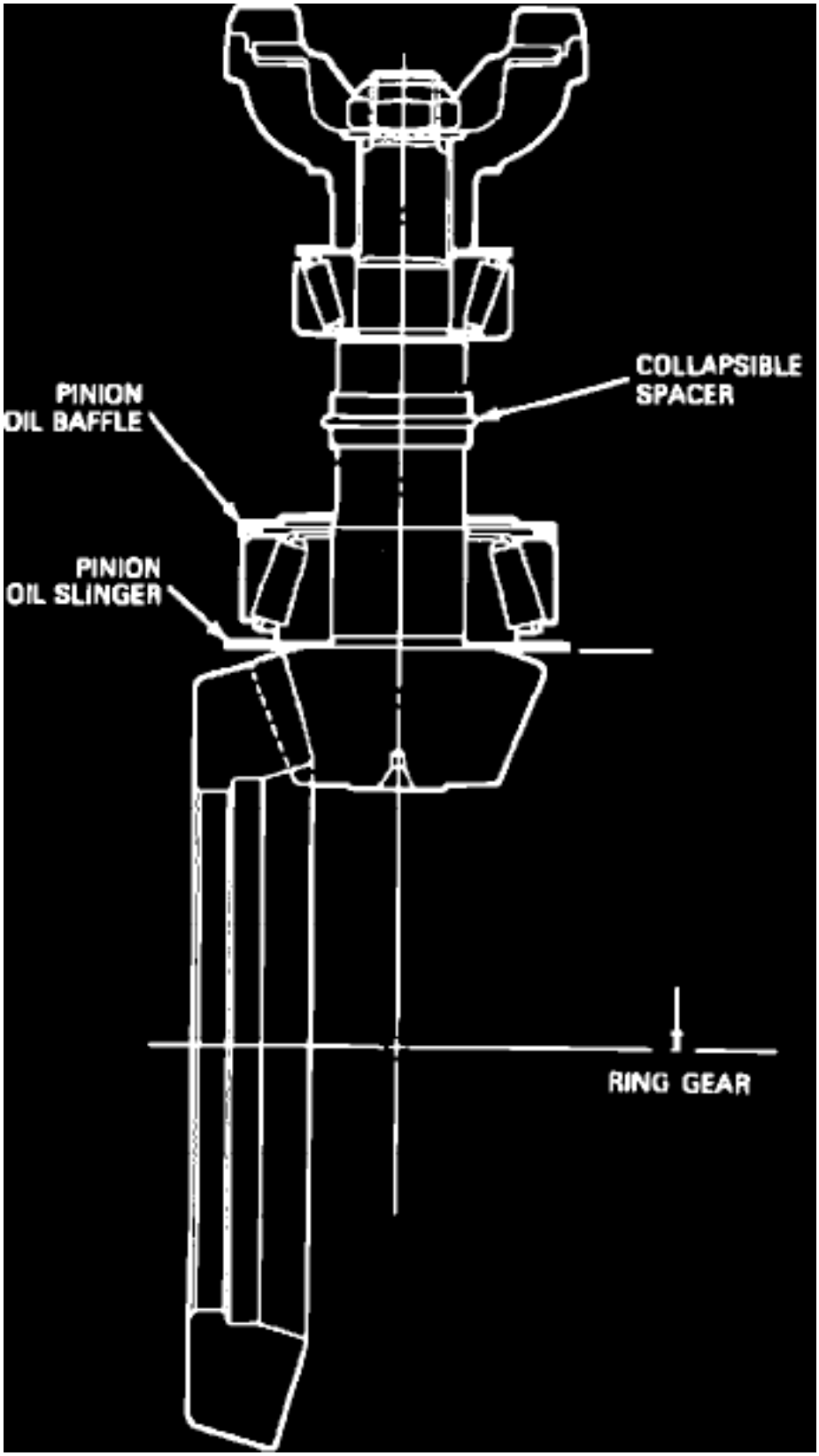
3. Using suitable puller, remove pinion seal.

4. Remove the pinion, bearing, and retainer assembly from carrier housing. Extreme care must be taken not to damage mounting surfaces of retainer and carrier.

5. Place protective sleeve on pinion pilot bearing surface and press drive pinion shaft out of pinion retainer.

6. Using Pinion Bearing Cone Removal tool No. T71P-4621-B or equivalent, press pinion shaft out of pinion rear bearing cone.

7. Clean and inspect all parts.


COLLAPSIBLE SPACER
PINION OIL BAFFLE
PINION OIL SLINGER
RING GEAR

Pinion Gear: Service and Repair Drive Pinion Installation

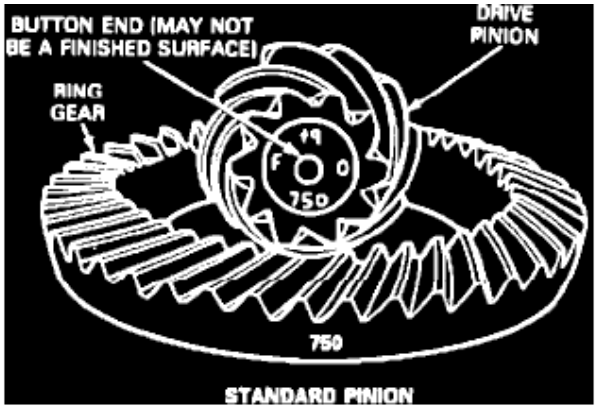
Two separate adjustments affect drive pinion and ring gear tooth contact: pinion depth and pinion to ring gear backlash.

Fig. 5 Drive Pinion Installation

Pinion depth is controlled by a selective thickness oil slinger located between drive pinion head and inner pinion bearing cone and an oil baffle located between inner bearing cup and carrier bore, Fig. 5.

Pinion to ring gear backlash is controlled by preload shims on model 28-IFS and 28-2 or a selective spacer on model 35-IFS, located between the differential bearing cup and carrier.

During pinion depth adjustment, the size of the selected thickness of oil slinger and baffle controls pinion position. Increasing oil slinger thickness moves pinion toward ring gear (-). Decreasing oil slinger thickness moves pinion away from ring gear (+).



Old Pinion Marking	New Pinion Marking (English)								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

OLD PINION MARKING	New Pinion Marking (Metric)								
	-10	-8	-5	-3	0	+3	+5	+8	+10
+10	+.20	+.18	+.15	+.13	+.10	+.08	+.05	+.03	0
+8	+.18	+.15	+.13	+.10	+.08	+.05	+.03	0	-.03
+5	+.15	+.13	+.10	+.08	+.05	+.03	0	-.03	-.05
+3	+.13	+.10	+.08	+.05	+.03	0	-.03	-.05	-.08
0	+.10	+.08	+.05	+.03	0	-.03	-.05	-.08	-.10
-3	+.08	+.05	+.03	0	-.03	-.05	-.08	-.10	-.13
-5	+.05	+.03	0	-.03	-.05	-.08	-.10	-.13	-.15
-8	+.03	0	-.03	-.05	-.08	-.10	-.13	-.15	-.18
-10	0	-.03	-.05	-.08	-.10	-.13	-.15	-.18	-.20

Fig. 6 Ring And Pinion Identification

On the button of each drive pinion is marked a plus (+), a minus (-) or a zero (0), Fig. 6. These markings indicate the position for each gear set. The position is determined by thickness of baffle between inner pinion bearing cup and carrier bearing bore and thickness of selective oil slinger between pinion head and and inner pinion bearing. Any pinion depth change is made by changing

thickness of selective oil slinger.

If the original gear set is being re-used, measure original baffle and selective slinger and replace with exact same size, if necessary.

Fig. 7 Drive Pinion Adjusting Shim Thickness Chart

Fig. 8 Drive Pinion Adjusting Shim Thickness Chart (Metric)

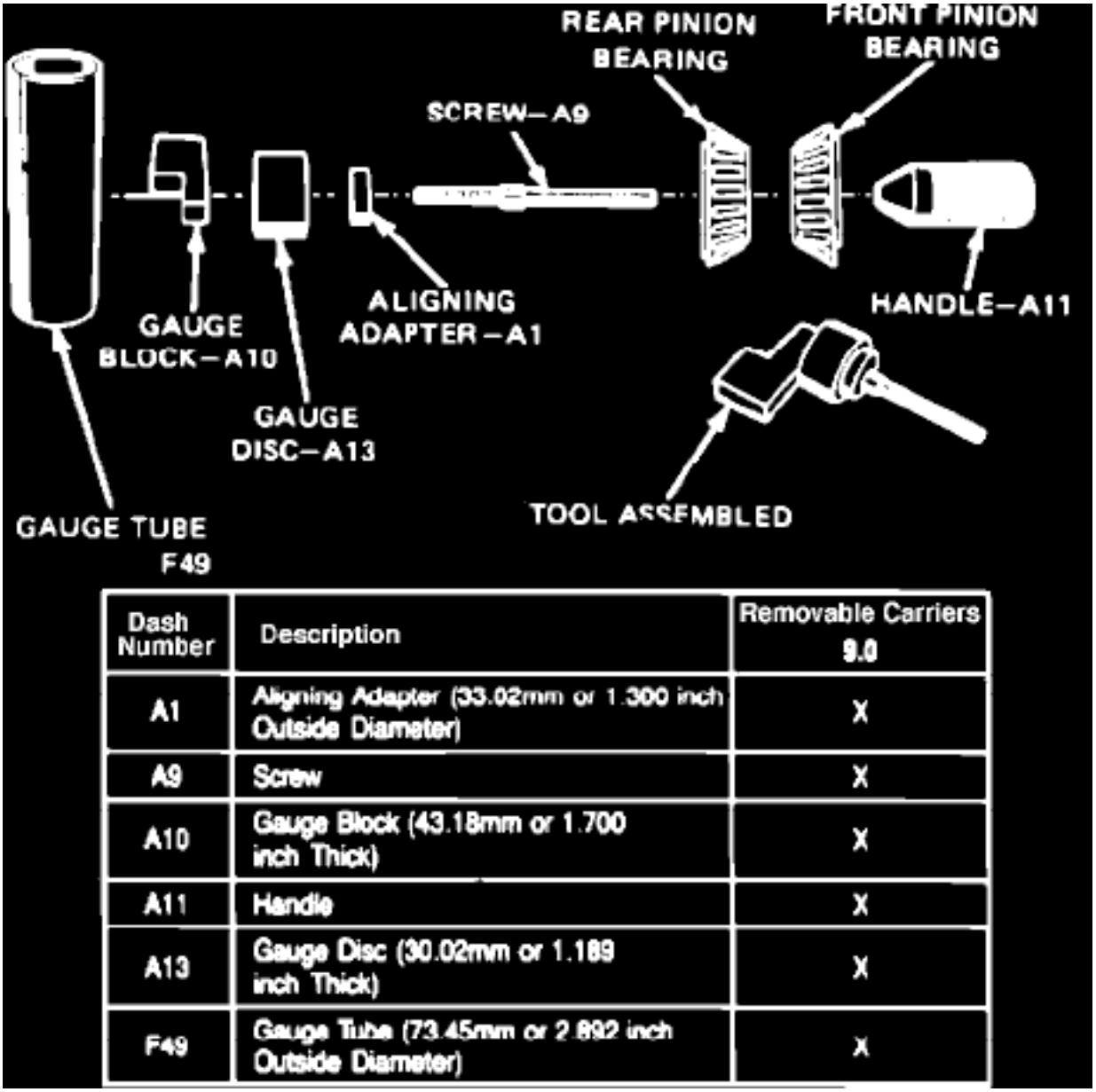
If a new gear set is being used, notice the plus (+), minus (-) or zero (0) etchings on both original and new drive pinion and adjust thickness of new selective oil oil slinger according to charts in Figs. 7 and 8.

Pinion Gear: Service and Repair Pilot Bearing

1. Using suitable tool, drive out pilot bearing.

2. Using suitable tool, drive in new bearing until it is bottomed.

3. Using suitable tool, install new pilot bearing retainer, concave side up.



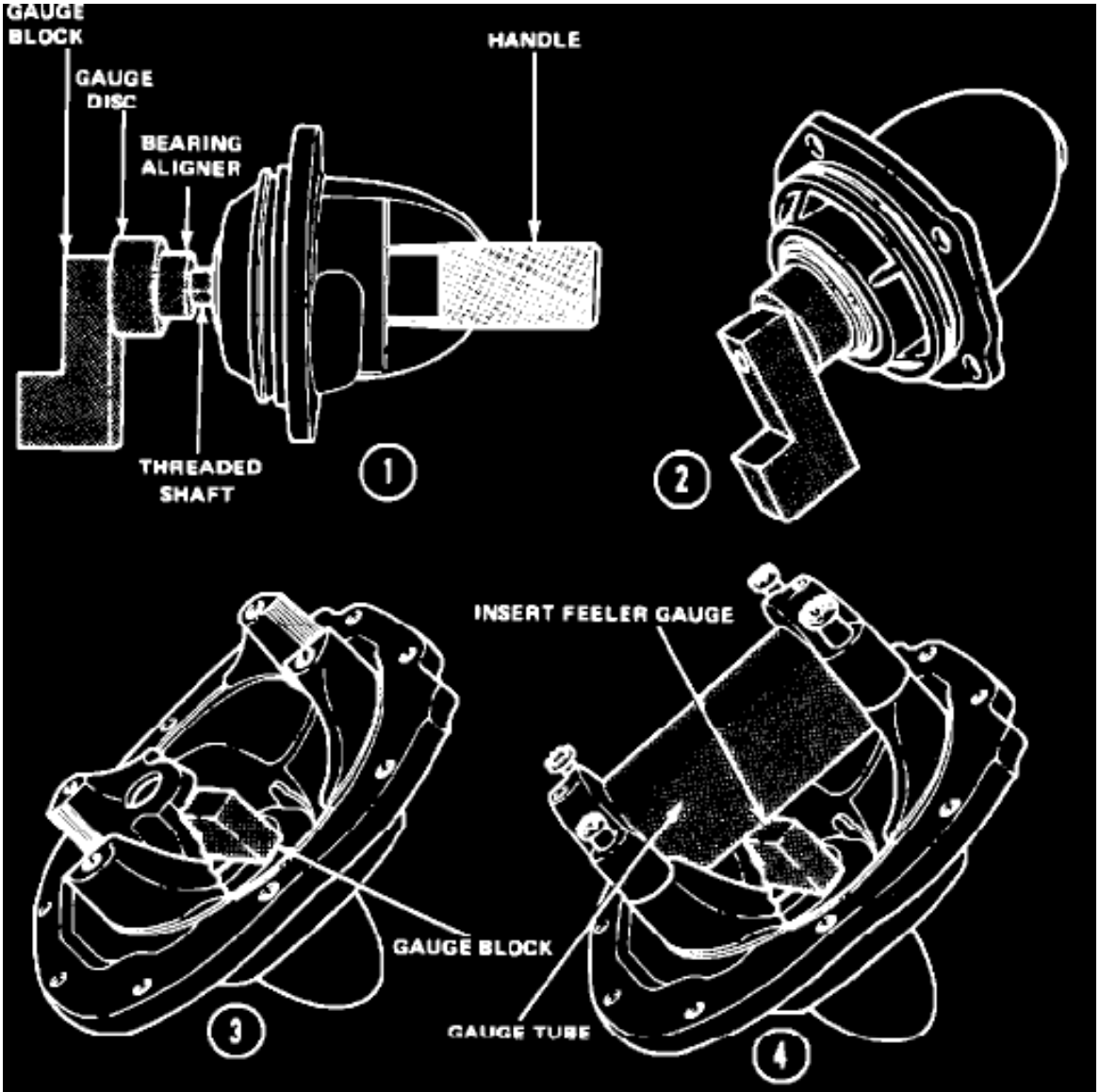
Dash Number	Description	Removable Carriers 9.0
A1	Aligning Adapter (33.02mm or 1.300 inch Outside Diameter)	X
A9	Screw	X
A10	Gauge Block (43.18mm or 1.700 inch Thick)	X
A11	Handle	X
A13	Gauge Disc (30.02mm or 1.189 inch Thick)	X
F49	Gauge Tube (73.45mm or 2.892 inch Outside Diameter)	X

Pinion Gear: Service and Repair Selecting Correct Pinion Shim

When the ring gear and drive pinion or pinion bearings are replaced, the correct pinion shim thickness must be determined using Pinion Depth Gauge tool No. T79P-4020-A or equivalent.

Fig. 5 Removable Carrier 9 Inch Ring Gear Axle Pinion Depth Tool Guage

1. Select proper rear pinion bearing aligning adapter and gauge disc and slide these adapters over screw or threaded shaft, Fig. 5.



FEELER GAUGE READING	SHIM REQUIRED	FEELER GAUGE READING	SHIM REQUIRED	FEELER GAUGE READING	SHIM REQUIRED
.035	.005	.023	.017	.011	.029
.034	.006	.022	.018	.010	.030
.033	.007	.021	.019	.009	.031
.032	.008	.020	.020	.008	.032
.031	.009	.019	.021	.007	.033
.030	.010	.018	.022	.006	.034
.029	.011	.017	.023	.005	.035
.028	.012	.016	.024	.004	.036
.027	.013	.015	.025	.003	.037
.026	.014	.014	.026	.002	.038
.025	.015	.013	.027		
.024	.016	.012	.028		

Fig. 6 Using Pinion Depth Guage Tool

2. Install gauge block on threaded shaft and tighten securely, Fig. 6 (1).

3. Place assembly and rear drive pinion bearing into pinion bearing retainer assembly, then install front pinion bearing and screw handle onto threaded shaft, tapered end into front pinion bearing, Fig. 6 (1) and (2). Flat end of handle has 3/8 inch hole cut in it so that an inch pound torque wrench may be used to obtain proper pinion bearing preload.

4. Install pinion bearing retainer assembly into carrier, less shim, torquing attaching bolts to specifications.

5. Rotate gauge block so that it rests against pilot boss, Fig. 6 (3).

6. Using feeler gauge, measure distance between gauge block and gauge tube, Fig. 6 (4). Insert blade directly along gauge block top to ensure a correct reading. Fit should be a slight drag-type feeling.

7. Select proper shim according to feeler gauge reading, Fig. 6.

Ring Gear: Testing and Inspection Gears

Examine drive pinion and ring gear teeth for scoring or signs of excessive wear. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring and flaking are the result of excessive shock loading or the use of improper lubricant. Scored gears cannot be reused.

Examine teeth and thrust surfaces of differential gears. Wear on hub of differential side gears may cause a chucking noise known as chuckle, when the vehicle is operated at low speeds. Wear of splines, thrust surfaces or thrust washers may contribute to excessive drive line backlash.

Ring Gear: Testing and Inspection Runout

Models equipped with anti-lock brakes incorporate a multi-tooth exciter ring which is pressed on the differential case located behind the ring gear assembly. Do not remove exciter ring to measure ring gear runout. A space is provided between the exciter ring and ring gear to measure ring gear runout.

If ring gear runout during disassembly exceeded specifications, the condition may be caused by a warped gear, or distorted or damaged case or foreign matter trapped between differential case halves or under ring gears.

To determine cause of excessive runout, assemble differential case without ring gear, then check as described below.

Install case in differential carrier without ring gear attached. Install bearing caps and adjuster nuts and tighten cap bolts to specifications. Tighten adjuster nuts to center differential side bearing. Mount a dial indicator and check runout of case flange and ring gear pilot. If runout at either point is excessive, install a new differential case. If runout is within specification, the ring gear is out of specification. When performing this check on a locking differential case the four compression springs within the case should be temporarily removed. This will prevent a false runout reading due to distortion caused by the springs forcing the case apart.

Ring Gear: Adjustments Backlash & Differential Bearing Preload Adjustment

1. Remove adjusting nut locks and loosen differential bearing cap bolts, then torque cap bolts to approximately 20 ft. lbs. Left adjusting nut is on ring gear side of carrier and right adjusting nut is on pinion side.

2. Loosen right nut until it is away from cup and tighten left nut until ring gear is just forced into position with zero backlash, then rotate pinion several revolutions to ensure that no binding is evident.

3. Check right nut to ensure that it is still loose, then install dial indicator.

4. Tighten right nut until it just contacts bearing cup, then set dial indicator to zero and apply pressure to bearings by tightening right nut until indicator reads .008-.012 inch.

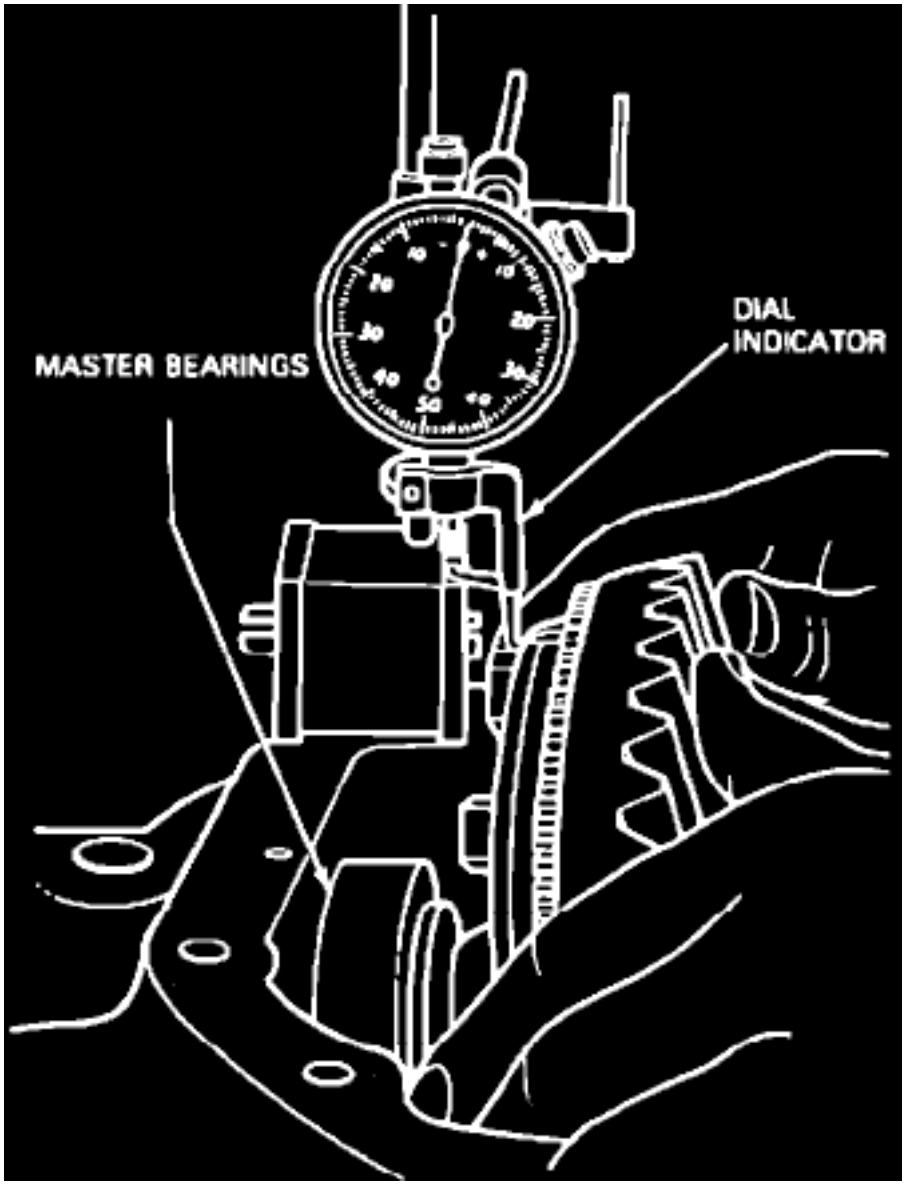
5. Turn pinion gear several times in each direction to seat bearings in cups and ensure that no binding is evident, then torque bearing caps to specifications.

6. Measure backlash on several teeth around ring gear.

7. If backlash varies by more than .004 inch between any two teeth, loosen one adjusting nut and tighten opposite nut an equal amount to move ring gear away from or toward pinion. Tightening left nut moves ring gear into pinion to decrease backlash while tightening right nut moves ring gear away. When moving adjusting nuts, final movement should always be made in a tightening direction. Assuming left nut had to be loosened one notch, loosen nut two notches, then tighten one notch.

8. Ensure that case spread remains within specifications.

9. Perform teeth pattern check. If backlash is correct and gross pattern error results, recheck pinion shim selection.



Ring Gear: Adjustments Pinion & Ring Gear Backlash

Fig. 7 Total Differential Case Endplay Check

1. Place differential case into position in carrier (differential case bearings should still be installed).

2. Force differential case away from drive pinion gear, until it is completely seated against cross bore face of carrier. Position a dial indicator so indicator tip rests on a ring gear bolt head, Fig. 7. Zero dial indicator.

3. Force ring gear against pinion gear. Rock ring gear slightly to ensure gear teeth are in contact, then force ring gear away from pinion gear, ensuring dial indicator returns to zero. Repeat this procedure until dial indicator reading is the same. This reading should be recorded as measurement ``B'' and reveals amount of shims necessary between differential case and differential bearing on ring gear side.

4. Assemble shim pack for ring gear side to measurement ``B.''

5. Subtract measurement ``B'' from measurement ``A'' obtained in step 3 under ``Total Differential Case Endplay'' as previously described to obtain measurement ``C.'' Measurement ``C'' equals amount of shims required between differential case and bearing on side opposite of ring gear.

6. Assemble shim pack for side opposite of ring gear to measurement ``C'' plus (+) .015 inch.

7. Remove differential case from carrier, then the bearings from case.

8. Place required amount of shims on hub of ring gear side of differential case, then install bearing and drive bearing onto hub using a suitable differential side bearing replacer.

9. Place required amount of shims on hub of differential case opposite of ring gear side, then install bearing. Place a suitable step plate on ring gear side bearing to protect bearing, then drive bearing opposite of ring gear side onto hub using differential side bearing replacer.

10. Install differential bearing cups onto bearings.

11. Mount Spreader tool No. TOOL-4000-E and Spreader Adapter tool No. T80T-4000-B or their equivalents onto carrier assembly.

12. Position a dial indicator onto carrier, then spread housing. Do not spread housing more than .015 inch.

13. Install differential case into carrier. If necessary, use a rawhide or plastic hammer to seat case in carrier bore. With partial and non-hunting/partial ring gear and pinion sets, align marks on ring gear and drive pinion, if applicable. Use care not to nick teeth of ring gear or pinion.

14. Remove spreader and dial indicator.

15. Install bearing caps and bolts, ensuring letters or numbers stamped on caps correspond in both position and direction with letters or numbers stamped into carrier, then torque bolts to specifications.

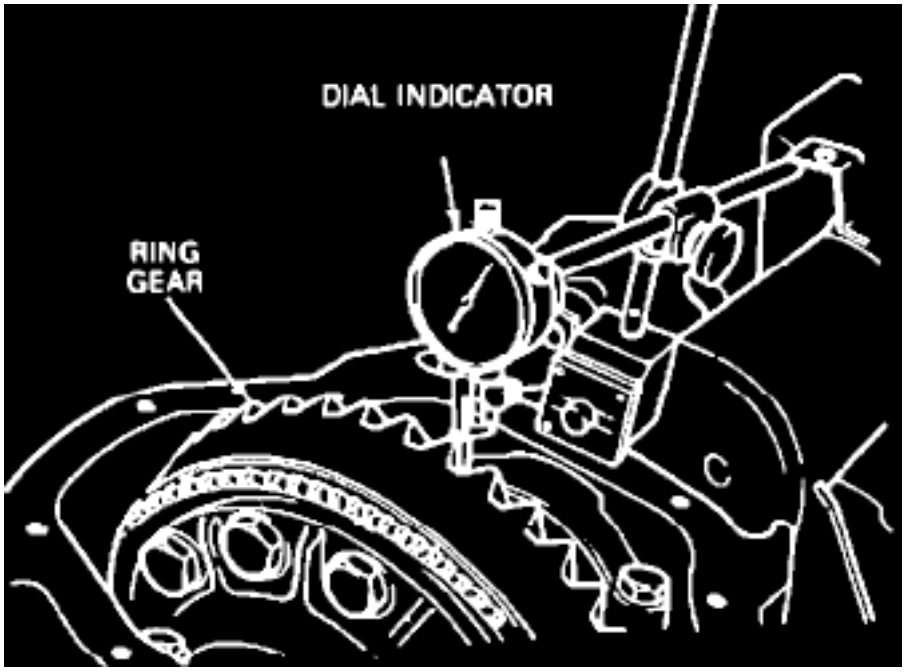


Fig. 16 Ring And Pinion Backlash Check

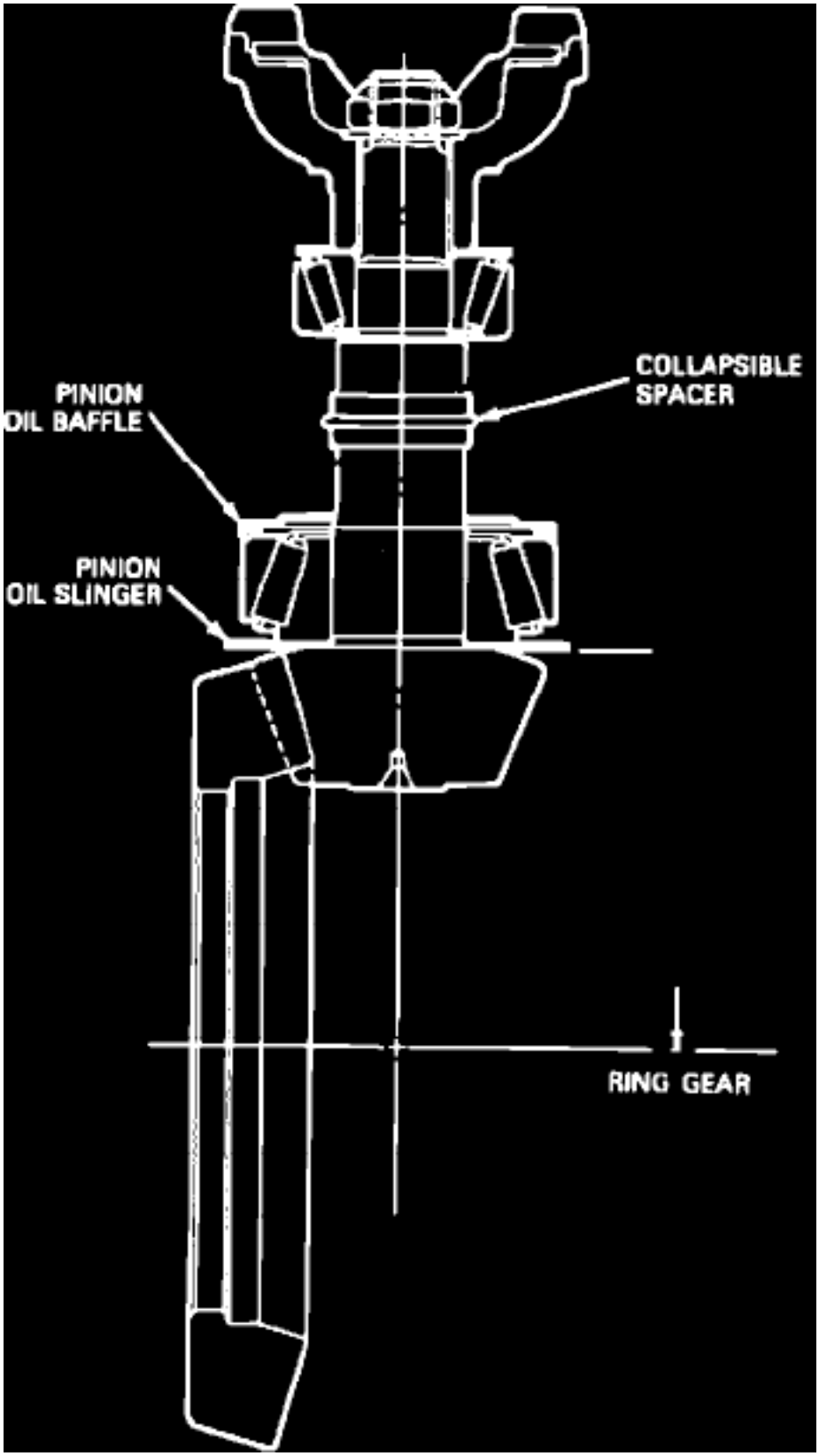
16. Install dial indicator on case, Fig. 16.

17. Check ring gear and pinion backlash at three equally spaced points on ring gear. Back lash tolerance is .005-.009 inch and cannot vary more than .003 inch between the three points.

18. If backlash is high, ring gear must be moved closer to pinion by moving shims to ring gear side from opposite side.

19. If backlash is low, ring gear must be moved away from pinion by moving shims from ring gear side to opposite side.

20. Install new cover gasket and cover plate, then the mounting bolts and torque to specifications.


COLLAPSIBLE SPACER
PINION OIL BAFFLE
PINION OIL SLINGER
RING GEAR

Ring Gear: Service and Repair

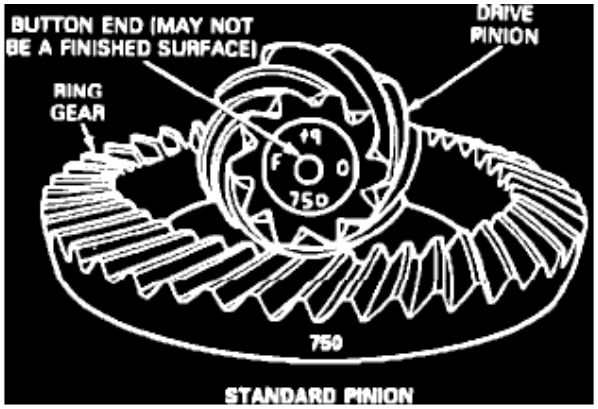
Two separate adjustments affect drive pinion and ring gear tooth contact: pinion depth and pinion to ring gear backlash.

Fig. 5 Drive Pinion Installation

Pinion depth is controlled by a selective thickness oil slinger located between drive pinion head and inner pinion bearing cone and an oil baffle located between inner bearing cup and carrier bore, Fig. 5.

Pinion to ring gear backlash is controlled by preload shims on model 28-IFS and 28-2 or a selective spacer on model 35-IFS, located between the differential bearing cup and carrier.

During pinion depth adjustment, the size of the selected thickness of oil slinger and baffle controls pinion position. Increasing oil slinger thickness moves pinion toward ring gear (-). Decreasing oil slinger thickness moves pinion away from ring gear (+).



Old Pinion Marking	New Pinion Marking (English)								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

OLD PINION MARKING	New Pinion Marking (Metric)								
	-10	-8	-5	-3	0	+3	+5	+8	+10
+10	+.20	+.18	+.15	+.13	+.10	+.08	+.05	+.03	0
+8	+.18	+.15	+.13	+.10	+.08	+.05	+.03	0	-.03
+5	+.15	+.13	+.10	+.08	+.05	+.03	0	-.03	-.05
+3	+.13	+.10	+.08	+.05	+.03	0	-.03	-.05	-.08
0	+.10	+.08	+.05	+.03	0	-.03	-.05	-.08	-.10
-3	+.08	+.05	+.03	0	-.03	-.05	-.08	-.10	-.13
-5	+.05	+.03	0	-.03	-.05	-.08	-.10	-.13	-.15
-8	+.03	0	-.03	-.05	-.08	-.10	-.13	-.15	-.18
-10	0	-.03	-.05	-.08	-.10	-.13	-.15	-.18	-.20

Fig. 6 Ring And Pinion Identification

On the button of each drive pinion is marked a plus (+), a minus (-) or a zero (0), Fig. 6. These markings indicate the position for each gear set. The position is determined by thickness of baffle between inner pinion bearing cup and carrier bearing bore and thickness of selective oil slinger between pinion head and and inner pinion bearing. Any pinion depth change is made by changing

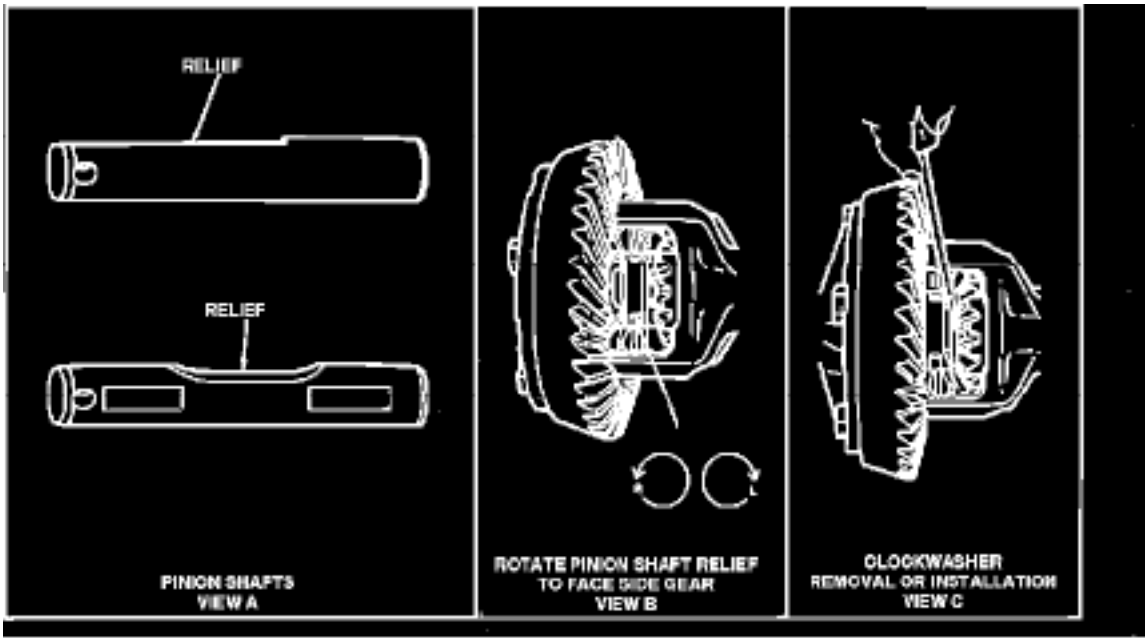
thickness of selective oil slinger.

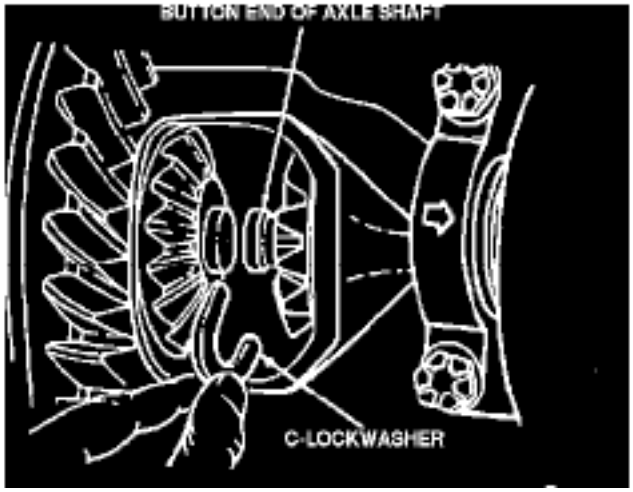
If the original gear set is being re-used, measure original baffle and selective slinger and replace with exact same size, if necessary.

Fig. 7 Drive Pinion Adjusting Shim Thickness Chart

Fig. 8 Drive Pinion Adjusting Shim Thickness Chart (Metric)

If a new gear set is being used, notice the plus (+), minus (-) or zero (0) etchings on both original and new drive pinion and adjust thickness of new selective oil oil slinger according to charts in Figs. 7 and 8.





Axle Bearing: Service and Repair

Fig. 1 Axle Shaft Removal. 3.73:1 or 4.10:1 Ratio Axle

Fig. 2 Axle Shaft Removal. Except 3.73:1 or 4.10:1 Ratio Axle

1. Raise and support vehicle.

2. Remove rear wheels and brake drums.

3. Drain rear axle lubricant by removing housing cover.

4. On models with 3.73:1 or 4.10:1 ratio axle, remove axle shafts as follows:

a. Remove pinion shaft lock bolt, then rotate pinion shaft until relief in shaft faces either side gear, Fig. 1, and remove C-lockwasher from axle

shaft.

b. Rotate pinion shaft 1/2 turn until relief faces opposite side gear and remove C-lockwasher from axle shafts. c. Carefully slide shafts out of housing.

5. On all models except those with 3.73:1 or 4.10:1 ratio axle, remove axle shafts as follows:

a. Remove differential pinion shaft lock bolt and the shaft. b. Push axle shafts inward toward center of vehicle and remove C-lockwashers from shafts, Fig. 2. c. Carefully slide axle shafts out of housing.

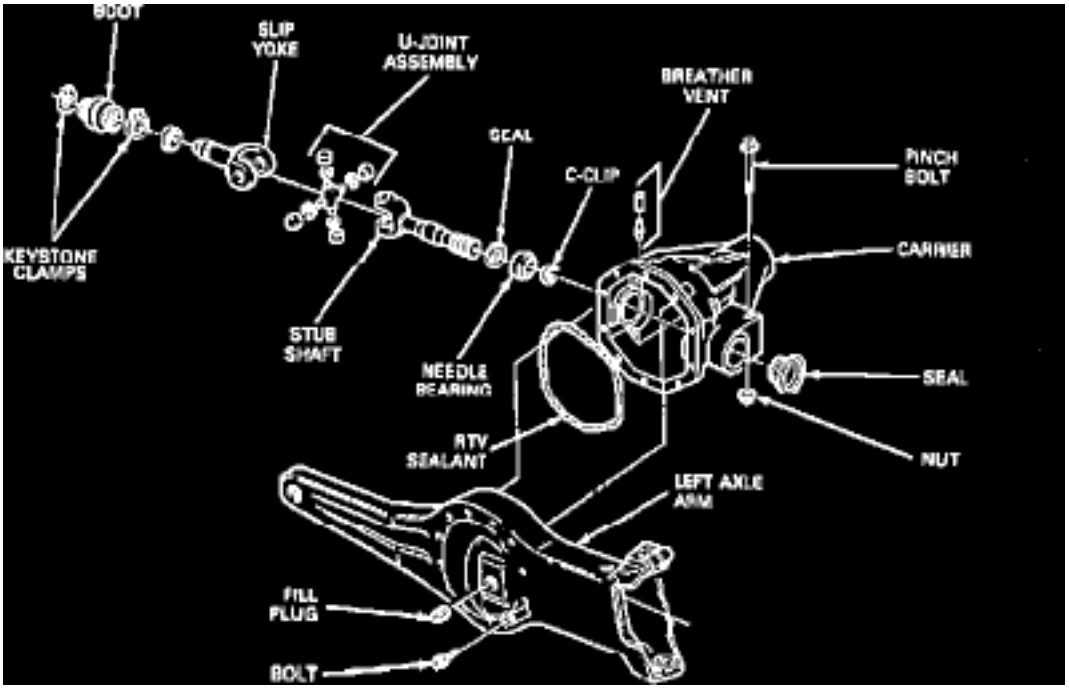
6. On all models, remove seal and bearing using a suitable hook-type puller.

7. Reverse procedure to install, noting the following:

a. Apply suitable grease between lips of axle shaft seal. b. Install bearing using axle tube bearing replacer tool No. T78P-1225-A, and install seal and using axle tube seal replacer tool No.

T78P-1177-A or equivalent.

c. Torque pinion shaft lock bolt to 15-22 ft. lbs. d. Torque differential housing cover bolts to 25-35 ft. lbs., except the ratio tag bolt which is torqued to 15-24 ft. lbs.



Axle Shaft: Service and Repair Right Hand Slip Yoke and Stub Shaft Assembly (4WD)

Fig. 2 Exploded View Of Right Slip Yoke & Stub Shaft

1. Disconnect driveshaft from yoke. Position driveshaft aside so it will not interfere with carrier removal.

2. Remove both spindles, Fig. 2, then the left and right shaft and U-joint assemblies as described previously.

3. Support carrier using a suitable jack, then remove carrier to support arm attaching bolts.

4. Separate carrier from support arm, then drain lubricant and remove carrier from vehicle.

5. Install carrier in suitable holding fixture, then rotate slip yoke and shaft assembly until open end of snap ring is exposed.

6. Remove snap ring, then the slip yoke and shaft assembly from carrier.

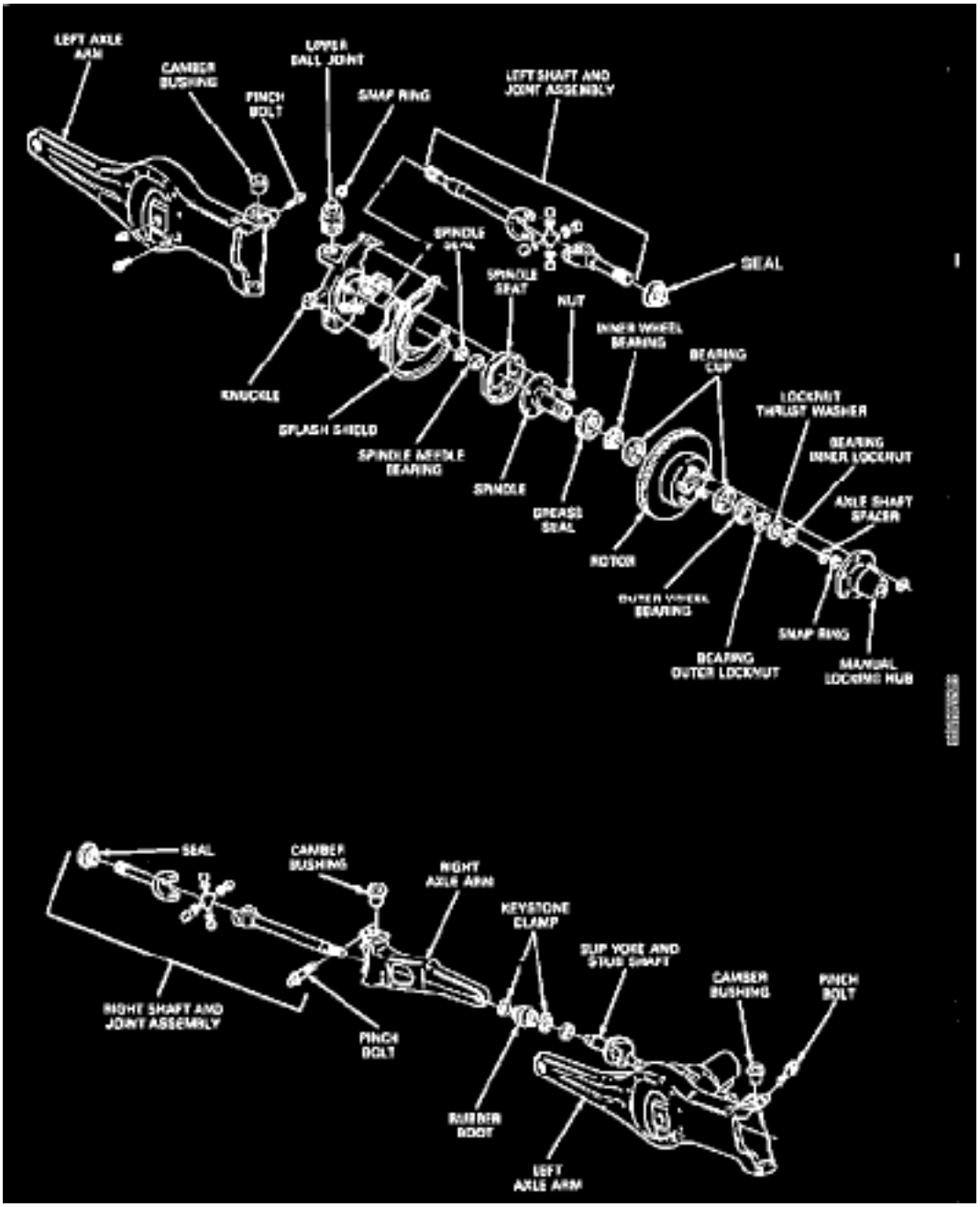
7. On 1987-89 models, remove oil seal and caged needle bearings simultaneously from carrier using tools No. T50T-100-A and D880L-100-A or equivalent. Discard seal and bearings.

8.

On 1990-92 models, using slide hammer tool No. T50T-100-A and seal puller tool Tool No. 1175-AC or equivalents, remove passenger side oil seal, then driver side oil seal. Using slide hammer tool No. T50T-100-A and axle bearing remover tool No. T90T-1225-A or equivalent, remove caged needle bearings.

9. On all models, reverse procedure to install, noting the following:

a. Clean mating surfaces of carrier and support arm. Apply a narrow bead of RTV sealant to mating surfaces. b. Install carrier attaching bolts hand tight, then tighten in a clockwise or counterclockwise pattern to specifications.



Axle Shaft: Service and Repair Spindle, Shaft and Joint (4WD)

Fig. 1 Exploded View Of Spindle, Shaft & Joint Assembly

1. Raise and support vehicle. Remove front wheels.

2. Remove disc brake caliper, hub locks, wheel bearings and locknuts, then the hub, rotor and outer wheel bearing cone, Fig. 1.

3. Remove and discard grease seal from rotor using slide hammer tool No. T50T-100-A and grease seal remover tool No. 1175-AC or equivalents.

4. Using bearing cup puller tool No. D78P-1225-B or equivalent, remove inner wheel bearing, then the inner and outer bearing cups.

5. Remove spindle to steering knuckle attaching nuts, then break spindle loose from knuckle and remove splash shield.

6. Remove shaft and joint assembly from right side of vehicle by pulling assembly out of carrier.

7. Remove and discard clamp from shaft and joint assembly and the stub shaft on right side of carrier. Slide rubber boot onto stub shaft, then pull shaft and joint assembly from stub shaft splines.

8. Install spindle, on second step, in suitable soft jawed vise.

9. Remove oil seal and needle bearing from spindle using bearing remover tool No. T50T-100-A and grease seal remover tool No. 1175-AC, or equivalent. Remove oil seal from shaft, if necessary.

10. Reverse procedure to install. Tighten spindle to steering knuckle attaching nuts to specifications.

Wheel Bearing: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

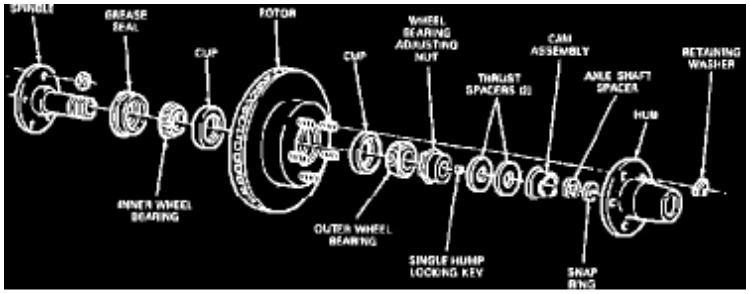
Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

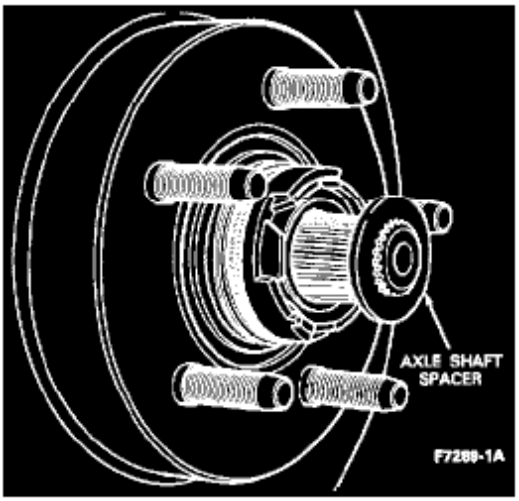
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

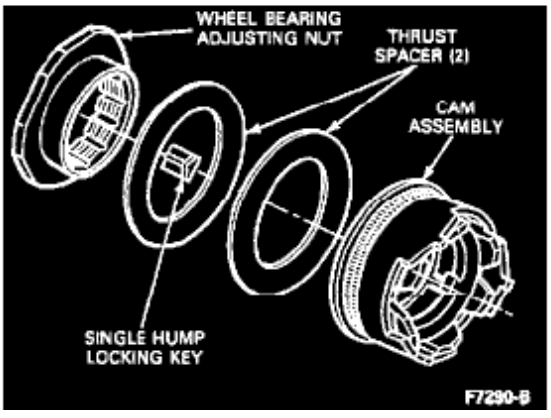
NOTES:

* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
THRUST SPACERS (2)
CAM ASSEMBLY
AXLE SHAFT SPACER
RETAINING WASHER
HUB
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


AXLE SHAFT SPACER
F7288-1A


WHEEL BEARING ADJUSTING NUT
THRUST SPACER (2)
CAM ASSEMBLY
SINGLE HUMP LOCKING KEY
F7290-B

Wheel Bearing: Adjustments With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer. 6. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

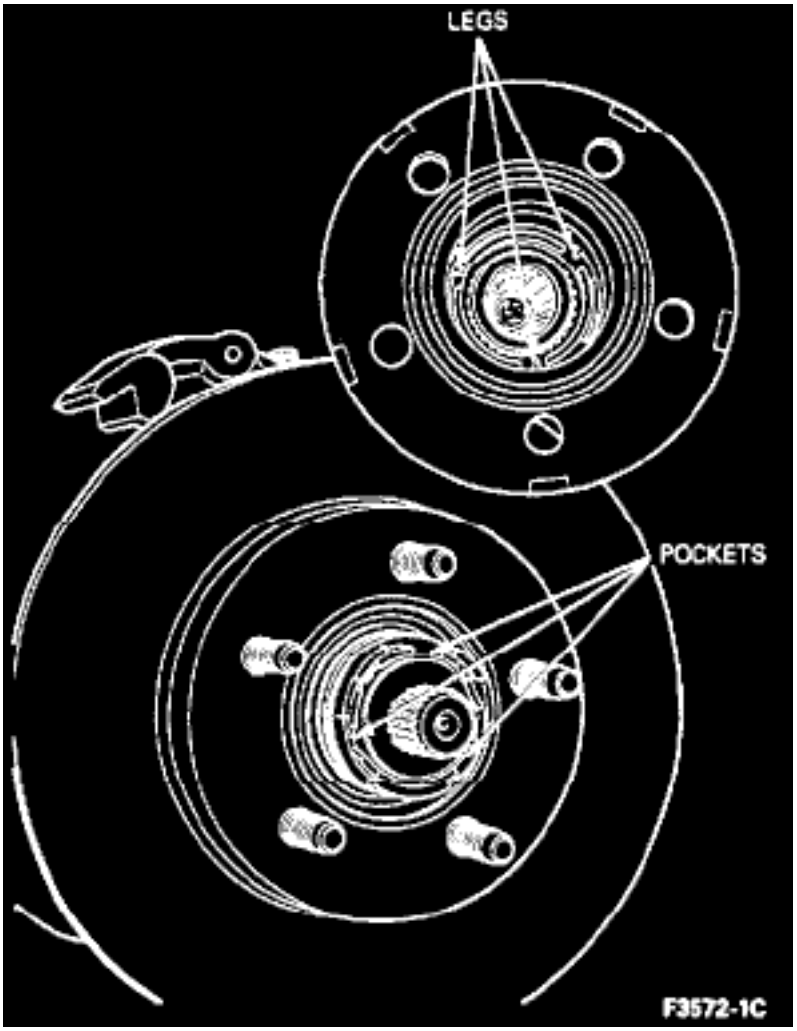
Cam Assembly And Locking Key

7. Using a magnet, remove the locking key.

NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

8. Loosen the wheel bearing adjusting nut from the spindle using a 2-3/8 inch hex locknut wrench.



9. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

10. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 11. Make sure the final end play of the wheel on the spindle is 0.00-0.08mm (0.000-0.003 inch). 12. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. the wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

13. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

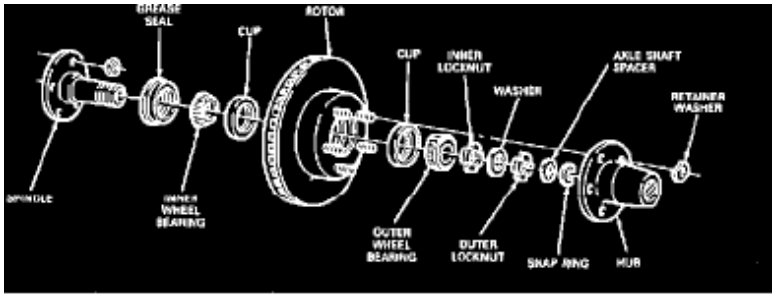
14. Install the axle shaft spacer. 15. Clip the snap ring onto the end of the spindle shaft.

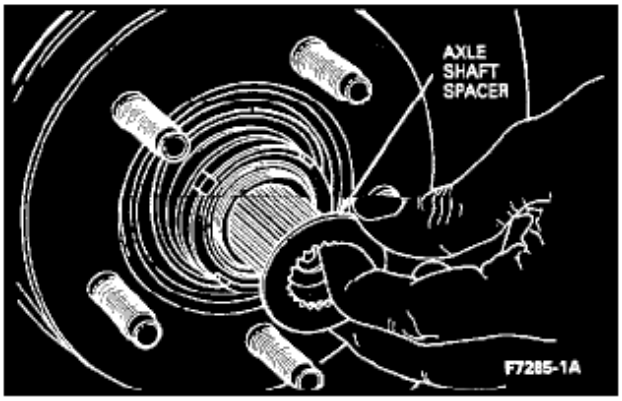
Automatic Locking Hub Installation

16. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

washers.

17. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB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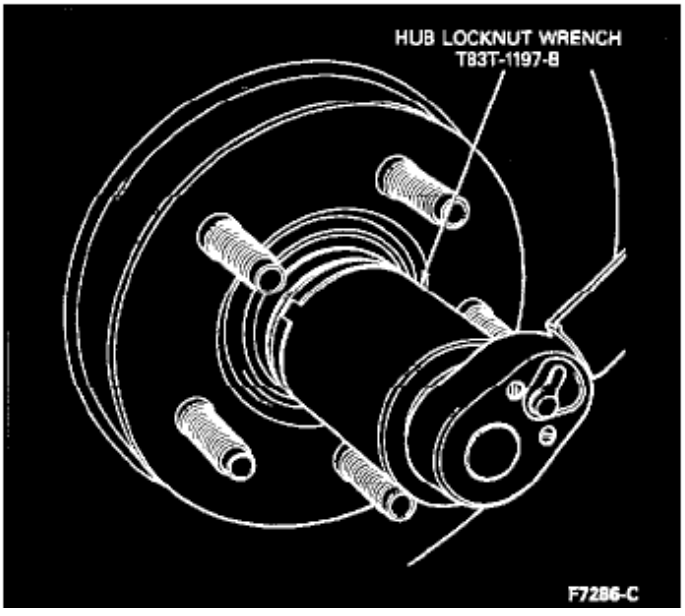

HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

Wheel Bearing: Adjustments With Manual Locking Hubs

Fig. 5 Manual Locking Hub

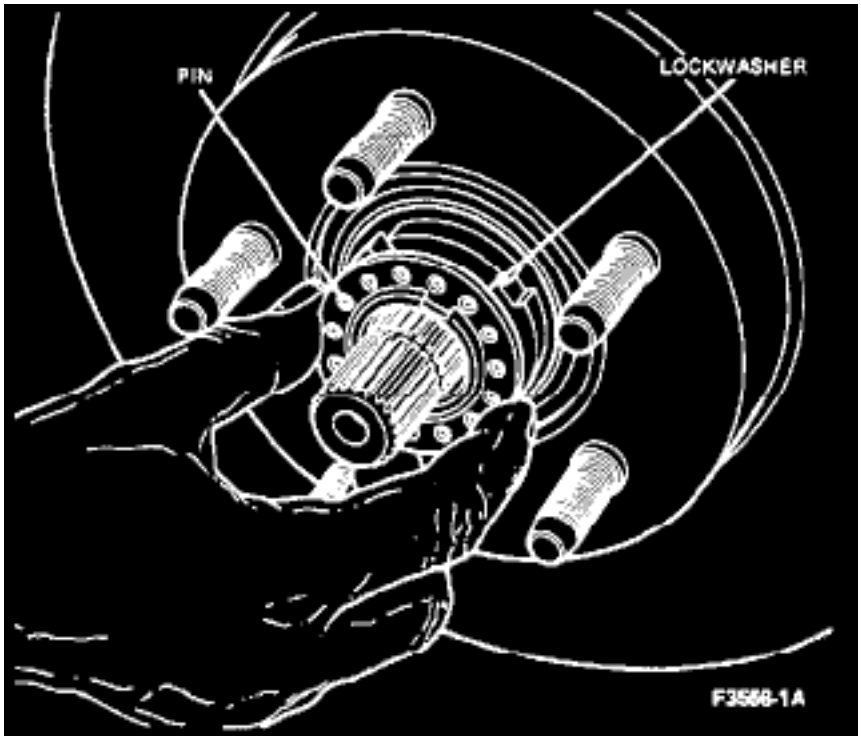
1. Raise the vehicle and install safety stands. 2. Remove the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.

Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.



Locknut Washer

7. Remove locknut washer from spindle. 8. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 9. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb).

10. Install the lockwasher on the spindle. 11. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 12. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.02-0.08 mm (0.001-0.003 inch). 13. Install the axle shaft spacer. 14. Clip the snap ring onto the end of the spindle shaft. 15. Install the manual hub assembly over the spindle. Install the retainer washers. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

Wheel Hub: Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Wheel Hub: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

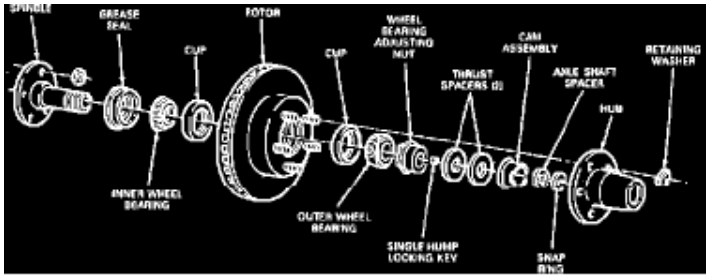
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

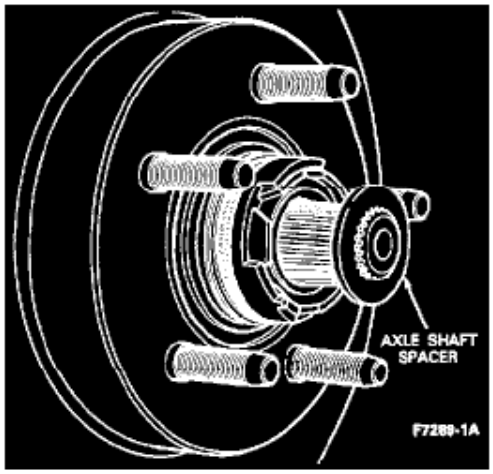
NOTES:

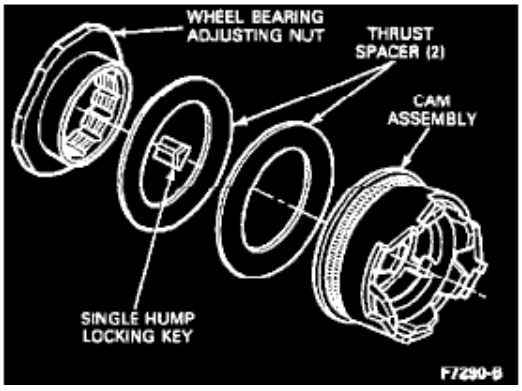
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Drive Axles, Bearings and Joints > Wheel Hub > Component Information > Service and Repair > Removal







Wheel Hub: Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

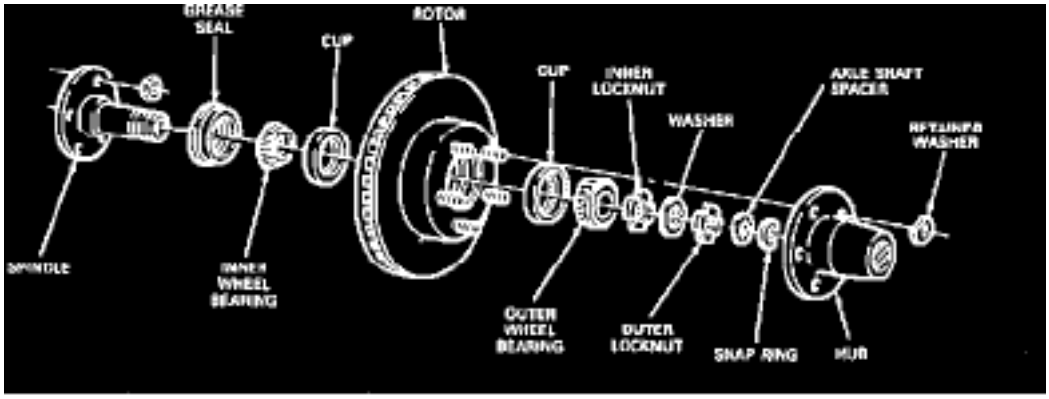
Axle Shaft Spacer

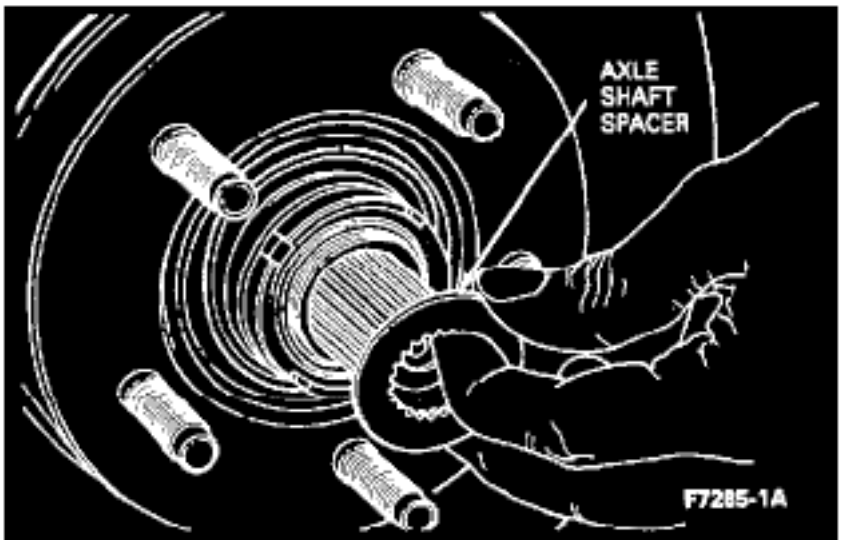
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

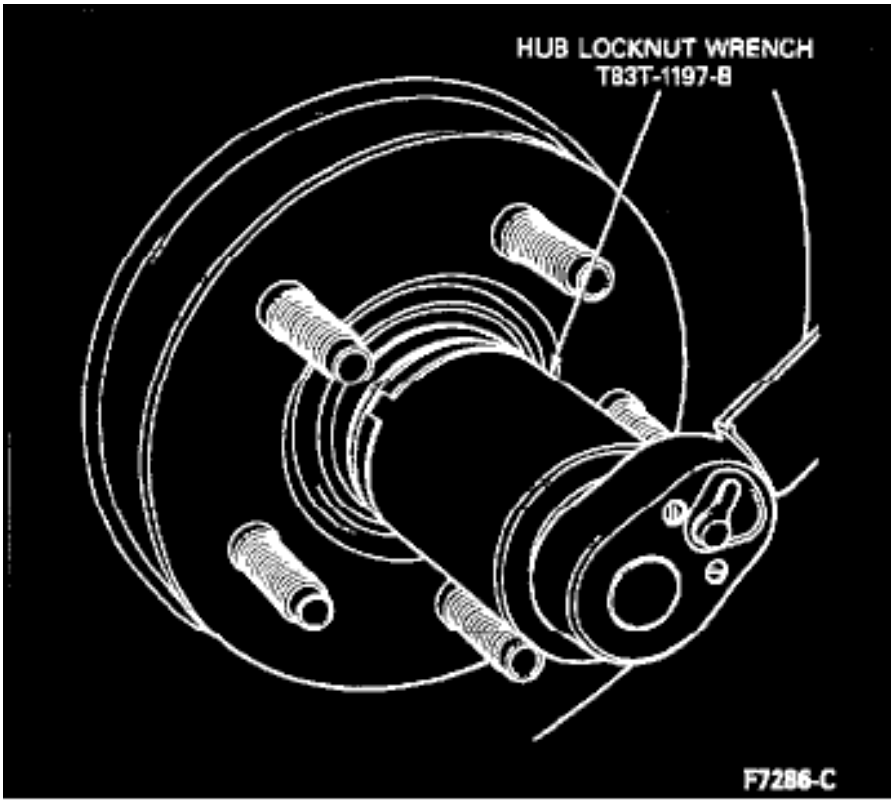
caliper.

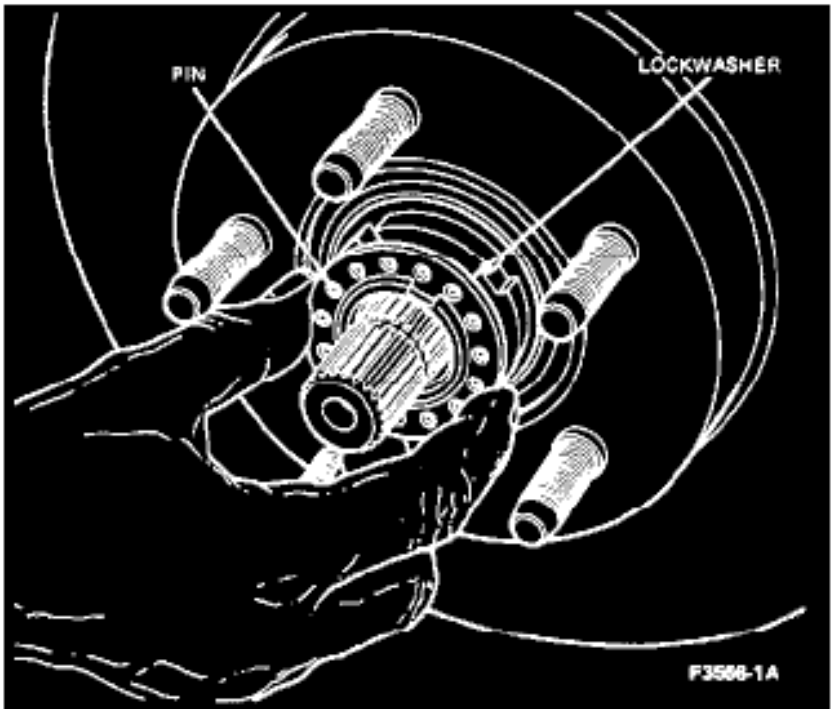
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

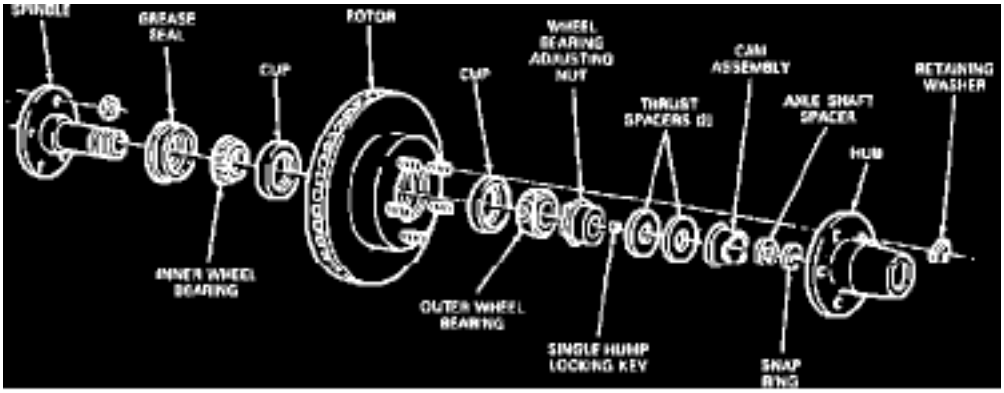

PIN
LOCKWASHER
F3566-1A

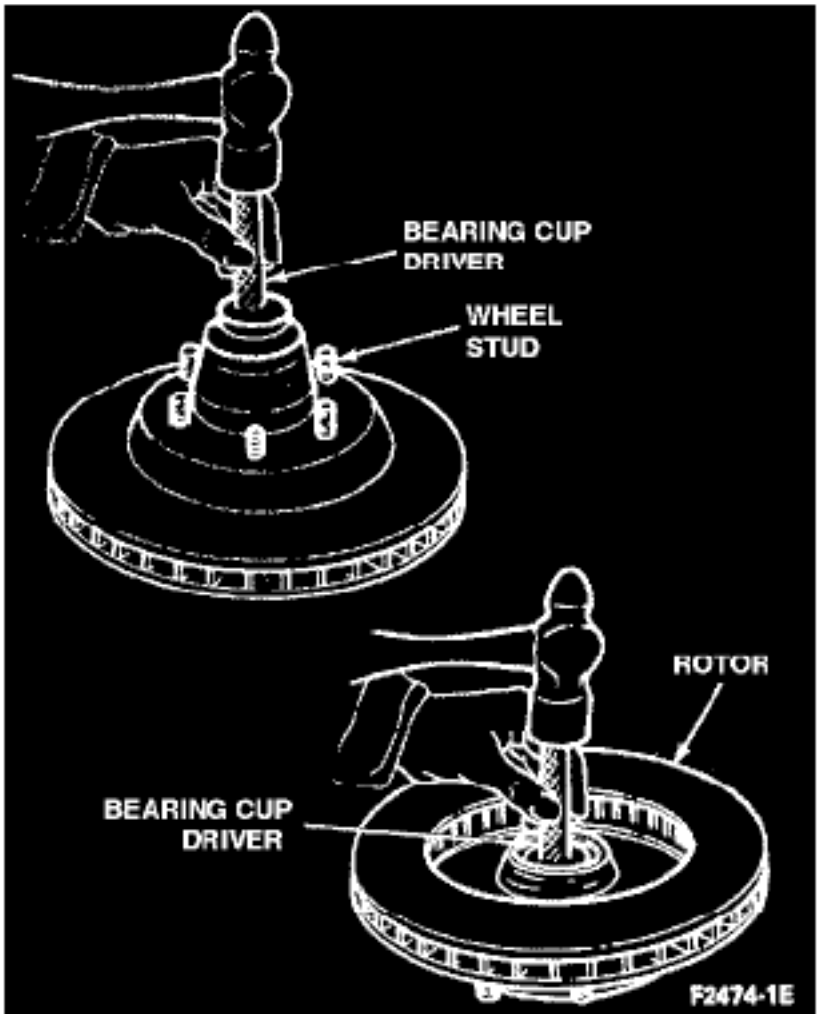
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
ROTOR
CUP
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
RETAINING WASHER
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub: Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

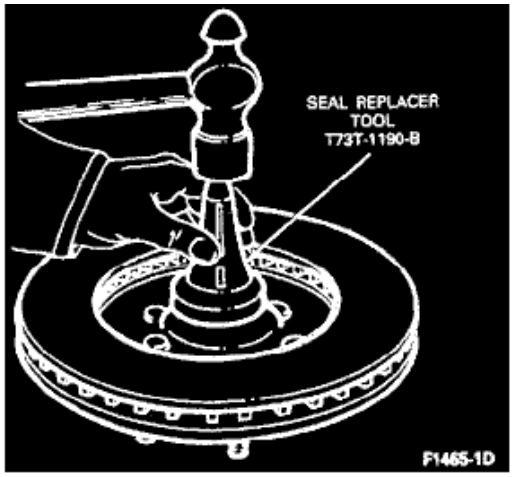
Installing Bearing Cups (Typical)

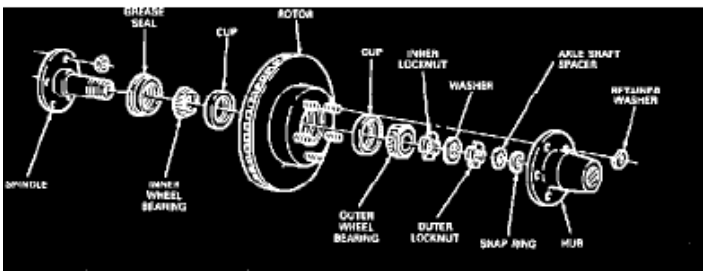
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

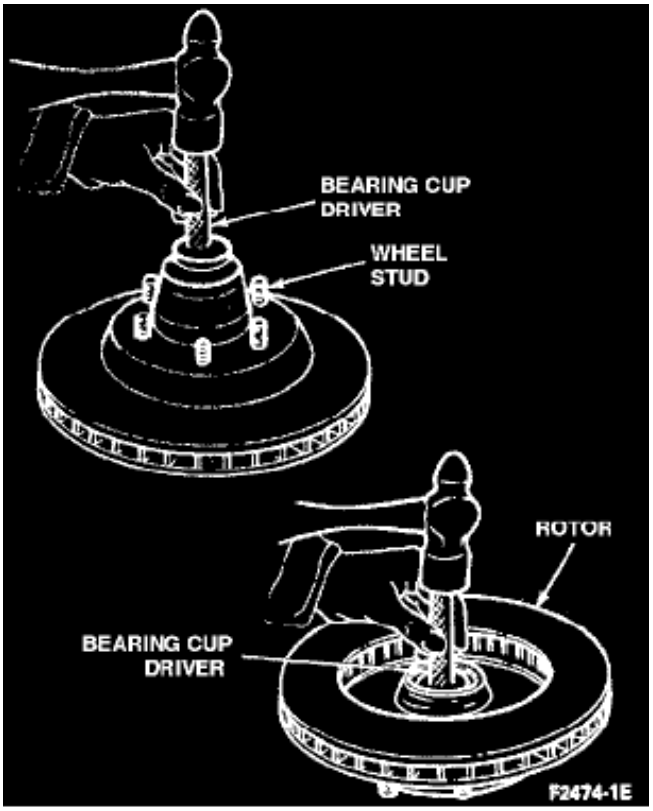
washers.

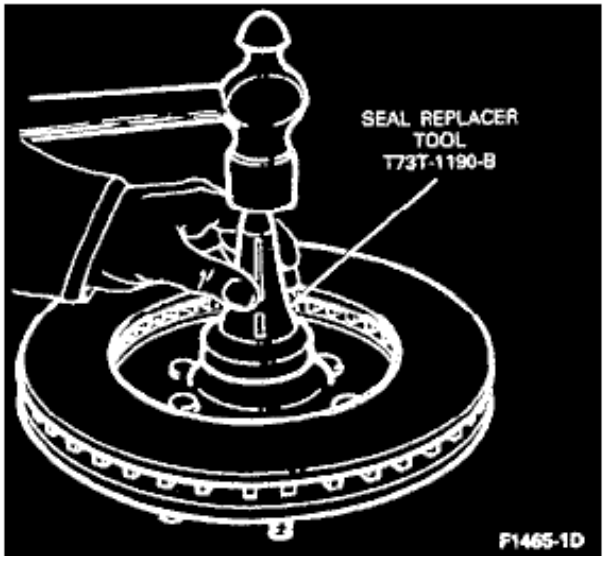
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E


SEAL REPLACER TOOL T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Wheel Hub (Locking): Customer Interest Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

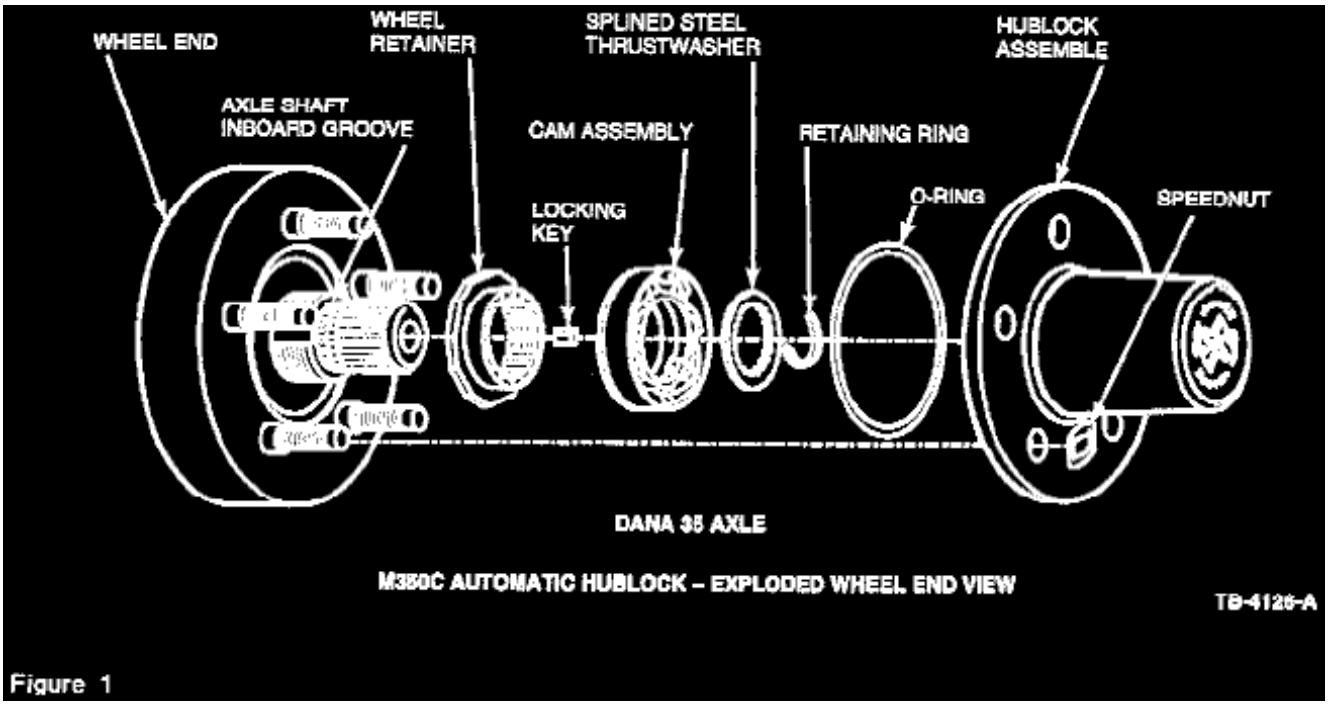


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

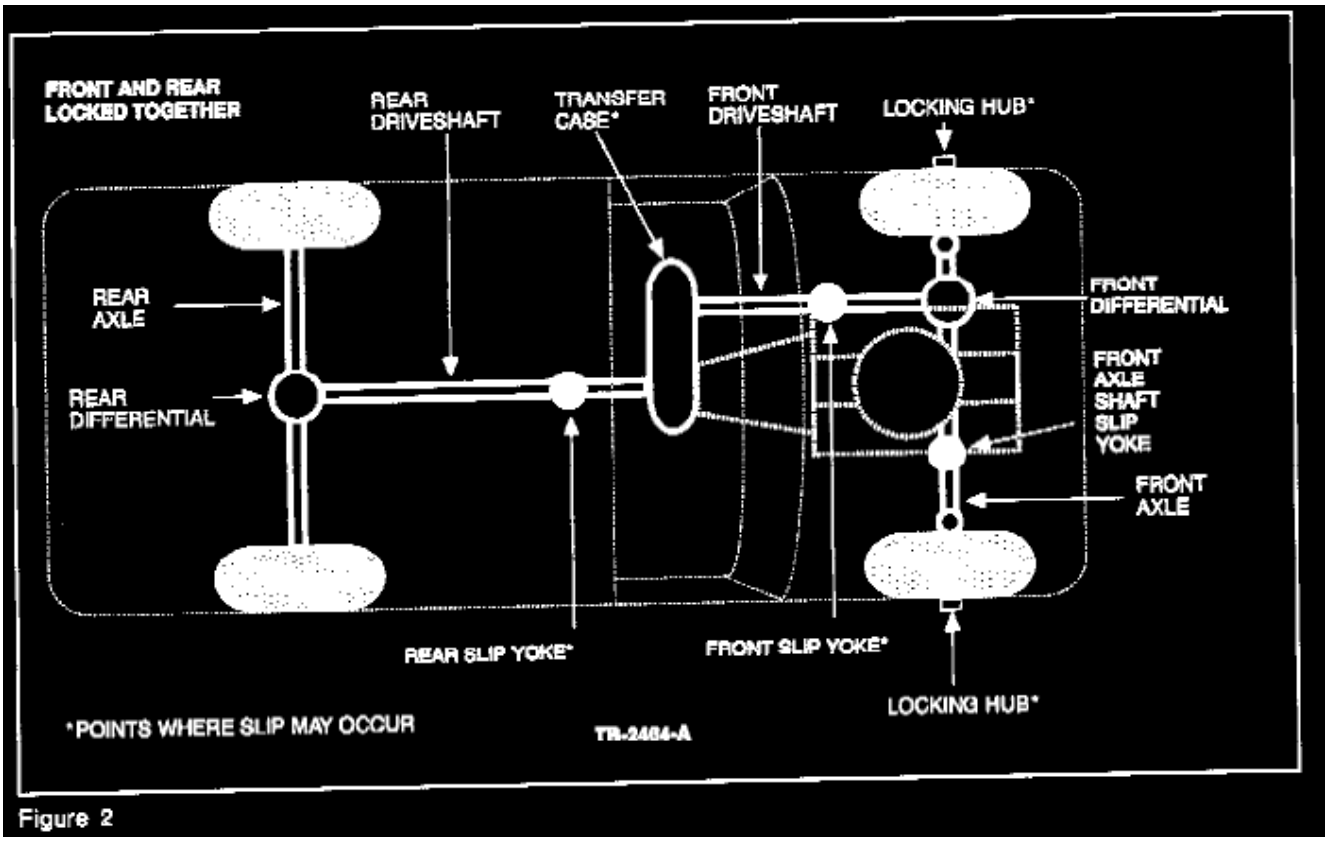


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART				
AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): All Technical Service Bulletins Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

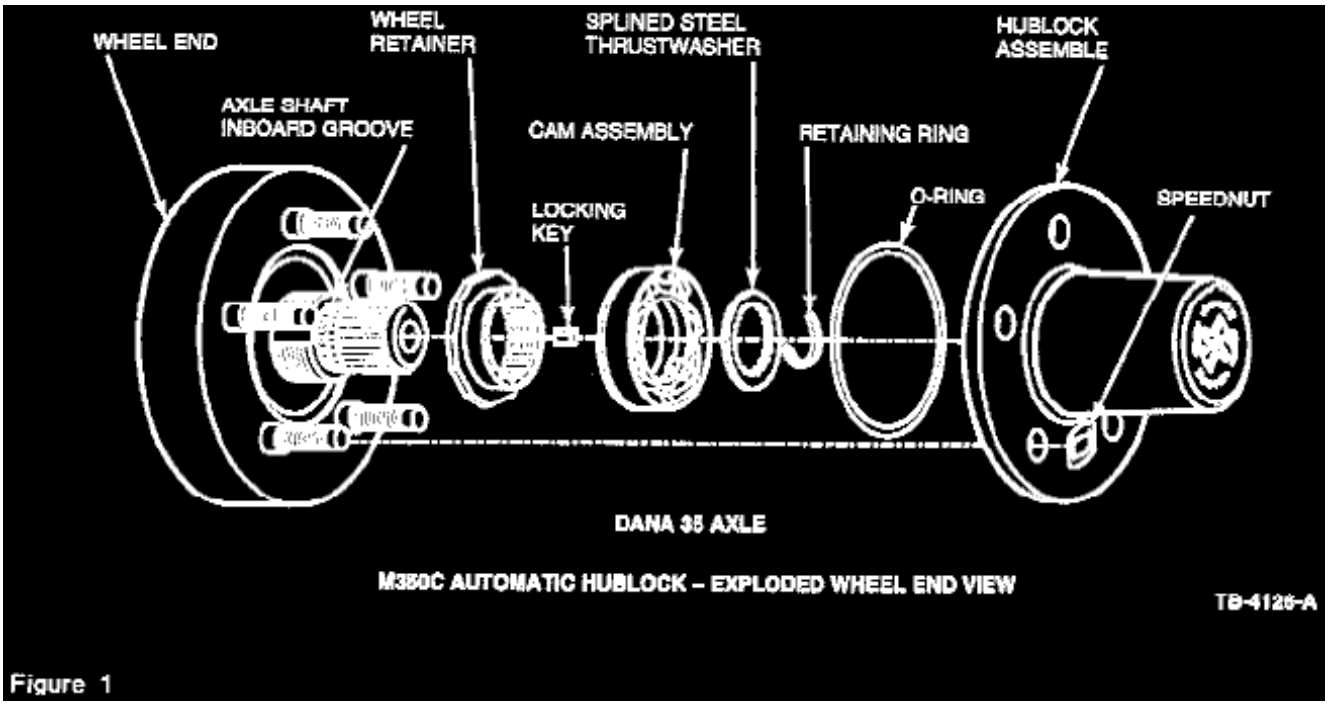


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

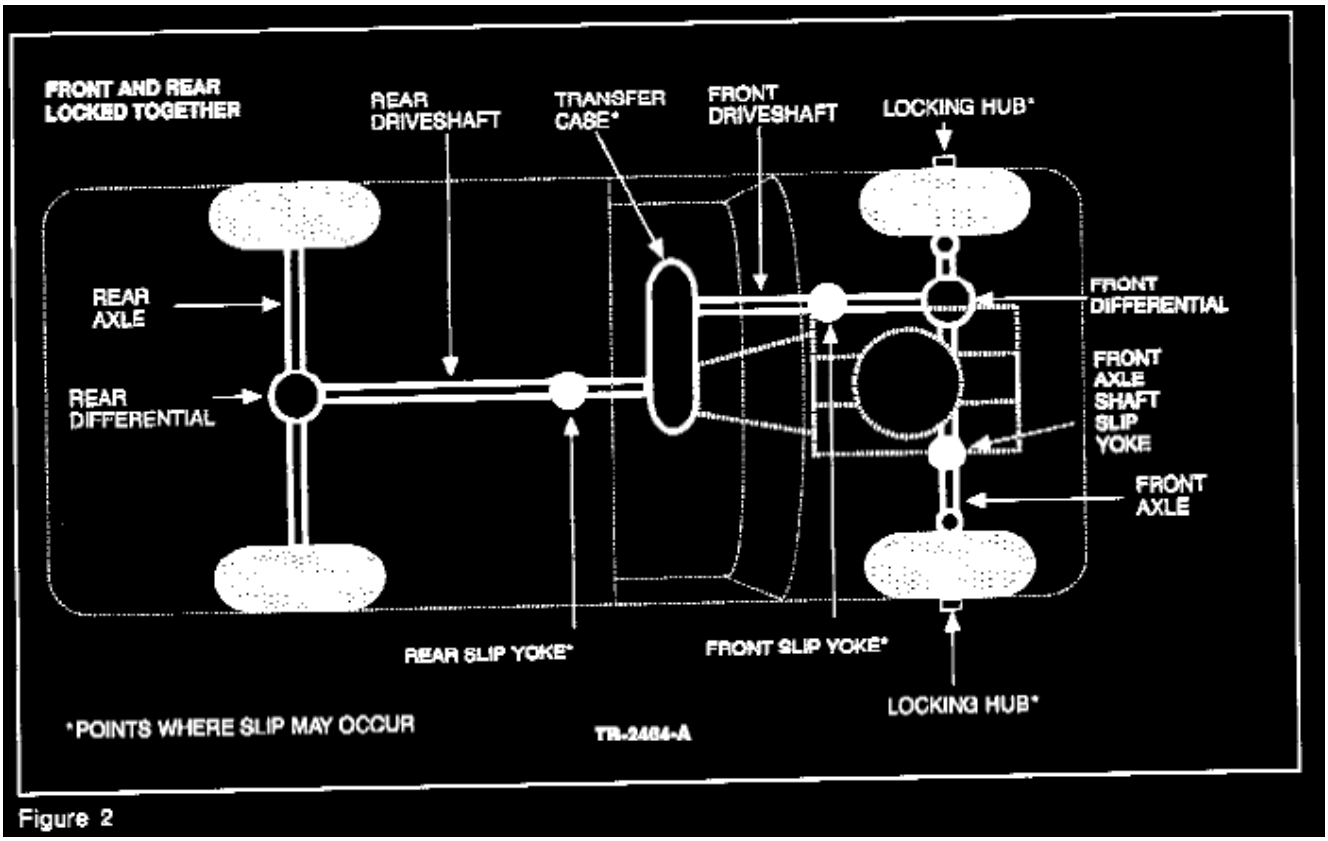


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART

AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

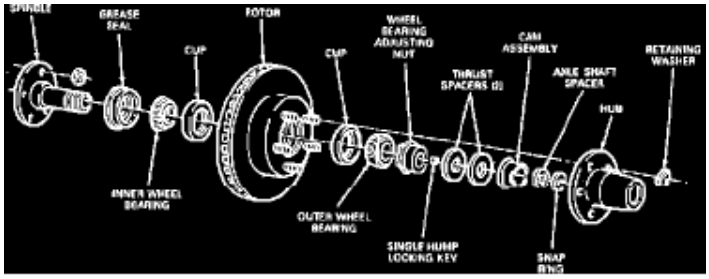
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

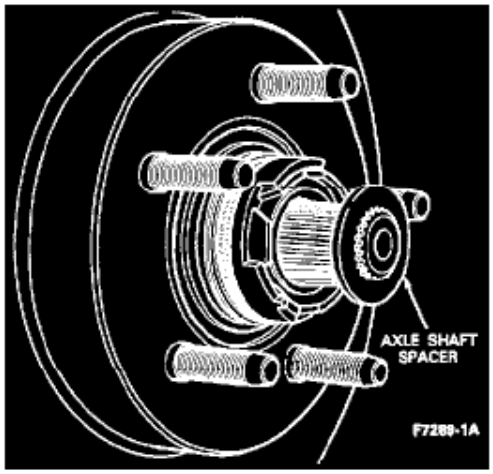
NOTES:

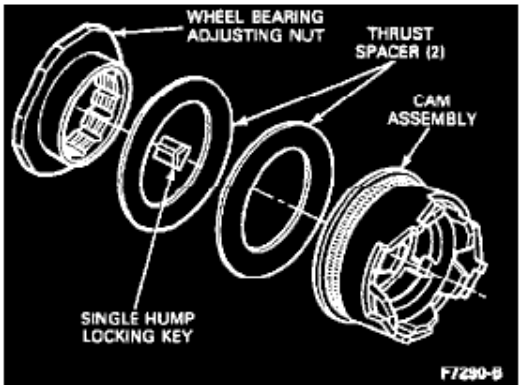
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Drive Axles, Bearings and Joints > Wheel Hub (Locking) > Component Information > Service and Repair > Removal







Wheel Hub (Locking): Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

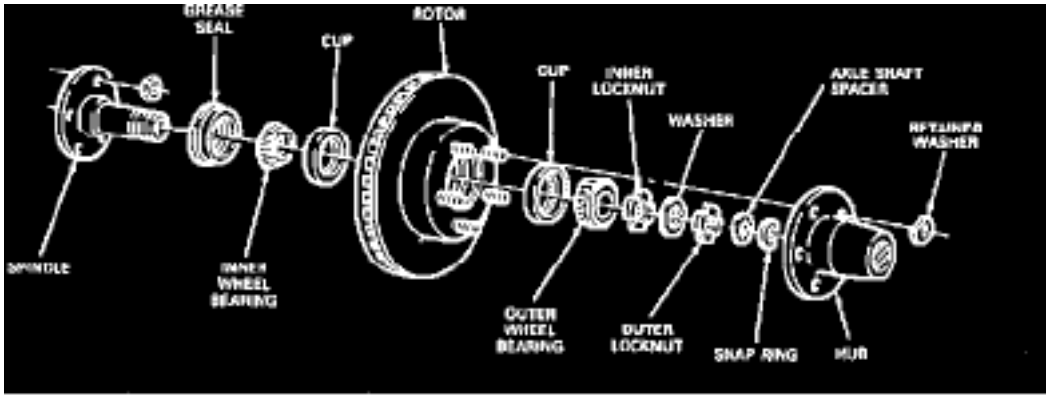
Axle Shaft Spacer

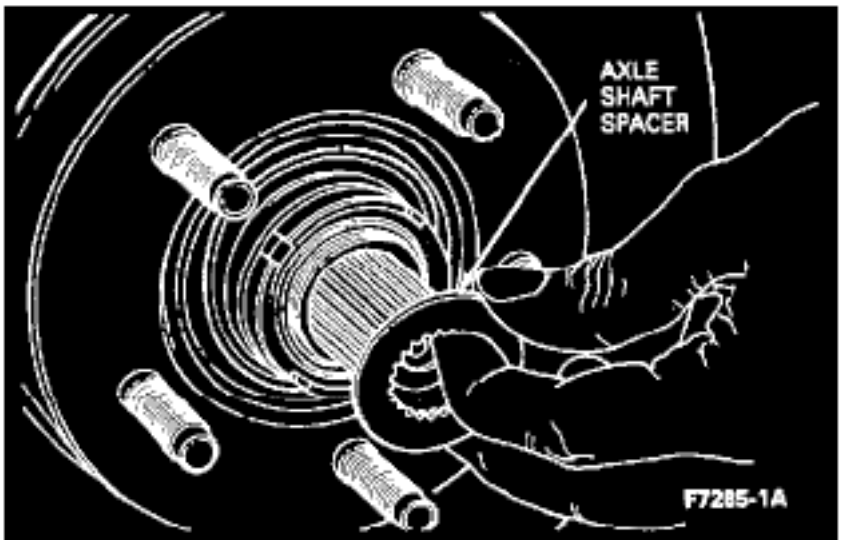
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

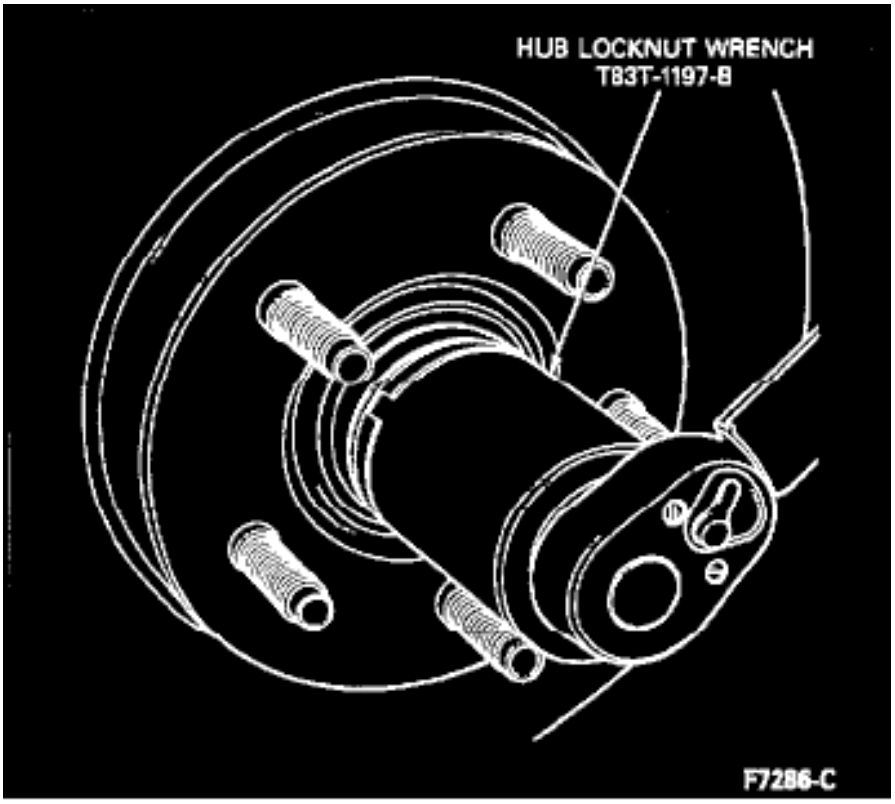
caliper.

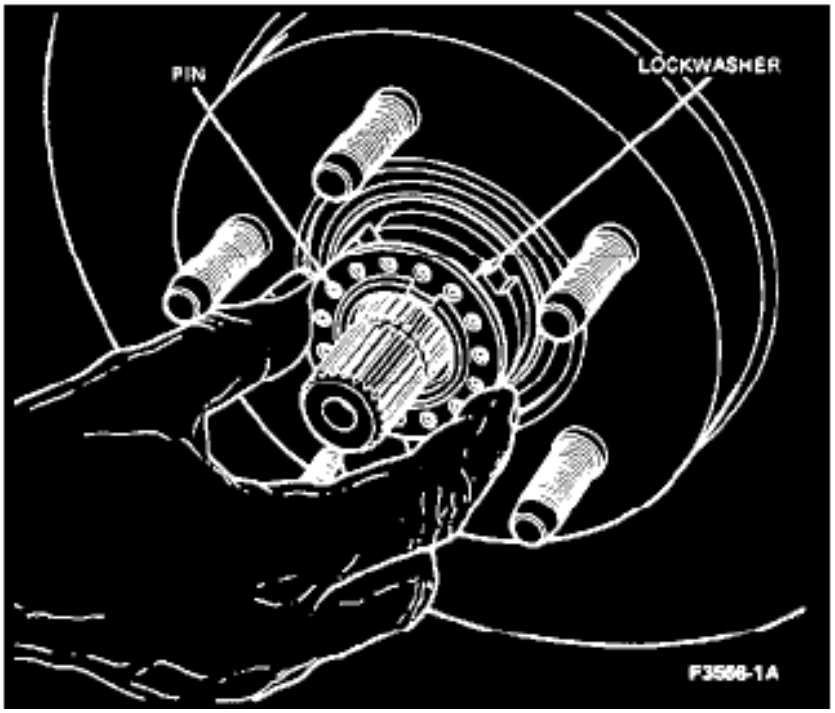
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

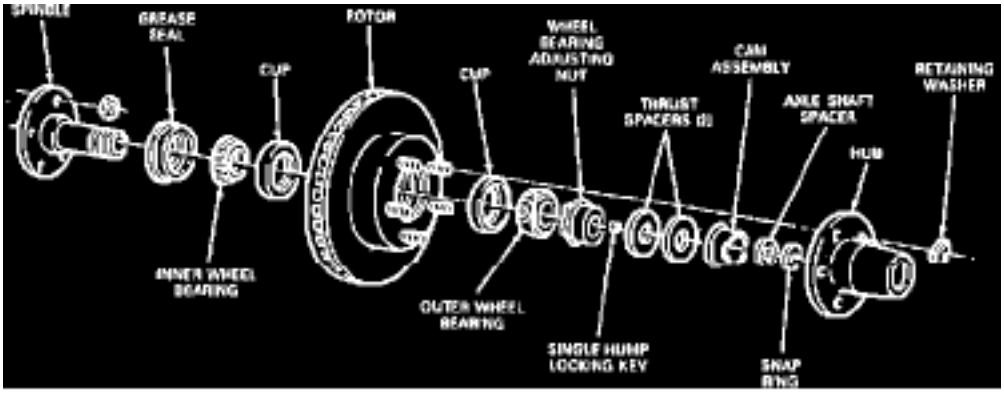

PIN
LOCKWASHER
F3566-1A

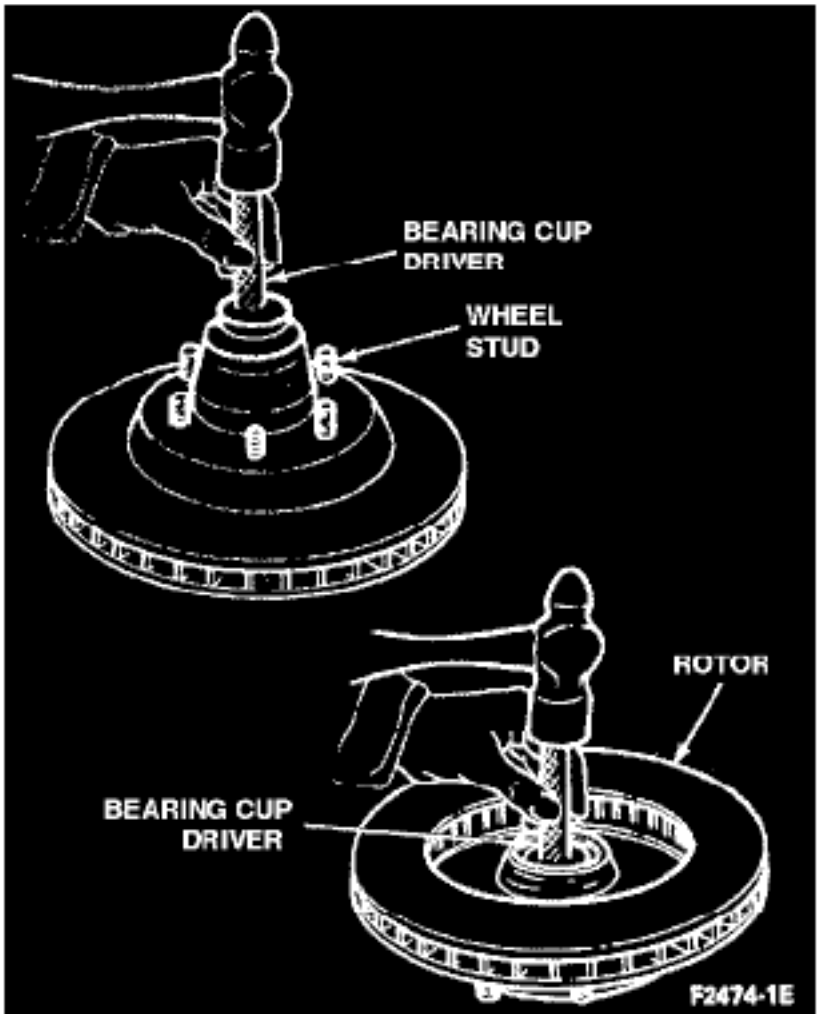
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub (Locking): Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

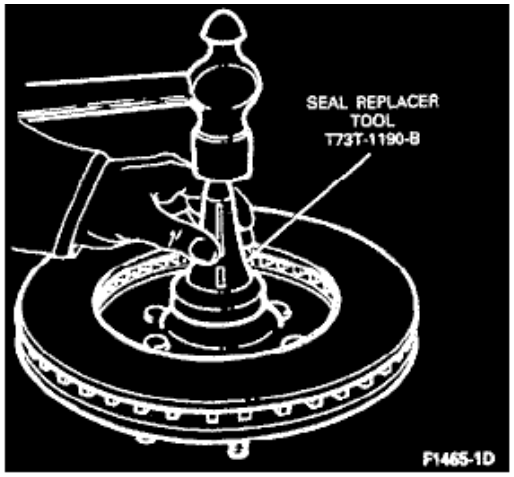
Installing Bearing Cups (Typical)

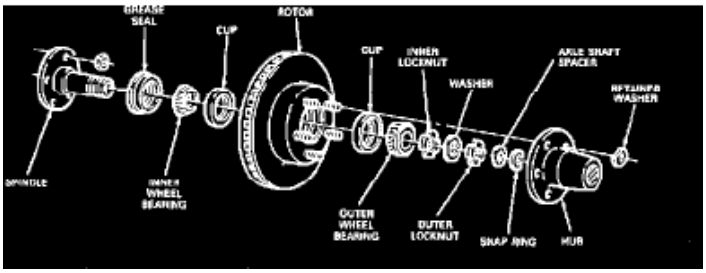
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

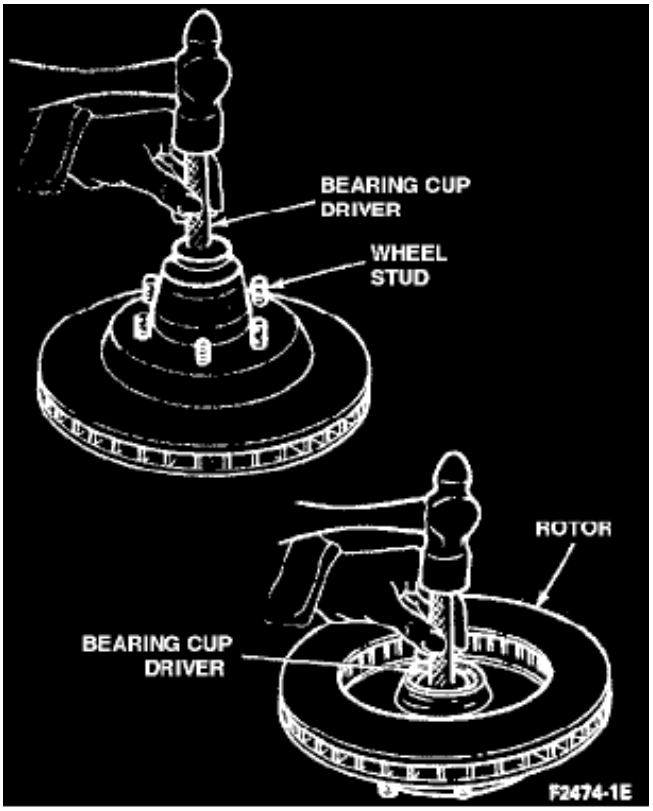
washers.

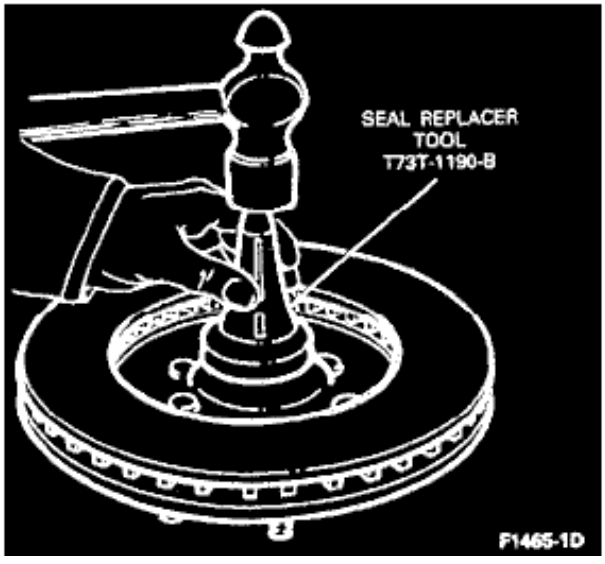
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E


SEAL REPLACER TOOL T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE			
Model Year *	A4LD Trans -4R602-	Mazda R 1 Trans -4R602-	TSB Reference
1989 Models (Excluding Mitsubishi 5-Speed)	E8TZ-U	E9TZ-L	91-13-11
1990 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	F0TZ-F	F0TZ-B	91-13-11
1990-93 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	F37Z-B	F37Z-A	94-2-24
1994 Models			
2.3L Splash 125" WB 4X2	F47Z-DA		
2.3L 125" WB 4X2	F37Z-B		
2.3L 125" WB 4X2		F37Z-A	
3.0L Splash 125" WB 4X2	F47Z-DA		
3.0L 125" WB 4X2	F37Z-B		
3.0L 125" WB 4X4	F37Z-C		
3.0L 125" WB 4X2		F37Z-A	
3.0L 125" WB 4X4		F37Z-C	
4.0L Splash 125" WB 4X2	F47Z-DA		
4.0L 125" WB 4X2	F37Z-B		
4.0L 125" WB 4X4	F37Z-C		
4.0L 125" WB 4X2		F37Z-A	
4.0L 125" WB 4X4		F37Z-C	
*1989 model part numbers are provided for convenience			

Technical Service Bulletin # 97-21-16 Date: 971013

Driveshaft - Boom/Vibration At 20-65 MPH

Article No. 97-21-16

10/13/97

^ NOISE - "BOOM" WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ DRIVESHAFT - "BOOM" VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH)-SUPERCAB MODELS ONLY

LIGHT TRUCK: 1989-97 RANGER

This TSB article is being republished in its entirety to remove mention of build dates in title.

ISSUE: A driveline "boom" or vibration may be experienced when driving 32-105 km/h (20-65 mph) in some vehicles. This may occur because of driveline sensitivity of the vehicle.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1995 Models		
2.3L Splash 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C
1996 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1997 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
2.3L 125" WB 4X2		F77Z-AA
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A

ACTION: Follow the Diagnostic Chart in this TSB article. Install revised design components as required to provide better isolation and improved driveline angles to resolve the concern. Refer to

the following Service Procedure for details.

NOTE:

THE SERVICE REPLACEMENT DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE WILL NOT FIT VEHICLES EQUIPPED WITH A MITSUBISHI MANUAL TRANSMISSION. IF DRIVESHAFT REPLACEMENT IS REQUIRED ON MITSUBISHI EQUIPPED MODELS, REFER TO THE PARTS CATALOG FOR CORRECT APPLICATION.

PARTS BLOCK AND TORQUE SPECIFICATION

Part Number	Part Name	Torque Spec.	Class
390066-S2	Screw - Transmission Mount-To-Crossmember (Pk/2)	103 N•m (76 lb-ft)	S
N605800-S100	Bolt - Center Bearing Bracket-To-Frame	50 N•m (37 lb-ft)	BS
N802594-S56	Frame Cap Bolts	50 N•m (37 lb-ft)	C
N800594-S100	Cap Screws - Driveshaft-to-Rear Axle	100 N•m (74 lb-ft)	AM
N621945-S2	M12-1.75 Nut (Transmission Mount-To-Crossmember) (Pk/4)	103 N•m (76 lb-ft)	RS
N620482-S2	Frame Cap Nuts (Pk/8)	50 N•m (37 lb-ft)	BG
N801673-S2	Nut (Pk/8)	50 N•m (37 lb-ft)	BS
F37Z-6068-A	Transmission Mount	-	A
F37Z-4831-B	Frame - Crossmember Cap	-	C
E8TZ-4R602-U	Driveshaft - 1989 Models With Automatic Transmission	-	B
E9TZ-4R602-L	Driveshaft - 1989 Models With Manual Transmission	-	C
FOTZ-4R602-F	*Driveshaft - 1990 Models With Automatic Transmission - Vehicles Built Before 12/15/89*	-	B
FOTZ-4R602-B	Driveshaft - 1990 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	-	C
F37Z-4R602-A	Driveshaft - 1990-93 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	-	C
F37Z-4R602-B	Driveshaft - 1990-93 Models With Automatic Transmission - Vehicles Built From 12/15/89 Through 3/30/93	-	C

Parts Block

OTHER APPLICABLE ARTICLES: 91-13-11, 93-18-15

SUPERSEDES: 97-20-16

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

For 1992-97 Models, Basic And Powertrain Warranty Coverage For 1989-91 Models

OPERATION DESCRIPTION TIME

972116A Replace Driveshaft 1.3 Hrs.

Assembly, And Replace Center Bearing Crossmember Cap As Outlined

DEALER CODING

CONDITION

BASIC PART NO. CODE

4R602 D9

OASIS CODES: 304000, 509000, 597997, 703000, 703200

Service Procedure

NOTE:

BEFORE DIAGNOSING A 4-WHEEL-DRIVE VEHICLE, MAKE SURE IT IS IN 2WD AND THE FRONT HUBS ARE UNLOCKED.

1. On smooth pavement, drive the vehicle at a constant speed and feel for the "float" condition:

a. This is the narrow, neutral range where the driveline can be said to "float" because neither accel nor decel forces are being applied to the driveline.

b. It is important to accurately identify vehicle behavior in "float" mode because the diagnostic routine to be used will depend on Noise/Vibration/Harshness (NVH) characteristics during float.

c. It may be necessary to drive the vehicle several minutes before the sensation can be clearly identified.

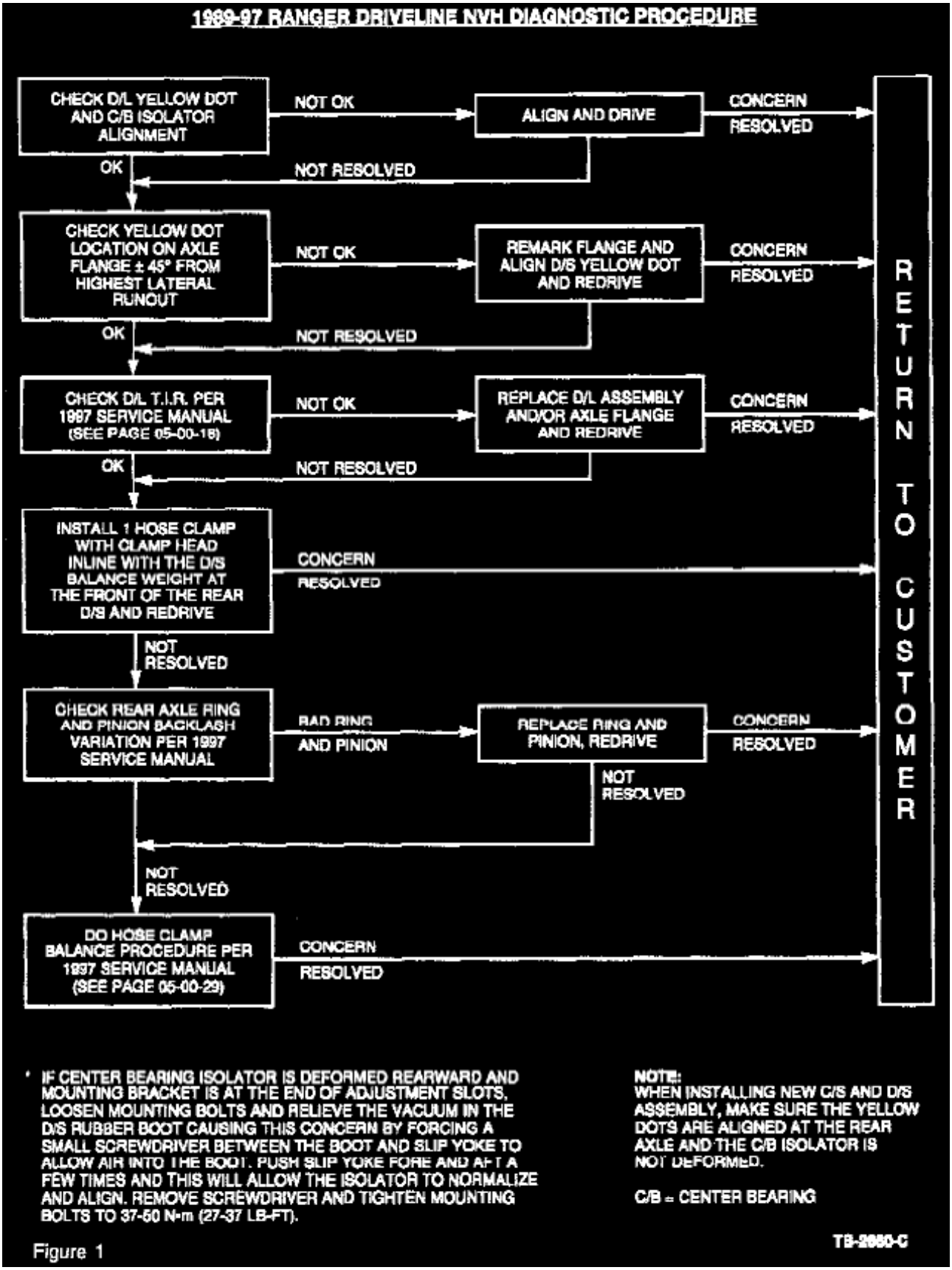


Figure 1

2. Perform the Driveline NVH Diagnostic Procedure shown in Figure 1 BEFORE replacing any components.

Vibration

Vibration, technically, is a high-frequency trembling, shaking or grounding condition, felt or heard, that is constant or variable in level and occurs during a portion of the total operating speed range. The types of vibrations that can be felt in the vehicle can be divided into three groups:

^ Vibrations of various unbalanced rotating parts of the vehicle

^ Body and frame vibrations excited by the powertrain, wind or road inputs

^ Tip-in moans or resonance vibrations from stressed engine or exhaust system mounts

If vibration is gone, check the front driveshaft, transfer case, front axle, or halfshafts for loose components. Refer to the 1997 Ranger Service Manual, Section 05-03B, for details.

NOTE:

DRIVING A 4-WHEEL-DRIVE VEHICLE WITH THE REAR DRIVESHAFT REMOVED FURTHER CONFIRMS ANY VIBRATION CONCERNS WITH THE FRONT DRIVE SYSTEM.

These vehicle vibrations can also be subdivided into those that occur at low speeds and those that are most noticeable at higher speeds. Since the dividing line between low and higher speed vibrations is not clear, there will be vibrations that overlap the two ranges.

Typical Low Speed Vibrations (less than 72 km/h (45 mph))

^ Exhaust vibration

^ Engine harshness

^ Driveline vibration due to improper driveline angles

^ Power steering pump disturbances

^ Air conditioner compressor or drive belt vibrations

^ Takeoff shudder (clutch or driveline problems)

^ Brake roughness or harshness

^ Driveline roughness

^ Clutch torsion vibration

^ Driveline slip-yoke or U-joints

Typical High Speed Vibrations (above than 72 km/h (45 mph))

^ Axle and companion flange runout or imbalance

^ Driveshaft imbalance

^ Excessive tire-wheel and drum assembly imbalance

^ Tire roughness due to high non-uniformity (force variation) or out-of-balance condition

^ Rear axle pinion gear pitch line runout

^ Excessive tire and wheel run out

^ Worn suspension components

^ Front end accessory vibrations

^ Exhaust vibration - Exhaust vibration is greatly reduced in Ranger exhaust systems de-coupled by a flexible coupling and mounted with blade and block hangers

Driveshaft Vibrates

1. Road test vehicle to determine critical vibration points. Note road speed, engine rpm and shift lever positions at which vibration occurs.

2. Stop vehicle and run engine with clutch depressed (automatic transmission in Neutral) through critical speed ranges determined in Step 1 of Driveshaft Vibrates.

3. If vibration is gone, the driveshaft must be balanced as described in the 1997 Ranger Service Manual, Page 05-00-29.

Component Test

Driveline Vibration

^ Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake

^ Driveline vibration is directly related to the speed of the vehicle and is usually noticed at speeds of 72 km/h (45 mph) or higher

^ Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum or boom

^ Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. If the vibration is

particularly noticeable during acceleration or deceleration, especially at lower speeds, then driveline angle should be checked

^ Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jackstands, though the brakes may need to be applied lightly in order to simulate road resistance. Refer to the 1997 Ranger Service Manual, Page 05-00-15, Steps 1-10

Driveshaft Runout and Balance

Vibration or shudder which is noticeable either on fast acceleration, when coasting, or when using the engine for braking, may be caused by the rear axle housing being loose on the rear suspension, improper tire balance, improper driveline installation, or driveline balance.

If driveshaft components are replaced and shaft vibration is encountered after installation, disconnect and remove the driveshaft. Rotate the rear axle companion flange 180 degrees; then, reconnect the driveshaft to the driveshaft slip-yoke and reinstall in vehicle. If the vibration persists, disconnect the driveshaft at the rear axle companion flange. Rotate the rear axle companion flange 180 degrees and reconnect the driveshaft to the rear axle companion flange.

If rotating the driveshaft 180 degrees does not eliminate vibration, the driveshaft may be balanced by referring to the 1997 Ranger Service Manual, Page 05-00-29, Steps 1-9, for details.

Slip-Yoke Spline

Vehicle noise and vibration can be caused by a seized driveshaft slip-yoke spline. The service resolution to minimize driveshaft slip-yoke spline contamination and ultimate seizure can be found in the 1997 Ranger Service Manual, Page 05-00-32, Steps 1-11.

Driveline Angularity

Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height (rear spring) and engine mounts.

Low speed vibration, less than 72 km/h (45 mph), especially when the vehicle is subjected to heavy acceleration or deceleration, is an indication of improper driveline angles. When these conditions exist, check the universal joints for proper seating, mounting and operation.

Center Bearing, Supercab 4X2 and 4X4

1. Unbolt the center bearing mount and spin the bearing. If bearing does not rotate freely it must be replaced.

2. Inspect the rubber insulator for evidence of hardening, cracking or deterioration before removing shaft. Replace if damaged. Refer to the 1997 Ranger Workshop Manual, Pages 05-01-14 and -15, for center bearing and rubber insulator service.

NOTE:

IF DRIVESHAFT AND COUPLING SHAFT ARE REMOVED, MAKE SURE THE YOKE IS REINSTALLED ON THE COUPLING SHAFT IN THE SAME ORIENTATION AS IT WAS ORIGINALLY INSTALLED. THE ORIENTATION IS CRITICAL SO THAT PROPER DRIVESHAFT BALANCE AND UNIVERSAL JOINT PHASING IS MAINTAINED. TORQUE THE ATTACHING NUT TO 136-163 N.m (100-120 LB-FT).

NOTE:

THE DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE ARE THE MOST RECENT RELEASED FOR SERVICE. REFER TO OTHER TSB ARTICLES LISTED FOR 1993 AND PRIOR MODELS.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE			
Model Year *	A4LD Trans -4R602-	Mazda R 1 Trans -4R602-	TSB Reference
1989 Models (Excluding Mitsubishi 5-Speed)	E8TZ-U	E9TZ-L	91-13-11
1990 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	F0TZ-F	F0TZ-B	91-13-11
1990-93 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	F37Z-B	F37Z-A	94-2-24
1994 Models			
2.3L Splash 125" WB 4X2	F47Z-DA		
2.3L 125" WB 4X2	F37Z-B		
2.3L 125" WB 4X2		F37Z-A	
3.0L Splash 125" WB 4X2	F47Z-DA		
3.0L 125" WB 4X2	F37Z-B		
3.0L 125" WB 4X4	F37Z-C		
3.0L 125" WB 4X2		F37Z-A	
3.0L 125" WB 4X4		F37Z-C	
4.0L Splash 125" WB 4X2	F47Z-DA		
4.0L 125" WB 4X2	F37Z-B		
4.0L 125" WB 4X4	F37Z-C		
4.0L 125" WB 4X2		F37Z-A	
4.0L 125" WB 4X4		F37Z-C	
*1989 model part numbers are provided for convenience			

Technical Service Bulletin # 97-21-16 Date: 971013

Driveshaft - Boom/Vibration At 20-65 MPH

Article No. 97-21-16

10/13/97

^ NOISE - "BOOM" WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ DRIVESHAFT - "BOOM" VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH)-SUPERCAB MODELS ONLY

LIGHT TRUCK: 1989-97 RANGER

This TSB article is being republished in its entirety to remove mention of build dates in title.

ISSUE: A driveline "boom" or vibration may be experienced when driving 32-105 km/h (20-65 mph) in some vehicles. This may occur because of driveline sensitivity of the vehicle.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1995 Models		
2.3L Splash 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C
1996 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1997 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
2.3L 125" WB 4X2		F77Z-AA
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A

ACTION: Follow the Diagnostic Chart in this TSB article. Install revised design components as required to provide better isolation and improved driveline angles to resolve the concern. Refer to

the following Service Procedure for details.

NOTE:

THE SERVICE REPLACEMENT DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE WILL NOT FIT VEHICLES EQUIPPED WITH A MITSUBISHI MANUAL TRANSMISSION. IF DRIVESHAFT REPLACEMENT IS REQUIRED ON MITSUBISHI EQUIPPED MODELS, REFER TO THE PARTS CATALOG FOR CORRECT APPLICATION.

PARTS BLOCK AND TORQUE SPECIFICATION

Part Number	Part Name	Torque Spec.	Class
390066-S2	Screw - Transmission Mount-To-Crossmember (Pk/2)	103 N•m (76 lb-ft)	S
N605800-S100	Bolt - Center Bearing Bracket-To-Frame	50 N•m (37 lb-ft)	BS
N802594-S56	Frame Cap Bolts	50 N•m (37 lb-ft)	C
N800594-S100	Cap Screws - Driveshaft-to-Rear Axle	100 N•m (74 lb-ft)	AM
N621945-S2	M12-1.75 Nut (Transmission Mount-To-Crossmember) (Pk/4)	103 N•m (76 lb-ft)	RS
N620482-S2	Frame Cap Nuts (Pk/8)	50 N•m (37 lb-ft)	BG
N801673-S2	Nut (Pk/8)	50 N•m (37 lb-ft)	BS
F37Z-6068-A	Transmission Mount	-	A
F37Z-4831-B	Frame - Crossmember Cap	-	C
E8TZ-4R602-U	Driveshaft - 1989 Models With Automatic Transmission	-	B
E9TZ-4R602-L	Driveshaft - 1989 Models With Manual Transmission	-	C
FOTZ-4R602-F	*Driveshaft - 1990 Models With Automatic Transmission - Vehicles Built Before 12/15/89*	-	B
FOTZ-4R602-B	Driveshaft - 1990 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	-	C
F37Z-4R602-A	Driveshaft - 1990-93 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	-	C
F37Z-4R602-B	Driveshaft - 1990-93 Models With Automatic Transmission - Vehicles Built From 12/15/89 Through 3/30/93	-	C

Parts Block

OTHER APPLICABLE ARTICLES: 91-13-11, 93-18-15

SUPERSEDES: 97-20-16

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

For 1992-97 Models, Basic And Powertrain Warranty Coverage For 1989-91 Models

OPERATION DESCRIPTION TIME

972116A Replace Driveshaft 1.3 Hrs.

Assembly, And Replace Center Bearing Crossmember Cap As Outlined

DEALER CODING

CONDITION

BASIC PART NO. CODE

4R602 D9

OASIS CODES: 304000, 509000, 597997, 703000, 703200

Service Procedure

NOTE:

BEFORE DIAGNOSING A 4-WHEEL-DRIVE VEHICLE, MAKE SURE IT IS IN 2WD AND THE FRONT HUBS ARE UNLOCKED.

1. On smooth pavement, drive the vehicle at a constant speed and feel for the "float" condition:

a. This is the narrow, neutral range where the driveline can be said to "float" because neither accel nor decel forces are being applied to the driveline.

b. It is important to accurately identify vehicle behavior in "float" mode because the diagnostic routine to be used will depend on Noise/Vibration/Harshness (NVH) characteristics during float.

c. It may be necessary to drive the vehicle several minutes before the sensation can be clearly identified.

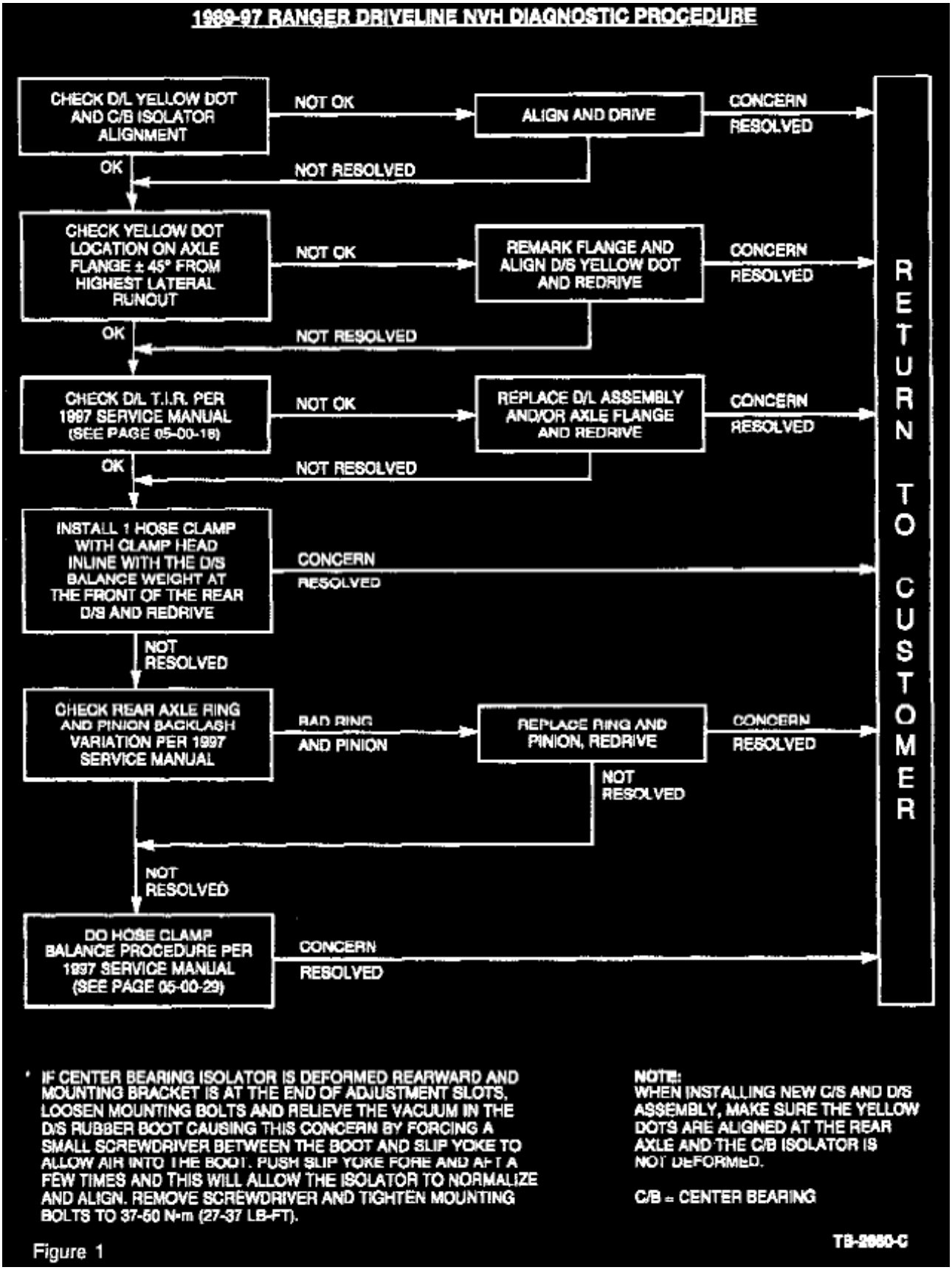


Figure 1

2. Perform the Driveline NVH Diagnostic Procedure shown in Figure 1 BEFORE replacing any components.

Vibration

Vibration, technically, is a high-frequency trembling, shaking or grounding condition, felt or heard, that is constant or variable in level and occurs during a portion of the total operating speed range. The types of vibrations that can be felt in the vehicle can be divided into three groups:

^ Vibrations of various unbalanced rotating parts of the vehicle

^ Body and frame vibrations excited by the powertrain, wind or road inputs

^ Tip-in moans or resonance vibrations from stressed engine or exhaust system mounts

If vibration is gone, check the front driveshaft, transfer case, front axle, or halfshafts for loose components. Refer to the 1997 Ranger Service Manual, Section 05-03B, for details.

NOTE:

DRIVING A 4-WHEEL-DRIVE VEHICLE WITH THE REAR DRIVESHAFT REMOVED FURTHER CONFIRMS ANY VIBRATION CONCERNS WITH THE FRONT DRIVE SYSTEM.

These vehicle vibrations can also be subdivided into those that occur at low speeds and those that are most noticeable at higher speeds. Since the dividing line between low and higher speed vibrations is not clear, there will be vibrations that overlap the two ranges.

Typical Low Speed Vibrations (less than 72 km/h (45 mph))

^ Exhaust vibration

^ Engine harshness

^ Driveline vibration due to improper driveline angles

^ Power steering pump disturbances

^ Air conditioner compressor or drive belt vibrations

^ Takeoff shudder (clutch or driveline problems)

^ Brake roughness or harshness

^ Driveline roughness

^ Clutch torsion vibration

^ Driveline slip-yoke or U-joints

Typical High Speed Vibrations (above than 72 km/h (45 mph))

^ Axle and companion flange runout or imbalance

^ Driveshaft imbalance

^ Excessive tire-wheel and drum assembly imbalance

^ Tire roughness due to high non-uniformity (force variation) or out-of-balance condition

^ Rear axle pinion gear pitch line runout

^ Excessive tire and wheel run out

^ Worn suspension components

^ Front end accessory vibrations

^ Exhaust vibration - Exhaust vibration is greatly reduced in Ranger exhaust systems de-coupled by a flexible coupling and mounted with blade and block hangers

Driveshaft Vibrates

1. Road test vehicle to determine critical vibration points. Note road speed, engine rpm and shift lever positions at which vibration occurs.

2. Stop vehicle and run engine with clutch depressed (automatic transmission in Neutral) through critical speed ranges determined in Step 1 of Driveshaft Vibrates.

3. If vibration is gone, the driveshaft must be balanced as described in the 1997 Ranger Service Manual, Page 05-00-29.

Component Test

Driveline Vibration

^ Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake

^ Driveline vibration is directly related to the speed of the vehicle and is usually noticed at speeds of 72 km/h (45 mph) or higher

^ Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum or boom

^ Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. If the vibration is

particularly noticeable during acceleration or deceleration, especially at lower speeds, then driveline angle should be checked

^ Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jackstands, though the brakes may need to be applied lightly in order to simulate road resistance. Refer to the 1997 Ranger Service Manual, Page 05-00-15, Steps 1-10

Driveshaft Runout and Balance

Vibration or shudder which is noticeable either on fast acceleration, when coasting, or when using the engine for braking, may be caused by the rear axle housing being loose on the rear suspension, improper tire balance, improper driveline installation, or driveline balance.

If driveshaft components are replaced and shaft vibration is encountered after installation, disconnect and remove the driveshaft. Rotate the rear axle companion flange 180 degrees; then, reconnect the driveshaft to the driveshaft slip-yoke and reinstall in vehicle. If the vibration persists, disconnect the driveshaft at the rear axle companion flange. Rotate the rear axle companion flange 180 degrees and reconnect the driveshaft to the rear axle companion flange.

If rotating the driveshaft 180 degrees does not eliminate vibration, the driveshaft may be balanced by referring to the 1997 Ranger Service Manual, Page 05-00-29, Steps 1-9, for details.

Slip-Yoke Spline

Vehicle noise and vibration can be caused by a seized driveshaft slip-yoke spline. The service resolution to minimize driveshaft slip-yoke spline contamination and ultimate seizure can be found in the 1997 Ranger Service Manual, Page 05-00-32, Steps 1-11.

Driveline Angularity

Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height (rear spring) and engine mounts.

Low speed vibration, less than 72 km/h (45 mph), especially when the vehicle is subjected to heavy acceleration or deceleration, is an indication of improper driveline angles. When these conditions exist, check the universal joints for proper seating, mounting and operation.

Center Bearing, Supercab 4X2 and 4X4

1. Unbolt the center bearing mount and spin the bearing. If bearing does not rotate freely it must be replaced.

2. Inspect the rubber insulator for evidence of hardening, cracking or deterioration before removing shaft. Replace if damaged. Refer to the 1997 Ranger Workshop Manual, Pages 05-01-14 and -15, for center bearing and rubber insulator service.

NOTE:

IF DRIVESHAFT AND COUPLING SHAFT ARE REMOVED, MAKE SURE THE YOKE IS REINSTALLED ON THE COUPLING SHAFT IN THE SAME ORIENTATION AS IT WAS ORIGINALLY INSTALLED. THE ORIENTATION IS CRITICAL SO THAT PROPER DRIVESHAFT BALANCE AND UNIVERSAL JOINT PHASING IS MAINTAINED. TORQUE THE ATTACHING NUT TO 136-163 N.m (100-120 LB-FT).

NOTE:

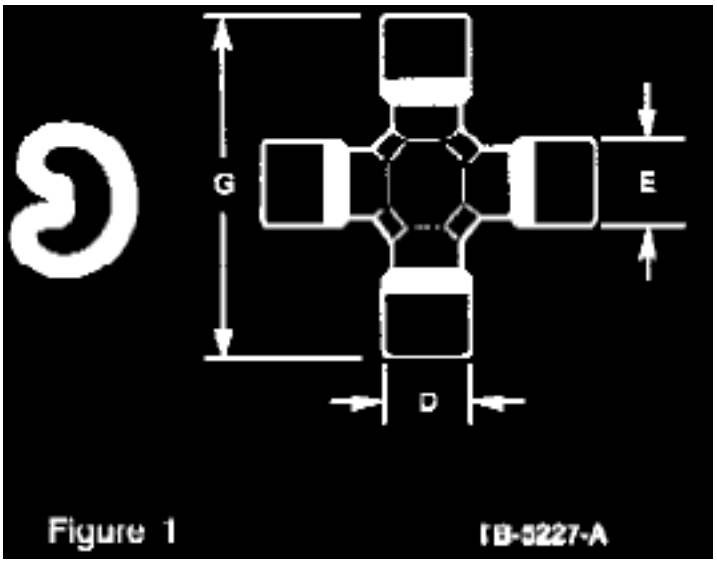
THE DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE ARE THE MOST RECENT RELEASED FOR SERVICE. REFER TO OTHER TSB ARTICLES LISTED FOR 1993 AND PRIOR MODELS.

Propeller Shaft: Service and Repair

1. Remove nuts and U-bolts securing front driveshaft to front drive axle.

2. Remove U-joint assembly from axle yoke, then slide the splined yoke assembly out of transfer case front output shaft and remove driveshaft assembly.

3. Reverse procedure to install. Tighten attaching nuts to specifications.



Universal Joint: Technical Service Bulletins Universal Joint - Greasable Design Availability

Article No. 97-20-15

09/29/97

^ DRIVESHAFT - U-JOINT - AVAILABILITY OF GREASEABLE SERVICE PARTS

^ DRIVESHAFT - U-JOINT - IDENTIFICATION OF SERVICE PARTS BY MEASUREMENT

^ DRIVESHAFT - U-JOINTS - IDENTIFICATION OF SERVICE PARTS BY MEASUREMENT

LIGHT TRUCK: 1990-96 BRONCO 1990-97 AEROSTAR, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-97 EXPLORER 1997 EXPEDITION, MOUNTAINEER

ISSUE: Available U-joints for driveshaft service are not always identifiable through model application charts. Some customers may request greaseable U-joints as a personal preference.

ACTION: Refer to the following Service Information for availability of U-joint with grease fittings.

SERVICE INFORMATION

TO IDENTIFY U-JOINT BY MEASUREMENT:

1. Remove the old U-joint.

2. Measure U-joint using the following measuring procedure.

a. Remove bearing cups.

b. Remove excess grease from bottom of bearing cups and trunnions.

c. Remove seals from bearing cups and trunnions.

d. Reinstall bearing cups on trunnions.

e. Measure as follows, permitting a tolerance of 10.005" at Dimension "G" in Figure 1 with Dimension "D" and "E" at 10.003".

Outside Snap Ring Style (Figure 1)

A) Measure "G" dimension and record.

B) Measure "D" dimension and record.

C) Measure "E" dimension and record,

CROSS-REFERENCE CHART: WITH OR WITHOUT GREASE FITTINGS

	Ford Service Part Number	
Industry Standard Sizing	U-Joint Without Grease Fitting	U-Joint With Grease Fitting
1210 Standard	—	E3TZ-4635-B
1310 Standard	F1TZ-4635-C	C3AZ-4635-J
1310 With 1-1/8" Bearing Cups	F2TZ-4635-A	C3AZ-4635-K
1330 Standard	F2TZ-4635-B	C3AZ 4635 L
1330 With 1-1/8" Bearing Cups	F2TZ-4635-C	C3AZ-4635-M
1350 Standard	F3TZ-4635-A	B5TZ-4635-A
1410 Standard	F2TZ-4635-E	B6TZ-4635-B

U-JOINT IDENTIFICATION BY MEASUREMENT

		U-Joint Dimensions		
Industry Standard Sizing	Ford U-Joint Part Number Without Grease Fitting	Outside Snap Ring Dimension "G"	Bearing Diameter "D"	Bearing Diameter "E"
1210 Standard	—	2.438"	1.063"	1.063"
1310 Standard	F1TZ-4635-C	3.218"	1.063"	1.063"
1310 With Two (2) Standard Cups And Two (2) 1-1/8" Bearing Cups (non-square)	F2TZ-4635-A	3.218"	1.063"	1.125"
1330 Standard	F2TZ-4635-B	3.625"	1.063"	1.063"
1330 With Two (2) Standard Cups And Two (2) 1-1/8" Bearing Cups (non-square)	F2TZ-4635-C	3.625"	1.063"	1.125"
1350 Standard	F3TZ 4635 A	3.622"	1.188"	1.188"
1410 Standard	F2TZ-4635-E	4.187"	1.188"	1.188"

3. Identify U-joint part number using reference dimensions in the Light Truck Cross Reference Chart found at the end of this TSB article.

TO IDENTIFY GREASEABLE U-JOINT FOR SERVICE:

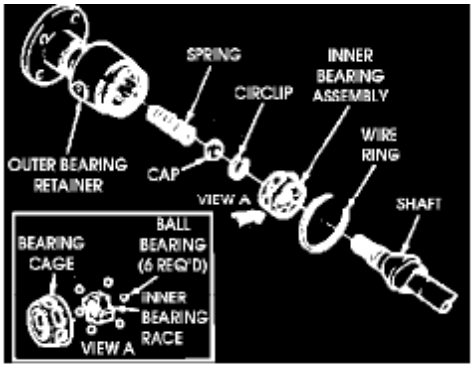
For customers who demand greaseable U-joints due to their specific vehicle duty cycle, refer to Light Truck Cross Reference Chart found at the end of this TSB article.

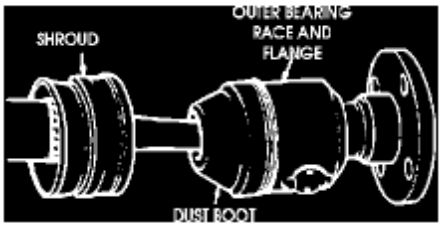
Greaseable U-joints are typically recommended only for vehicles which operate 100% of the time in a high grit environment (e.g., coal mines).

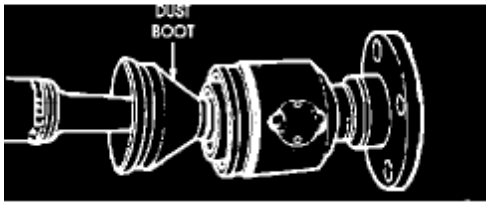
NOTE:

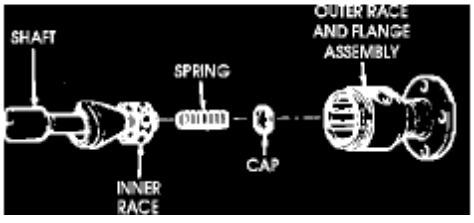
GREASEABLE U-JOINTS DO NOT CONTAIN END PLAY THRUST WASHERS AND MAY CAUSE NOISE/VIBRATION/HARSHNESS (NVH) CONCERNS ON CERTAIN APPLICATIONS.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 509000, 590000, 597997


SPRING
INNER BEARING ASSEMBLY
CIRCLIP
WIRE RING
OUTER BEARING RETAINER
CAP
VIEW A
SHAFT
BEARING CAGE
BALL BEARING (6 REQ'D)
INNER BEARING RACE
VIEW A


SHROUD
OUTER BEARING RACE AND FLANGE
DUST BOOT


DUST BOOT


SHAFT
SPRING
OUTER RACE AND FLANGE ASSEMBLY
CAP
INNER RACE

Universal Joint: Service and Repair Constant Velocity Type

Fig. 7 Constant Velosity Joint

The CV type joint, Fig. 7, incorporates an outer bearing retainer and flange, spring, cap, circlip, inner bearing assembly and a wire ring. The inner bearing assembly incorporates a bearing cage, six ball bearings and an inner race.

DISASSEMBLY

1. Remove clamp retaining shroud to outer bearing race and flange assembly.

Fig. 8 Removing Shroud

2. Remove shroud taking care not to damage dust boot or outer bearing race and flange assembly, Fig. 8. It may be necessary to tap shroud using a plastic hammer.

Fig. 9 Positioning Dust Boot

3. Peel dust boot upward, Fig. 9, and away from outer bearing race and flange assembly.

4. Using a suitable screwdriver, remove wire ring that retains the inner race to outer race.

Fig. 10 Removing Inner Race from Outer Race

5. Remove inner race and shaft assembly from outer race and flange assembly, Fig. 10, then cap and spring from inside the outer retainer.

6. Using suitable snap ring pliers, remove circlip retaining the inner race assembly to shaft, then inner race assembly. Discard circlip.

7. If necessary, remove clamp retaining boot to shaft, then boot.

8. Using a suitable screwdriver, pry ball bearings from cage. Do not scratch or damage cage, race or ball bearings.

9. Rotate inner race to align it with cage windows, then remove inner race through wider end of cage.

ASSEMBLY

Individual components are not available for service. Therefore, if inspection determines component replacement, the entire CV joint must be replaced as an assembly.

1. Install inner bearing race in bearing cage with counterbore facing large end of cage.

2. Push race to top of cage, then rotate race until ball slots are aligned with windows. This will lock race to top of cage.

3. Install ball bearings.

4. If removed, install dust boot on shaft using a new clamp.

5. Install inner bearing assembly on shaft, then the circlip.

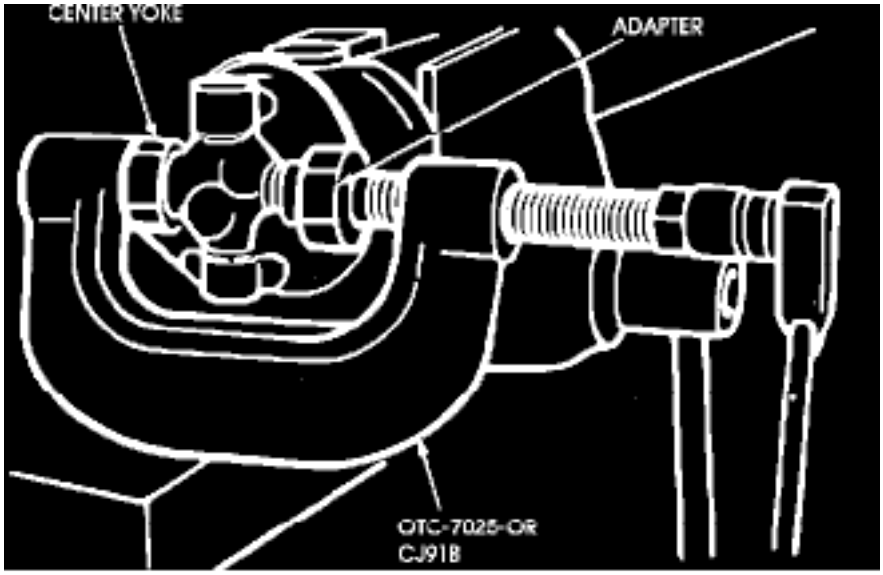
6. Install spring and cap in outer bearing retainer and flange, then fill outer bearing retainer with suitable grease.

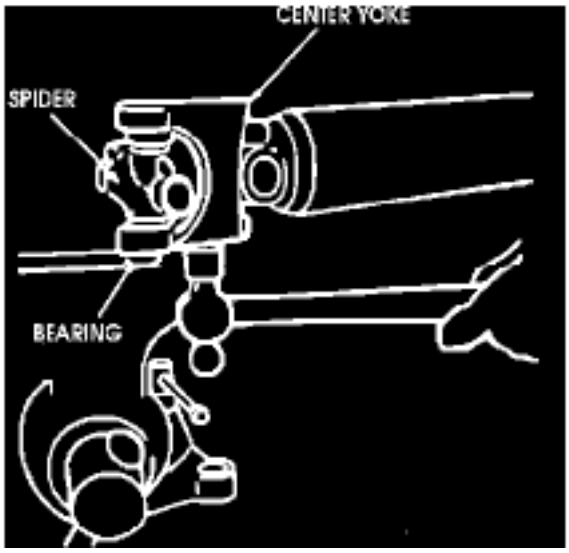
7. Install inner race and shaft assembly in the outer bearing retainer and flange, then push inner race down and install wire ring.

8. Fill top of outer bearing retainer with suitable grease. Remove excess grease from external surfaces.

9. Pull dust boot over retainer until boot is seated in groove. Insert a suitable screwdriver blade between boot and outer bearing retainer to allow trapped air to escape from boot.

10. Install shroud over boot and retainer, then clamp in position.





Universal Joint: Service and Repair Cross & Roller Type

With Replacement Tool

Disassembly

1. Place driveshaft in a vise using care to avoid damaging it.

2. Remove bearing retaining snap rings. Some universal joints use injected nylon retainers in place of snap rings. During servicing, the snap rings supplied with the replacement universal joint assembly must be used.

Fig. 4 Removing Bearing Caps Using Tool And Adapter

Fig. 5 Removing Bearing Cap By Holding In A Vice And Striking Center Yoke With Hammer

3. Position tool on shaft and press bearing out of yoke, Fig. 4. If bearing cannot be pressed all the way out, remove it using vise grips or channel lock pliers or position driveshaft as shown and strike center yoke with hammer, Fig. 5. Mark yoke and shaft to make sure they will be reassembled in their same relative positions.

4. Reposition tool so that it presses on the spider in order to press other bearing from opposite side of flange.

5. If used, remove flange from spider.

Assembly

1. Start new bearing into yoke, then position spider into yoke and press bearing until it is 1/4 inch below surface.

2. Remove tool and install a new snap ring.

3. Start new bearing in opposite side of yoke, then install tool and press on bearing until opposite bearing contacts snap ring.

4. Remove tool and install remaining snap ring.

Without Replacement Tool

Disassembly

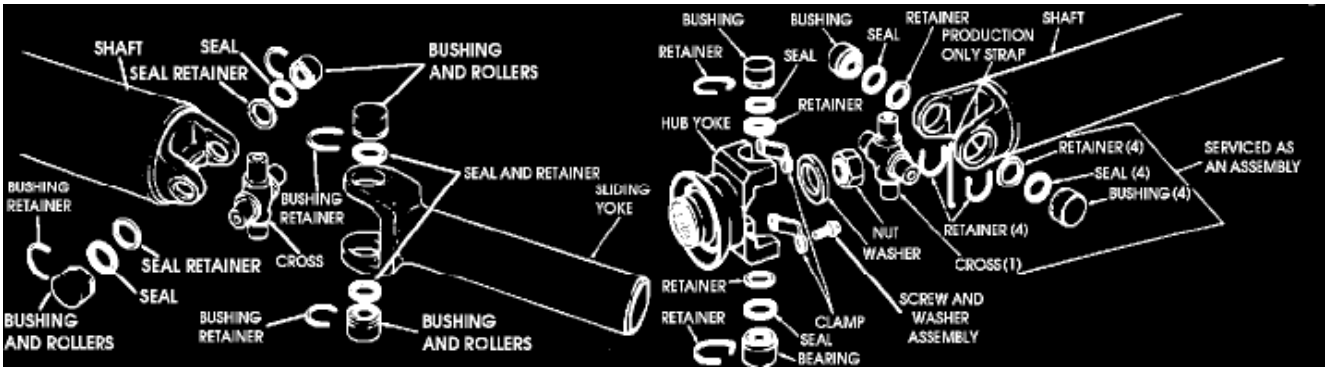


Fig. 3 Cross And Roller Type Universal Joint

1. Remove snap rings (or retainer plates) that retain bearings in yoke and driveshaft Fig. 3

2. Place U-joint in a vise.

3. Select a wrench socket with an outside diameter slightly smaller than the U-joint bearings. Select another wrench socket with an inside diameter slightly larger than the U-joint bearings.

4. Place the sockets at opposite bearings in the yoke so that the smaller socket becomes a bearing pusher and the larger socket becomes a bearing receiver when the vise jaws come together. Close vise jaws until both bearings are free of yoke and remove bearings from the cross or spider.

5. If bearings will not come all the way out, close vise until bearing in receiver socket protrudes from yoke as much as possible without using excessive force. Then remove from vise and place that portion of bearing which protrudes from yoke between vise jaws. Tighten vise to hold bearing and drive yoke off with a soft hammer.

6. To remove opposite bearing from yoke, replace in vise with pusher socket on exposed cross journal with receiver socket over bearing cup. Then tighten vise jaws to press bearing back through yoke into receiving socket.

7. Remove yoke from driveshaft and again place protruding portion of bearing between vise jaws. Then tighten vise to hold bearing while driving yoke off bearing with soft hammer.

8. Turn spider or cross 1/4 turn and use the same procedure to press bearings out of driveshaft.

Assembly

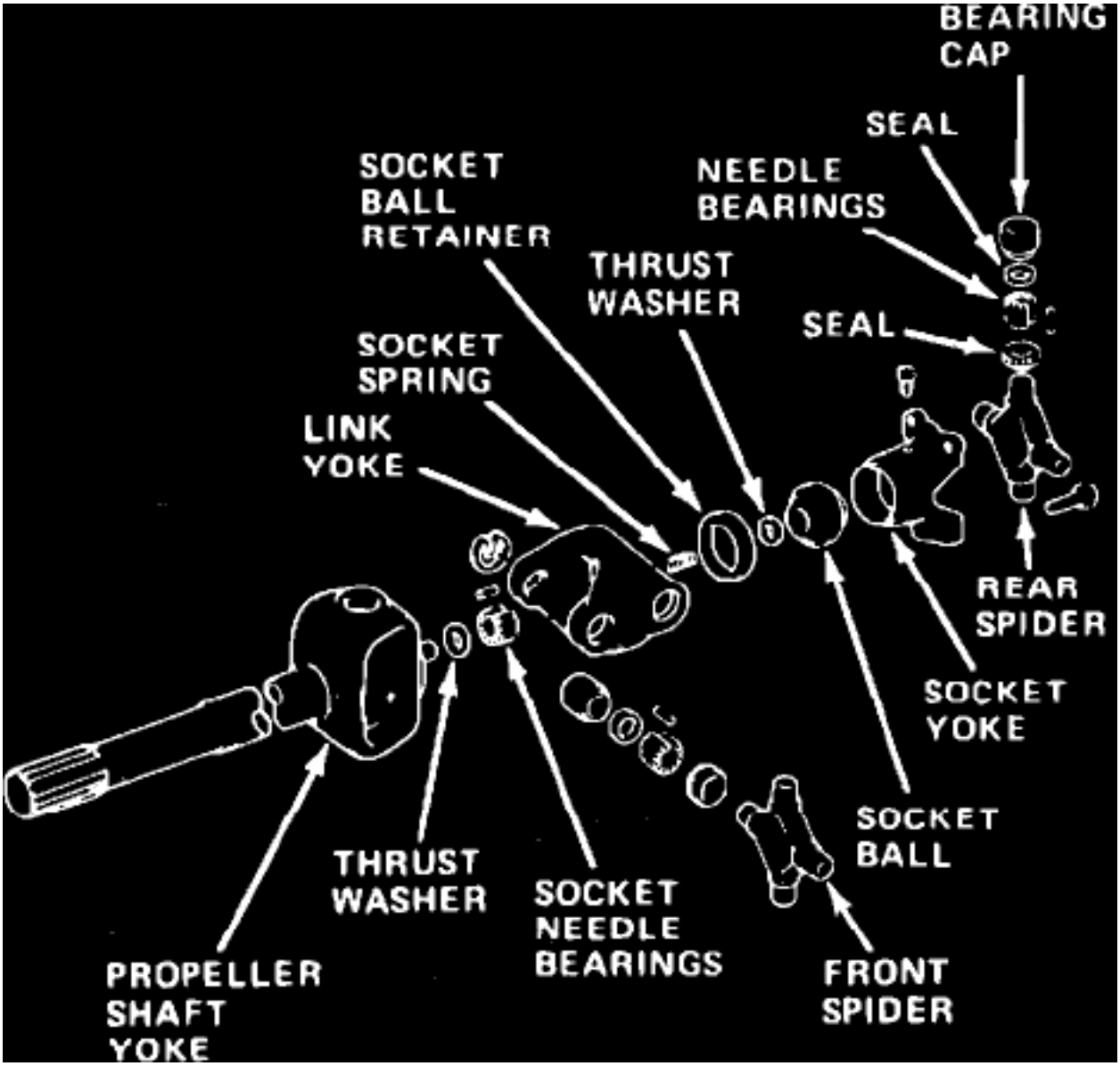
1. If old parts are to be reassembled, pack bearing cups with universal joint grease. Do not fill cups completely or use excessive amounts as over-lubrication may damage seals during reassembly. Use new seals.

2. If new parts are being installed, check new bearings for adequate grease before assembling.

3. With the pusher (smaller) socket, press one bearing part way into driveshaft. Position spider into the partially installed bearing. Place second bearing into driveshaft. Fasten driveshaft in vise so that bearings are in contact with faces of vise jaws. Some spiders are provided with locating lugs which must face toward driveshaft when installed.

4. Press bearings all the way into position and install snap rings or retainer plates.

5. Install bearings in yoke in same manner. When installation is completed, check U-joint for binding or roughness. If free movement is impeded, correct the condition before installation in vehicle.



Universal Joint: Service and Repair Disassembly and Assembly

Fig. 9 Double cardan universal joint exploded view

The double cardan type joint, Fig. 9, incorporates two universal joints, a centering socket yoke, and center yoke at one end of the shaft. A single universal joint is used at the other end.

DISASSEMBLY

1. Remove all bearing cap retainers.

2. Mark bearing caps, spiders, propeller shaft yoke, link yoke and socket yoke for assembly alignment reference, Fig. 9.

3. Remove bearing caps attaching from spider to propeller shaft yoke as follows:

a. Use a 5/8 inch socket to drive the bearing cap and a 11/16 inch socket to receive the opposite bearing cap as it is driven out. b. Place 5/8 inch socket on one bearing cap and 11/16 inch socket on opposite bearing. c. Position assembly in vise so vise jaws bear directly against sockets. d. Tighten vise to press first bearing cap out of link yoke. e. Loosen vise, reposition sockets and press opposite bearing cap out of link yoke.

4. Disengage propeller shaft yoke from link yoke.

5. Remove bearing caps attaching front spider to propeller shaft as described in step 3 above.

6. Remove front spider from yoke.

7. Remove bearing caps attaching rear spider to link yoke as outlined in step 3 above and remove spider and socket yoke from link yoke.

8. Clean all parts in solvent and wipe dry. Inspect assembly for damage or wear. If any component is worn or damaged, the entire assembly must be replaced.

ASSEMBLY

When assembling universal joint, make sure to align spiders and yokes according to marks made during disassembly.

1. Lubricate all bearings and contact surfaces with lithium base chassis grease.

2. Install bearing caps on yoke ends of rear spider and secure caps with tape, Fig. 9.

3. Assemble socket yoke and rear spider.

4. Position rear spider in link yoke and install bearing caps. Press caps into yoke using 5/8 inch socket until bearing cap retainer grooves are exposed.

5. Install rear spider-to-link yoke bearing cap retainers.

6. Position front spider in propeller shaft yoke and install bearing caps. Press caps into yoke using a 5/8 inch socket until bearing cap retainer grooves are exposed.

7. Install front spider-to-propeller shaft yoke bearing cap retainers.

8. Install thrust washer and socket spring in ball socket bearing bore, if removed.

9. Install thrust washer on ball socket bearing boss (located on propeller shaft yoke), if removed.

10. Align ball socket bearing boss on propeller shaft yoke with ball socket bearing bore and insert boss into bore.

11. Align front spider with link yoke bearing cap bores and install bearing caps. Press caps into yoke using a 5/8 inch socket until bearing cap retainer grooves are exposed.

12. Install front spider-to-link yoke bearing cap retainers.

Universal Joint: Service and Repair Service Notes

Fig. 1 Production Type Universal Joint Which Use Nylon Injection Rings In Place Of Snap Rings

Fig. 2 Service Type Universal Joint (Internal Snap Ring Type)

Before disassembling any universal joint, examine the assembly carefully and note the position of the grease fitting (if used). Also, be sure to mark the yokes with relation to the propeller shaft so they may be reassembled in the same relative position. Failure to observe these precautions may produce rough vehicle operation which results in rapid wear and failure of parts, and place an unbalanced load on transmission, engine and rear axle.

When universal joints are disassembled for lubrication or inspection, and the old parts are to be reinstalled, special care must be exercised to avoid damage to universal joint spider or cross and bearing cups. Some driveshafts use an injected nylon retainer on the universal joint bearings. When service is necessary, pressing the bearings out will sheer the nylon retainer, Fig. 1. Replacement with the conventional steel snap ring type is then necessary, Fig. 2.

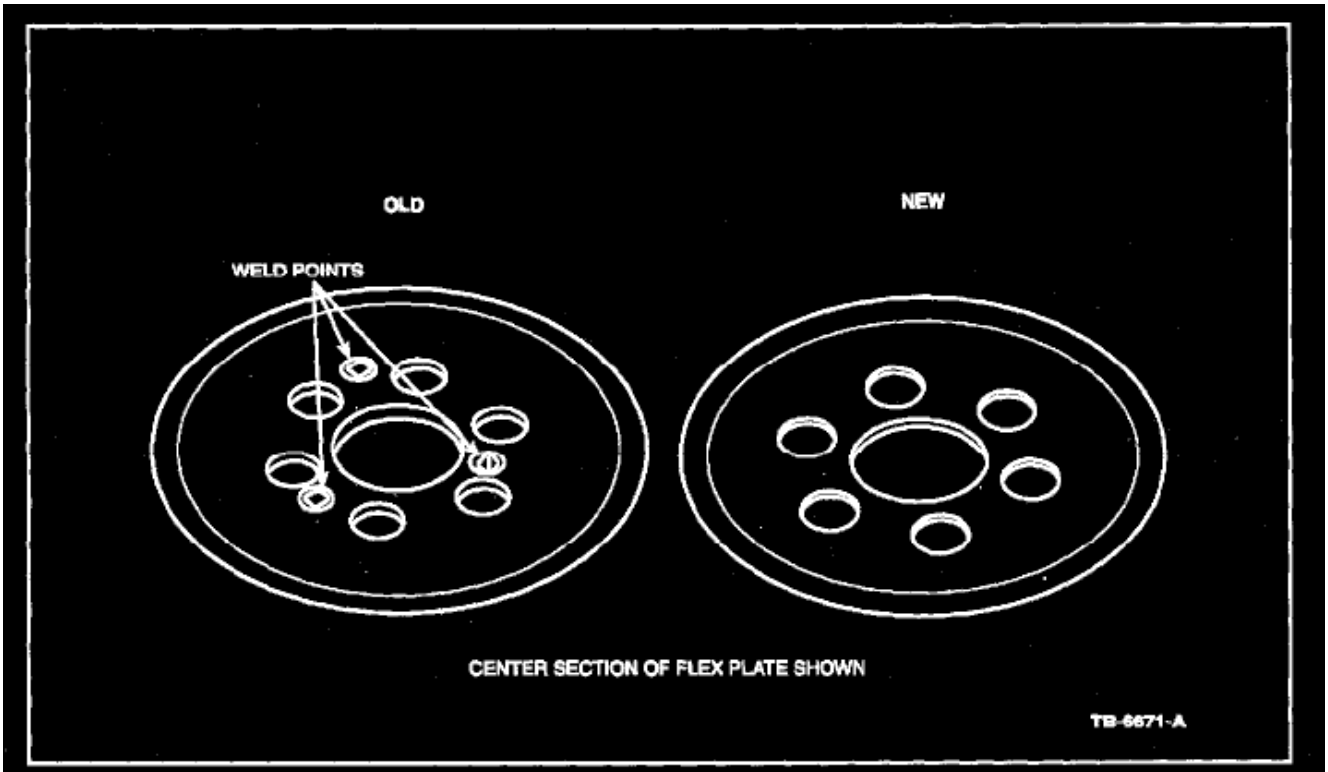


Figure 1

Flex Plate: Customer Interest Engine - Noise/Vibration/No Crank/No A/T Engagement

Article No. 02-14-2

07/22/02

^ ENGINE - 4.0L OHV - POSSIBLE CRACKED FLEXPLATE - NOISE OR VIBRATION - VEHICLES EQUIPPED WITH AUTOMATIC TRANSMISSION ONLY

^ ENGINE - NO CRANK - POSSIBLE CRACKED FLEXPLATE - NOISE OR VIBRATION - VEHICLES EQUIPPED WITH 4.0L ENGINE AND AUTOMATIC TRANSMISSION ONLY

^ NOISE - NOISE DURING CRANKING - POSSIBLE CRACKED FLEXPLATE - VEHICLES EQUIPPED WITH 4.0L OHV ENGINE AND AUTOMATIC TRANSMISSION ONLY

^ TRANSMISSION - A4LD - 4R55E - NO FORWARD OF REVERSE ENGAGEMENT - POSSIBLE CRACKED FLEXPLATE - VEHICLES EQUIPPED WITH 4.0L OHV ENGINE ONLY

FORD: 1991-1996 AEROSTAR, EXPLORER, RANGER

ISSUE

Some vehicles equipped with an automatic transmission and a 4.0L OHV engine may exhibit a noise/vibration, no drive, unusual noise during cranking or a no crank condition. This may be caused by a crack in the flexplate.

ACTION

Verify that one of the conditions exists. if the condition is verified and the flexplate has been isolated as the cause, replace the flexplate with revised

PART NUMBER	PART NAME
F1TZ-6375-BA	Flexplate

Service Part F1TZ-6375-BA (Figure 1). Refer to the following Service Procedure for details.

SERVICE PROCEDURE

NOTE

THIS ARTICLE DOES NOT APPLY TO ANY OTHER CONDITIONS OR COMPONENTS THAT MAY CAUSE SIMILAR SYMPTOMS AND IS ONLY WRITTEN TO COVER THESE SPECIFIC CONDITIONS.

1. Verify that one of the conditions exist; noise/vibration, no drive, unusual noise during cranking 6r a no crank condition.

2. Verify that the starter operates properly. If not, service as necessary, then recheck if one of the other conditions still exist.

3. If the one of the conditions still exist and the flexplate has been. isolated as the cause, the flexplate will have to be replaced with revised part F1TZ-6375-BA (Figure 1).

4. Following the procedures listed in the appropriate year Workshop Manual, Engine Section 03, In-Vehicle Service, Flywheel, replace the Automatic Transmission Flexplate.

5. After completing the replacement procedure, check the transmission fluid level and adjust if necessary to the proper level.

6. Verify service.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000, 504000, 597997, 601300

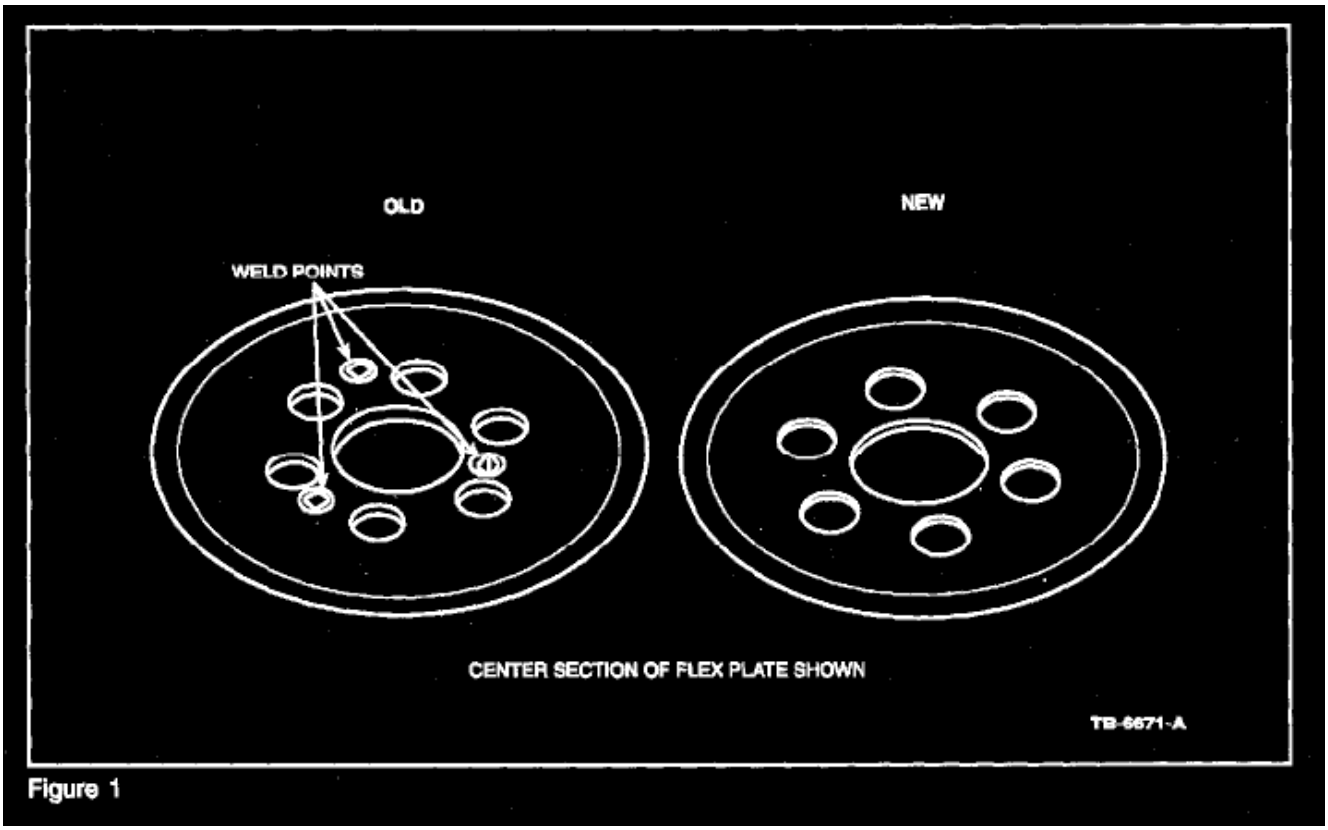


Figure 1

Flex Plate: All Technical Service Bulletins Engine - Noise/Vibration/No Crank/No A/T Engagement

Article No. 02-14-2

07/22/02

^ ENGINE - 4.0L OHV - POSSIBLE CRACKED FLEXPLATE - NOISE OR VIBRATION - VEHICLES EQUIPPED WITH AUTOMATIC TRANSMISSION ONLY

^ ENGINE - NO CRANK - POSSIBLE CRACKED FLEXPLATE - NOISE OR VIBRATION - VEHICLES EQUIPPED WITH 4.0L ENGINE AND AUTOMATIC TRANSMISSION ONLY

^ NOISE - NOISE DURING CRANKING - POSSIBLE CRACKED FLEXPLATE - VEHICLES EQUIPPED WITH 4.0L OHV ENGINE AND AUTOMATIC TRANSMISSION ONLY

^ TRANSMISSION - A4LD - 4R55E - NO FORWARD OF REVERSE ENGAGEMENT - POSSIBLE CRACKED FLEXPLATE - VEHICLES EQUIPPED WITH 4.0L OHV ENGINE ONLY

FORD: 1991-1996 AEROSTAR, EXPLORER, RANGER

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1. Verify that one of the conditions exist; noise/vibration, no drive, unusual noise during cranking 6r a no crank condition.

2. Verify that the starter operates properly. If not, service as necessary, then recheck if one of the other conditions still exist.

3. If the one of the conditions still exist and the flexplate has been. isolated as the cause, the flexplate will have to be replaced with revised part F1TZ-6375-BA (Figure 1).

4. Following the procedures listed in the appropriate year Workshop Manual, Engine Section 03, In-Vehicle Service, Flywheel, replace the Automatic Transmission Flexplate.

5. After completing the replacement procedure, check the transmission fluid level and adjust if necessary to the proper level.

6. Verify service.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 497000, 499000, 504000, 597997, 601300

Flex Plate: Specifications

Flywheel to Crankshaft 59 ft.lb

Flywheel: Specifications

Flywheel to Crankshaft 59 ft.lb

Bell Housing: Customer Interest M/T Clutch Housing - Fluid Inside

Article No. 91-18-14 09/05/91

^ CLUTCH-SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

^ LEAKS-CLUTCH SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

LIGHT TRUCK: 1988-89 ECONOLINE 1988-91 AEROSTAR, BRONCO, F-150-350 SERIES, RANGER 1989-90 BRONCO II 1991 EXPLORER

ISSUE: Fluid detected inside the clutch housing may be caused by a leaking clutch slave cylinder. This may occur when vehicles are driven in severely muddy or dusty environments or when operated with extensive idle time. Vehicles include...

^ 1988-1991 Ranger, 1988-1990 Bronco II, 1988-1991 Aerostar and 1991 Explorer with manual transmissions.

^ 1988-1991 Bronco, F-150-350, and 1988-1989 Econoline with 5-Speed Manual Transmissions, except 7.3L Diesel and 7.5L engines.

ACTION: Replace the clutch slave cylinder if inspection confirms the cylinder is leaking. The new clutch slave cylinder contains a guide seal which improves durability and resistance to dirt entry. Refer to the following procedures for service details.

INSPECTION PROCEDURE:

1. If the vehicle is a Bronco or F-150, the repair will only involve 5 speed manual transmissions. Other vehicles described include all manual transmissions.

This slave cylinder is the internal "Concentric" and not the external style. Inspect vehicle to visually verify the style of slave cylinder installed.

2. Determine if the slave cylinder is leaking by checking for a fluid trace inside the bottom of the clutch housing.

REPAIR PROCEDURE

1. Remove the clutch slave cylinder. Refer to the appropriate Light Truck Shop Manual for service details.

2. Replace the clutch slave cylinder with a new slave cylinder (F1TZ-7A564-A). Refer to the appropriate Light Truck Shop Manual for service details.

PART NUMBER PART NAME CLASS

F1TZ-7A564-A Slave Cylinder B

NOTE: APPPROPRIATE SUPPLIMENT OPERATIONS SHOULD BE USED WITH THE LABOR OPERATIONS LISTED.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911814A Inspect For Fluid Leak - All 0.3 Hr.

Vehicles

911814B Replace Clutch Slave 1.8 Hr.

Cylinder - Ranger 4X2 With 2.3L

911814C Replace Clutch Slave 3.2 Hr.

Cylinder - Ranger 4X4 With

2.3L And F-Series 4X2 With 5.8L

911814D Replace Clutch Slave 2.0 Hr.

Cylinder - Ranger 4X2 With 2.9L Or 3.0L And Aerostar With 3.0L

911814E Replace Clutch Slave 2.6 Hr.

Cylinder - Bronco II With 2.9L

911814F Replace Clutch Slave 3.5 Hr.

Cylinder - Ranger 4X4 And Bronco II 4X4 With 2.9L And F-Series 4X4 And Bronco With 5.0L

911814G Replace Clutch Slave 2.9 Hr.

Cylinder - Ranger 4X2 And Explorer 4X2 With 4.0L

911814H Replace Clutch Slave 3.7 Hr.

Cylinder - Ranger 4X4 And

911814I Replace Clutch Slave 2.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And Mazda Transmission

911814J Replace Clutch Slave 2.3 Hr.

Cylinder - F-Series 4X2 With 5.0L

911814K Replace Clutch Slave 3.3 Hr.

Cylinder - F-Series 4X4 And Bronco With 4.9L And Mazda Transmission

911814L Replace Clutch Slave 3.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And ZF Transmission

911814M Replace Clutch Slave 4.1 Hr.

Cylinder - F-Series 4X4 With 4.9L And ZF Transmission

911814N Replace Clutch Slave 4.3 Hr.

Cylinder - F-Series 4X4 With 5.8L

911814O Replace Clutch Slave 2.8 Hr.

Cylinder - Econoline

DEALER CODING

BASIC PART NO. CONDITION CODE

7A564 77

OASIS CODES: 505000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Manual Transmission/Transaxle > Bell Housing, M/T > Component Information > Technical Service Bulletins > All Technical Service Bulletins: > 911814 > Sep > 91 > M/T Clutch Housing - Fluid Inside

Bell Housing: All Technical Service Bulletins M/T Clutch Housing - Fluid Inside

Article No. 91-18-14 09/05/91

^ CLUTCH-SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

^ LEAKS-CLUTCH SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

LIGHT TRUCK: 1988-89 ECONOLINE 1988-91 AEROSTAR, BRONCO, F-150-350 SERIES, RANGER 1989-90 BRONCO II 1991 EXPLORER

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^ 1988-1991 Bronco, F-150-350, and 1988-1989 Econoline with 5-Speed Manual Transmissions, except 7.3L Diesel and 7.5L engines.

ACTION: Replace the clutch slave cylinder if inspection confirms the cylinder is leaking. The new clutch slave cylinder contains a guide seal which improves durability and resistance to dirt entry. Refer to the following procedures for service details.

INSPECTION PROCEDURE:

1. If the vehicle is a Bronco or F-150, the repair will only involve 5 speed manual transmissions. Other vehicles described include all manual transmissions.

This slave cylinder is the internal "Concentric" and not the external style. Inspect vehicle to visually verify the style of slave cylinder installed.

2. Determine if the slave cylinder is leaking by checking for a fluid trace inside the bottom of the clutch housing.

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PART NUMBER PART NAME CLASS

F1TZ-7A564-A Slave Cylinder B

NOTE: APPPROPRIATE SUPPLIMENT OPERATIONS SHOULD BE USED WITH THE LABOR OPERATIONS LISTED.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

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2.3L And F-Series 4X2 With 5.8L

911814D Replace Clutch Slave 2.0 Hr.

Cylinder - Ranger 4X2 With 2.9L Or 3.0L And Aerostar With 3.0L

911814E Replace Clutch Slave 2.6 Hr.

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911814F Replace Clutch Slave 3.5 Hr.

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911814G Replace Clutch Slave 2.9 Hr.

Cylinder - Ranger 4X2 And Explorer 4X2 With 4.0L

911814H Replace Clutch Slave 3.7 Hr.

Cylinder - Ranger 4X4 And

911814I Replace Clutch Slave 2.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And Mazda Transmission

911814J Replace Clutch Slave 2.3 Hr.

Cylinder - F-Series 4X2 With 5.0L

911814K Replace Clutch Slave 3.3 Hr.

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911814L Replace Clutch Slave 3.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And ZF Transmission

911814M Replace Clutch Slave 4.1 Hr.

Cylinder - F-Series 4X4 With 4.9L And ZF Transmission

911814N Replace Clutch Slave 4.3 Hr.

Cylinder - F-Series 4X4 With 5.8L

911814O Replace Clutch Slave 2.8 Hr.

Cylinder - Econoline

DEALER CODING

BASIC PART NO. CONDITION CODE

7A564 77

OASIS CODES: 505000

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

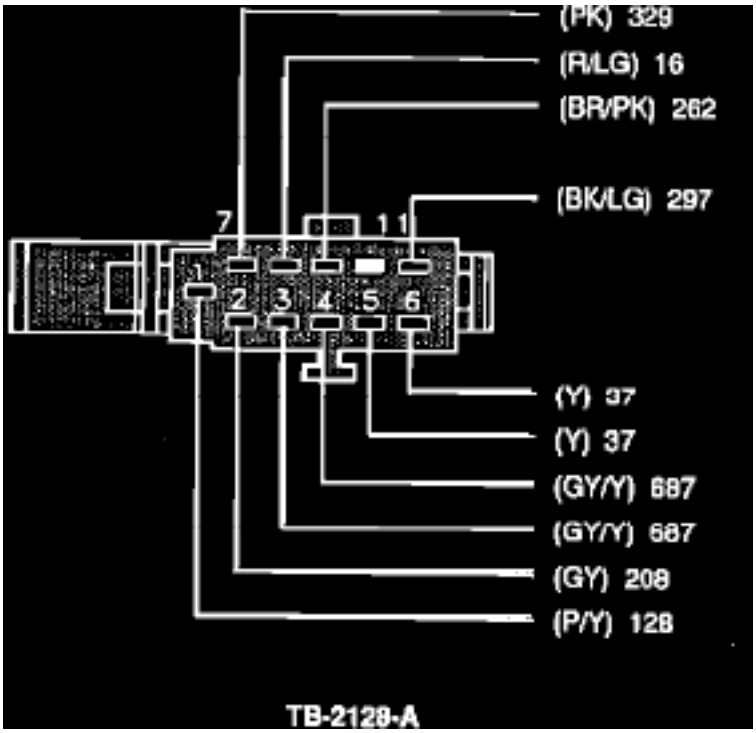
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

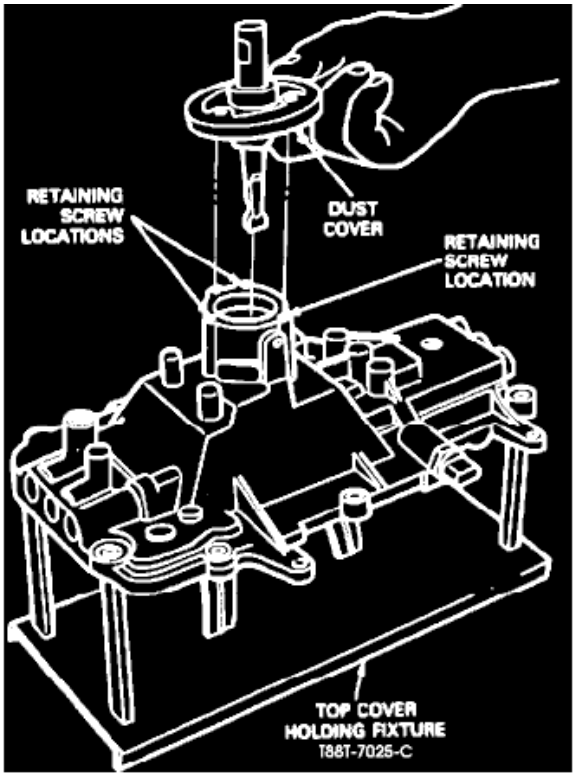
911309A Install Ignition Switch 0.6 Hr.

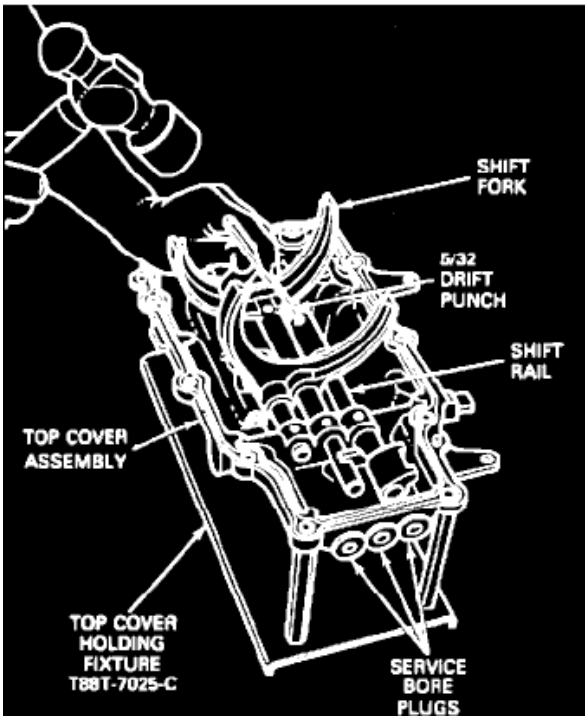
DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300


RETAINING SCREW LOCATIONS
DUST COVER
RETAINING SCREW LOCATION
TOP COVER HOLDING FIXTURE
T88T-7025-C


SHIFT FORK
5/32 DRIFT PUNCH
SHIFT RAIL
TOP COVER ASSEMBLY
TOP COVER HOLDING FIXTURE T88T-7025-C
SERVICE BORE PLUGS

Case: Service and Repair

DISASSEMBLY

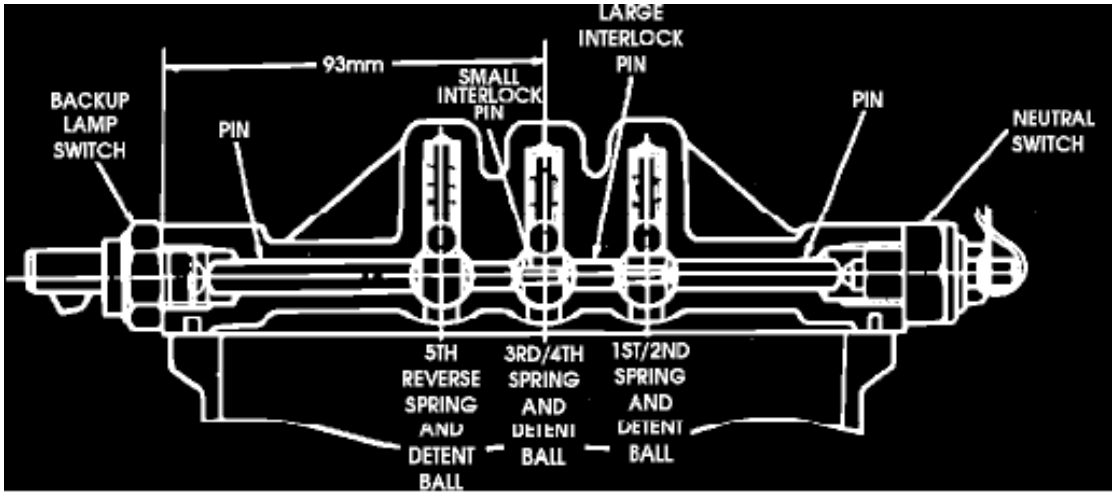
Removing Dust Cover

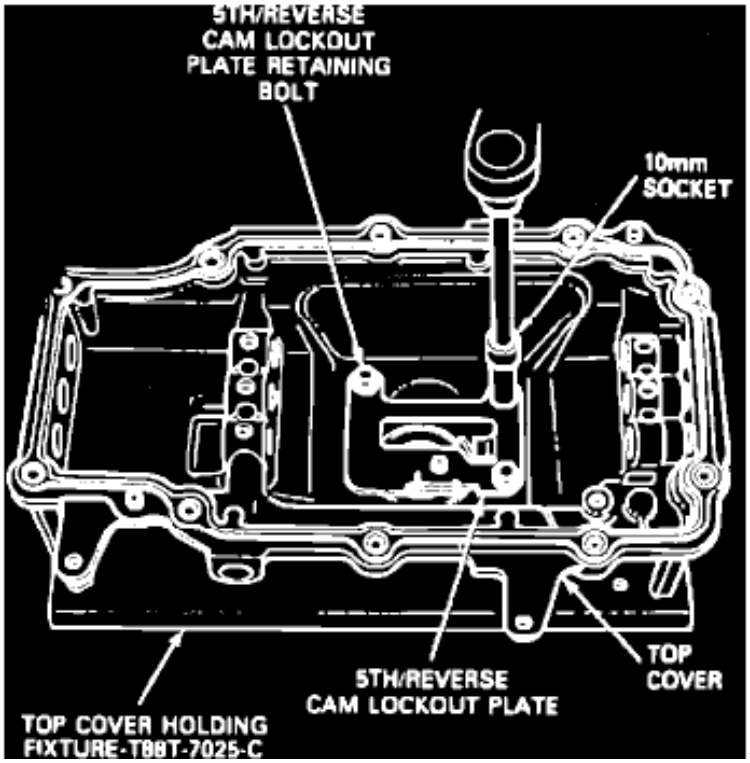
1. Place top cover in a suitable holding fixture. 2. If necessary, remove dust boot, then lift shift lever from top cover. 3. Remove three dust cover retaining screws, then the dust cover. To facilitate installation, note grooves in bushing align with slots in lower shift

lever faces towards front of transmission.

Removing Shift Forks

4. Invert top cover on holding fixture, then remove back-up lamp switch and back-up lamp switch pin.


LARGE
INTERLOCK
PIN
93mm
SMALL
INTERLOCK
PIN
BACKUP
LAMP
SWITCH
PIN
PIN
NEUTRAL
SWITCH
5TH
REVERSE
SPRING
AND
DETENT
BALL
3RD/4TH
SPRING
AND
DETENT
BALL
1ST/2ND
SPRING
AND
DETENT
BALL


5TH/REVERSE
CAM LOCKOUT
PLATE RETAINING
BOLT
10mm
SOCKET
TOP
COVER
5TH/REVERSE
CAM LOCKOUT PLATE
TOP COVER HOLDING
FIXTURE-T88T-7025-C

5. Remove spring pins retaining shift forks to shift rails, then discard spring pins. 6. Ensure 5th/reverse shift rail is in full forward position, then remove spring pin from end of 5th/reverse rail.

Cross-Sectional View Of Shift Rail Assembly

7. Remove three rubber plugs blocking shift rod service bores. To prevent component loss when performing the following procedures, cover lock

balls, friction device and spring seats with a suitable clean cloth held firmly in place.

WARNING: Ensure to wear safety glasses during shift rail removal.

8. Remove 5th/reverse shift rail from top cover through service bore. If necessary, insert a 5/16 inch drift punch through spring pin bore and gently

rock shift rail from side to side while maintaining rearward pressure.

9. Remove 3rd/4th shift rail from top cover through service bore. If necessary, insert a suitable drift through spring pin bore and gently rock shift rail

from side to side while maintaining rearward pressure.

Removing 5th/Reverse Cam Lockout Plate

10. Remove 5th/reverse cam lockout plate retaining bolts, then the 5th/reverse cam lockout plate.

ASSEMBLY

1. Place top cover in a suitable holding fixture. 2. Position 5th/reverse cam lockout plate to top cover. Install 5th/reverse cam lockout plate retaining bolts, then torque to 6-7 ft lbs. 3. Position 3rd/4th shift rail into top cover through service bore. If necessary, insert a 5/16 inch drift punch through spring pin bore and gently rock

shift rail from side to side while maintaining forward pressure.

4. Engage 3rd/4th shift fork with shift rail, then position detent ball and spring into top cover spring seats. 5. Compress detent ball and spring assembly, then push shift rail into position over detent ball. 6. Position friction device and spring into top cover spring seats. 7. Compress friction device and spring assembly, then push shift rail into position over friction device. 8. Install 3rd/4th shift fork to shift rail retaining spring. 9. Position 1st/2nd shift rail into top cover through service bore. If necessary, insert a 5/16 inch drift punch through spring pin bore and gently rock

shift rail from side to side while maintaining forward pressure.

10. Engage 1st/2nd shift fork with shift rail, then position detent ball and spring into top cover spring seats. 11. Compress detent ball and spring assembly, then push shift rail into position over detent ball. 12. Position friction device and spring into top cover spring seats. 13. Compress friction device and spring assembly, then push shift rail into position over friction device. 14. Install 1st/2nd shift fork to shift rail retaining spring. 15. Position 5th/reverse shift rail into top cover through service bore. If necessary, insert a 5/16 inch drift punch through spring pin bore and gently

rock shift rail from side to side while maintaining forward pressure.

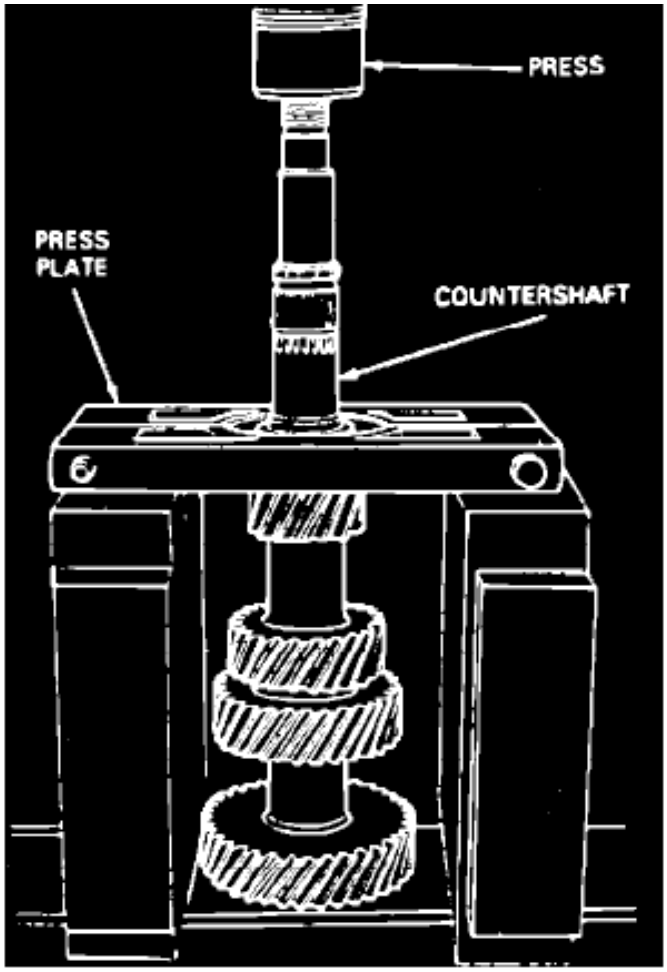
16. Engage 5th/reverse shift fork with shift rail, then position detent ball and spring into spring seats. 17. Compress detent ball and spring assembly, then push shift rail into position over detent ball. 18. Install shift rail to top cover spring pins, then the 5th/reverse shift fork to shift rail retaining spring pin. 19. Install rubber plugs into service bores. 20. Insert interlock pins into 1st/2nd and 3rd/4th shift rails. Ensure large and small interlock pins are installed into their original positions.

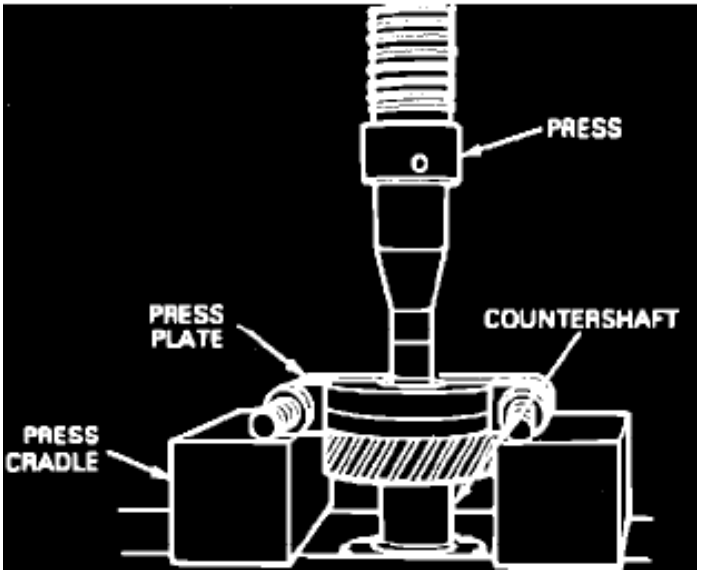
NOTE: Improper installation of interlock pins will prevent activation of neutral switch and/or back-up lamp switch.

21. Apply a suitable sealant to back-up lamp switch and neutral switch threads. Install switches in top cover, then torque to 18-26 ft lbs. 22. Position lower shift lever and dust cover assembly into top cover, then install three retaining screws and tighten.

Countershaft: Testing and Inspection

Check countershaft gear teeth and countershaft splines for wear or damage. If bent, worn or scored, replace countershaft.


PRESS
PRESS PLATE
COUNTERSHAFT


PRESS
PRESS PLATE
COUNTERSHAFT
PRESS CRADLE

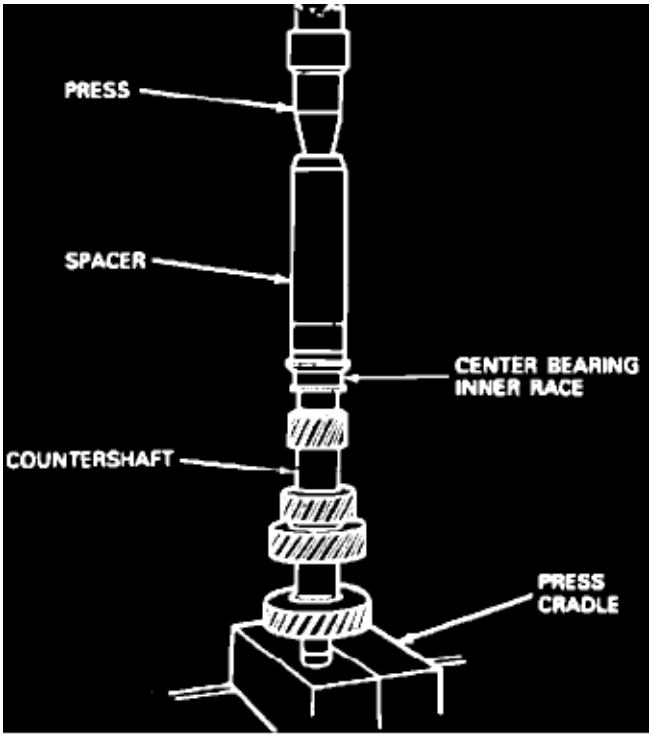
Countershaft: Service and Repair

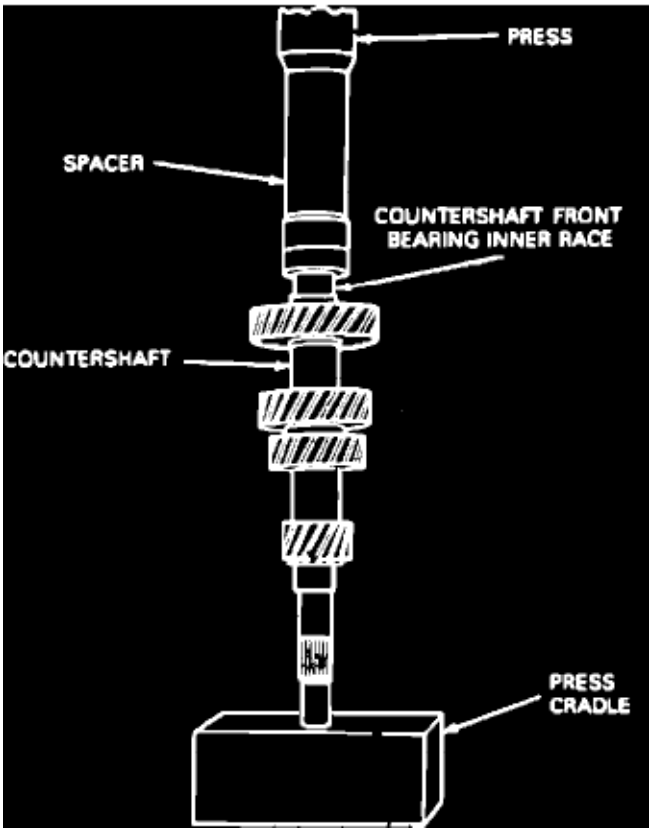
Removing Countershaft Center Bearing Inner Race

1. Remove countershaft center bearing inner race, using a suitable press and bearing cone remover, tool No. T71P-4621-B or equivalent.

Removing Countershaft Rear Bearing Inner Race

2. Remove countershaft front bearing inner race, using bearing splitter tool No. D84L-1123-A or equivalent.


PRESS
SPACER
CENTER BEARING INNER RACE
COUNTERSHAFT
PRESS CRADLE


PRESS
SPACER
COUNTERSHAFT FRONT BEARING INNER RACE
COUNTERSHAFT
PRESS CRADLE

Installing Countershaft Center Bearing Inner Race

3. Install center bearing inner race, using bearing replacer tool No. T53T-4621-B or equivalent.

Installing Countershaft Front Bearing Inner Race

4. Install countershaft front bearing inner race, using bearing replacer tool No. T53T-4621-B or equivalent.

Extension Housing: Testing and Inspection

Check extension housing for cracks. Ensure machined mating surfaces are free from burrs, nicks or any other damage. If necessary, replace oil seal after extension housing has been installed onto transmission.

NOTE: Extension housing rear bushing cannot be serviced. If service is required, replace as a unit.

Fluid - M/T: Technical Service Bulletins M/T - Mercon(R) V ATF Usage Information

TSB 06-26-1

01/08/07

MERCON ATF IS BEING REPLACED BY MERCON V AS A SERVICE FLUID FOR SOME MANUAL TRANSMISSIONS

FORD: 1981-2003 Escort 1984-1995 Thunderbird 1985-2007 Mustang 1985-1996 Bronco 1985-2007 Ranger 1986-1997 Aerostar 1991-2004 Explorer 1995-2007 F-150 1996-2007 F-Super Duty 2001-2003 Explorer Sport Trac, Explorer Sport

LINCOLN: 2001-2002 Lincoln LS

MERCURY: 1984-1995 Cougar 1987-1999 Tracer

ISSUE MERCON(R) Automatic Transmission Fluid is being replaced by MERCON(R) V as the service fluid for manual transmissions originally requiring MERCON(R).

ACTION Beginning immediately all manual transmission applications requiring MERCON(R) can now be serviced using MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON(R) / MERCON(R) V. After July 1, 2007, MERCON(R) Automatic Transmission Fluid will no longer be manufactured, therefore, availability of this fluid will continue until remaining inventory has been depleted.

SERVICE PROCEDURE

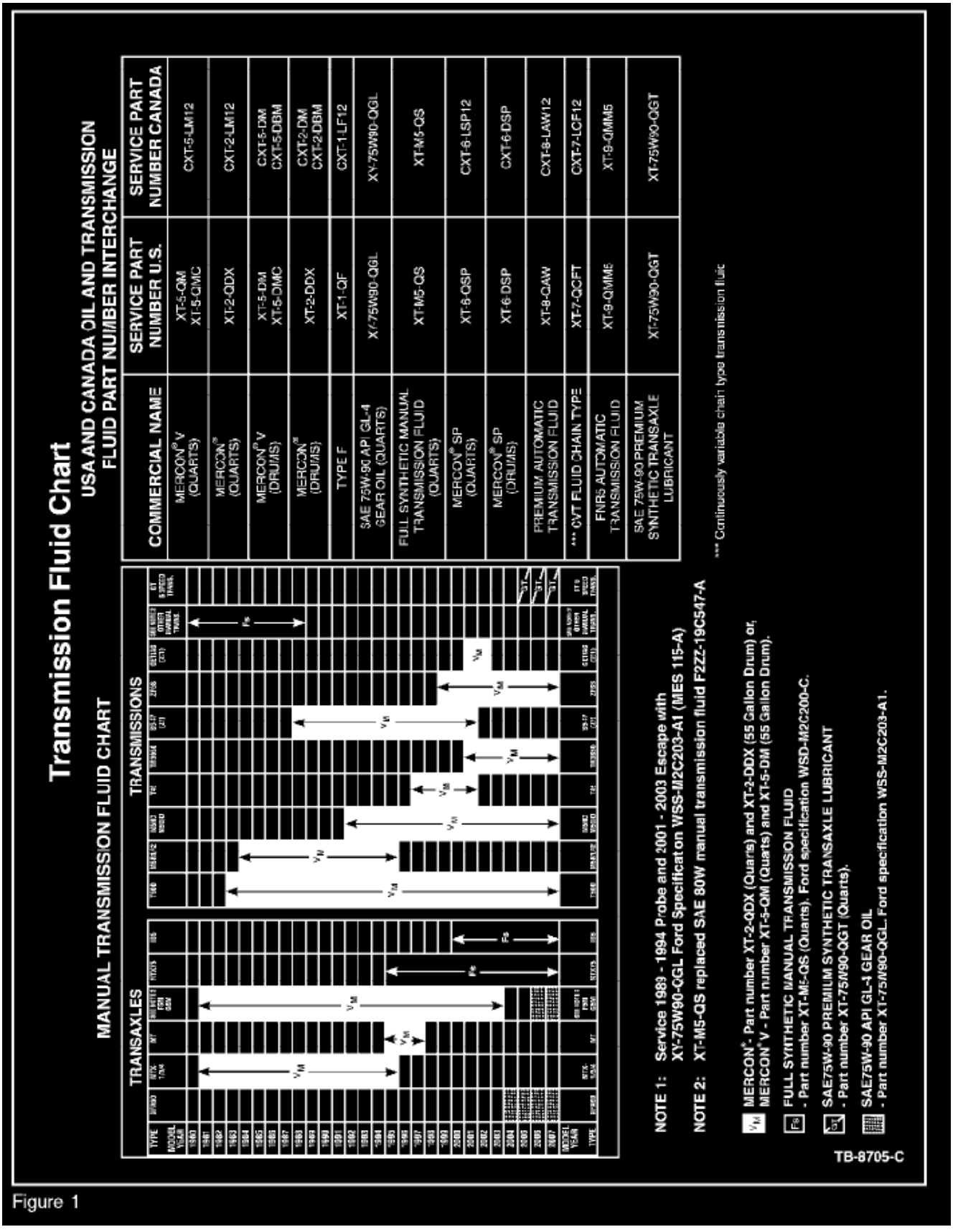

Transmission Fluid Chart
USA AND CANADA OIL AND TRANSMISSION FLUID PART NUMBER INTERCHANGE
MANUAL TRANSMISSION FLUID CHART
TRANSAXLES
TRANSMISSIONS
COMMERCIAL NAME
SERVICE PART NUMBER U.S.
SERVICE PART NUMBER CANADA
MERCON® V (QUARTS)
XT-5-QM XT-5-QMC
CXT-5-LM12
MERCON® (QUARTS)
XT-2-QDX
CXT-2-LM12
MERCON® V (DRUMS)
XT-5-DM XT-5-DMC
CXT-5-DM CXT-5-DBM
MERCON® (DRUMS)
XT-2-DDX
CXT-2-DM CXT-2-DBM
TYPE F
XT-1-QF
CXT-1-LF12
SAE 75W-90 API GL-4 GEAR OIL (QUARTS)
XY-75W90-QGL
XY-75W90-QGL
FULL SYNTHETIC MANUAL TRANSMISSION FLUID (QUARTS)
XT-M5-QS
XT-M5-QS
MERCON® SP (QUARTS)
XT-6-QSP
CXT-6-LSP12
MERCON® SP (DRUMS)
XT-6-DSP
CXT-6-DSP
PREMIUM AUTOMATIC TRANSMISSION FLUID
XT-8-QAW
CXT-8-LAW12
*** CVT FLUID CHAIN TYPE
XT-7-QCFT
CXT-7-LCF12
FNR5 AUTOMATIC TRANSMISSION FLUID
XT-9-QMM5
XT-9-QMM5
SAE 75W-90 PREMIUM SYNTHETIC TRANSAXLE LUBRICANT
XT-75W90-QGT
XT-75W90-QGT
NOTE 1: Service 1983 - 1994 Probe and 2001 - 2003 Escape with XY-75W90-QGL Ford Specification WSS-M2C203-A1 (MES 115-A)
NOTE 2: XT-M5-QS replaced SAE 80W manual transmission fluid F2ZZ-19C547-A
*** Continuously variable chain type transmission fluid
MERCON®: Part number XT-2-QDX (Quarts) and XT-2-DDX (55 Gallon Drum) or; MERCON® V - Part number XT-5-QM (Quarts) and XT-5-DM (55 Gallon Drum).
FULL SYNTHETIC MANUAL TRANSMISSION FLUID
- Part number XT-M5-QS (Quarts). Ford specification WSD-M2C200-C.
SAE75W-90 PREMIUM SYNTHETIC TRANSAXLE LUBRICANT
- Part number XT-75W90-QGT (Quarts).
SAE75W-90 API GL-4 GEAR OIL
- Part number XT-75W90-QGL. Ford specification WSS-M2C203-A1.
TB-8705-C

Figure 1

Service manual transmissions requiring MERCON(R) with MERCON(R) V or MERCON(R) Automatic Transmission Fluid or dual usage fluids labeled MERCON/MERCON(R) V. For proper fluid application on current and past model manual transmissions refer to the fluid usage chart. (Figure 1)

WARNING

FULL SYNTHETIC MANUAL TRANSMISSION FLUID (XT-M5-QS), SAE 75W-90 API GL-4 GEAR OIL (XY-75W90-QGL) AND SAE 75W-90 PREMIUM SYNTHETIC TRANSAXLE LUBRICANT (XT-75W90-QGT) ARE UNIQUE FLUIDS AND MUST BE USED IN APPLICATIONS RECOMMENDING THAT PARTICULAR FLUID.

USE OF ANY OTHER FLUID MAY CAUSE REDUCED FUNCTIONALITY OR DAMAGE.

PART NUMBER	PART NAME
XT-2-QDX	MERCON® (Quart)
XT-5-QM	MERCON® V (Quart)
XT-2-DDX	MERCON® (55 Gallon Drum)
XT-5-DM	MERCON® V (55 Gallon Drum)

NOTE: The information in Technical Service Bulletins is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. It informs these technicians of conditions that may occur on some vehicles, or provides information that could assist in proper vehicle service. The procedures should not be performed by "do-it-yourselfers". Do not assume that a condition described affects your car or truck. Contact a Ford, Lincoln, or Mercury dealership to determine whether the Bulletin applies to your vehicle.

Parts Block

WARRANTY STATUS: Information Only

Disclaimer

Fluid - M/T: Capacity Specifications

Type 4-speed 80W EP

5-speed Mitsubishi* 80W EP

Used in some Ranger & Bronco II and identified by

drain plug located in middle of pan

5-speed, All others Mercon(R) Automatic Transmission Fluid

CAPACITY, Refill: 5-speed (Mazda) R1, R2 Aerostar, Ranger, Bronco II 5.6 pt (US) Explorer

Bronco, Econoline, F-series 7.6 pt (US)

5-speed S5-42 ZF Bronco, Econoline, F-series 6.8 pt (US)

5-speed (Mitsubishi) Ranger, Bronco II 4.8 pt (US)

4-speed ex. OD 7.0 pt (US)

W/OD 4.5 pt (US)

Transmission	U.S. Pints	Imperial Pints	Litres
Five-Speed Manual Overdrive Transmission (Ford Manual Transmission Motorcraft MERCON® Multipurpose Automatic Transmission Fluid XT-2-QDX or DDX E4XZ-19582-B (ESP-M2C166-H) or Equivalent)	5.6	4.5	2.65

CC3401-1C

Fluid - M/T: Fluid Type Specifications

Key to Lubrication Abbreviations

BL Self-adjusting Brake Lubricant

EC Ethylene Glycol Coolant

Mix 50/50 with water or at least to -20°F (-29°C) protection

EP Extreme Pressure Gear Lubricant

Ford Part No. D8DZ-19C547-A

FA Automatic Transmission Fluid, Type F

HBH Hydraulic Brake Fluid, Extra

Heavy-Duty

HP Hypoid Gear Oil

Ford Part No. E0AZ-19580-A

HP* Hypoid Gear Oil for Limited-Slip

or Traction-Lok Differential

LM Lithium Grease, with Polyethylene

LS Steering Gear Lubricant

MA MERCON(R) Automatic Transmission

Fluid

MH Manifold Heat Valve Solvent

SG Motor Oil, API Service SG

Mazda M5OD 5-SPD O/D M/T

The Mazda M5OD 5-SPD O/D M/T uses ATF as shown. The Mitsubishi 5-SPD M/T uses gear oil, for more information on the Mitsubishi 5-SPD M/T, refer to 1991 Ranger 4x4 with 2.9L engine.

Synchronizer Hub: Customer Interest M/T - Crunching Shifting From 2nd to 3rd Gear

Article No. 91-18-11 09/05/91

^ NOISE-INTERMITTENT "CRUNCHING" WHEN SHIFTING FROM 2ND TO 3RD-VEHICLES WITH M50D (MAZDA R1 AND R2) TRANSMISSION

^ TRANSMISSION-M50D (MAZDA R1 AND R2)- INTERMITTENT "CRUNCHING" NOISE WHEN SHIFTING FROM 2ND TO 3RD

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, RANGER 1991 EXPLORER

ISSUE: A slight intermittent "crunch" or grinding noise may be heard when shifting from 2nd to 3rd. This is caused by improper synchronizer engagement.

ACTION: Install a new synchronizer service kit. Refer to the Parts Block for correct parts usage and the following procedure for service details.

INSPECTION

1. Drive the vehicle to warm the transmission oil temperature to about 125~F (52~C). This can usually be done after driving about 10 miles at highway speed when the outside temperature is above freezing.

2. On a smooth road surface, accelerate the vehicle from a stop to 3rd gear at normal shift speeds as defined in the owners guide.

3. If a slight "crunch" is heard or grinding sensation is felt in the shift lever when shifting from 2nd to 3rd, proceed with the following synchronizer kit installation procedure.

SYNCHRONIZER KIT INSTALLATION

1. Remove the transmission from the vehicle. Refer to the appropriate Light Truck Shop Manual, Section 07-03A, for removal procedure.

2. Remove the 1st/2nd and 3rd/4th clutch hub and sleeve assembly along with the corresponding synchronizer ring.

3. Install all parts from the appropriate synchronizer kit. The kits contain new 1, 2, 3, and 4 synchronizer rings, a new 3/4 synchronizer sleeve and an instruction sheet. The original 1/2 clutch hub sleeve assembly and 3/4 clutch hub must be reused.

4. Put a label on the transmission showing it was updated per TSB 91-18-11 and to refer to this TSB before servicing.

NOTE: THE NEW 3RD GEAR SYNCHRONIZER RING AND 3/4 SYNCHRONIZER SLEEVE ARE UNIQUE FROM THE ORIGINAL COMPONENTS. THE NEW COMPONENTS MUST BE INSTALLED AS A SET IN THE PROPER POSITION. FAILURE TO DO SO WILL RESULT IN THE INABILITY TO SHIFT THE TRANSMISSION INTO ONE OF THE GEARS. note>

PART NUMBER PART NAME CLASS

FOTZ-7C391-H Synchronizer Kit - R2 (F-150, C

Bronco, Econoline)

FOTZ-7C391-F Synchronizer Kit - R1 (Ranger, C

Bronco II, Explorer)

FOTZ-7C391-G Synchronizer Kit - R1 C

(Aerostar)

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911811A Inspect Transmission 0.3 Hr.

911811B Install Synchronizer Kit 5.0 Hr.

Ranger 4X2 With 2.OL, 2.3L, 2.9L, or 3.OL And

Aerostar With 3.OL

911811C Install Synchronizer Kit 6.7 Hr.

Ranger 4X4 With 2.3L or 4.OL and Explorer 4X4

911811D Install Synchronizer Kit - 6.9 Hr.

Ranger 4X4 With 2.9L

911811E Install Synchronizer Kit - 6.0 Hr.

Ranger 4X2 And Explorer 4X2 With 4.OL

911811F Install Synchronizer Kit - 6.5 Hr.

Bronco II 4X2 With 2.9L And Bronco With 5.OL

911811G Install Synchronizer Kit - 6.9 Hr.

Bronco II 4X4 With 2.9L

911811H Install Synchronizer Kit 5.1 Hr.

F-150 4X2 With 4.9L

911811I Install Synchronizer Kit 6.3 Hr.

F-150 4X4 With 4.9L or 5.OL And Bronco With 4.9L

911811J Install Synchronizer Kit - 5.3 Hr.

F-150 4X2 With 5.OL

911811K Install Synchronizer Kit - 5.2 Hr.

Econoline With 4.9L

DEALER CODING

BASIC PART NO. CONDITION CODE

7C391 56

OASIS CODES: 505000, 505200, 506000, 702000

Article No. 91-18-11 09/05/91

^ NOISE-INTERMITTENT "CRUNCHING" WHEN SHIFTING FROM 2ND TO 3RD-VEHICLES WITH M50D (MAZDA R1 AND R2) TRANSMISSION

^ TRANSMISSION-M50D (MAZDA R1 AND R2)- INTERMITTENT "CRUNCHING" NOISE WHEN SHIFTING FROM 2ND TO 3RD

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, RANGER 1991 EXPLORER

ISSUE: A slight intermittent "crunch" or grinding noise may be heard when shifting from 2nd to 3rd. This is caused by improper synchronizer engagement.

ACTION: Install a new synchronizer service kit. Refer to the Parts Block for correct parts usage and the following procedure for service details.

INSPECTION

1. Drive the vehicle to warm the transmission oil temperature to about 125~F (52~C). This can usually be done after driving about 10 miles at highway speed when the outside temperature is above freezing.

2. On a smooth road surface, accelerate the vehicle from a stop to 3rd gear at normal shift speeds as defined in the owners guide.

3. If a slight "crunch" is heard or grinding sensation is felt in the shift lever when shifting from 2nd to 3rd, proceed with the following synchronizer kit installation procedure.

SYNCHRONIZER KIT INSTALLATION

1. Remove the transmission from the vehicle. Refer to the appropriate Light Truck Shop Manual, Section 07-03A, for removal procedure.

2. Remove the 1st/2nd and 3rd/4th clutch hub and sleeve assembly along with the corresponding synchronizer ring.

3. Install all parts from the appropriate synchronizer kit. The kits contain new 1, 2, 3, and 4 synchronizer rings, a new 3/4 synchronizer sleeve and an instruction sheet. The original 1/2 clutch hub sleeve assembly and 3/4 clutch hub must be reused.

4. Put a label on the transmission showing it was updated per TSB 91-18-11 and to refer to this TSB before servicing.

NOTE: THE NEW 3RD GEAR SYNCHRONIZER RING AND 3/4 SYNCHRONIZER SLEEVE ARE UNIQUE FROM THE ORIGINAL COMPONENTS. THE NEW COMPONENTS MUST BE INSTALLED AS A SET IN THE PROPER POSITION. FAILURE TO DO SO WILL RESULT IN THE INABILITY TO SHIFT THE TRANSMISSION INTO ONE OF THE GEARS. note>

PART NUMBER PART NAME CLASS

FOTZ-7C391-H Synchronizer Kit - R2 (F-150, C

Bronco, Econoline)

FOTZ-7C391-F Synchronizer Kit - R1 (Ranger, C

Bronco II, Explorer)

FOTZ-7C391-G Synchronizer Kit - R1 C

(Aerostar)

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911811A Inspect Transmission 0.3 Hr.

911811B Install Synchronizer Kit 5.0 Hr.

Ranger 4X2 With 2.OL, 2.3L, 2.9L, or 3.OL And

Aerostar With 3.OL

911811C Install Synchronizer Kit 6.7 Hr.

Ranger 4X4 With 2.3L or 4.OL and Explorer 4X4

911811D Install Synchronizer Kit - 6.9 Hr.

Ranger 4X4 With 2.9L

911811E Install Synchronizer Kit - 6.0 Hr.

Ranger 4X2 And Explorer 4X2 With 4.OL

911811F Install Synchronizer Kit - 6.5 Hr.

Bronco II 4X2 With 2.9L And Bronco With 5.OL

911811G Install Synchronizer Kit - 6.9 Hr.

Bronco II 4X4 With 2.9L

911811H Install Synchronizer Kit 5.1 Hr.

F-150 4X2 With 4.9L

911811I Install Synchronizer Kit 6.3 Hr.

F-150 4X4 With 4.9L or 5.OL And Bronco With 4.9L

911811J Install Synchronizer Kit - 5.3 Hr.

F-150 4X2 With 5.OL

911811K Install Synchronizer Kit - 5.2 Hr.

Econoline With 4.9L

DEALER CODING

BASIC PART NO. CONDITION CODE

7C391 56

OASIS CODES: 505000, 505200, 506000, 702000

Synchronizer Ring: Customer Interest M/T - Crunching Shifting From 2nd to 3rd Gear

Article No. 91-18-11 09/05/91

^ NOISE-INTERMITTENT "CRUNCHING" WHEN SHIFTING FROM 2ND TO 3RD-VEHICLES WITH M50D (MAZDA R1 AND R2) TRANSMISSION

^ TRANSMISSION-M50D (MAZDA R1 AND R2)- INTERMITTENT "CRUNCHING" NOISE WHEN SHIFTING FROM 2ND TO 3RD

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, RANGER 1991 EXPLORER

ISSUE: A slight intermittent "crunch" or grinding noise may be heard when shifting from 2nd to 3rd. This is caused by improper synchronizer engagement.

ACTION: Install a new synchronizer service kit. Refer to the Parts Block for correct parts usage and the following procedure for service details.

INSPECTION

1. Drive the vehicle to warm the transmission oil temperature to about 125~F (52~C). This can usually be done after driving about 10 miles at highway speed when the outside temperature is above freezing.

2. On a smooth road surface, accelerate the vehicle from a stop to 3rd gear at normal shift speeds as defined in the owners guide.

3. If a slight "crunch" is heard or grinding sensation is felt in the shift lever when shifting from 2nd to 3rd, proceed with the following synchronizer kit installation procedure.

SYNCHRONIZER KIT INSTALLATION

1. Remove the transmission from the vehicle. Refer to the appropriate Light Truck Shop Manual, Section 07-03A, for removal procedure.

2. Remove the 1st/2nd and 3rd/4th clutch hub and sleeve assembly along with the corresponding synchronizer ring.

3. Install all parts from the appropriate synchronizer kit. The kits contain new 1, 2, 3, and 4 synchronizer rings, a new 3/4 synchronizer sleeve and an instruction sheet. The original 1/2 clutch hub sleeve assembly and 3/4 clutch hub must be reused.

4. Put a label on the transmission showing it was updated per TSB 91-18-11 and to refer to this TSB before servicing.

NOTE: THE NEW 3RD GEAR SYNCHRONIZER RING AND 3/4 SYNCHRONIZER SLEEVE ARE UNIQUE FROM THE ORIGINAL COMPONENTS. THE NEW COMPONENTS MUST BE INSTALLED AS A SET IN THE PROPER POSITION. FAILURE TO DO SO WILL RESULT IN THE INABILITY TO SHIFT THE TRANSMISSION INTO ONE OF THE GEARS. note>

PART NUMBER PART NAME CLASS

FOTZ-7C391-H Synchronizer Kit - R2 (F-150, C

Bronco, Econoline)

FOTZ-7C391-F Synchronizer Kit - R1 (Ranger, C

Bronco II, Explorer)

FOTZ-7C391-G Synchronizer Kit - R1 C

(Aerostar)

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911811A Inspect Transmission 0.3 Hr.

911811B Install Synchronizer Kit 5.0 Hr.

Ranger 4X2 With 2.OL, 2.3L, 2.9L, or 3.OL And

Aerostar With 3.OL

911811C Install Synchronizer Kit 6.7 Hr.

Ranger 4X4 With 2.3L or 4.OL and Explorer 4X4

911811D Install Synchronizer Kit - 6.9 Hr.

Ranger 4X4 With 2.9L

911811E Install Synchronizer Kit - 6.0 Hr.

Ranger 4X2 And Explorer 4X2 With 4.OL

911811F Install Synchronizer Kit - 6.5 Hr.

Bronco II 4X2 With 2.9L And Bronco With 5.OL

911811G Install Synchronizer Kit - 6.9 Hr.

Bronco II 4X4 With 2.9L

911811H Install Synchronizer Kit 5.1 Hr.

F-150 4X2 With 4.9L

911811I Install Synchronizer Kit 6.3 Hr.

F-150 4X4 With 4.9L or 5.OL And Bronco With 4.9L

911811J Install Synchronizer Kit - 5.3 Hr.

F-150 4X2 With 5.OL

911811K Install Synchronizer Kit - 5.2 Hr.

Econoline With 4.9L

DEALER CODING

BASIC PART NO. CONDITION CODE

7C391 56

OASIS CODES: 505000, 505200, 506000, 702000

Synchronizer Ring: Customer Interest M/T - M50D Hard Shift Condition

Article No. 91-10-15

5/15/91

TRANSMISSION - M50D - HARD SHIFT TO REVERSE OR FIFTH GEAR

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, F-250, RANGER 1991 EXPLORER

ISSUE: The 5-R synchronizer sliding sleeve clutching teeth may wear on the reverse side. This may cause a hard to engage or partial engagement of fifth or reverse gear and could result in the transmission jumping out of gear. If the wear is allowed to continue, it may become difficult or impossible to engage 1-2-3 or 4th gear.

ACTION: Inspect the 5-R synchronizer sliding sleeve for wear and replace if excessive wear is found. Refer to the following procedure for service details.

INSPECTION PROCEDURE:

1. Remove necessary components so that the transmission extension housing can be removed without removing the entire transmission. Refer to the

Light Truck Shop Manual Section 07-03A for service details.

NOTE: COMPACT VEHICLES MAY REQUIRE REMOVAL OF TRANSMISSION

2. Remove the transmission extension housing.

3. Inspect the 5-R synchronizer sliding sleeve for wear of the reverse clutching teeth.

REPAIR PROCEDURE

1. If wear is observed, remove speedometer drive gear (4 x 2 only).

2. Remove the top cover (if repairing on the bench).

3. Carefully remove the main shaft and counter shaft locking nuts.

4. Remove and replace the following transmission parts. Refer to the Light Truck Shop Manual for service procedures.

^ 5th Counter Shaft Gear

^ 5-R Synchronizer, hub and ring assembly

NOTE: INSTALL WITH THE DOT ON THE SYNCHRONIZER SLEEVE FACING REVERSE GEAR.

^ Reverse counter shaft gear

^ 5-R Counter Lever

^ 5-R Shift fork and rod

NOTE: USE THE SPRING AND BALL FROM THE EXISTING ASSEMBLY.

^ Replace the idler shaft in the reverse idler gear assembly (R1 only).

NOTE: THERE ARE EXTRA ADJUSTING SHIMS PROVIDED IN CASE IT IS NECESSARY TO RESET THE 5-R SYNCHRONIZER HUB AND CONTROL REVERSE GEAR END PLAYS TO SPECIFICATION. USE THE NEW MAIN SHAFT AND COUNTER SHAFT LOCKING NUTS UPON ASSEMBLY.

CAUTION: USE ALL THE PARTS CONTAINED IN THE SERVICE KIT INCLUDING THE COUNTER REVERSE LEVER. ALTHOUGH THE

NEW LEVER LOOKS THE SAME AS THE ONE CONTAINED IN THE TRANSMISSION, CONTACT ANGLES ARE SLIGHTLY DIFFERENT TO INSURE PROPER TIMING AND

ENGAGEMENT.

PART NUMBER PART NAME CLASS

F0TZ-7C391-E Synchronizer Service Kit - R2 C

F0TZ-7C391-C Synchronizer Service Kit - 2.3L, C

2.9L, 3.0L, R1

F0TZ-7C391-D Synchronizer Service Kit - 4.0L C

R1

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage OPERATION DESCRIPTION

TIME

911015A Install Synchronizer Service 2.1 Hr.

Kit - 4 x 2

911015A Install Synchronizer Service 2.9 Hr.

Kit - 4 x 4

DEALER CODING

BASIC PART NO. CONDITION CODE

7124 30

OASIS CODES: 505000

Synchronizer Ring: All Technical Service Bulletins M/T - Crunching Shifting From 2nd to 3rd Gear

Article No. 91-18-11 09/05/91

^ NOISE-INTERMITTENT "CRUNCHING" WHEN SHIFTING FROM 2ND TO 3RD-VEHICLES WITH M50D (MAZDA R1 AND R2) TRANSMISSION

^ TRANSMISSION-M50D (MAZDA R1 AND R2)- INTERMITTENT "CRUNCHING" NOISE WHEN SHIFTING FROM 2ND TO 3RD

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, RANGER 1991 EXPLORER

ISSUE: A slight intermittent "crunch" or grinding noise may be heard when shifting from 2nd to 3rd. This is caused by improper synchronizer engagement.

ACTION: Install a new synchronizer service kit. Refer to the Parts Block for correct parts usage and the following procedure for service details.

INSPECTION

1. Drive the vehicle to warm the transmission oil temperature to about 125~F (52~C). This can usually be done after driving about 10 miles at highway speed when the outside temperature is above freezing.

2. On a smooth road surface, accelerate the vehicle from a stop to 3rd gear at normal shift speeds as defined in the owners guide.

3. If a slight "crunch" is heard or grinding sensation is felt in the shift lever when shifting from 2nd to 3rd, proceed with the following synchronizer kit installation procedure.

SYNCHRONIZER KIT INSTALLATION

1. Remove the transmission from the vehicle. Refer to the appropriate Light Truck Shop Manual, Section 07-03A, for removal procedure.

2. Remove the 1st/2nd and 3rd/4th clutch hub and sleeve assembly along with the corresponding synchronizer ring.

3. Install all parts from the appropriate synchronizer kit. The kits contain new 1, 2, 3, and 4 synchronizer rings, a new 3/4 synchronizer sleeve and an instruction sheet. The original 1/2 clutch hub sleeve assembly and 3/4 clutch hub must be reused.

4. Put a label on the transmission showing it was updated per TSB 91-18-11 and to refer to this TSB before servicing.

NOTE: THE NEW 3RD GEAR SYNCHRONIZER RING AND 3/4 SYNCHRONIZER SLEEVE ARE UNIQUE FROM THE ORIGINAL COMPONENTS. THE NEW COMPONENTS MUST BE INSTALLED AS A SET IN THE PROPER POSITION. FAILURE TO DO SO WILL RESULT IN THE INABILITY TO SHIFT THE TRANSMISSION INTO ONE OF THE GEARS. note>

PART NUMBER PART NAME CLASS

FOTZ-7C391-H Synchronizer Kit - R2 (F-150, C

Bronco, Econoline)

FOTZ-7C391-F Synchronizer Kit - R1 (Ranger, C

Bronco II, Explorer)

FOTZ-7C391-G Synchronizer Kit - R1 C

(Aerostar)

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911811A Inspect Transmission 0.3 Hr.

911811B Install Synchronizer Kit 5.0 Hr.

Ranger 4X2 With 2.OL, 2.3L, 2.9L, or 3.OL And

Aerostar With 3.OL

911811C Install Synchronizer Kit 6.7 Hr.

Ranger 4X4 With 2.3L or 4.OL and Explorer 4X4

911811D Install Synchronizer Kit - 6.9 Hr.

Ranger 4X4 With 2.9L

911811E Install Synchronizer Kit - 6.0 Hr.

Ranger 4X2 And Explorer 4X2 With 4.OL

911811F Install Synchronizer Kit - 6.5 Hr.

Bronco II 4X2 With 2.9L And Bronco With 5.OL

911811G Install Synchronizer Kit - 6.9 Hr.

Bronco II 4X4 With 2.9L

911811H Install Synchronizer Kit 5.1 Hr.

F-150 4X2 With 4.9L

911811I Install Synchronizer Kit 6.3 Hr.

F-150 4X4 With 4.9L or 5.OL And Bronco With 4.9L

911811J Install Synchronizer Kit - 5.3 Hr.

F-150 4X2 With 5.OL

911811K Install Synchronizer Kit - 5.2 Hr.

Econoline With 4.9L

DEALER CODING

BASIC PART NO. CONDITION CODE

7C391 56

OASIS CODES: 505000, 505200, 506000, 702000

Synchronizer Ring: All Technical Service Bulletins M/T - M50D Hard Shift Condition

Article No. 91-10-15

5/15/91

TRANSMISSION - M50D - HARD SHIFT TO REVERSE OR FIFTH GEAR

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, F-250, RANGER 1991 EXPLORER

ISSUE: The 5-R synchronizer sliding sleeve clutching teeth may wear on the reverse side. This may cause a hard to engage or partial engagement of fifth or reverse gear and could result in the transmission jumping out of gear. If the wear is allowed to continue, it may become difficult or impossible to engage 1-2-3 or 4th gear.

ACTION: Inspect the 5-R synchronizer sliding sleeve for wear and replace if excessive wear is found. Refer to the following procedure for service details.

INSPECTION PROCEDURE:

1. Remove necessary components so that the transmission extension housing can be removed without removing the entire transmission. Refer to the

Light Truck Shop Manual Section 07-03A for service details.

NOTE: COMPACT VEHICLES MAY REQUIRE REMOVAL OF TRANSMISSION

2. Remove the transmission extension housing.

3. Inspect the 5-R synchronizer sliding sleeve for wear of the reverse clutching teeth.

REPAIR PROCEDURE

1. If wear is observed, remove speedometer drive gear (4 x 2 only).

2. Remove the top cover (if repairing on the bench).

3. Carefully remove the main shaft and counter shaft locking nuts.

4. Remove and replace the following transmission parts. Refer to the Light Truck Shop Manual for service procedures.

^ 5th Counter Shaft Gear

^ 5-R Synchronizer, hub and ring assembly

NOTE: INSTALL WITH THE DOT ON THE SYNCHRONIZER SLEEVE FACING REVERSE GEAR.

^ Reverse counter shaft gear

^ 5-R Counter Lever

^ 5-R Shift fork and rod

NOTE: USE THE SPRING AND BALL FROM THE EXISTING ASSEMBLY.

^ Replace the idler shaft in the reverse idler gear assembly (R1 only).

NOTE: THERE ARE EXTRA ADJUSTING SHIMS PROVIDED IN CASE IT IS NECESSARY TO RESET THE 5-R SYNCHRONIZER HUB AND CONTROL REVERSE GEAR END PLAYS TO SPECIFICATION. USE THE NEW MAIN SHAFT AND COUNTER SHAFT LOCKING NUTS UPON ASSEMBLY.

CAUTION: USE ALL THE PARTS CONTAINED IN THE SERVICE KIT INCLUDING THE COUNTER REVERSE LEVER. ALTHOUGH THE

NEW LEVER LOOKS THE SAME AS THE ONE CONTAINED IN THE TRANSMISSION, CONTACT ANGLES ARE SLIGHTLY DIFFERENT TO INSURE PROPER TIMING AND

ENGAGEMENT.

PART NUMBER PART NAME CLASS

F0TZ-7C391-E Synchronizer Service Kit - R2 C

F0TZ-7C391-C Synchronizer Service Kit - 2.3L, C

2.9L, 3.0L, R1

F0TZ-7C391-D Synchronizer Service Kit - 4.0L C

R1

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage OPERATION DESCRIPTION

TIME

911015A Install Synchronizer Service 2.1 Hr.

Kit - 4 x 2

911015A Install Synchronizer Service 2.9 Hr.

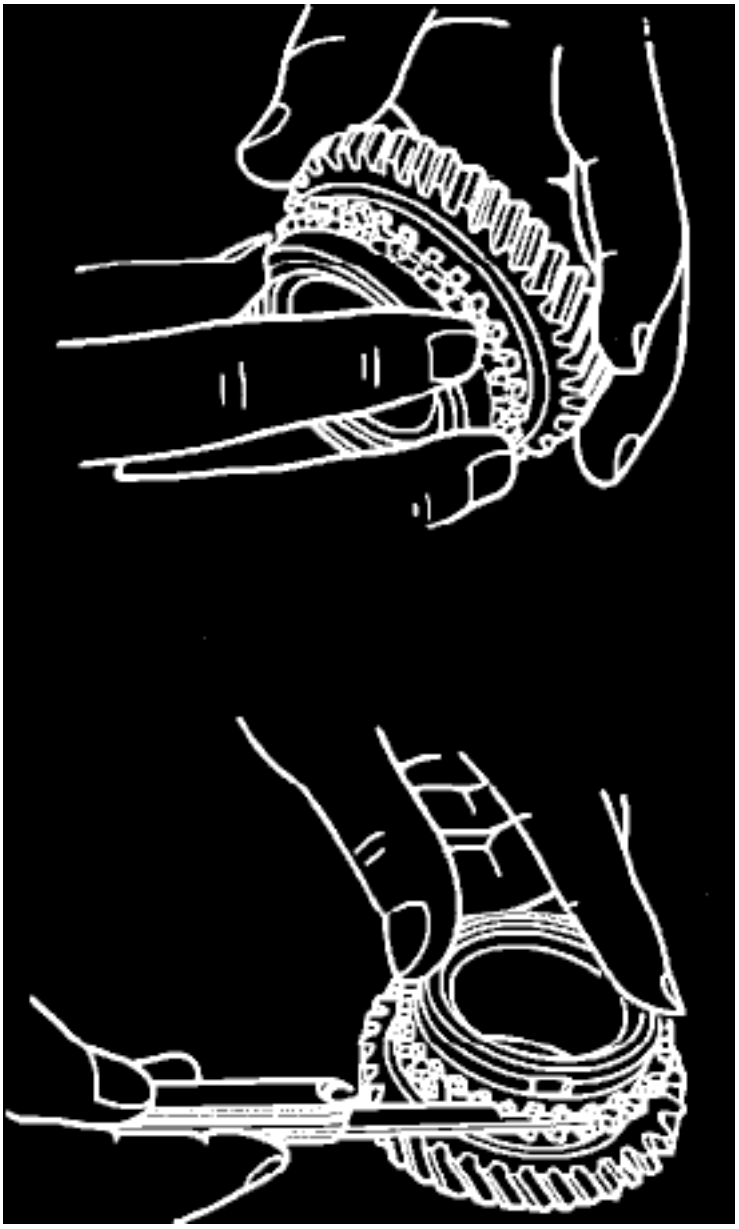
Kit - 4 x 4

DEALER CODING

BASIC PART NO. CONDITION CODE

7124 30

OASIS CODES: 505000



Synchronizer Ring: Testing and Inspection

1. Inspect gear teeth on synchronizer ring. If evidence of chipping or excessively worn teeth are present, replace component.

Checking Synchronizer Ring

2. Check synchronizer ring for wear by assembling synchronizer ring to gear cone. 3. Measure clearance between side faces of synchronizer ring and gear using a suitable feeler gauge. If clearance is less than 0.031 inch, replace

synchronizer ring or gear.

NOTE: 1st/2nd, 3rd/4th and 5th/reverse synchronizer to gear clearance specifications are the same.

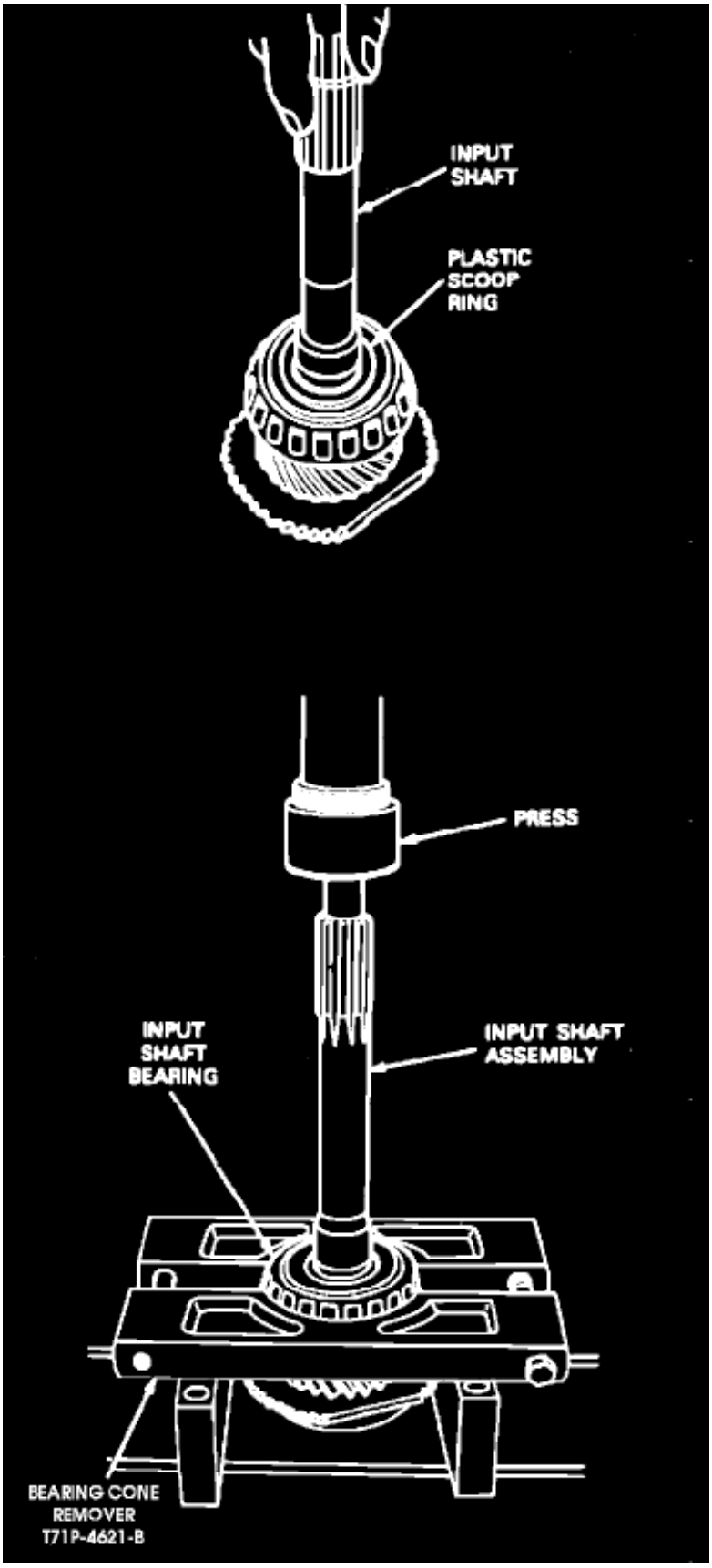
4. Check for proper contact between inner surface of synchronizer ring and cone surface of gear by applying a thin coat of Prussian blue or

equivalent to surface of cone, then fitting it into ring. If contact pattern is poor, correct by applying compound and lapping surfaces together.

5. Ensure clutch sleeve slides easily onto clutch hub. 6. Check synchronizer inserts (keys), inner surface of clutch sleeve, then the insert groove on clutch hub from wear. 7. Check synchronizer insert spring for tension.

Input Shaft: Testing and Inspection

Check input shaft for spline damage. If needle bearing surface in bore of bearing is worn or rough or if cone surface is damaged, replace input shaft.

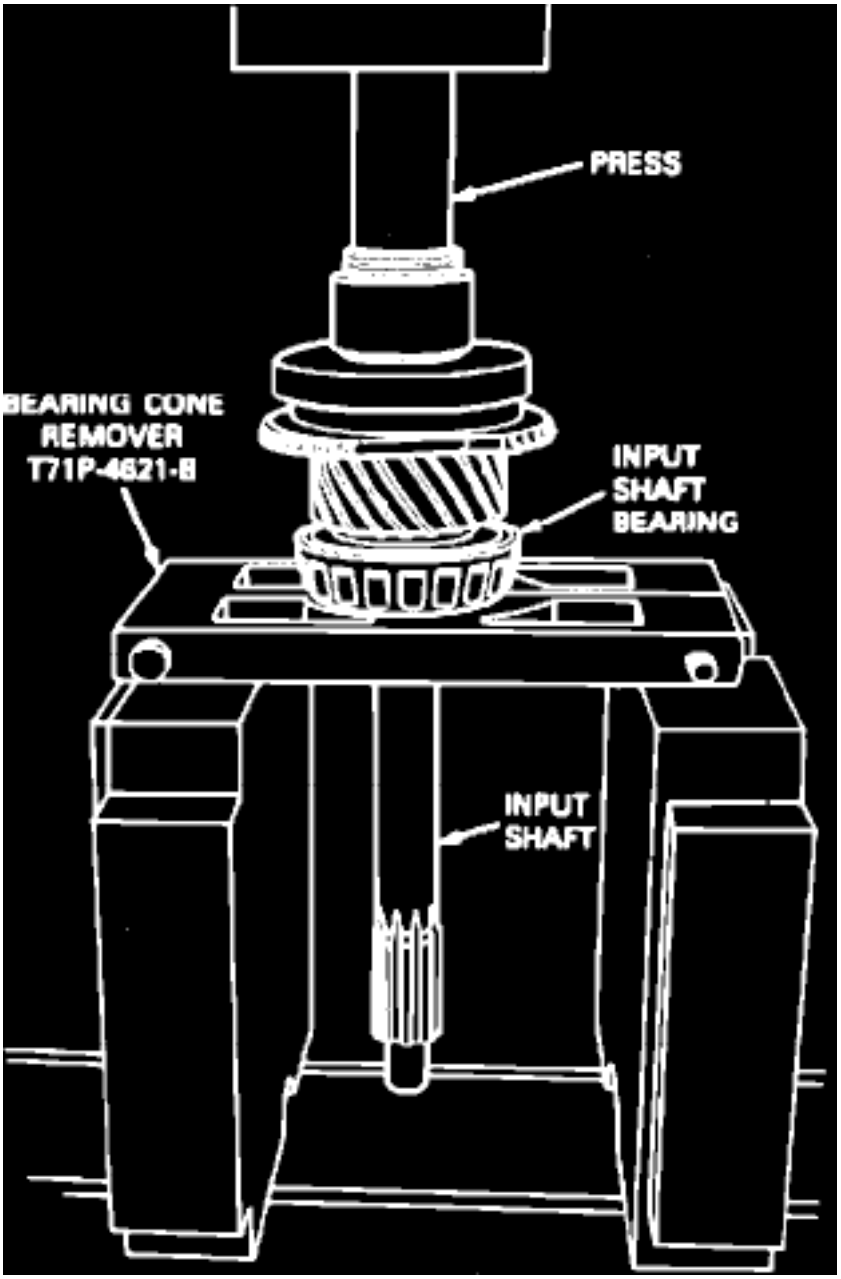

INPUT SHAFT
PLASTIC SCOOP RING
PRESS
INPUT SHAFT BEARING
INPUT SHAFT ASSEMBLY
BEARING CONE REMOVER T71P-4621-B

Input Shaft: Service and Repair

1. Remove and discard plastic scoop ring.

Disassembling Input Shaft

2. Press tapered roller bearing from input shaft using bearing remover tool No. T71P-4621-B or equivalent and a suitable press.



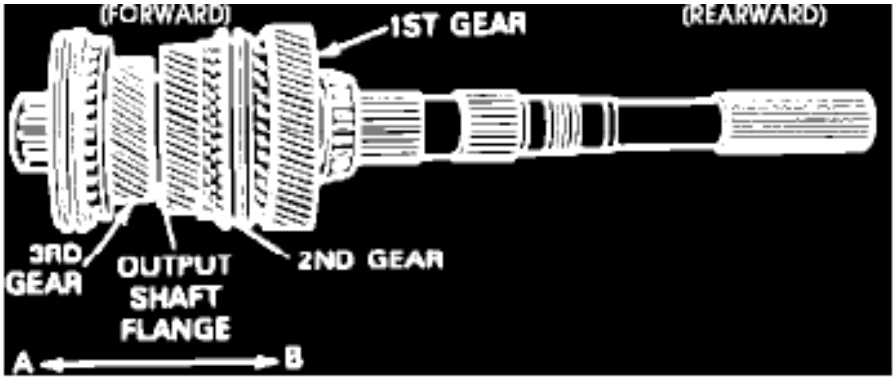
Installing Input Shaft Bearing

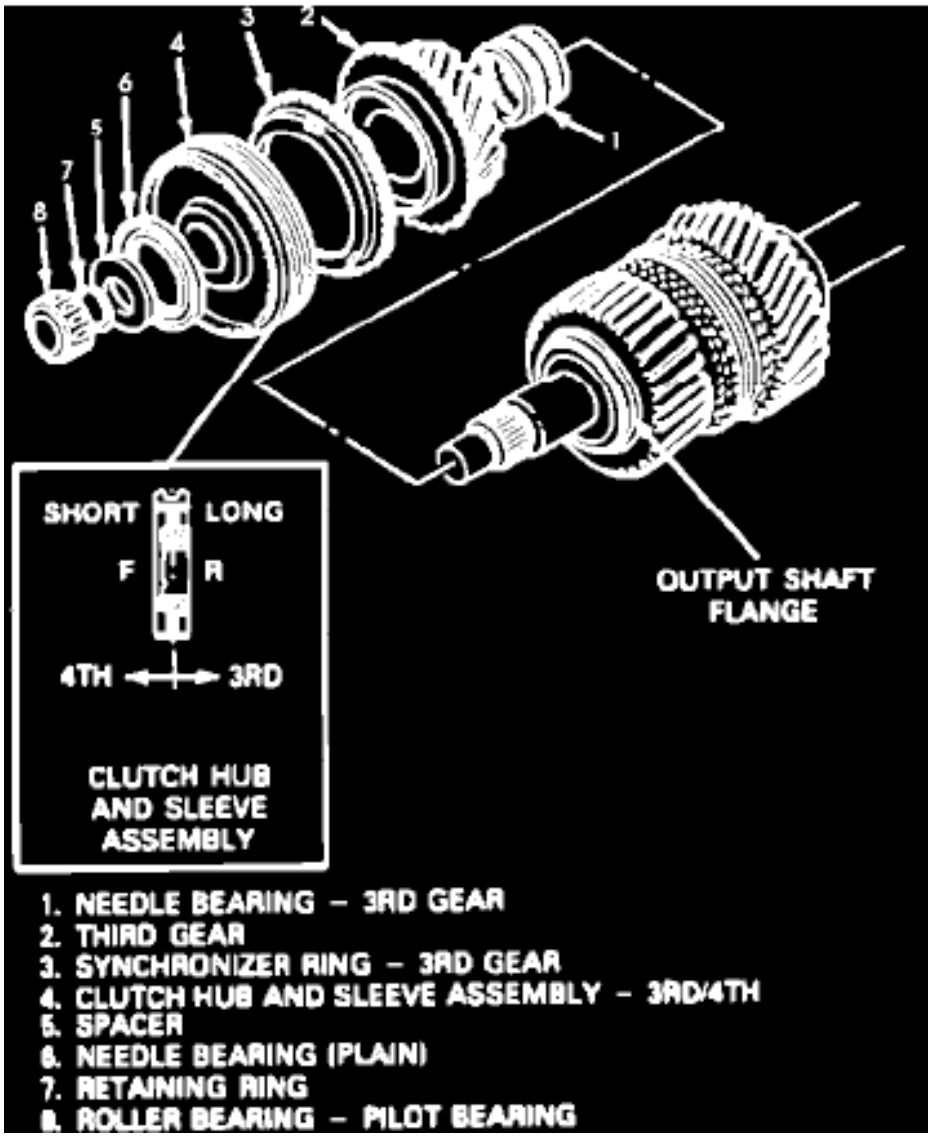
3. Install input shaft tapered roller bearing, using bearing cone installer tool No. T88T-7025-B or equivalent. 4. Install new plastic scoop ring onto input shaft, then manually rotate ring clockwise to ensure input shaft oil holes are properly aligned with scoop

ring and a click is heard.

Output Shaft: Testing and Inspection

1. Check output shaft runout by placing output shaft in V-blocks. 2. Mount a suitable dial indicator next to shaft, then measure runout at several points along shaft. 3. Total output shaft runout should not exceed 0.002 inch.


(FORWARD)
1ST GEAR
(REARWARD)
3RD GEAR
OUTPUT SHAFT FLANGE
2ND GEAR
A
B


1
2
3
4
5
6
7
8
SHORT
LONG
F
R
4TH
3RD
CLUTCH HUB AND SLEEVE ASSEMBLY
OUTPUT SHAFT FLANGE
1. NEEDLE BEARING – 3RD GEAR
2. THIRD GEAR
3. SYNCHRONIZER RING – 3RD GEAR
4. CLUTCH HUB AND SLEEVE ASSEMBLY – 3RD/4TH
5. SPACER
6. NEEDLE BEARING (PLAIN)
7. RETAINING RING
8. ROLLER BEARING – PILOT BEARING

Output Shaft: Service and Repair

DISASSEMBLY

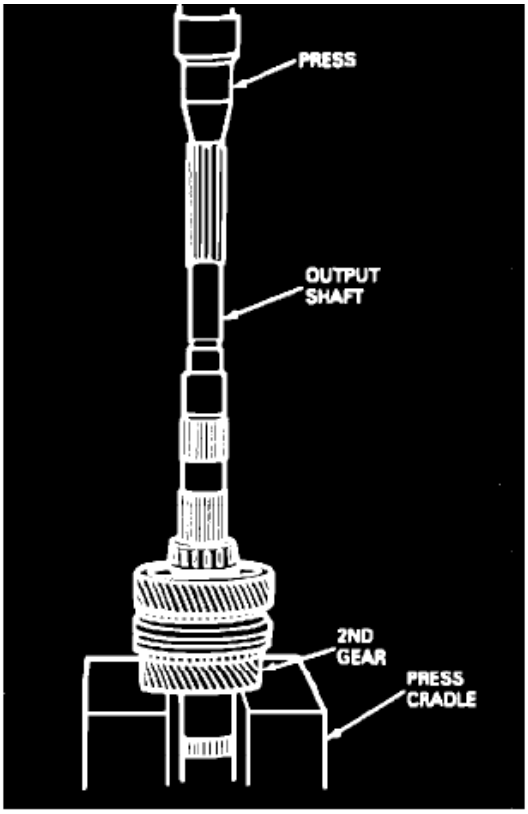
Positioning output Shaft For Component Replacement

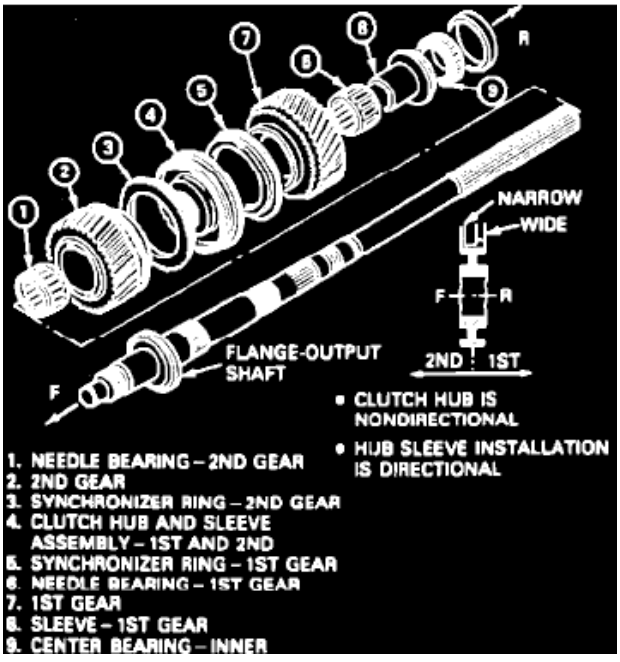
1. Position output shaft front flange, then remove pilot bearing, snap ring, needle bearing and front spacer.

Output Shaft Components

2. Position front (short side of flange) of output shaft facing upward, then lift off clutch hub and sleeve assembly (3rd/4th), synchronizer ring (3rd)

and needle bearing as an assembly.


PRESS
OUTPUT SHAFT
2ND GEAR
PRESS CRADLE


1
2
3
4
5
6
7
8
9
R
NARROW
WIDE
F
R
2ND
1ST
FLANGE-OUTPUT SHAFT
F
• CLUTCH HUB IS NONDIRECTIONAL
• HUB SLEEVE INSTALLATION IS DIRECTIONAL
1. NEEDLE BEARING – 2ND GEAR
2. 2ND GEAR
3. SYNCHRONIZER RING – 2ND GEAR
4. CLUTCH HUB AND SLEEVE ASSEMBLY – 1ST AND 2ND
5. SYNCHRONIZER RING – 1ST GEAR
6. NEEDLE BEARING – 1ST GEAR
7. 1ST GEAR
8. SLEEVE – 1ST GEAR
9. CENTER BEARING – INNER

Removing Output Shaft Components

3. Position output shaft with rear end facing upward on a suitable press. 4. Press off center bearing, 1st gear sleeve, 1st gear, needle bearing, 1st/2nd clutch hub and sleeve assembly, 1st/2nd synchronizer rings, 2nd gear

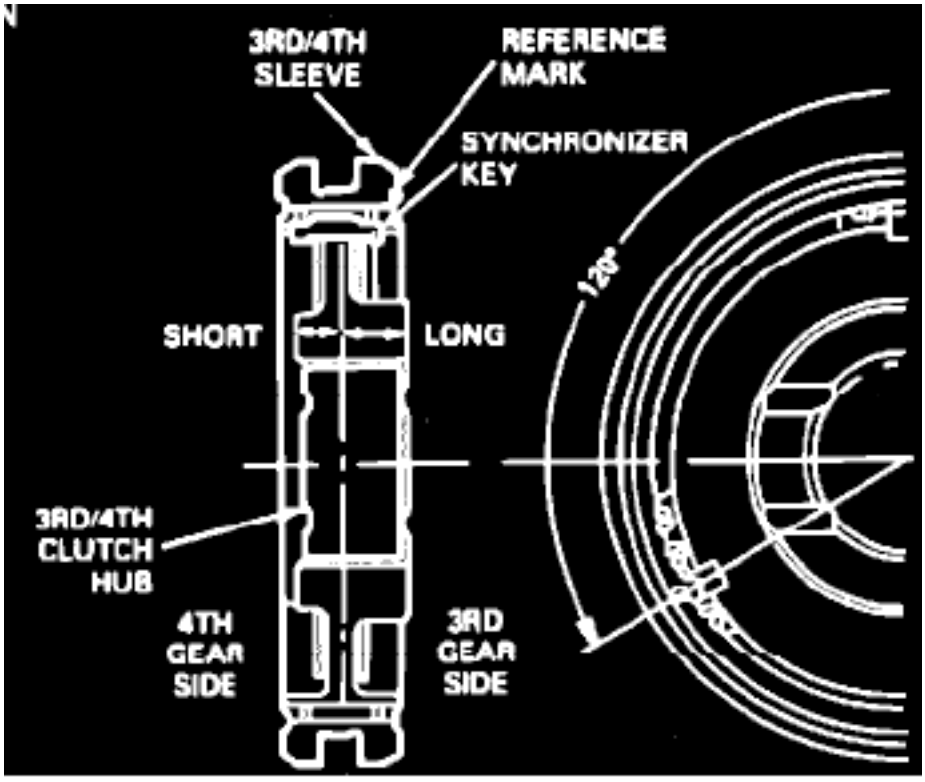
and needle bearing as an assembly.

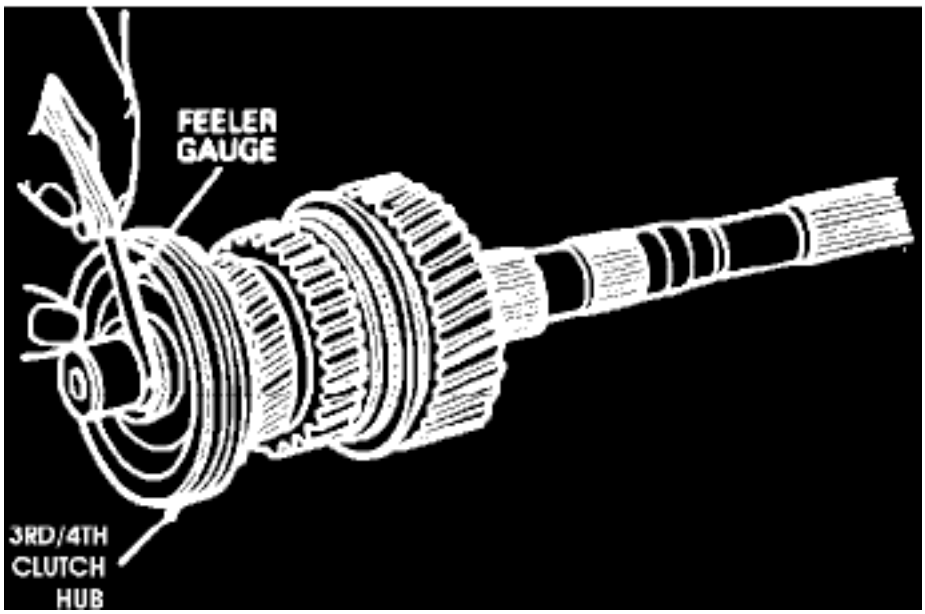
ASSEMBLY

Output Shaft Components

1. Position output shaft with long side of flange facing upward, then position output shaft components to facilitate installation. 2. Assemble 2nd gear needle bearing, 2nd gear, 2nd gear synchronizer ring, 1st/2nd clutch hub and sleeve assembly, 1st gear synchronizer ring, 1st

gear needle bearing, 1st gear, 1st gear sleeve and center bearing onto shaft.


3RD/4TH SLEEVE
REFERENCE MARK
SYNCHRONIZER KEY
120°
SHORT
LONG
3RD/4TH CLUTCH HUB
4TH GEAR SIDE
3RD GEAR SIDE


FEELER GAUGE
3RD/4TH CLUTCH HUB

NOTE: When installing 1st/2nd clutch hub and sleeve, ensure smaller width of sleeve is facing front side of 2nd gear.

3. Press components onto shaft, using tools bearing replacer No. T53T-4621-B and bearing plate T75L-1165-B or equivalent and a suitable press. 4. Ensure center bearing race is installed into transmission case, then install center bearing onto output shaft. 5. Position output shaft with short side of shaft facing upward on a suitable press, then install 3rd gear needle bearing, 3rd gear, and 3rd gear

synchronizer ring.

6. Install 3rd/4th clutch hub and sleeve as follows:

a. Mate clutch hub synchronizer key groove with reference mark on clutch hub sleeve. b. Ensure mark is facing rearward.

Installing 3rd/4th Clutch Hub

c. Install longer flange on clutch hub sleeve toward 3rd gear. Front and rear sides of clutch are similar except for reference mark on one side.

7. Install in order, spacer, needle bearing with rollers upward, retaining ring, then the pilot roller bearing. 8. Install original retaining ring.

Measuring Clutch Hub.

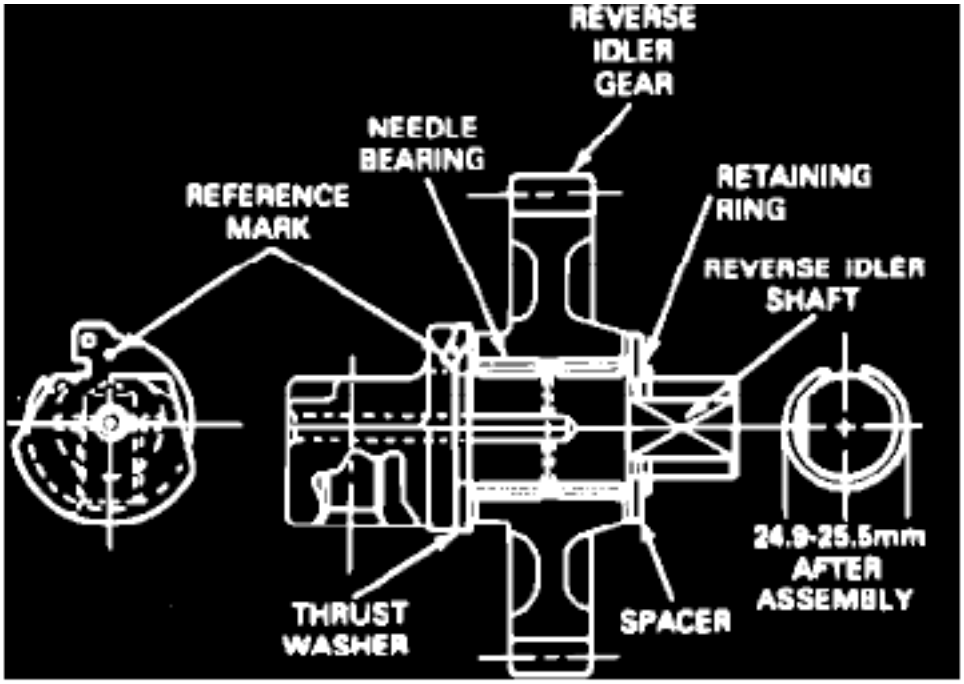
9. Check clutch hub endplay, using a suitable feeler gauge.

Part No.	Thickness	
	Millimeters	Inches
E8TZ-7030-A	1.50	.059
E8TZ-7030-B	1.55	.061
E8TZ-7030-C	1.60	.0629
E8TZ-7030-D	1.65	.0649
E8TZ-7030-E	1.70	.0669
E8TZ-7030-F	1.75	.0688
E8TZ-7030-G	1.80	.0708
E8TZ-7030-H	1.85	.0728
E8TZ-7030-J	1.90	.0748
E8TZ-7030-K	1.95	.0767

3rd/4th Clutch Hub Selective Retaining Ring Chart

10. If necessary, adjust 3rd/4th clutch hub endplay to specifications. Endplay should be 0.0-0.0019 inch. If endplay is not as specified, select a

suitable retaining ring from chart that will bring endplay to within specifications.



Part No.	Thickness	
	Millimeters	Inches
E8TZ-7156-A	1.50	.059
E8TZ-7156-G	1.60	.0629
E8TZ-7156-H	1.70	.0669
E8TZ-7156-J	1.80	.0708
E8TZ-7156-K	1.90	.0748

Reverse Gear Shaft: Service and Repair

Cross-Sectional View Of Reverse Idler Gear Shaft

1. Remove retaining ring, spacer, idle gear, needle bearings and thrust washer from reverse idler gear shaft. 2. Install thrust washer onto reverse idler gear shaft. Ensure tab on thrust washer mates with groove on reverse idler shaft to prevent rotation of thrust

washer.

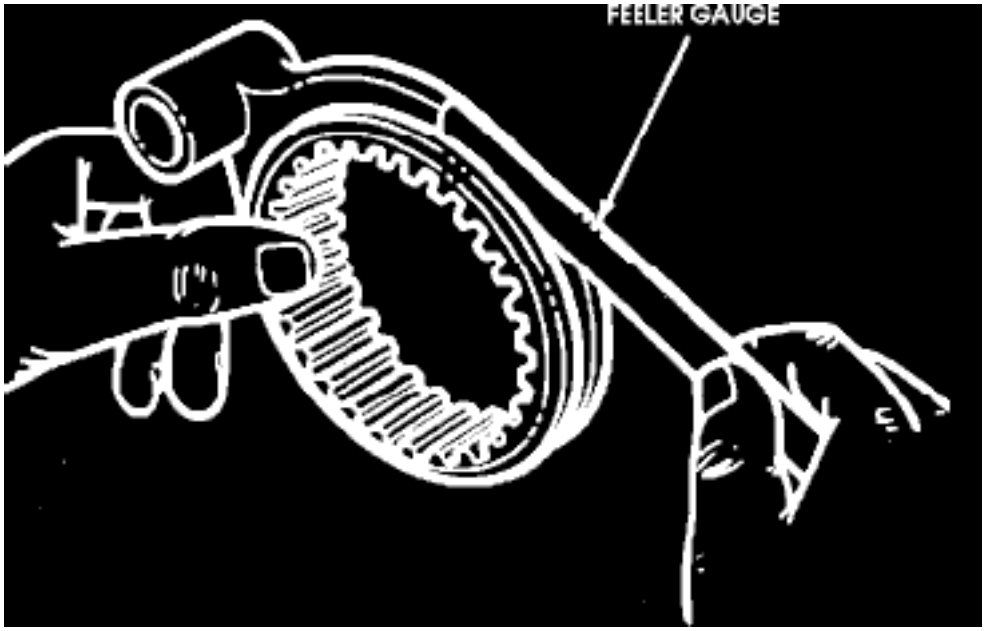
3. Install needle bearings, idler gear and spacer. 4. Install original retaining ring onto reverse idler gear shaft, then insert a suitable feeler gauge between retaining ring and reverse idler gear to

measure endplay.

Reverse Idler Gear Selective Retaining Ring Chart

5. Endplay should be 0.0039-0.0078 inch (0.1-0.2mm). If endplay is not as specified, select a suitable retaining ring from chart that will bring

endplay to within specifications.



Shift Fork: Testing and Inspection

Checking Shift Fork Hub Sleeve

1. Check contact surface of shift fork and clutch hub sleeve for evidence of wear or damage. Measure from shift fork to clutch hub sleeve. Clearance

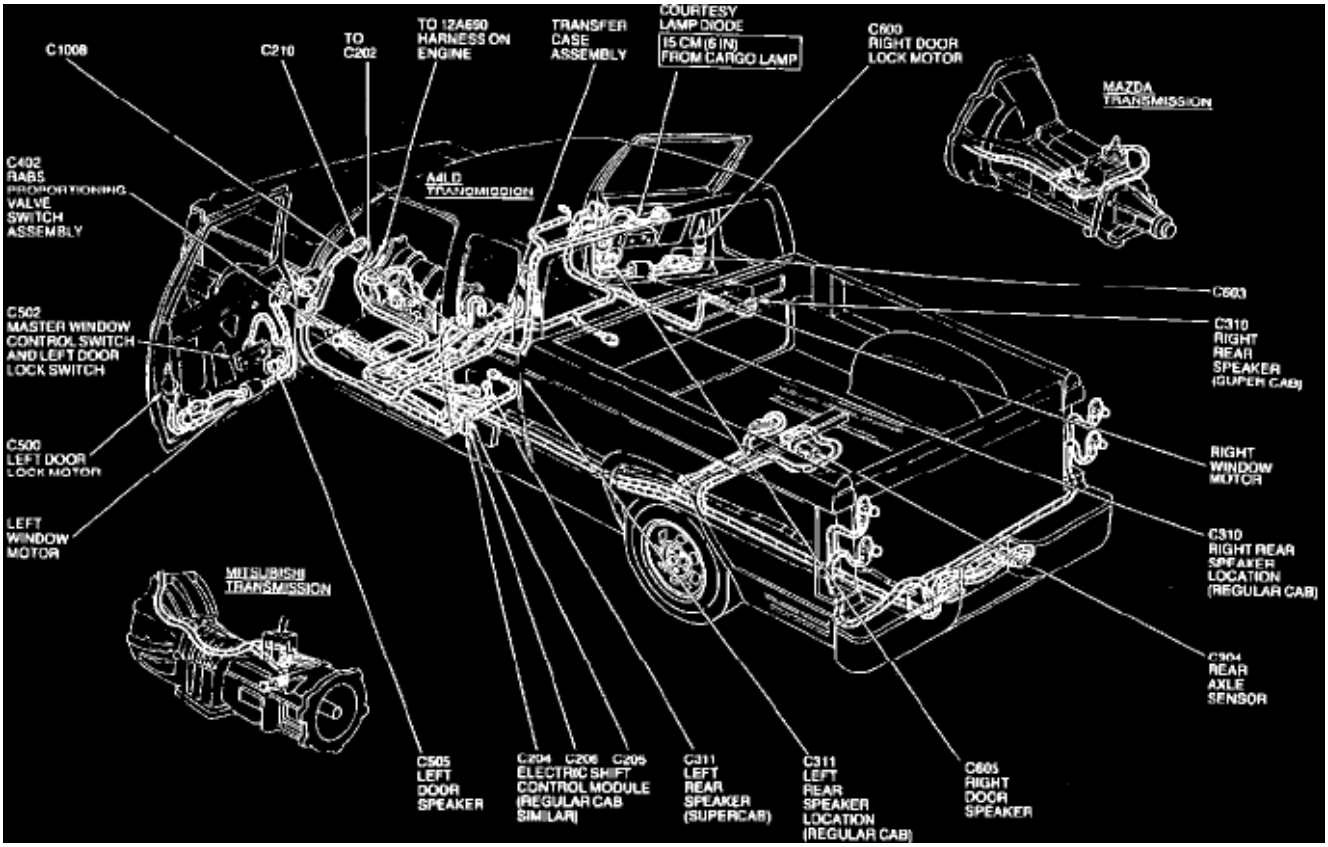
should be 0.031 inch.

2. Check operation of clutch hub sleeve while assembled to hub. 3. Position clutch hub sleeve horizontally, then lift hub approximately 3/4 of the way off the sleeve and release. Hub should slide downward into

sleeve on its own. If necessary to push hub into sleeve, service as necessary.

Speedometer Gear, M/T: Testing and Inspection

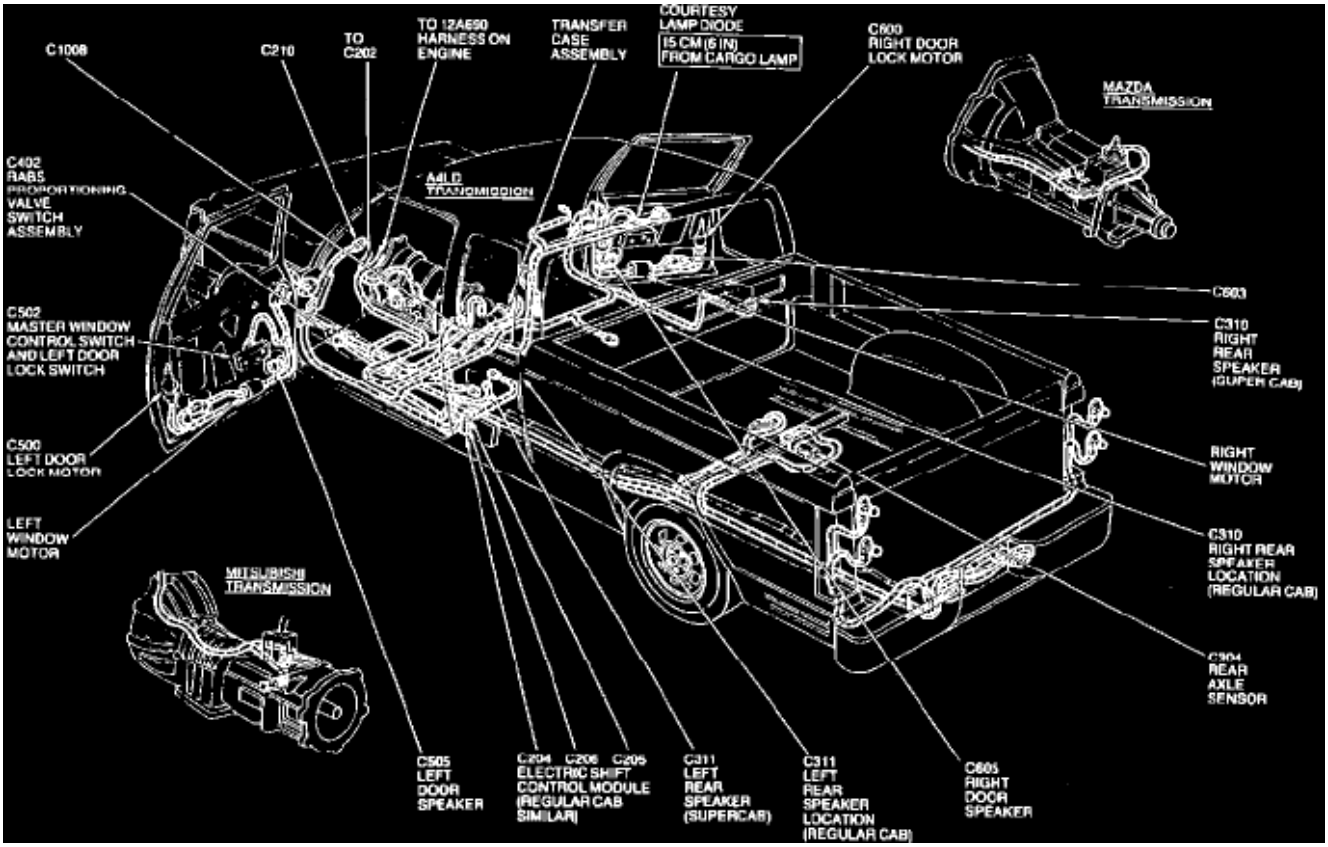
Check speedometer drive and driven gear shafts for wear or damage. Check O-ring and oil seals for weakness or damage.



Control Module: Locations Regular Cab

Body Components

Lower LH Rear Corner Of Cab



Control Module: Locations Supercab

Body Components

Between Bottom Of LH ``B'' Pillar & Rear Of Cab

Electronic Shift Control Module: Technical Service Bulletins Transfer Case - Revised Shift Procedures

Article No. 90-18-10

^ ELECTRONIC SHIFT MODULE (4X4) - MODIFIED OPERATION

^ TRANSFER CASE - 4X4 ELECTRONIC SHIFT MODULE - REVISED OPERATION PROCEDURE

LIGHT TRUCK: 1986-90 BRONCO II

1986-91 BRONCO, RANGER 1991 EXPLORER

ISSUE: The shift procedures into and out of LOW RANGE are revised for Ranger, Bronco and Explorer trucks built after 8/1/90 due to module changes. The new module will also be used to service prior model year trucks.

ACTION: If service is required on models built prior to 8/1/90, advise the customers of the following changes made to their vehicles.

Operation of the 1991 modules have been changed as follows:

To shift into 4 LOW: ^

Truck must be in 4x4 HIGH by previously pressing the 4x4 switch

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press LOW RANGE switch

To shift out of 4 LOW:

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press the LOW RANGE switch to shift back into 4x4 HIGH

^ Press the 4x4 HIGH switch to shift into 2 HIGH if desired

Previously, the module would respond to the LOW RANGE input from any mode (2H, 4H, 4L). If conditions A and B above are not met, the module would respond by flashing the 4 LOW indicator and wait until conditions A and B are met before completing the shift into or out of LOW RANGE. If LOW RANGE was selected while in 2 HIGH mode, the module would shift to 4 HIGH before flashing the indicator.

PART NUMBER PART NAME CLASS

F1TZ-7E453-A 4X4 Electronic Shift Module B

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

508000

Electronic Shift Control Module: Technical Service Bulletins Electric Shift Module Wiring Schematic - Correction

Article No. 91-3-11

02/02/91

0GTRANSFER CASE - 4X4 ELECTRIC SHIFT MODULE - EVTM WIRING CORRECTIONS

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Some of the wiring schematics shown in the EVTMs contain errors which make circuit tracing difficult. A complete update of these schematics will be made in the near future.

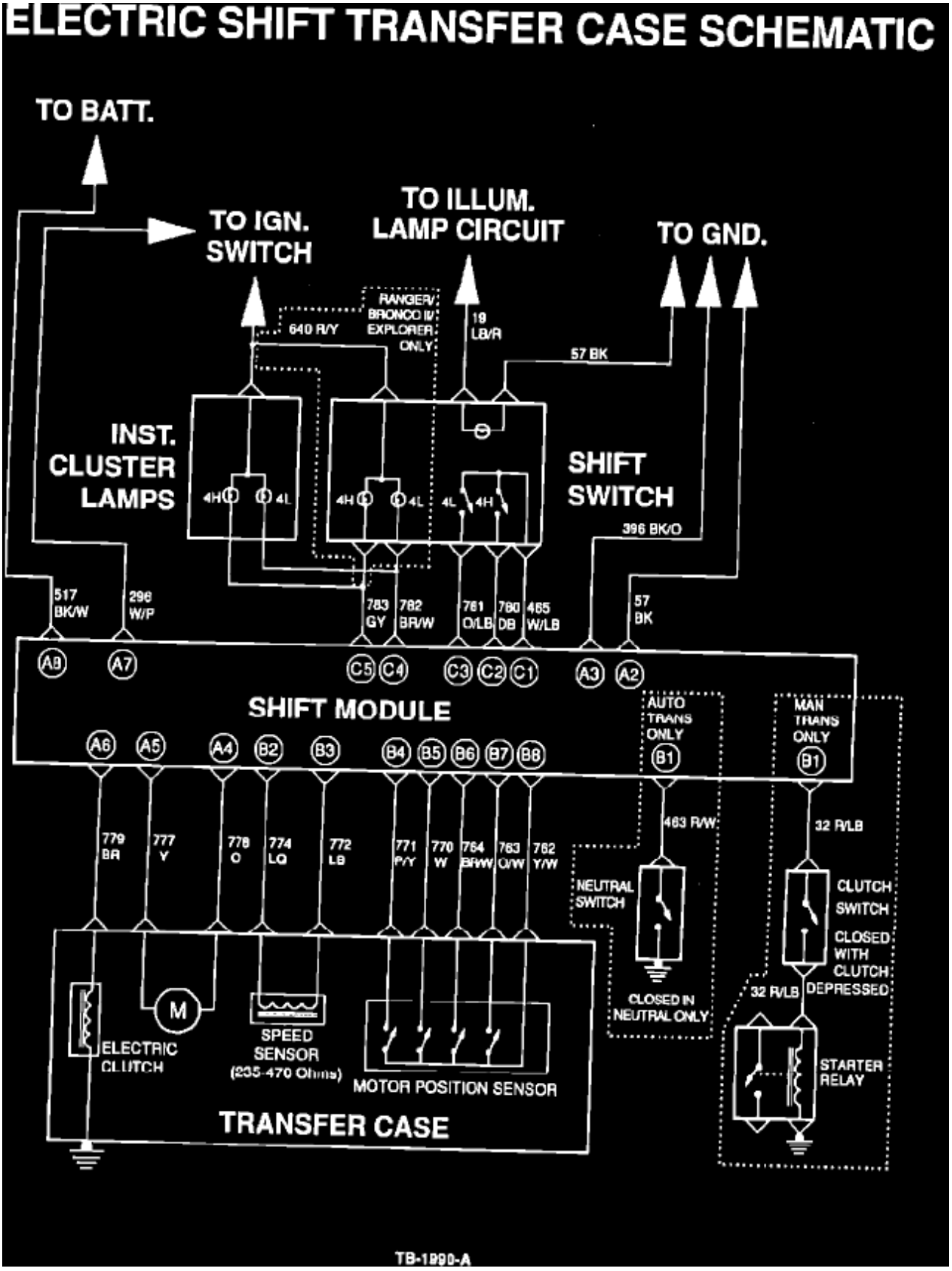

ELECTRIC SHIFT TRANSFER CASE SCHEMATIC
TO BATT.
TO IGN. SWITCH
TO ILLUM. LAMP CIRCUIT
TO GND.
RANGER/ BRONCO II/ EXPLORER ONLY
640 R/Y
19 LB/R
57 BK
INST. CLUSTER LAMPS
4H
4L
SHIFT SWITCH
396 BK/O
517 BK/W
296 W/P
783 GY
782 BR/W
781 O/LB
780 DB
485 W/LB
57 BK
A8
A7
C5
C4
C3
C2
C1
A3
A2
SHIFT MODULE
A6
A5
A4
B2
B3
B4
B5
B6
B7
B8
AUTO TRANS ONLY
B1
MAN TRANS ONLY
B1
779 BR
777 Y
778 O
774 LG
772 LB
771 P/Y
770 W
764 BR/W
763 O/W
762 Y/W
463 R/W
32 R/LB
NEUTRAL SWITCH
CLUTCH SWITCH
CLOSED WITH CLUTCH DEPRESSED
32 R/LB
CLOSED IN NEUTRAL ONLY
M
ELECTRIC CLUTCH
SPEED SENSOR (235-470 Ohms)
MOTOR POSITION SENSOR
STARTER RELAY
TRANSFER CASE
TB-1990-A

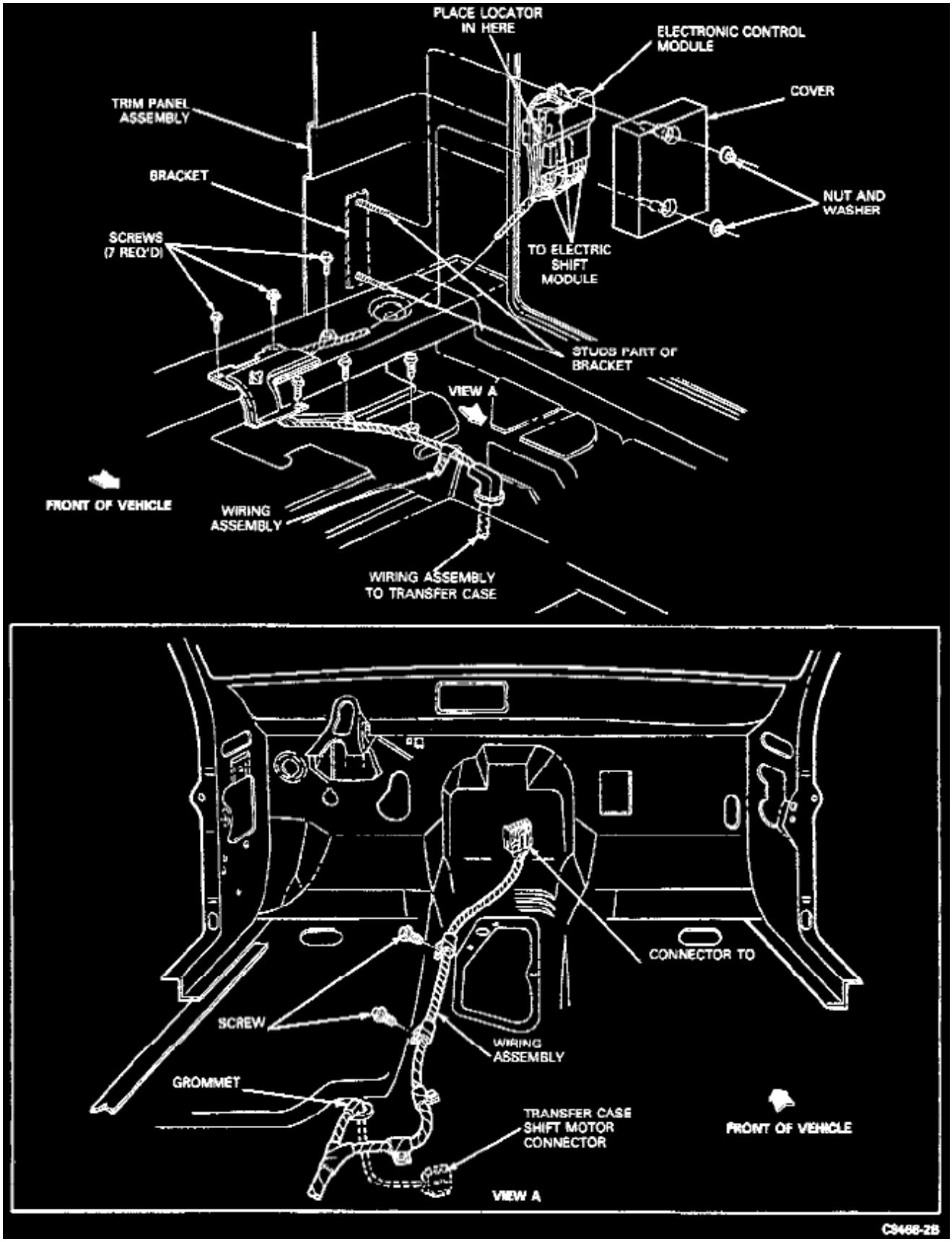
Figure 1

ACTION: In the interim, refer to the simplified schematic, Figure 1. It shows the electrical circuitry for the transfer case shift mechanism while deleting connectors and interconnects with other circuits for clarity.

OTHER APPLICABLE ARTICLES: None

WARRANTY STATUS: INFORMATION ONLY

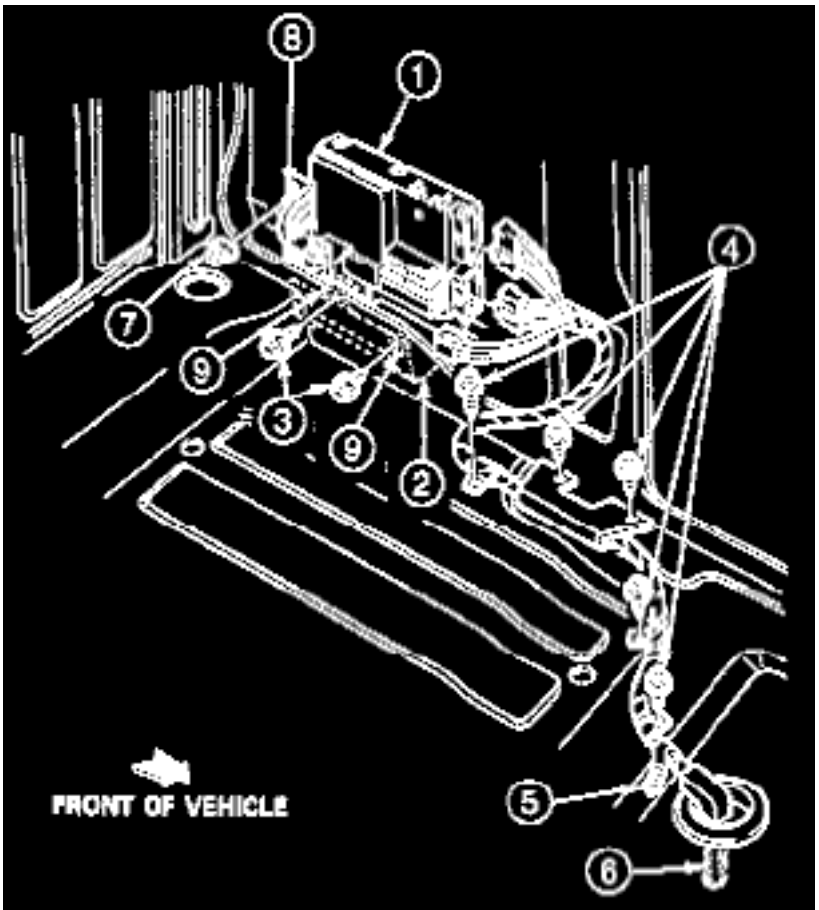
OASIS CODES: 203200, 290000, 508000, 590000



Electronic Shift Control Module: Locations Regular Cab

Electronic Control Module Location

The Electric Shift Control Module is located at the lower Left Hand rear corner of cab.



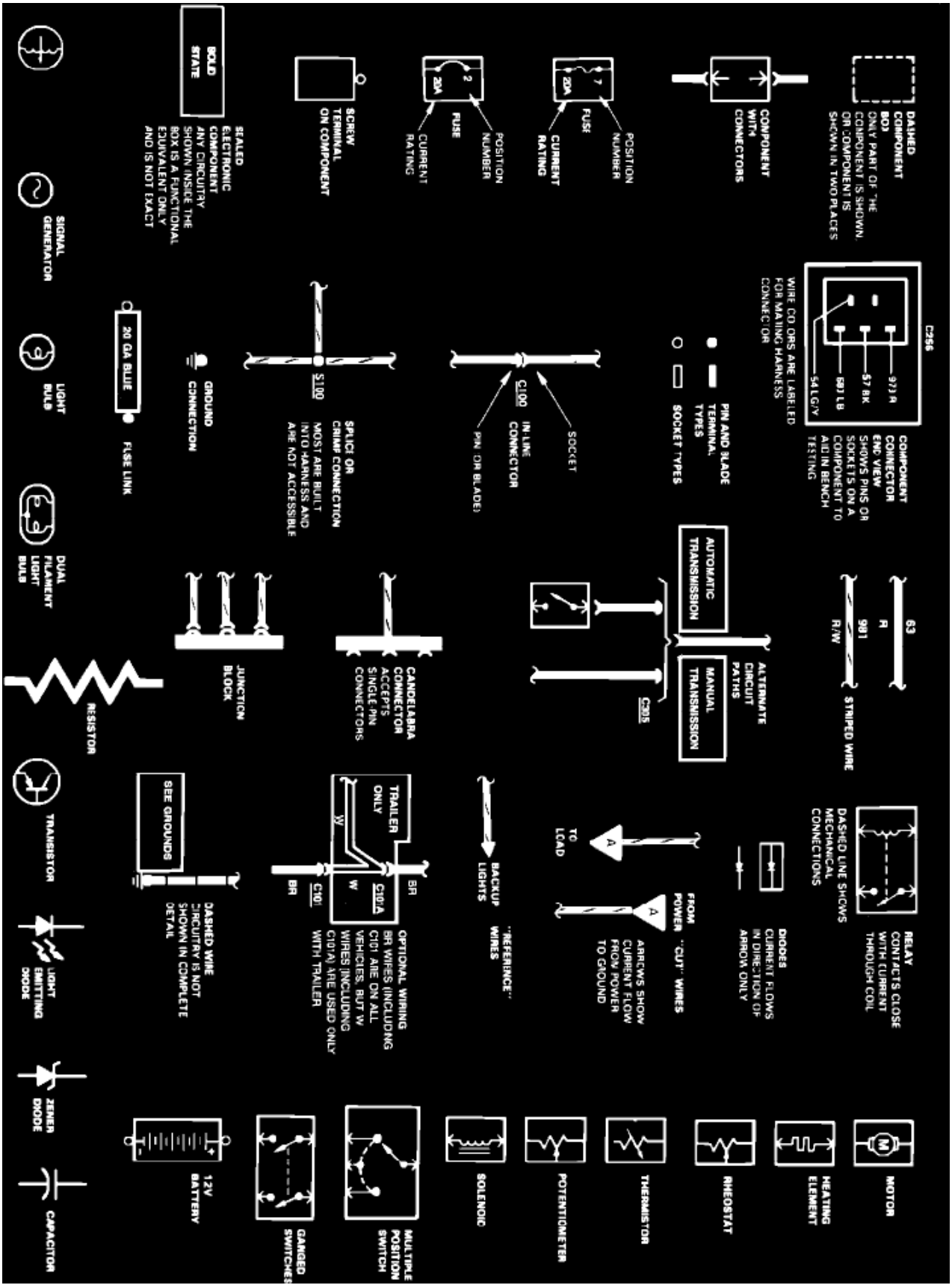
Item No.	Description
1	Electronic Control Module
2	Bracket, Shift Module
3	Screw (2 Req.)
4	Screw (5 Req.)
5	Wiring Assembly
6	Wiring Assembly
7	Nut and Washer Assembly
8	Stud Part for Module Bracket
9	Nut Assembly (2 Req.)

CC10860-A

Electronic Shift Control Module: Locations Supercab

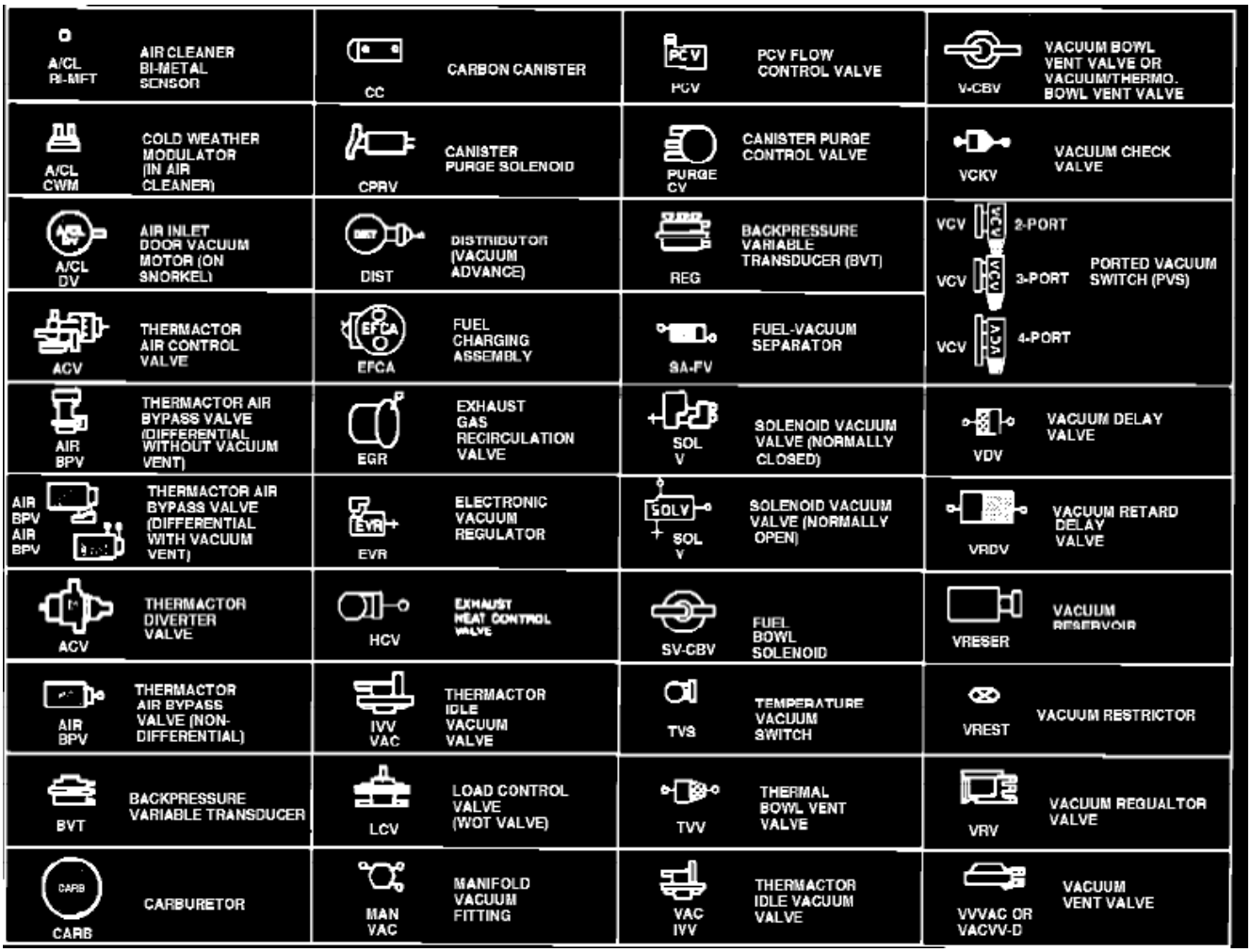
Control Module Circuits, Ranger SuperCab

The Electric Shift Control Module is located between the bottom of the Left Hand "B" pillar and the rear of the cab.

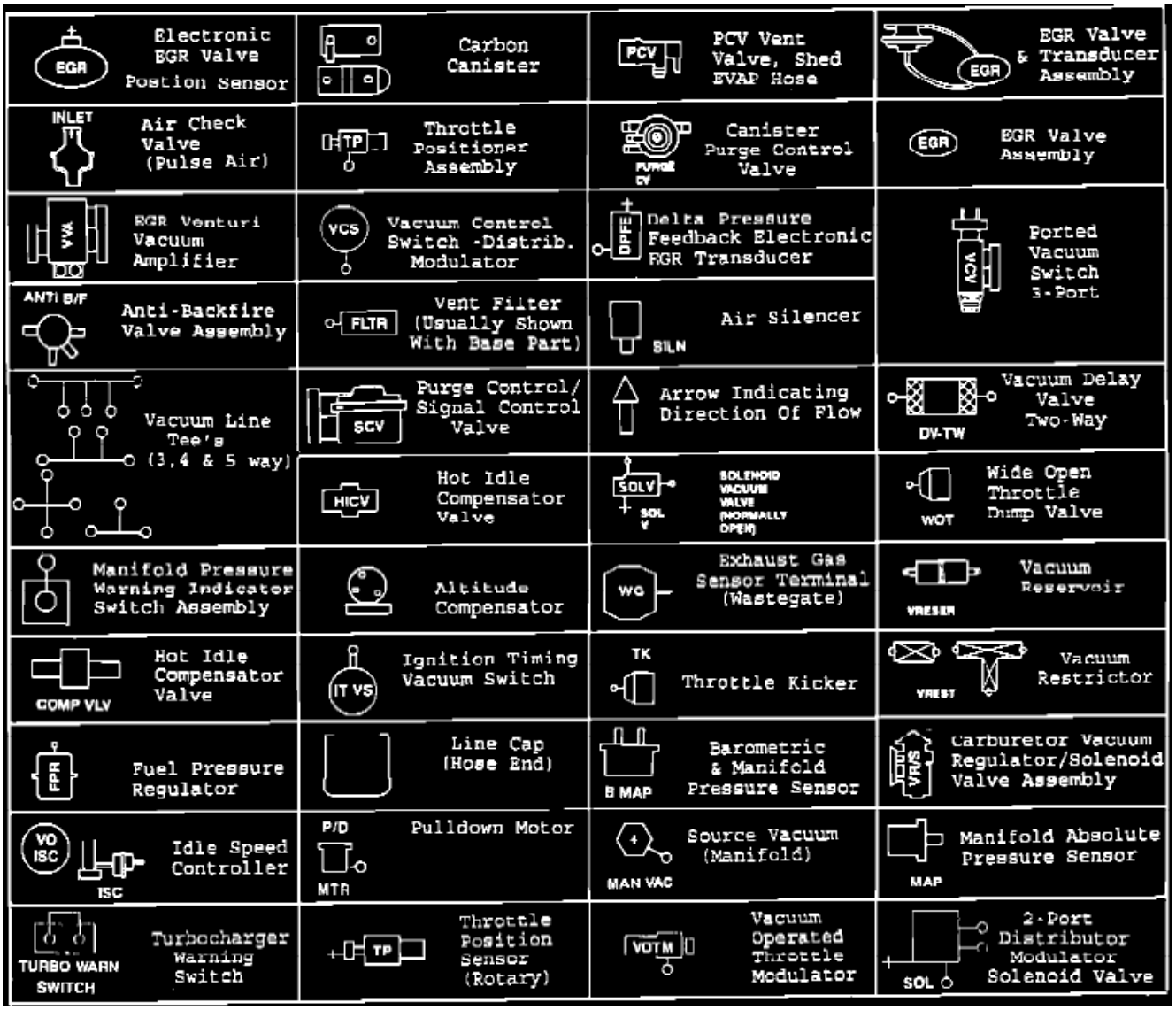


Electronic Shift Control Module: Diagram Information and Instructions

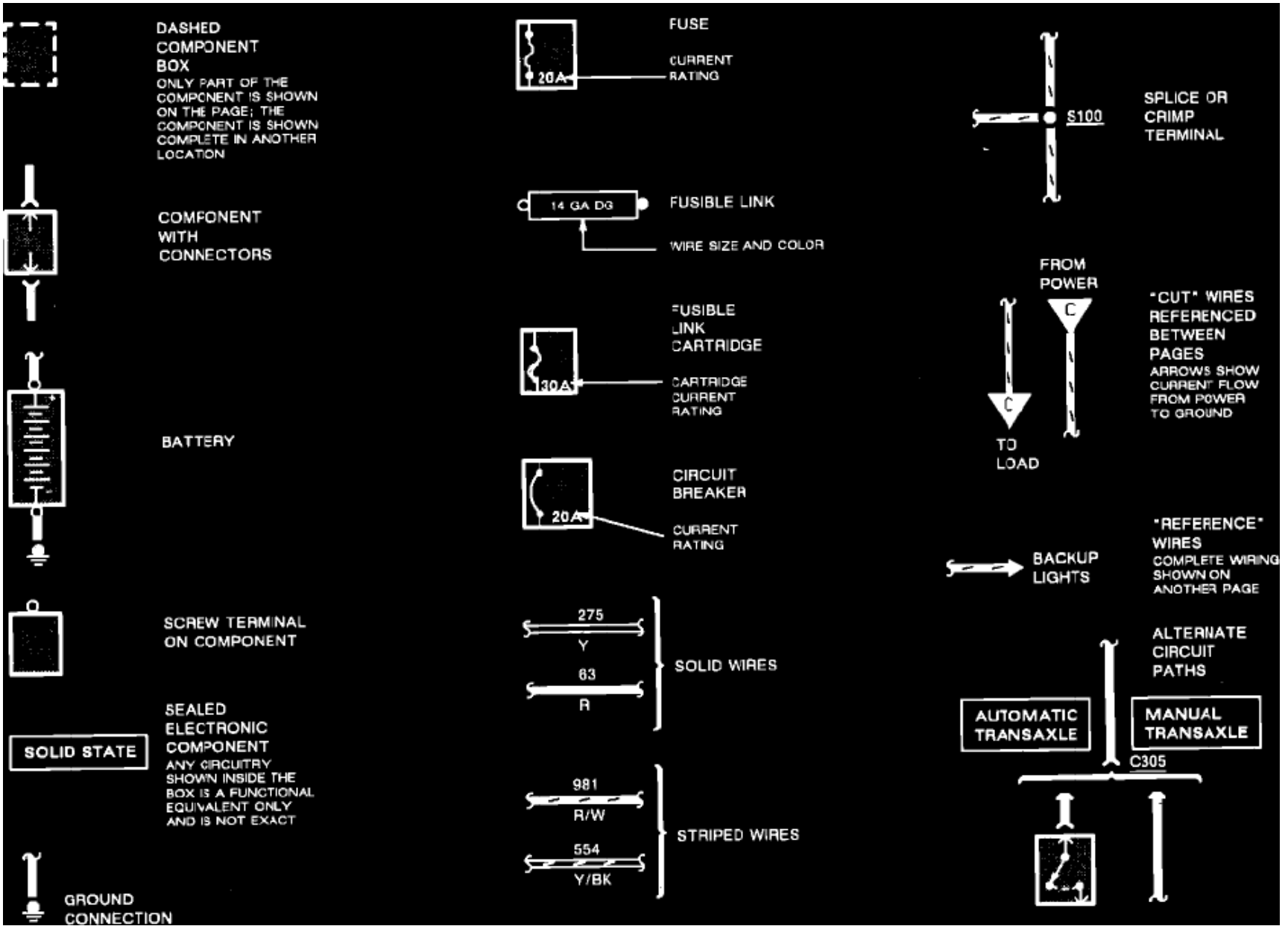
Symbol Identification

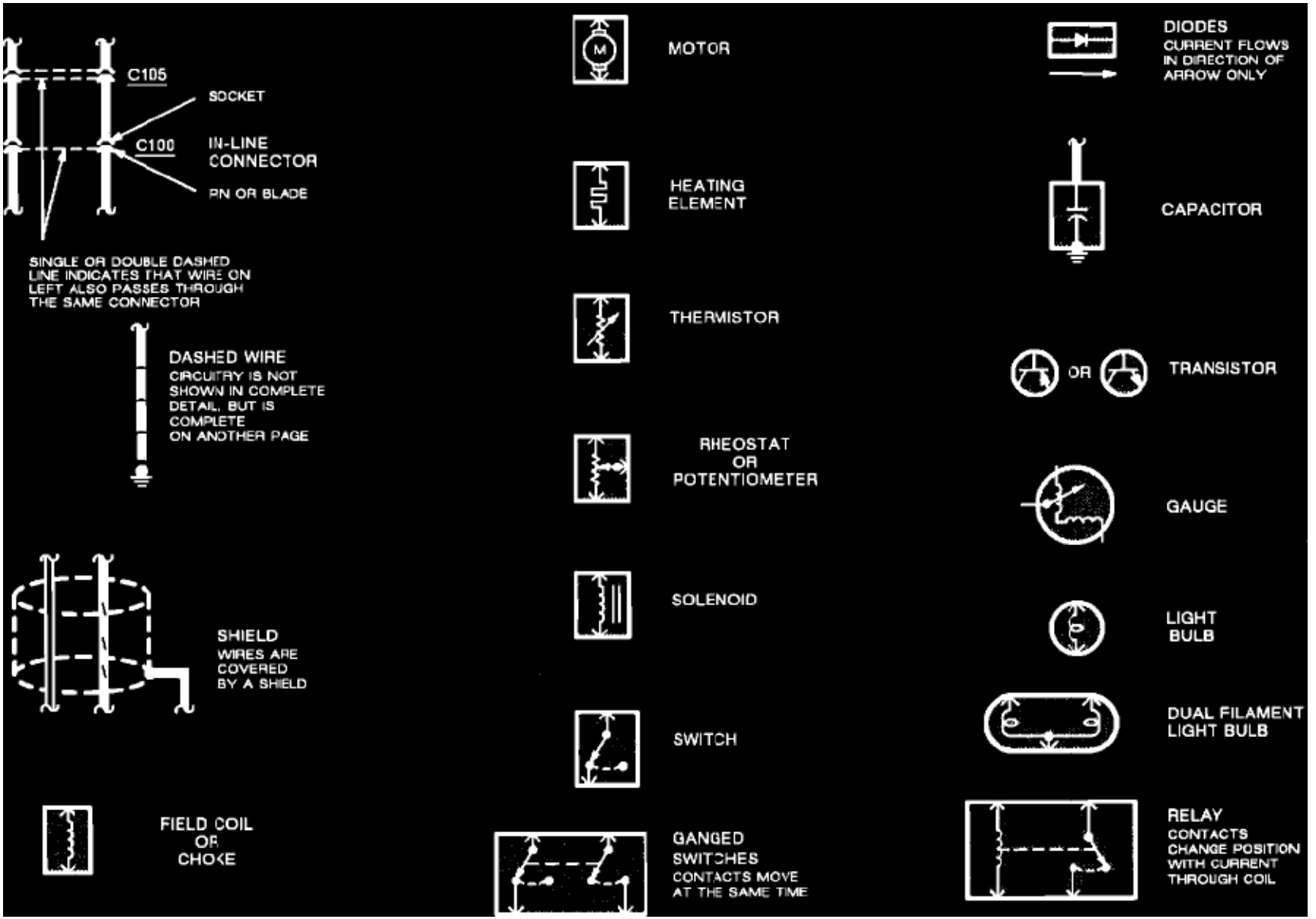


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

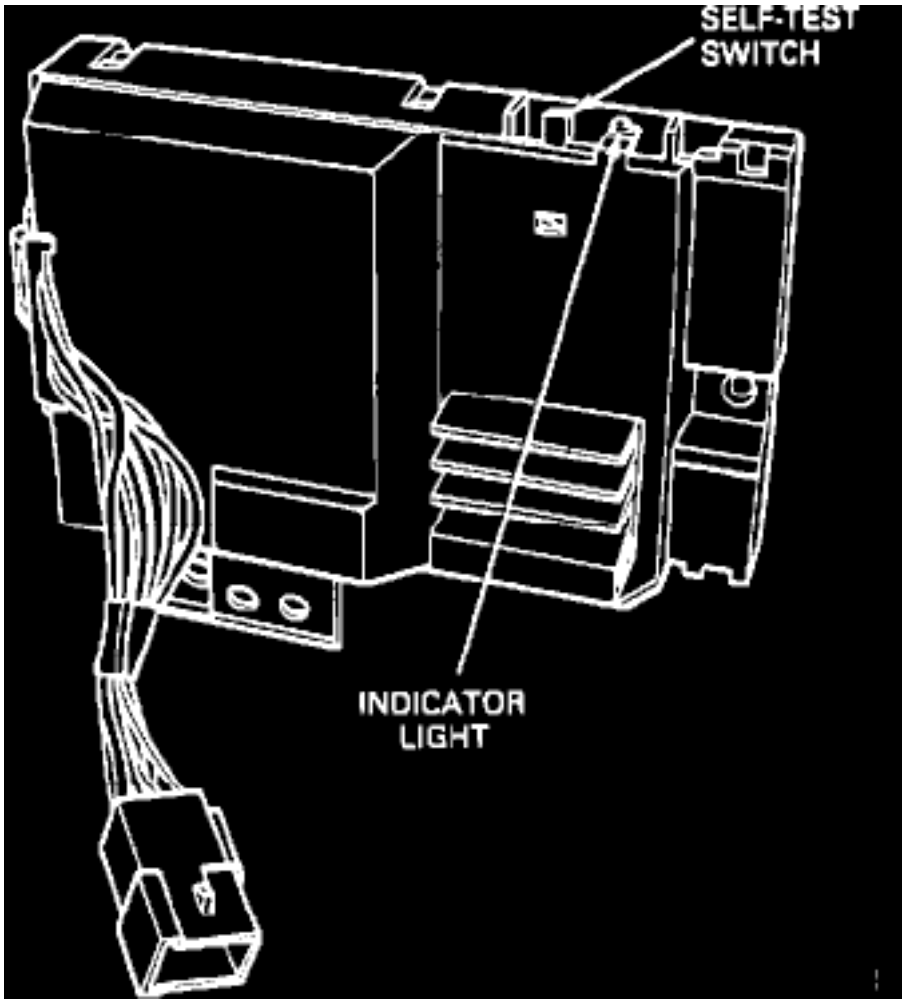
V: Violet

W: White

Y: Yellow

Electronic Shift Control Module: Description and Operation

The electronic control module conducts transfer case operation in response to inputs from the vehicle speed sensor, neutral start switch and clutch interlock switch and push-button actuation made by the operator.



Electronic Shift Control Module: Testing and Inspection

The electronic control module has a diagnostic capability of its internal circuitry. Self test procedure is as follows:

1. Disconnect five-wire and eight wire connectors from electronic control module.

2. Turn ignition switch to the RUN position.

3. Activate the self test switch and note result:

Control Module Self Test

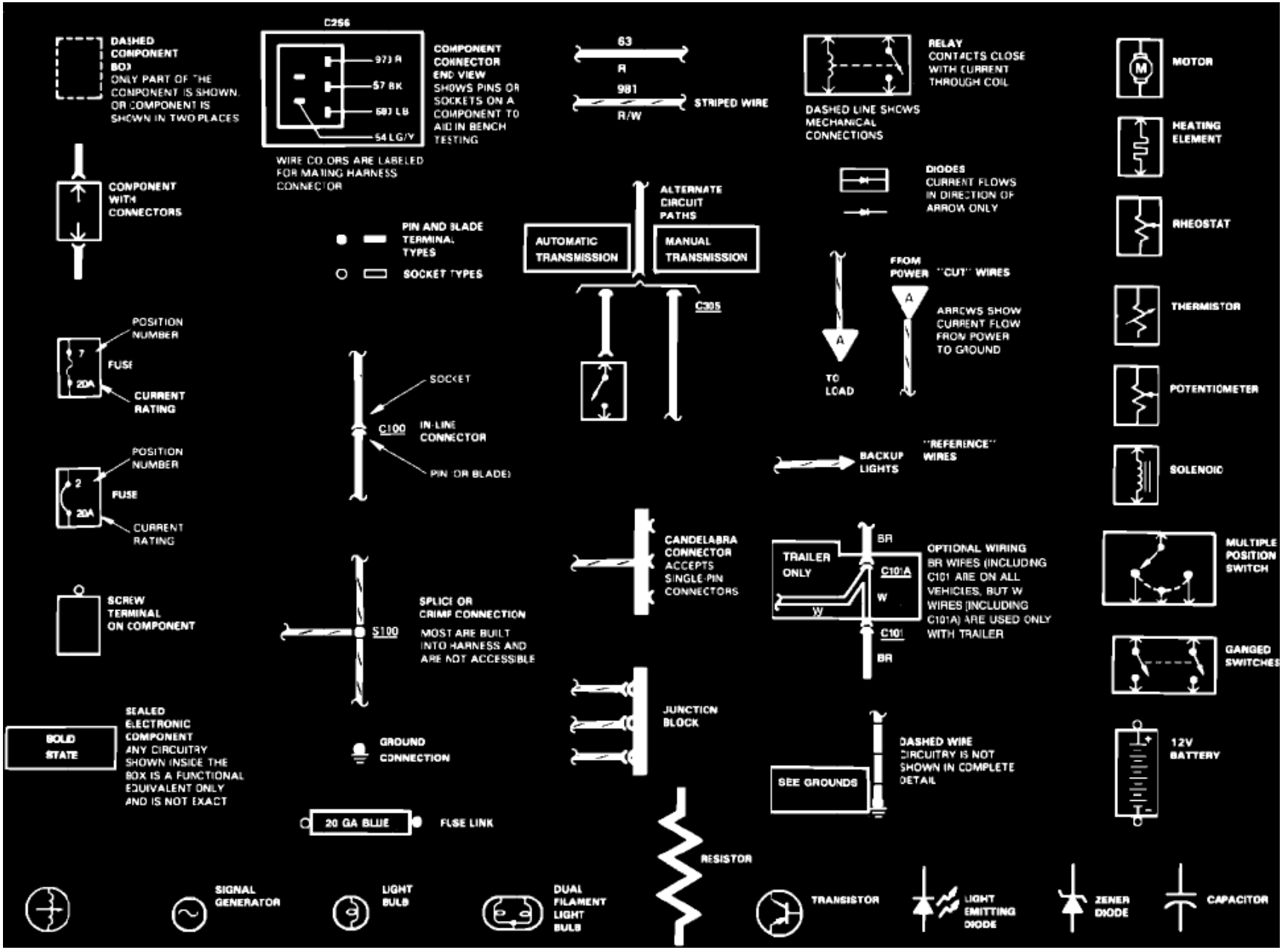
NOTE: The self test switch and indicator light is located on the Electronic Control Module.

A FLASHING INDICATOR LAMP, (approximately one flash per second), indicates control module is functioning properly.

A STEADY INDICATOR LIGHT, indicates that control module is inoperative and must be replaced.

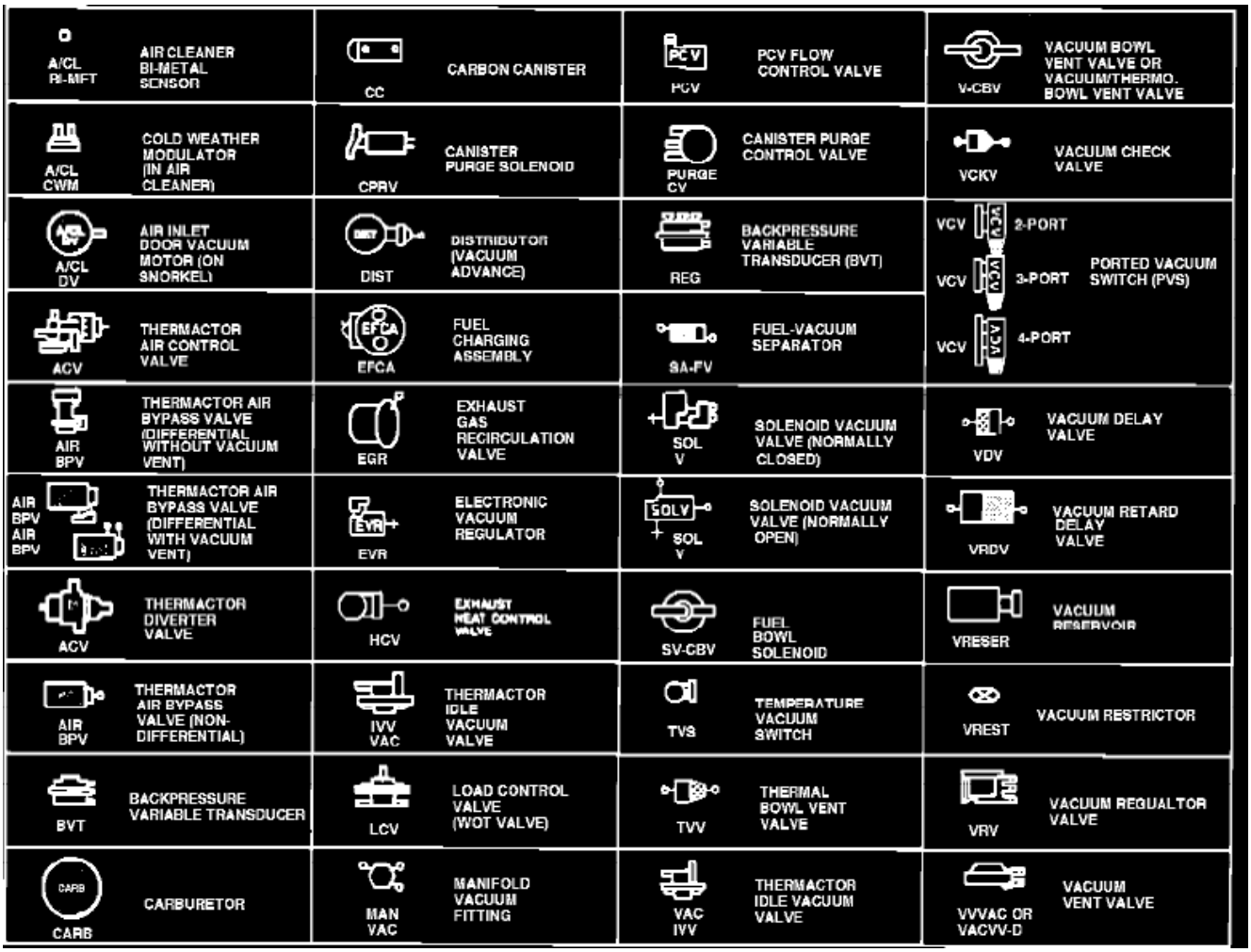
Transmission Temperature Sensor/Switch: Testing and Inspection

Pinpoint testing procedures for this component are located in the system level Testing and Inspection.

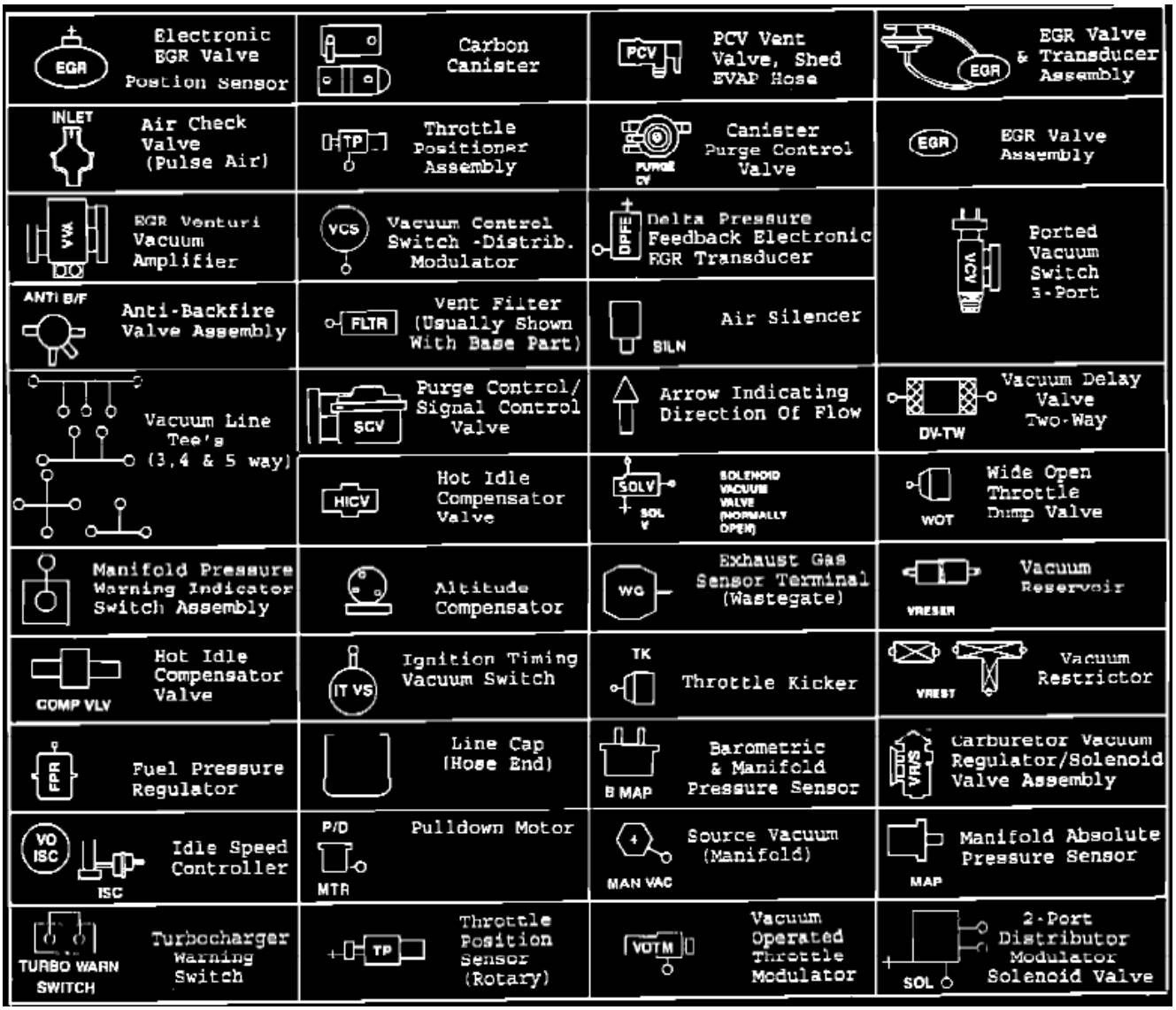


Four Wheel Drive Selector Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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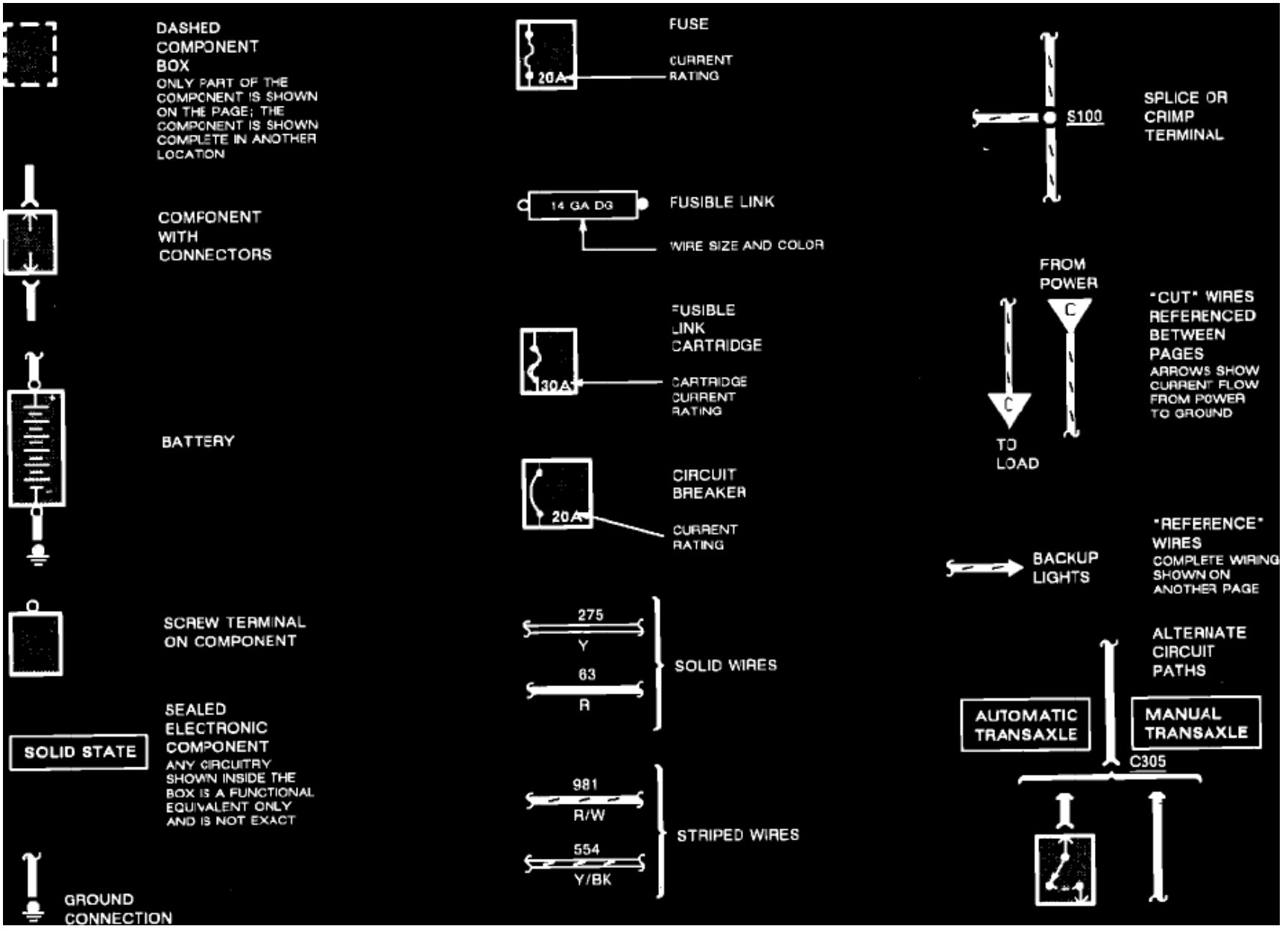
DASHED COMPONENT BOX
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WIRE SIZE AND COLOR
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CARTRIDGE CURRENT RATING
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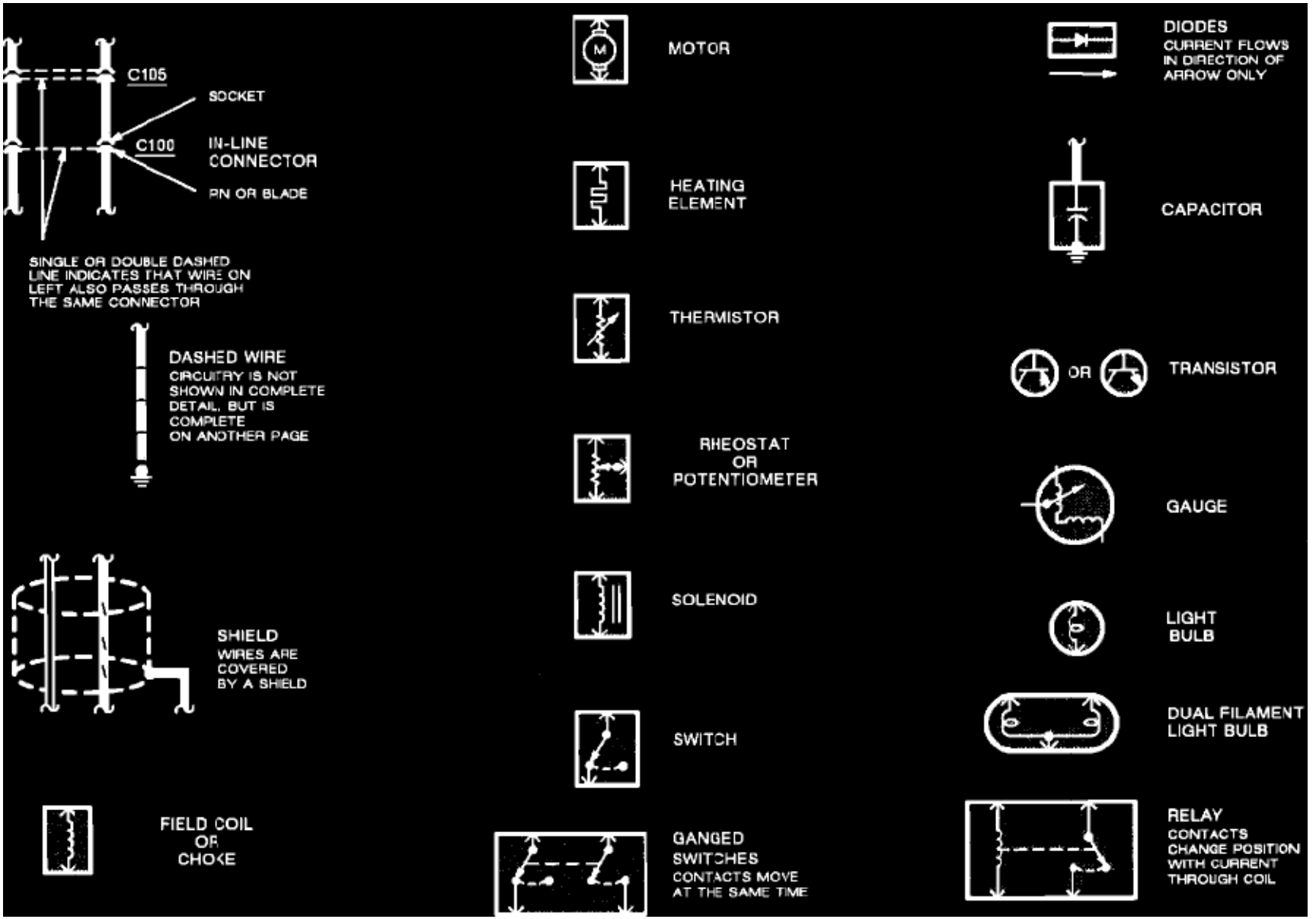

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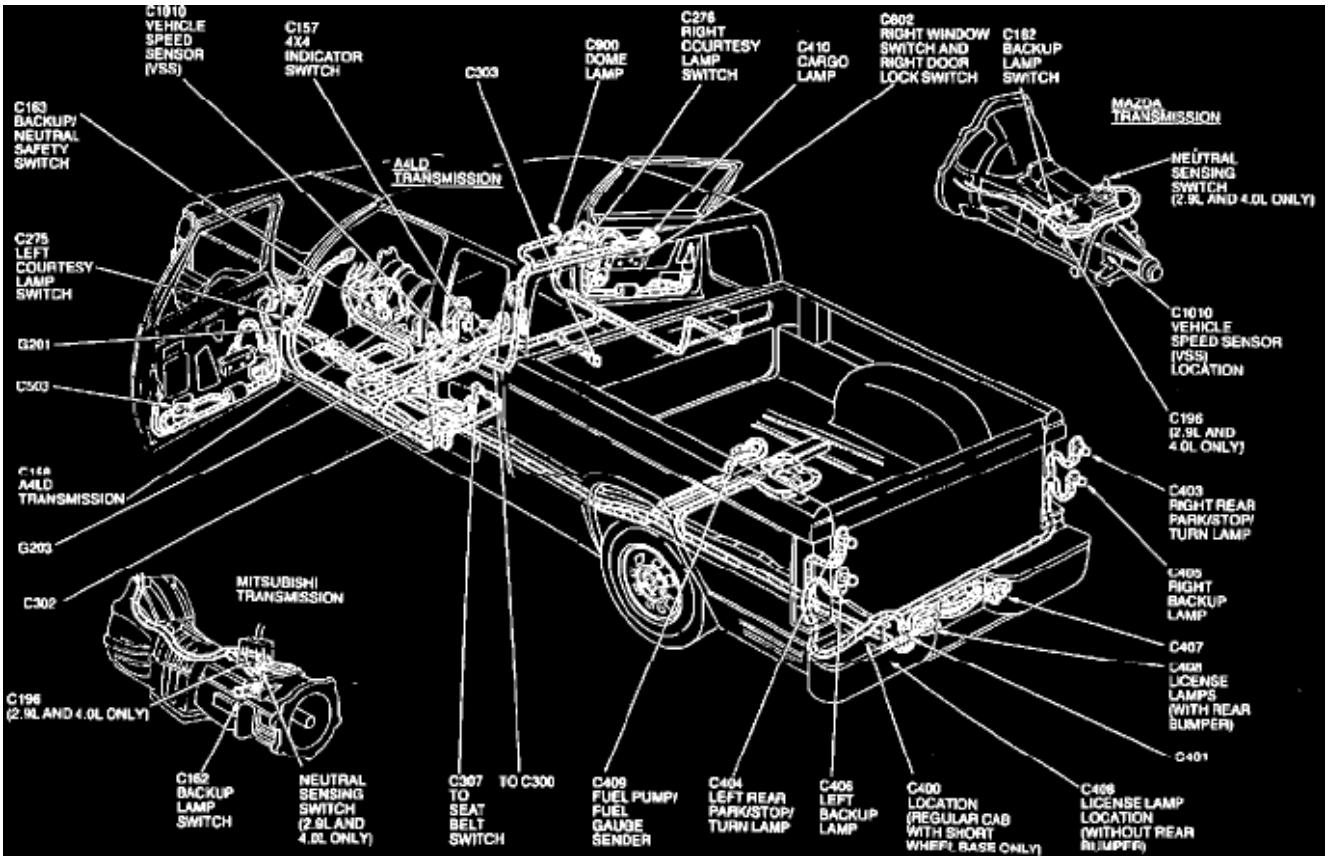


4 X 4 Indicator Switch: Locations

Body Components

Top Front Of Transfer Case

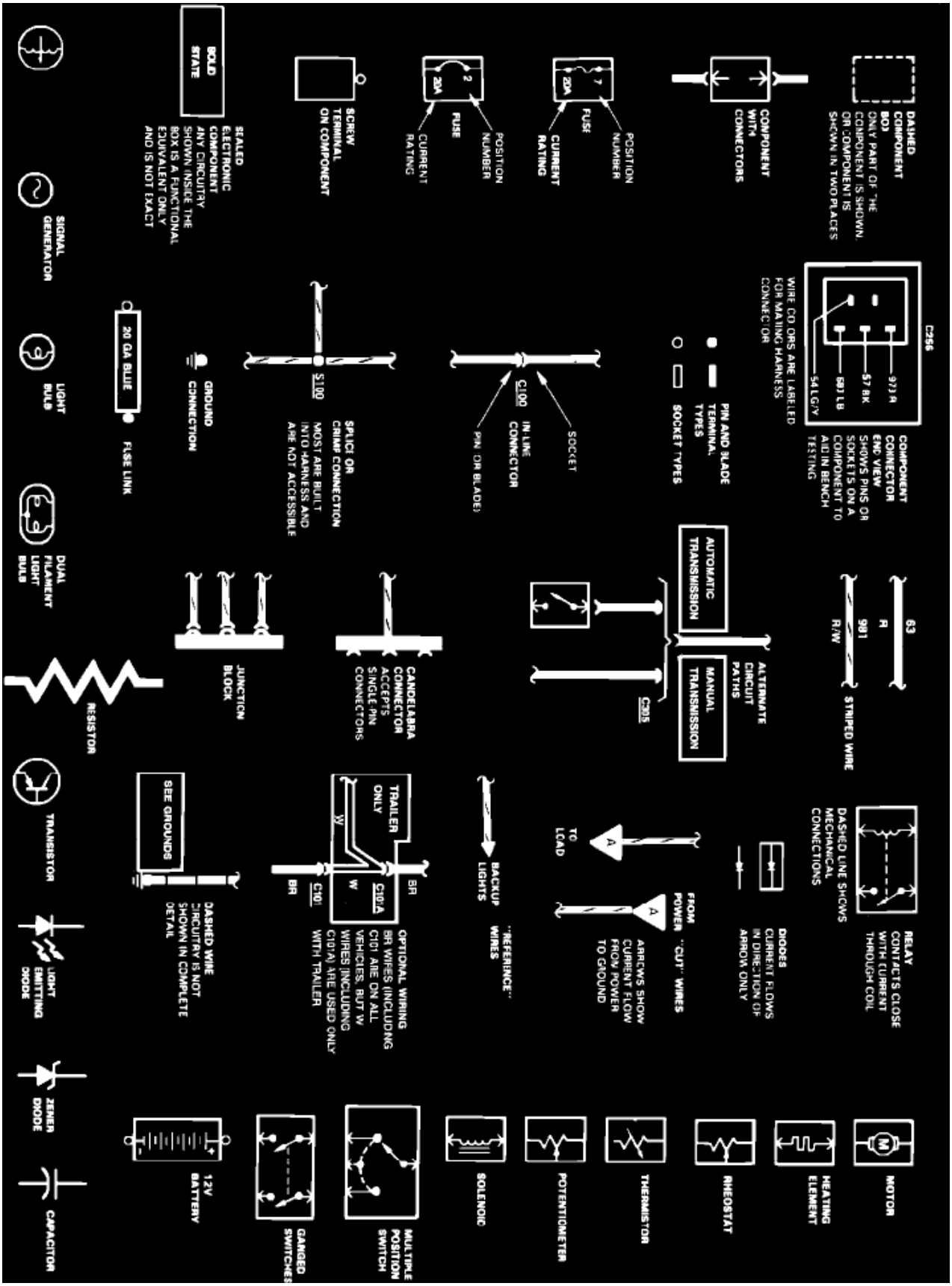
4 X 4 Indicator Switch: Description and Operation

The shift position sensor is an integral component of the electronic shift motor. The sensor inputs shift position of the transfer case to the electronic control module.

Speed Sensor: Description and Operation

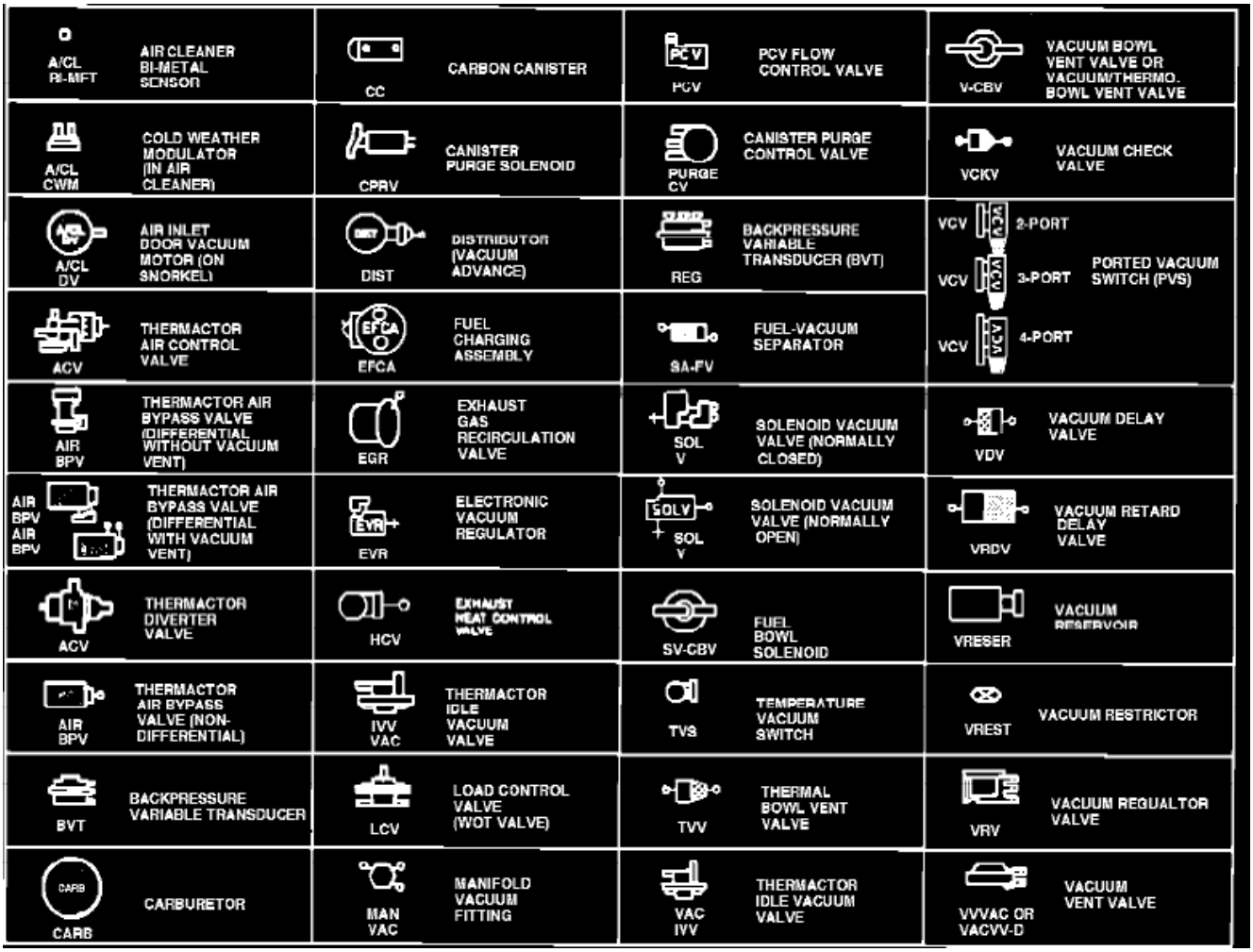
The speed sensor information to the electronic control module verifies the proper speed to allow range shifts (in or out of 4-Low) to occur.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Actuators and Solenoids - Transfer Case > Transfer Case Actuator > Component Information > Diagrams > Diagram Information and Instructions

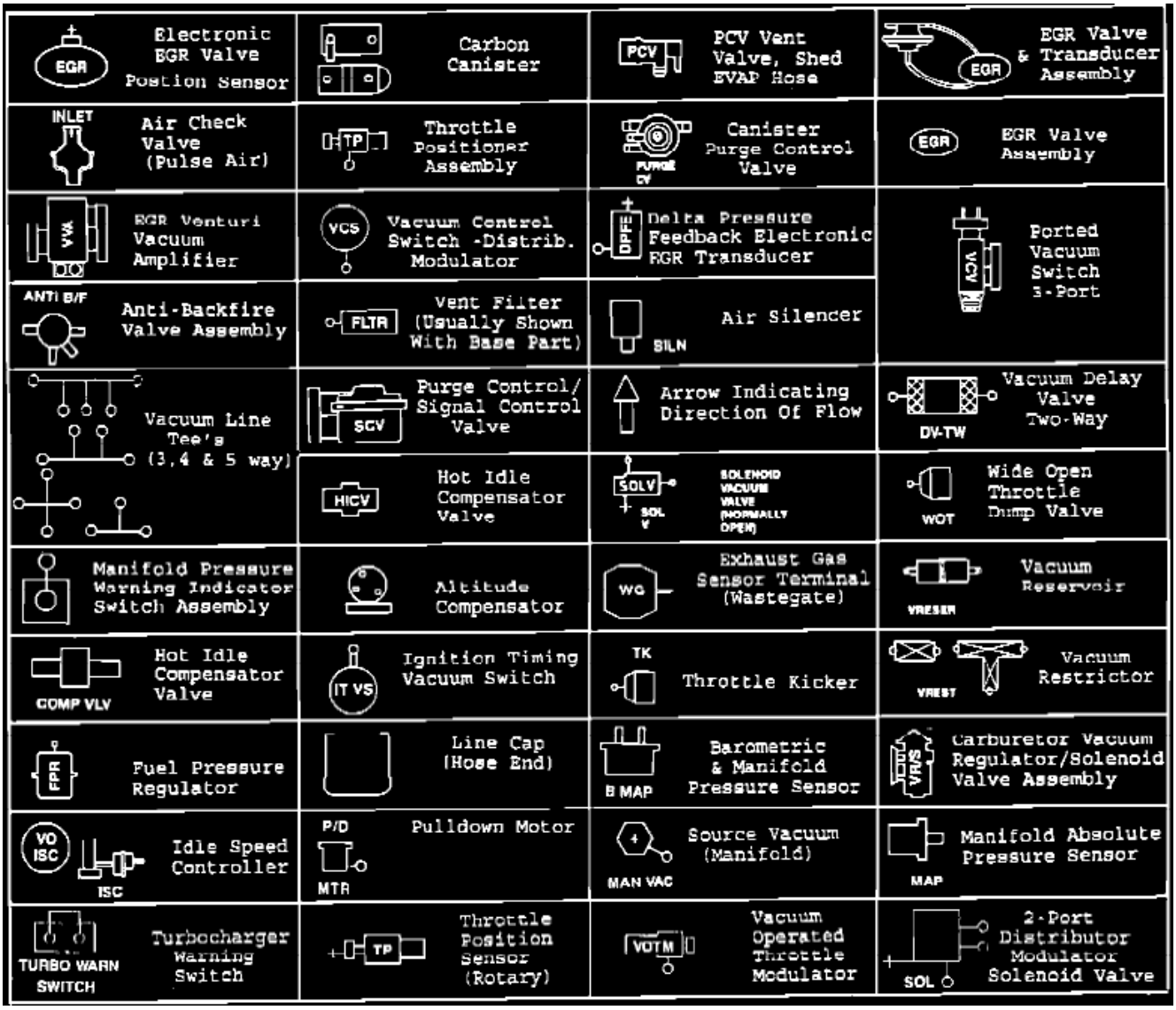


Transfer Case Actuator: Diagram Information and Instructions

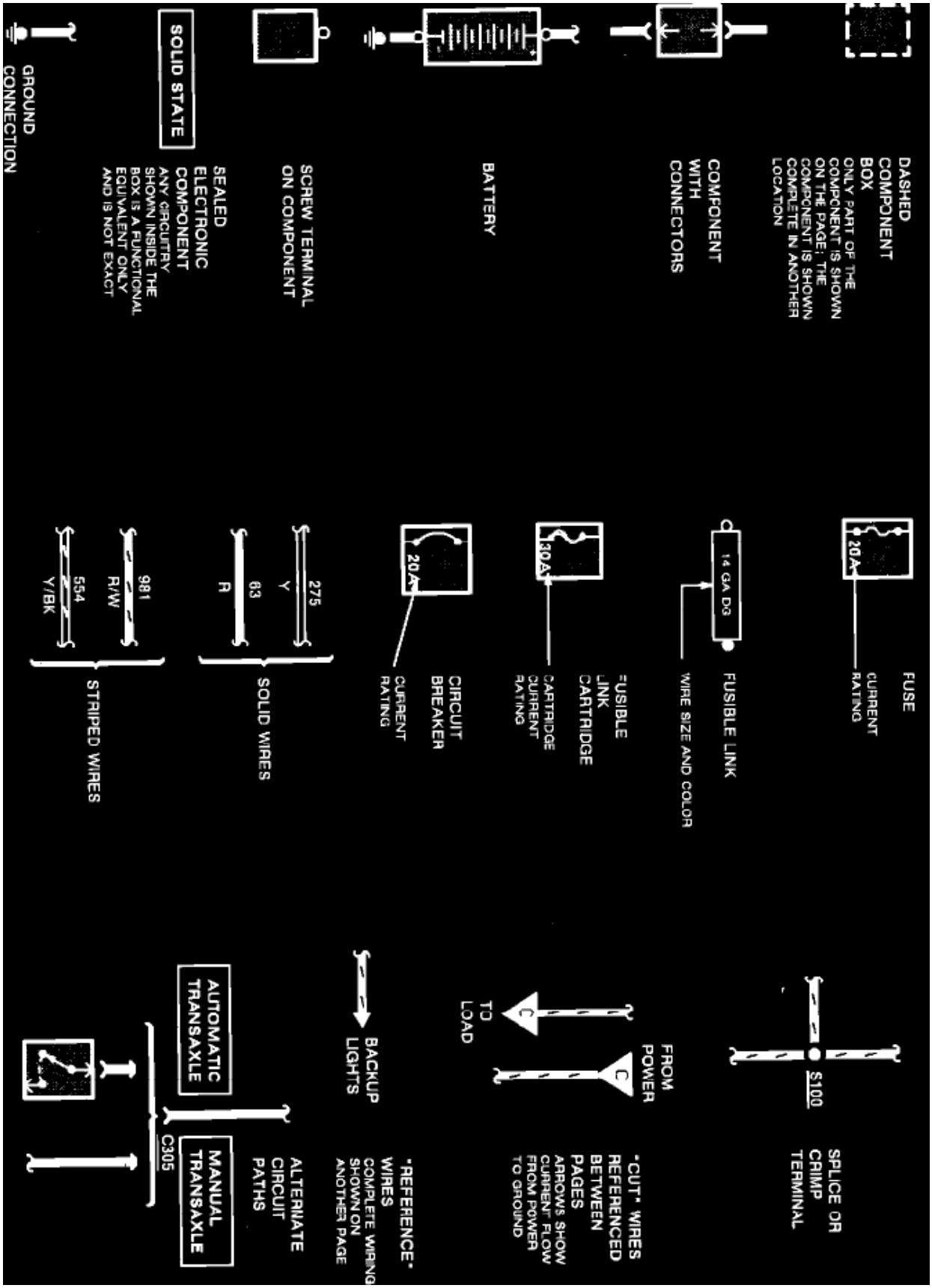
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
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BATTERY
SCREW TERMINAL ON COMPONENT
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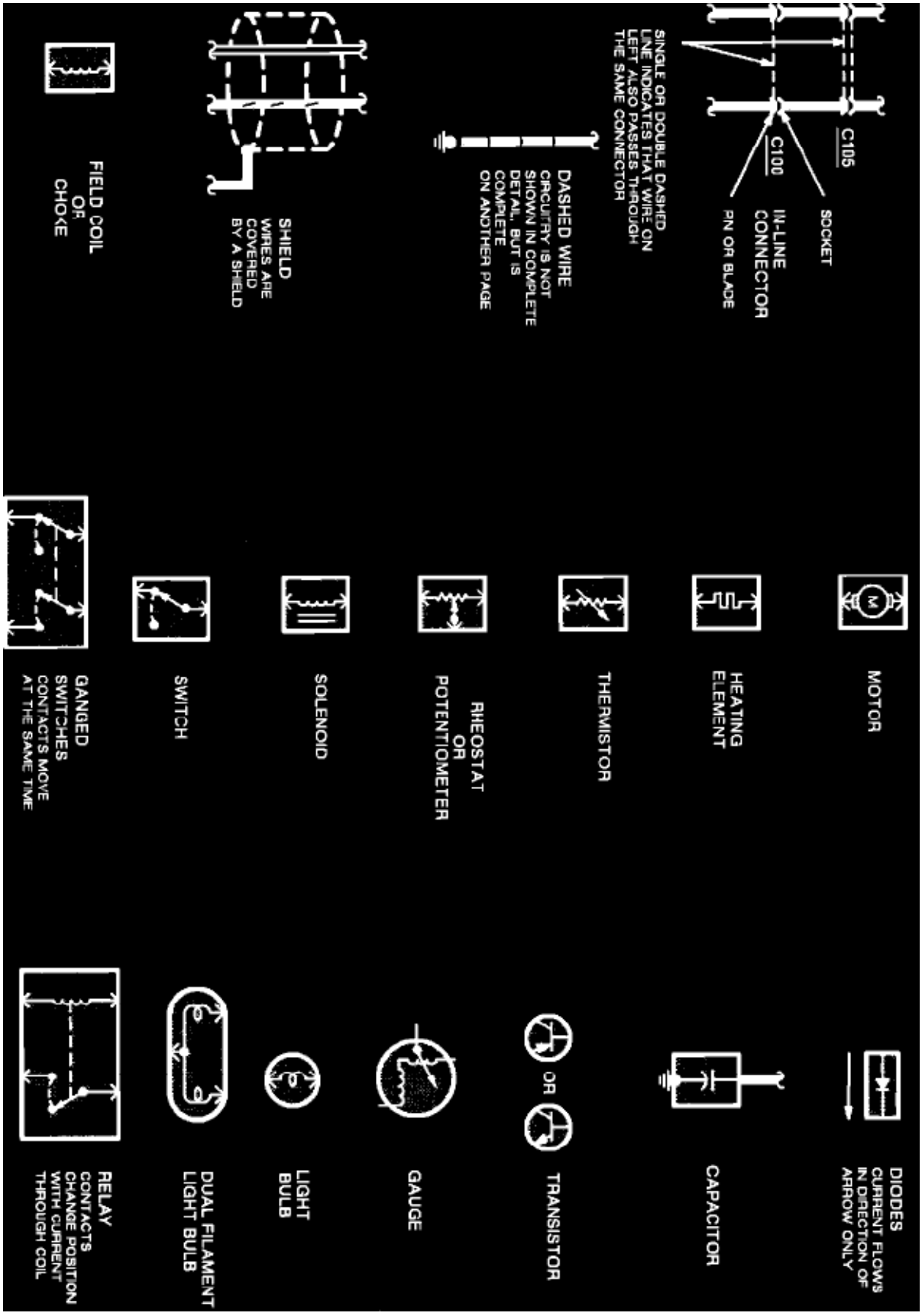
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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V: Violet

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Y: Yellow

Transfer Case Actuator: Description and Operation

The electronic shift motor prompts a rotary helical cam to move the 2W-4W shift fork and 4H-4L reduction shift fork to the selected vehicle drive postion.

Electronic Shift Control Module: Technical Service Bulletins Transfer Case - Revised Shift Procedures

Article No. 90-18-10

^ ELECTRONIC SHIFT MODULE (4X4) - MODIFIED OPERATION

^ TRANSFER CASE - 4X4 ELECTRONIC SHIFT MODULE - REVISED OPERATION PROCEDURE

LIGHT TRUCK: 1986-90 BRONCO II

1986-91 BRONCO, RANGER 1991 EXPLORER

ISSUE: The shift procedures into and out of LOW RANGE are revised for Ranger, Bronco and Explorer trucks built after 8/1/90 due to module changes. The new module will also be used to service prior model year trucks.

ACTION: If service is required on models built prior to 8/1/90, advise the customers of the following changes made to their vehicles.

Operation of the 1991 modules have been changed as follows:

To shift into 4 LOW: ^

Truck must be in 4x4 HIGH by previously pressing the 4x4 switch

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press LOW RANGE switch

To shift out of 4 LOW:

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press the LOW RANGE switch to shift back into 4x4 HIGH

^ Press the 4x4 HIGH switch to shift into 2 HIGH if desired

Previously, the module would respond to the LOW RANGE input from any mode (2H, 4H, 4L). If conditions A and B above are not met, the module would respond by flashing the 4 LOW indicator and wait until conditions A and B are met before completing the shift into or out of LOW RANGE. If LOW RANGE was selected while in 2 HIGH mode, the module would shift to 4 HIGH before flashing the indicator.

PART NUMBER PART NAME CLASS

F1TZ-7E453-A 4X4 Electronic Shift Module B

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

508000

Electronic Shift Control Module: Technical Service Bulletins Electric Shift Module Wiring Schematic - Correction

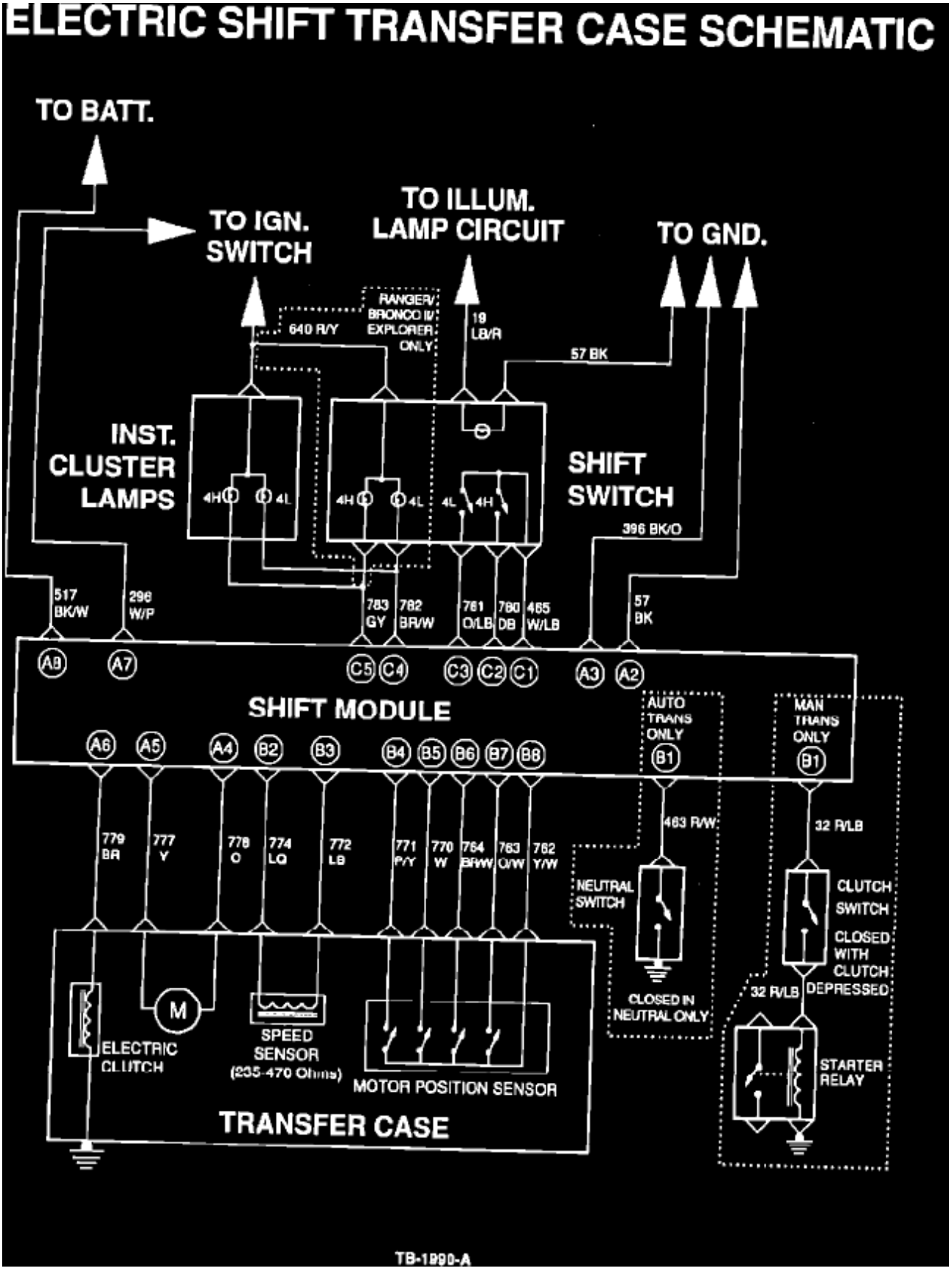
Article No. 91-3-11

02/02/91

0GTRANSFER CASE - 4X4 ELECTRIC SHIFT MODULE - EVTM WIRING CORRECTIONS

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Some of the wiring schematics shown in the EVTMs contain errors which make circuit tracing difficult. A complete update of these schematics will be made in the near future.


ELECTRIC SHIFT TRANSFER CASE SCHEMATIC
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TO ILLUM. LAMP CIRCUIT
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RANGER/ BRONCO II/ EXPLORER ONLY
640 R/Y
19 LB/R
57 BK
INST. CLUSTER LAMPS
4H
4L
SHIFT SWITCH
396 BK/O
517 BK/W
296 W/P
783 GY
782 BR/W
781 O/LB
780 DB
485 W/LB
57 BK
A8
A7
C5
C4
C3
C2
C1
A3
A2
SHIFT MODULE
A6
A5
A4
B2
B3
B4
B5
B6
B7
B8
AUTO TRANS ONLY
B1
MAN TRANS ONLY
B1
779 BR
777 Y
778 O
774 LG
772 LB
771 P/Y
770 W
764 BR/W
763 O/W
762 Y/W
463 R/W
32 R/LB
NEUTRAL SWITCH
CLUTCH SWITCH
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CLOSED IN NEUTRAL ONLY
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ELECTRIC CLUTCH
SPEED SENSOR (235-470 Ohms)
MOTOR POSITION SENSOR
STARTER RELAY
TRANSFER CASE
TB-1990-A

Figure 1

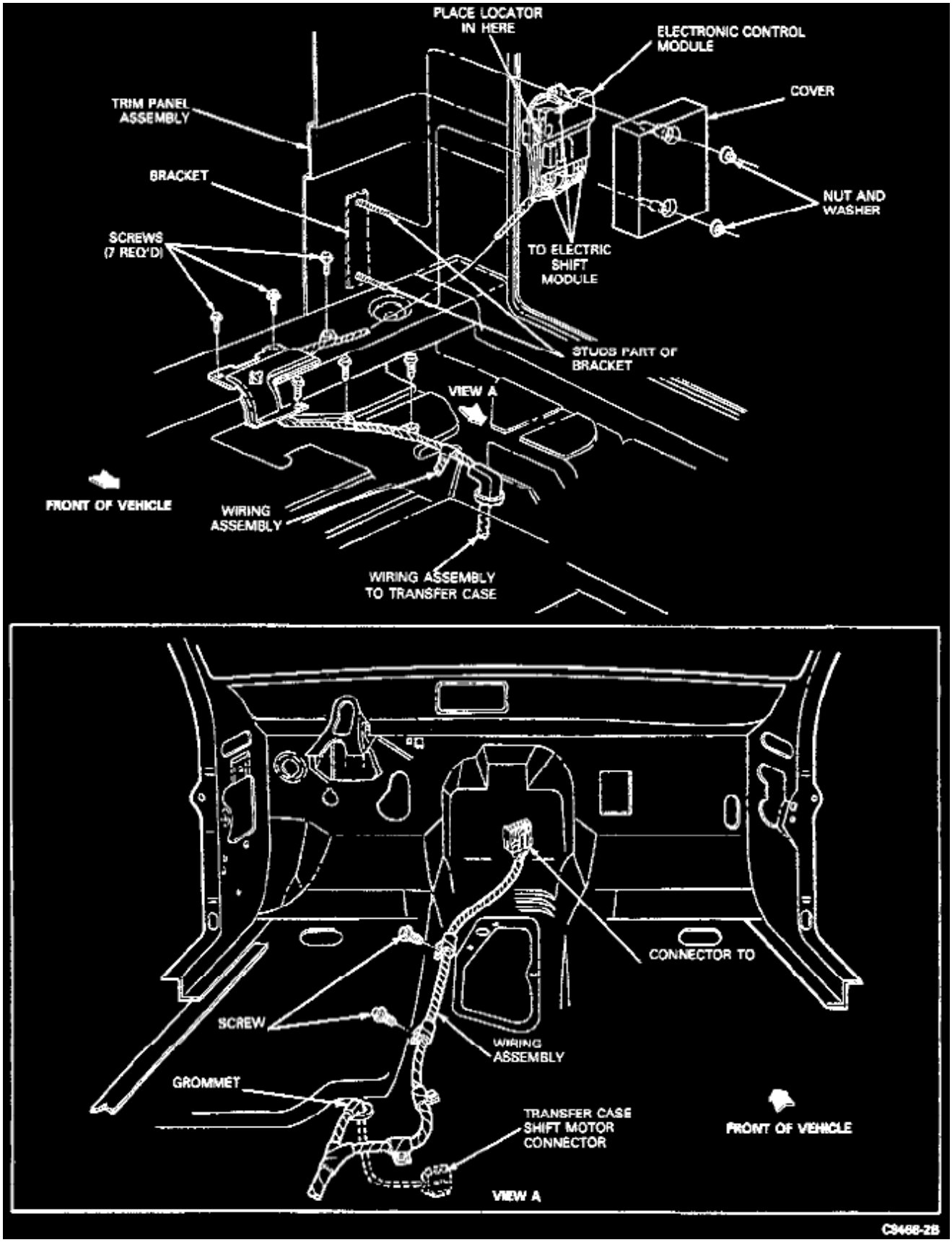
ACTION: In the interim, refer to the simplified schematic, Figure 1. It shows the electrical circuitry for the transfer case shift mechanism while deleting connectors and interconnects with other circuits for clarity.

OTHER APPLICABLE ARTICLES: None

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203200, 290000, 508000, 590000

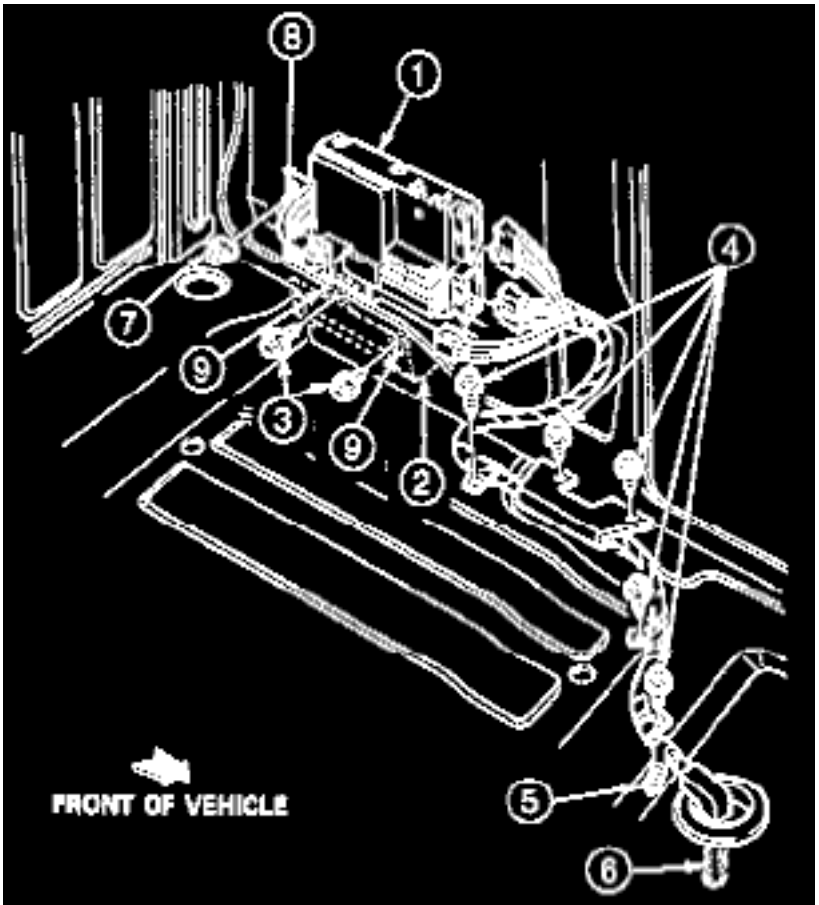
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Electronic Shift Control Module <--> [Control Module, Transfer Case] > Component Information > Locations > Regular Cab



Electronic Shift Control Module: Locations Regular Cab

Electronic Control Module Location

The Electric Shift Control Module is located at the lower Left Hand rear corner of cab.



Item No.	Description
1	Electronic Control Module
2	Bracket, Shift Module
3	Screw (2 Req.)
4	Screw (5 Req.)
5	Wiring Assembly
6	Wiring Assembly
7	Nut and Washer Assembly
8	Stud Part for Module Bracket
9	Nut Assembly (2 Req.)

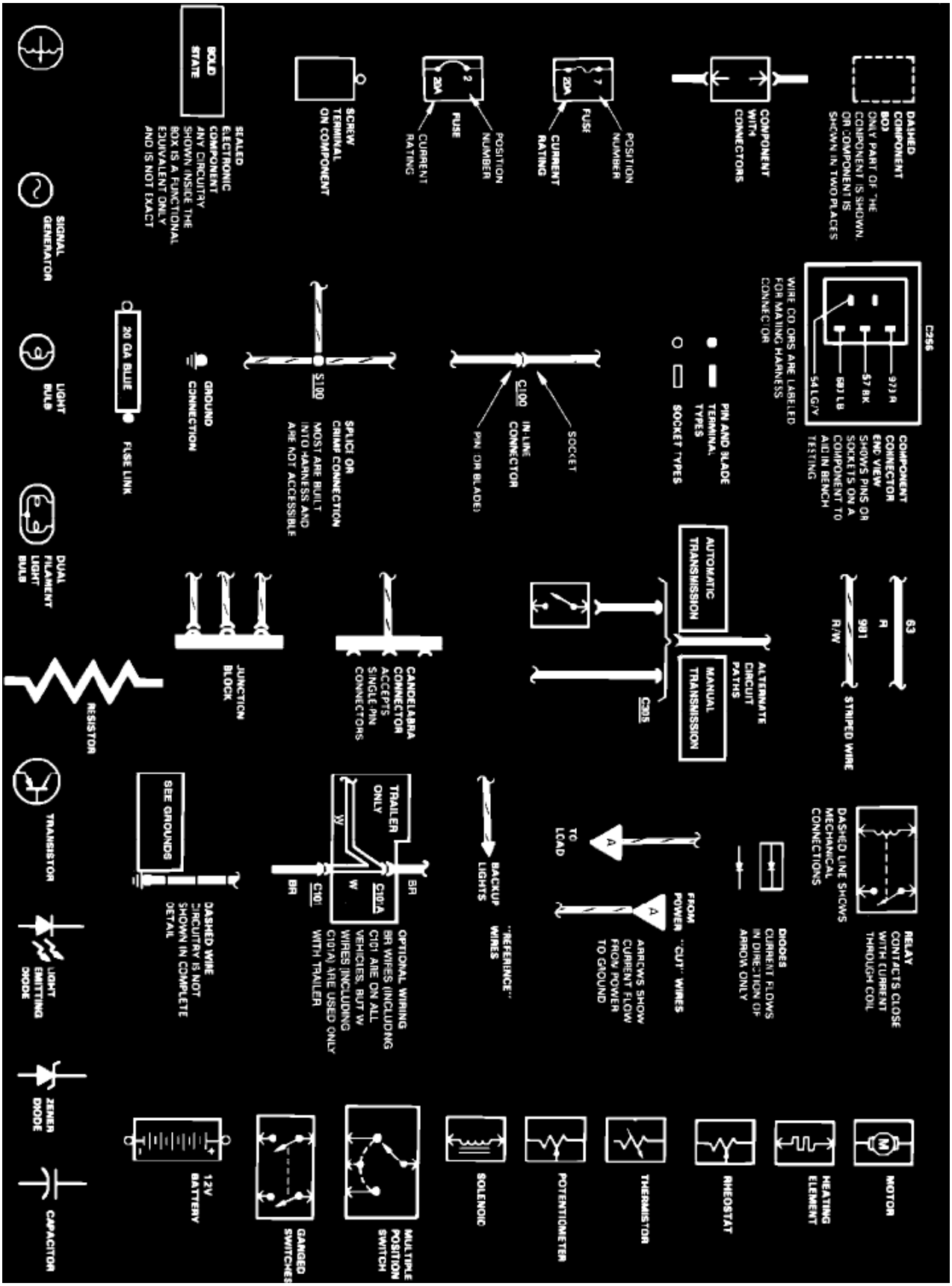
CC10860-A

Electronic Shift Control Module: Locations Supercab

Control Module Circuits, Ranger SuperCab

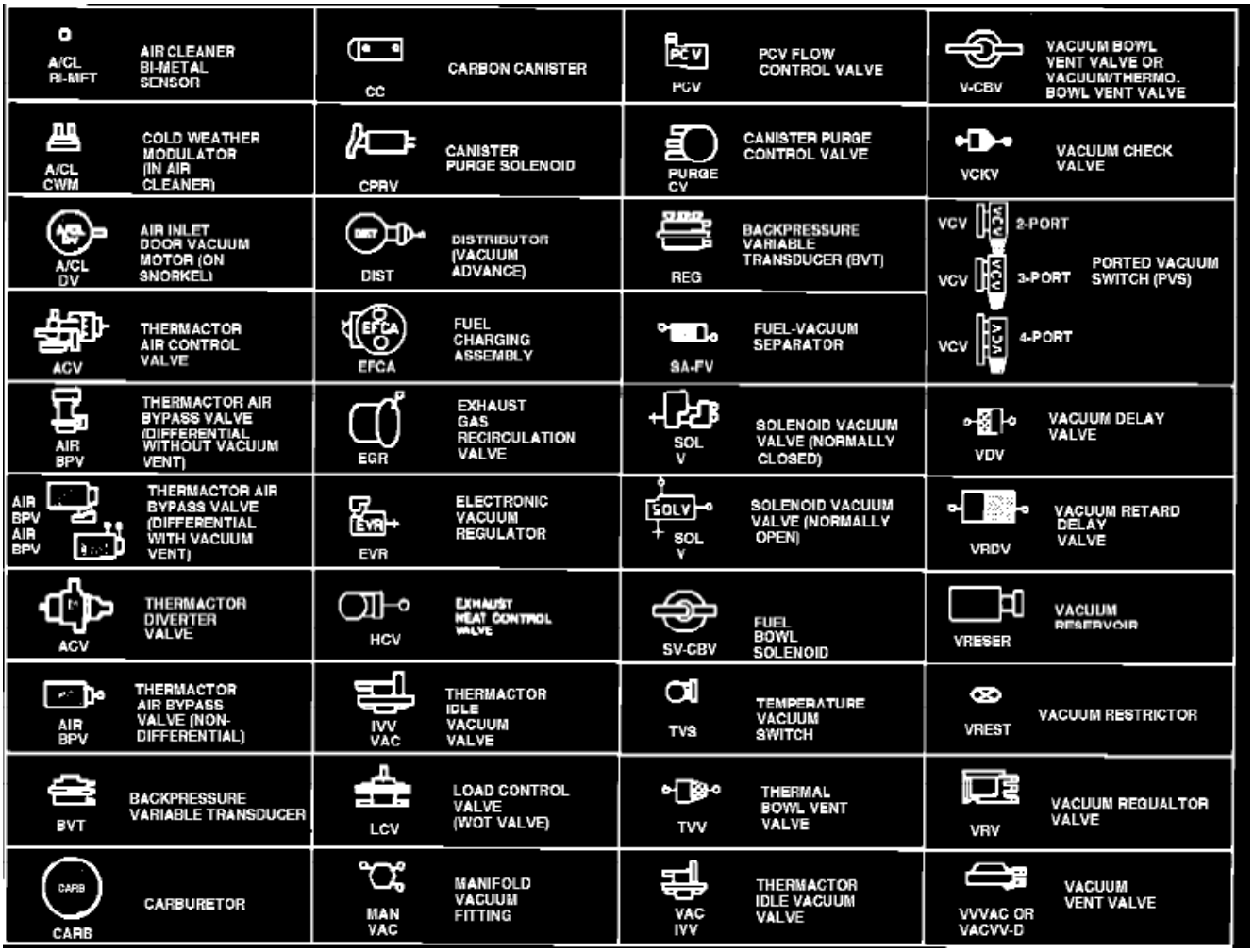
The Electric Shift Control Module is located between the bottom of the Left Hand "B" pillar and the rear of the cab.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Electronic Shift Control Module <--> [Control Module, Transfer Case] > Component Information > Diagrams > Diagram Information and Instructions

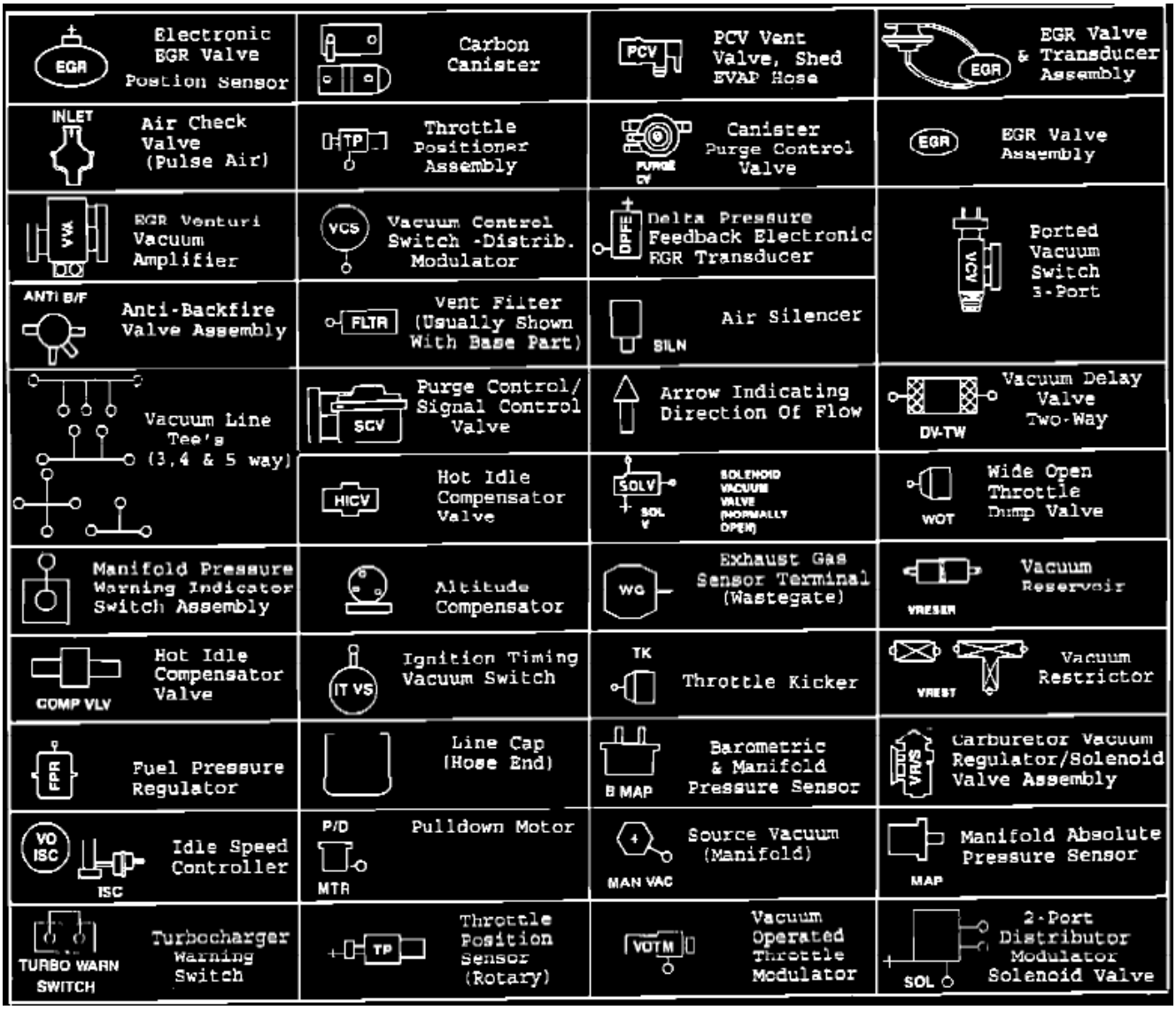


Electronic Shift Control Module: Diagram Information and Instructions

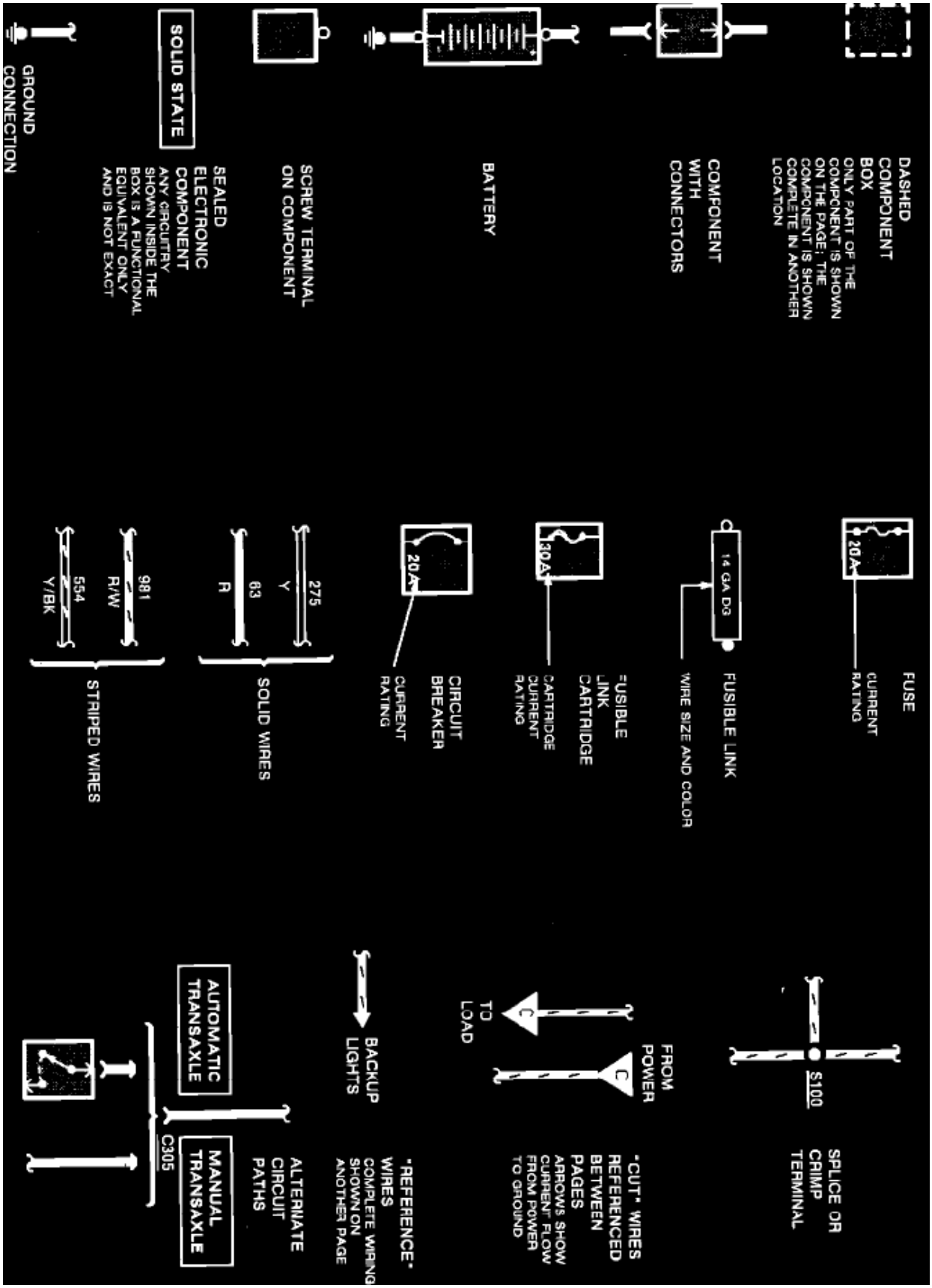
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
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SCREW TERMINAL ON COMPONENT
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ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
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GROUND CONNECTION
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CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
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981
R/W
554
Y/BK
STRIPED WIRES
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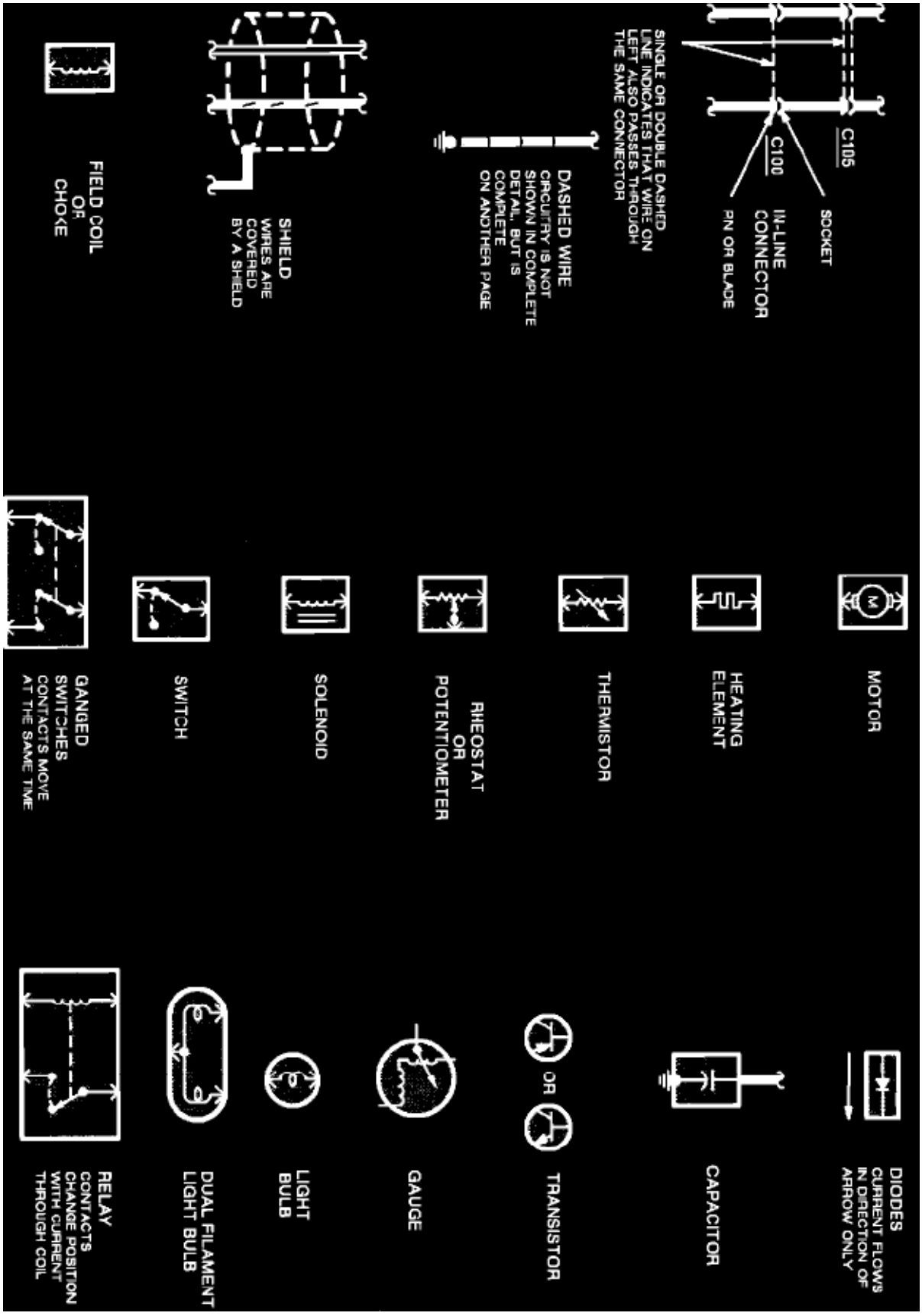
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

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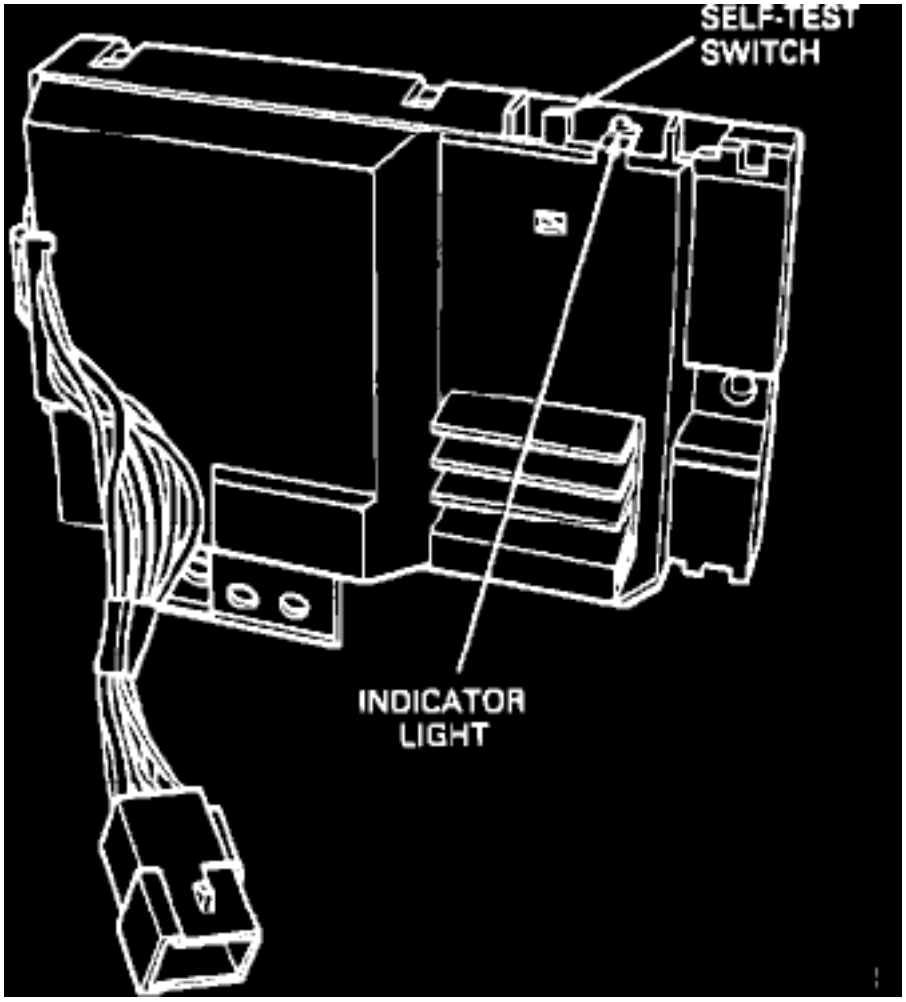
Electronic Shift Control Module: Description and Operation

The electronic control module conducts transfer case operation in response to inputs from the vehicle speed sensor, neutral start switch and clutch interlock switch and push-button actuation made by the operator.



Electronic Shift Control Module: Testing and Inspection

The electronic control module has a diagnostic capability of its internal circuitry. Self test procedure is as follows:

1. Disconnect five-wire and eight wire connectors from electronic control module.

2. Turn ignition switch to the RUN position.

3. Activate the self test switch and note result:

Control Module Self Test

NOTE: The self test switch and indicator light is located on the Electronic Control Module.

A FLASHING INDICATOR LAMP, (approximately one flash per second), indicates control module is functioning properly.

A STEADY INDICATOR LIGHT, indicates that control module is inoperative and must be replaced.

Fluid - Transfer Case: Capacity Specifications

TYPE MERCON(R) Automatic Transmission Fluid

CAPACITY, Refill: Warner 1345 6.5 pt (US)

Warner 1350 Ranger, Bronco II 3.0 pt (US)

Warner 1354 Ranger, Bronco II, Explorer 2.5 pt (US)

Warner 1356 4.0 pt (US)

Spicer TC28 Aerostar 4.5 pt (US)

Fluid - Transfer Case: Fluid Type Specifications

BL Self-adjusting Brake Lubricant

EC Ethylene Glycol Coolant

Mix 50/50 with water to at least -20°F (-29°C) protection

EP Extreme Pressure Gear Lubricant

Ford Part No. D8DZ-19C547-A

FA Automatic Transmission Fluid, Type F

HBH Hydraulic Brake Fluid, Extra

Heavy-Duty

HP* Hypoid Gear Oil

Ford Part No. E0AZ-19580-A

HP* Hypoid Gear Oil for Limited-Slip

or Traction-Lok Differential

LM Lithium Grease, with Polyethylene

LS Steering Gear Lubricant

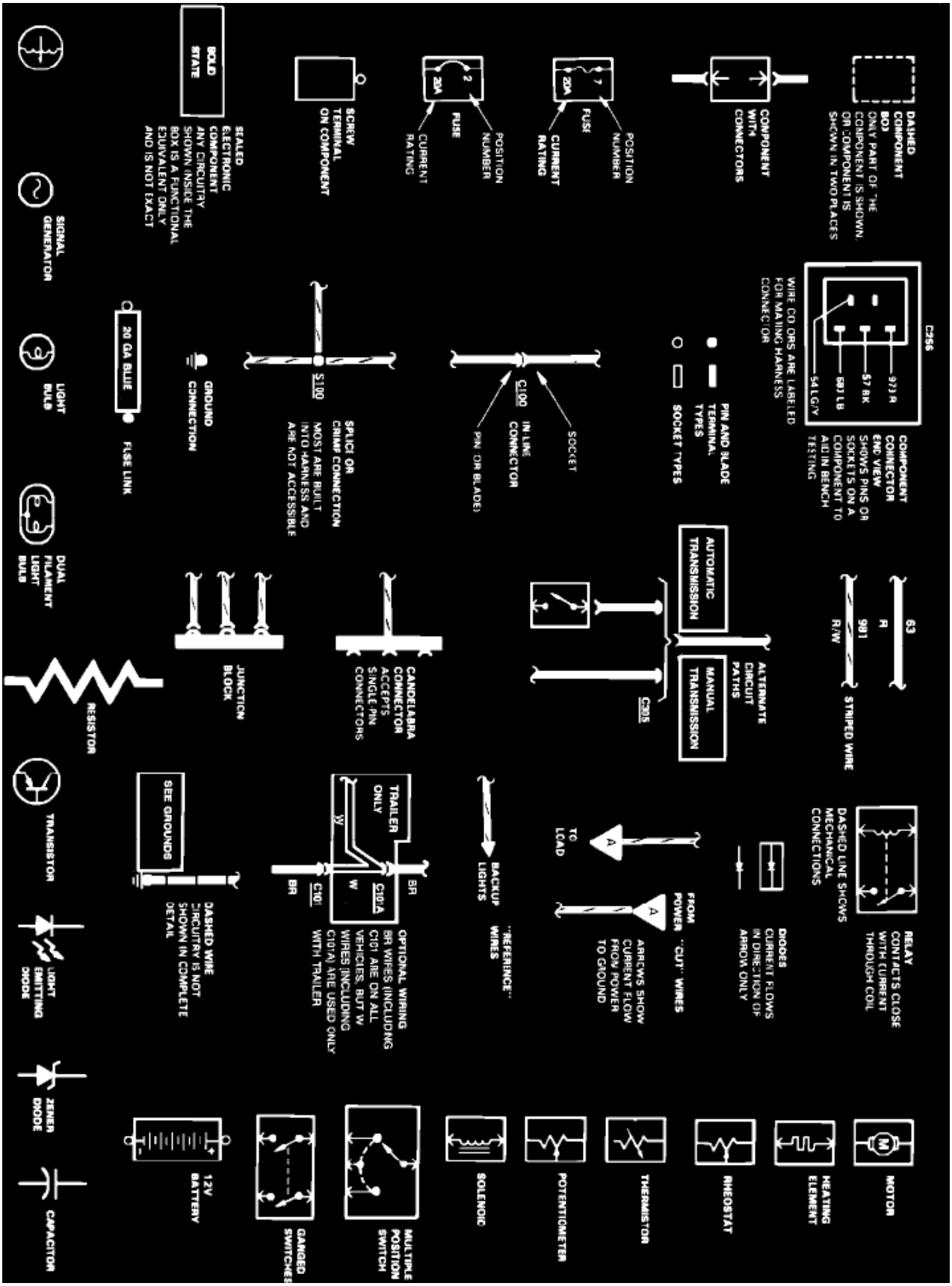
MA MERCON Automatic Transmission

Fluid

MH Manifold Heat Valve Solvent

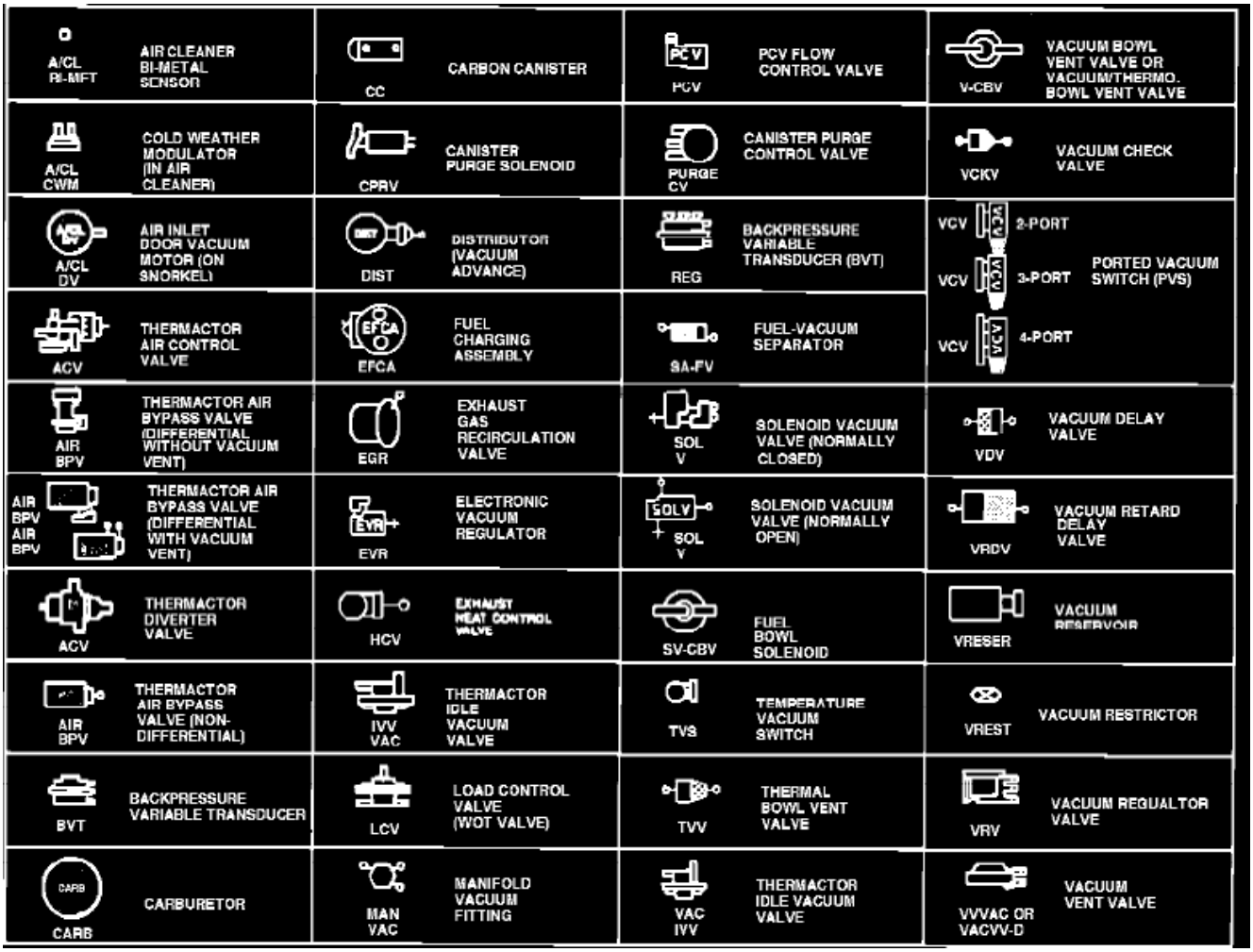
SG Motor Oil, API Service SG

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Four Wheel Drive Selector Switch > Component Information > Diagrams > Diagram Information and Instructions

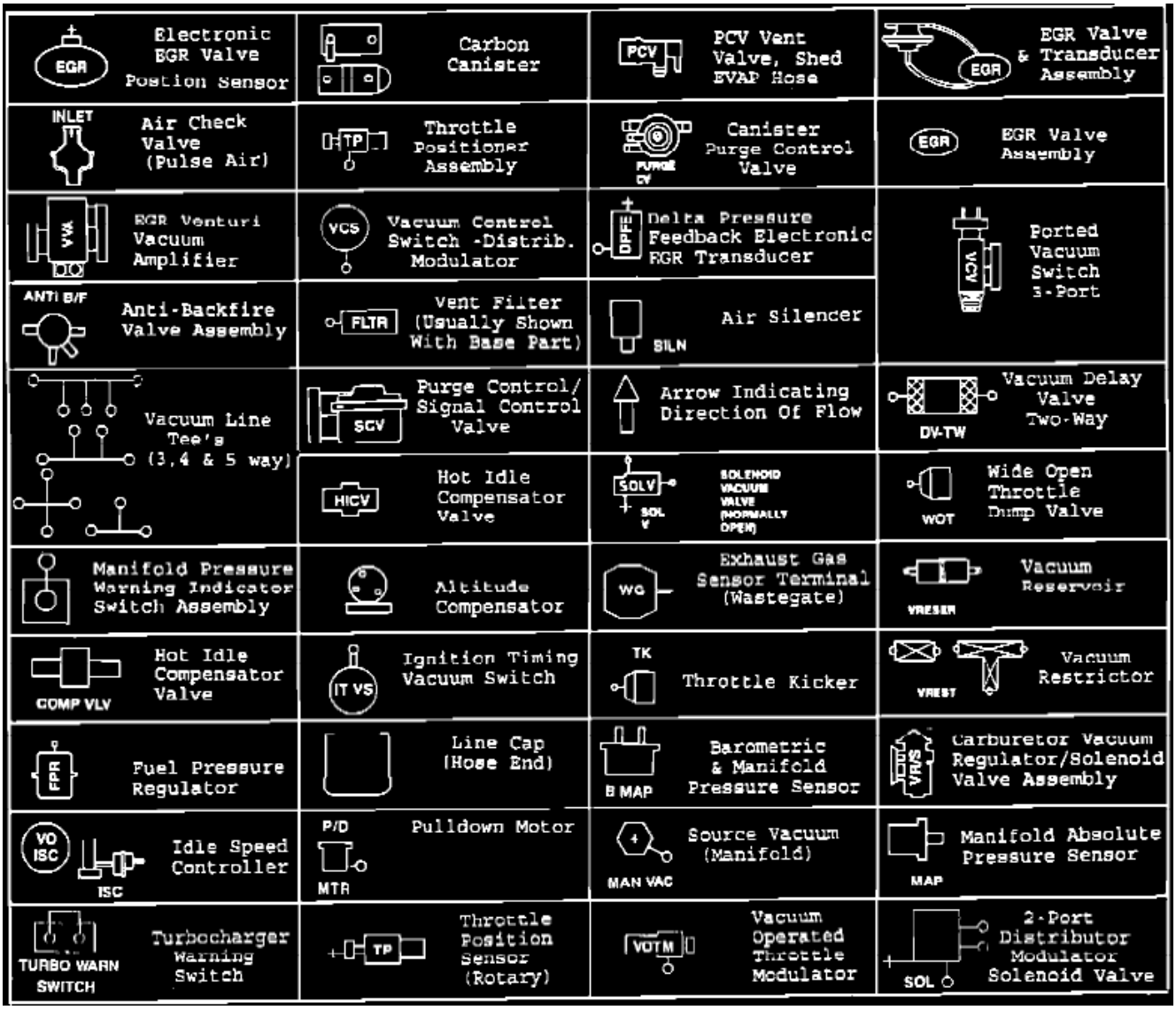


Four Wheel Drive Selector Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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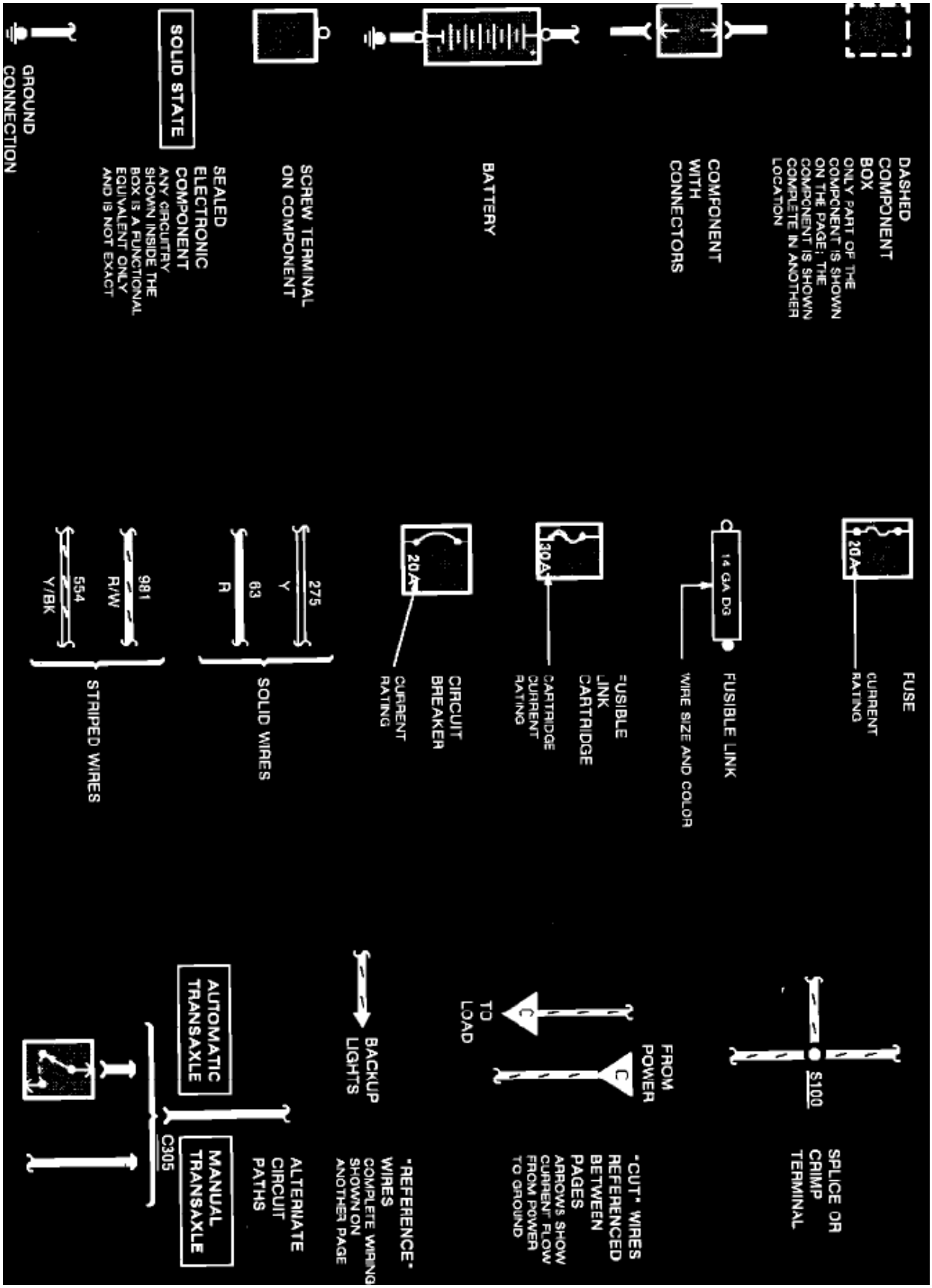
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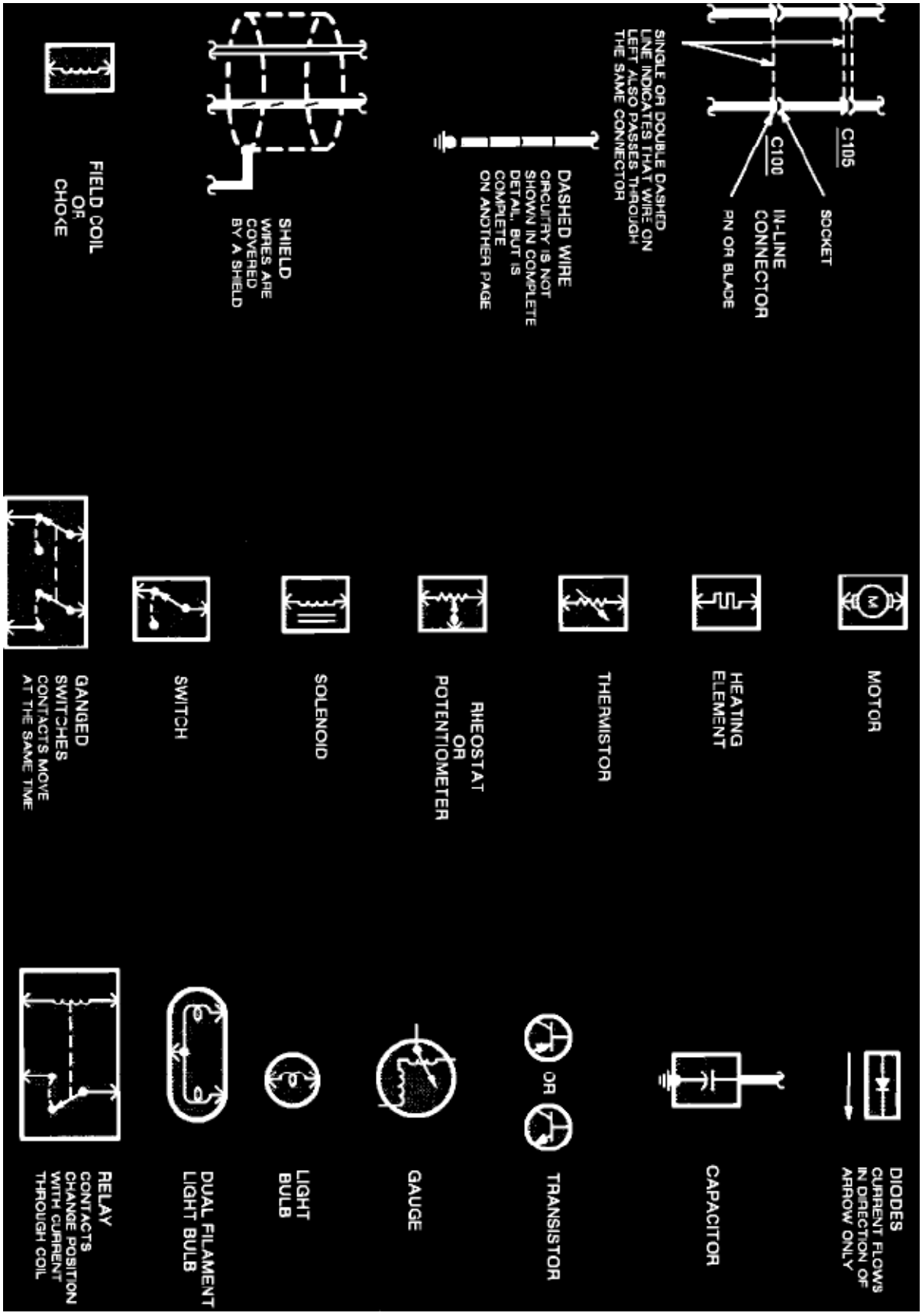
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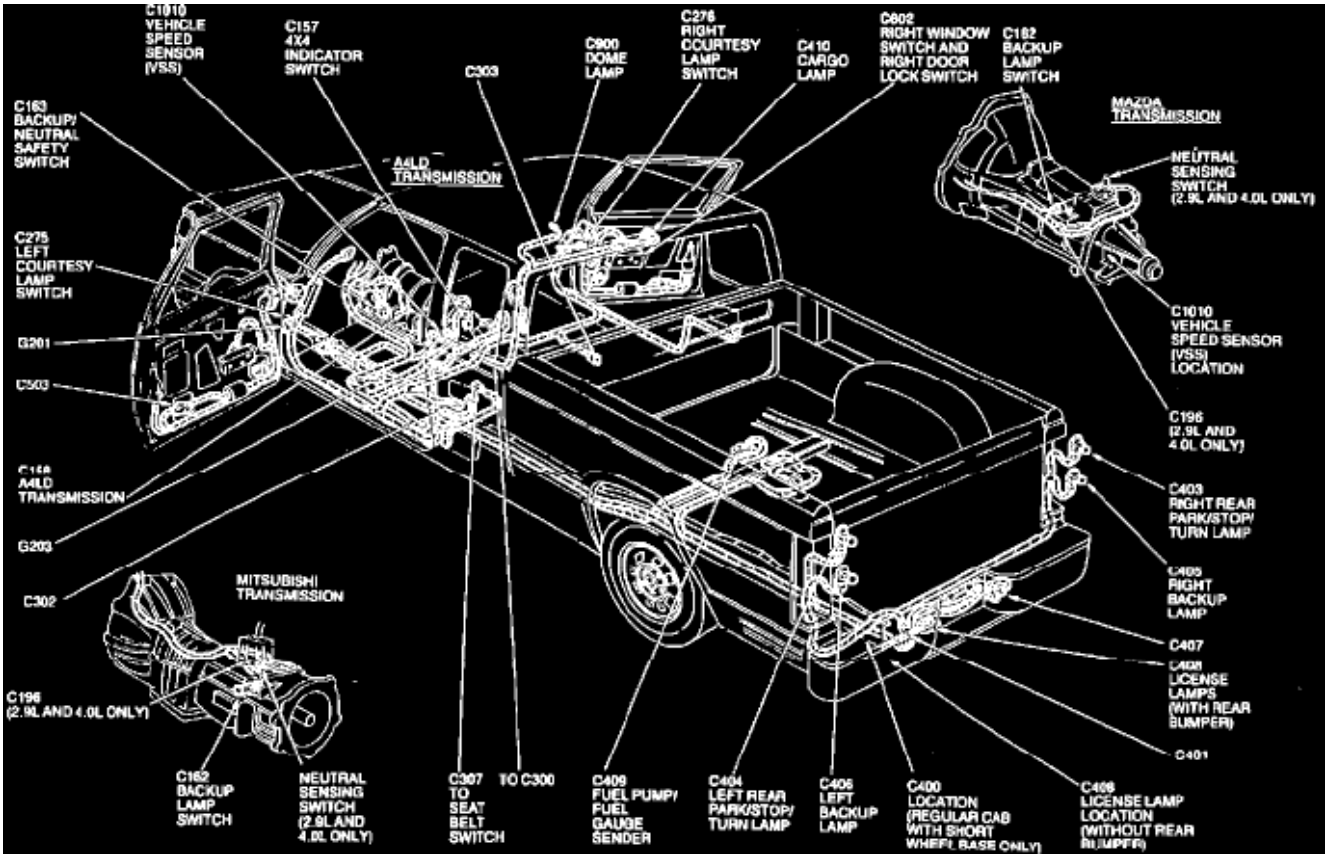

4 X 4 Indicator Switch: Locations

Body Components

Top Front Of Transfer Case

4 X 4 Indicator Switch: Description and Operation

The shift position sensor is an integral component of the electronic shift motor. The sensor inputs shift position of the transfer case to the electronic control module.

Electronic Shift Control Module: Technical Service Bulletins Transfer Case - Revised Shift Procedures

Article No. 90-18-10

^ ELECTRONIC SHIFT MODULE (4X4) - MODIFIED OPERATION

^ TRANSFER CASE - 4X4 ELECTRONIC SHIFT MODULE - REVISED OPERATION PROCEDURE

LIGHT TRUCK: 1986-90 BRONCO II

1986-91 BRONCO, RANGER 1991 EXPLORER

ISSUE: The shift procedures into and out of LOW RANGE are revised for Ranger, Bronco and Explorer trucks built after 8/1/90 due to module changes. The new module will also be used to service prior model year trucks.

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^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press LOW RANGE switch

To shift out of 4 LOW:

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press the LOW RANGE switch to shift back into 4x4 HIGH

^ Press the 4x4 HIGH switch to shift into 2 HIGH if desired

Previously, the module would respond to the LOW RANGE input from any mode (2H, 4H, 4L). If conditions A and B above are not met, the module would respond by flashing the 4 LOW indicator and wait until conditions A and B are met before completing the shift into or out of LOW RANGE. If LOW RANGE was selected while in 2 HIGH mode, the module would shift to 4 HIGH before flashing the indicator.

PART NUMBER PART NAME CLASS

F1TZ-7E453-A 4X4 Electronic Shift Module B

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

508000

Electronic Shift Control Module: Technical Service Bulletins Electric Shift Module Wiring Schematic - Correction

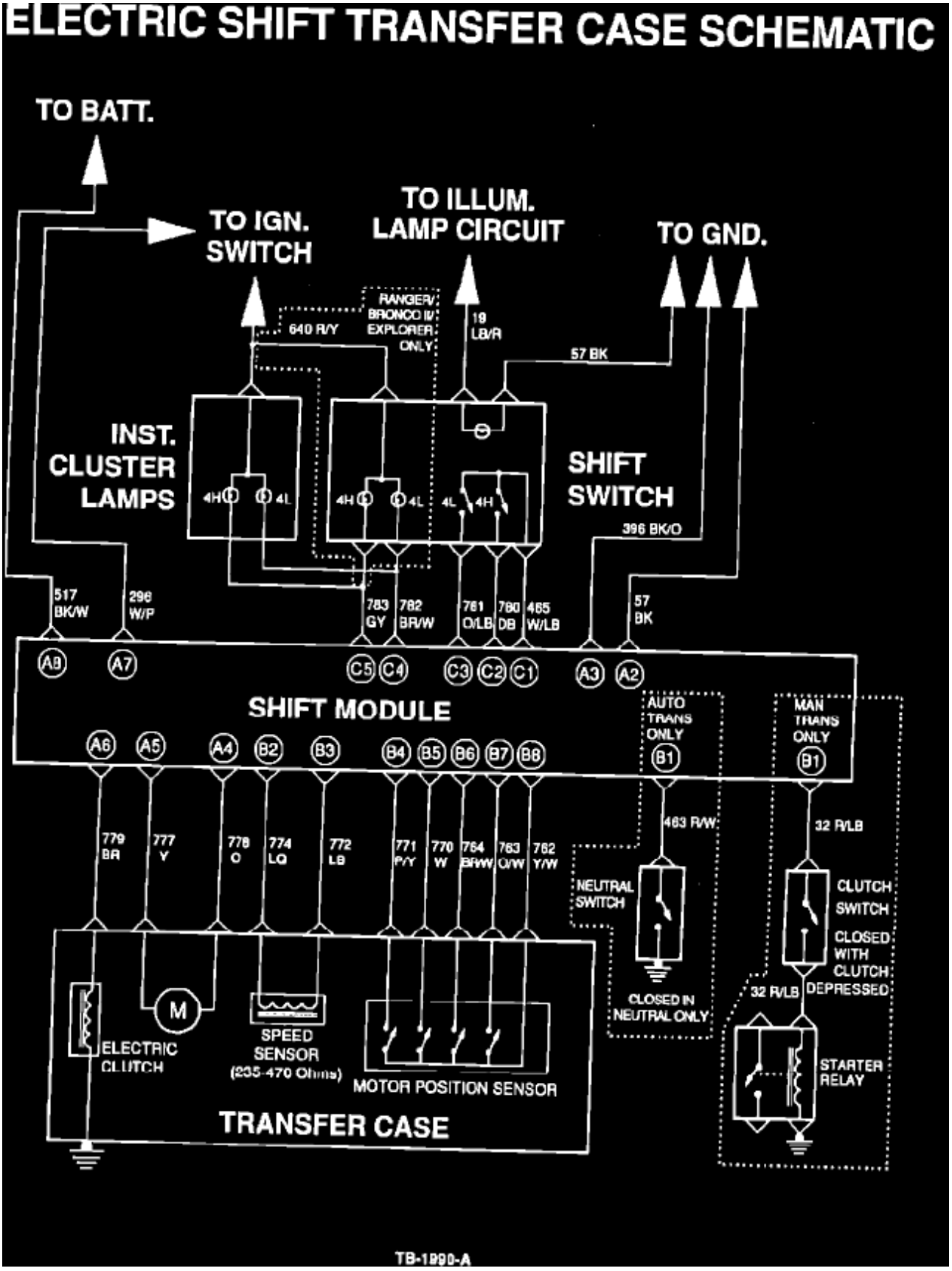
Article No. 91-3-11

02/02/91

0GTRANSFER CASE - 4X4 ELECTRIC SHIFT MODULE - EVTM WIRING CORRECTIONS

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Some of the wiring schematics shown in the EVTMs contain errors which make circuit tracing difficult. A complete update of these schematics will be made in the near future.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783 GY
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781 O/LB
780 DB
485 W/LB
57 BK
A8
A7
C5
C4
C3
C2
C1
A3
A2
SHIFT MODULE
A6
A5
A4
B2
B3
B4
B5
B6
B7
B8
AUTO TRANS ONLY
B1
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B1
779 BR
777 Y
778 O
774 LG
772 LB
771 P/Y
770 W
764 BR/W
763 O/W
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Figure 1

ACTION: In the interim, refer to the simplified schematic, Figure 1. It shows the electrical circuitry for the transfer case shift mechanism while deleting connectors and interconnects with other circuits for clarity.

OTHER APPLICABLE ARTICLES: None

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203200, 290000, 508000, 590000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
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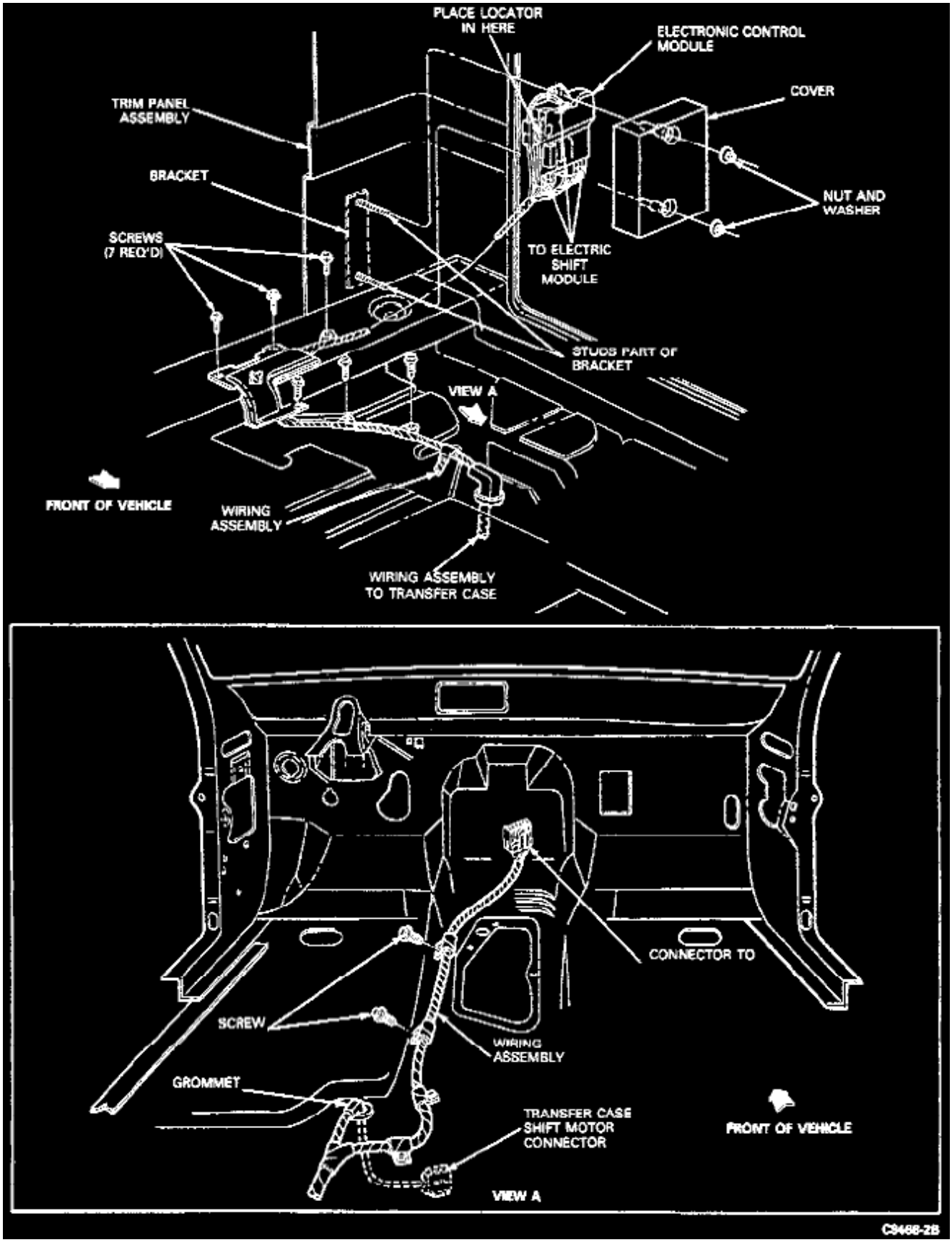
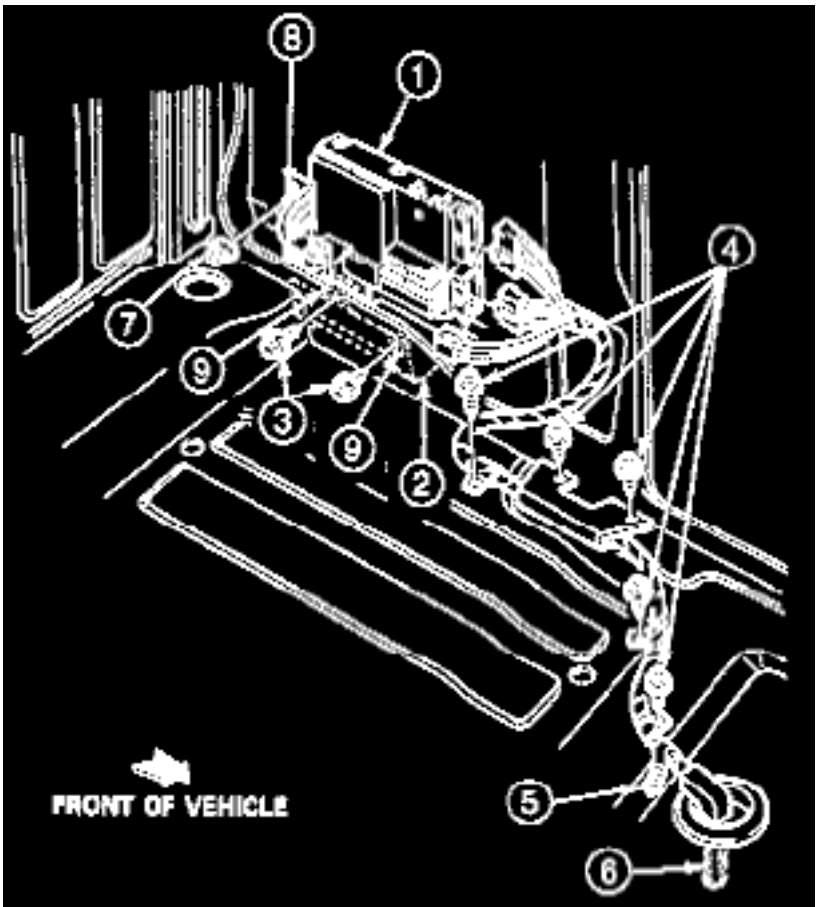


Electronic Shift Control Module: Locations Regular Cab

Electronic Control Module Location

The Electric Shift Control Module is located at the lower Left Hand rear corner of cab.



Item No.	Description
1	Electronic Control Module
2	Bracket, Shift Module
3	Screw (2 Req.)
4	Screw (5 Req.)
5	Wiring Assembly
6	Wiring Assembly
7	Nut and Washer Assembly
8	Stud Part for Module Bracket
9	Nut Assembly (2 Req.)

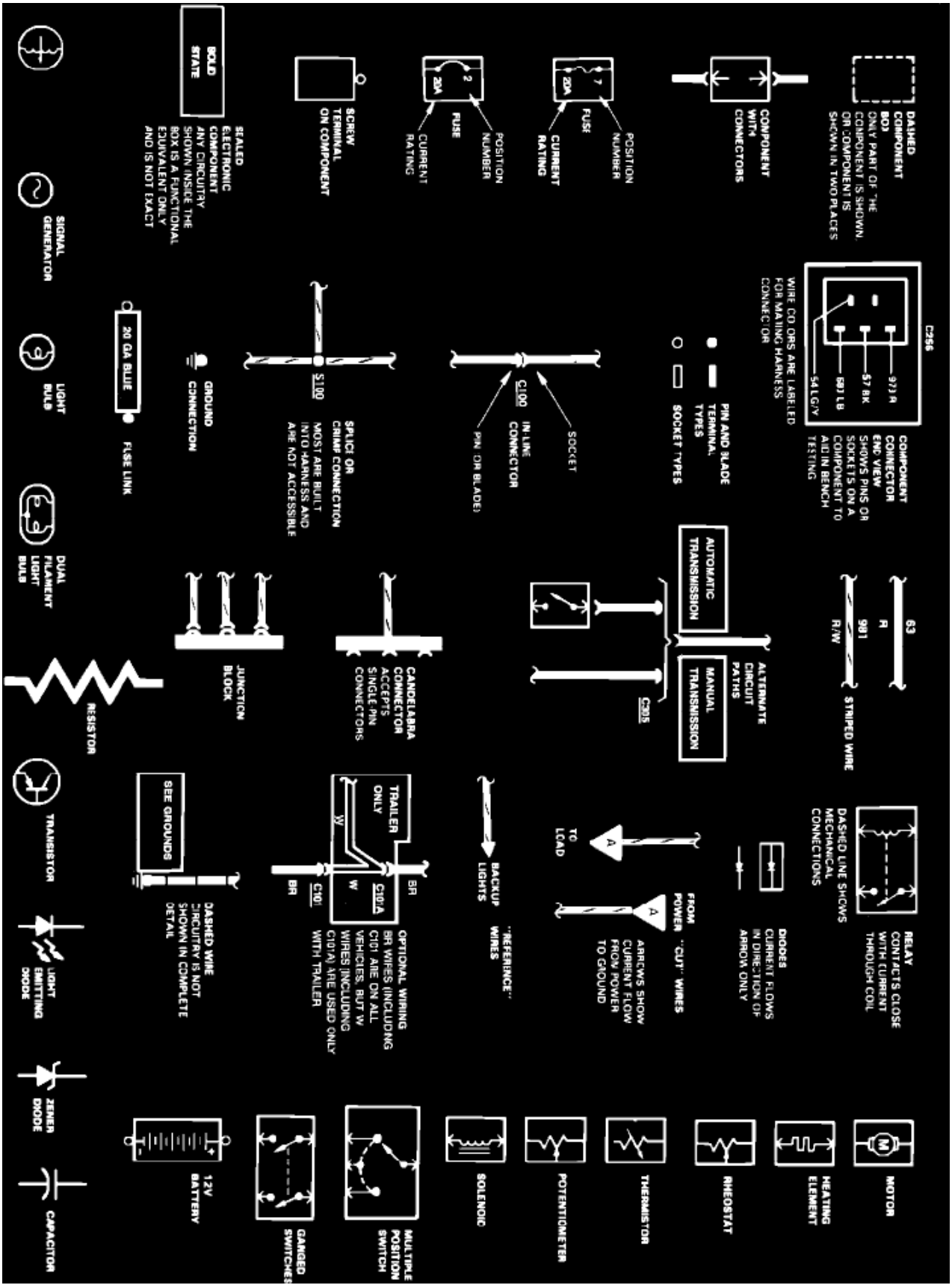
CC10860-A

Electronic Shift Control Module: Locations Supercab

Control Module Circuits, Ranger SuperCab

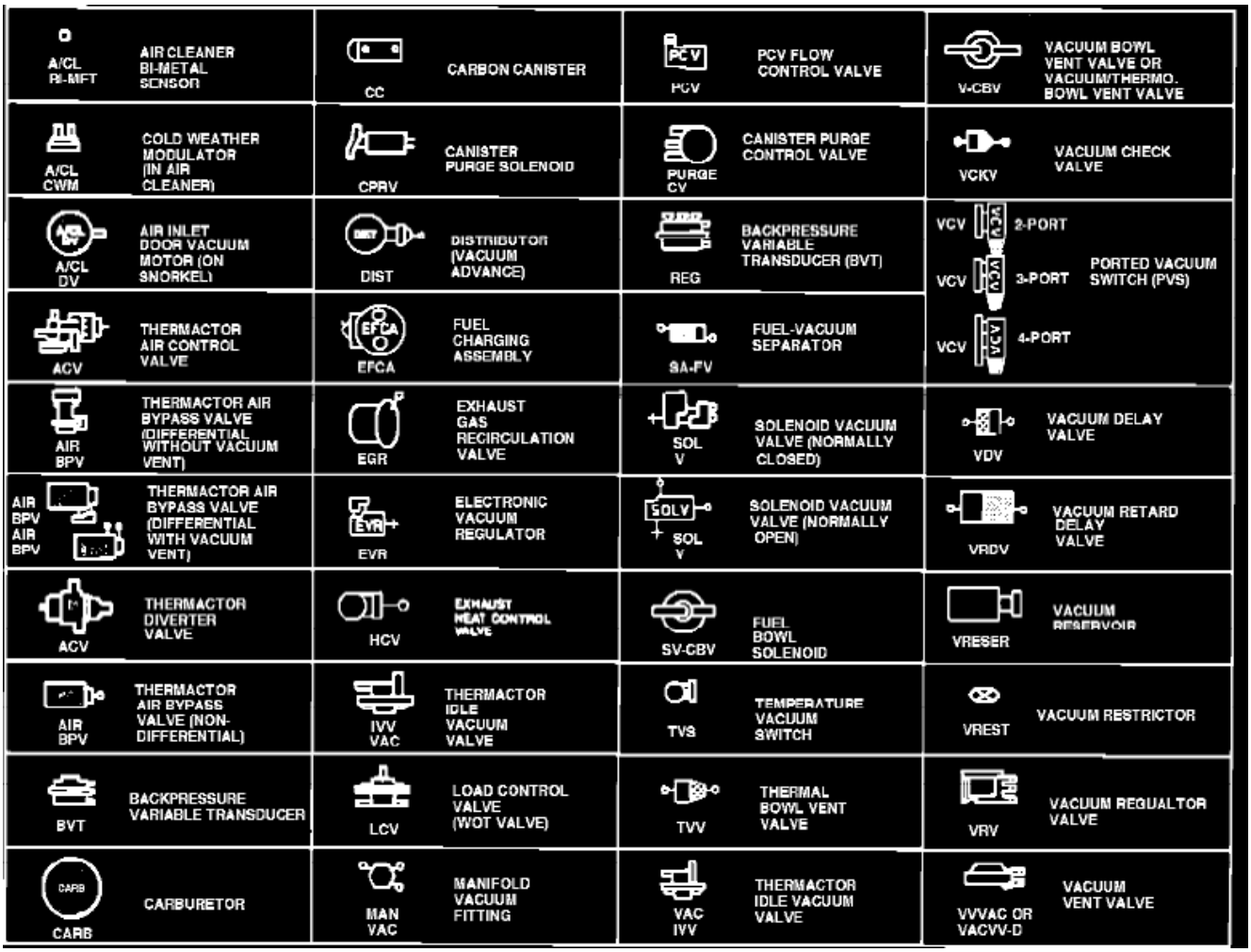
The Electric Shift Control Module is located between the bottom of the Left Hand "B" pillar and the rear of the cab.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Relays and Modules - Transfer Case > Electronic Shift Control Module <--> [Control Module, Transfer Case] > Component Information > Diagrams > Diagram Information and Instructions

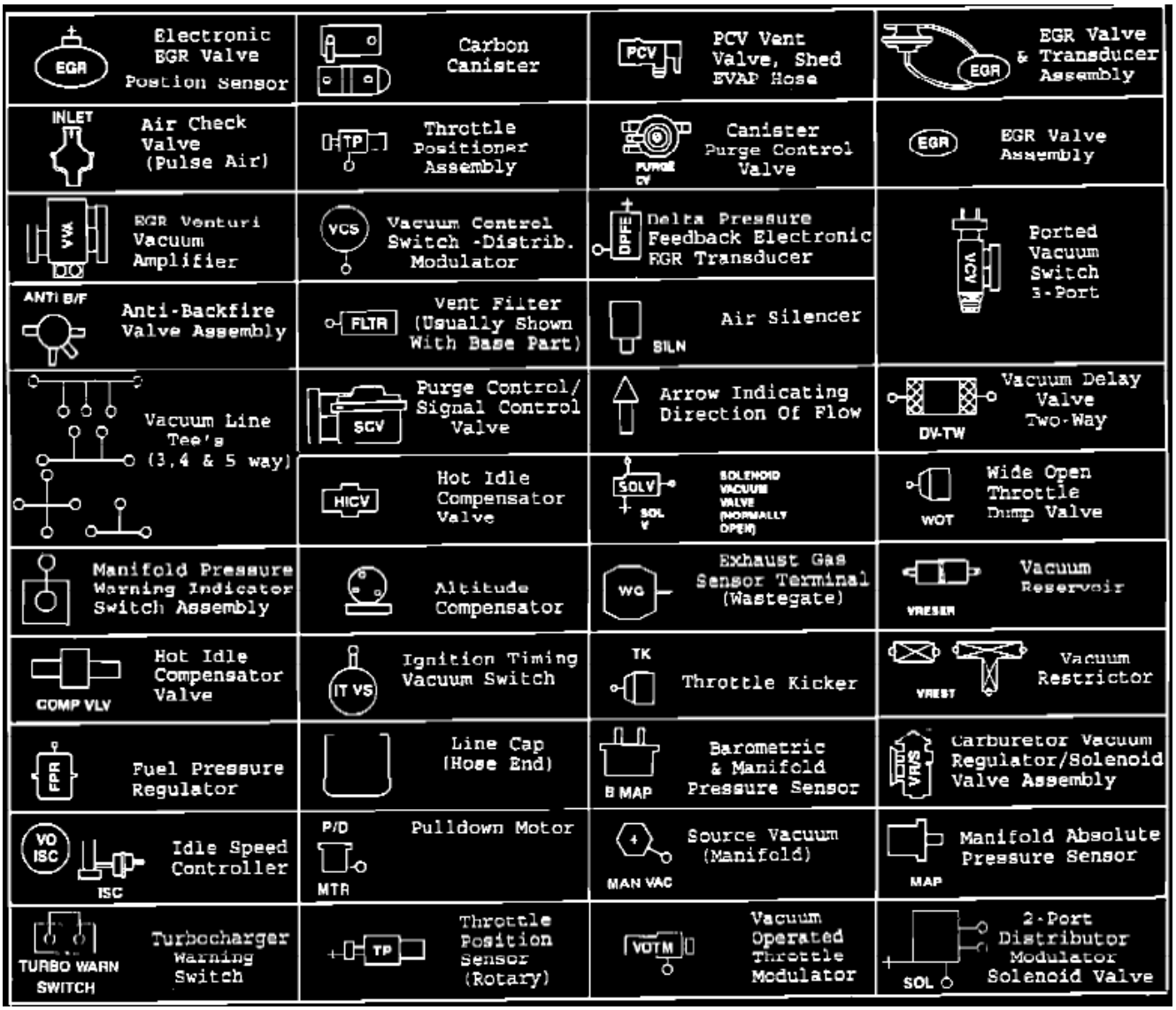


Electronic Shift Control Module: Diagram Information and Instructions

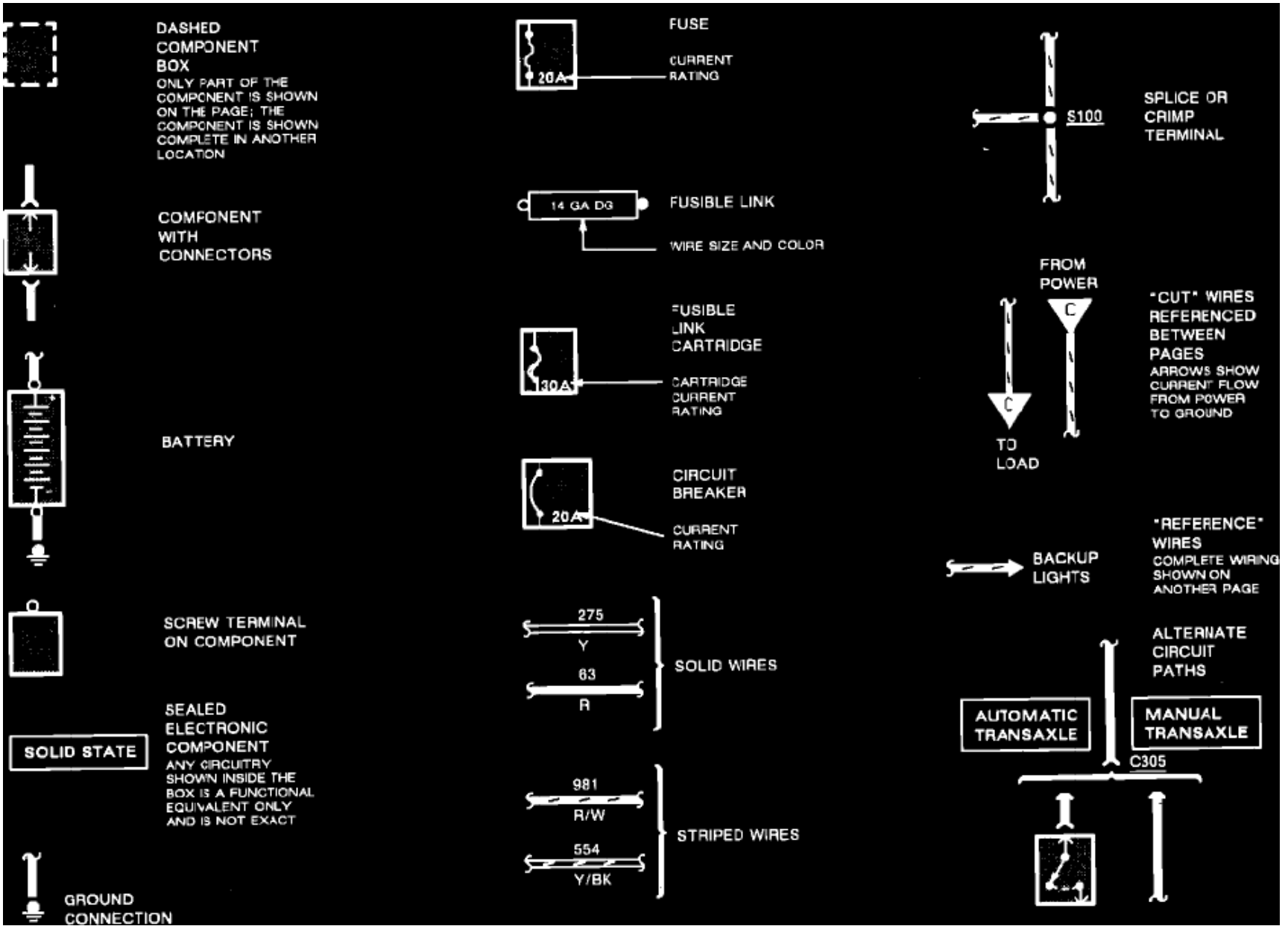
Symbol Identification

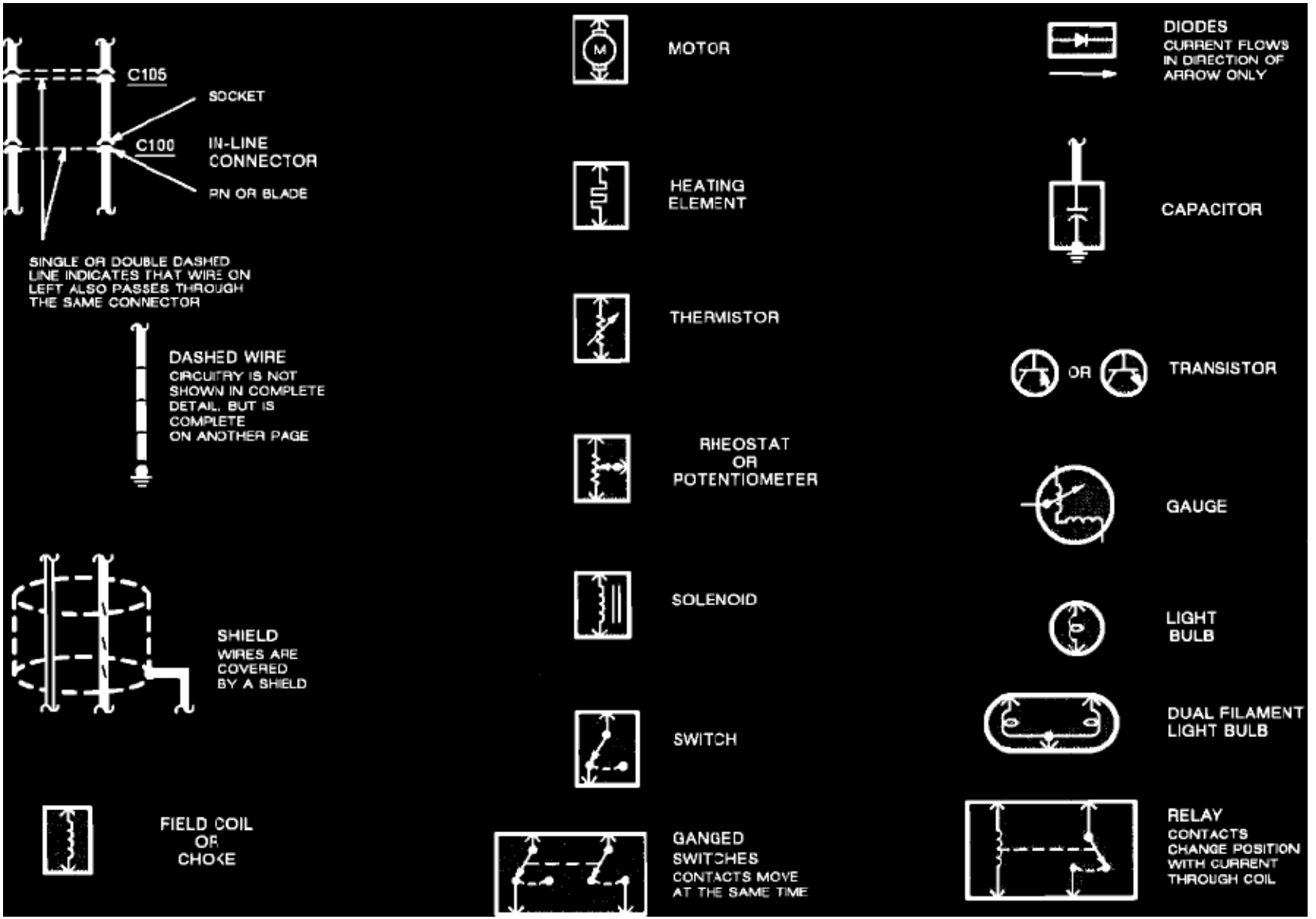


Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SOLID STATE
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
20A
FUSE
CURRENT RATING
14 GA DG
FUSIBLE LINK
WIRE SIZE AND COLOR
30A
FUSIBLE LINK CARTRIDGE
CARTRIDGE CURRENT RATING
20A
CIRCUIT BREAKER
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
ALTERNATE CIRCUIT PATHS
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

T: Tan

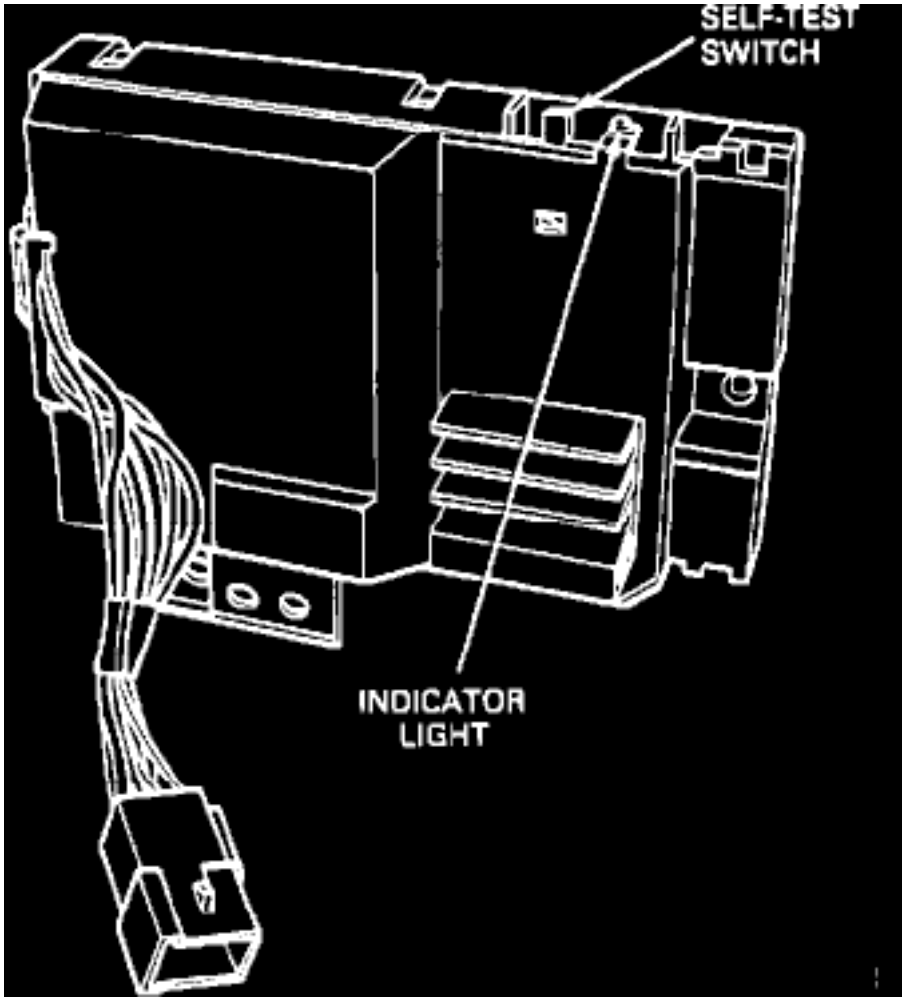
V: Violet

W: White

Y: Yellow

Electronic Shift Control Module: Description and Operation

The electronic control module conducts transfer case operation in response to inputs from the vehicle speed sensor, neutral start switch and clutch interlock switch and push-button actuation made by the operator.



Electronic Shift Control Module: Testing and Inspection

The electronic control module has a diagnostic capability of its internal circuitry. Self test procedure is as follows:

1. Disconnect five-wire and eight wire connectors from electronic control module.

2. Turn ignition switch to the RUN position.

3. Activate the self test switch and note result:

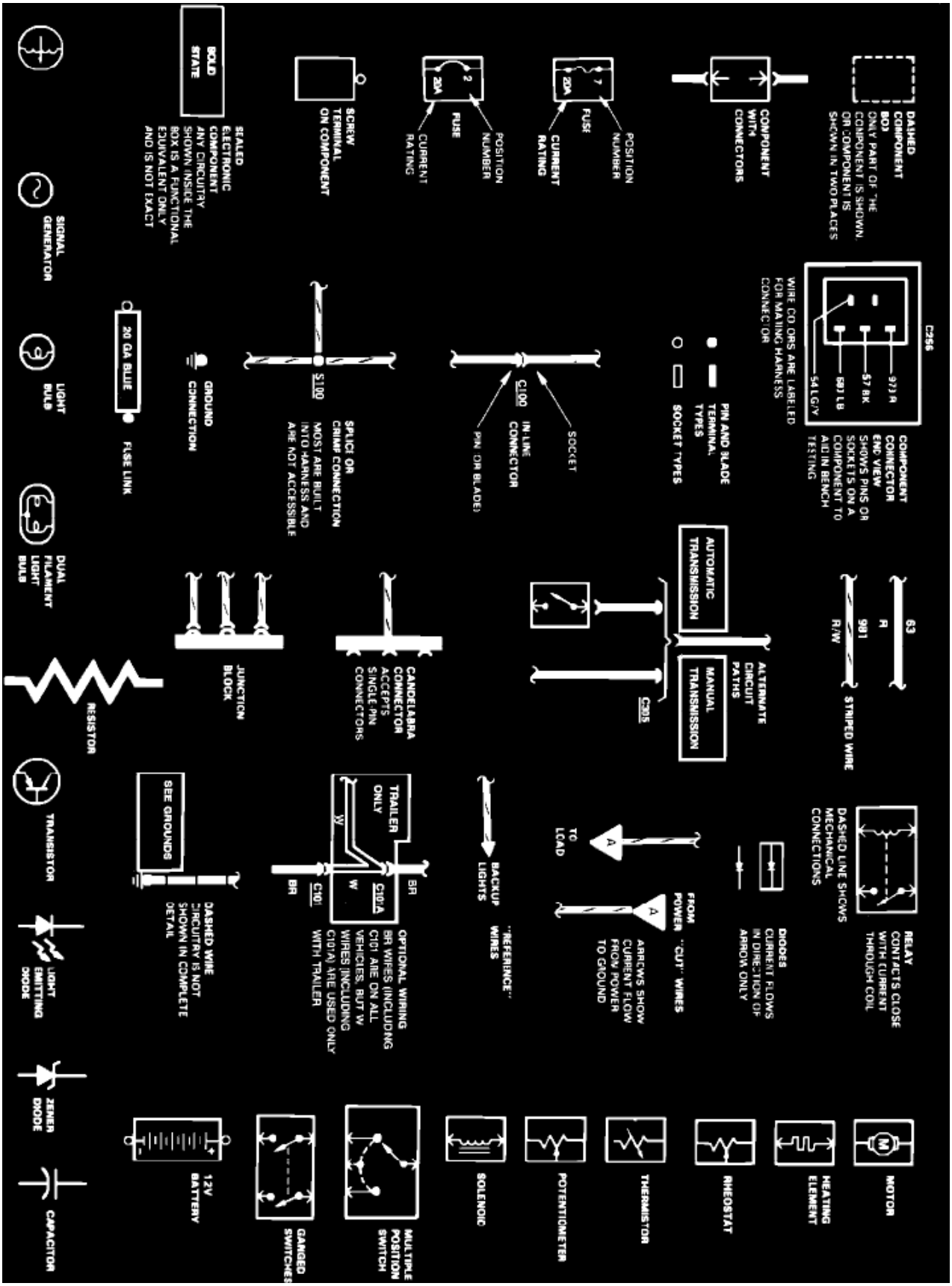
Control Module Self Test

NOTE: The self test switch and indicator light is located on the Electronic Control Module.

A FLASHING INDICATOR LAMP, (approximately one flash per second), indicates control module is functioning properly.

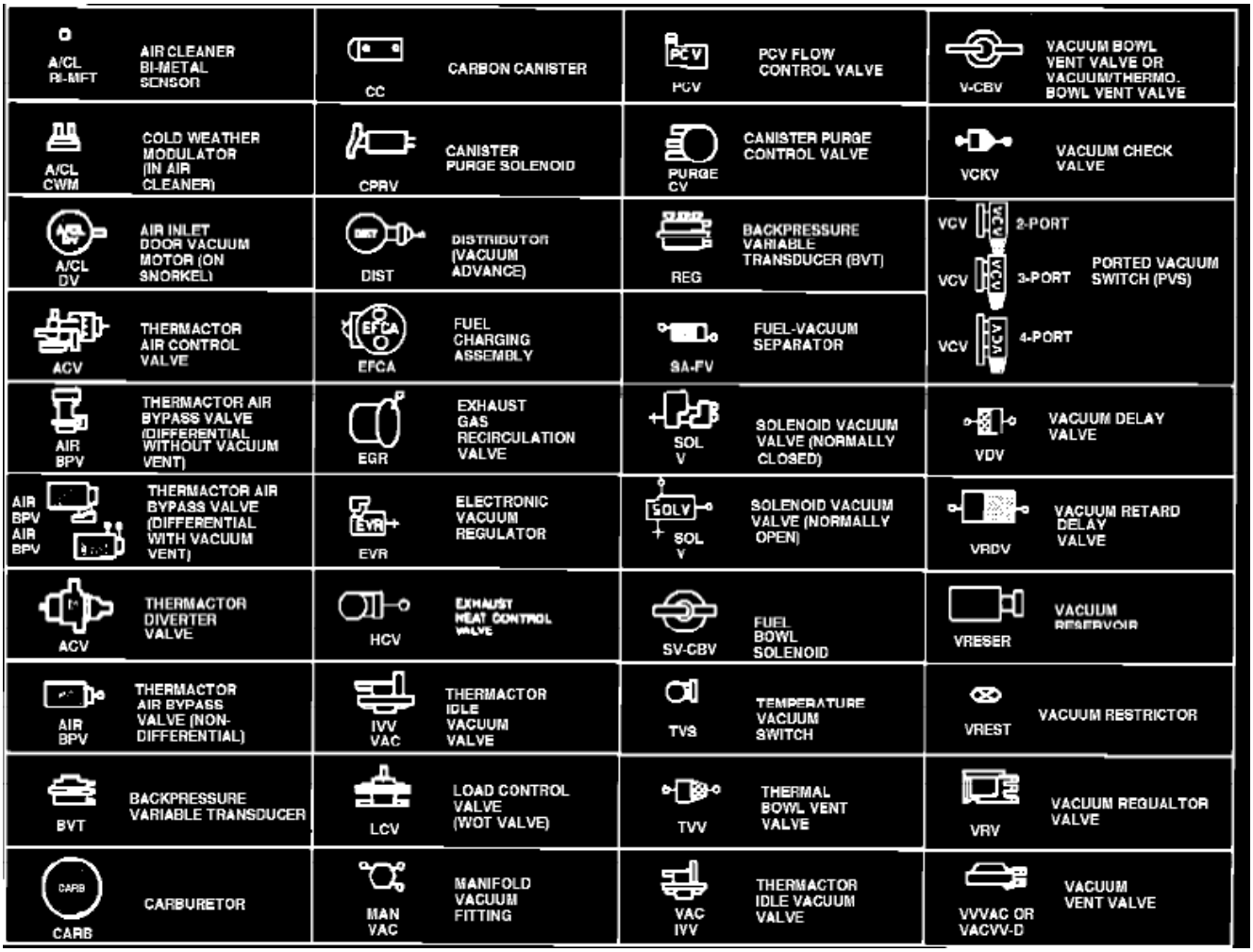
A STEADY INDICATOR LIGHT, indicates that control module is inoperative and must be replaced.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Sensors and Switches - Transfer Case > Four Wheel Drive Selector Switch > Component Information > Diagrams > Diagram Information and Instructions

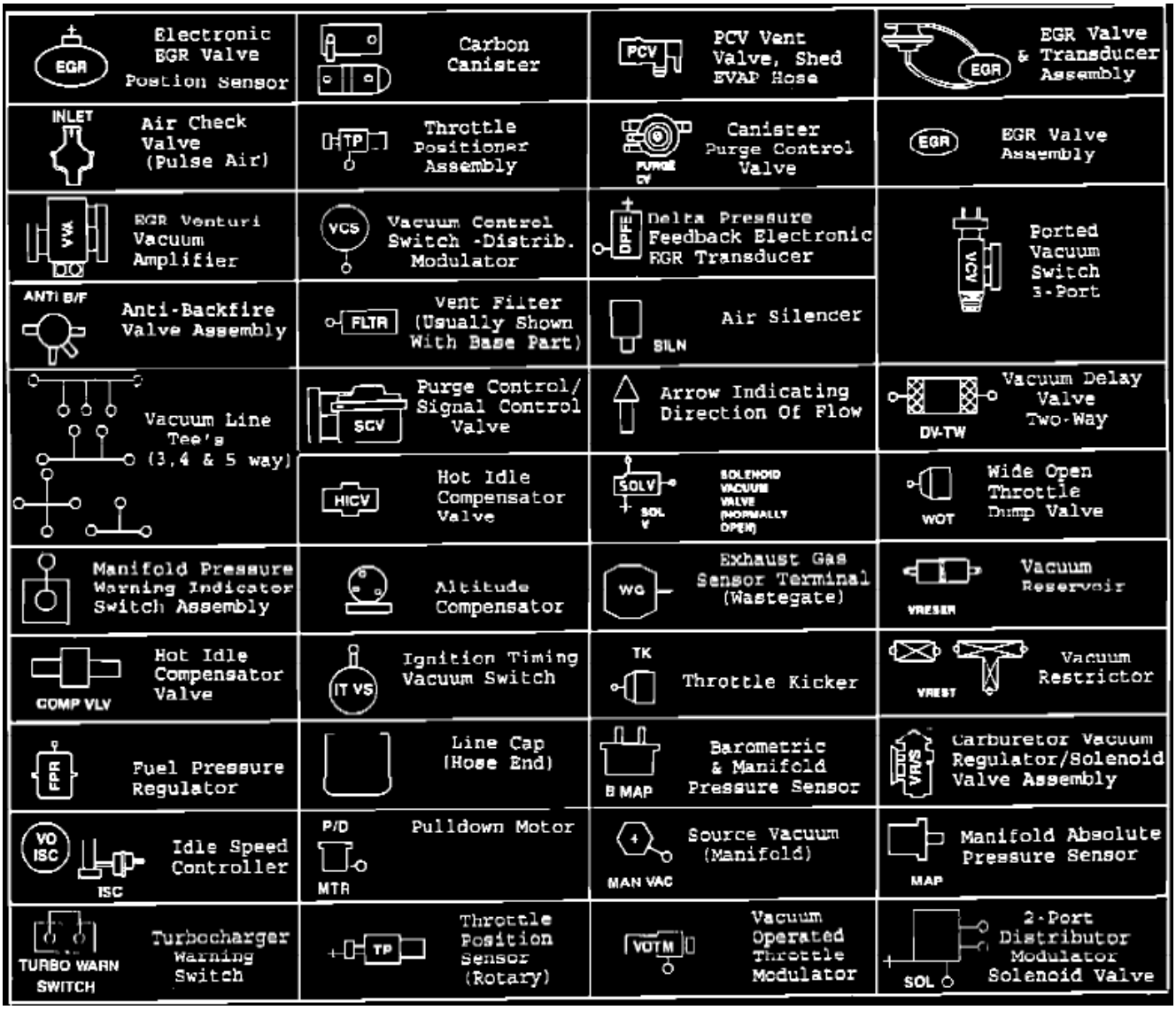


Four Wheel Drive Selector Switch: Diagram Information and Instructions

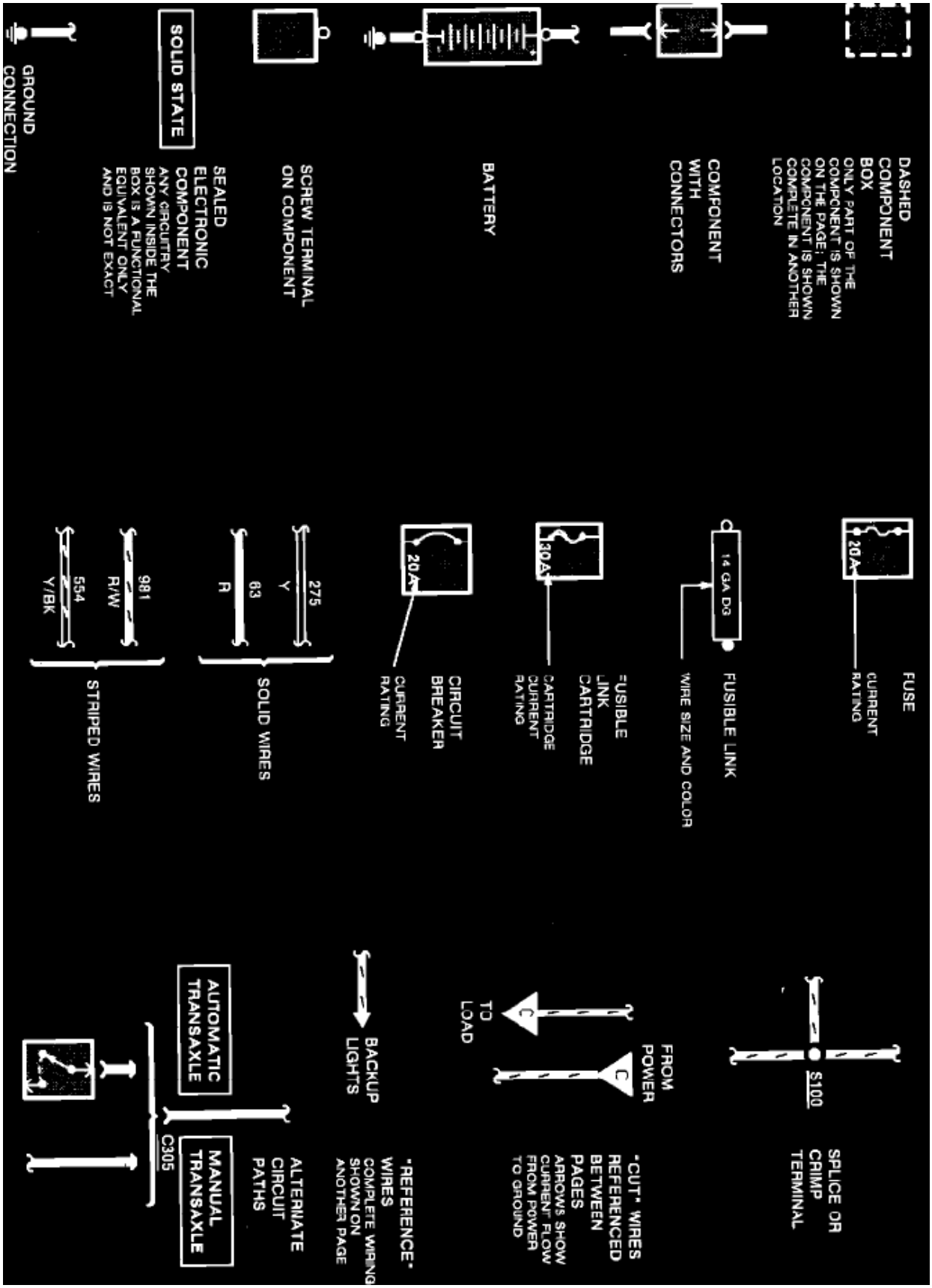
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
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SCREW TERMINAL ON COMPONENT
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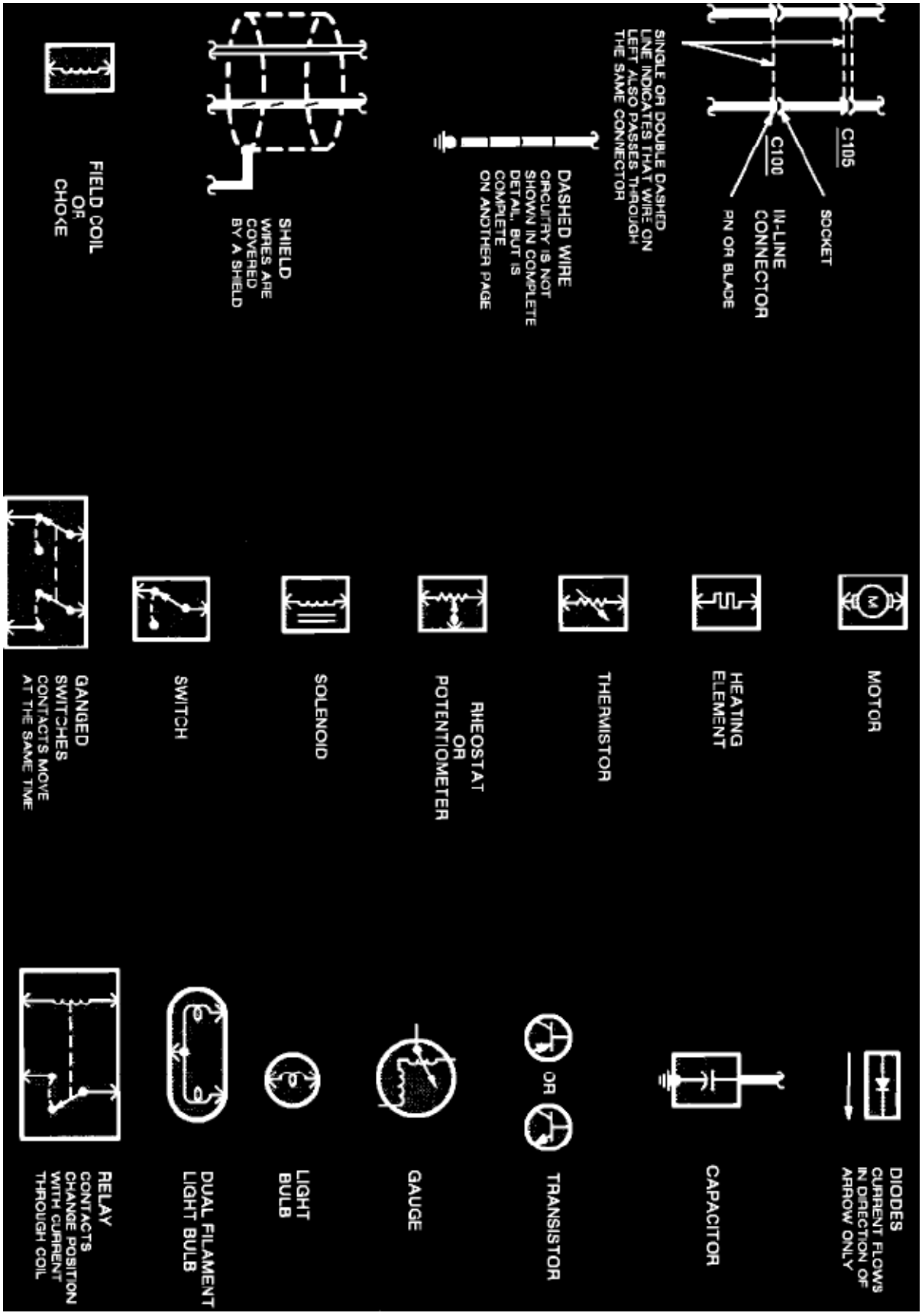
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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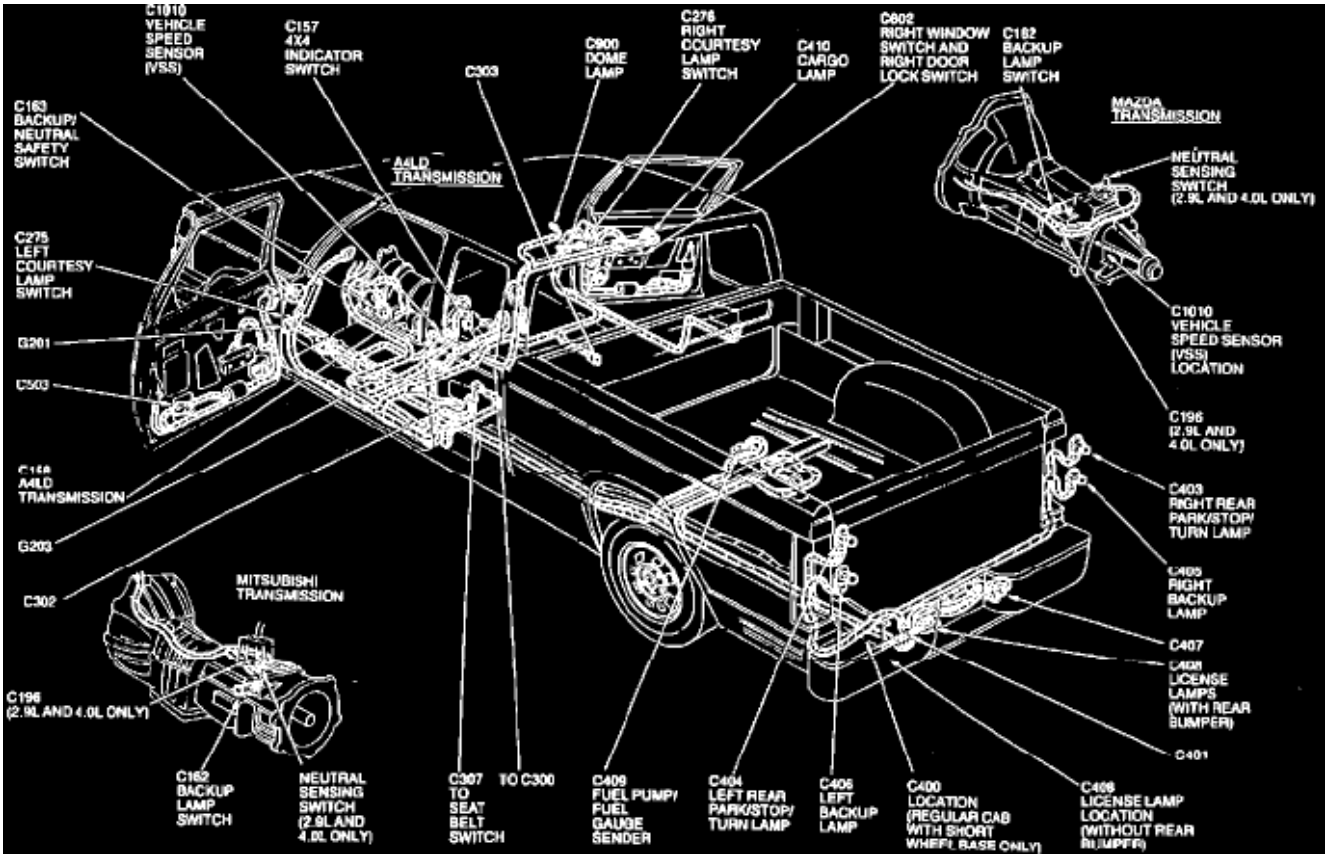


4 X 4 Indicator Switch: Locations

Body Components

Top Front Of Transfer Case

4 X 4 Indicator Switch: Description and Operation

The shift position sensor is an integral component of the electronic shift motor. The sensor inputs shift position of the transfer case to the electronic control module.

Speed Sensor: Description and Operation

The speed sensor information to the electronic control module verifies the proper speed to allow range shifts (in or out of 4-Low) to occur.

Shift Fork: Customer Interest Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

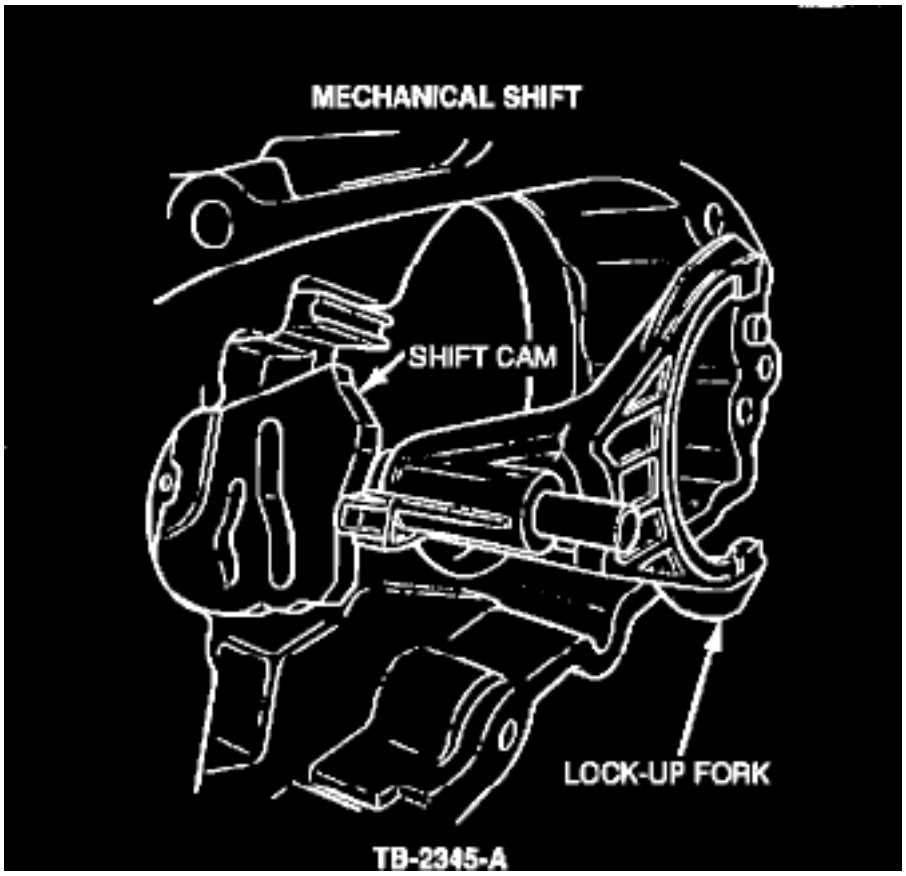
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

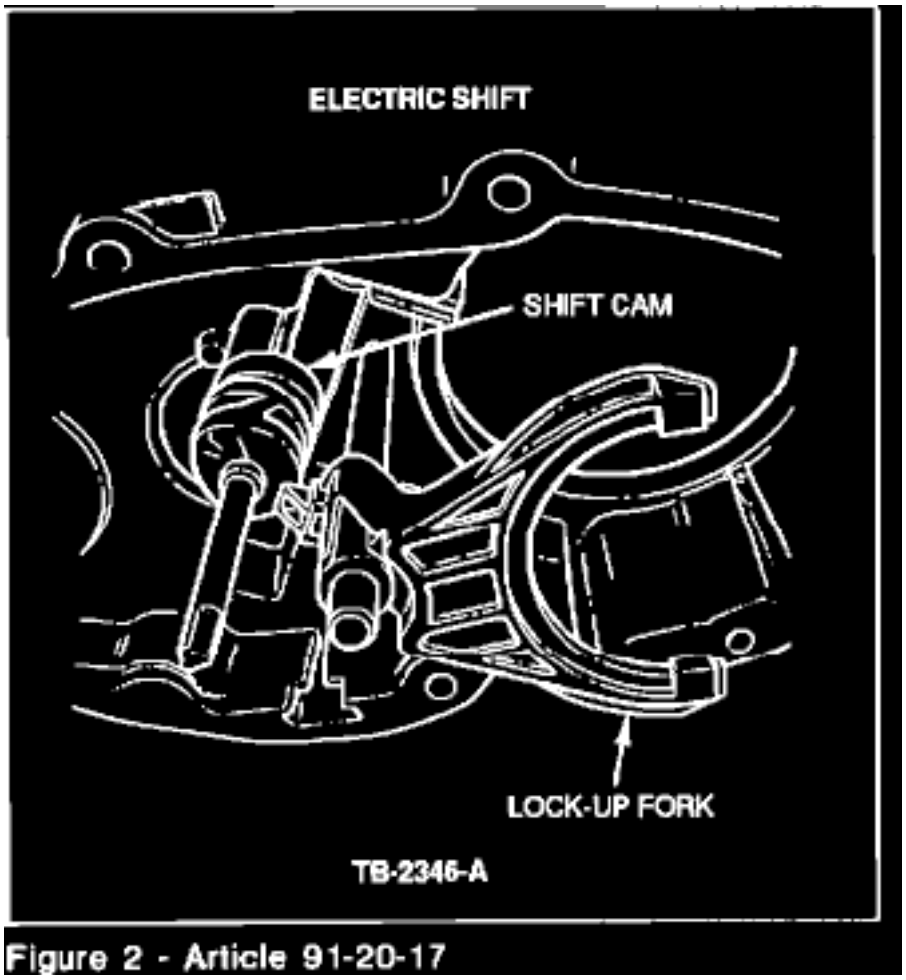


Figure 2 - Article 91-20-17

Figure 2

NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

EGTZ-7D126-A Sleeve Spring B

F1TZ-7289-D Lock-Up Fork B

OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

912017A Perform Initial Checks 0.5 Hr.

912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Shift Fork: All Technical Service Bulletins Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

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ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

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2. Set the tire pressure as specified on the safety compliance certification label.

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NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

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VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

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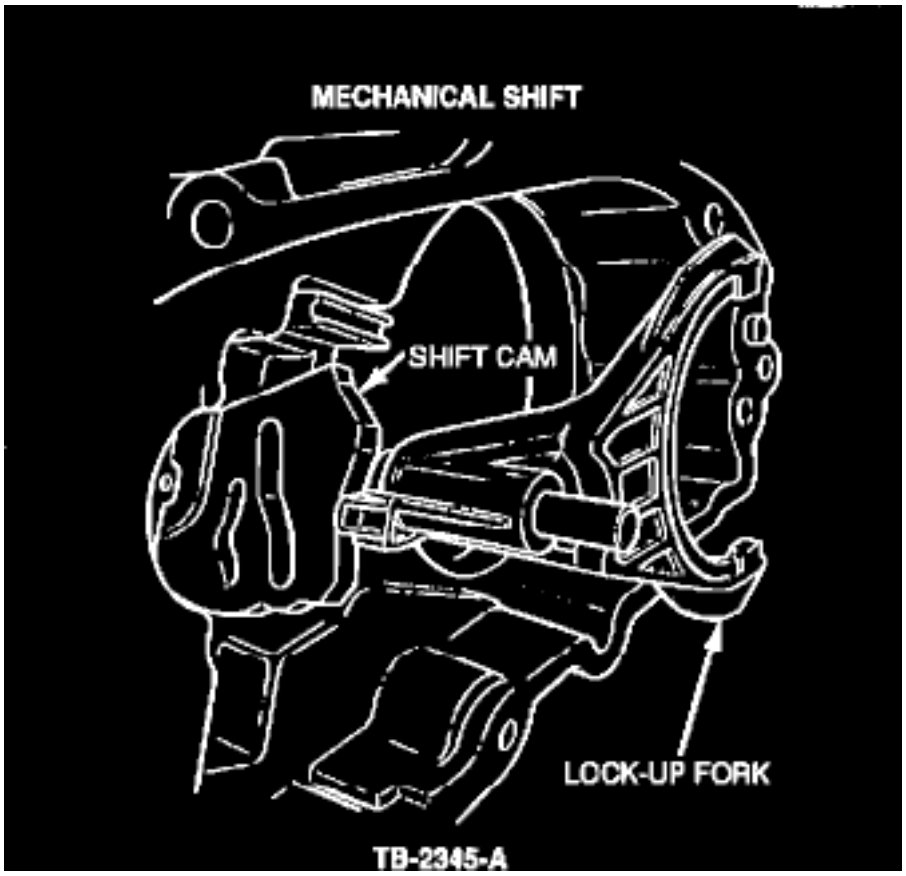

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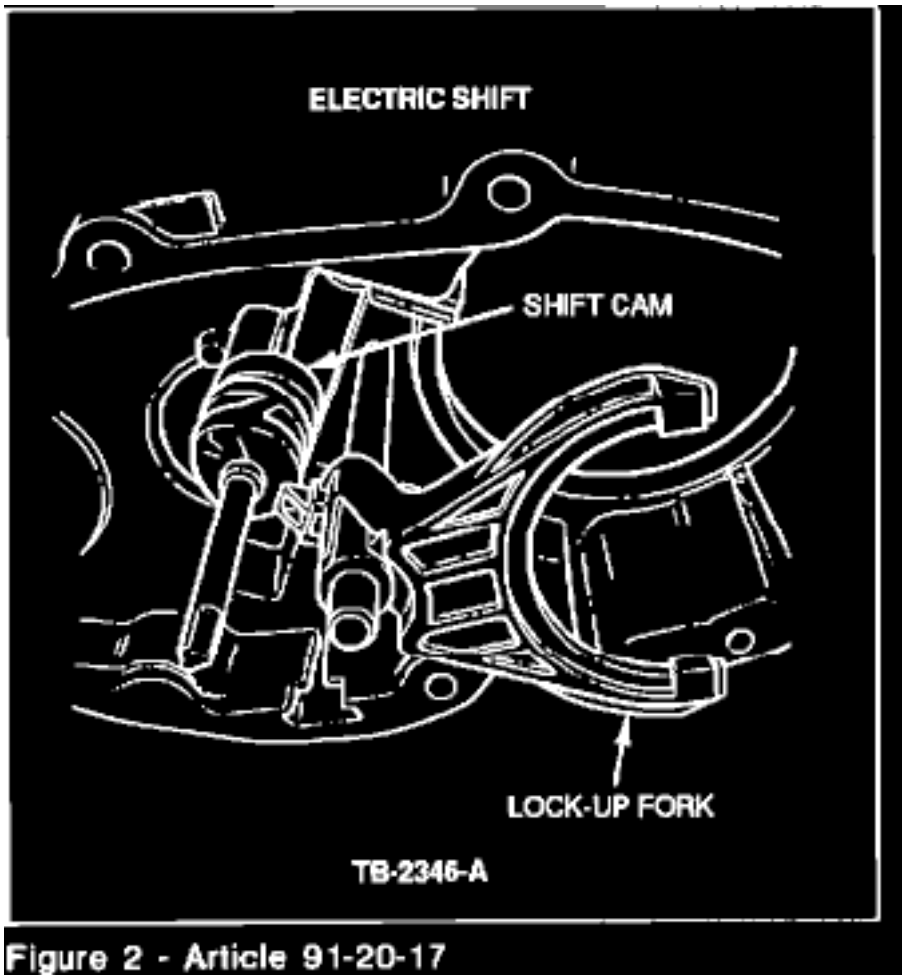

Figure 2 - Article 91-20-17

Figure 2

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Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

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OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

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OPERATION DESCRIPTION TIME

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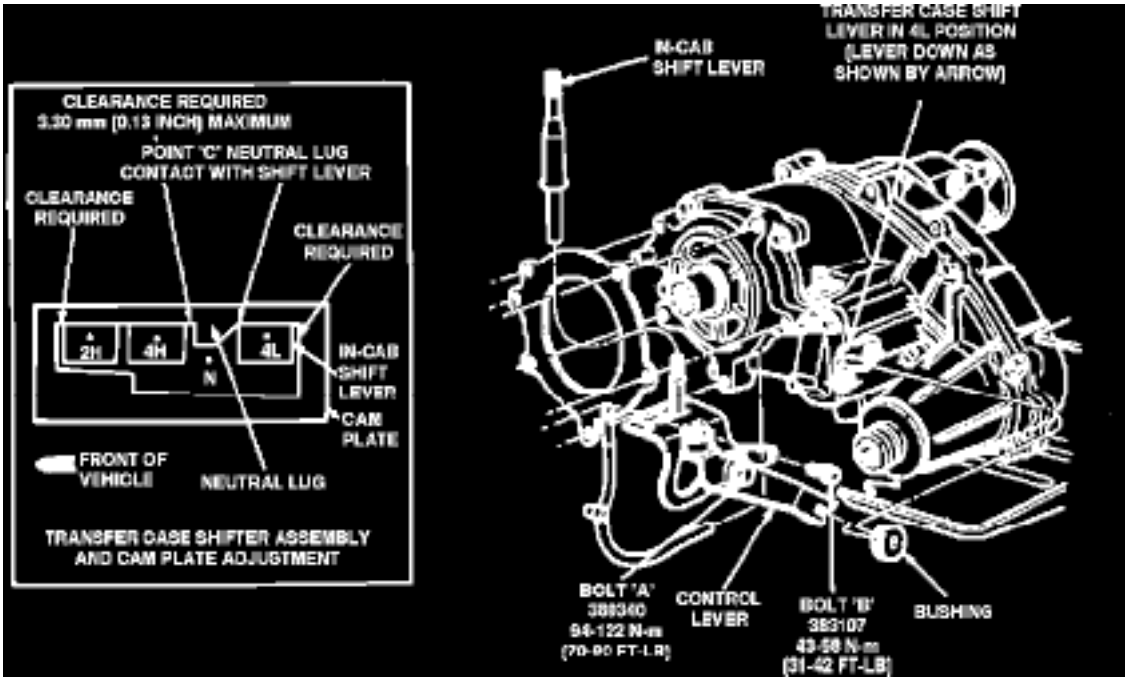
Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000



Shift Lever: Adjustments

Fig. 5 Shift Linkage Adjustment

1. Raise shift boot to expose cam plate, loosen bolts A and B, Fig. 5, approximately two turns, then place shift lever in 4L position.

2. Move cam plate rearward until bottom corner of neutral lug just contacts forward right edge of shift lever (Point C), Fig. 5.

3. With cam plate positioned as outlined above, torque bolt A to 70-90 ft. lbs., then bolt B to 31-42 ft. lbs.

4. Place shift lever in all shift positions and check for positive engagement.

5. Check clearance between shift lever and cam plate with shift lever positioned in 2H, 4H and 4L positions as shown, Fig. 5. Clearance should not exceed .130 inch. If clearance exceeds specification, repeat adjustment

Shift Lever: Service and Repair

Removal of the shift ball is necessary only if the shift ball, boot, or lever is being replaced. If not, remove the ball, boot and lever as an assembly.

1. Remove plastic insert from shift ball, then warm ball to approximately 140-180°F and knock ball off lever with a hammer and a block of wood.

2. Remove rubber boot and pan cover, then disconnect vent hose from control lever.

3. Unscrew shift lever from control lever, then remove shifter to extension housing retaining bolt and the shoulder bolt. Remove control lever and bushings.

4. Reverse procedure to install. Note the following:

a. Torque shifter to extension housing retaining bolt to 31-42 ft. lbs. and shoulder bolt to 70-90 ft. lbs. The shifter retaining bolt must be

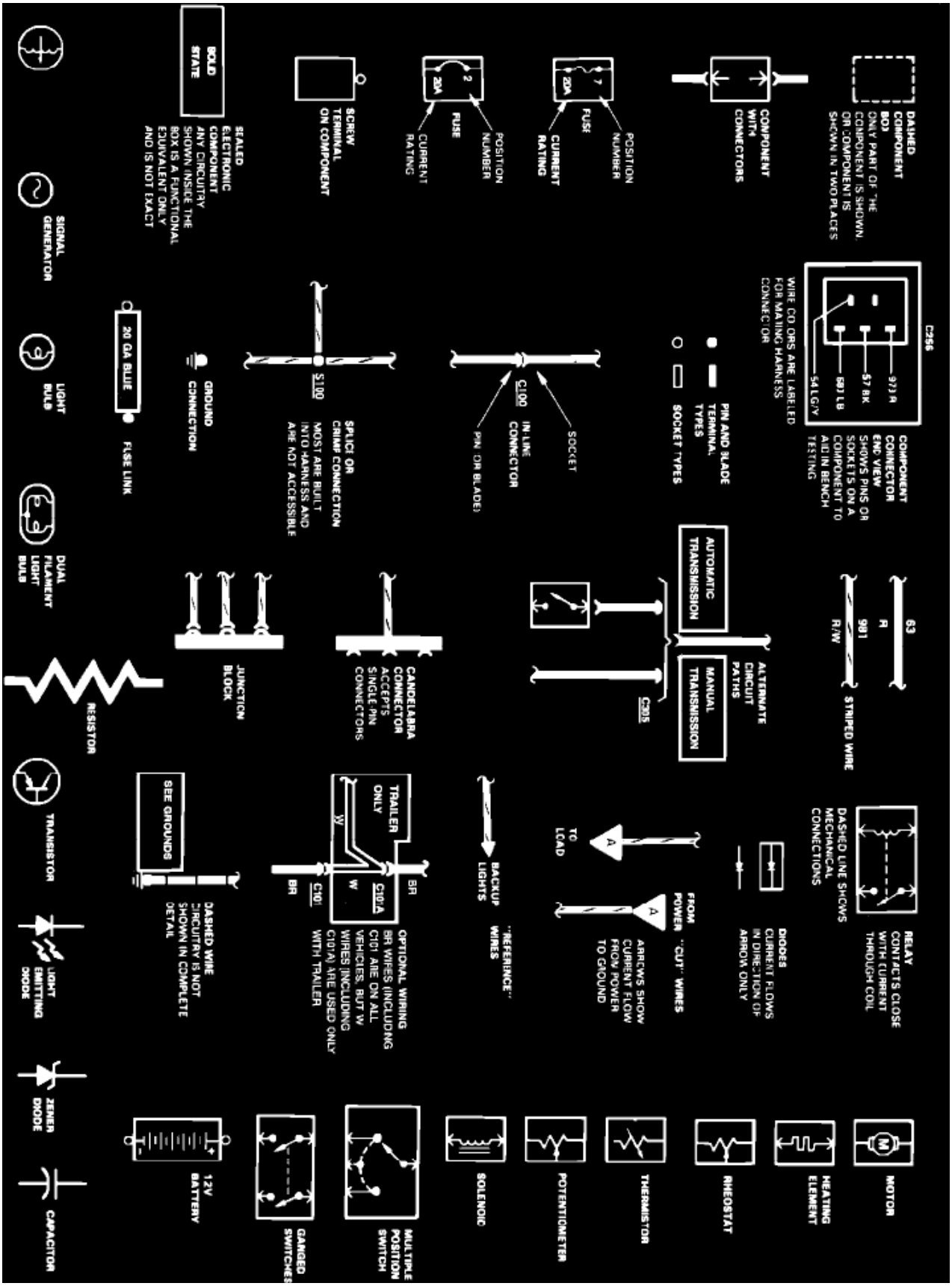
tightened before the shoulder bolt.

b. Torque shift lever to 27-37 ft. lbs. c. Install vent assembly so the white marking on housing is in line with notch in shifter. Position upper end of vent hose inside shift lever bolts. d. Install shift ball to the end of knurl on upper part of shift lever.

Speed Sensor: Description and Operation

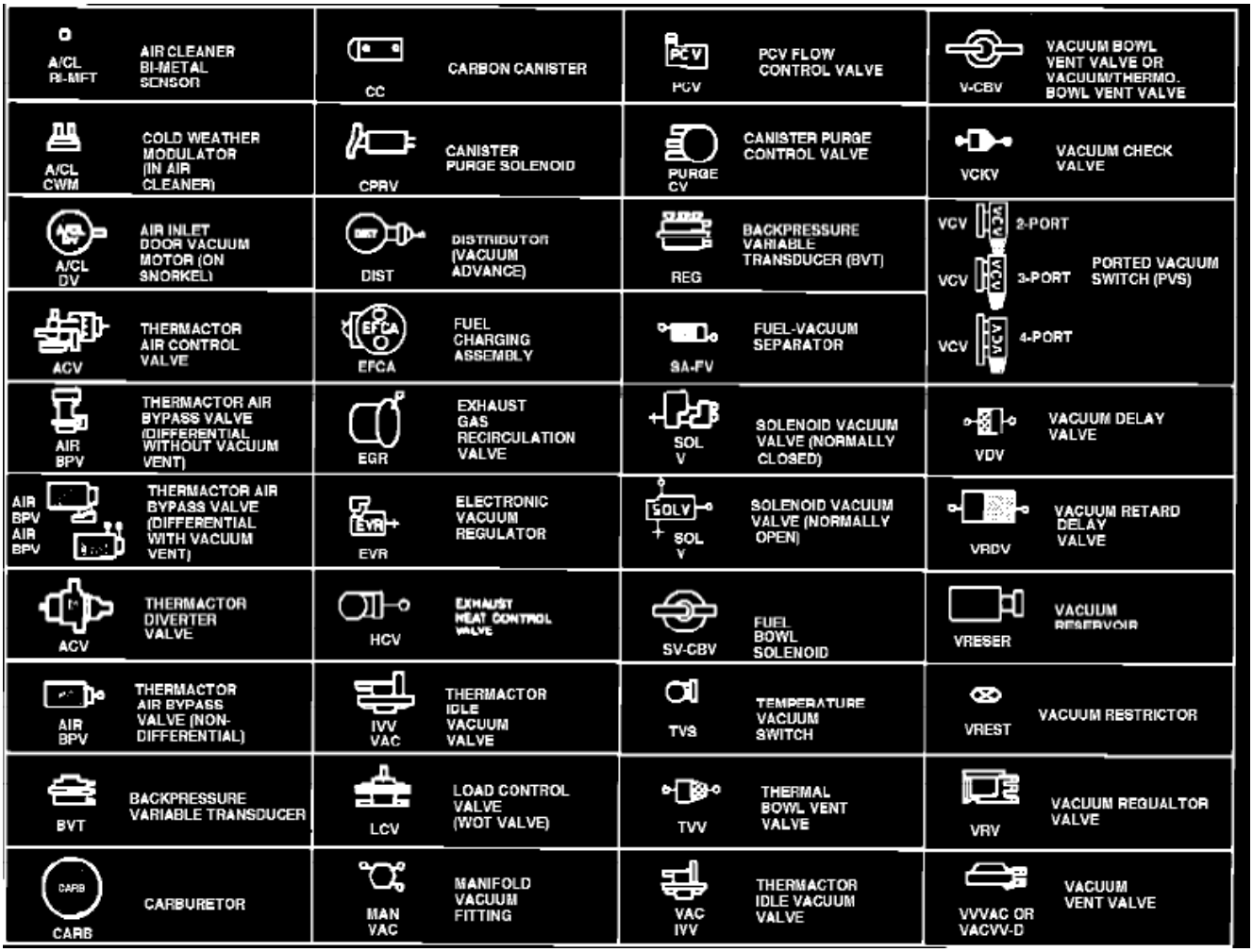
The speed sensor information to the electronic control module verifies the proper speed to allow range shifts (in or out of 4-Low) to occur.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transfer Case > Transfer Case Actuator > Component Information > Diagrams > Diagram Information and Instructions

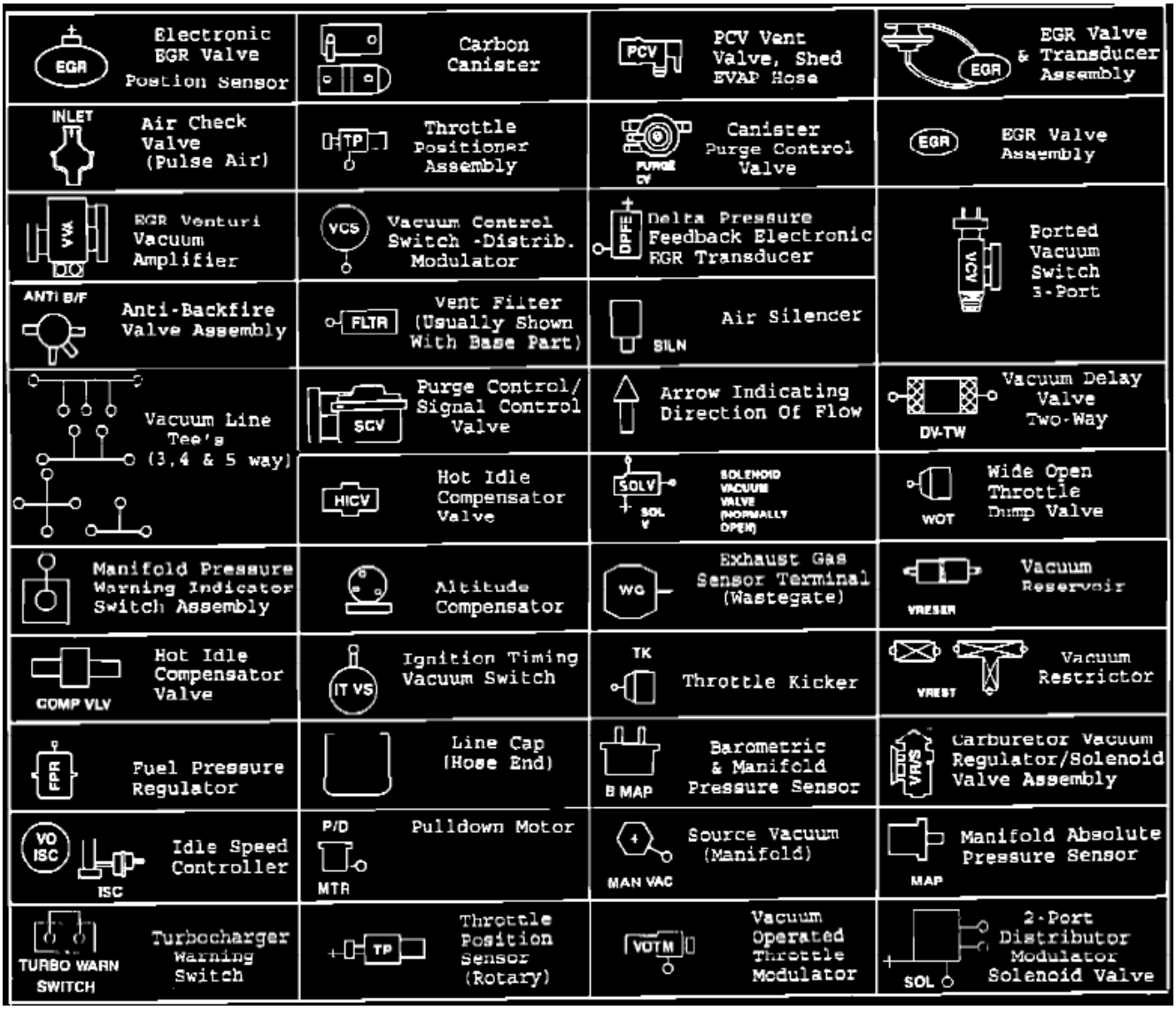


Transfer Case Actuator: Diagram Information and Instructions

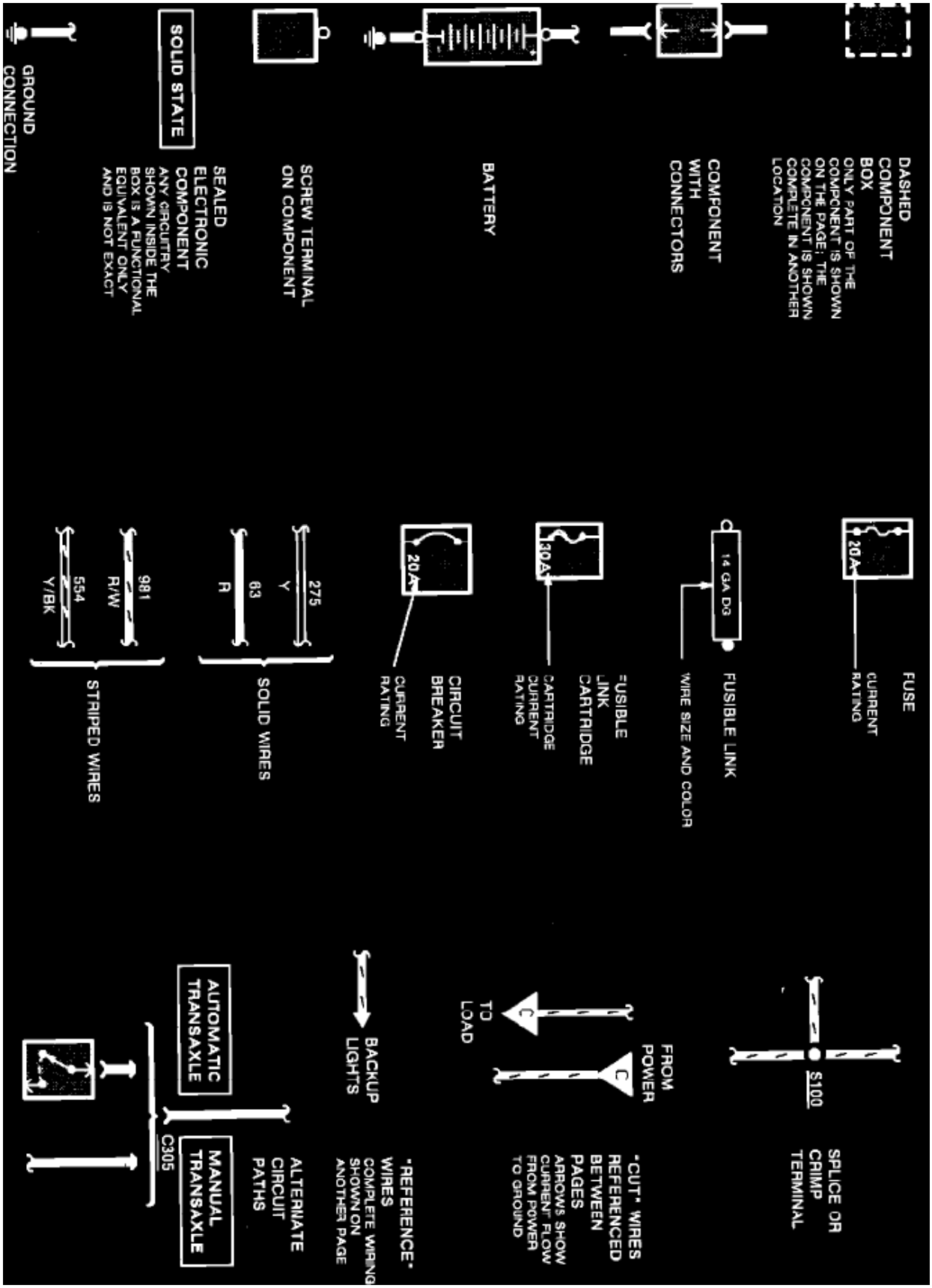
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
C
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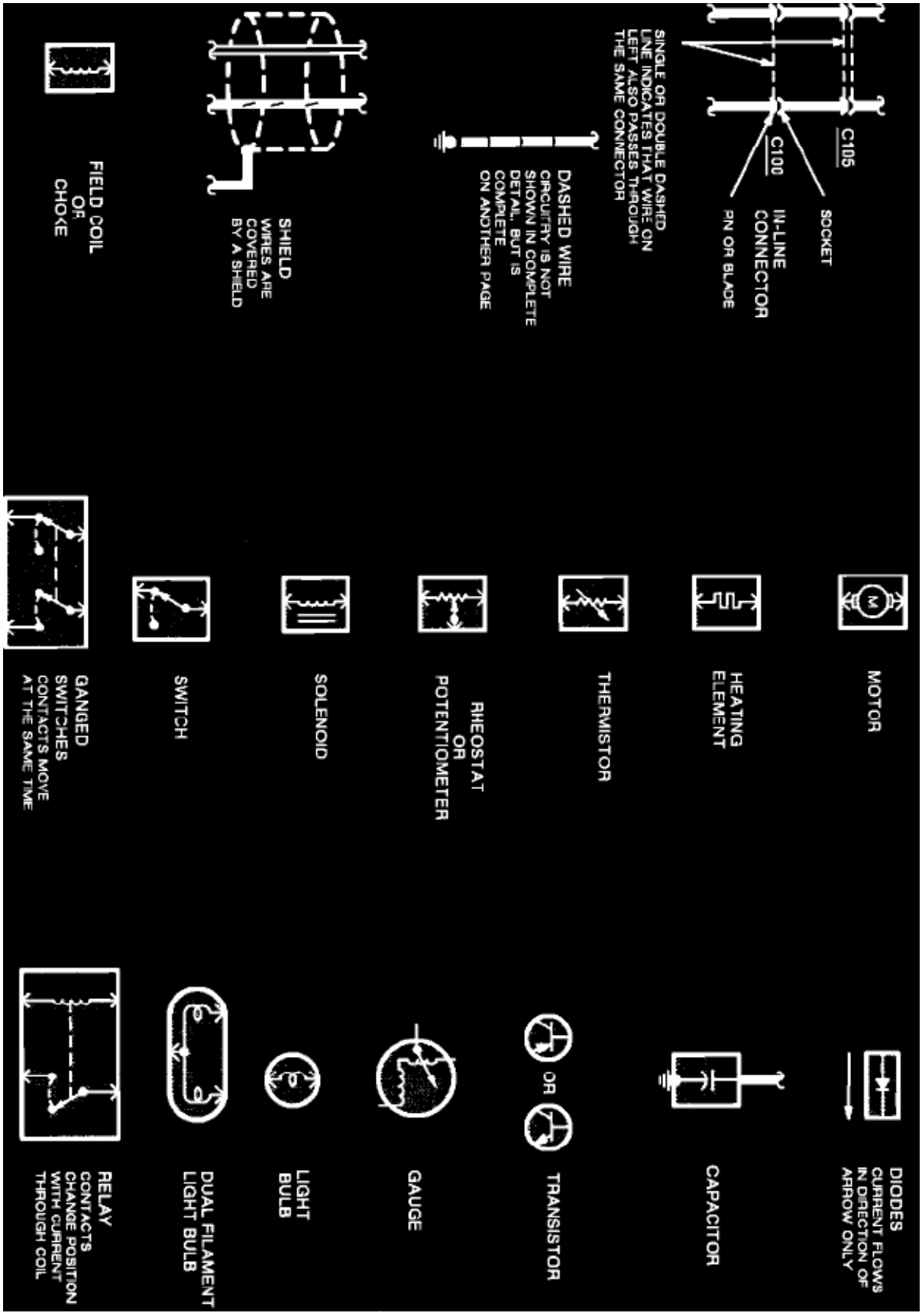
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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Transfer Case Actuator: Description and Operation

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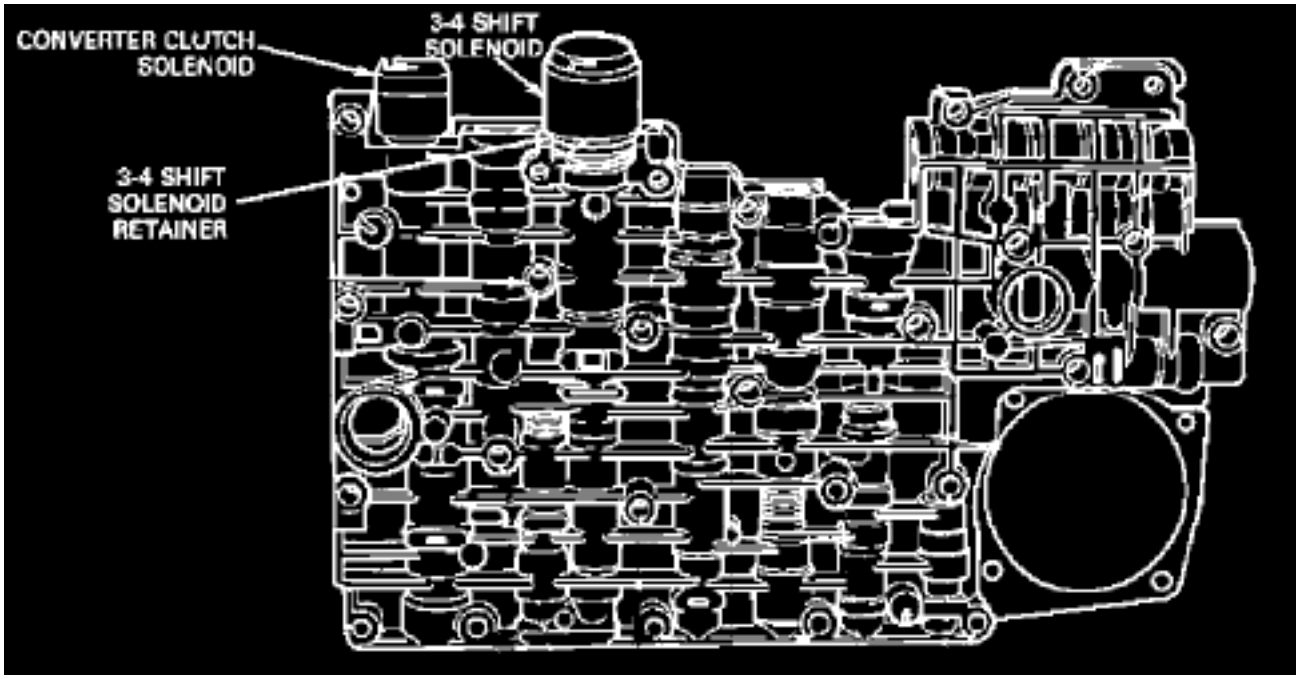
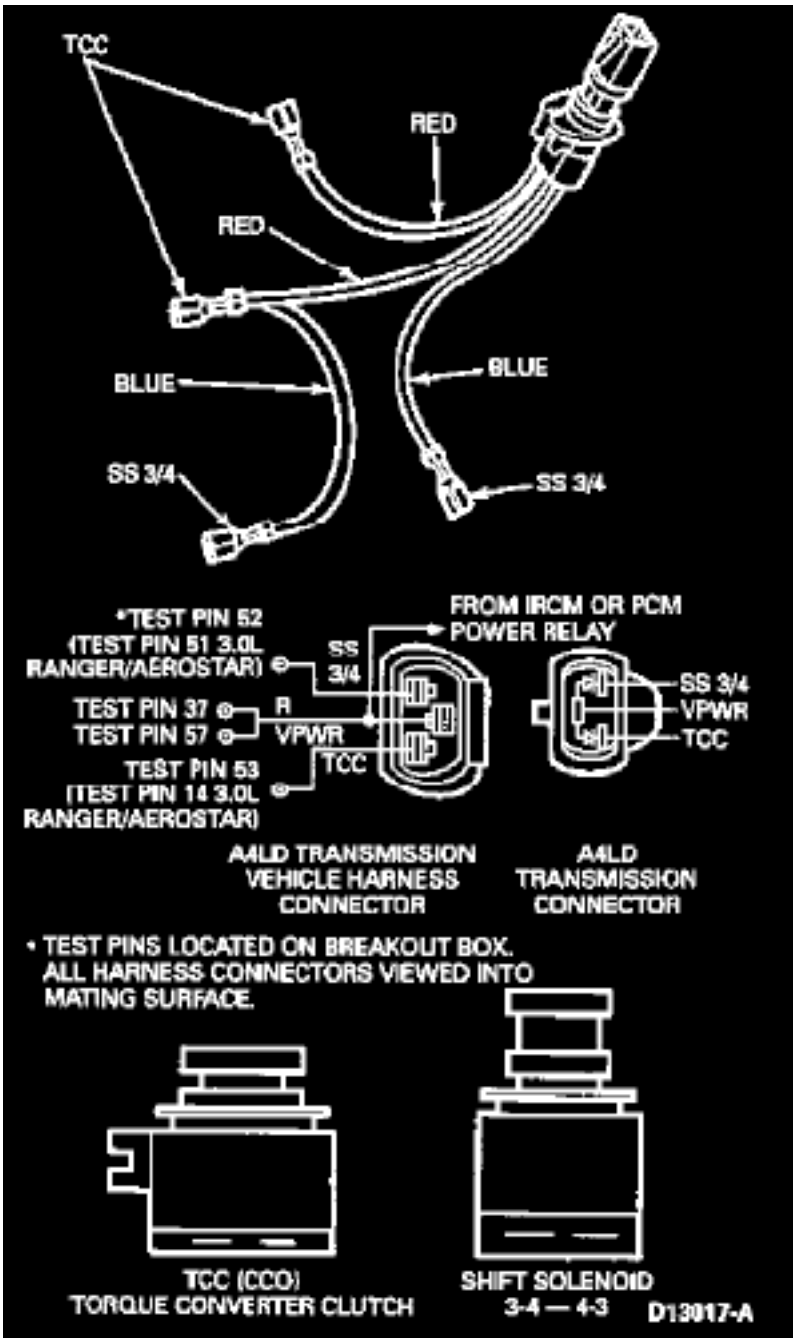

CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

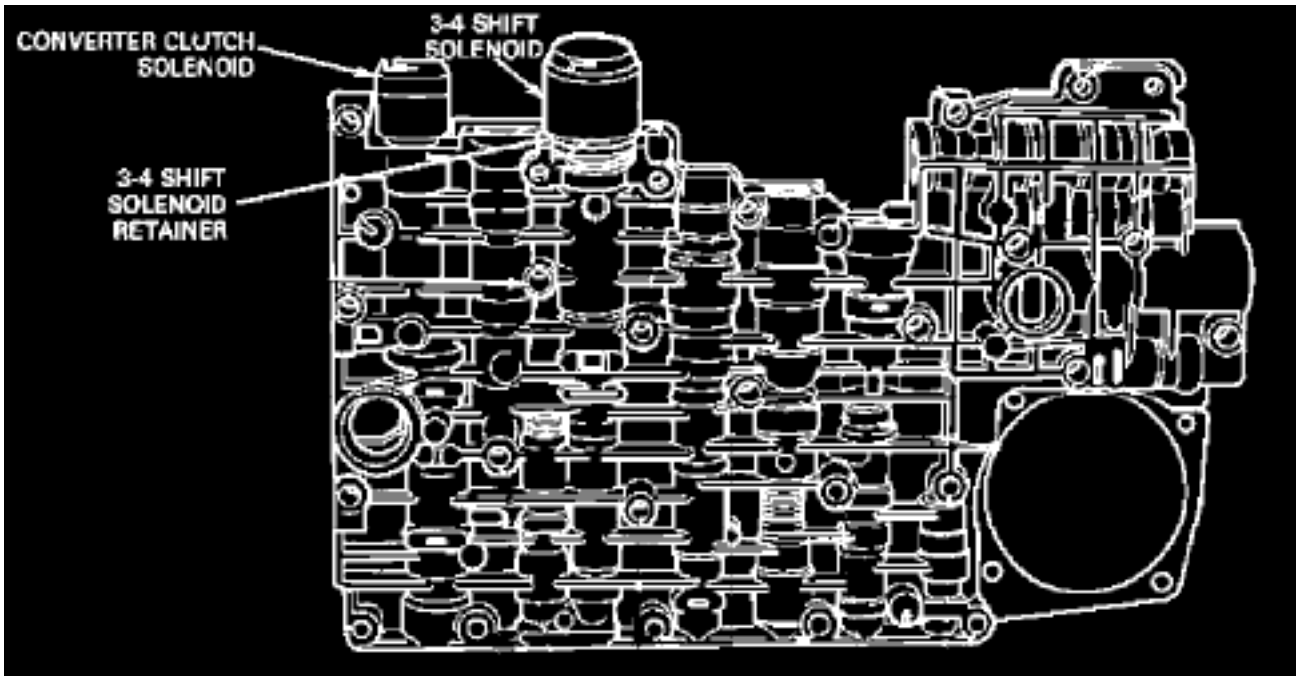


Shift Solenoid: Description and Operation

Shift Solenoid 3-4 (SS 3-4)

The 3-4 shift solenoid is used to control the 3-4/4-3 shift valve.

Transmission Function: Used to shift from third gear to fourth gear, and fourth gear to third gear.

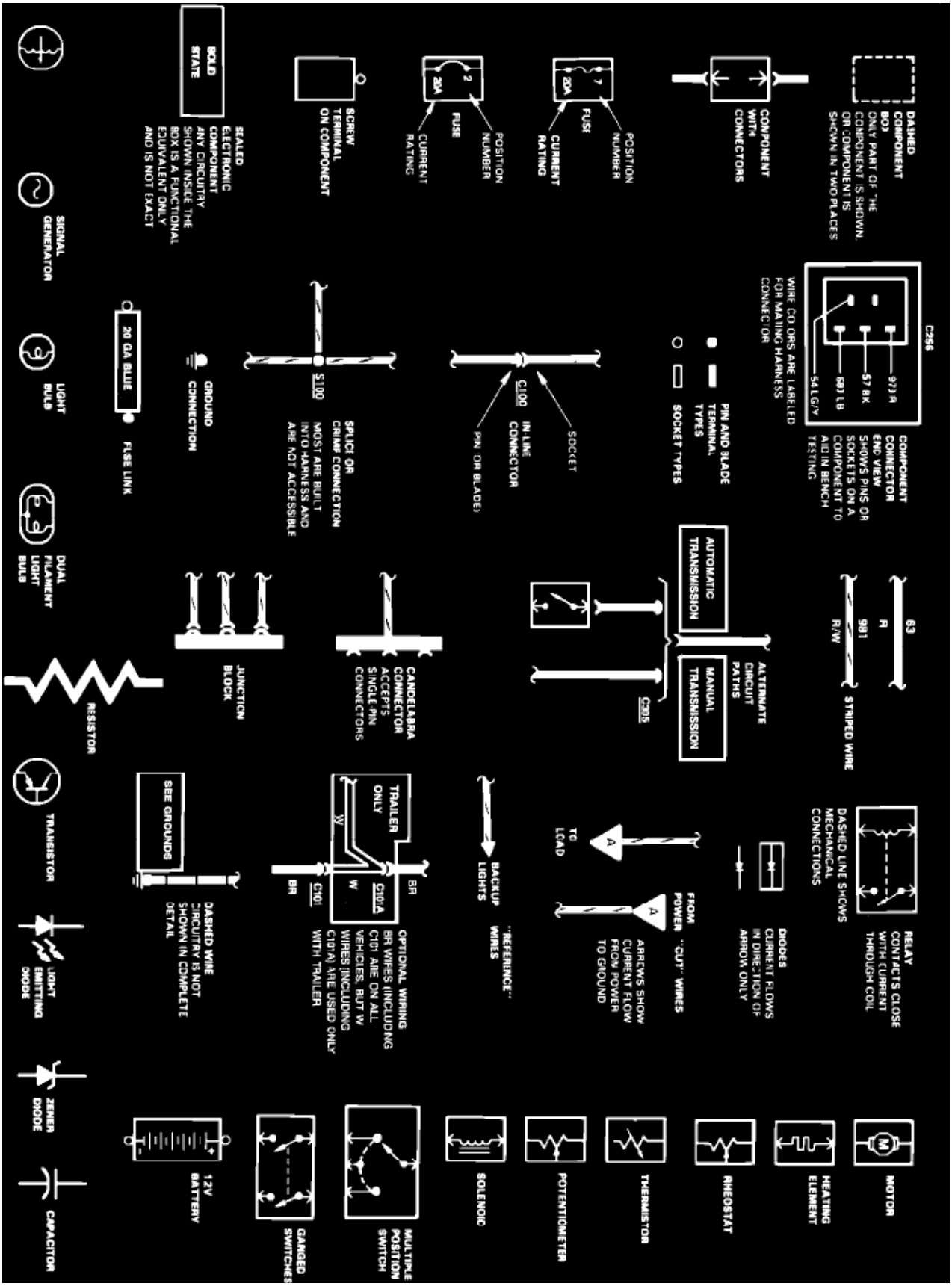

CONVERTER CLUTCH SOLENOID
3-4 SHIFT SOLENOID
3-4 SHIFT SOLENOID RETAINER

Converter Clutch Override Solenoid: Description and Operation

Torque Converter Clutch Solenoid (TCC)

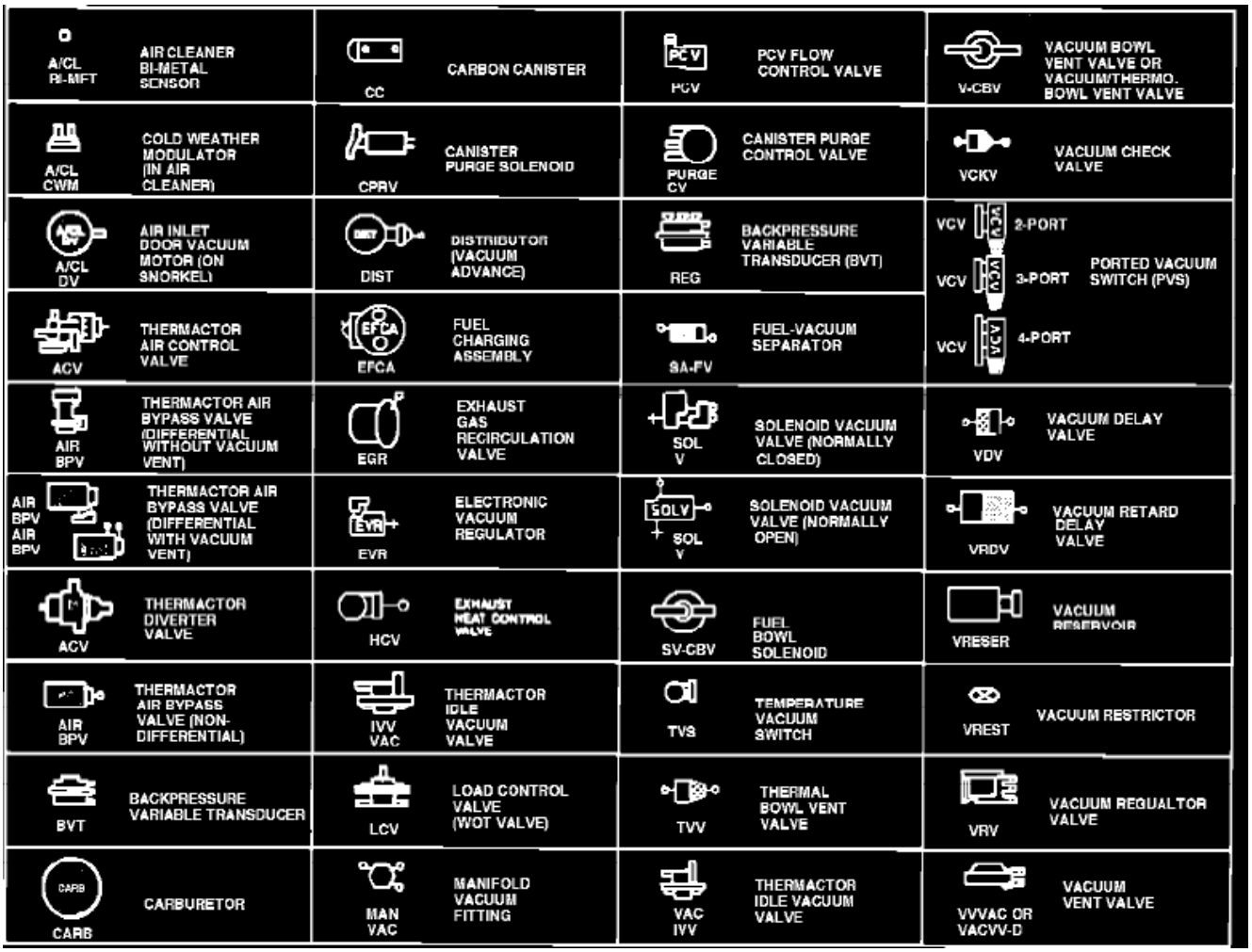
The torque torque converter clutch solenoid (TCC) is used to control the apply and release of the torque converter clutch.

Transmission Function: Used to engage the torque converter clutch.

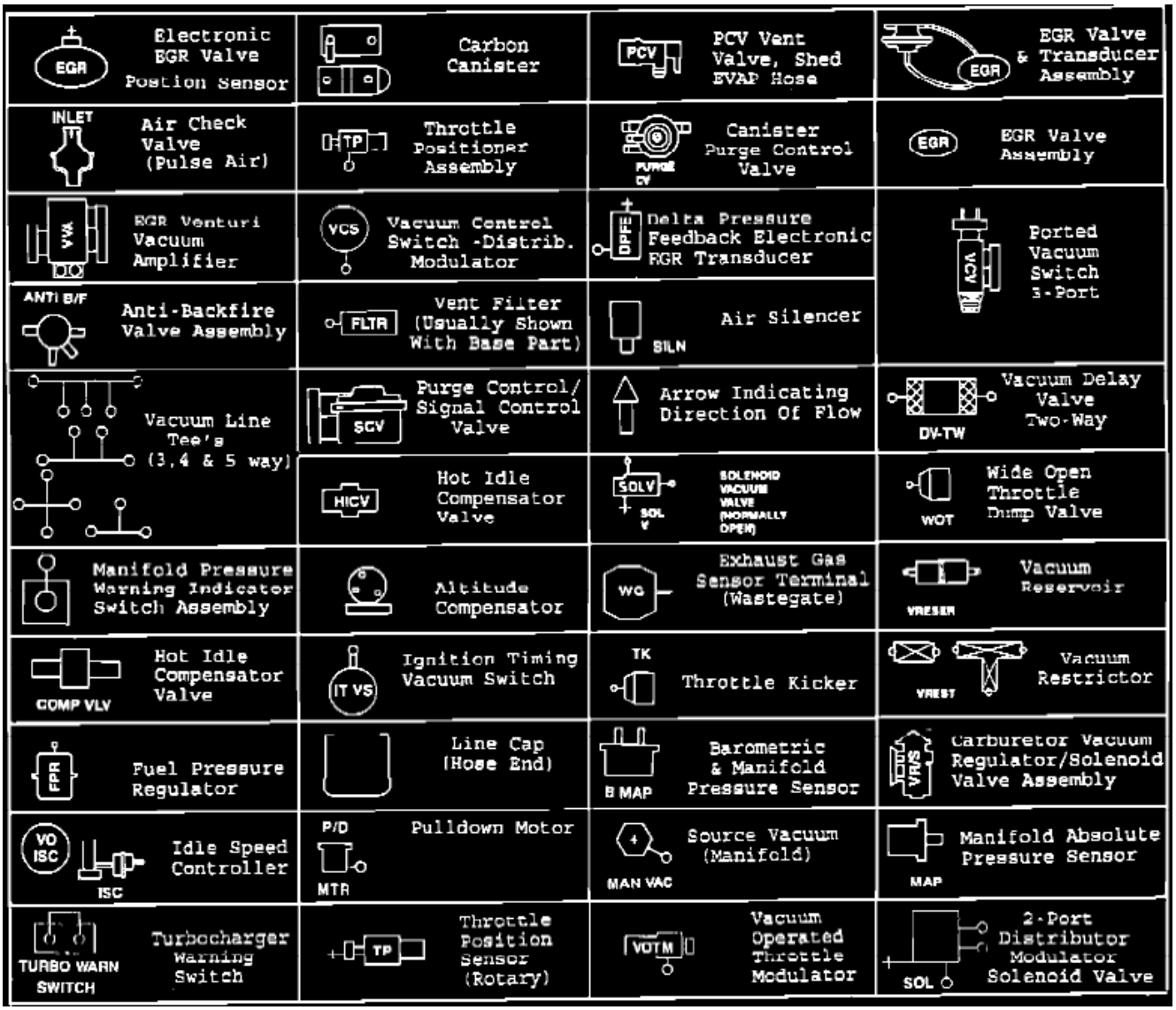


Transfer Case Actuator: Diagram Information and Instructions

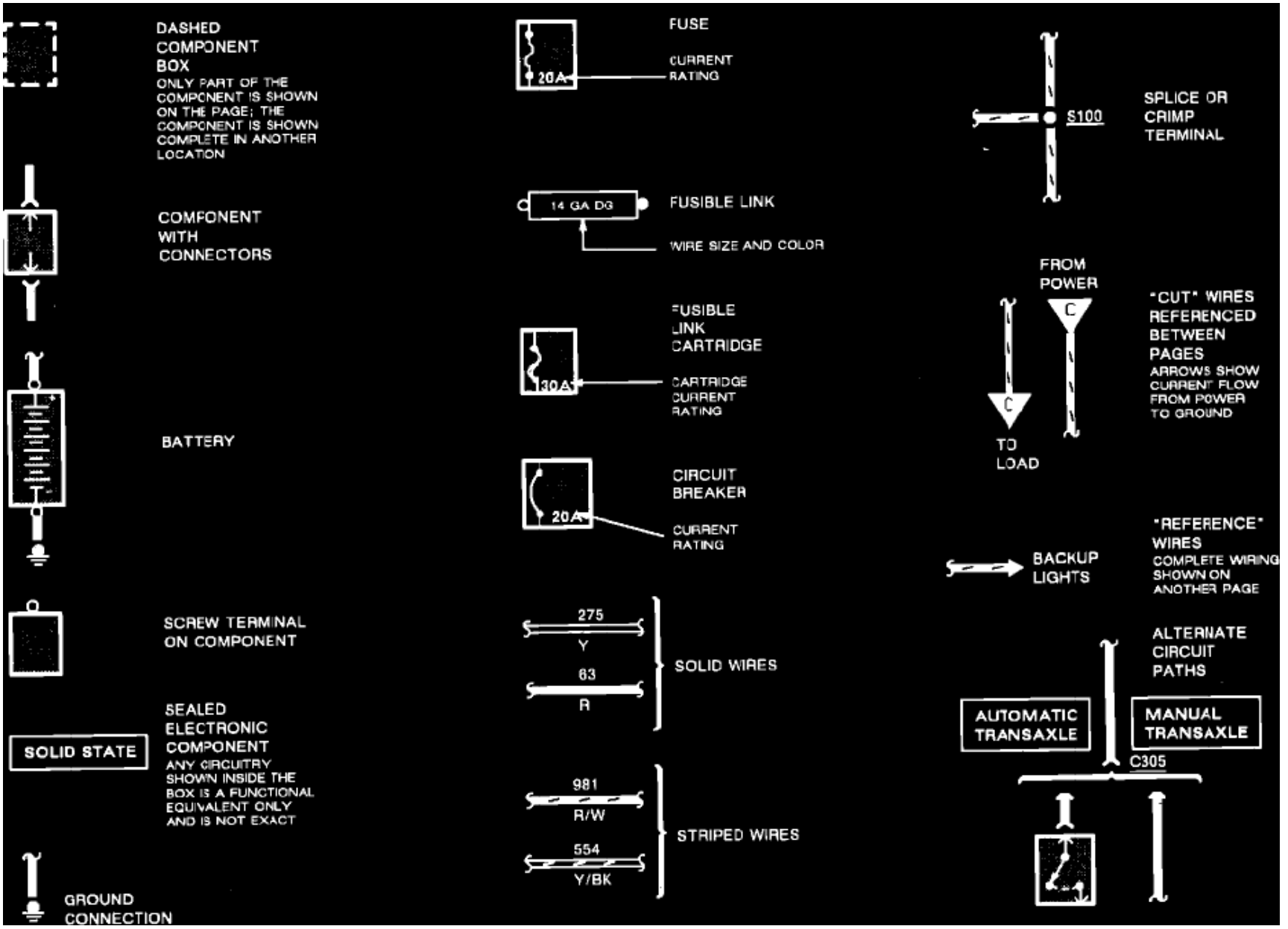
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols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STRIPED WIRES
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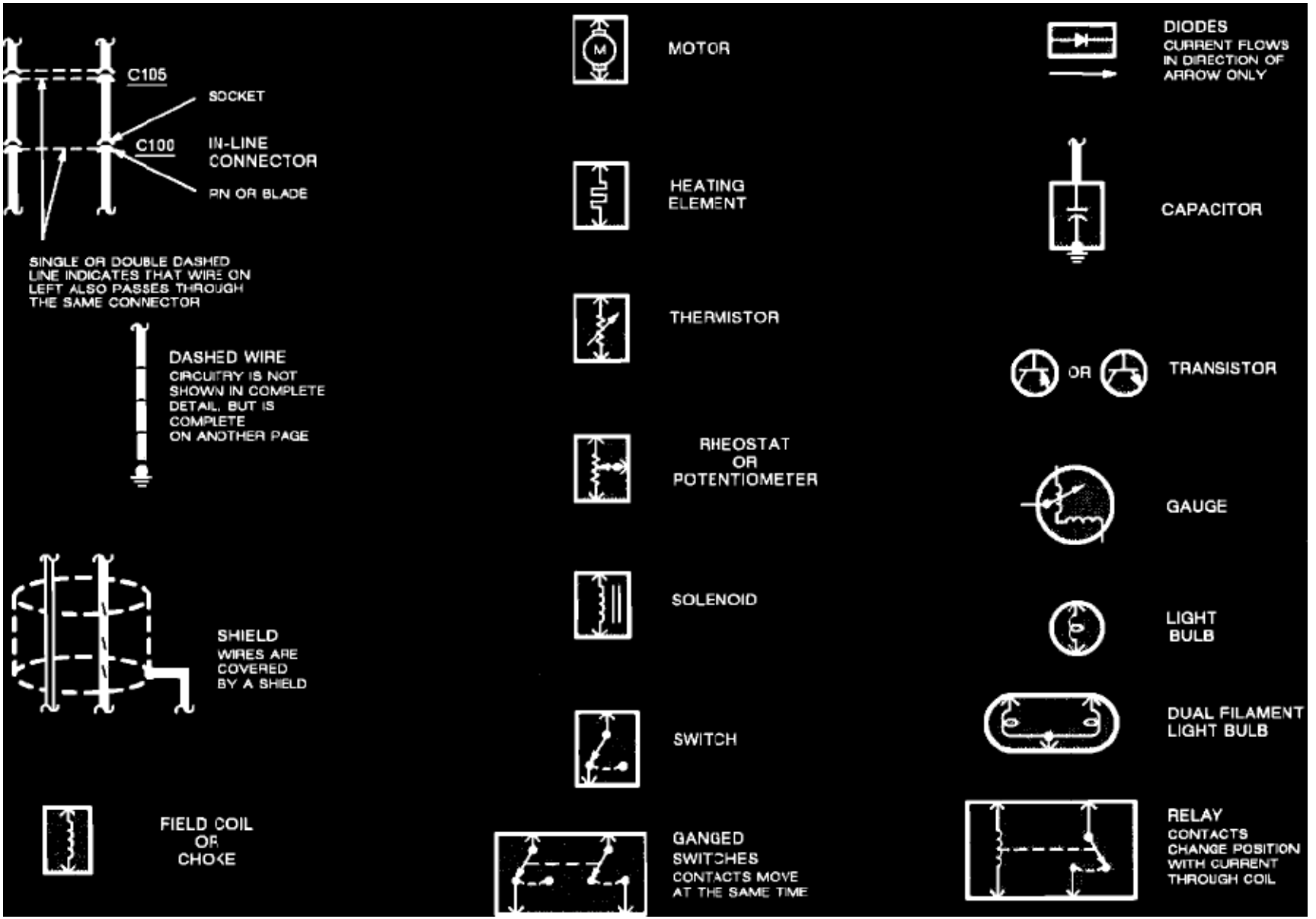
C305



Electrical Symbols

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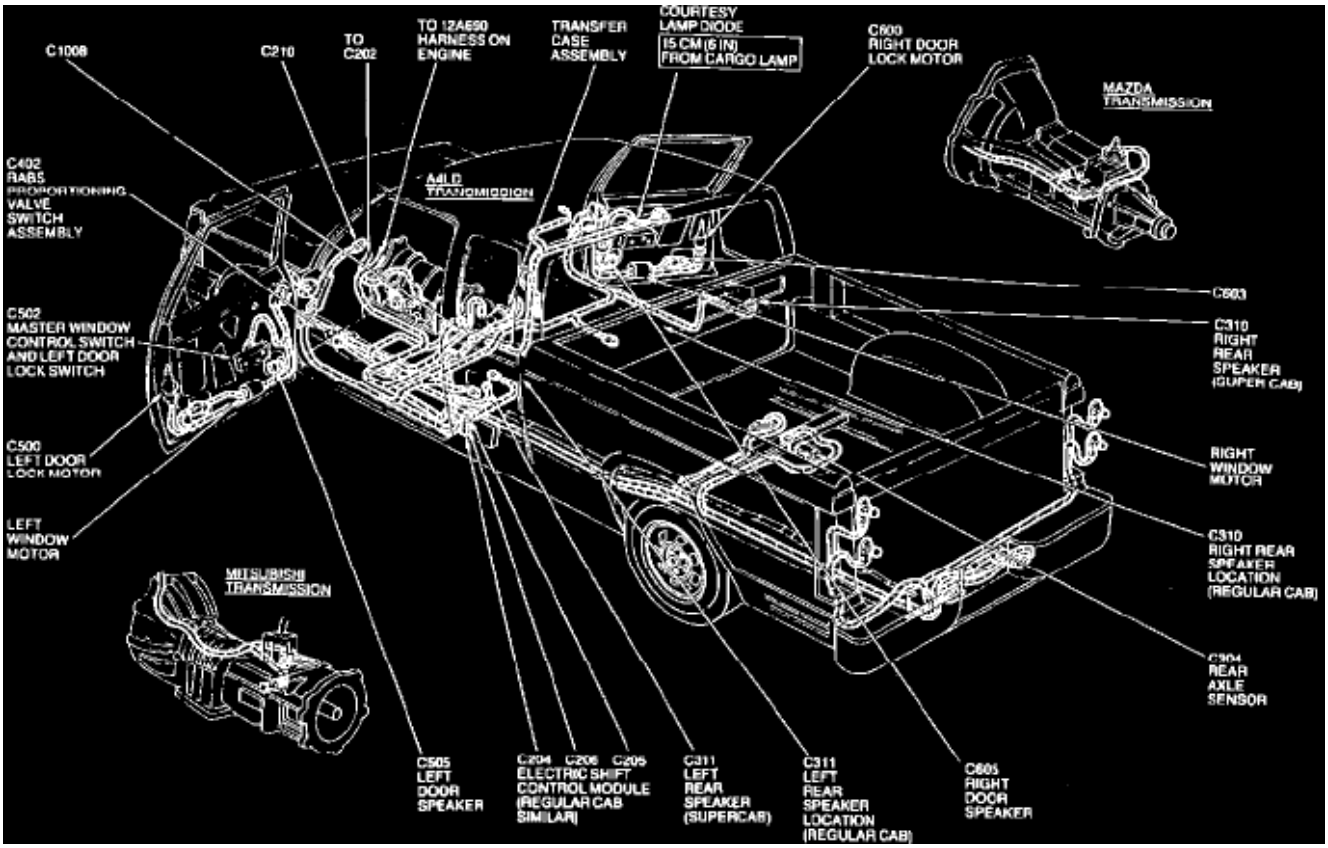
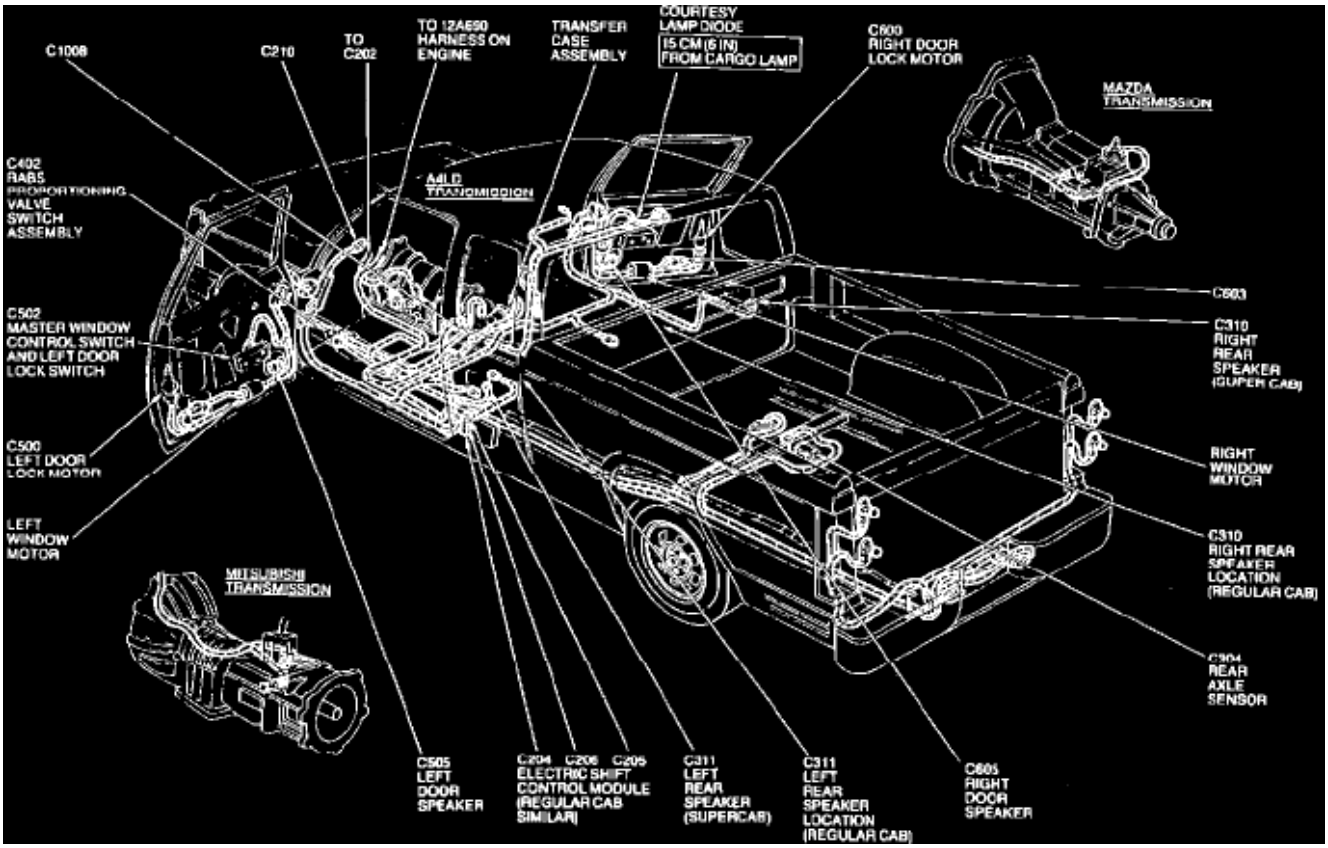


Control Module: Locations Regular Cab

Body Components

Lower LH Rear Corner Of Cab



Control Module: Locations Supercab

Body Components

Between Bottom Of LH ``B'' Pillar & Rear Of Cab

Electronic Shift Control Module: Technical Service Bulletins Transfer Case - Revised Shift Procedures

Article No. 90-18-10

^ ELECTRONIC SHIFT MODULE (4X4) - MODIFIED OPERATION

^ TRANSFER CASE - 4X4 ELECTRONIC SHIFT MODULE - REVISED OPERATION PROCEDURE

LIGHT TRUCK: 1986-90 BRONCO II

1986-91 BRONCO, RANGER 1991 EXPLORER

ISSUE: The shift procedures into and out of LOW RANGE are revised for Ranger, Bronco and Explorer trucks built after 8/1/90 due to module changes. The new module will also be used to service prior model year trucks.

ACTION: If service is required on models built prior to 8/1/90, advise the customers of the following changes made to their vehicles.

Operation of the 1991 modules have been changed as follows:

To shift into 4 LOW: ^

Truck must be in 4x4 HIGH by previously pressing the 4x4 switch

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press LOW RANGE switch

To shift out of 4 LOW:

^ Truck must be stopped (condition A)

^ The clutch must be depressed or the automatic transmission must be in neutral (condition B)

^ Then press the LOW RANGE switch to shift back into 4x4 HIGH

^ Press the 4x4 HIGH switch to shift into 2 HIGH if desired

Previously, the module would respond to the LOW RANGE input from any mode (2H, 4H, 4L). If conditions A and B above are not met, the module would respond by flashing the 4 LOW indicator and wait until conditions A and B are met before completing the shift into or out of LOW RANGE. If LOW RANGE was selected while in 2 HIGH mode, the module would shift to 4 HIGH before flashing the indicator.

PART NUMBER PART NAME CLASS

F1TZ-7E453-A 4X4 Electronic Shift Module B

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

508000

Electronic Shift Control Module: Technical Service Bulletins Electric Shift Module Wiring Schematic - Correction

Article No. 91-3-11

02/02/91

0GTRANSFER CASE - 4X4 ELECTRIC SHIFT MODULE - EVTM WIRING CORRECTIONS

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Some of the wiring schematics shown in the EVTMs contain errors which make circuit tracing difficult. A complete update of these schematics will be made in the near future.

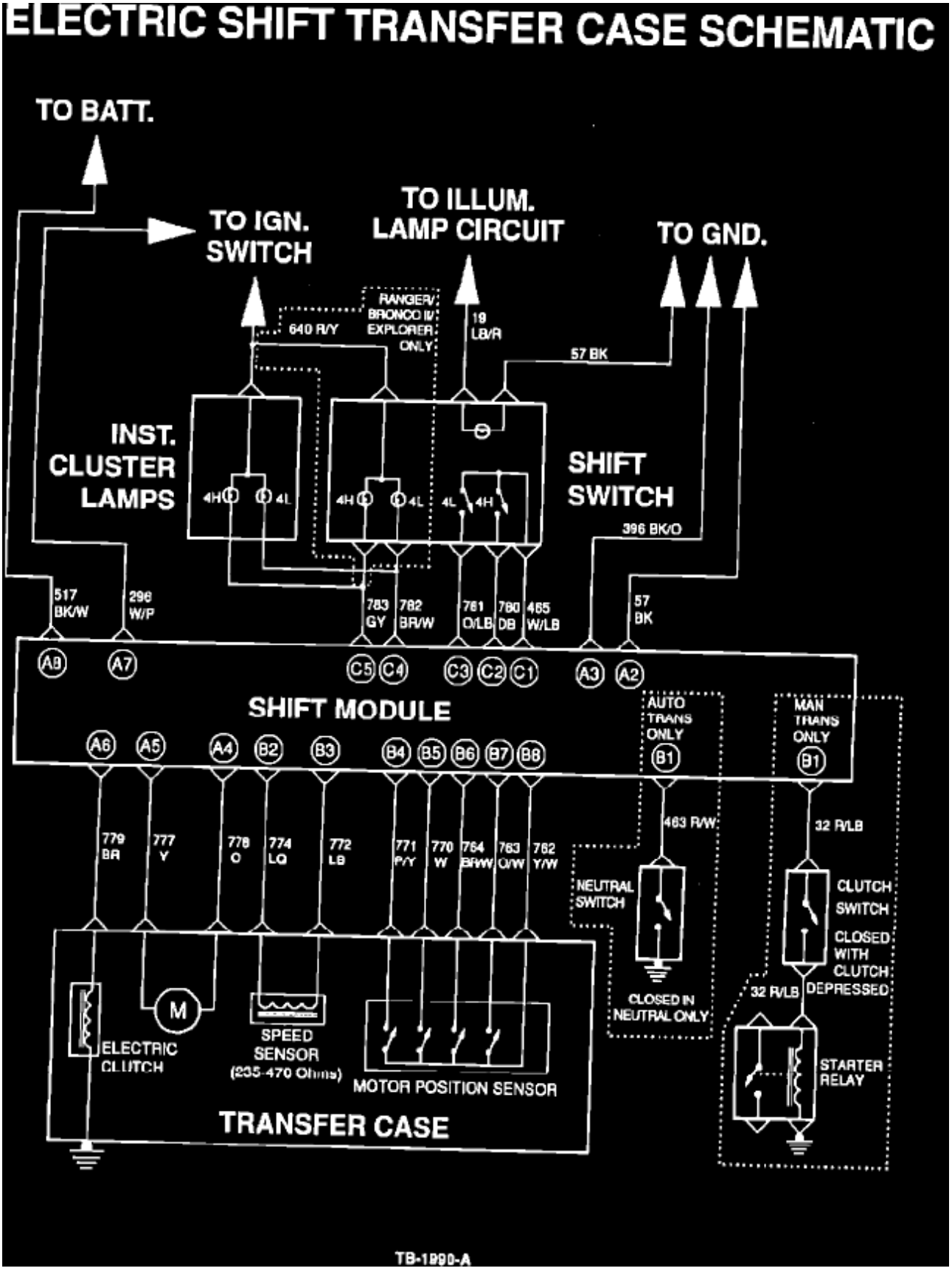

ELECTRIC SHIFT TRANSFER CASE SCHEMATIC
TO BATT.
TO IGN. SWITCH
TO ILLUM. LAMP CIRCUIT
TO GND.
RANGER/ BRONCO II/ EXPLORER ONLY
640 R/Y
19 LB/R
57 BK
INST. CLUSTER LAMPS
4H
4L
SHIFT SWITCH
396 BK/O
517 BK/W
296 W/P
783 GY
782 BR/W
781 O/LB
780 DB
485 W/LB
57 BK
A8
A7
C5
C4
C3
C2
C1
A3
A2
SHIFT MODULE
A6
A5
A4
B2
B3
B4
B5
B6
B7
B8
AUTO TRANS ONLY
B1
MAN TRANS ONLY
B1
779 BR
777 Y
778 O
774 LG
772 LB
771 P/Y
770 W
764 BR/W
763 O/W
762 Y/W
463 R/W
32 R/LB
NEUTRAL SWITCH
CLUTCH SWITCH
CLOSED WITH CLUTCH DEPRESSED
32 R/LB
CLOSED IN NEUTRAL ONLY
M
ELECTRIC CLUTCH
SPEED SENSOR (235-470 Ohms)
MOTOR POSITION SENSOR
STARTER RELAY
TRANSFER CASE
TB-1990-A

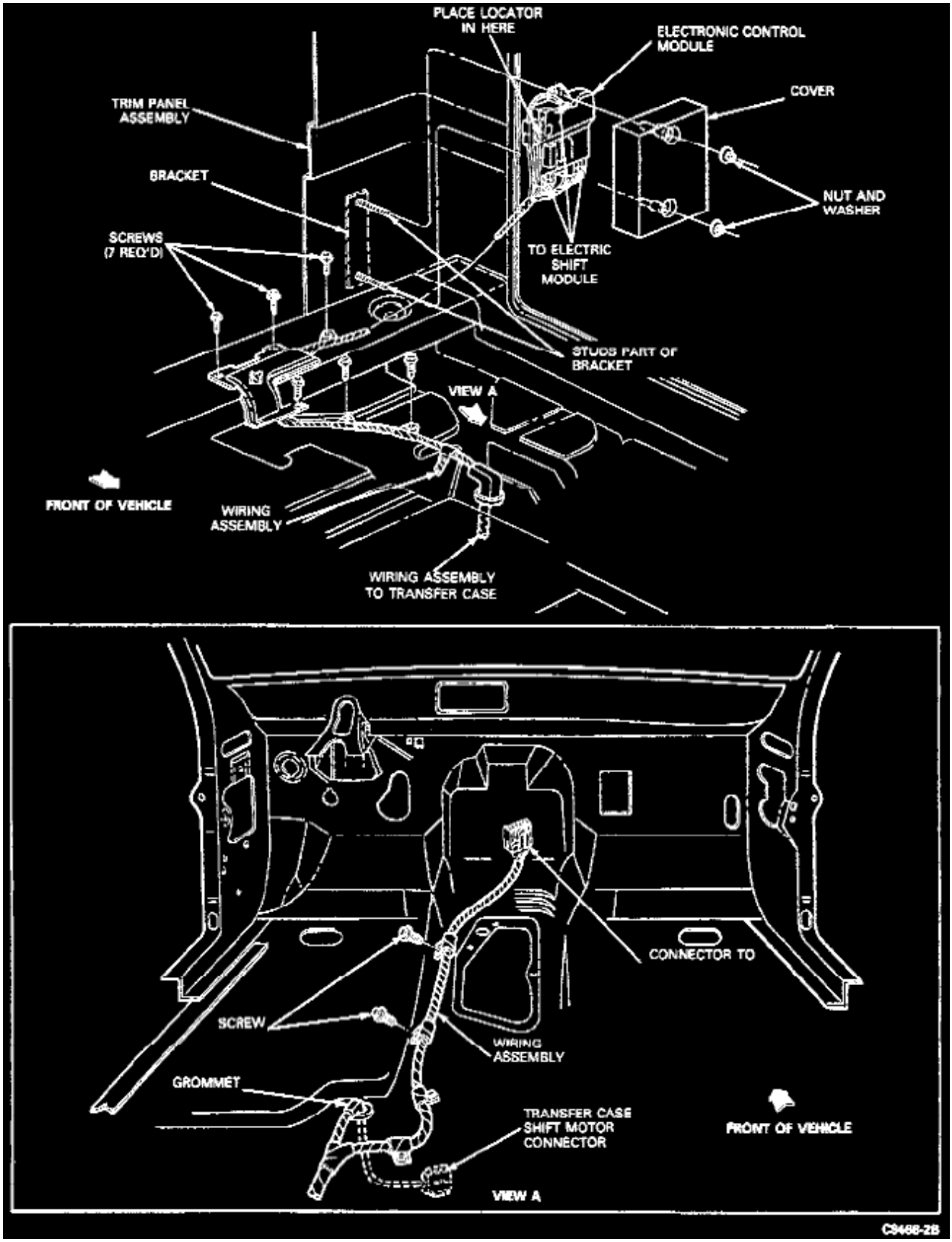
Figure 1

ACTION: In the interim, refer to the simplified schematic, Figure 1. It shows the electrical circuitry for the transfer case shift mechanism while deleting connectors and interconnects with other circuits for clarity.

OTHER APPLICABLE ARTICLES: None

WARRANTY STATUS: INFORMATION ONLY

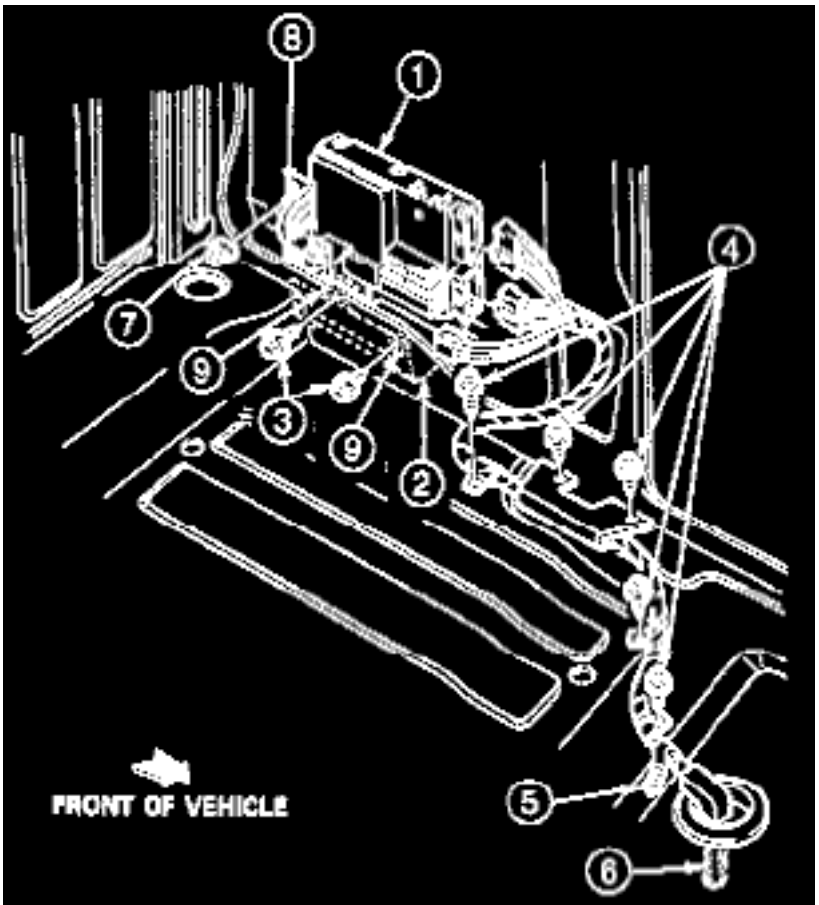
OASIS CODES: 203200, 290000, 508000, 590000



Electronic Shift Control Module: Locations Regular Cab

Electronic Control Module Location

The Electric Shift Control Module is located at the lower Left Hand rear corner of cab.



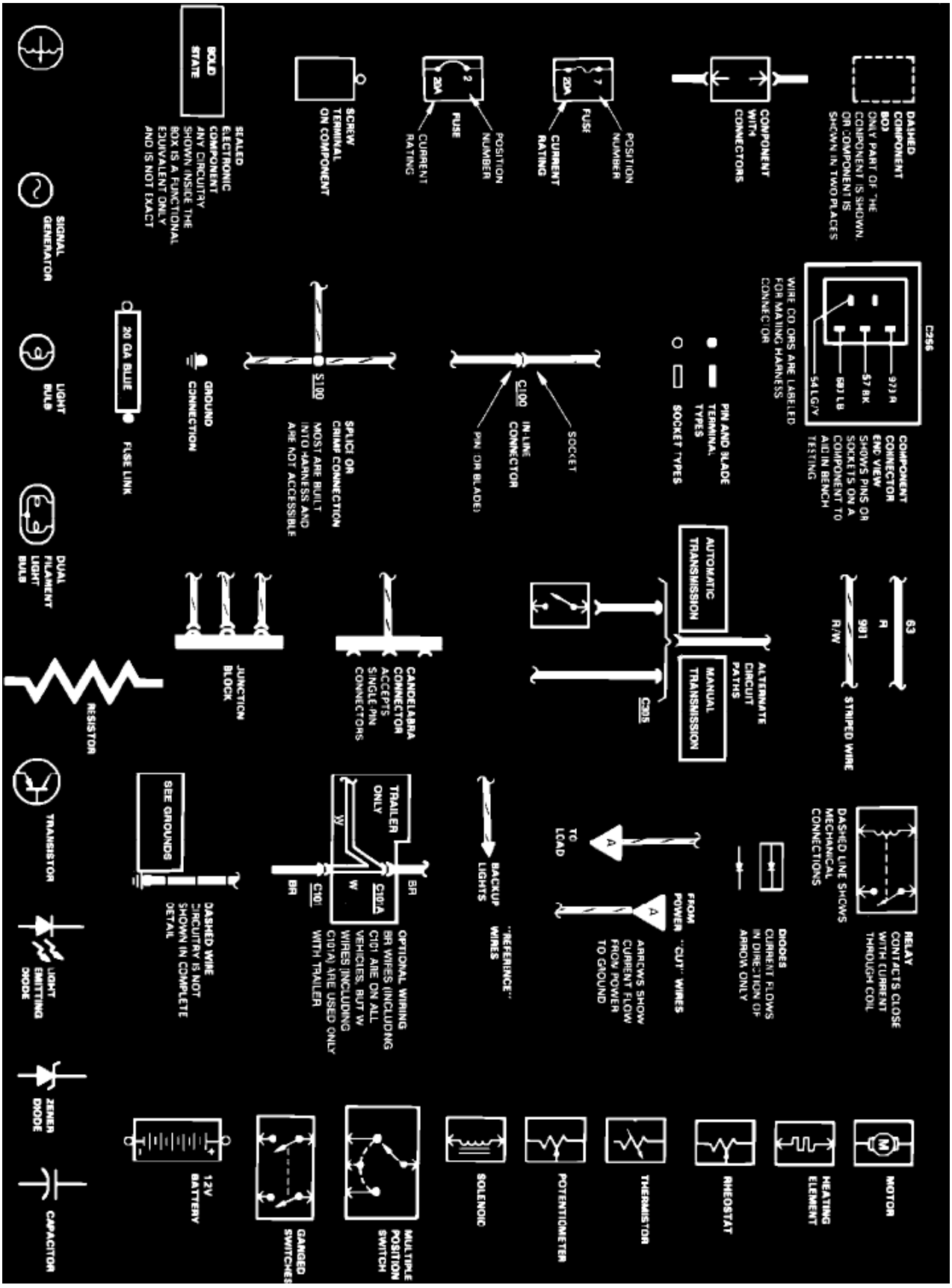
Item No.	Description
1	Electronic Control Module
2	Bracket, Shift Module
3	Screw (2 Req.)
4	Screw (5 Req.)
5	Wiring Assembly
6	Wiring Assembly
7	Nut and Washer Assembly
8	Stud Part for Module Bracket
9	Nut Assembly (2 Req.)

CC10860-A

Electronic Shift Control Module: Locations Supercab

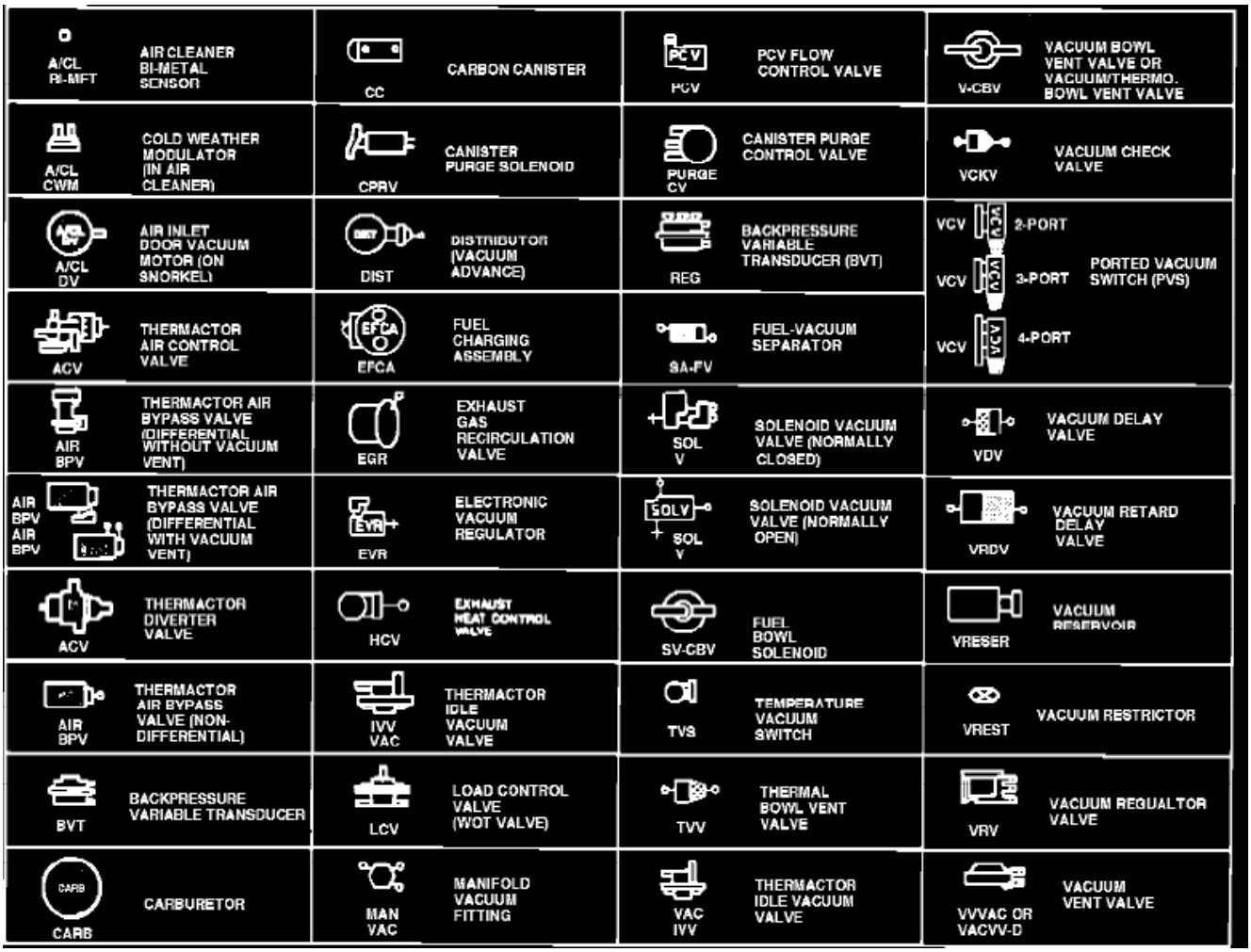
Control Module Circuits, Ranger SuperCab

The Electric Shift Control Module is located between the bottom of the Left Hand "B" pillar and the rear of the cab.

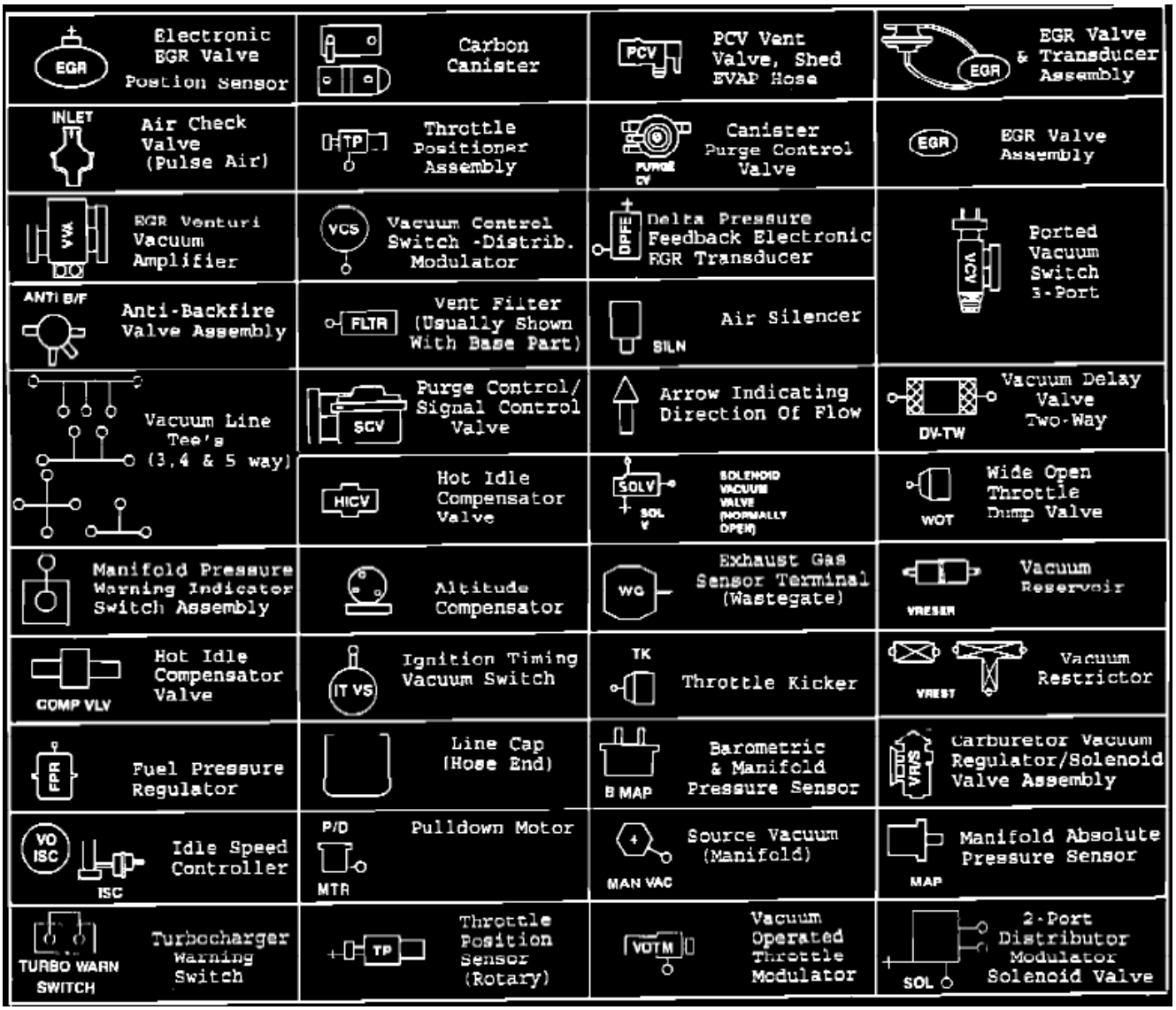


Electronic Shift Control Module: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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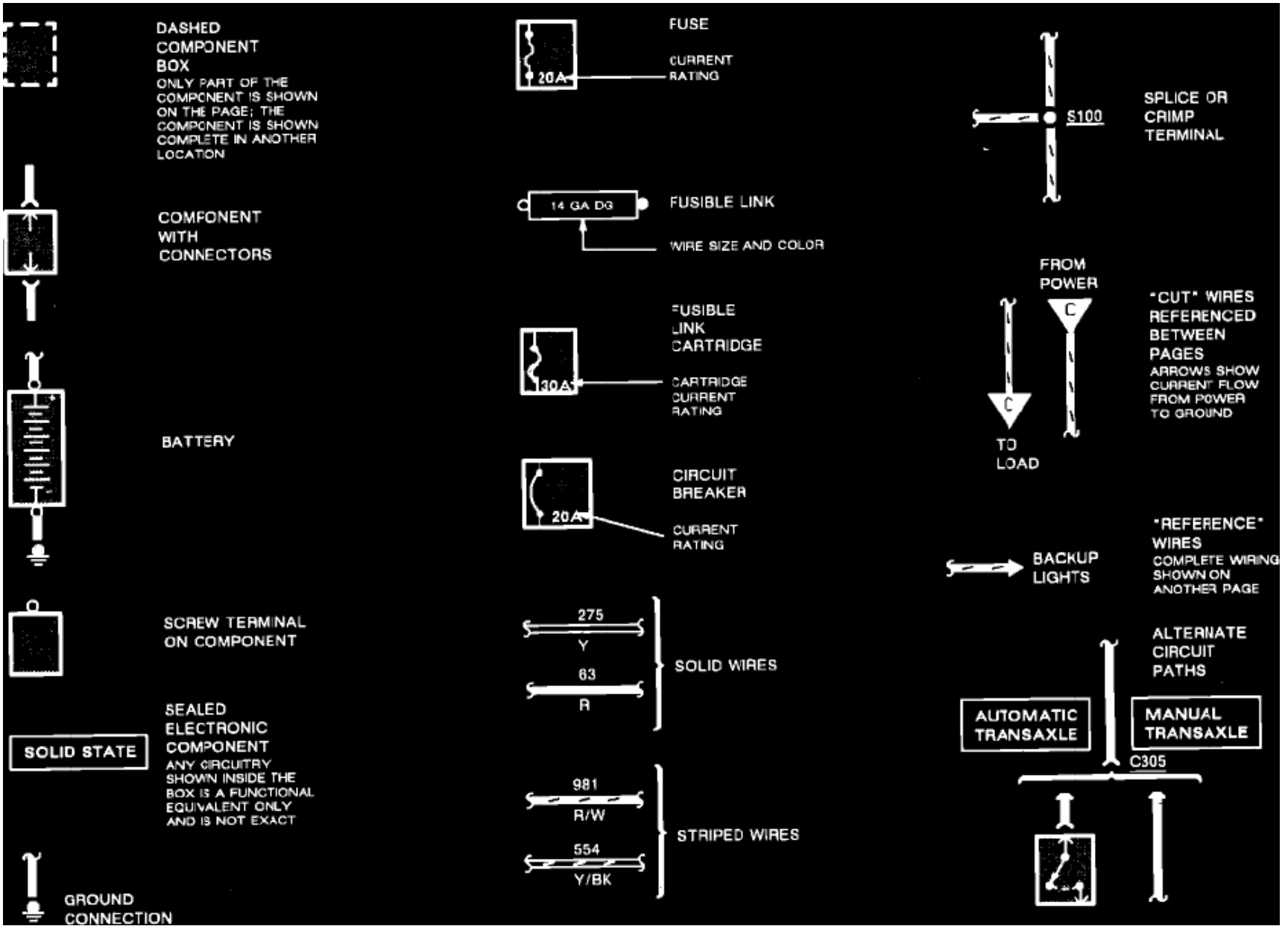
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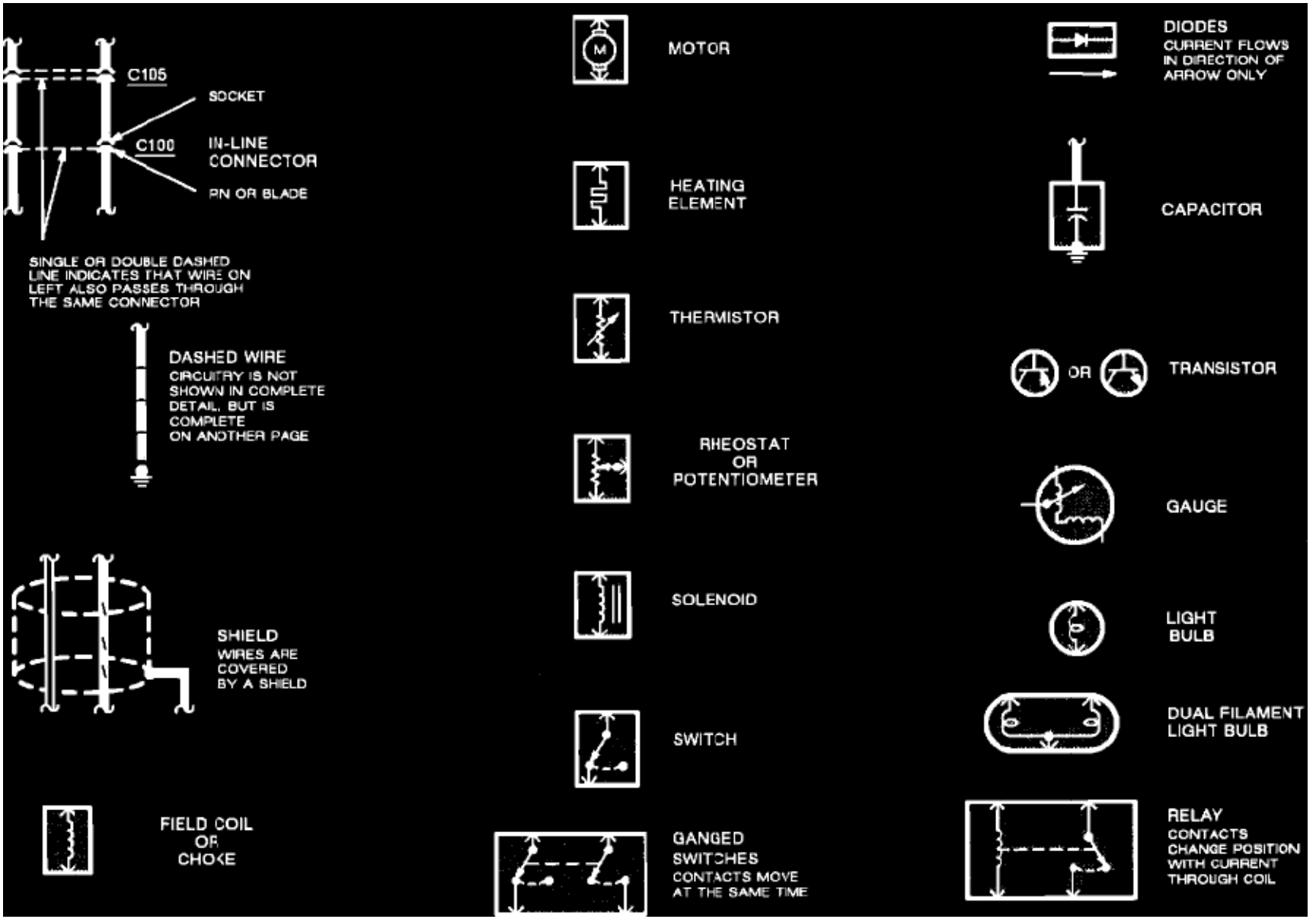

Electrical Symbols

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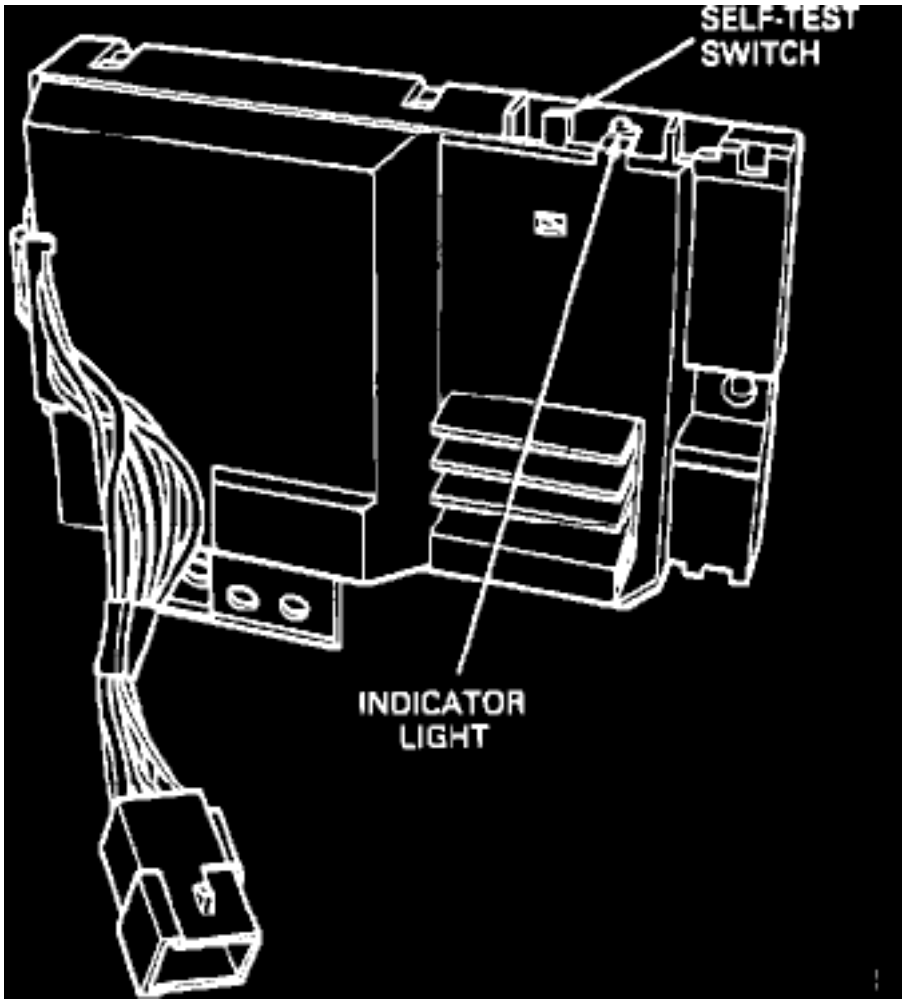
Electronic Shift Control Module: Description and Operation

The electronic control module conducts transfer case operation in response to inputs from the vehicle speed sensor, neutral start switch and clutch interlock switch and push-button actuation made by the operator.



Electronic Shift Control Module: Testing and Inspection

The electronic control module has a diagnostic capability of its internal circuitry. Self test procedure is as follows:

1. Disconnect five-wire and eight wire connectors from electronic control module.

2. Turn ignition switch to the RUN position.

3. Activate the self test switch and note result:

Control Module Self Test

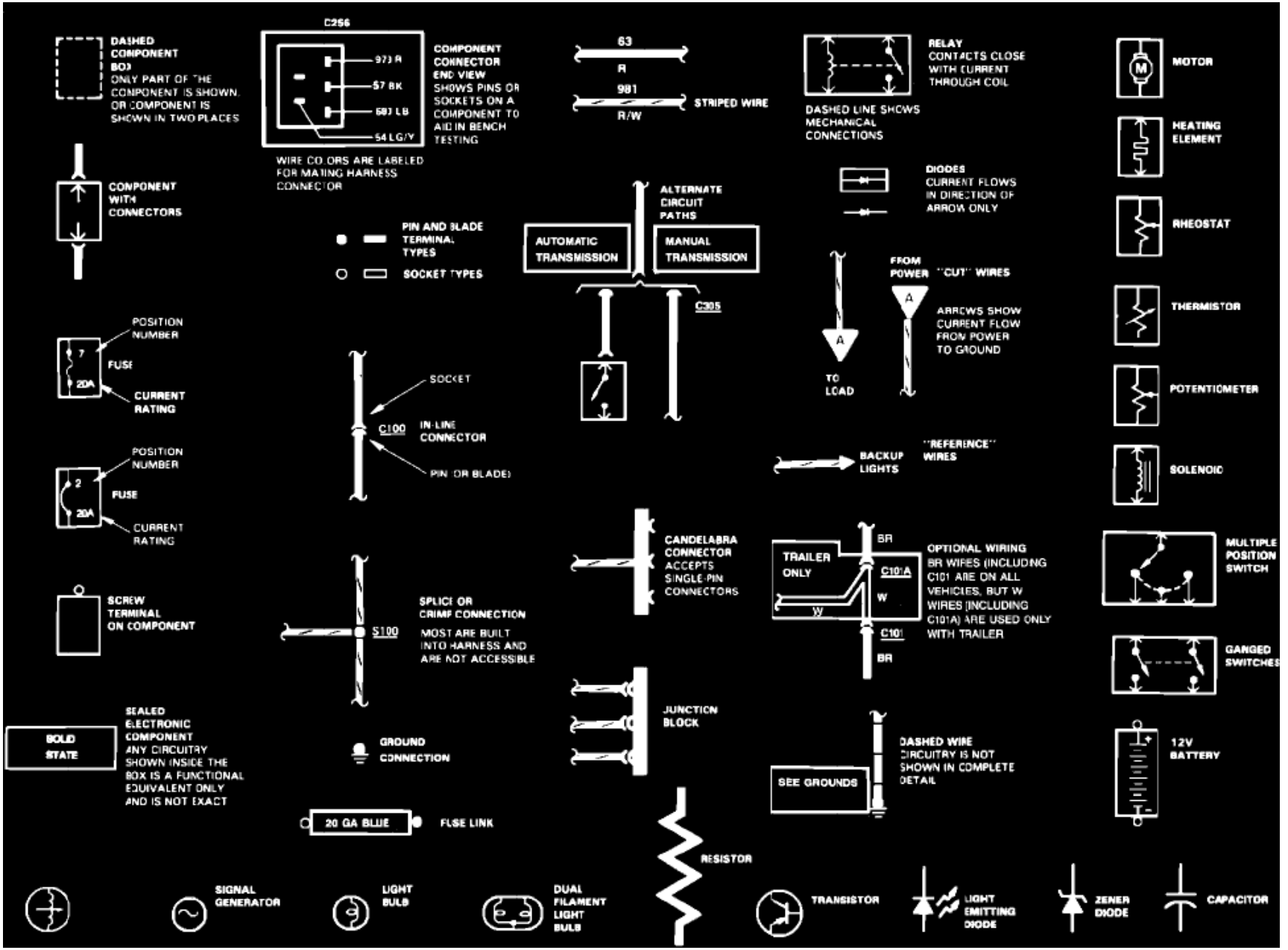
NOTE: The self test switch and indicator light is located on the Electronic Control Module.

A FLASHING INDICATOR LAMP, (approximately one flash per second), indicates control module is functioning properly.

A STEADY INDICATOR LIGHT, indicates that control module is inoperative and must be replaced.

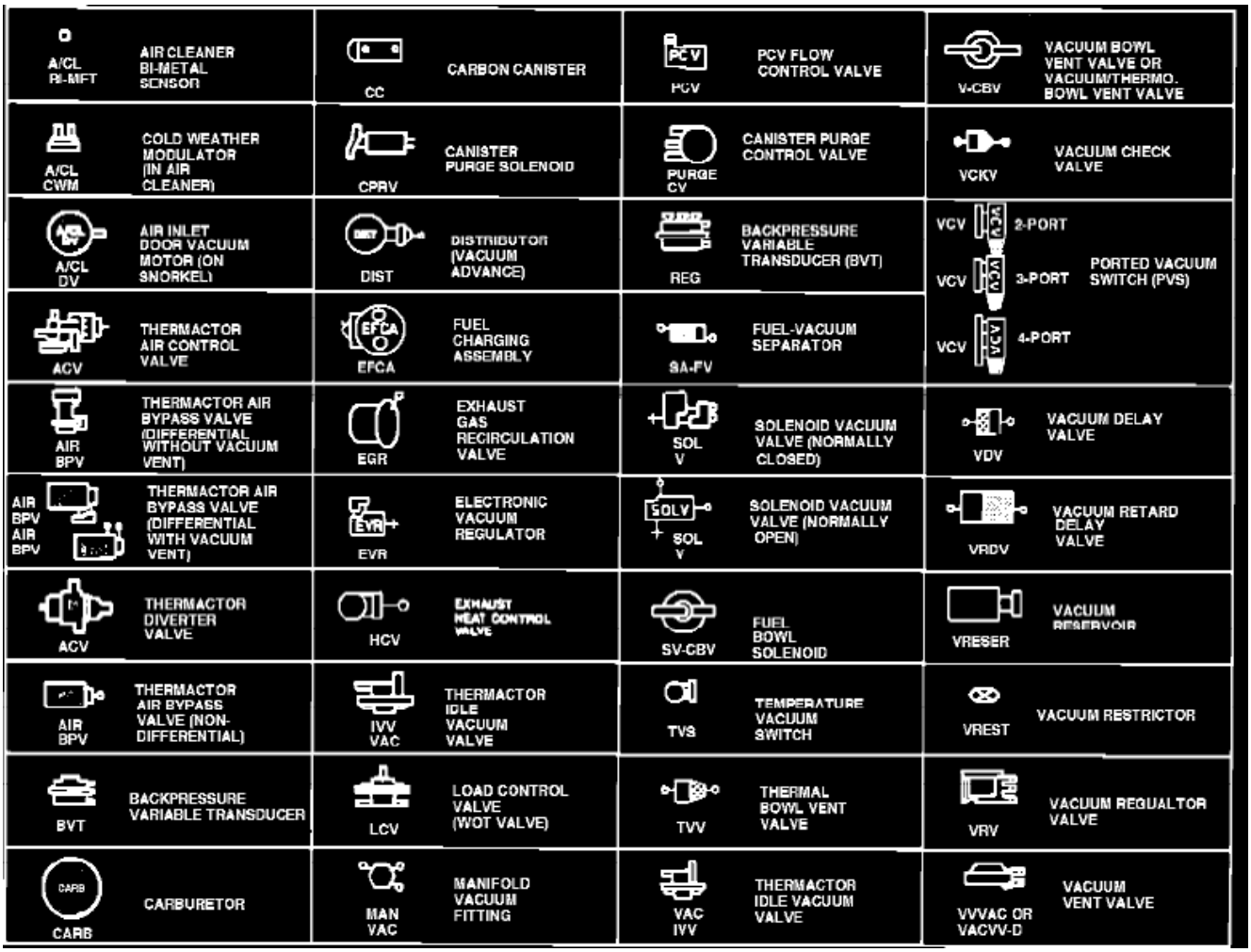
Transmission Temperature Sensor/Switch: Testing and Inspection

Pinpoint testing procedures for this component are located in the system level Testing and Inspection.

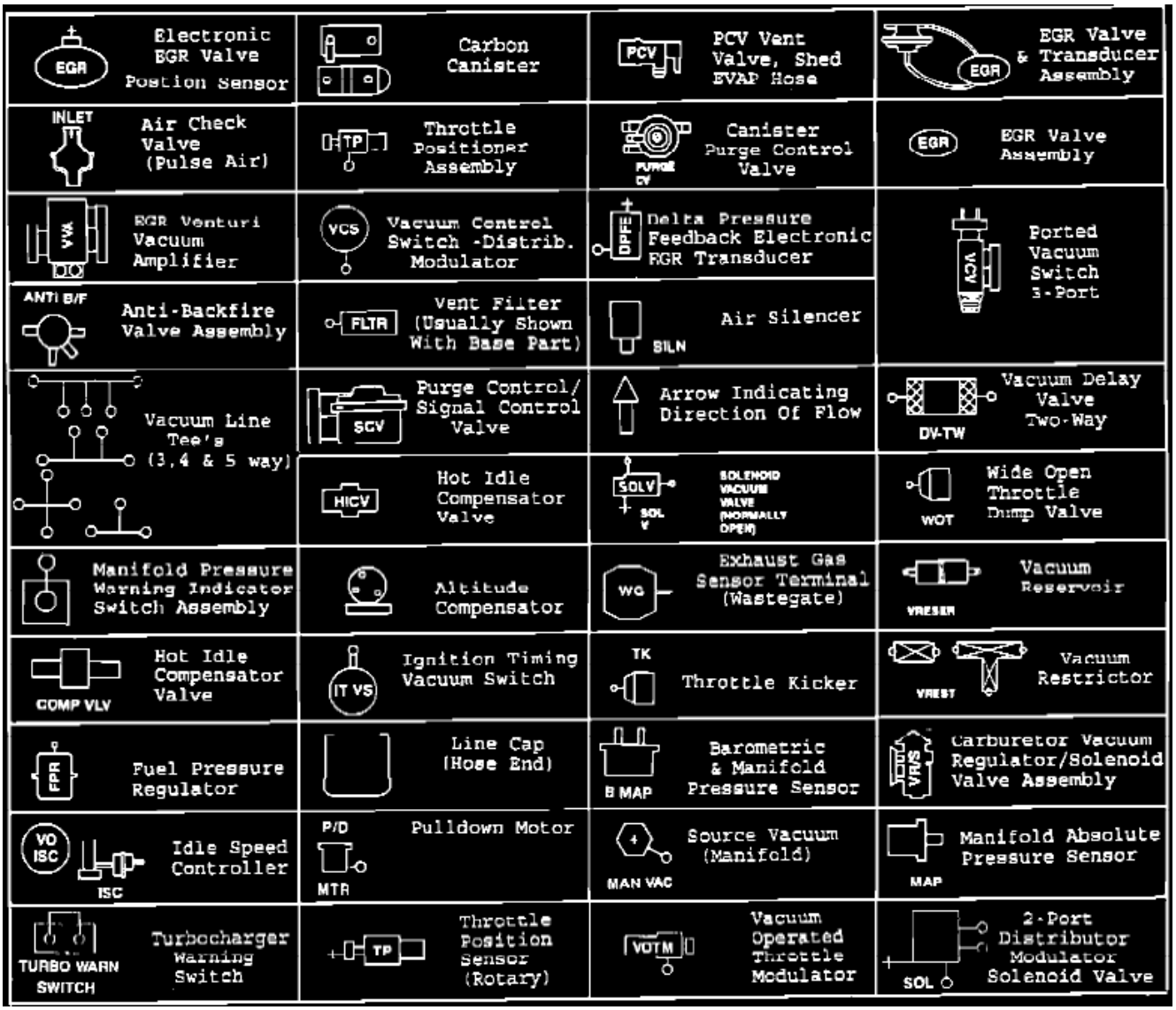


Four Wheel Drive Selector Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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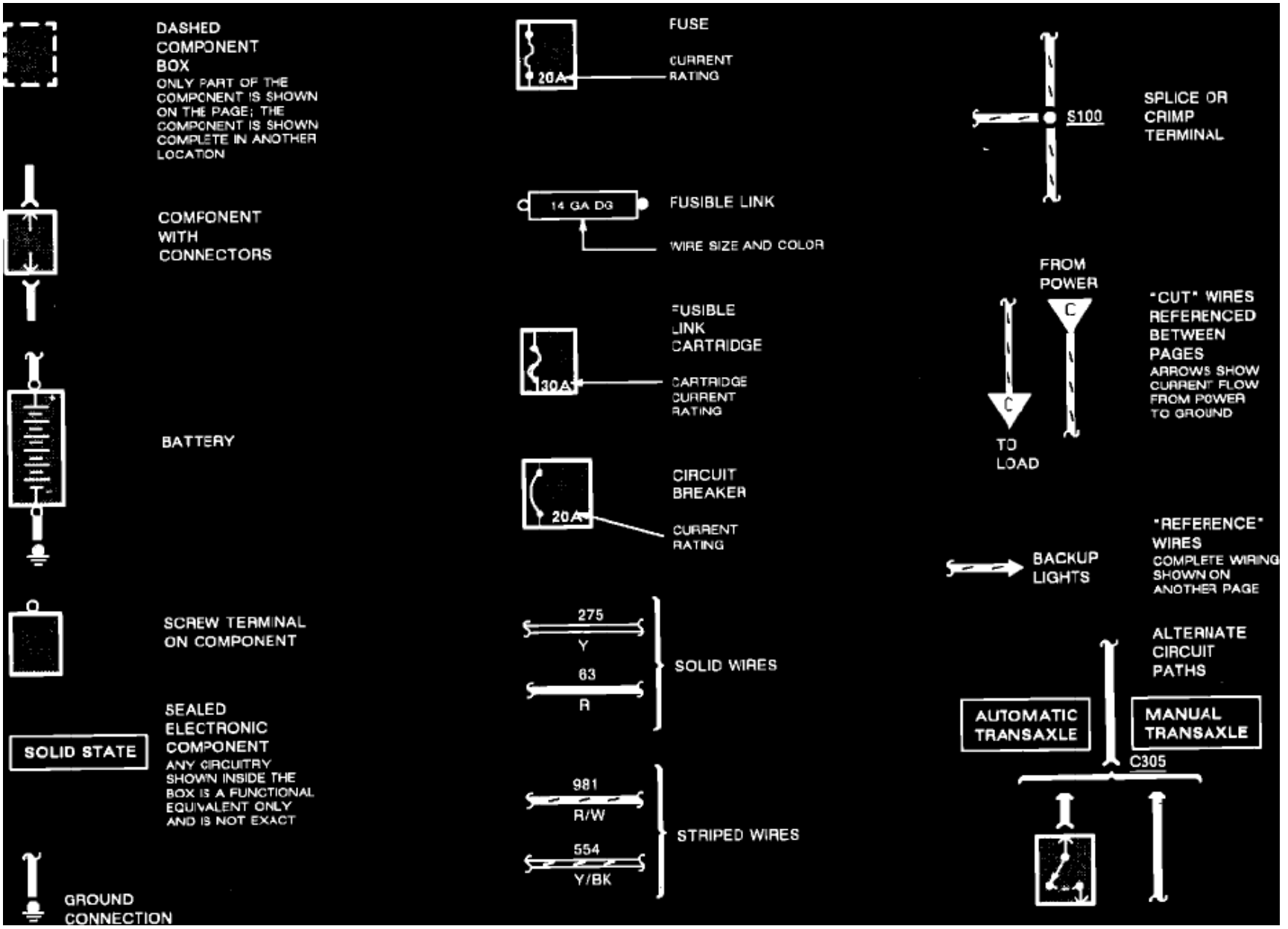
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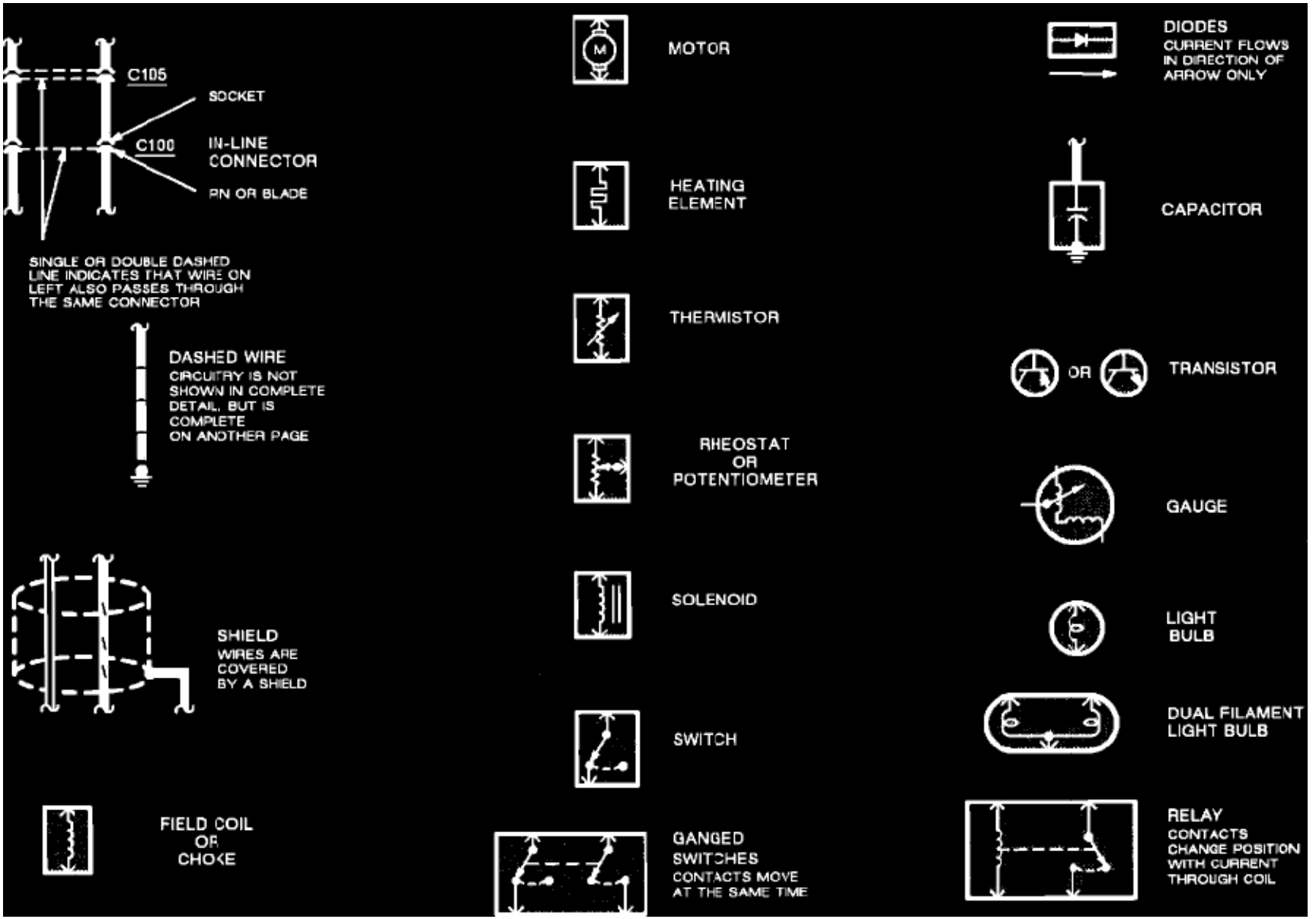
MANUAL TRANSAXLE
C305



Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N:

Natural

O: Orange

PK: Pink R:

Red

P: Purple

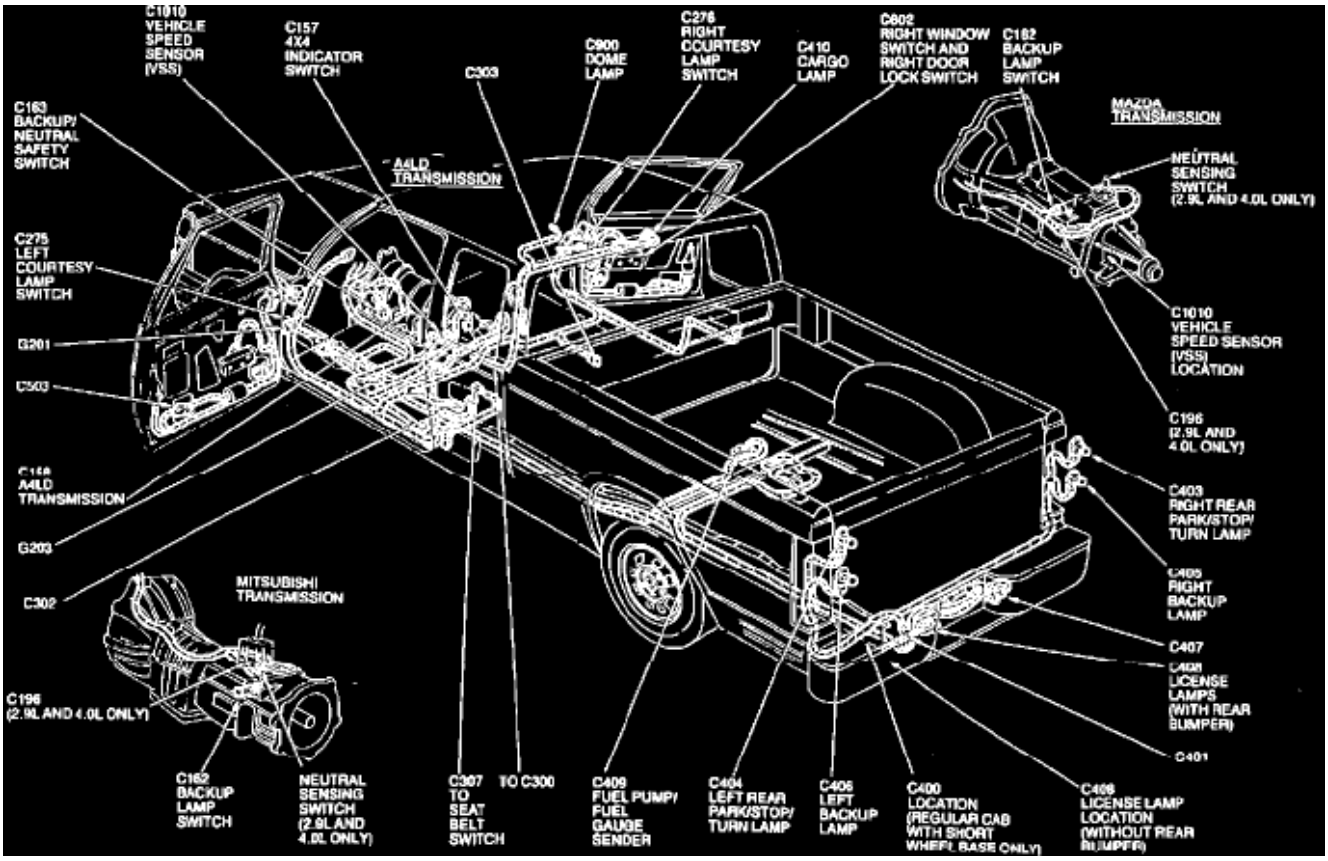
T: Tan

V: Violet

W: White

Y: Yellow

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Transmission and Drivetrain > Transmission Control Systems > Sensors and Switches - Transmission and Drivetrain > Sensors and Switches - Transfer Case > 4 X 4 Indicator Switch <--> [Gear Sensor/Switch, Transfer Case] > Component Information > Locations



4 X 4 Indicator Switch: Locations

Body Components

Top Front Of Transfer Case

4 X 4 Indicator Switch: Description and Operation

The shift position sensor is an integral component of the electronic shift motor. The sensor inputs shift position of the transfer case to the electronic control module.

Speed Sensor: Description and Operation

The speed sensor information to the electronic control module verifies the proper speed to allow range shifts (in or out of 4-Low) to occur.

RABS MODULE (ECU) SERVICE CHART

MODEL YEAR	VEHICLE LINE	SERVICE PART NUMBER
1987-91	F-SRW	F3PZ-2C018-A
1992-93	F-SRW	F3PZ-2C018-C
1987-91	F-DRW	F3PZ-2C018-B
1992-93	F-DRW	F3PZ-2C018-D
1987-91	BRONCO	F3PZ-2C018-A
1992 ONLY	BRONCO	F3PZ-2C018-C
1990-91	E-SRW	F3PZ-2C018-E
1992-93	E-SRW	F3UZ-2C018-A
1990-91	E-DRW	F3PZ-2C018-F
1992-93	E-DRW	F3UZ-2C018-B
1990-93	AEROSTAR	F29Z-2C018-A
1989-93	RANGER	F29Z-2C018-A
1991-92	EXPLORER	F29Z-2C018-A
1987-88	BRONCO II	F3PZ-2C018-G
1989-90	BRONCO II	F29Z-2C018-A

PART NUMBER	PART NAME	CLASS
F3PZ-2C018-A	RABS Module	B
F3PZ-2C018-B	RABS Module	B
F3PZ-2C018-C	RABS Module	B
F3PZ-2C018-D	RABS Module	B
F3PZ-2C018-E	RABS Module	B
F3UZ-2C018-A	RABS Module	B
F3PZ-2C018-F	RABS Module	B
F3UZ-2C018-B	RABS Module	B
F29Z-2C018-A	RABS Module	B
F3PZ-2C018-G	RABS Module	B

Electronic Brake Control Module: Technical Service Bulletins Antilock Brakes - Service Tips

Article No. 93-15-16

07/21/93

^ BRAKES - REAR ANTI-LOCK BRAKE SYSTEM (RABS) - ADVERSE BRAKING CHARACTERISTICS - RABS WARNING LIGHT NOT ON, MAY OCCUR WHEN INCORRECT RABS MODULE IS INSTALLED - SERVICE TIP

^ BRAKES - REAR ANTI-LOCK BRAKE SYSTEM (RABS) - INCORRECT (RABS I) ELECTRONIC CONTROL UNIT INSTALLED IN RABS II EQUIPPED VEHICLES - SERVICE TIP

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 BRONCO 1987-93 F-150 1989-93 RANGER 1990-93 AEROSTAR, E SERIES 1991-92 EXPLORER

ISSUE: Adverse braking characteristics and failure of the RABS light to indicate a RABS failure may be caused by improper servicing of RABS II equipped vehicles with RABS I electronic control units.

ACTION:

When replacing a RABS electronic control unit, refer to the following RABS Module Chart for correct parts usage.

RABS II modules have been designed with Keep Alive Memory and are to be used to service all prior year RABS I systems, except for 1987 and 1988 Bronco II vehicles.

SRW = SINGLE REAR WHEEL; DRW = DUAL REAR WHEEL

Parts Block

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000

OBSOLETE PART INFORMATION	
OBSOLETE PART NUMBER	REPLACING MODEL MAT. NO. OR PART NUMBER
E7TZ-2C018-A	Refer to MAT 92046
F2UZ-2C018-A	Refer to MAT 92049
F2TZ-2C018-A	Refer to MAT 92047
FOUZ-2C018-A	Refer to MAT 92048
E99Z-2C018-A	F29Z-2C018-A

Electronic Brake Control Module: Technical Service Bulletins Brake Computer Module - Obsolete Service Part Return

Article No. 93-17-13

08/18/93

SERVICE PARTS RETURN OF BRAKE COMPUTER MODULE

LIGHT TRUCK: 1987-93 F-150-350 SERIES 1989-93 BRONCO, RANGER 1990-93 AEROSTAR 1991-92 EXPLORER

ISSUE: The subject Module - Brake Computer (E7TZ-2C018-A, F2UZ-2C018-A, F2TZ-2C018-A, FOUZ-2C018-A and E99Z-2C018-A) are being replaced by different part numbers. They should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

ACTION: Remove and return the obsolete parts from your dealership's inventory.

1. Return obsolete parts (Noted above) to your facing PDC using the least expensive transportation.

2. If claim is processed electronically via DOES II use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

3. In the Remarks Section write "Returned per TSB 93-17-13".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

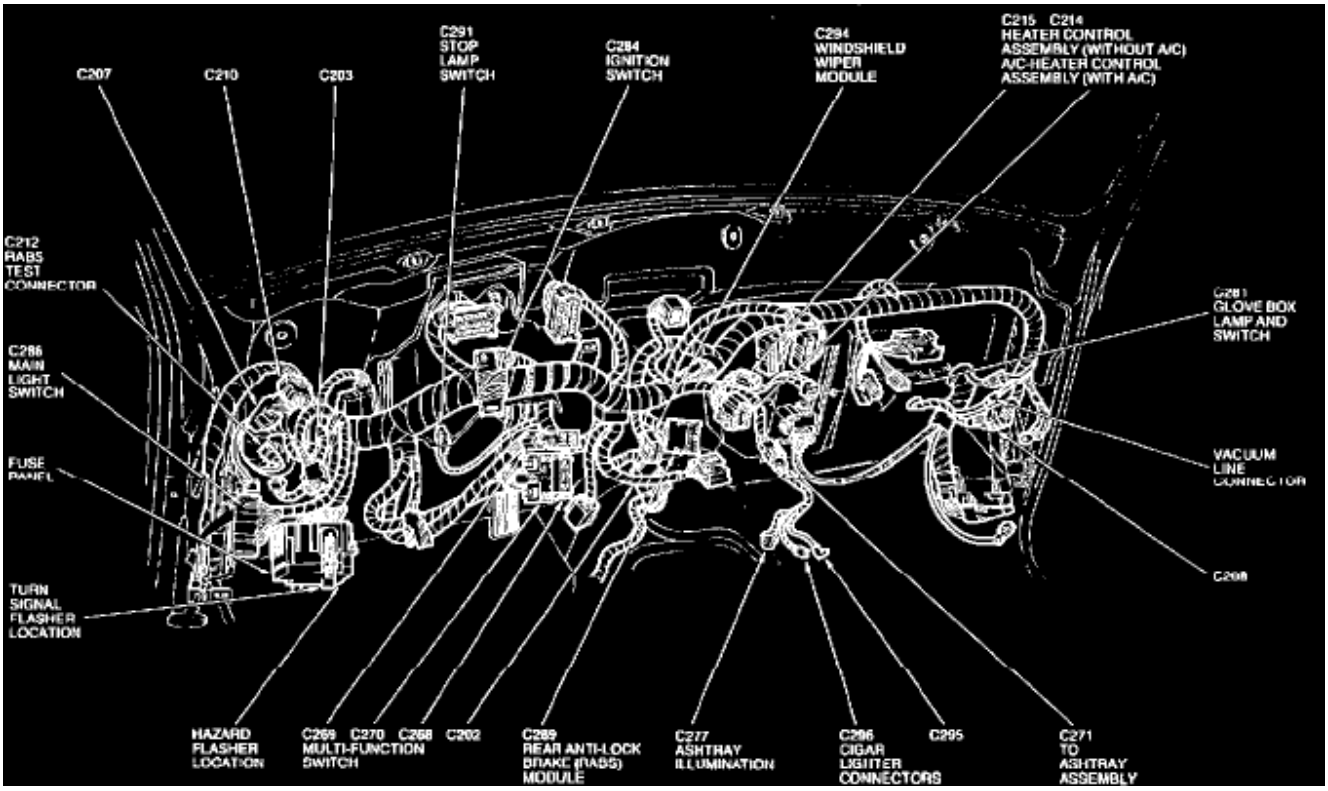
^ The parts returned must have been purchased from FPSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000



Electronic Brake Control Module: Locations

I/P Components

Behind Center Of I/P, LH Side Of Ashtray

Electronic Brake Control Module: Service and Repair

1. Disconnect battery ground cable.

2. Disconnect wiring harness from RABS module.

3. On Bronco, Bronco II, F-Series, Ranger and Explorer models, remove module to instrument panel retaining screws behind center of instrument panel.

4. On Aerostar models, remove module to instrument panel anti-skid plate retaining screws on lefthand side of engine cover under instrument panel.

5.

On E-Series models, remove parking brake actuator assembly as follows: a.

Loosen adjusting nut at equalizer.

b. From inside engine compartment, remove nuts attaching actuator assembly to cowl.

c. From under instrument panel, remove one bolt attaching actuator assembly to lower flange of instrument panel.

d. Remove parking brake cable from actuator assembly by compressing conduit end fitting prongs using a 1/2 inch box wrench.

e. Remove actuator assembly.

6. On Aerostar and E-Series models, remove two module attaching screws, then the module.

7. On all models, reverse procedure to install, then check system for proper operation.

Hydraulic Control Assembly - Antilock Brakes: Service and Repair

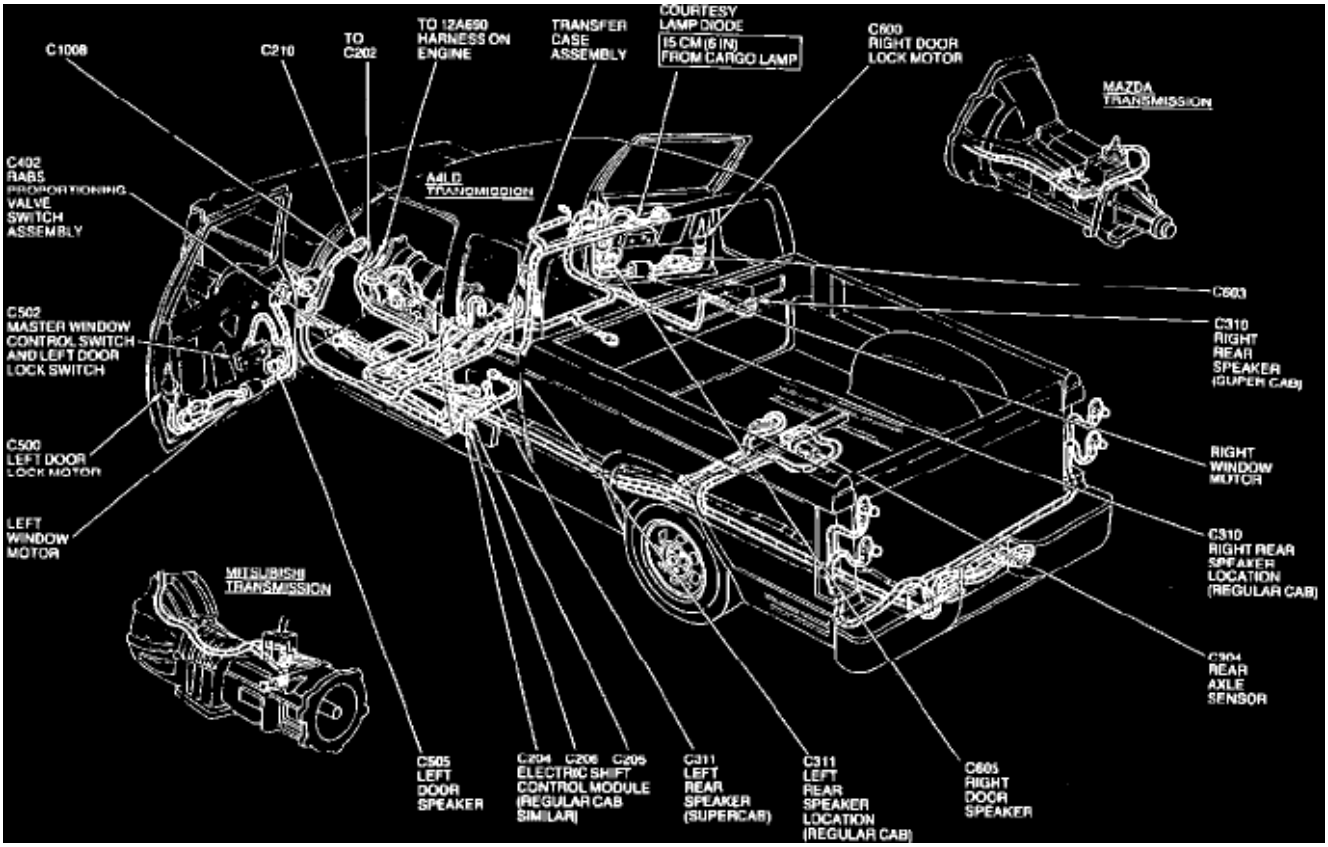
1. Disconnect and plug brake lines from valve.

2. Disconnect wiring harness, then remove valve attaching nuts and valve from frame rail.

3. Position new valve onto frame rail, then install and torque attaching nuts to 30-40 inch lbs on Aerostar models, 11-14 ft. lbs. on Bronco II, Explorer and Ranger models, 19-24 ft. lbs. on E-Series models or 12-17 ft. lbs. on Bronco and F-Series models.

4. Reconnect wiring harness and brake lines, torque brake lines to valve, 1/2 20 threaded fitting to 10-17 ft. lbs., 7/16 24 threaded fitting to 10-15 ft. lbs. and 3/8 24 threaded fitting to 10-15 ft. lbs.

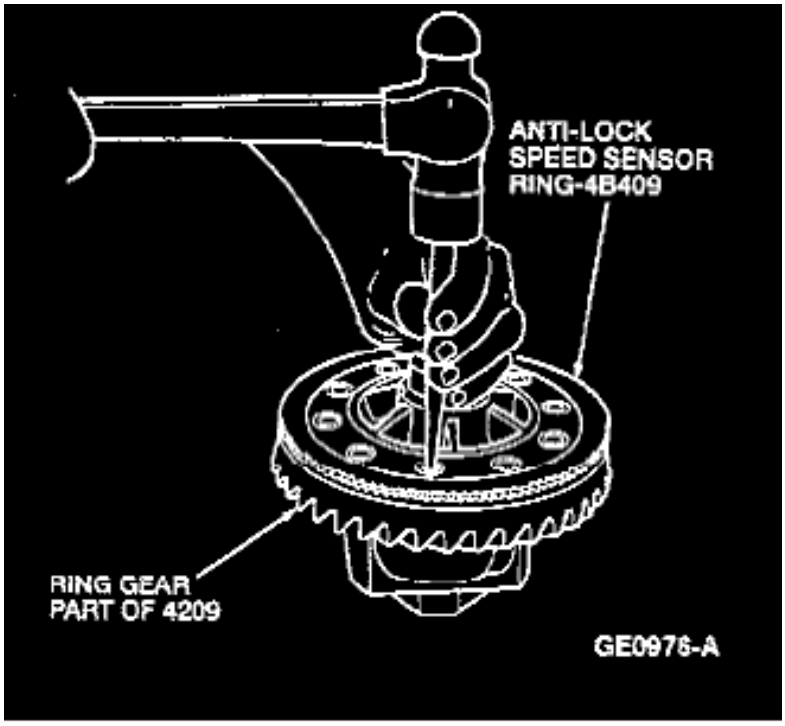
5. Perform system brake bleeding procedures as required.

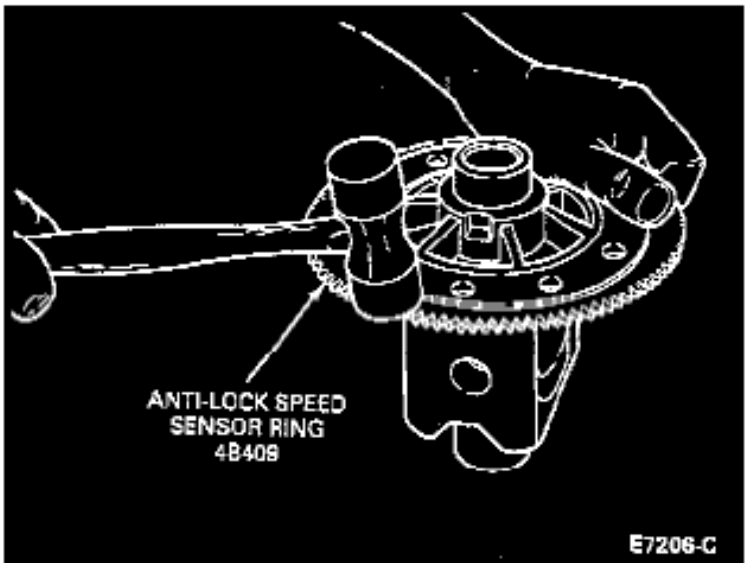


Wheel Speed Sensor: Locations

Body Components

Top Of Rear Differential


ANTI-LOCK
SPEED SENSOR
RING-4B409
RING GEAR
PART OF 4209
GE0976-A


ANTI-LOCK SPEED
SENSOR RING
4B409
E7206-C

Wheel Speed Sensor: Service and Repair Toothed Ring

NOTE: To service the speed sensor ring, the differential case must be removed from the axle housing.

REMOVAL

1. Remove the bolts retaining the ring gear to the differential case. Remove the ring gear by striking at alternate holes around the gear.

CAUTION: Extreme care should be taken not to scratch, dent, chip or otherwise cause damage to anti-lock brake sensor ring teeth while handling or during assembly.

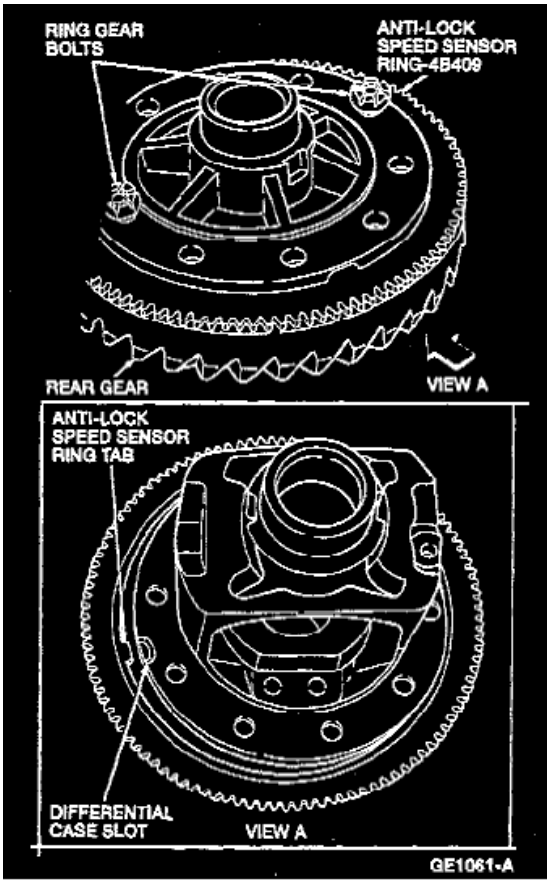
NOTE:

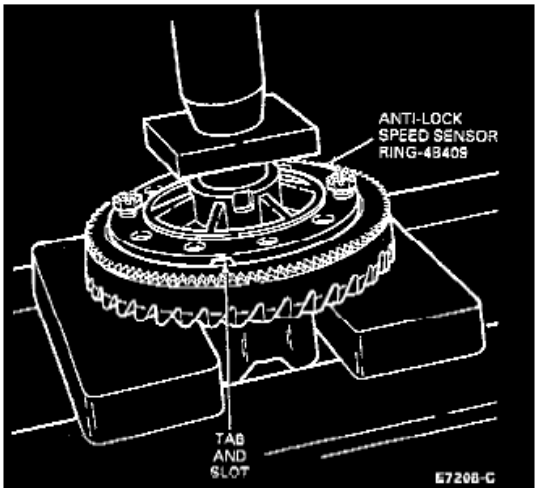
^ Before removing ring gear inspect it and determine if ring runout check is necessary.

^ Do not remove anti-lock speed sensor ring unless replacement is required. It does not have to be removed for ring gear replacement.

2. If replacement is required remove the anti-lock brake sensor ring by tapping with a soft-faced hammer. Discard the anti-lock speed sensor ring.

CAUTION: The anti-lock speed sensor ring must be discarded upon removal. If removed, a new anti-lock brake sensor ring must be installed.


RING GEAR BOLTS
ANTI-LOCK SPEED SENSOR RING-4B409
REAR GEAR
VIEW A
ANTI-LOCK SPEED SENSOR RING TAB
DIFFERENTIAL CASE SLOT
VIEW A
GE1061-A


ANTI-LOCK SPEED SENSOR RING-4B409
TAB AND SLOT
E7208-C

INSTALLATION

1. Position the ring gear and anti-lock speed sensor ring on the differential case. The tab on the anti-lock speed sensor ring must be aligned with the

slot in the differential case as shown. Start two ring gear retaining bolts through the differential case into the ring gear to make sure case-to-ring gear bolt hole alignment is achieved.

CAUTION:

^ Extreme care should be taken not to scratch, dent, chip or otherwise cause damage to anti-lock speed sensor ring teeth while handling or during assembly.

^ The tab on the anti-lock speed sensor ring must be aligned with the slot in the differential case.

2. Press the ring gear and anti-lock speed sensor ring on the differential case using the ring gear as a pilot.

3. Coat the threads of the ring gear retaining bolts with Stud and Bearing Mount EOAZ-19554-BA or equivalent meeting Ford specification

WSK-M2G349-A1. Install the bolts and alternately and evenly tighten to 95-115 Nm (70-85 ft. lbs.).

Wheel Speed Sensor: Service and Repair Wheel Speed Sensor

REMOVAL

1. At the rear axle housing pull the wiring harness connector from the speed sensor. 2. Remove the speed sensor hold down bolt and remove the speed sensor from the rear axle housing.

INSTALLATION

1. Clean the rear axle housing mounting surface. Use care to prevent dirt from entering the rear axle housing. 2. Inspect and clean the magnetized sensor pole piece to make sure that it is free from loose metal particles which could cause erratico■ system

operation. Inspect the speed sensor O-ring for damage and replace if necessary.

3. Lightly lubricate the speed sensor O-ring with motor oil, align the bolt hole, and install.

NOTE: Do not apply force to the plastic sensor connector. The sensor flange should slide to the mounting surface. This will make sure the air gap setting is between 0.127-1.143 mm (0.005-0.045 inches).

4. Install the speed sensor hold-down bolt and tighten to 34-40 Nm (25-29 ft. lbs.). 5. Push the connector on the speed sensor.

Brake Bleeding: Service and Repair Manual Bleeding

Bleed the primary and secondary hydraulic brake systems separately.

NOTICE: Do not allow the reservoir to run dry during the bleeding operation. Keep the master cylinder reservoirs filled with the specified brake fluid. Never reuse the fluid that has been drained from the hydraulic system.

1. Loosen the master cylinder to hydraulic line nut. 2. Wrap a shop cloth around the tubing below the fitting to absorb escaping brake fluid. 3. Push the brake pedal down slowly by hand to the floor of the cab. This will force air trapped in the master cylinder to escape at the fitting. 4. Hold the pedal down and tighten the fitting. Release the brake pedal.

NOTICE: Do not release the brake pedal until the fitting is tightened or air will re-enter the master cylinder.

5. Repeat this procedure until air ceases to excape at the fitting and the brake pedal is firm. 6. Place a box wrench on the bleeder fitting on the Rear Antilock Brake System (RABS) valve. Attach a rubber drain tube to the bleeder fitting

making sure the end of the tube fits snugly around the bleeder fitting.

7. Submerge the free end of the tube in a container partially filled with clean brake fluid. Loosen the bleeder fitting approximately three-quarters of a

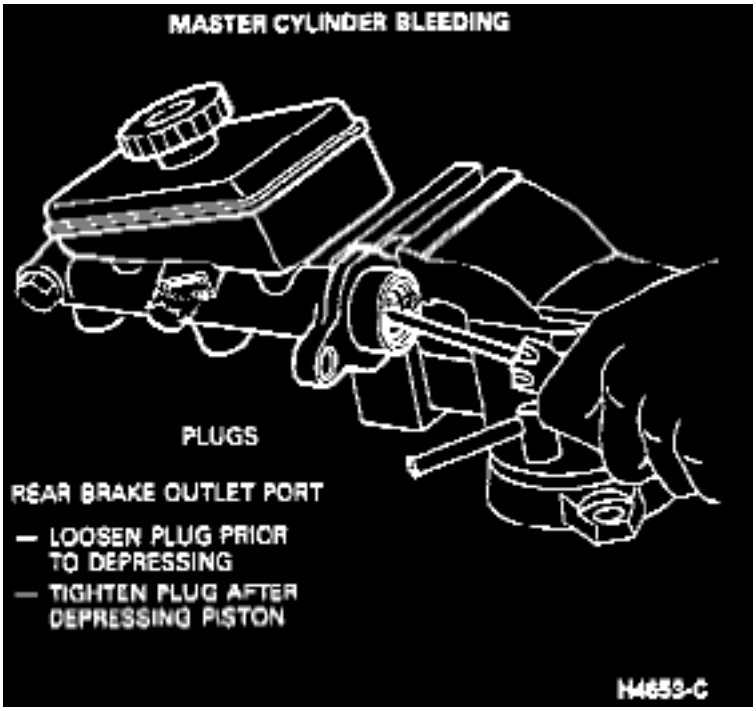
turn.

8. Slowly press the brake pedal all the way down. Close the bleeder fitting, and return the pedal to the fully released position. Repeat this operation

until air bubbles no longer appear at the submerged end of the bleeder tube.

9. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the bleeder tube.

10. Repeat this procedure at the RR, LR, RF and LF wheels. 11. When the bleeding procedure is complete, fill the master cylinder to the maximum level line of the master cylinder reservoir.



Brake Bleeding: Service and Repair Master Cylinder Bleeding

Bench Bleeding Master Cylinder

1. Support the master cylinder body in a vise, and fill both fluid reservoirs with heavy duty DOT 3 brake fluid. 2. Install plugs in the front and rear brake outlet ports. Bleed the rear brake outlet system first. 3. Loosen the plug in the rear brake outlet port. Depress the primary piston slowly to force the air out of the master cylinder. Tighten plug while

piston is depressed or air will enter the master cylinder.

4. Repeat this procedure until air ceases to exit at the outlet port. 5. Repeat steps 3 and 4 for the front brake outlet port with the rear brake outlet plugged. 6. Tighten the plugs and try to depress the piston. Depressing the piston should be harder after all air is expelled. 7. Install the cover and diaphragm assembly making sure the cover retainer is tightened securely. Remove the plugs.

For additional information see Bench Bleeding Notes.

Brake Bleeding: Service and Repair Pressure Bleeding

Be sure the bleeder tank contains enough of the specified brake fluid to complete the bleeding operation. Charge the tank with approximately 69-206 kPa (10-30 psi). Never exceed 345 kPa (50 psi). Never use brake fluid that has been drained from the hydraulic system. Bleed the longest lines first.

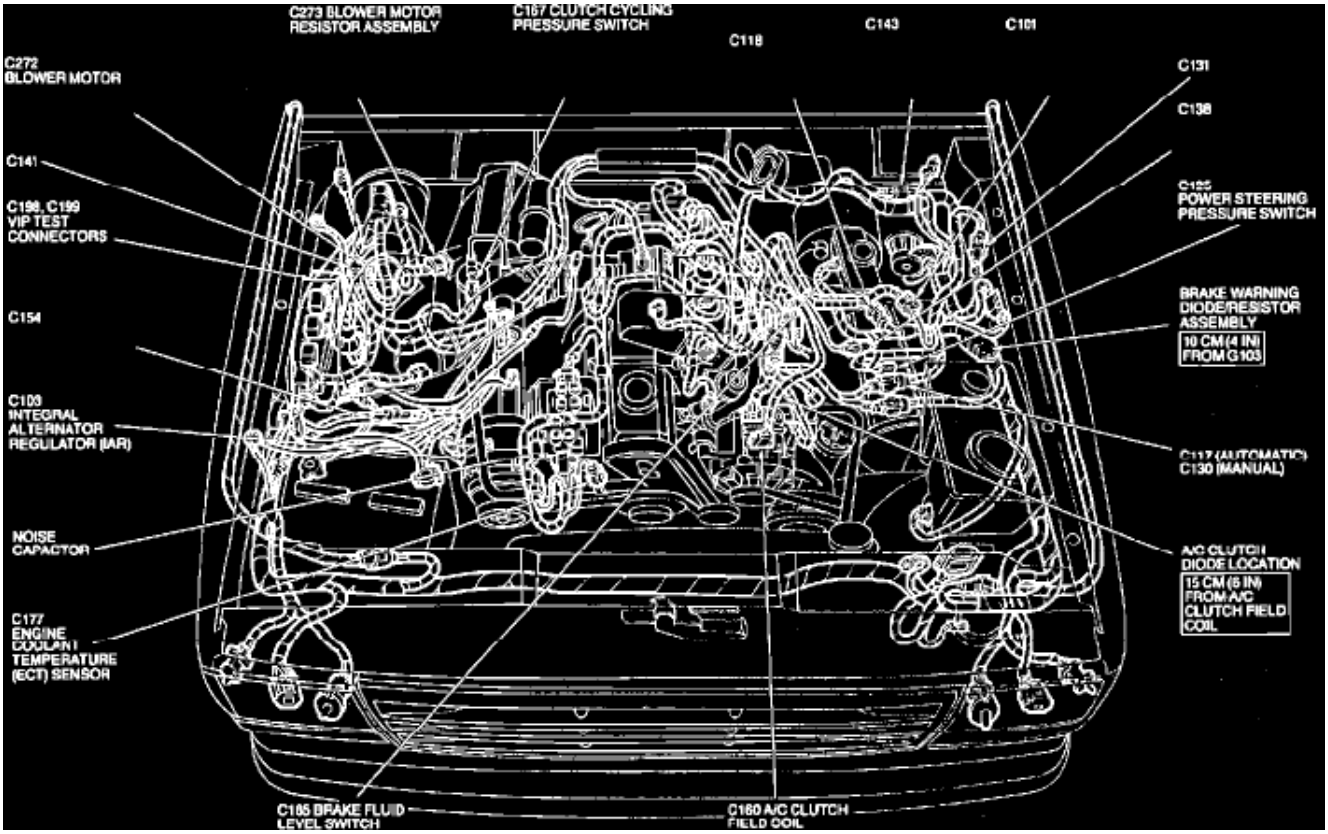
1. Clean all dirt from the master cylinder reservoir cap. 2. Remove the master cylinder reservoir cap and fill the master cylinder reservoir with the specified brake fluid. Install the pressure bleeder adapter

tool on the master cylinder, and attach the bleeder tank hose to the fitting on the adapter.

NOTE: Master cylinder pressure bleeder adapter tools are available from the manufacturers of pressure bleeding equipment. Follow the manufacturer's instructions when installing the adapter.

3. Place a 3/8 inch box wrench on the bleeder fitting on the right rear brake wheel cylinder. Attach a bleeder tube snugly to the bleeder fitting. 4. Open the valve on the bleeder tank and admit pressurized brake fluid to the master cylinder reservoir. 5. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting. 6. When air bubbles no longer appear in the fluid at the submerged end of the bleeder tube, close the bleeder fitting and remove the tube. 7. Repeat Steps 3 through 6 at the opposite wheel cylinder. On front brakes, bleed the right front caliper first. 8. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting. 9. Remove the pressure bleeder adapter tool. Fill the master cylinder reservoirs with the specified brake fluid to within 3 mm (1/8 in) from the top of

the filler neck. Install the master cylinder cover.



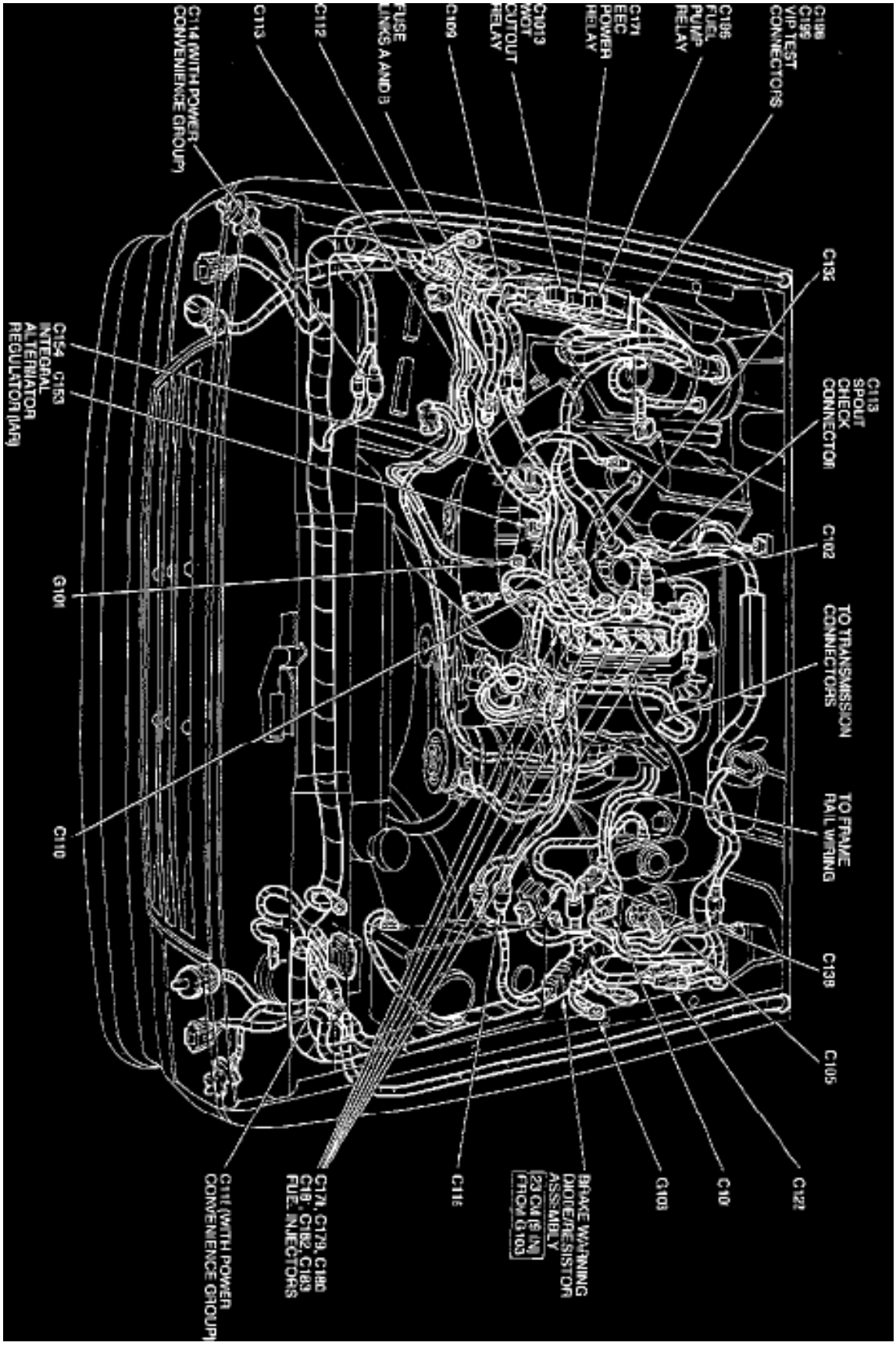
Brake Warning Indicator: Locations

BRAKE INDICATOR RESISTOR/DIODE ASSEMBLY

Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

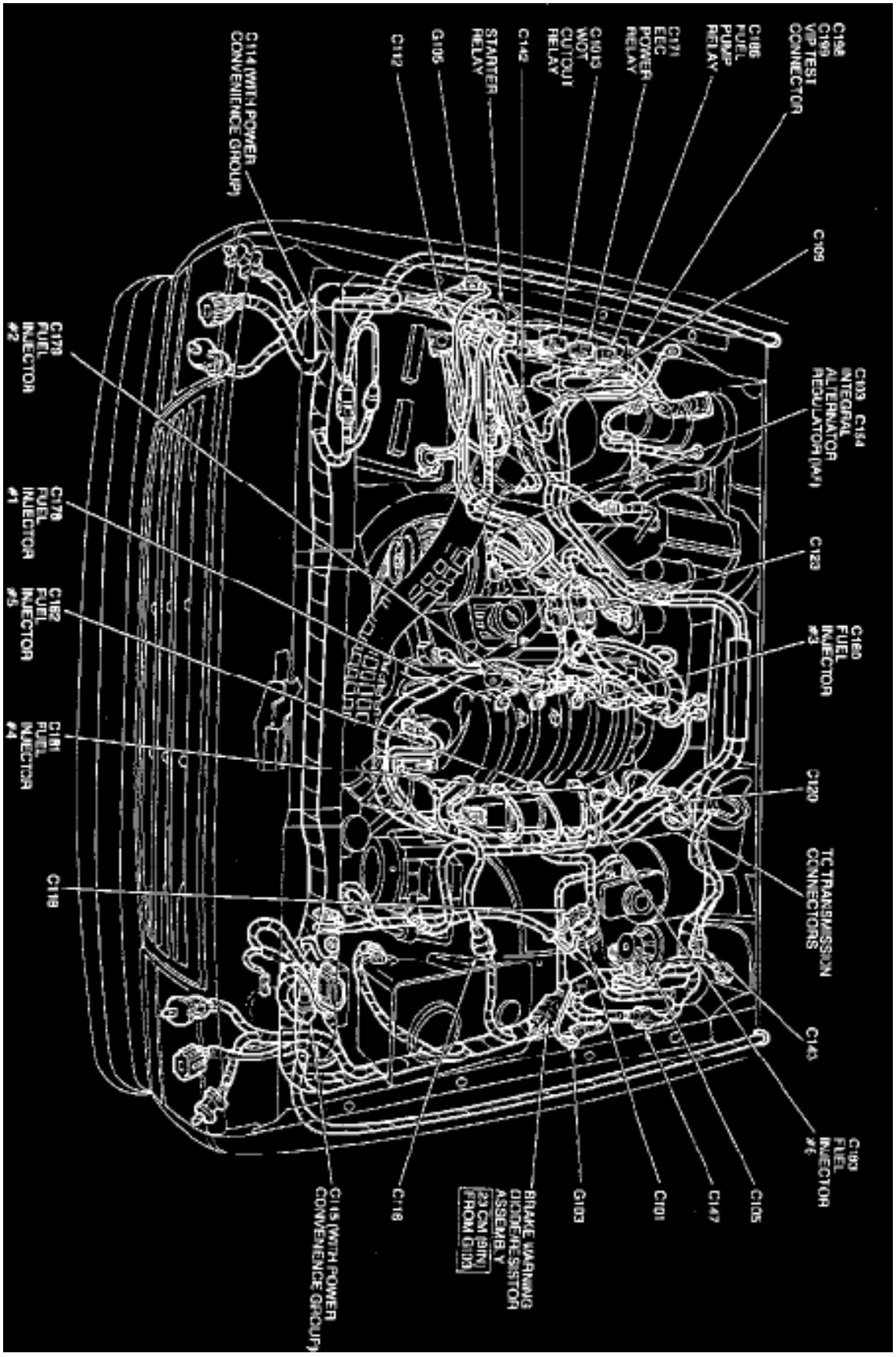
Applicable to: 2.3L/4-140


C198
C196
VIP TEST
CONNECTORS
C196
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
KNOT
CUTOUT
RELAY
C109
FUSE
LINKS A AND B
C112
C113
C114 (WITH POWER
CONVENIENCE GROUP)
C154 C153
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
G101
C110
C134
C113
SPOUT
CHECK
CONNECTOR
C102
TO TRANSMISSION
CONNECTORS
TO FRAME
RAIL WIRING
C139
C105
BRAKE WARNING
DIODE/RESISTOR
ASSEMBLY
23 CM (9 IN)
FROM G103
C122
C10
G103
C116
C174, C179, C180
C18, C182, C183
FUEL INJECTORS
C115 (WITH POWER
CONVENIENCE GROUP)

Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

Applicable to: 2.9L/V6-179

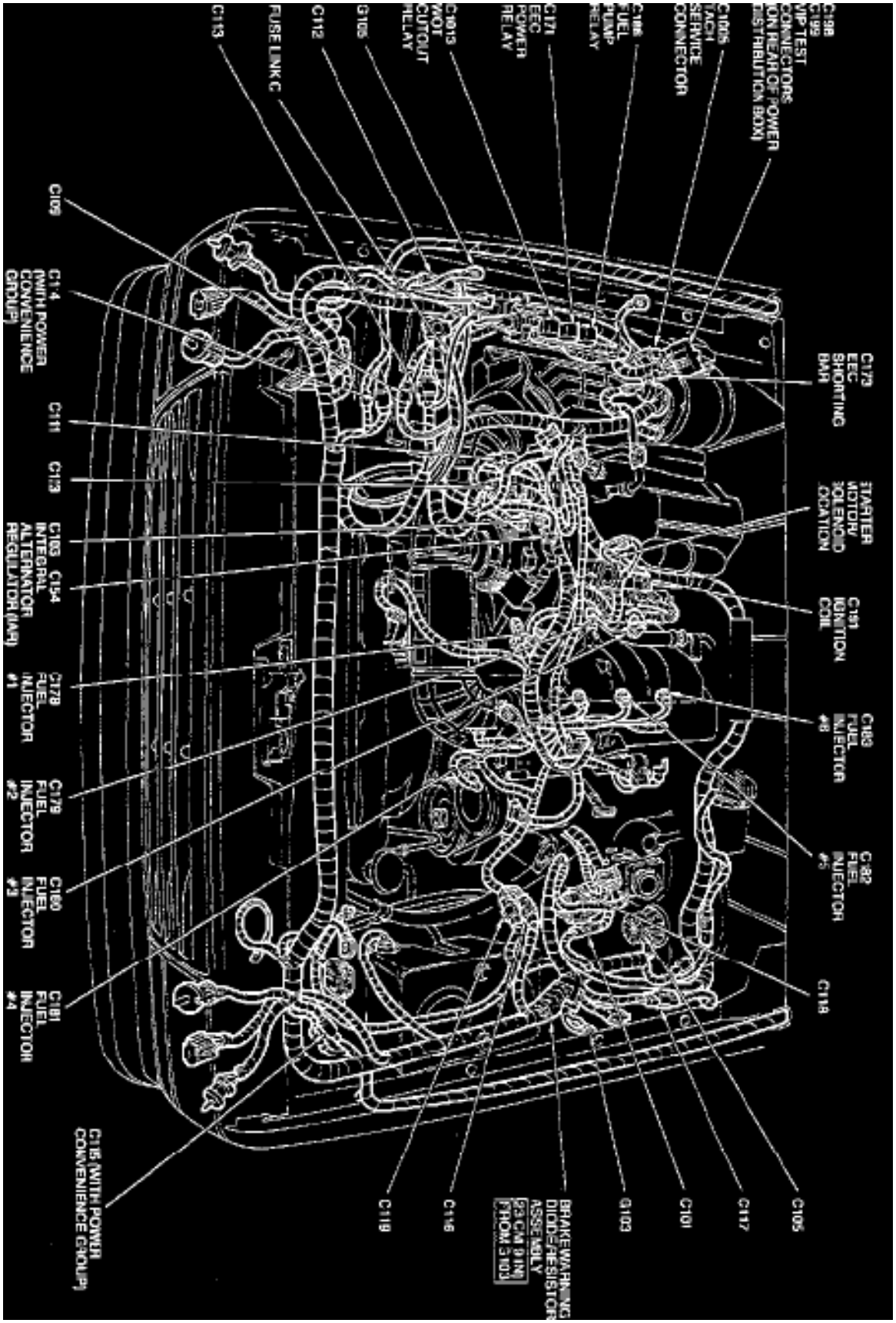

C158
C199
VIP TEST
CONNECTOR
C186
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
WOT
CUTOUT
RELAY
C142
STARTER
RELAY
G105
C112
C114 (WITH POWER
CONVENIENCE GROUP)
C109
C103 C154
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
C123
C160
FUEL
INJECTOR
#3
C120
TC TRANSMISSION
CONNECTORS
C145
C193
FUEL
INJECTOR
#6
C178
FUEL
INJECTOR
#2
C179
FUEL
INJECTOR
#1
C182
FUEL
INJECTOR
#5
C181
FUEL
INJECTOR
#4
C118
C105
C147
C101
G103
C118
BRAKE WARNING
DIODE/RESISTOR
ASSEMBLY
23 CM (9IN)
FROM G103
C115 (WITH POWER
CONVENIENCE GROUP)

Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

Applicable to: 3.0L/V6-181

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Brake Warning Indicator > Component Information > Locations > Page 4891



Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Disc Brake System > Brake Caliper > Component Information > Technical Service Bulletins > Customer Interest for Brake Caliper: > 93117 > May > 93 > Brakes - Sticking/Binding/Grabbing

Brake Caliper: Customer Interest Brakes - Sticking/Binding/Grabbing

Article No. 93-11-7

05/26/93

BRAKES - STICK/BIND/GRAB - FRONT CALIPER PINS CORRODED

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

This TSB article is being republished in its entirety to include F Super Duty vehicles.

ISSUE: Sticking, binding or grabbing of the brakes may be caused by brake caliper slide pins that are corroded. The corrosion does not allow the brake caliper assembly to move freely.

ACTION: Install the new improved caliper pins that are corrosion resistant. Refer to the following Service Procedure for service details.

SERVICE PROCEDURE

1. Remove the caliper and pins. Refer to the applicable Light Truck Service Manual for service details.

NOTE: IF PADS ARE DAMAGED OR WORN, PAD REPLACEMENT IS REQUIRED.

2. Clean the upper and lower knuckle pin grooves, upper and lower knuckle inner pad grooves, and the upper and lower caliper pin grooves with a wire brush or portable wire wheel.

WARNING: USE SAFETY GLASSES AND AN AIR RESPIRATOR WHEN CLEANING THE GROOVES.

3. Apply a light coat of lubricant (D7AZ-19590-A) to the upper and lower knuckle inner pad grooves and upper and lower caliper pin grooves.

CAUTION: LUBRICANT SHOULD NOT BE USED ON ROTORS, LININGS OR CALIPER PISTON BOOTS.

4. Re-assemble the caliper using the new pins, (F2TZ-2C150-A) for all vehicles except F Super Duty. Use new pins (F2TZ-2C150-B) for F Super Duty vehicles.

NOTE: NORMAL BRAKE MAINTENANCE REQUIREMENTS LISTED IN THE OWNER MANUAL SHOULD BE PERFORMED EVERY 15,000 MILES.

PART NUMBER PART NAME CLASS

D7AZ-19590-A Lubricant-Disc Brake AM

F2TZ-2C150-A Pin-Brake Caliper B

F2TZ-2C150-B Pin-Brake Caliper (F Super B

Duty)

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 92-12-14

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models And Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

931107A Aerostar/Ranger/Bronco II, 0.8 Hr.

(Through 1990), Explorer (Starting 1991), F-Series Under 8500 GVW, Bronco And Econoline Under 8500

931107B F-Series Over 8500 GVW 0.9 Hr.

And Econoline Over 8500 GVW Through 1991

931107C F Super Duty Front 1.2 Hr.

931107D F Super Duty Rear 1.2 Hr.

931107E F Super Duty Front And 2.1 Hr.

Rear

DEALER CODING

BASIC PART NO. CONDITION CODE

2C150 41

OASIS CODES: 301000

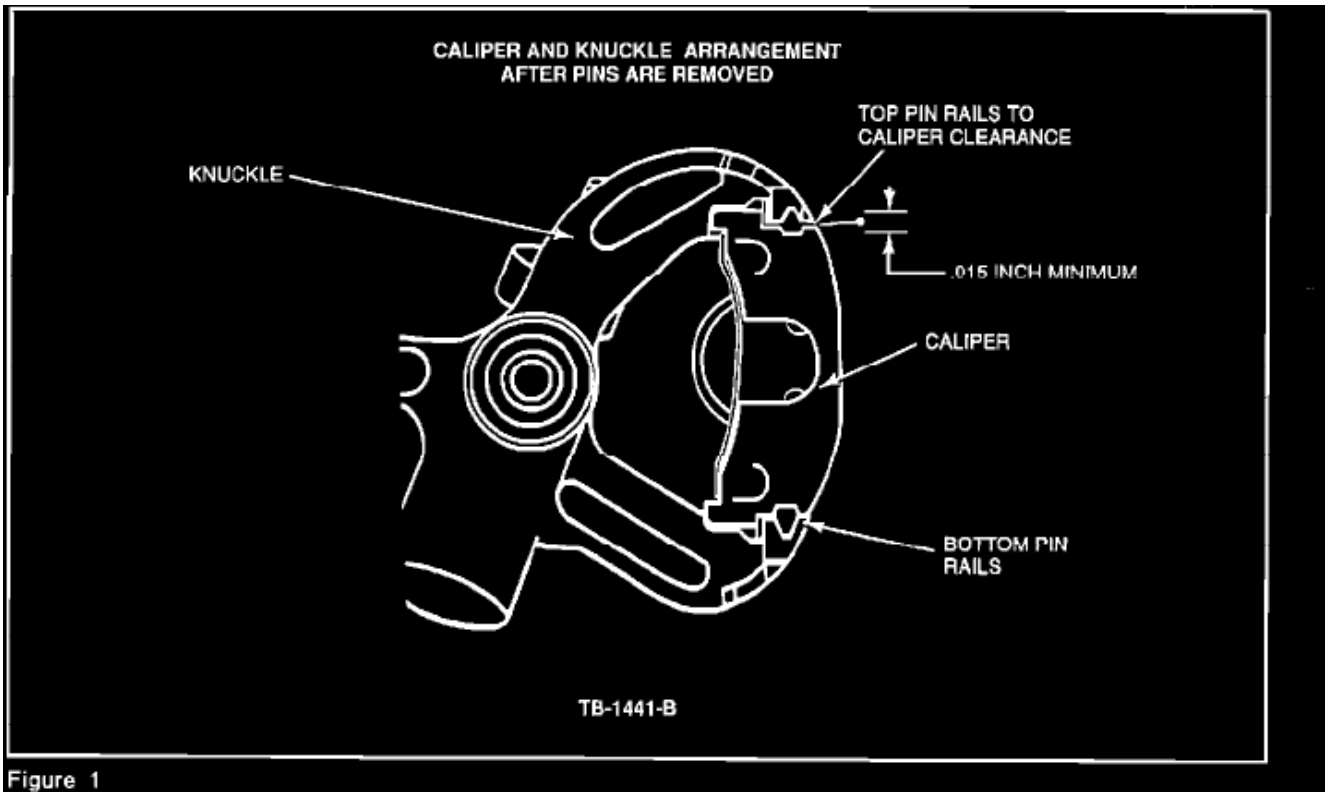


Figure 1

Brake Caliper: Customer Interest Front Brakes - Popping or Clunking Noise

Article No. 92-14-7

07/01/92

^ BRAKES - FRONT DISC - "POPPING" OR "CLUNKING" SOUND DURING BRAKING

^ NOISE - "POPPING" OR "CLUNKING" SOUND WHEN BRAKING

^ VIBRATION THROUGH FLOOR BOARD WHEN BRAKING

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 AEROSTAR, RANGER 1991-92 EXPLORER

See TSB # 93-20-11 for additional information.

ISSUE: A "popping" or "clunking" noise and a floor board vibration may occur during braking. The noise and/or vibration may be caused by the front brake caliper suddenly springing away from the caliper abutment and returning.

ACTION: Check and adjust the brake pads and caliper knuckle clearance by using the following service procedure.

1. Road test to confirm that the "popping" or "clunking" noise occurs only during braking at the initial part of the stop.

2. Raise the front of the vehicle.

a. Remove the front wheels.

b. Remove the pins from the caliper.

3. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

NOTE:

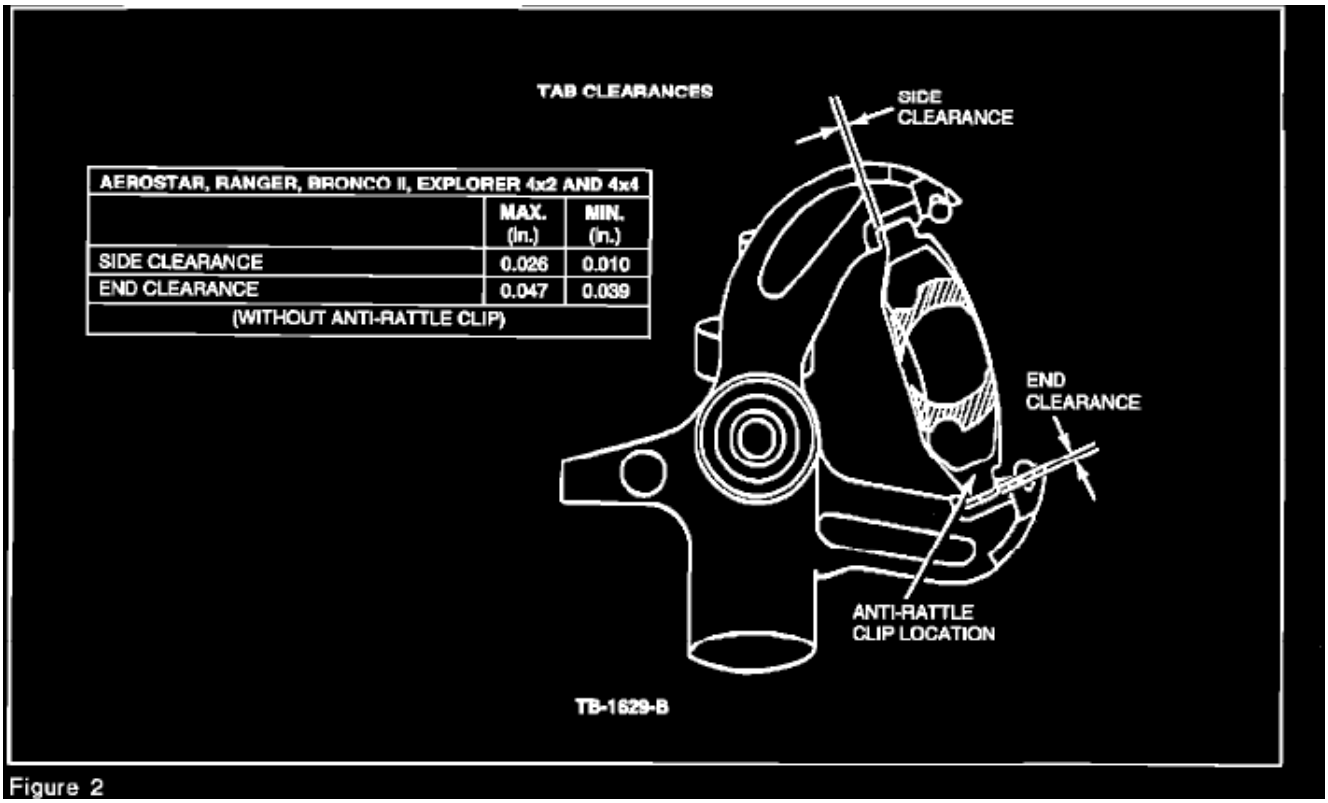


Figure 2

THE CLEARANCE SHOULD BE A MINIMUM OF .015" (.381 MM).

a. If the caliper clearance is less than .015" (.381 mm) on either caliper, replace the caliper and repeat the measurements.

b. If the caliper clearance is less than .015" (.381 mm) on both calipers, replace both calipers and recheck clearance.

c. If the caliper clearance is still less than .015" (.381 mm) on both calipers, replace both spindles (4X2) or knuckles (4X4) and recheck clearance.

NOTE: CHECK THE CLEARANCE OF THE NEW KNUCKLE BEFORE INSTALLATION.

4. After measuring the caliper/knuckle for proper clearance, remove both calipers and brake pad assemblies. Refer to the appropriate Light Truck Service Manual, Section 06-03, for the removal procedure.

5. Replace the caliper piston (FOTZ-2196-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for the replacement procedure.

6. Install the new lining kit (FO9Z-2001-A).

a. Check the side and end clearances with a feeler gauge.

b. Refer to Figure 2 for clearance dimensions.

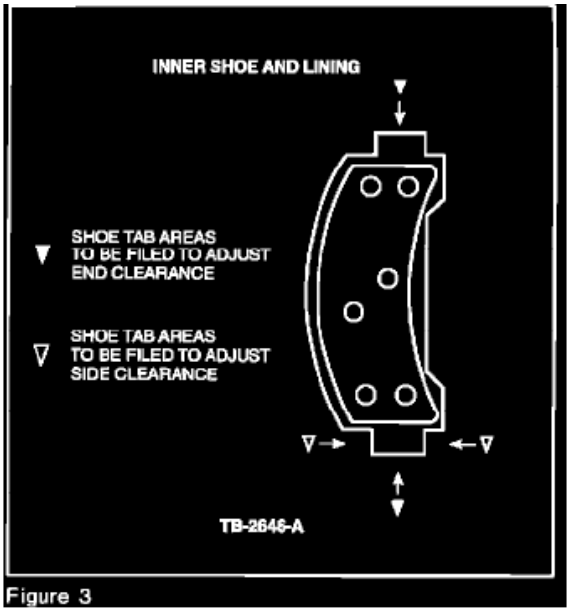


Figure 3

PART NUMBER	PART NAME	CLASS
F0TZ-2196-A	Caliper Piston	B
E8TZ-2C150-B	Caliper Pin	B
F09Z-2001-A	Brake Lining Kit	B
D7AZ-19590-A	Disc Brake Lubricant	AM
F09Z-2B120-A	Caliper, RH	B
F09Z-2B121-A	Caliper, LH	B
E9TZ-3105-B	Spindle Assembly, RH - (Ranger, Bronco II, Explorer)	B
E9TZ-3106-B	Spindle Assembly, LH - (Ranger, Bronco II, Explorer)	B
E79Z-3105-A	Spindle Assembly, RH - (Aerostar)	B
E79Z-3106-A	Spindle Assembly, LH - (Aerostar)	B
F09Z-3130-A	Knuckle, RH (AWD Aerostar)	C
F09Z-3131-A	Knuckle, LH (AWD Aerostar)	C
F0TZ-3130-A	Arm Assembly, RH (4X4 Explorer)	B
F0TZ-3131-A	Arm Assembly, LH (4X4 Explorer)	B
E8TZ-3130-A	Arm Assembly, RH (4X4 Bronco II)	B
E8TZ-3131-A	Arm Assembly, LH (4X4 Bronco II)	B

7. If the lining clearance is not to the required dimensions, file the shoe tab. Remove equal amounts from both sides and ends, Figure 3.

WARNING: USE SAFETY GLASSES WHEN FILING THE BACKING PLATES.

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

8. Assemble the brakes and caliper pins (E8TZ-2C150-B). Lubricate the caliper pins with disc brake lubricant (D7AZ-19590-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for assembling details.

9. Apply a light coat of disc brake lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove. Also apply a light coat of disc brake lubricant (D7AZ-19590-A) to the caliper rails.

CAUTION: PREVENT LUBRICANT FROM STICKING TO ROTORS, LININGS OR CALIPER PISTON BOOTS.

PART NUMBER

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models

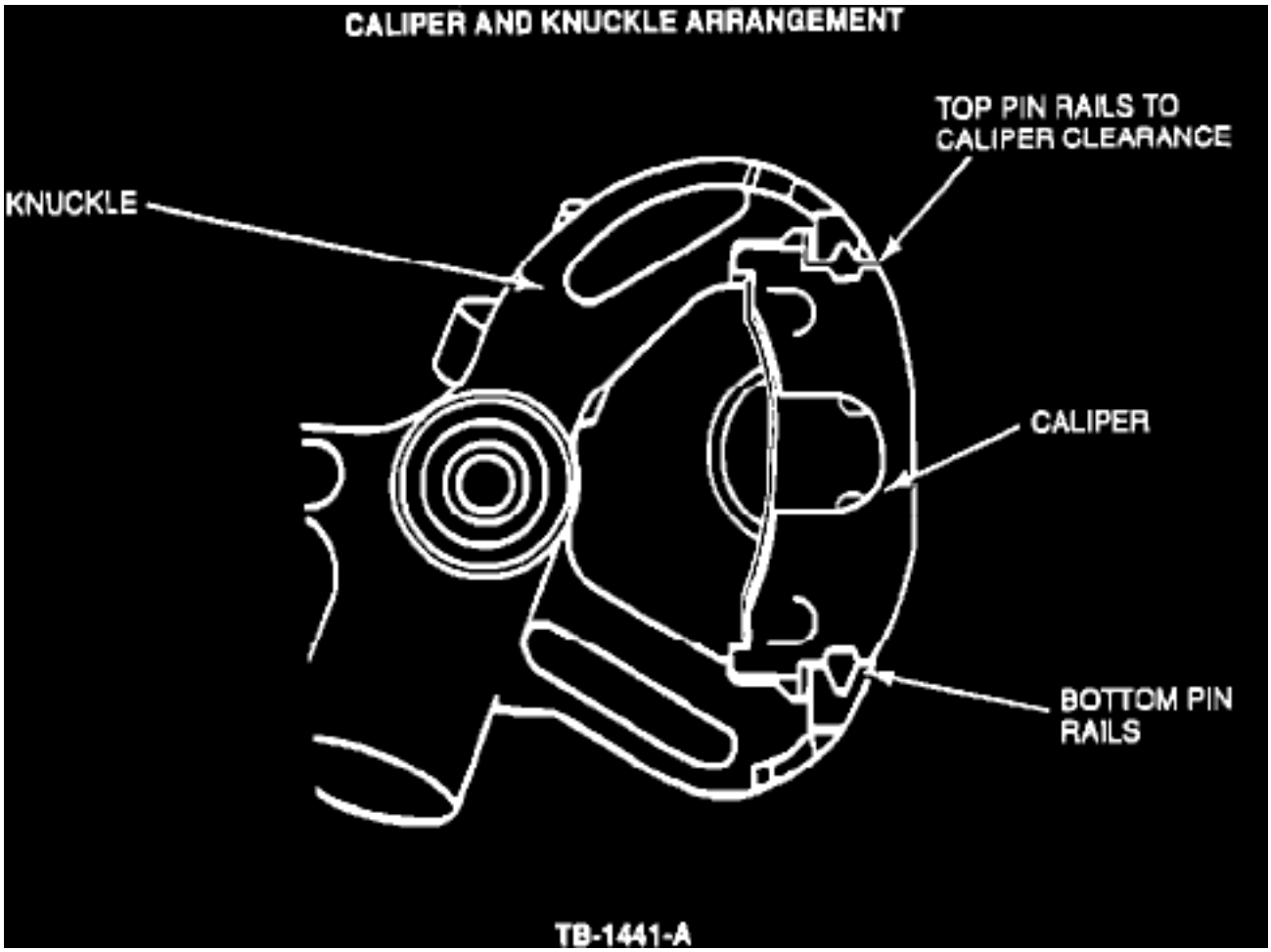
OPERATION	DESCRIPTION	TIME
921407A	Check Clearance/Replace Caliper Pistons/Replace Pads/File Pads to Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.3 Hrs.
921407B	Check Clearance/Replace Caliper Assembly/Replace One Caliper Piston/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.7 Hrs.
921407C	Check Clearance/Replace Both Caliper Assemblies/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.9 Hrs.
921407D	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.9 Hrs.
921407E	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/ Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Explorer 4X4	3.1 Hrs.
921407F	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	2.6 Hrs.
921407G	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	2.7 Hrs.
921407H	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.0 Hrs.
921407I	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	3.4 Hrs.
921407J	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.0 Hrs.
921407K	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Both Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.0 Hrs.
921407L	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	3.3 Hrs.
921407M	Replace Both Caliper Assemblies/Replace Both Knuckles/ Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	4.3 Hrs.
921407N	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.3 Hrs.
921407O	Replace Both Caliper Assemblies/Replace Both Knuckles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.6 Hrs.

DEALER CODING

BASIC PART NO.	CONDITION CODE
2C150	56

OASIS CODES: 301000, 702100, 703000

WARRANTY STATUS AND OPERATION DESCRIPTION



Technical Service Bulletin # 9097 Date: 900427

Steering/Suspension - Pull/Drift Diagnostic Procedure

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

Article No. 90-9-7

LIGHT TRUCK: 1988-90 BRONCO II, RANGER 1991 EXPLORER

ISSUE: A comprehensive, pull and drift diagnostic procedure has been developed to assist techicians with truck service.

ACTION: Use the following service procedure to resolve drift and pull concerns.

This is the same basic procedure as published in TSB 90-7-16 for the 1988-90 Bronco and F-150, 4x4 models. However, you should note that there are some differences such as replacing radius arm bushings instead of installing a radius arm bracket kit, etc.

Proceed with the Pull and Drift Diagnostic Procedure if the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE: THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

Service Procedure

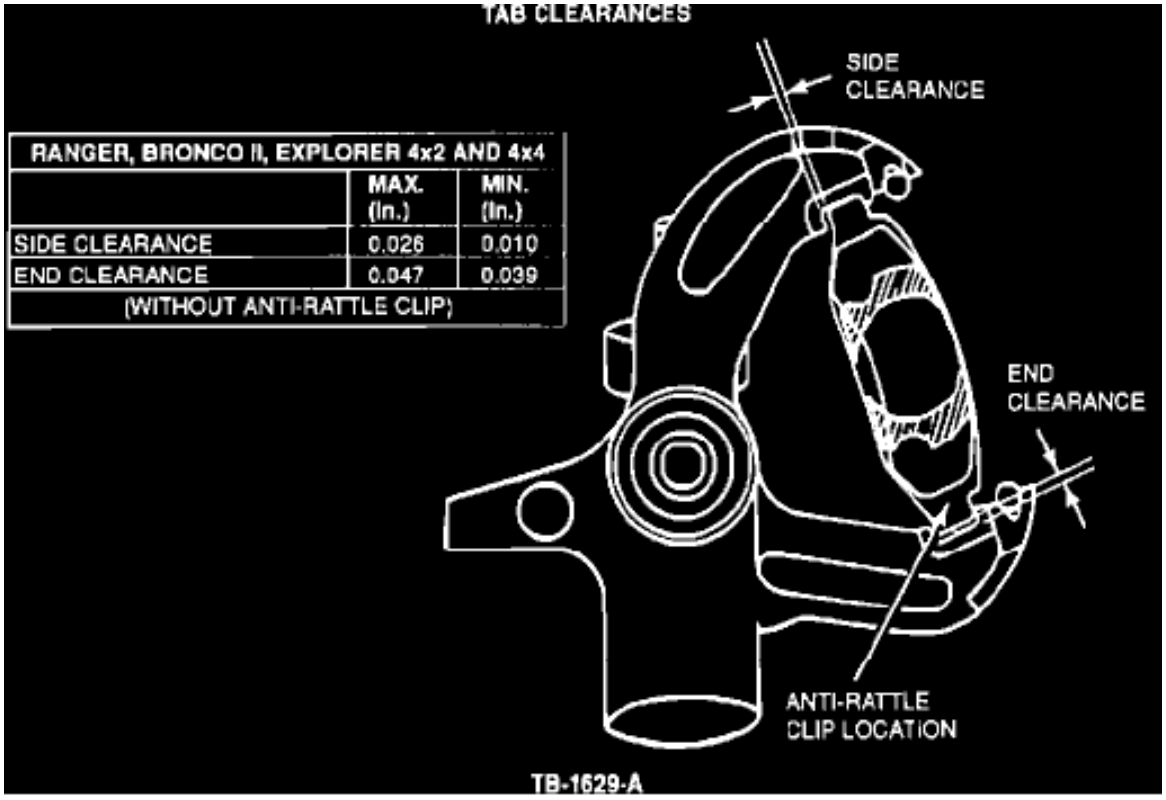
Figure 1

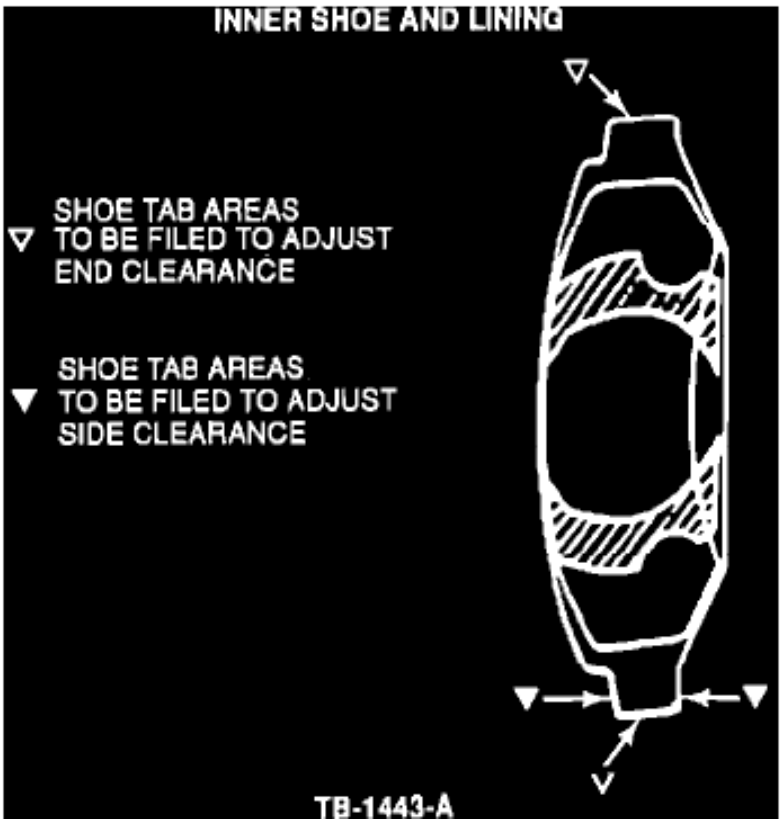
1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

Clearance should be a minimum of .015 ".





c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE: CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

Figure 2

Figure 3

f. Re-install pad and check the side and end clearances with a feeler gauge. (See Figure 2 for clearance dimensions.)

g. If the pad clearances are within specification, refer to Service Procedure Step 2 - "Caliper Groove Lubrication". If the pad clearances are not to the

required dimensions, file the steel backing plate.

WARNING: USE SAFETY GLASSES WHEN FILING STEEL BACKING PLATES

h. File material, removing equal amounts from both sides or ends. (See Figure 3.)

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

i. Check the tab clearances and install anti-rattle clip on the lower pad tab, Figure

2.

2. Apply a light coat of lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove and caliper rails. CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

3. Replace the right and left side arm bushings with new bushings (FITZ-3B203-A). Refer to the appropriate Light Truck Shop Manual, Section 04-OIC

for service details.

NOTE: THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

Pull Drift Diagnostic Procedure

The Pull Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the truck with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) are present.

The Road Test

It is important to test drive the truck with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind.

^ Tire pressure should be checked and adjusted, if necessary.

^ A second person in the truck during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location.

^ On trucks with automatic locking hubs, it is necessary to drive (20) feet forward and then backwards to unlock the hubs.

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 50-55 mph (80-89 km/h). **DO NOT BRAKE**	Is there a steady state pull? If no, go to the next step.	**See Diagnostic Procedure 1.** Tire mismatch or tire pressure concern
While stopped, have second person move to the left hand rear passenger location. Maintaining 50-55 mph (80-89 km/h).	Any change in pull? If no change, go to next step.	**See Diagnostic Procedure 2** Caster split
Make sure front hubs are unlocked (if equipped*). Accelerate the truck - decelerate the truck using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next step.	**See Diagnostic Procedure 3.** Possible limited slip rear axle and tire circumference
Maintain a steady speed of 50-55 mph (80-89 km/h). Put the vehicle in neutral and shut off the engine.	Does the pull go away? If no, go to the next step.	**See Diagnostic Procedure 4.** Steering gear valve off center
Stop the truck along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the truck; rotate the wheel full right. Does the pull change - better or worse? If no, go to next step.	**See Diagnostic Procedure 5.** Possible Rubber Ball Socket (RBS) memory steer
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging RABS.	Does the trucks heading change during brake application? If no, go to next step.	**See Diagnostic Procedure 6.** Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the truck from 50 mph (80 km/h).	Does the vehicle pull with A/L disconnected? If no, go to next step.	**See Diagnostic Procedure 6** Possible inadequate rear brake application
Brake the truck hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** Possible unequal rear brake application

NOTE: IT IS POSSIBLE THAT THE TRUCK MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART FOLLOWS.

NOTE: RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO (regular production option) list and set tire psi to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side to side and road test. If the concern is not corrected, continue with next step.

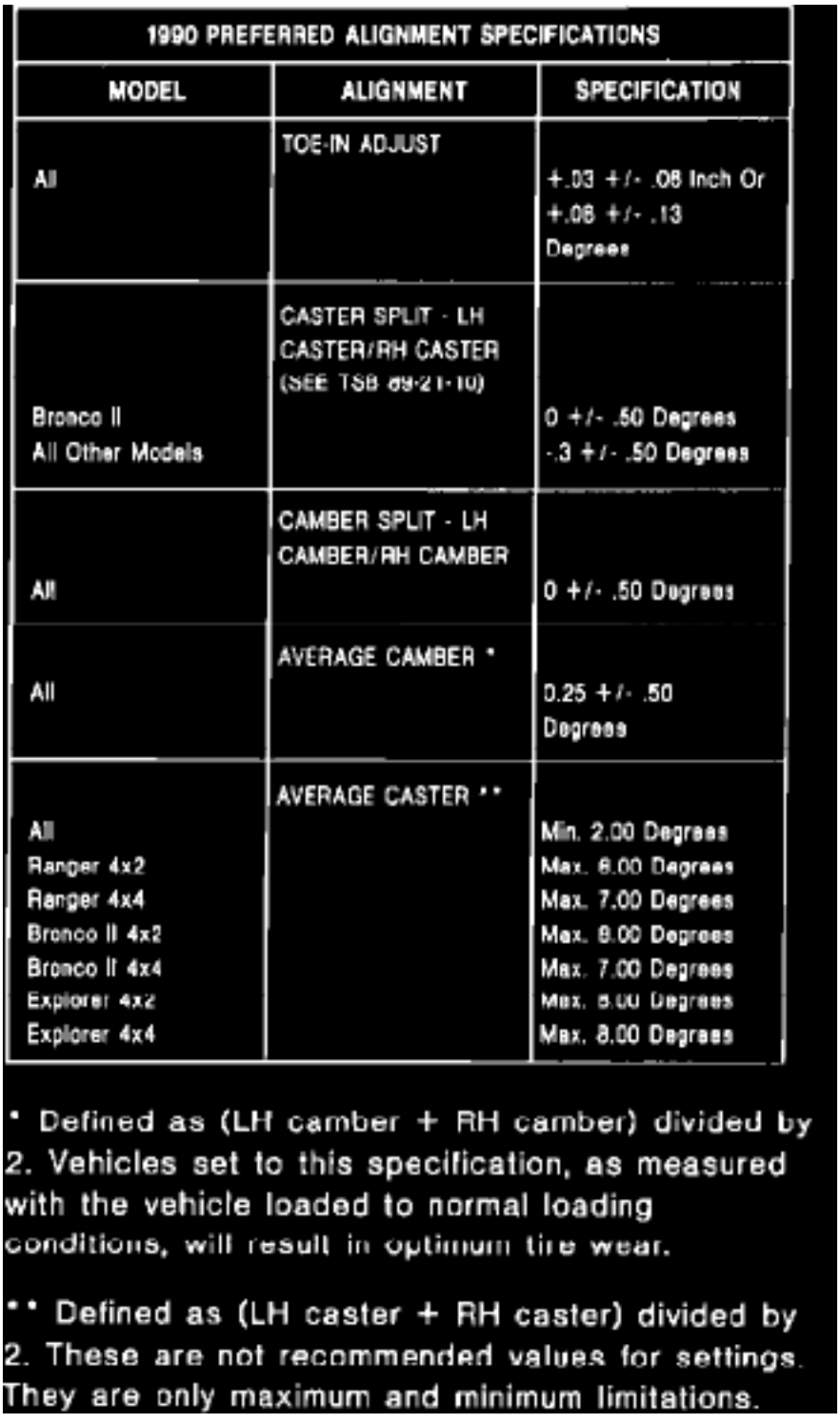
3. Tire Pull - Swap rear tires from side to side and road test. If the concern is not corrected, continue with next step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE: ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE

CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1990 PREFERRED ALIGNMENT SPECIFICATIONS

MODEL	ALIGNMENT	SPECIFICATION
All	TOE-IN ADJUST	+.03 +/- .08 Inch Or +.08 +/- .13 Degrees
Bronco II All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0 +/- .50 Degrees -.3 +/- .50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 +/- .50 Degrees
All	AVERAGE CAMBER *	0.25 +/- .50 Degrees
All Ranger 4x2 Ranger 4x4 Bronco II 4x2 Bronco II 4x4 Explorer 4x2 Explorer 4x4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out of specification vehicles, align to the "1990 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked, if hubs are unlocked, the axle shaft will not rotate with the wheels.

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications.

^ Set the tire pressure to the specification on the certification label.

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to HPO (regular production option) list and set tire pressure to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Drive vehicle after alignment is performed. ^

Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns.

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns.

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Shop Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four tires; put the two closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The truck should be raised so that there is no interference with the steering linkage.

^ The front wheels should also spin freely.

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,789 kPa (0-2000 psi) pressure-gauge (Tool D79L-33610-A, Power Steering Analyzer) in the pressure line between the power steering

pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premimum Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and

re-check the fluid level. Add Premium Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach an lb.in. torque wrench to the steering wheel nut. Apply

sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 6 lb.in. (0.68

N-m), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - Rbs Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greasable steel linkage.

NOTE: ALL SERVICE PART STEERING LINKAGE IS THE GREASABLE STEEL SOCKET TYPE.

Diagnostic Procedure # 6 - Brake Imbalance

Spin the front tires make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 30 mph (48 km/h).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull

concern.

c. Raise the front end of the truck so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE: FOR ALL 4 WHEEL DRIVE TRUCKS, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occurring. Some brake drag will naturally be present for each size of truck.

3. If the truck has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out the bleeder

screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Light Truck Shop Manual, Section 06-06 for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a "C" clamp and wooden block. The piston should easily move back into the bore under the

force of the clamp. Re-build or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side to side.

NOTE: SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. SEE FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 40 mph before evaluating for brake drift. If there is no change in drift while braking, it may be

assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminates (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables and improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out of specification, check for proper

function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums.

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel.

^ Re-apply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder.

^ Re-install the drum and repeat the procedure for the other rear brake.

8. If the condition still exists, swap rear shoes from side to side and drive the truck. If the drift is significantly reduced, replace the rear linings. If the

drift/pull is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

PART NUMBER PART NAME CLASS

E6AZ-19582-AA Steering Fluid V

D7AZ-19690-A Lubricant AW

F1TZ-3B203-A Radius Arm Bushings, 2 B

required

Diagnostic Check List

NOTE: THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances.

_ Caliper to knuckle clearance.

_ Inner shoe side and end clearance.

2. Lubrication of components.

_ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings.

_ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE:

1. Tire mismatch.

_ Unlocked hubs check.

_ Front tires swapped side to side.

_ Rear tires swapped side to side.

_ Front to rear tire swap.

2. Alignment.

_ Unlocked hubs check.

_ Toe changed to _.

_ Caster changed and split is _.

_ Camber changed and split is _.

3. Tire circumference.

_ Unlocked hubs check.

_ Tire circumference checked and two closest circumference tires swapped to rear axle.

4. Steering gear valve.

_ Unlocked hubs check.

_ Install pressure gauge.

_ Check fluid level with engine off and on.

_ Apply torque to the steering wheel nut and check gauge readings.

_ Replaced the shaft and control assembly.

_ Removed the pressure gauge.

5. RABS linkage.

_ Replaced the RBS linkage.

6. Brake imbalance.

_ Unlocked hubs check.

_ Front wheel rotational drag check.

_ Master cylinder check.

_ Piston retraction check.

_ Rotors and linings swapped from side to side.

_ Rear brakes checked.

_ Rear drums and shoes swapped from side to side.

7. Miscellaneous.

_ Check for loose, damaged or worn parts.

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 WARRANTY STATUS:

Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

900907A Service Procedure 1.3 Hr.

900907B Road Test 0.3 Hr.

900907C Procedure 1 1.9 Hr.

900907D Procedure 2 2.4 Hr.

900907E Procedure 3 0.5 Hr.

900907F Procedure 4 0.9 Hr.

900907G Procedure 6 2.3 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

FRONT W2

OASIS CODES: 3050, 3051, 3100, 3200, 3300

Brake Caliper: All Technical Service Bulletins Brakes - Sticking/Binding/Grabbing

Article No. 93-11-7

05/26/93

BRAKES - STICK/BIND/GRAB - FRONT CALIPER PINS CORRODED

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

This TSB article is being republished in its entirety to include F Super Duty vehicles.

ISSUE: Sticking, binding or grabbing of the brakes may be caused by brake caliper slide pins that are corroded. The corrosion does not allow the brake caliper assembly to move freely.

ACTION: Install the new improved caliper pins that are corrosion resistant. Refer to the following Service Procedure for service details.

SERVICE PROCEDURE

1. Remove the caliper and pins. Refer to the applicable Light Truck Service Manual for service details.

NOTE: IF PADS ARE DAMAGED OR WORN, PAD REPLACEMENT IS REQUIRED.

2. Clean the upper and lower knuckle pin grooves, upper and lower knuckle inner pad grooves, and the upper and lower caliper pin grooves with a wire brush or portable wire wheel.

WARNING: USE SAFETY GLASSES AND AN AIR RESPIRATOR WHEN CLEANING THE GROOVES.

3. Apply a light coat of lubricant (D7AZ-19590-A) to the upper and lower knuckle inner pad grooves and upper and lower caliper pin grooves.

CAUTION: LUBRICANT SHOULD NOT BE USED ON ROTORS, LININGS OR CALIPER PISTON BOOTS.

4. Re-assemble the caliper using the new pins, (F2TZ-2C150-A) for all vehicles except F Super Duty. Use new pins (F2TZ-2C150-B) for F Super Duty vehicles.

NOTE: NORMAL BRAKE MAINTENANCE REQUIREMENTS LISTED IN THE OWNER MANUAL SHOULD BE PERFORMED EVERY 15,000 MILES.

PART NUMBER PART NAME CLASS

D7AZ-19590-A Lubricant-Disc Brake AM

F2TZ-2C150-A Pin-Brake Caliper B

F2TZ-2C150-B Pin-Brake Caliper (F Super B

Duty)

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 92-12-14

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models And Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

931107A Aerostar/Ranger/Bronco II, 0.8 Hr.

(Through 1990), Explorer (Starting 1991), F-Series Under 8500 GVW, Bronco And Econoline Under 8500

931107B F-Series Over 8500 GVW 0.9 Hr.

And Econoline Over 8500 GVW Through 1991

931107C F Super Duty Front 1.2 Hr.

931107D F Super Duty Rear 1.2 Hr.

931107E F Super Duty Front And 2.1 Hr.

Rear

DEALER CODING

BASIC PART NO. CONDITION CODE

2C150 41

OASIS CODES: 301000

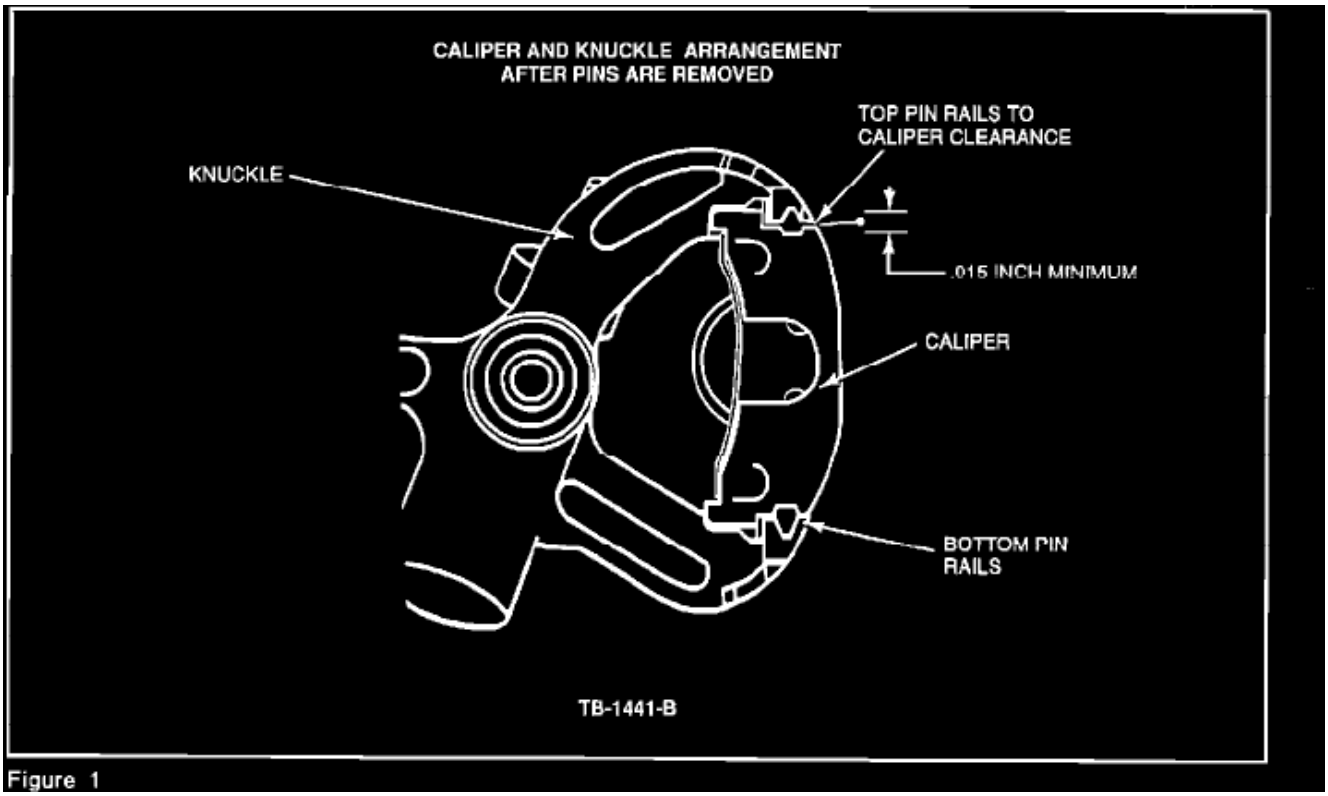


Figure 1

Brake Caliper: All Technical Service Bulletins Front Brakes - Popping or Clunking Noise

Article No. 92-14-7

07/01/92

^ BRAKES - FRONT DISC - "POPPING" OR "CLUNKING" SOUND DURING BRAKING

^ NOISE - "POPPING" OR "CLUNKING" SOUND WHEN BRAKING

^ VIBRATION THROUGH FLOOR BOARD WHEN BRAKING

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 AEROSTAR, RANGER 1991-92 EXPLORER

See TSB # 93-20-11 for additional information.

ISSUE: A "popping" or "clunking" noise and a floor board vibration may occur during braking. The noise and/or vibration may be caused by the front brake caliper suddenly springing away from the caliper abutment and returning.

ACTION: Check and adjust the brake pads and caliper knuckle clearance by using the following service procedure.

1. Road test to confirm that the "popping" or "clunking" noise occurs only during braking at the initial part of the stop.

2. Raise the front of the vehicle.

a. Remove the front wheels.

b. Remove the pins from the caliper.

3. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

NOTE:

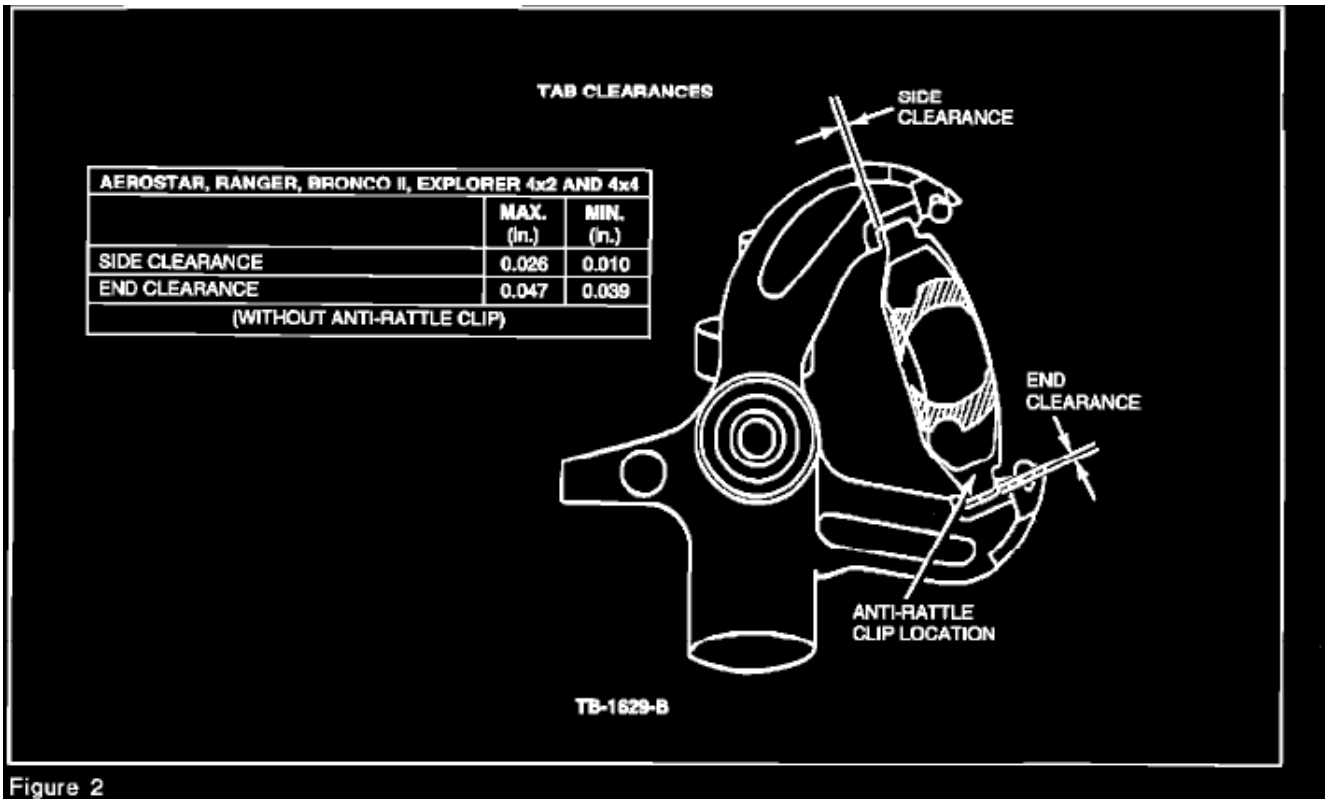


Figure 2

THE CLEARANCE SHOULD BE A MINIMUM OF .015" (.381 MM).

a. If the caliper clearance is less than .015" (.381 mm) on either caliper, replace the caliper and repeat the measurements.

b. If the caliper clearance is less than .015" (.381 mm) on both calipers, replace both calipers and recheck clearance.

c. If the caliper clearance is still less than .015" (.381 mm) on both calipers, replace both spindles (4X2) or knuckles (4X4) and recheck clearance.

NOTE: CHECK THE CLEARANCE OF THE NEW KNUCKLE BEFORE INSTALLATION.

4. After measuring the caliper/knuckle for proper clearance, remove both calipers and brake pad assemblies. Refer to the appropriate Light Truck Service Manual, Section 06-03, for the removal procedure.

5. Replace the caliper piston (FOTZ-2196-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for the replacement procedure.

6. Install the new lining kit (FO9Z-2001-A).

a. Check the side and end clearances with a feeler gauge.

b. Refer to Figure 2 for clearance dimensions.

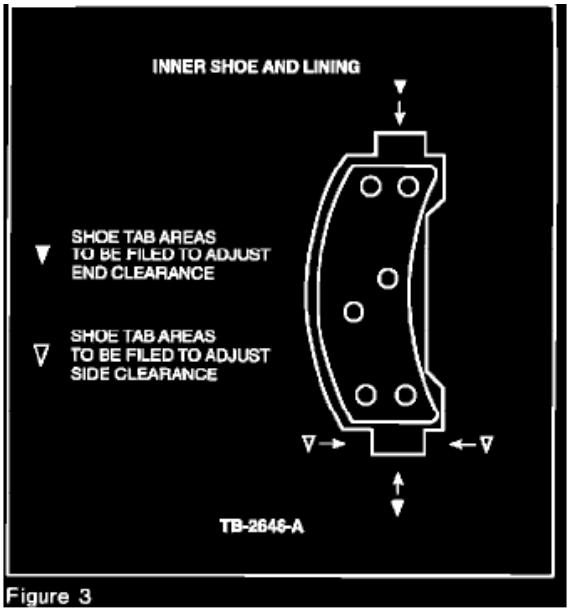


Figure 3

PART NUMBER	PART NAME	CLASS
F0TZ-2196-A	Caliper Piston	B
E8TZ-2C150-B	Caliper Pin	B
F09Z-2001-A	Brake Lining Kit	B
D7AZ-19590-A	Disc Brake Lubricant	AM
F09Z-2B120-A	Caliper, RH	B
F09Z-2B121-A	Caliper, LH	B
E9TZ-3105-B	Spindle Assembly, RH - (Ranger, Bronco II, Explorer)	B
E9TZ-3106-B	Spindle Assembly, LH - (Ranger, Bronco II, Explorer)	B
E79Z-3105-A	Spindle Assembly, RH - (Aerostar)	B
E79Z-3106-A	Spindle Assembly, LH - (Aerostar)	B
F09Z-3130-A	Knuckle, RH (AWD Aerostar)	C
F09Z-3131-A	Knuckle, LH (AWD Aerostar)	C
F0TZ-3130-A	Arm Assembly, RH (4X4 Explorer)	B
F0TZ-3131-A	Arm Assembly, LH (4X4 Explorer)	B
E8TZ-3130-A	Arm Assembly, RH (4X4 Bronco II)	B
E8TZ-3131-A	Arm Assembly, LH (4X4 Bronco II)	B

7. If the lining clearance is not to the required dimensions, file the shoe tab. Remove equal amounts from both sides and ends, Figure 3.

WARNING: USE SAFETY GLASSES WHEN FILING THE BACKING PLATES.

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

8. Assemble the brakes and caliper pins (E8TZ-2C150-B). Lubricate the caliper pins with disc brake lubricant (D7AZ-19590-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for assembling details.

9. Apply a light coat of disc brake lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove. Also apply a light coat of disc brake lubricant (D7AZ-19590-A) to the caliper rails.

CAUTION: PREVENT LUBRICANT FROM STICKING TO ROTORS, LININGS OR CALIPER PISTON BOOTS.

PART NUMBER

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models

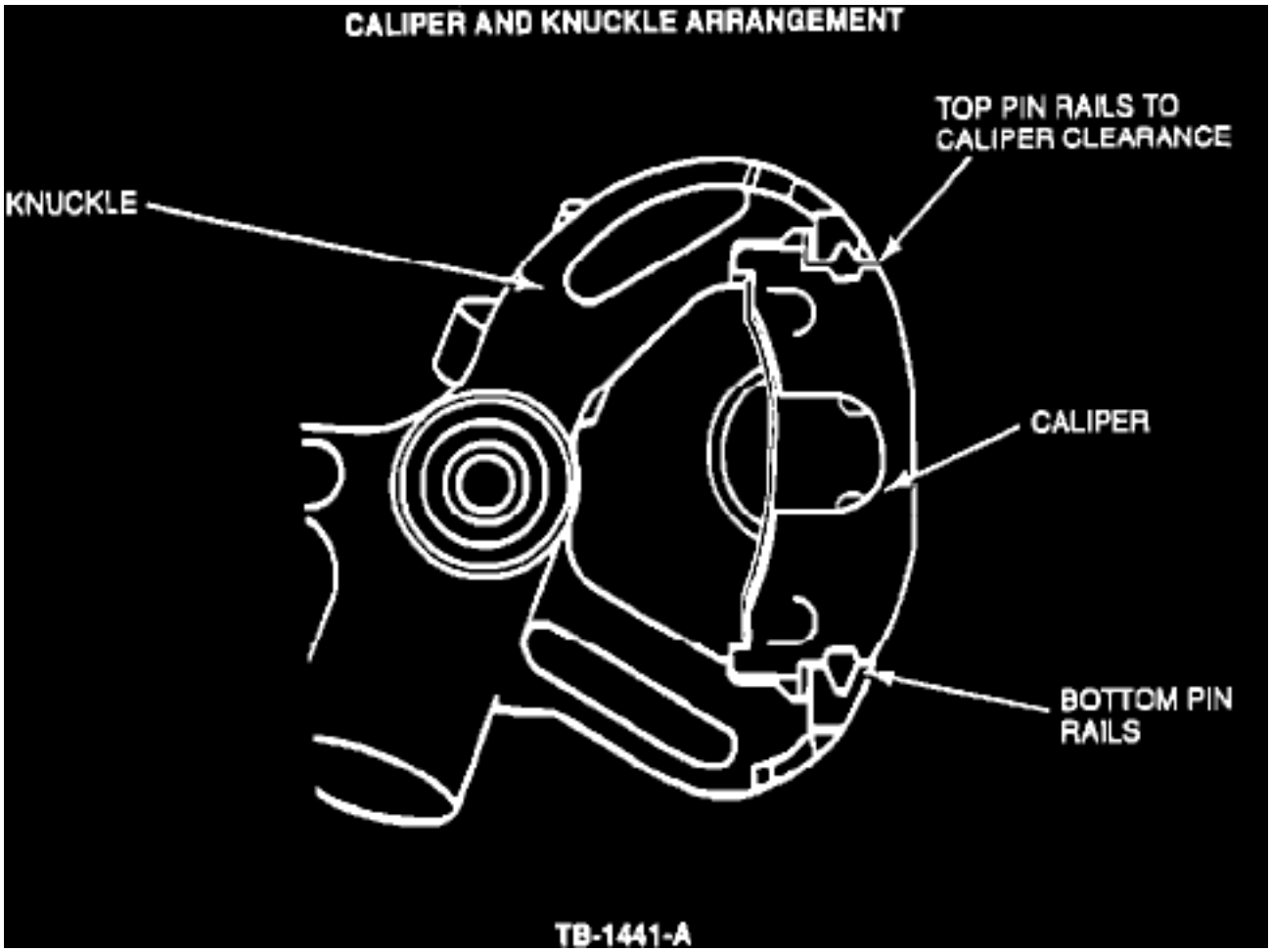
OPERATION	DESCRIPTION	TIME
921407A	Check Clearance/Replace Caliper Pistons/Replace Pads/File Pads to Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.3 Hrs.
921407B	Check Clearance/Replace Caliper Assembly/Replace One Caliper Piston/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.7 Hrs.
921407C	Check Clearance/Replace Both Caliper Assemblies/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.9 Hrs.
921407D	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.9 Hrs.
921407E	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/ Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Explorer 4X4	3.1 Hrs.
921407F	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	2.6 Hrs.
921407G	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	2.7 Hrs.
921407H	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.0 Hrs.
921407I	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	3.4 Hrs.
921407J	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.0 Hrs.
921407K	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Both Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.0 Hrs.
921407L	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	3.3 Hrs.
921407M	Replace Both Caliper Assemblies/Replace Both Knuckles/ Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	4.3 Hrs.
921407N	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.3 Hrs.
921407O	Replace Both Caliper Assemblies/Replace Both Knuckles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.6 Hrs.

DEALER CODING

BASIC PART NO.	CONDITION CODE
2C150	56

OASIS CODES: 301000, 702100, 703000

WARRANTY STATUS AND OPERATION DESCRIPTION



Technical Service Bulletin # 9097 Date: 900427

Steering/Suspension - Pull/Drift Diagnostic Procedure

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

Article No. 90-9-7

LIGHT TRUCK: 1988-90 BRONCO II, RANGER 1991 EXPLORER

ISSUE: A comprehensive, pull and drift diagnostic procedure has been developed to assist techicians with truck service.

ACTION: Use the following service procedure to resolve drift and pull concerns.

This is the same basic procedure as published in TSB 90-7-16 for the 1988-90 Bronco and F-150, 4x4 models. However, you should note that there are some differences such as replacing radius arm bushings instead of installing a radius arm bracket kit, etc.

Proceed with the Pull and Drift Diagnostic Procedure if the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE: THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

Service Procedure

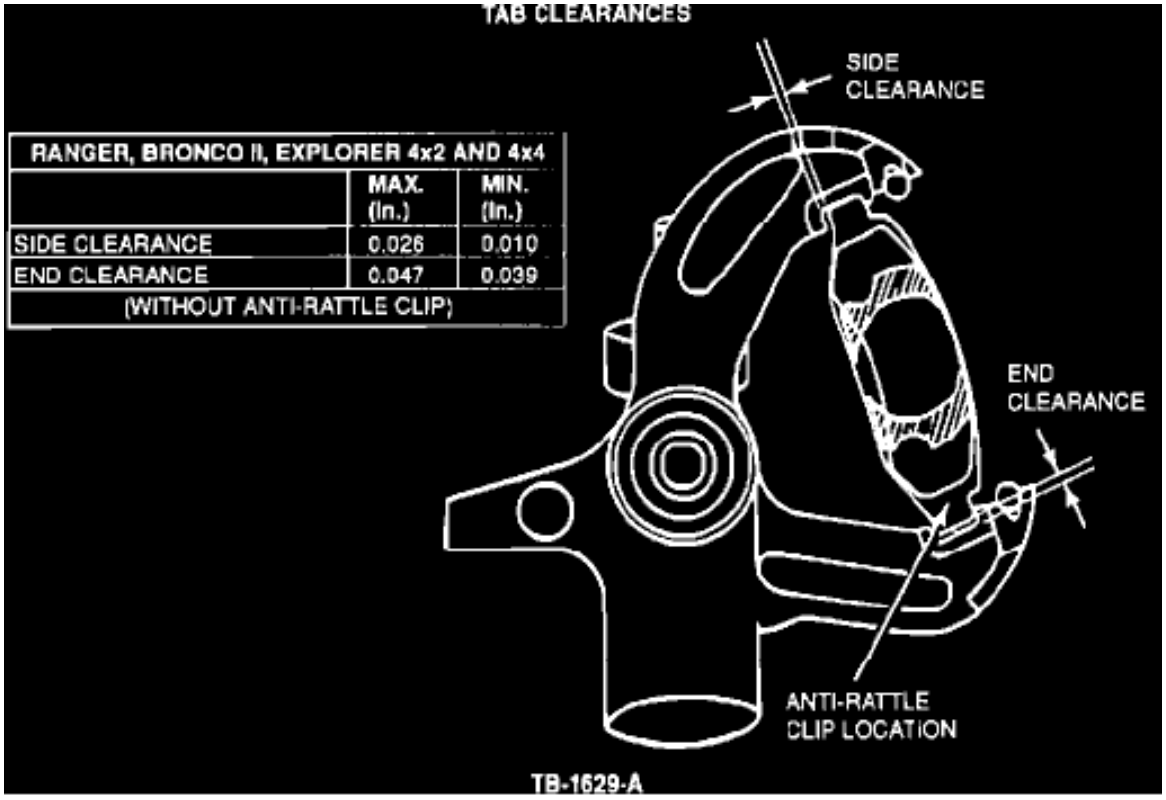
Figure 1

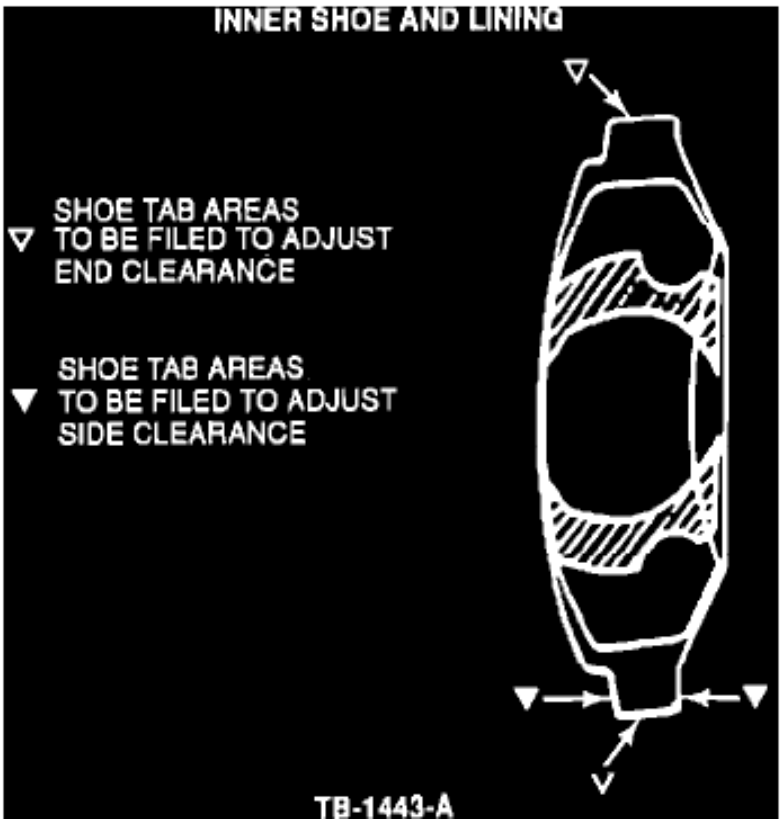
1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

Clearance should be a minimum of .015 ".





c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE: CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

Figure 2

Figure 3

f. Re-install pad and check the side and end clearances with a feeler gauge. (See Figure 2 for clearance dimensions.)

g. If the pad clearances are within specification, refer to Service Procedure Step 2 - "Caliper Groove Lubrication". If the pad clearances are not to the

required dimensions, file the steel backing plate.

WARNING: USE SAFETY GLASSES WHEN FILING STEEL BACKING PLATES

h. File material, removing equal amounts from both sides or ends. (See Figure 3.)

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

i. Check the tab clearances and install anti-rattle clip on the lower pad tab, Figure

2.

2. Apply a light coat of lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove and caliper rails. CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

3. Replace the right and left side arm bushings with new bushings (FITZ-3B203-A). Refer to the appropriate Light Truck Shop Manual, Section 04-OIC

for service details.

NOTE: THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

Pull Drift Diagnostic Procedure

The Pull Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the truck with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) are present.

The Road Test

It is important to test drive the truck with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind.

^ Tire pressure should be checked and adjusted, if necessary.

^ A second person in the truck during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location.

^ On trucks with automatic locking hubs, it is necessary to drive (20) feet forward and then backwards to unlock the hubs.

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 50-55 mph (80-89 km/h). **DO NOT BRAKE**	Is there a steady state pull? If no, go to the next step.	**See Diagnostic Procedure 1.** Tire mismatch or tire pressure concern
While stopped, have second person move to the left hand rear passenger location. Maintaining 50-55 mph (80-89 km/h).	Any change in pull? If no change, go to next step.	**See Diagnostic Procedure 2** Caster split
Make sure front hubs are unlocked (if equipped*). Accelerate the truck - decelerate the truck using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next step.	**See Diagnostic Procedure 3.** Possible limited slip rear axle and tire circumference
Maintain a steady speed of 50-55 mph (80-89 km/h). Put the vehicle in neutral and shut off the engine.	Does the pull go away? If no, go to the next step.	**See Diagnostic Procedure 4.** Steering gear valve off center
Stop the truck along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the truck; rotate the wheel full right. Does the pull change - better or worse? If no, go to next step.	**See Diagnostic Procedure 5.** Possible Rubber Ball Socket (RBS) memory steer
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging RABS.	Does the trucks heading change during brake application? If no, go to next step.	**See Diagnostic Procedure 6.** Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the truck from 50 mph (80 km/h).	Does the vehicle pull with A/L disconnected? If no, go to next step.	**See Diagnostic Procedure 6** Possible inadequate rear brake application
Brake the truck hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** Possible unequal rear brake application

NOTE: IT IS POSSIBLE THAT THE TRUCK MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART FOLLOWS.

NOTE: RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO (regular production option) list and set tire psi to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side to side and road test. If the concern is not corrected, continue with next step.

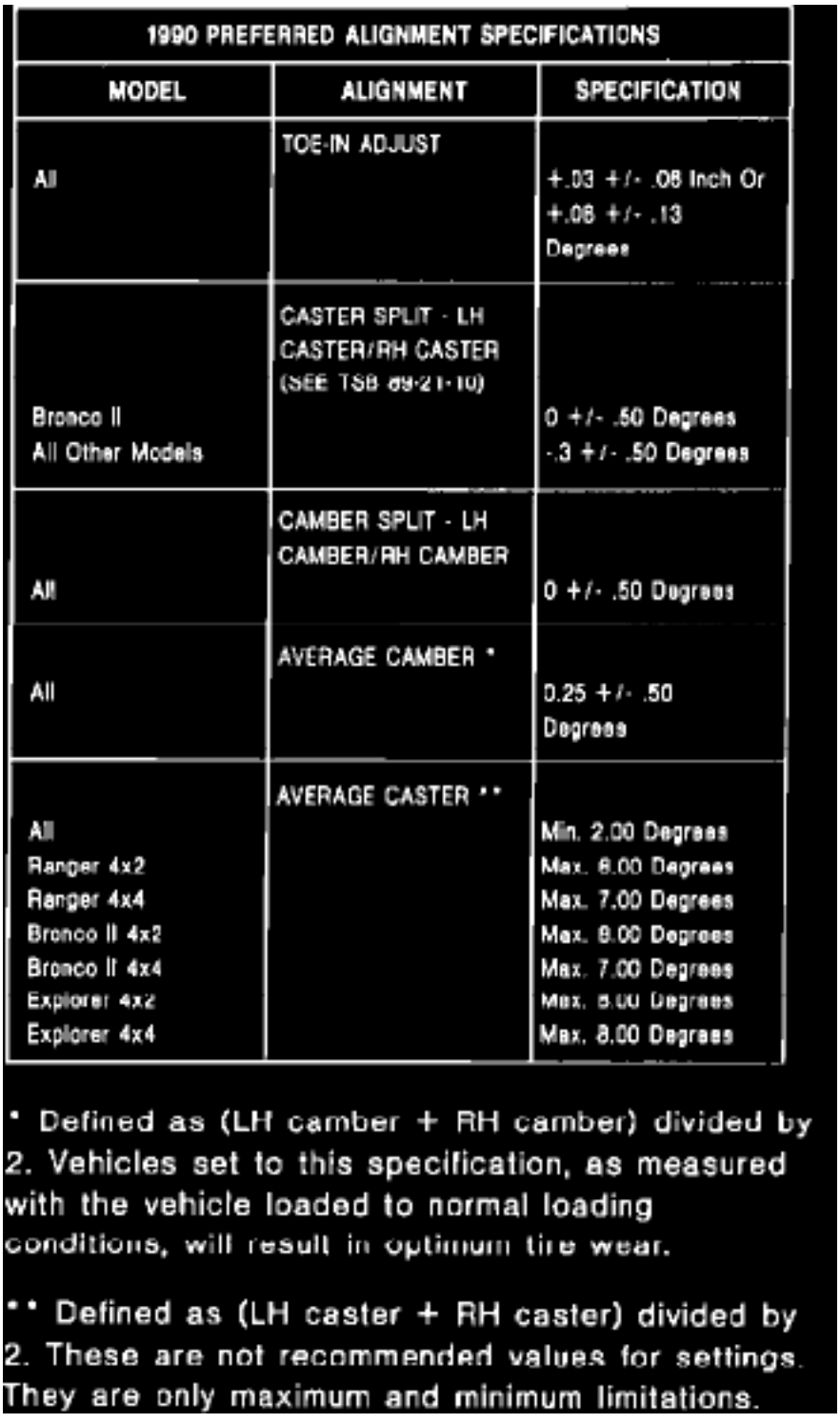
3. Tire Pull - Swap rear tires from side to side and road test. If the concern is not corrected, continue with next step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE: ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE

CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1990 PREFERRED ALIGNMENT SPECIFICATIONS		
MODEL	ALIGNMENT	SPECIFICATION
All	TOE-IN ADJUST	+.03 +/- .08 Inch Or +.08 +/- .13 Degrees
Bronco II All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0 +/- .50 Degrees -.3 +/- .50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 +/- .50 Degrees
All	AVERAGE CAMBER *	0.25 +/- .50 Degrees
All Ranger 4x2 Ranger 4x4 Bronco II 4x2 Bronco II 4x4 Explorer 4x2 Explorer 4x4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out of specification vehicles, align to the "1990 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked, if hubs are unlocked, the axle shaft will not rotate with the wheels.

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications.

^ Set the tire pressure to the specification on the certification label.

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to HPO (regular production option) list and set tire pressure to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Drive vehicle after alignment is performed. ^

Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns.

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns.

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Shop Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four tires; put the two closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The truck should be raised so that there is no interference with the steering linkage.

^ The front wheels should also spin freely.

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,789 kPa (0-2000 psi) pressure-gauge (Tool D79L-33610-A, Power Steering Analyzer) in the pressure line between the power steering

pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premimum Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and

re-check the fluid level. Add Premium Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach an lb.in. torque wrench to the steering wheel nut. Apply

sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 6 lb.in. (0.68

N-m), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - Rbs Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greasable steel linkage.

NOTE: ALL SERVICE PART STEERING LINKAGE IS THE GREASABLE STEEL SOCKET TYPE.

Diagnostic Procedure # 6 - Brake Imbalance

Spin the front tires make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 30 mph (48 km/h).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull

concern.

c. Raise the front end of the truck so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE: FOR ALL 4 WHEEL DRIVE TRUCKS, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occurring. Some brake drag will naturally be present for each size of truck.

3. If the truck has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out the bleeder

screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Light Truck Shop Manual, Section 06-06 for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a "C" clamp and wooden block. The piston should easily move back into the bore under the

force of the clamp. Re-build or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side to side.

NOTE: SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. SEE FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 40 mph before evaluating for brake drift. If there is no change in drift while braking, it may be

assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminates (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables and improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out of specification, check for proper

function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums.

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel.

^ Re-apply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder.

^ Re-install the drum and repeat the procedure for the other rear brake.

8. If the condition still exists, swap rear shoes from side to side and drive the truck. If the drift is significantly reduced, replace the rear linings. If the

drift/pull is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

PART NUMBER PART NAME CLASS

E6AZ-19582-AA Steering Fluid V

D7AZ-19690-A Lubricant AW

F1TZ-3B203-A Radius Arm Bushings, 2 B

required

Diagnostic Check List

NOTE: THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances.

_ Caliper to knuckle clearance.

_ Inner shoe side and end clearance.

2. Lubrication of components.

_ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings.

_ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE:

1. Tire mismatch.

_ Unlocked hubs check.

_ Front tires swapped side to side.

_ Rear tires swapped side to side.

_ Front to rear tire swap.

2. Alignment.

_ Unlocked hubs check.

_ Toe changed to _.

_ Caster changed and split is _.

_ Camber changed and split is _.

3. Tire circumference.

_ Unlocked hubs check.

_ Tire circumference checked and two closest circumference tires swapped to rear axle.

4. Steering gear valve.

_ Unlocked hubs check.

_ Install pressure gauge.

_ Check fluid level with engine off and on.

_ Apply torque to the steering wheel nut and check gauge readings.

_ Replaced the shaft and control assembly.

_ Removed the pressure gauge.

5. RABS linkage.

_ Replaced the RBS linkage.

6. Brake imbalance.

_ Unlocked hubs check.

_ Front wheel rotational drag check.

_ Master cylinder check.

_ Piston retraction check.

_ Rotors and linings swapped from side to side.

_ Rear brakes checked.

_ Rear drums and shoes swapped from side to side.

7. Miscellaneous.

_ Check for loose, damaged or worn parts.

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 WARRANTY STATUS:

Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

900907A Service Procedure 1.3 Hr.

900907B Road Test 0.3 Hr.

900907C Procedure 1 1.9 Hr.

900907D Procedure 2 2.4 Hr.

900907E Procedure 3 0.5 Hr.

900907F Procedure 4 0.9 Hr.

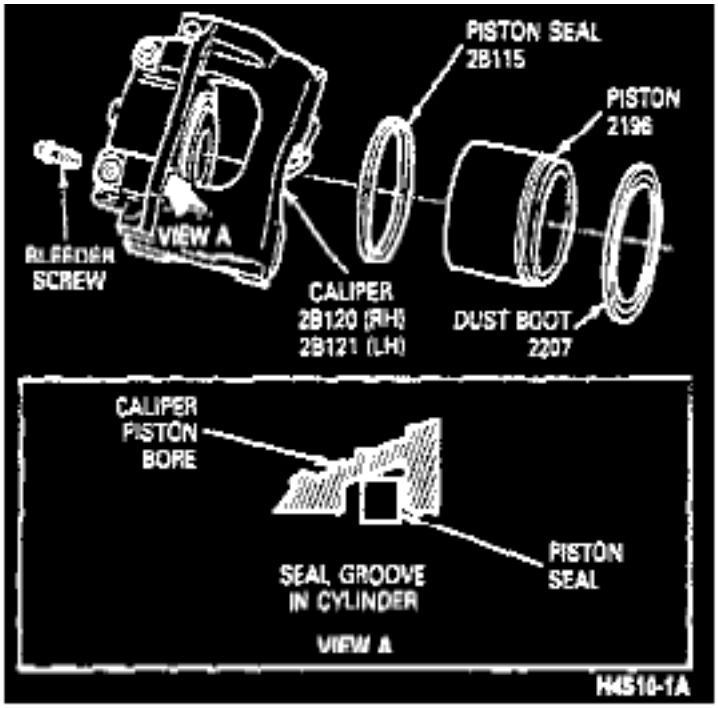
900907G Procedure 6 2.3 Hr.

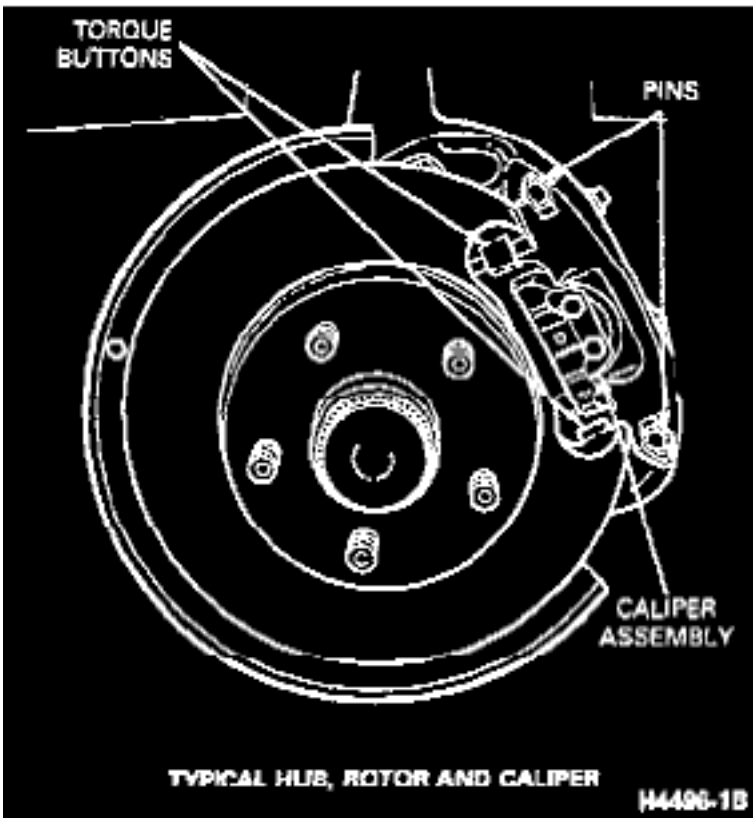
DEALER CODING

BASIC PART NO. CONDITION CODE

FRONT W2

OASIS CODES: 3050, 3051, 3100, 3200, 3300


PISTON SEAL
2B115
PISTON
2196
BLEEDER
SCREW
VIEW A
CALIPER
2B120 (RH)
2B121 (LH)
DUST BOOT
2207
CALIPER
PISTON
BORE
PISTON
SEAL
SEAL GROOVE
IN CYLINDER
VIEW A
H4510-1A


TORQUE
BUTTONS
PINS
CALIPER
ASSEMBLY
TYPICAL HUB, ROTOR AND CALIPER
H4496-1B

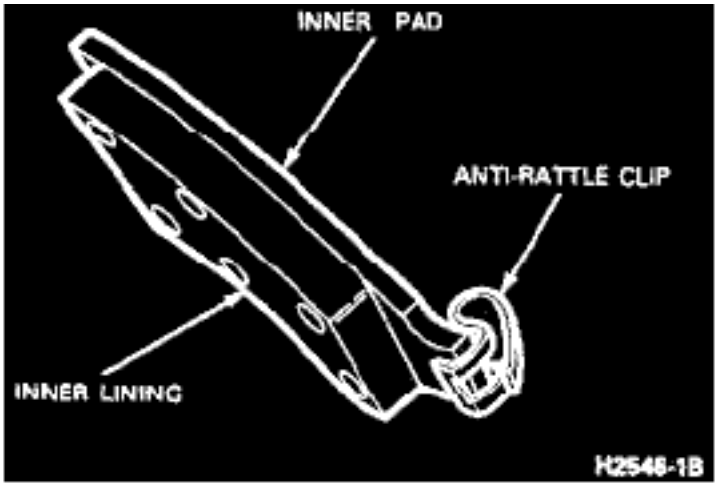
Brake Caliper: Description and Operation

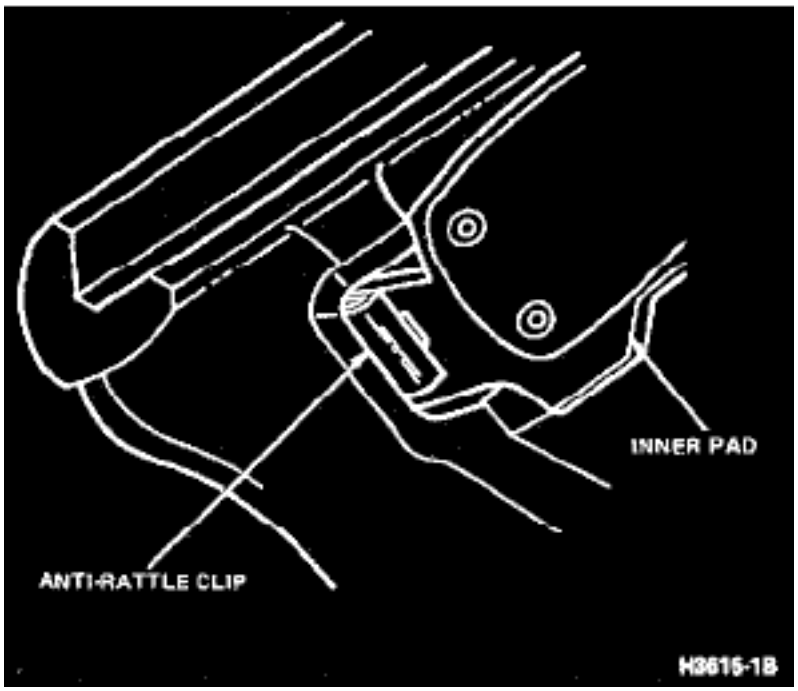
Caliper Assembly

Brake Caliper

The caliper assembly consists of a pin slider caliper housing, inner and outer pad and lining assemblies, and a single piston. The caliper assembly slides on two pins which also attach the caliper to the spindle.

The caliper housing contains a piston. The piston has a molded rubber dust boot on its outer end that is pressed into a cylinder bore groove to prevent cylinder contamination. There is also a rectangular section rubber piston seal located in the cylinder bore providing sealing between the cylinder and piston. This seal also causes the piston to retract once the brakes are released.





Brake Caliper: Service and Repair Inspection

For additional information see Installation Notes. See: Fundamentals and Basics

1. The caliper piston must be "bottomed out" when replacing pad and lining assemblies with new parts. "Bottom out" the caliper piston with an eight

inch c-clamp using a worn out inner pad or a block of wood to push against the piston. Never attempt to "bottom out" piston with outer pad installed.

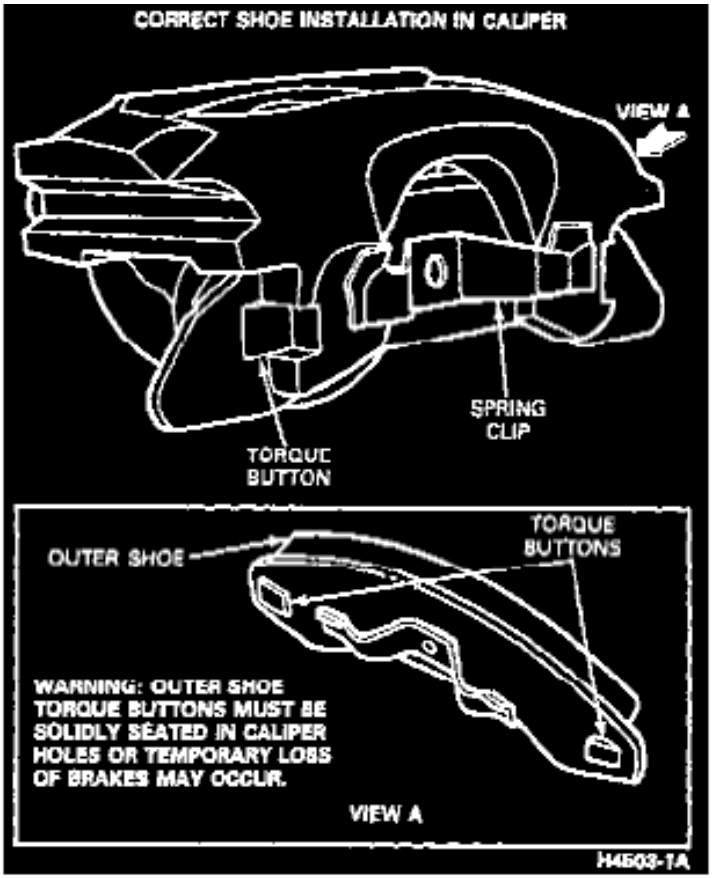
Installing Anti-Rattle Clip

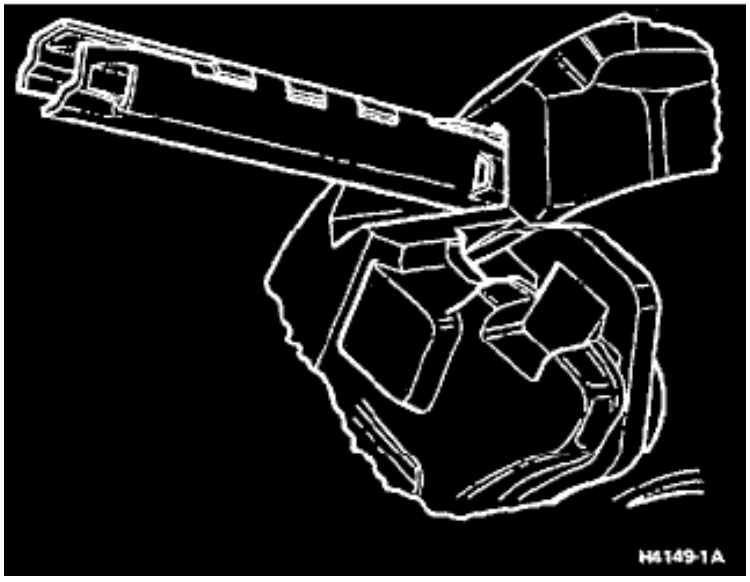
2. Place a new anti-rattle clip on the lower end of the inner pad. Be sure the tabs on the clip are positioned properly and the clip is fully seated.

Installing Inner Shoe And Anti-Rattle Clip

3. Position the inner pad and anti-rattle clip in the pad abutment with the anti-rattle clip tab against the pad abutment and the loop-type spring away

from the rotor. Compress the anti-rattle clip and slide the upper end of the pad in position.


CORRECT SHOE INSTALLATION IN CALIPER
VIEW A
SPRING CLIP
TORQUE BUTTON
TORQUE BUTTONS
OUTER SHOE
WARNING: OUTER SHOE TORQUE BUTTONS MUST BE SOLIDLY SEATED IN CALIPER HOLES OR TEMPORARY LOSS OF BRAKES MAY OCCUR.
VIEW A
H4503-1A


H4149-1A

Outer Pad Installation

4. Install the outer pad, making sure the torque buttons on the pad are seated solidly in the matching holes in the caliper. 5. Install the caliper on the spindle, making sure the mounting surfaces are free of dirt and lubricate the caliper grooves with disc brake caliper

grease.

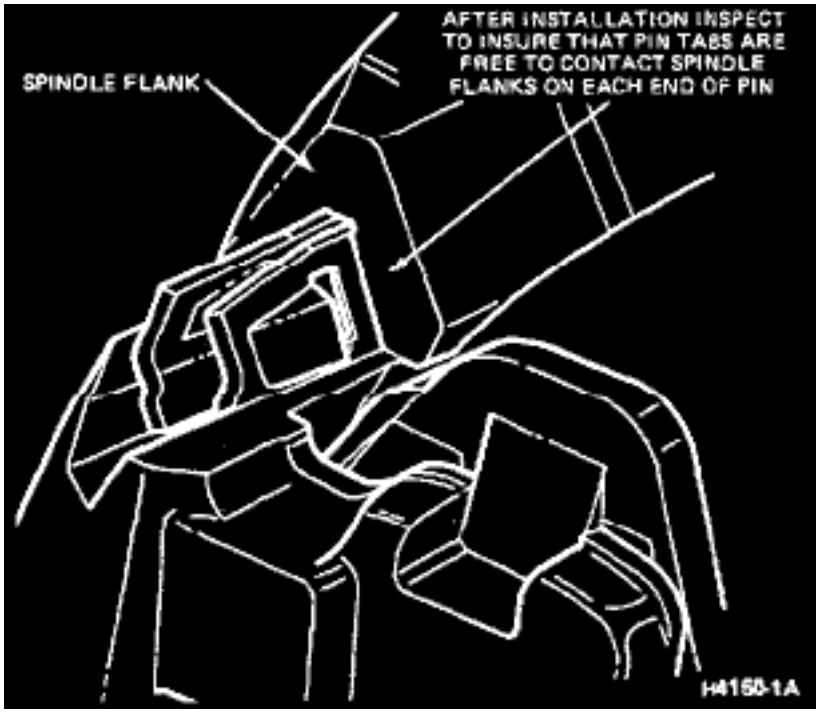
Caliper Pin Installation

6. Position pin with the pin retention tabs oriented adjacent to the spindle groove.

NOTE: Do not use the bolt and nut with the new pin.

7. Tap the pin on the outboard end with a hammer. Continue tapping the pin inward until the retention tabs on the sides of the pin contact the spindle

face. Repeat procedure for the lower pin.



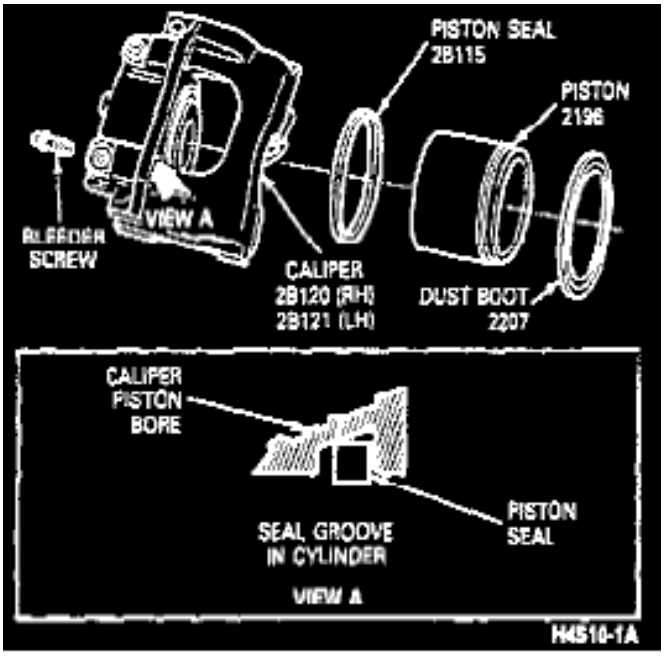
Correct Caliper Pin Installation

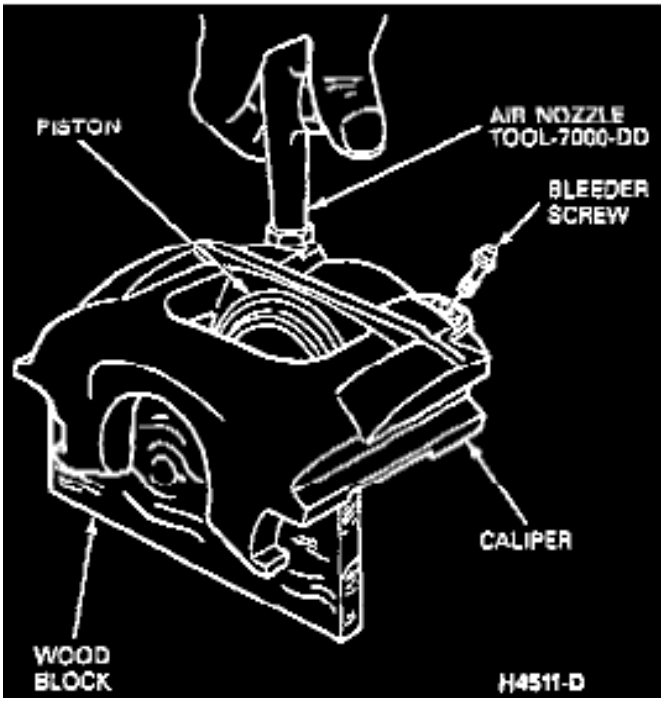
CAUTION: During the installation procedure do not allow the tabs of the caliper pin to be tapped too far into the spindle groove. If this happens it will be necessary to tap the other end of the caliper pin until the tabs snap into place. The tabs on each end of the caliper pin must be free to catch on the spindle flanks.

8. If removed, install the brake hose to the caliper and perform brake bleeding procedures.

Lower the vehicle, check the brake fluid level and fill as necessary. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.


PISTON SEAL
2B115
PISTON
2196
BLEEDER
SCREW
VIEW A
CALIPER
2B120 (RH)
2B121 (LH)
DUST BOOT
2207
CALIPER
PISTON
BORE
PISTON
SEAL
SEAL GROOVE
IN CYLINDER
VIEW A
H4510-1A


PISTON
AIR NOZZLE
TOOL-7000-DD
BLEEDER
SCREW
CALIPER
WOOD
BLOCK
H4511-D

Brake Caliper: Service and Repair Rebuild

Caliper Assembly

NOTE: Do not use a screwdriver or any similar tool to pry piston into or out of the bore to prevent chipping or scuffing damage to the phenolic piston.

DISASSEMBLY

1. Remove the caliper assembly. Place a block of wood over the piston before applying air pressure to prevent damage to the piston.

Removing Piston

WARNING: Do not place fingers in front of piston in an attempt to catch or protect it when applying compressed air. This could result in serious injury.

2. Apply air pressure to the fluid port in the caliper with a rubber-tipped nozzle to remove the piston. If the piston is seized and cannot be forced

from the caliper, tap lightly around the piston while applying air pressure.

3. Remove the dust boot from the caliper assembly. 4. Remove the rubber piston seal from the cylinder and discard it.

CLEANING AND INSPECTION

^ Clean all metal parts with isopropyl alcohol or brake parts cleaner. Then, clean out and dry the grooves and passageways with compressed air. Make sure caliper bore and component parts are thoroughly clean.

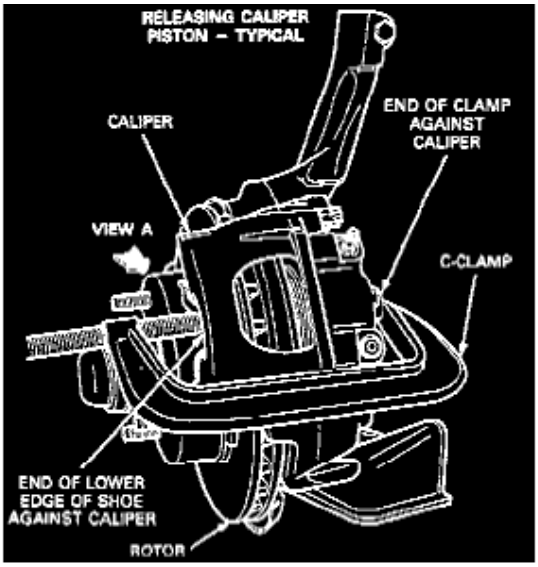
^ Check the cylinder bore and piston for damage or excessive wear. Replace the piston if it shows signs of pitting, scoring or cracks.

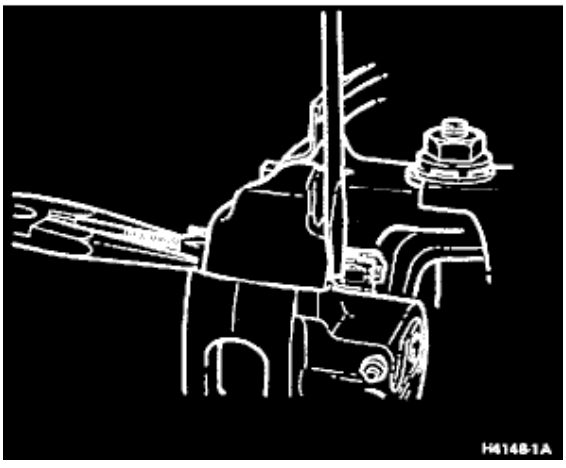
ASSEMBLY

1. Apply a film of clean brake fluid to the new caliper piston seal, and install it in the cylinder bore. Be sure the seal does not become twisted but is

firmly seated in the groove.

2. Install a new dust boot by setting the flange squarely in the outer groove of the caliper bore. 3. Coat the piston with brake fluid, and install the piston in the cylinder bore. 4. Spread the dust boot over the piston as it is installed. Seat the dust boot in the piston groove. 5. Install the caliper.


RELEASING CALIPER PISTON – TYPICAL
CALIPER
END OF CLAMP AGAINST CALIPER
VIEW A
C-CLAMP
END OF LOWER EDGE OF SHOE AGAINST CALIPER
ROTOR


H4148-1A

Brake Caliper: Service and Repair Removal

For additional information see Removal Notes. See: Fundamentals and Basics

1. Use a clean siphon or suction hose to remove a portion of the fluid from the master cylinder. Discard the removed fluid.

CAUTION: System contamination may result if anything other than a clean device is used to remove fluid from master cylinder.

2. Raise the vehicle and install safety stands. Remove wheel and tire assembly.

Compressing Caliper

3. Use an eight-inch C-clamp to move the piston back into its bore as follows:

a. Place the head of the C-clamp against the caliper, and the screw end of the C-clamp against the outer pad below the spring clip.

CAUTION: Do not position C-clamp on the spring clip. Also, do not compress piston further than is required to disengage torque buttons from caliper. Damage to the spring clip will result. Replace pad if spring clip is bent or damaged.

CAUTION: Do not attempt to "bottom" the piston in the bore at this time. Use an old, worn out brake pad or block of wood and the C-clamp to bottom the piston once caliper is removed from rotor, and the pads are removed from the caliper.

b. Tighten the clamp until the torque buttons just clear the caliper (about 3 mm [1/8 in]). Remove the C-clamp.

CAUTION: Do not use a screwdriver or similar tool to pry piston away from the rotor.

4. Clean excess dirt from area around pin tabs. 5. Tap upper caliper pin towards inboard side until pin locking tabs touch the spindle face. 6. Insert a screwdriver into the slot provided behind the pin tabs on the inboard side of the pin.

Compressing Pin Tabs

7. Use needle nose pliers to compress the outboard end of the pin while prying at the same time with the screwdriver, until tabs slip into the spindle

groove.

8. Place one end of a punch (approximately 7/16 inch diameter) against the end of the caliper pin and drive the caliper pin out of the caliper slide

groove.

9. Repeat removal procedure for lower pin.

10. Remove the caliper from the rotor. If the caliper is to be removed for service, disconnect the brake hose from the caliper. If not, secure the caliper

with wire.

CAUTION: Do not let the caliper hang with its weight on the brake hose.

11. Compress the anti-rattle clip and remove the inner pad from the caliper.

Brake Caliper: Fundamentals and Basics Removal Notes

When Removing the Caliper, Remember...

- Prior to removing the calipers, remove/siphon brake fluid from master-cylinder until the reservoir is only 1/3 full.

- Brake fluid will remove paint and damage electrical connections. Use a drip pan and fender covers to protect the vehicle's finish and electrical system.

- Always replace all brake linings on an axle. Never replace only one wheel. Unequal lining thickness between wheels on the same axle will result in a strong steering pull when the brakes are applied.

- Work on one side at a time. If you forget how to reassemble the parts you can always use the other side as a model.

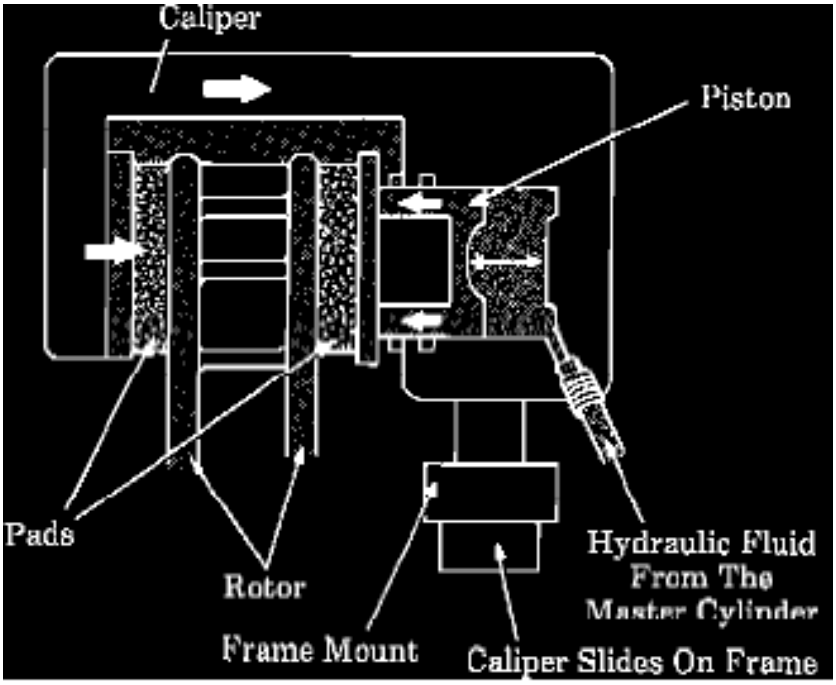
- When forcing the piston back into the caliper, open the bleeder valve first. Corrosion and other deposits accumulate inside of the caliper. If the bleeder valve is not opened when the piston is forced back into the caliper, these deposits will be forced back through the brake lines and into the master-cylinder.

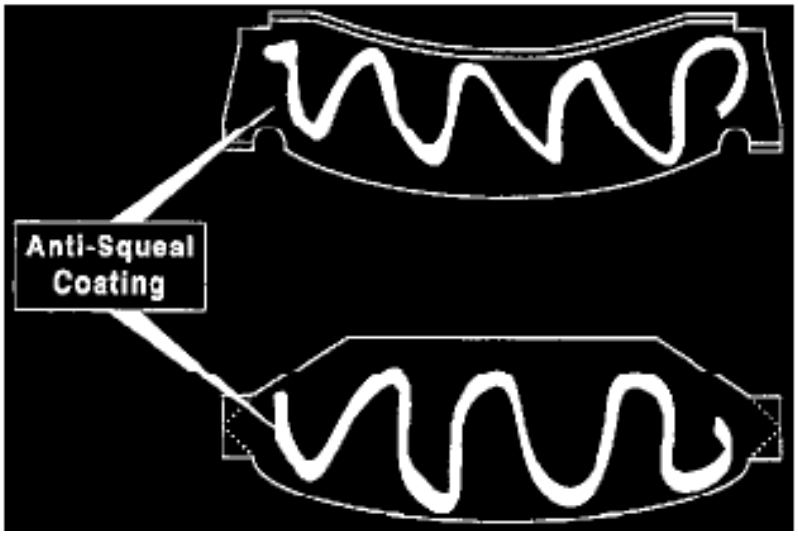
-

When pushing the pistons back into the caliper with the bleeder screw open, a stream of brake fluid will be expelled from the bleeder screw for 2-3 feet. Use a drip pan and be careful not to "shoot" brake fluid onto the vehicle's finish. A cleaner method is to use a piece of clear plastic hose and a glass or plastic jar to catch the expelled fluid.

- Upon removal, Do Not allow the calipers to hang by the flexible brake hoses. The brake hoses can be damaged easily by this practice. These hoses are double walled, damage to the interior pressure hose will not be visible.

- Do not depress the brake pedal with either caliper removed from the rotor. The caliper pistons will be inadvertently expelled from the caliper. If this occurs rebuild or replace the caliper, do not attempt to insert the piston back into the caliper.


Caliper
Piston
Pads
Rotor
Frame Mount
Hydraulic Fluid
From The
Caliper Slides On Frame


Anti-Squeal
Coating

Brake Caliper: Fundamentals and Basics Installation Notes

WHEN INSTALLING CALIPERS AND PADS, REMEMBER...

- Clean and lubricate caliper slide joint/pins with high temperature silicone grease:

Unlike drum brakes, disc brakes do not utilize a spring to withdraw the pads/linings when the brake pedal is released. Disc brakes rely on the elasticity of the piston seals, and the unrestricted movement of the caliper slide assemblies to release the brakes.

If the slide joints/pins are not cleaned and lubricated properly the disc brake linings will drag upon the release of the brake pedal. This will result in overheated brakes and premature brake wear.

Disc Brake Mechanical Force Diagram

NOTE: Floating calipers require free and unrestricted movement on the caliper mounting. Floating or sliding calipers have pistons only on one side of the rotor. The first part of the piston's travel forces the inner pad against the rotor, then further travel forces the movable part of the caliper to pull the outer pad against the rotor.

High temperature silicone lubricant must be used. Low temperature grease can melt and contaminate the pads and rotors, or can bake into a very hard substance which binds the slides. Petroleum based grease can cause the slide boots to soften and swell.

-

Work on one side at a time. If you forget how to reassemble the parts you can always use the other side as a model.

Anti-squeal Coating

- Apply an anti-squeal coating to the back side of the pads/linings. This coatings acts as an insulator to dampen high frequency vibrations that are generated during normal braking. These compounds are highly effective in preventing brake squeal.

- Many professional repair shops recommend always rebuilding or replacing the calipers when replacing the brake linings, because:

When the pistons are forced back into the calipers, the piston seals are dragged across any corrosion or abrasives that may be deposited on the inside of the caliper.

Damage to the seals may not be initially evident. As the new brake linings begin to wear, the piston is gradually withdrawn from the caliper.

This results in the piston seals again being dragged across the layer of corrosion and deposits.

Calipers which are not rebuilt or replaced have a higher probability of sticking or leaking.

- Check to ensure the bleeder screw is not frozen prior to reinstalling caliper. Freeing a stuck bleeder screw is much easier with the caliper removed from the vehicle.

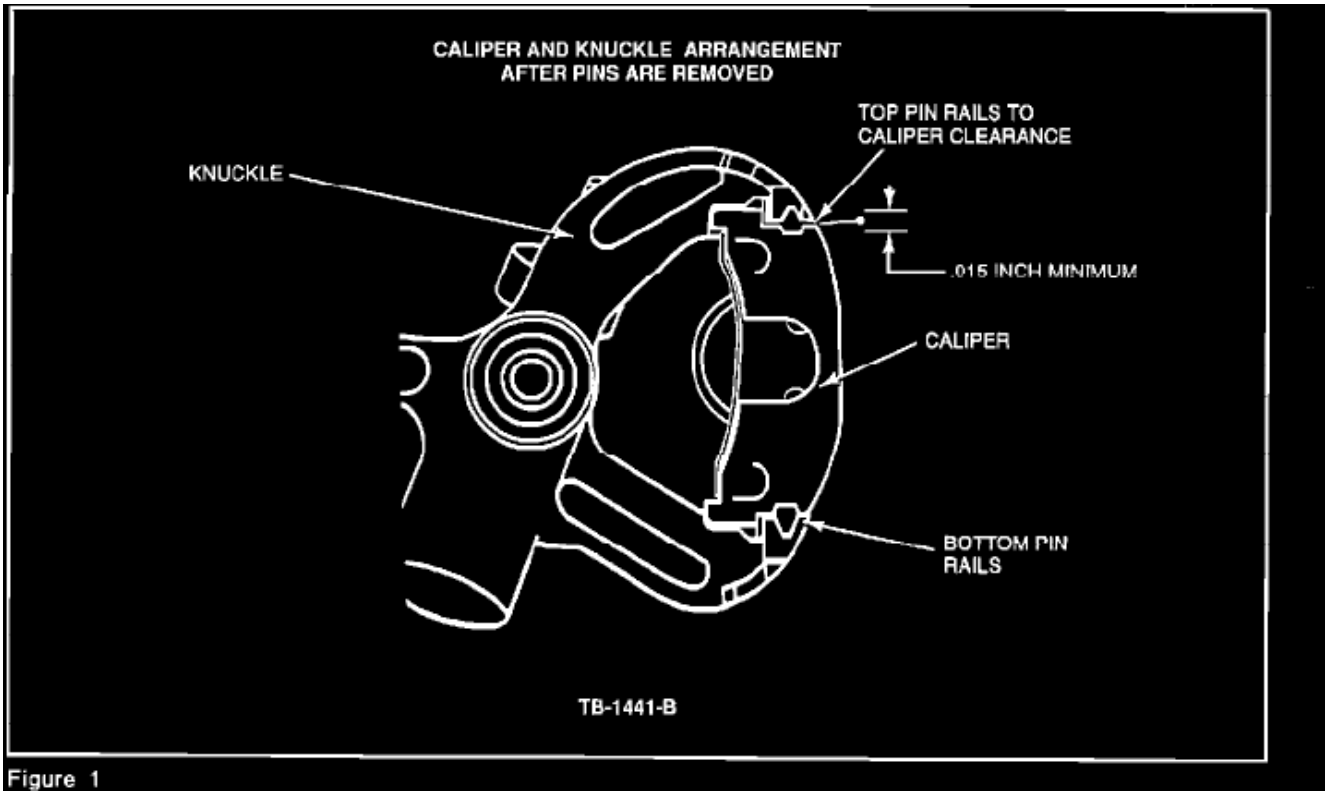


Figure 1

Brake Pad: Customer Interest Front Brakes - Popping or Clunking Noise

Article No. 92-14-7

07/01/92

^ BRAKES - FRONT DISC - "POPPING" OR "CLUNKING" SOUND DURING BRAKING

^ NOISE - "POPPING" OR "CLUNKING" SOUND WHEN BRAKING

^ VIBRATION THROUGH FLOOR BOARD WHEN BRAKING

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 AEROSTAR, RANGER 1991-92 EXPLORER

See TSB # 93-20-11 for additional information.

ISSUE: A "popping" or "clunking" noise and a floor board vibration may occur during braking. The noise and/or vibration may be caused by the front brake caliper suddenly springing away from the caliper abutment and returning.

ACTION: Check and adjust the brake pads and caliper knuckle clearance by using the following service procedure.

1. Road test to confirm that the "popping" or "clunking" noise occurs only during braking at the initial part of the stop.

2. Raise the front of the vehicle.

a. Remove the front wheels.

b. Remove the pins from the caliper.

3. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

NOTE:

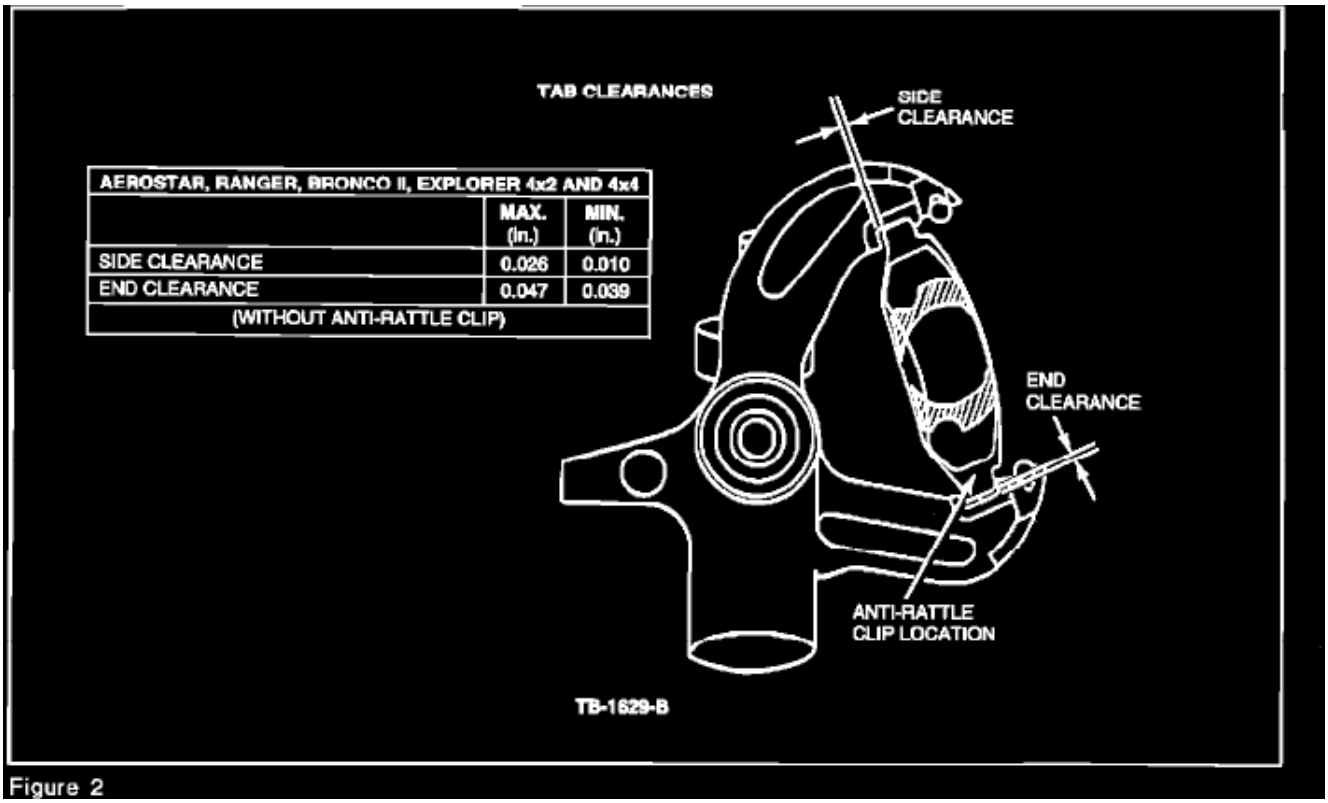


Figure 2

THE CLEARANCE SHOULD BE A MINIMUM OF .015" (.381 MM).

a. If the caliper clearance is less than .015" (.381 mm) on either caliper, replace the caliper and repeat the measurements.

b. If the caliper clearance is less than .015" (.381 mm) on both calipers, replace both calipers and recheck clearance.

c. If the caliper clearance is still less than .015" (.381 mm) on both calipers, replace both spindles (4X2) or knuckles (4X4) and recheck clearance.

NOTE: CHECK THE CLEARANCE OF THE NEW KNUCKLE BEFORE INSTALLATION.

4. After measuring the caliper/knuckle for proper clearance, remove both calipers and brake pad assemblies. Refer to the appropriate Light Truck Service Manual, Section 06-03, for the removal procedure.

5. Replace the caliper piston (FOTZ-2196-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for the replacement procedure.

6. Install the new lining kit (FO9Z-2001-A).

a. Check the side and end clearances with a feeler gauge.

b. Refer to Figure 2 for clearance dimensions.

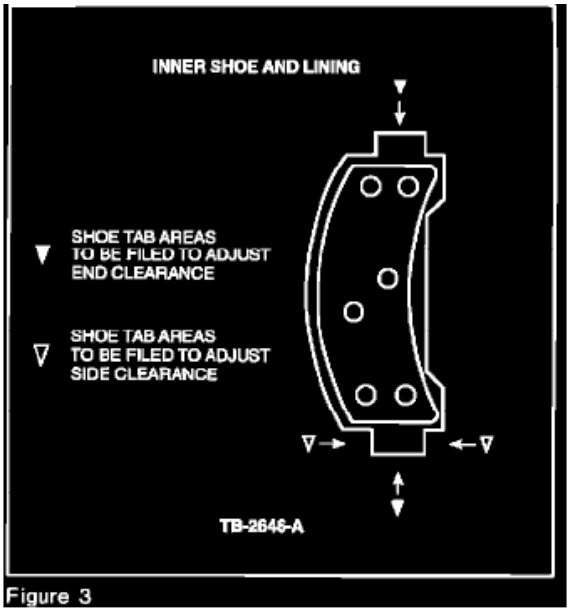


Figure 3

PART NUMBER	PART NAME	CLASS
F0TZ-2196-A	Caliper Piston	B
E8TZ-2C150-B	Caliper Pin	B
F09Z-2001-A	Brake Lining Kit	B
D7AZ-19590-A	Disc Brake Lubricant	AM
F09Z-2B120-A	Caliper, RH	B
F09Z-2B121-A	Caliper, LH	B
E9TZ-3105-B	Spindle Assembly, RH - (Ranger, Bronco II, Explorer)	B
E9TZ-3106-B	Spindle Assembly, LH - (Ranger, Bronco II, Explorer)	B
E79Z-3105-A	Spindle Assembly, RH - (Aerostar)	B
E79Z-3106-A	Spindle Assembly, LH - (Aerostar)	B
F09Z-3130-A	Knuckle, RH (AWD Aerostar)	C
F09Z-3131-A	Knuckle, LH (AWD Aerostar)	C
F0TZ-3130-A	Arm Assembly, RH (4X4 Explorer)	B
F0TZ-3131-A	Arm Assembly, LH (4X4 Explorer)	B
E8TZ-3130-A	Arm Assembly, RH (4X4 Bronco II)	B
E8TZ-3131-A	Arm Assembly, LH (4X4 Bronco II)	B

7. If the lining clearance is not to the required dimensions, file the shoe tab. Remove equal amounts from both sides and ends, Figure 3.

WARNING: USE SAFETY GLASSES WHEN FILING THE BACKING PLATES.

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

8. Assemble the brakes and caliper pins (E8TZ-2C150-B). Lubricate the caliper pins with disc brake lubricant (D7AZ-19590-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for assembling details.

9. Apply a light coat of disc brake lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove. Also apply a light coat of disc brake lubricant (D7AZ-19590-A) to the caliper rails.

CAUTION: PREVENT LUBRICANT FROM STICKING TO ROTORS, LININGS OR CALIPER PISTON BOOTS.

PART NUMBER

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models

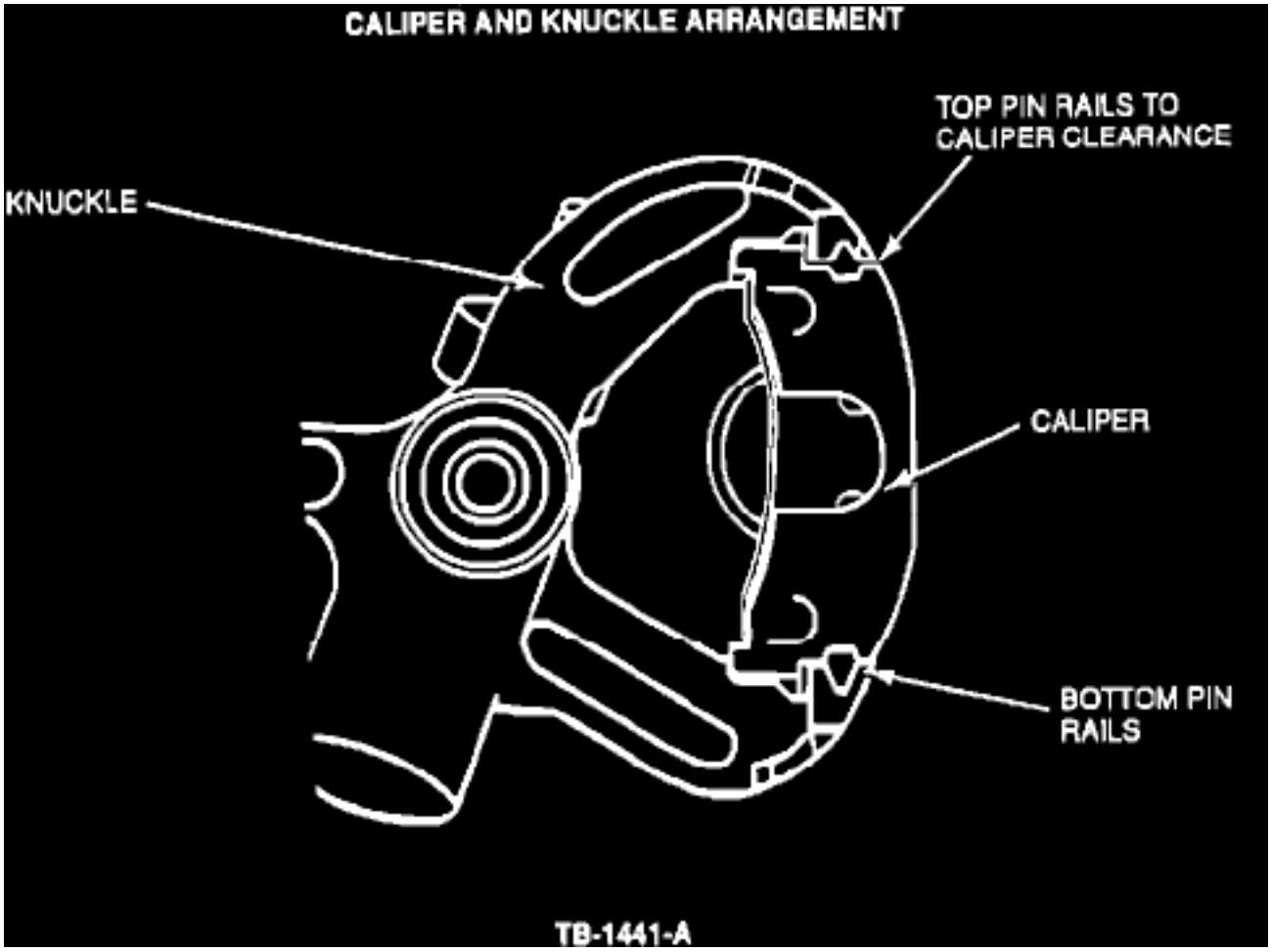
OPERATION	DESCRIPTION	TIME
921407A	Check Clearance/Replace Caliper Pistons/Replace Pads/File Pads to Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.3 Hrs.
921407B	Check Clearance/Replace Caliper Assembly/Replace One Caliper Piston/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.7 Hrs.
921407C	Check Clearance/Replace Both Caliper Assemblies/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.9 Hrs.
921407D	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.9 Hrs.
921407E	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/ Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Explorer 4X4	3.1 Hrs.
921407F	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	2.6 Hrs.
921407G	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	2.7 Hrs.
921407H	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.0 Hrs.
921407I	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	3.4 Hrs.
921407J	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.0 Hrs.
921407K	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Both Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.0 Hrs.
921407L	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	3.3 Hrs.
921407M	Replace Both Caliper Assemblies/Replace Both Knuckles/ Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	4.3 Hrs.
921407N	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.3 Hrs.
921407O	Replace Both Caliper Assemblies/Replace Both Knuckles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.6 Hrs.

DEALER CODING

BASIC PART NO.	CONDITION CODE
2C150	56

OASIS CODES: 301000, 702100, 703000

WARRANTY STATUS AND OPERATION DESCRIPTION



Technical Service Bulletin # 9097 Date: 900427

Steering/Suspension - Pull/Drift Diagnostic Procedure

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

Article No. 90-9-7

LIGHT TRUCK: 1988-90 BRONCO II, RANGER 1991 EXPLORER

ISSUE: A comprehensive, pull and drift diagnostic procedure has been developed to assist techicians with truck service.

ACTION: Use the following service procedure to resolve drift and pull concerns.

This is the same basic procedure as published in TSB 90-7-16 for the 1988-90 Bronco and F-150, 4x4 models. However, you should note that there are some differences such as replacing radius arm bushings instead of installing a radius arm bracket kit, etc.

Proceed with the Pull and Drift Diagnostic Procedure if the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE: THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

Service Procedure

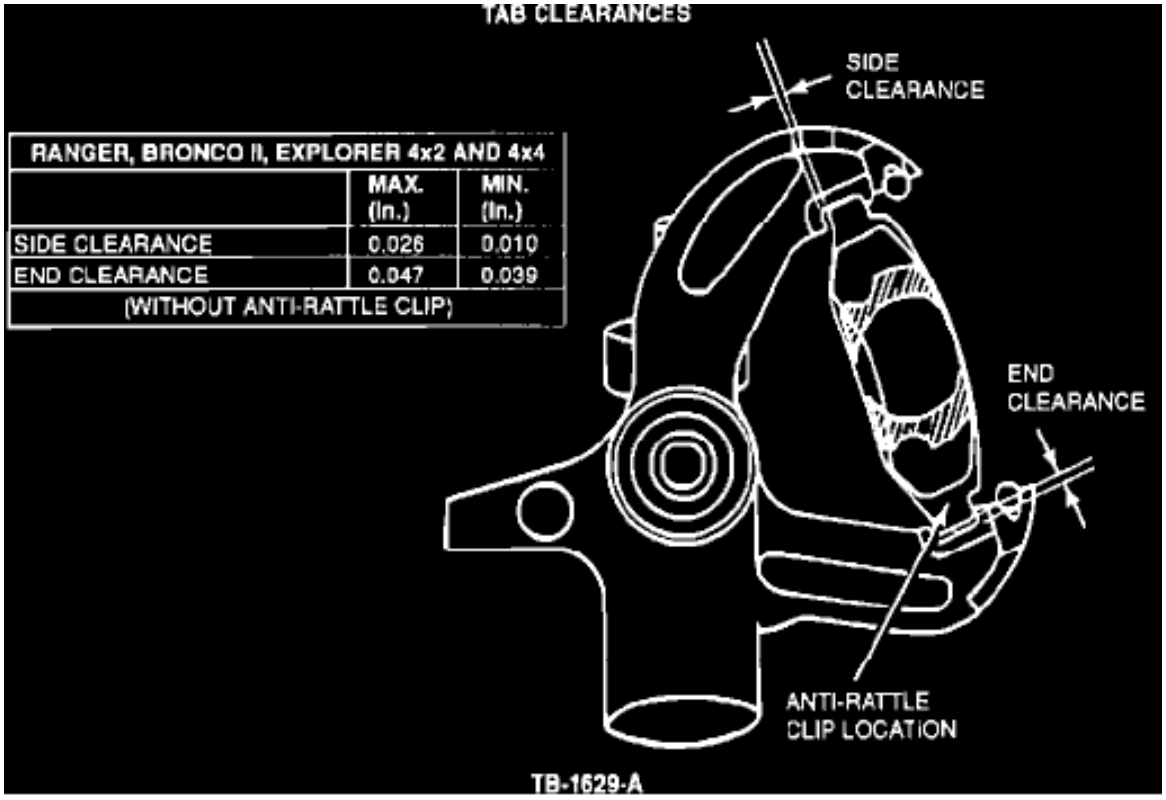
Figure 1

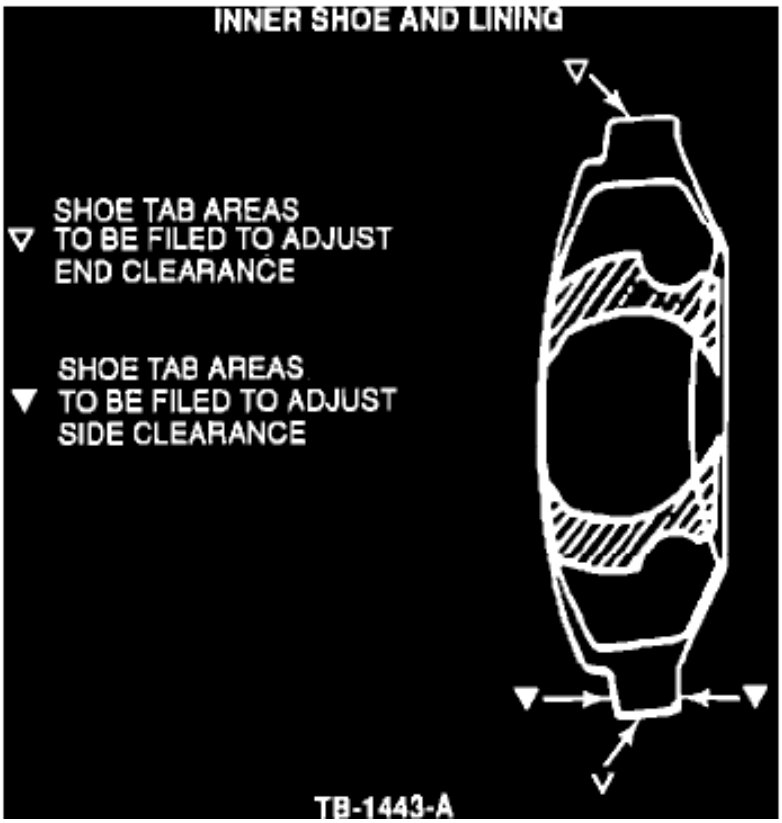
1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

Clearance should be a minimum of .015 ".





c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE: CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

Figure 2

Figure 3

f. Re-install pad and check the side and end clearances with a feeler gauge. (See Figure 2 for clearance dimensions.)

g. If the pad clearances are within specification, refer to Service Procedure Step 2 - "Caliper Groove Lubrication". If the pad clearances are not to the

required dimensions, file the steel backing plate.

WARNING: USE SAFETY GLASSES WHEN FILING STEEL BACKING PLATES

h. File material, removing equal amounts from both sides or ends. (See Figure 3.)

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

i. Check the tab clearances and install anti-rattle clip on the lower pad tab, Figure

2.

2. Apply a light coat of lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove and caliper rails. CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

3. Replace the right and left side arm bushings with new bushings (FITZ-3B203-A). Refer to the appropriate Light Truck Shop Manual, Section 04-OIC

for service details.

NOTE: THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

Pull Drift Diagnostic Procedure

The Pull Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the truck with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) are present.

The Road Test

It is important to test drive the truck with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind.

^ Tire pressure should be checked and adjusted, if necessary.

^ A second person in the truck during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location.

^ On trucks with automatic locking hubs, it is necessary to drive (20) feet forward and then backwards to unlock the hubs.

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 50-55 mph (80-89 km/h). **DO NOT BRAKE**	Is there a steady state pull? If no, go to the next step.	**See Diagnostic Procedure 1.** Tire mismatch or tire pressure concern
While stopped, have second person move to the left hand rear passenger location. Maintaining 50-55 mph (80-89 km/h).	Any change in pull? If no change, go to next step.	**See Diagnostic Procedure 2** Caster split
Make sure front hubs are unlocked (if equipped*). Accelerate the truck - decelerate the truck using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next step.	**See Diagnostic Procedure 3.** Possible limited slip rear axle and tire circumference
Maintain a steady speed of 50-55 mph (80-89 km/h). Put the vehicle in neutral and shut off the engine.	Does the pull go away? If no, go to the next step.	**See Diagnostic Procedure 4.** Steering gear valve off center
Stop the truck along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the truck; rotate the wheel full right. Does the pull change - better or worse? If no, go to next step.	**See Diagnostic Procedure 5.** Possible Rubber Ball Socket (RBS) memory steer
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging RABS.	Does the trucks heading change during brake application? If no, go to next step.	**See Diagnostic Procedure 6.** Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the truck from 50 mph (80 km/h).	Does the vehicle pull with A/L disconnected? If no, go to next step.	**See Diagnostic Procedure 6** Possible inadequate rear brake application
Brake the truck hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** Possible unequal rear brake application

NOTE: IT IS POSSIBLE THAT THE TRUCK MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART FOLLOWS.

NOTE: RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO (regular production option) list and set tire psi to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side to side and road test. If the concern is not corrected, continue with next step.

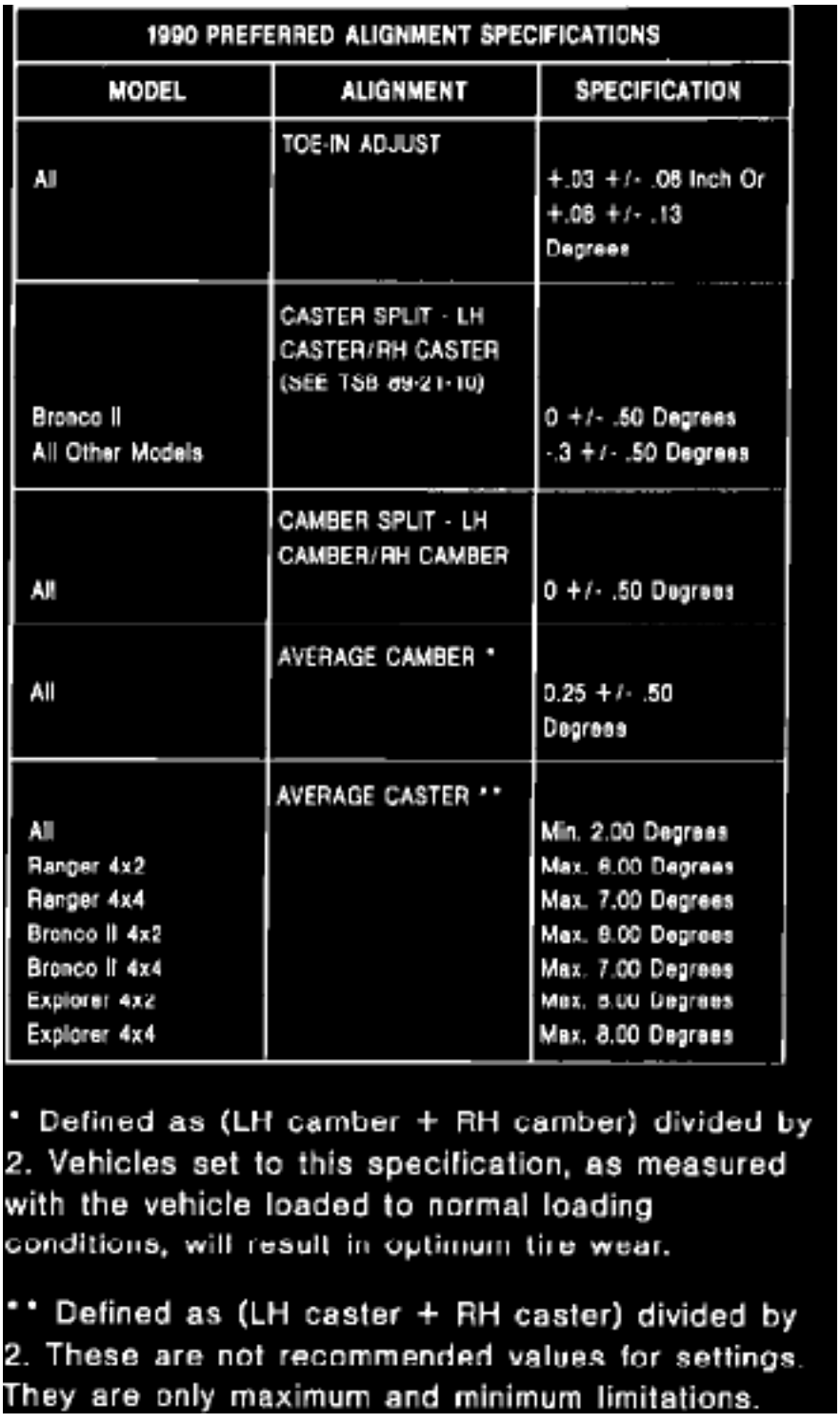
3. Tire Pull - Swap rear tires from side to side and road test. If the concern is not corrected, continue with next step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE: ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE

CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1990 PREFERRED ALIGNMENT SPECIFICATIONS		
MODEL	ALIGNMENT	SPECIFICATION
All	TOE-IN ADJUST	+.03 +/- .08 Inch Or +.08 +/- .13 Degrees
Bronco II All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0 +/- .50 Degrees -.3 +/- .50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 +/- .50 Degrees
All	AVERAGE CAMBER *	0.25 +/- .50 Degrees
All Ranger 4x2 Ranger 4x4 Bronco II 4x2 Bronco II 4x4 Explorer 4x2 Explorer 4x4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out of specification vehicles, align to the "1990 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked, if hubs are unlocked, the axle shaft will not rotate with the wheels.

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications.

^ Set the tire pressure to the specification on the certification label.

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to HPO (regular production option) list and set tire pressure to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Drive vehicle after alignment is performed. ^

Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns.

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns.

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Shop Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four tires; put the two closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The truck should be raised so that there is no interference with the steering linkage.

^ The front wheels should also spin freely.

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,789 kPa (0-2000 psi) pressure-gauge (Tool D79L-33610-A, Power Steering Analyzer) in the pressure line between the power steering

pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premimum Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and

re-check the fluid level. Add Premium Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach an lb.in. torque wrench to the steering wheel nut. Apply

sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 6 lb.in. (0.68

N-m), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - Rbs Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greasable steel linkage.

NOTE: ALL SERVICE PART STEERING LINKAGE IS THE GREASABLE STEEL SOCKET TYPE.

Diagnostic Procedure # 6 - Brake Imbalance

Spin the front tires make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 30 mph (48 km/h).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull

concern.

c. Raise the front end of the truck so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE: FOR ALL 4 WHEEL DRIVE TRUCKS, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occurring. Some brake drag will naturally be present for each size of truck.

3. If the truck has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out the bleeder

screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Light Truck Shop Manual, Section 06-06 for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a "C" clamp and wooden block. The piston should easily move back into the bore under the

force of the clamp. Re-build or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side to side.

NOTE: SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. SEE FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 40 mph before evaluating for brake drift. If there is no change in drift while braking, it may be

assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminates (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables and improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out of specification, check for proper

function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums.

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel.

^ Re-apply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder.

^ Re-install the drum and repeat the procedure for the other rear brake.

8. If the condition still exists, swap rear shoes from side to side and drive the truck. If the drift is significantly reduced, replace the rear linings. If the

drift/pull is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

PART NUMBER PART NAME CLASS

E6AZ-19582-AA Steering Fluid V

D7AZ-19690-A Lubricant AW

F1TZ-3B203-A Radius Arm Bushings, 2 B

required

Diagnostic Check List

NOTE: THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances.

_ Caliper to knuckle clearance.

_ Inner shoe side and end clearance.

2. Lubrication of components.

_ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings.

_ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE:

1. Tire mismatch.

_ Unlocked hubs check.

_ Front tires swapped side to side.

_ Rear tires swapped side to side.

_ Front to rear tire swap.

2. Alignment.

_ Unlocked hubs check.

_ Toe changed to _.

_ Caster changed and split is _.

_ Camber changed and split is _.

3. Tire circumference.

_ Unlocked hubs check.

_ Tire circumference checked and two closest circumference tires swapped to rear axle.

4. Steering gear valve.

_ Unlocked hubs check.

_ Install pressure gauge.

_ Check fluid level with engine off and on.

_ Apply torque to the steering wheel nut and check gauge readings.

_ Replaced the shaft and control assembly.

_ Removed the pressure gauge.

5. RABS linkage.

_ Replaced the RBS linkage.

6. Brake imbalance.

_ Unlocked hubs check.

_ Front wheel rotational drag check.

_ Master cylinder check.

_ Piston retraction check.

_ Rotors and linings swapped from side to side.

_ Rear brakes checked.

_ Rear drums and shoes swapped from side to side.

7. Miscellaneous.

_ Check for loose, damaged or worn parts.

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 WARRANTY STATUS:

Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

900907A Service Procedure 1.3 Hr.

900907B Road Test 0.3 Hr.

900907C Procedure 1 1.9 Hr.

900907D Procedure 2 2.4 Hr.

900907E Procedure 3 0.5 Hr.

900907F Procedure 4 0.9 Hr.

900907G Procedure 6 2.3 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

FRONT W2

OASIS CODES: 3050, 3051, 3100, 3200, 3300

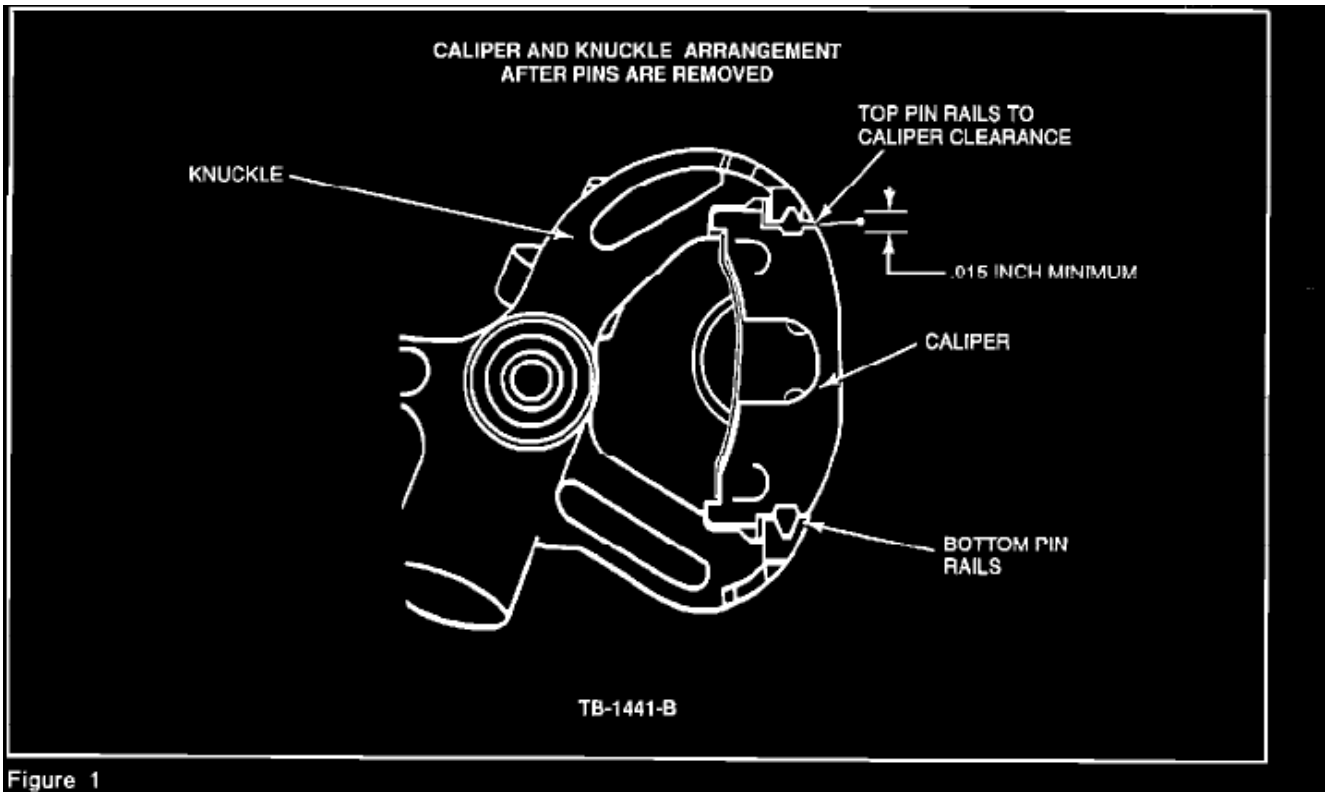


Figure 1

Brake Pad: All Technical Service Bulletins Front Brakes - Popping or Clunking Noise

Article No. 92-14-7

07/01/92

^ BRAKES - FRONT DISC - "POPPING" OR "CLUNKING" SOUND DURING BRAKING

^ NOISE - "POPPING" OR "CLUNKING" SOUND WHEN BRAKING

^ VIBRATION THROUGH FLOOR BOARD WHEN BRAKING

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 AEROSTAR, RANGER 1991-92 EXPLORER

See TSB # 93-20-11 for additional information.

ISSUE: A "popping" or "clunking" noise and a floor board vibration may occur during braking. The noise and/or vibration may be caused by the front brake caliper suddenly springing away from the caliper abutment and returning.

ACTION: Check and adjust the brake pads and caliper knuckle clearance by using the following service procedure.

1. Road test to confirm that the "popping" or "clunking" noise occurs only during braking at the initial part of the stop.

2. Raise the front of the vehicle.

a. Remove the front wheels.

b. Remove the pins from the caliper.

3. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

NOTE:

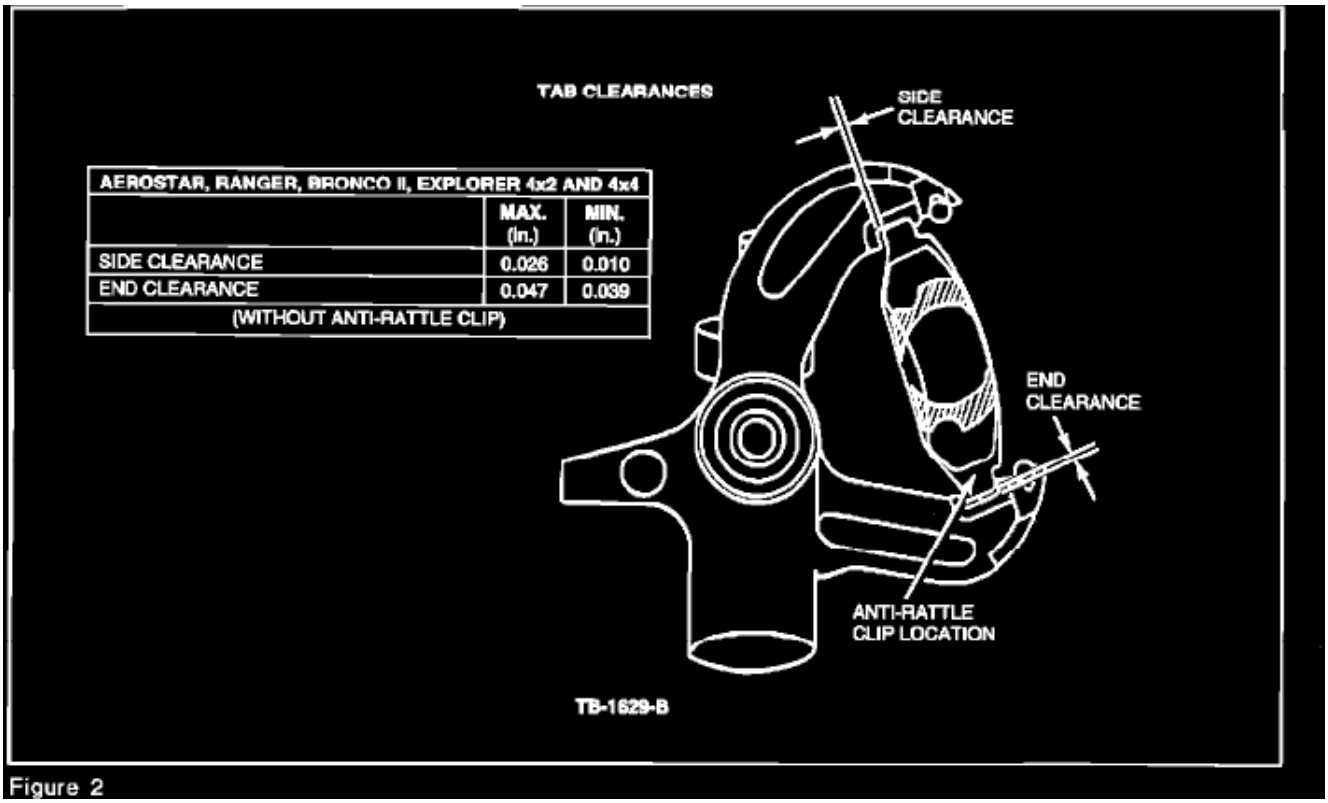


Figure 2

THE CLEARANCE SHOULD BE A MINIMUM OF .015" (.381 MM).

a. If the caliper clearance is less than .015" (.381 mm) on either caliper, replace the caliper and repeat the measurements.

b. If the caliper clearance is less than .015" (.381 mm) on both calipers, replace both calipers and recheck clearance.

c. If the caliper clearance is still less than .015" (.381 mm) on both calipers, replace both spindles (4X2) or knuckles (4X4) and recheck clearance.

NOTE: CHECK THE CLEARANCE OF THE NEW KNUCKLE BEFORE INSTALLATION.

4. After measuring the caliper/knuckle for proper clearance, remove both calipers and brake pad assemblies. Refer to the appropriate Light Truck Service Manual, Section 06-03, for the removal procedure.

5. Replace the caliper piston (FOTZ-2196-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for the replacement procedure.

6. Install the new lining kit (FO9Z-2001-A).

a. Check the side and end clearances with a feeler gauge.

b. Refer to Figure 2 for clearance dimensions.

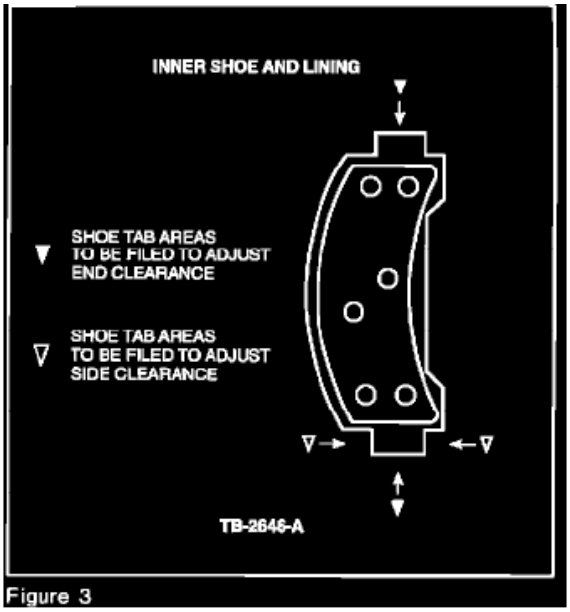


Figure 3

PART NUMBER	PART NAME	CLASS
F0TZ-2196-A	Caliper Piston	B
E8TZ-2C150-B	Caliper Pin	B
F09Z-2001-A	Brake Lining Kit	B
D7AZ-19590-A	Disc Brake Lubricant	AM
F09Z-2B120-A	Caliper, RH	B
F09Z-2B121-A	Caliper, LH	B
E9TZ-3105-B	Spindle Assembly, RH - (Ranger, Bronco II, Explorer)	B
E9TZ-3106-B	Spindle Assembly, LH - (Ranger, Bronco II, Explorer)	B
E79Z-3105-A	Spindle Assembly, RH - (Aerostar)	B
E79Z-3106-A	Spindle Assembly, LH - (Aerostar)	B
F09Z-3130-A	Knuckle, RH (AWD Aerostar)	C
F09Z-3131-A	Knuckle, LH (AWD Aerostar)	C
F0TZ-3130-A	Arm Assembly, RH (4X4 Explorer)	B
F0TZ-3131-A	Arm Assembly, LH (4X4 Explorer)	B
E8TZ-3130-A	Arm Assembly, RH (4X4 Bronco II)	B
E8TZ-3131-A	Arm Assembly, LH (4X4 Bronco II)	B

7. If the lining clearance is not to the required dimensions, file the shoe tab. Remove equal amounts from both sides and ends, Figure 3.

WARNING: USE SAFETY GLASSES WHEN FILING THE BACKING PLATES.

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

8. Assemble the brakes and caliper pins (E8TZ-2C150-B). Lubricate the caliper pins with disc brake lubricant (D7AZ-19590-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for assembling details.

9. Apply a light coat of disc brake lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove. Also apply a light coat of disc brake lubricant (D7AZ-19590-A) to the caliper rails.

CAUTION: PREVENT LUBRICANT FROM STICKING TO ROTORS, LININGS OR CALIPER PISTON BOOTS.

PART NUMBER

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models

OPERATION	DESCRIPTION	TIME
921407A	Check Clearance/Replace Caliper Pistons/Replace Pads/File Pads to Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.3 Hrs.
921407B	Check Clearance/Replace Caliper Assembly/Replace One Caliper Piston/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.7 Hrs.
921407C	Check Clearance/Replace Both Caliper Assemblies/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.9 Hrs.
921407D	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.9 Hrs.
921407E	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/ Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Explorer 4X4	3.1 Hrs.
921407F	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	2.6 Hrs.
921407G	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	2.7 Hrs.
921407H	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.0 Hrs.
921407I	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	3.4 Hrs.
921407J	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.0 Hrs.
921407K	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Both Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.0 Hrs.
921407L	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	3.3 Hrs.
921407M	Replace Both Caliper Assemblies/Replace Both Knuckles/ Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	4.3 Hrs.
921407N	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.3 Hrs.
921407O	Replace Both Caliper Assemblies/Replace Both Knuckles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.6 Hrs.

DEALER CODING

BASIC PART NO.	CONDITION CODE
2C150	56

OASIS CODES: 301000, 702100, 703000

WARRANTY STATUS AND OPERATION DESCRIPTION

Brake Pad: All Technical Service Bulletins Brakes - Intermittent Brake Squeal

Article No. 90-22-6

^ BRAKES - OCCASIONAL OR INTERMITTENT "SQUEAL"

^ NOISE - BRAKES - OCCASIONAL OR INTERMITTENT SQUEAL"

FORD: 1985-86 LTD 1985-88 EXP

1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-91 TAURUS

LINCOLN-MERCURY: 1985-86 CAPRI, MARQUIS

1985-87 LYNX

1985-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER 1991 CAPRI

MERKUR: 1985-89 XR4TI

LIGHT TRUCK: 1985-90 BRONCO II

1985-91 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1988-91 F SUPER DUTY 1991 EXPLORER

This TSB article is being republished in its entirety to expand the model and model year coverage.

ISSUE: Occasional or intermittent brake squeal may be cause by the brake friction material generating noise and heat in order to dissipate energy. This occasional or intermittent squeal may be a normal condition and requires no corrective action.

ACTION: If a customer is concerned about occasional or intermittent brake squeal, it should be explained that brake friction materials inherently generate noise and heat in order to dissipate energy. As a result, an occasional squeal condition may be normal, and could be affected by cold, heat, wetness, snow, salt, mud etc.

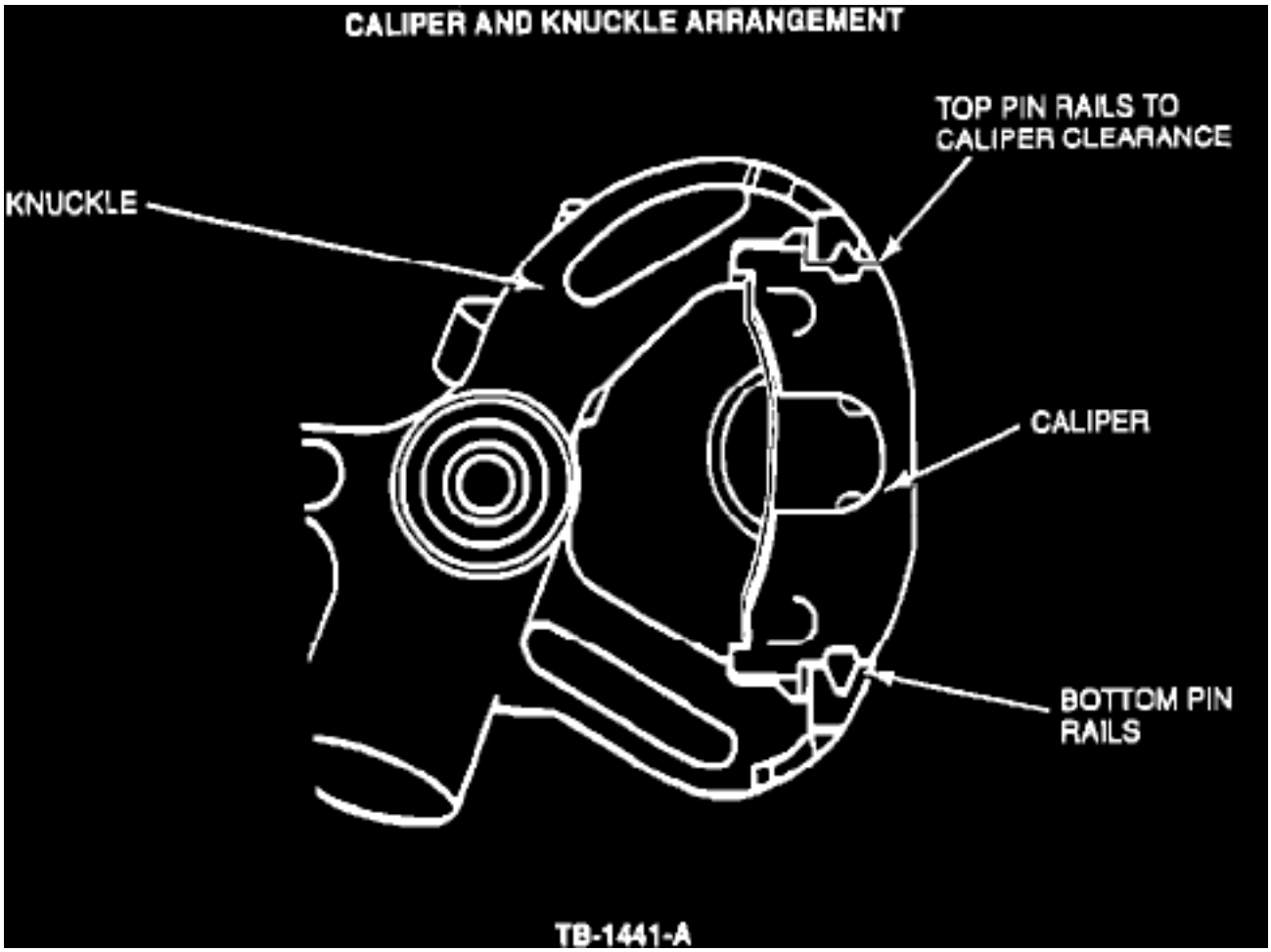
NOTE: THIS OCCASIONAL OR INTERMITTENT SQUEAL IS NOT A FUNCTIONAL PROBLEM AND DOES NOT INDICATE ANY LOSS OF BRAKE EFFECTIVENESS.

OTHER APPLICABLE ARTICLES: None SUPERSEDES:

87-16-7

WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

301000, 702000, 702100



Technical Service Bulletin # 9097 Date: 900427

Steering/Suspension - Pull/Drift Diagnostic Procedure

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

Article No. 90-9-7

LIGHT TRUCK: 1988-90 BRONCO II, RANGER 1991 EXPLORER

ISSUE: A comprehensive, pull and drift diagnostic procedure has been developed to assist techicians with truck service.

ACTION: Use the following service procedure to resolve drift and pull concerns.

This is the same basic procedure as published in TSB 90-7-16 for the 1988-90 Bronco and F-150, 4x4 models. However, you should note that there are some differences such as replacing radius arm bushings instead of installing a radius arm bracket kit, etc.

Proceed with the Pull and Drift Diagnostic Procedure if the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE: THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

Service Procedure

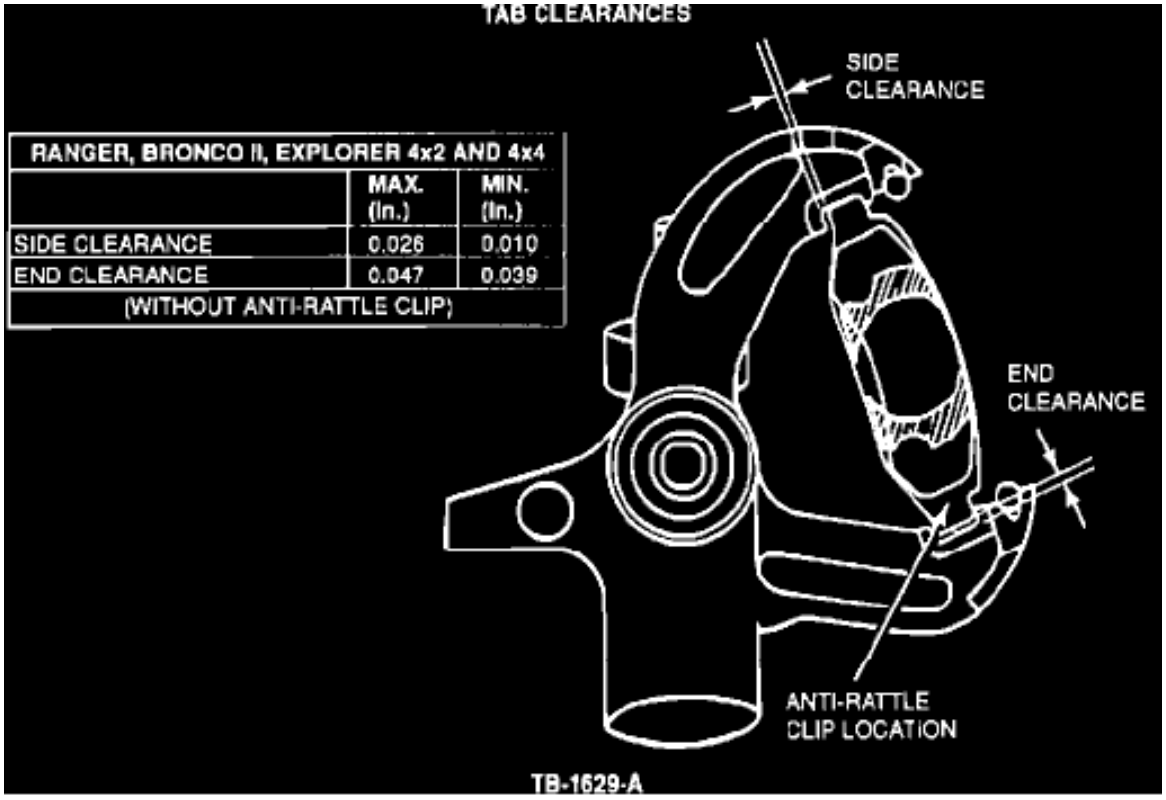
Figure 1

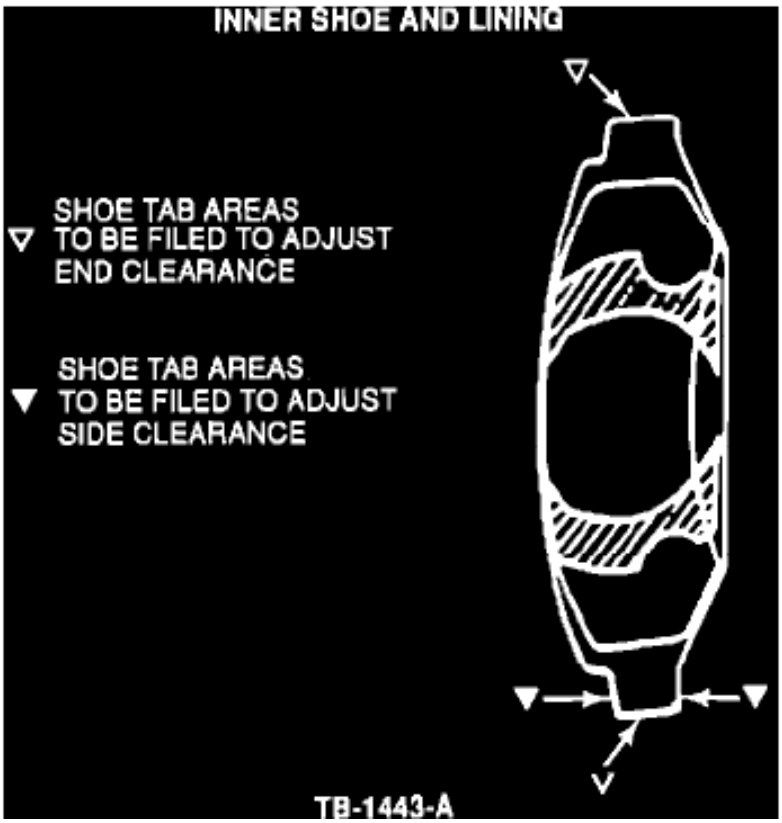
1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

Clearance should be a minimum of .015 ".





c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE: CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

Figure 2

Figure 3

f. Re-install pad and check the side and end clearances with a feeler gauge. (See Figure 2 for clearance dimensions.)

g. If the pad clearances are within specification, refer to Service Procedure Step 2 - "Caliper Groove Lubrication". If the pad clearances are not to the

required dimensions, file the steel backing plate.

WARNING: USE SAFETY GLASSES WHEN FILING STEEL BACKING PLATES

h. File material, removing equal amounts from both sides or ends. (See Figure 3.)

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

i. Check the tab clearances and install anti-rattle clip on the lower pad tab, Figure

2.

2. Apply a light coat of lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove and caliper rails. CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

3. Replace the right and left side arm bushings with new bushings (FITZ-3B203-A). Refer to the appropriate Light Truck Shop Manual, Section 04-OIC

for service details.

NOTE: THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

Pull Drift Diagnostic Procedure

The Pull Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the truck with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) are present.

The Road Test

It is important to test drive the truck with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind.

^ Tire pressure should be checked and adjusted, if necessary.

^ A second person in the truck during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location.

^ On trucks with automatic locking hubs, it is necessary to drive (20) feet forward and then backwards to unlock the hubs.

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 50-55 mph (80-89 km/h). **DO NOT BRAKE**	Is there a steady state pull? If no, go to the next step.	**See Diagnostic Procedure 1.** Tire mismatch or tire pressure concern
While stopped, have second person move to the left hand rear passenger location. Maintaining 50-55 mph (80-89 km/h).	Any change in pull? If no change, go to next step.	**See Diagnostic Procedure 2** Caster split
Make sure front hubs are unlocked (if equipped*). Accelerate the truck - decelerate the truck using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next step.	**See Diagnostic Procedure 3.** Possible limited slip rear axle and tire circumference
Maintain a steady speed of 50-55 mph (80-89 km/h). Put the vehicle in neutral and shut off the engine.	Does the pull go away? If no, go to the next step.	**See Diagnostic Procedure 4.** Steering gear valve off center
Stop the truck along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the truck; rotate the wheel full right. Does the pull change - better or worse? If no, go to next step.	**See Diagnostic Procedure 5.** Possible Rubber Ball Socket (RBS) memory steer
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging RABS.	Does the trucks heading change during brake application? If no, go to next step.	**See Diagnostic Procedure 6.** Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the truck from 50 mph (80 km/h).	Does the vehicle pull with A/L disconnected? If no, go to next step.	**See Diagnostic Procedure 6** Possible inadequate rear brake application
Brake the truck hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** Possible unequal rear brake application

NOTE: IT IS POSSIBLE THAT THE TRUCK MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART FOLLOWS.

NOTE: RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO (regular production option) list and set tire psi to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side to side and road test. If the concern is not corrected, continue with next step.

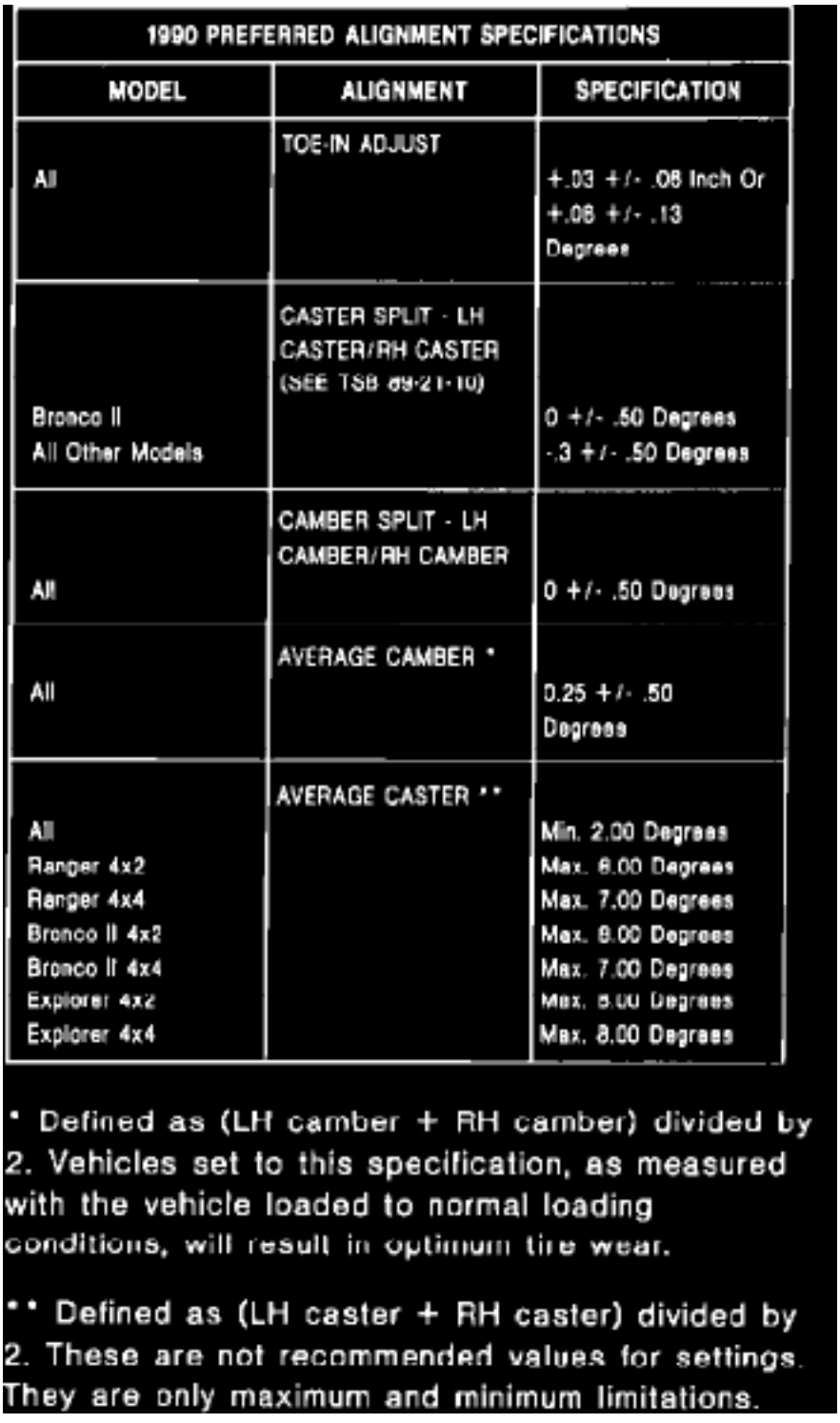
3. Tire Pull - Swap rear tires from side to side and road test. If the concern is not corrected, continue with next step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE: ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE

CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1990 PREFERRED ALIGNMENT SPECIFICATIONS

MODEL	ALIGNMENT	SPECIFICATION
All	TOE-IN ADJUST	+.03 +/- .08 Inch Or +.08 +/- .13 Degrees
Bronco II All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0 +/- .50 Degrees -.3 +/- .50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 +/- .50 Degrees
All	AVERAGE CAMBER *	0.25 +/- .50 Degrees
All Ranger 4x2 Ranger 4x4 Bronco II 4x2 Bronco II 4x4 Explorer 4x2 Explorer 4x4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out of specification vehicles, align to the "1990 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked, if hubs are unlocked, the axle shaft will not rotate with the wheels.

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications.

^ Set the tire pressure to the specification on the certification label.

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to HPO (regular production option) list and set tire pressure to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Drive vehicle after alignment is performed. ^

Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns.

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns.

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Shop Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four tires; put the two closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The truck should be raised so that there is no interference with the steering linkage.

^ The front wheels should also spin freely.

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,789 kPa (0-2000 psi) pressure-gauge (Tool D79L-33610-A, Power Steering Analyzer) in the pressure line between the power steering

pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premimum Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and

re-check the fluid level. Add Premium Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach an lb.in. torque wrench to the steering wheel nut. Apply

sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 6 lb.in. (0.68

N-m), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - Rbs Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greasable steel linkage.

NOTE: ALL SERVICE PART STEERING LINKAGE IS THE GREASABLE STEEL SOCKET TYPE.

Diagnostic Procedure # 6 - Brake Imbalance

Spin the front tires make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 30 mph (48 km/h).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull

concern.

c. Raise the front end of the truck so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE: FOR ALL 4 WHEEL DRIVE TRUCKS, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occurring. Some brake drag will naturally be present for each size of truck.

3. If the truck has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out the bleeder

screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Light Truck Shop Manual, Section 06-06 for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a "C" clamp and wooden block. The piston should easily move back into the bore under the

force of the clamp. Re-build or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side to side.

NOTE: SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. SEE FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 40 mph before evaluating for brake drift. If there is no change in drift while braking, it may be

assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminates (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables and improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out of specification, check for proper

function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums.

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel.

^ Re-apply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder.

^ Re-install the drum and repeat the procedure for the other rear brake.

8. If the condition still exists, swap rear shoes from side to side and drive the truck. If the drift is significantly reduced, replace the rear linings. If the

drift/pull is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

PART NUMBER PART NAME CLASS

E6AZ-19582-AA Steering Fluid V

D7AZ-19690-A Lubricant AW

F1TZ-3B203-A Radius Arm Bushings, 2 B

required

Diagnostic Check List

NOTE: THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances.

_ Caliper to knuckle clearance.

_ Inner shoe side and end clearance.

2. Lubrication of components.

_ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings.

_ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE:

1. Tire mismatch.

_ Unlocked hubs check.

_ Front tires swapped side to side.

_ Rear tires swapped side to side.

_ Front to rear tire swap.

2. Alignment.

_ Unlocked hubs check.

_ Toe changed to _.

_ Caster changed and split is _.

_ Camber changed and split is _.

3. Tire circumference.

_ Unlocked hubs check.

_ Tire circumference checked and two closest circumference tires swapped to rear axle.

4. Steering gear valve.

_ Unlocked hubs check.

_ Install pressure gauge.

_ Check fluid level with engine off and on.

_ Apply torque to the steering wheel nut and check gauge readings.

_ Replaced the shaft and control assembly.

_ Removed the pressure gauge.

5. RABS linkage.

_ Replaced the RBS linkage.

6. Brake imbalance.

_ Unlocked hubs check.

_ Front wheel rotational drag check.

_ Master cylinder check.

_ Piston retraction check.

_ Rotors and linings swapped from side to side.

_ Rear brakes checked.

_ Rear drums and shoes swapped from side to side.

7. Miscellaneous.

_ Check for loose, damaged or worn parts.

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 WARRANTY STATUS:

Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

900907A Service Procedure 1.3 Hr.

900907B Road Test 0.3 Hr.

900907C Procedure 1 1.9 Hr.

900907D Procedure 2 2.4 Hr.

900907E Procedure 3 0.5 Hr.

900907F Procedure 4 0.9 Hr.

900907G Procedure 6 2.3 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

FRONT W2

OASIS CODES: 3050, 3051, 3100, 3200, 3300

Brake Pad: All Technical Service Bulletins Brakes - Intermittent Brake Squeal

Article No. 90-22-6

^ BRAKES - OCCASIONAL OR INTERMITTENT "SQUEAL"

^ NOISE - BRAKES - OCCASIONAL OR INTERMITTENT SQUEAL"

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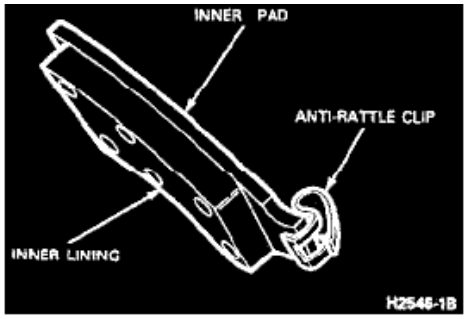
OTHER APPLICABLE ARTICLES: None SUPERSEDES:

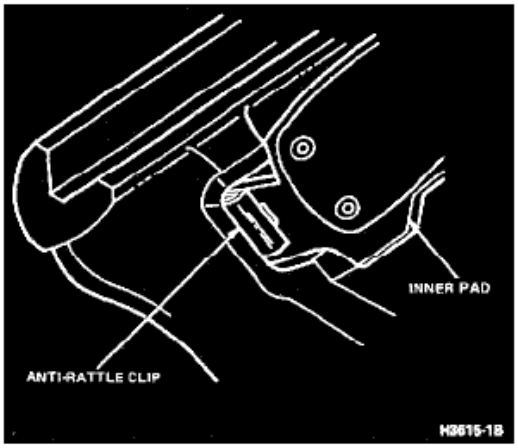
87-16-7

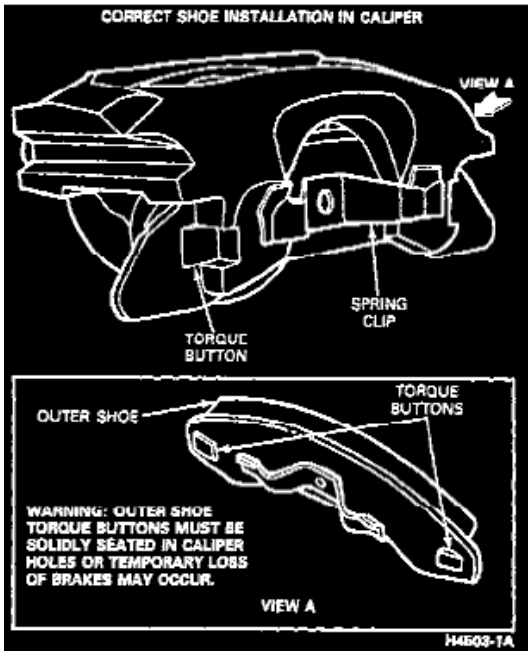
WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

301000, 702000, 702100

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Disc Brake System > Brake Pad > Component Information > Service and Repair > Installation







Brake Pad: Service and Repair Installation

Installing Anti-Rattle Clip

1. Place a new anti-rattle clip on the lower end of the inner pad. Be sure the tabs on the clip are positioned properly and the clip is fully seated.

Installing Inner Shoe And Anti-Rattle Clip

2. Position the inner pad and anti-rattle clip in the pad abutment with the anti-rattle clip tab against the pad abutment and the loop-type spring away

from the rotor. Compress the anti-rattle clip and slide the upper end of the pad in position.

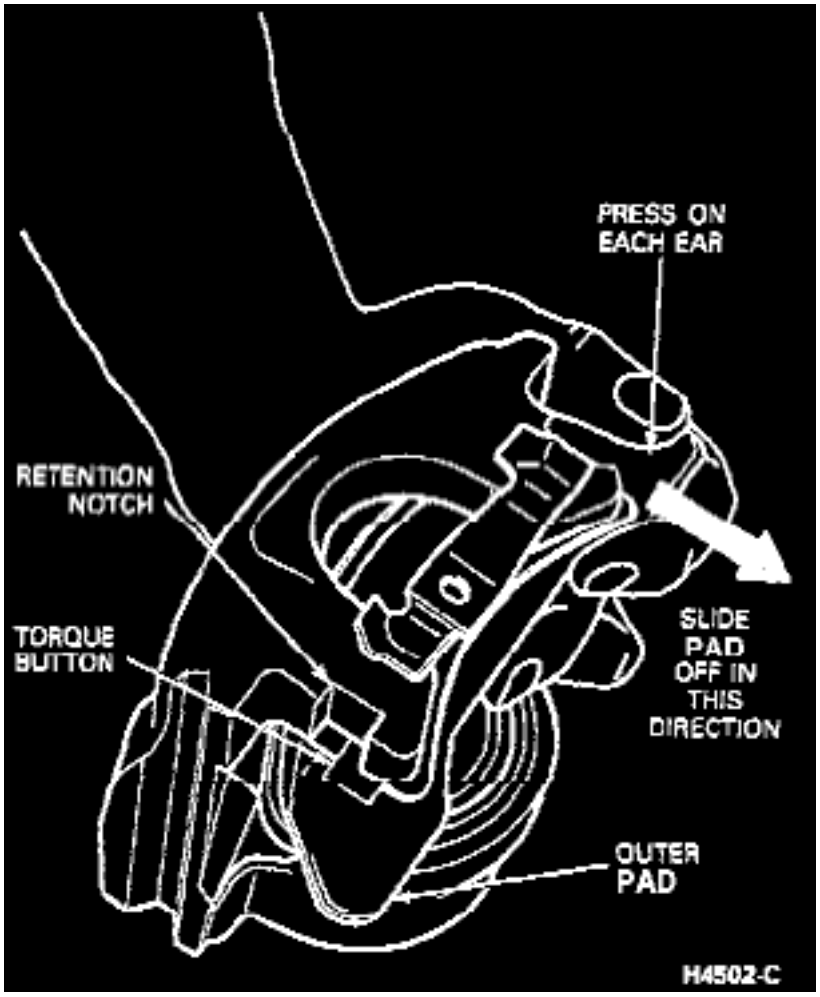
Outer Pad Installation

3. Install the outer pad, making sure the torque buttons on the pad are seated solidly in the matching holes in the caliper. 4. Install the caliper on the spindle, making sure the mounting surfaces are free of dirt and lubricate the caliper grooves with disc brake caliper

grease. See Caliper/Service and Repair See: Brake Caliper/Service and Repair

5. Install wheel and tire assembly. 6. Lower the vehicle, check the brake fluid level and fill as necessary. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.



Brake Pad: Service and Repair Removal

1. Remove tire and wheel assembly. 2. Remove caliper. See Caliper/Service and Repair See: Brake Caliper/Service and Repair 3. Compress the anti-rattle clip and remove the inner pad from the caliper.

Removing Outer Brake Pad

4. To remove the outer pad from the caliper, press each ear of the pad away from the caliper, slide the torque buttons out of the retention notches and

slide the pad off.

Brake Rotor/Disc: Recalls Recall 98E010000: Brake Rotor Cracking

Year: 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997 Make: FORD TRUCK Model: AEROSTAR

Year: 1994 Make: MAZDA TRUCK Model: PICKUP

Year: 1990 Make: FORD TRUCK Model: BRONCO II

Year: 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994 Make: FORD TRUCK Model: RANGER

Year of Recall: '98 Type of Report: Equipment Potential Number of Units Affected: 23500 Summary:

Equipment Description: Brake rotors for use on Ford and Mazda trucks. Cracked castings caused cracks to appear on the outer diameter of the rotor hat or around the stud hole.

Loss of braking can result.

Aimco will reimburse consumers/installers for the cost of replacement rotors and installation. Consumers are requested to return to the location where the rotors were originally purchased/installed for replacement.

Owner notification is expected to begin during April 1998. Owners who do not receive the free rotors within a reasonable time should contact Aimco at 1-800-264-3414. Also contact the National Highway Traffic Safety Administration's Auto Safety Hotline at 1-888-DASH-2-DOT (1-888-327-4236).

Brake Rotor/Disc: All Technical Service Bulletins Recall 98E010000: Brake Rotor Cracking

Year: 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997 Make: FORD TRUCK Model: AEROSTAR

Year: 1994 Make: MAZDA TRUCK Model: PICKUP

Year: 1990 Make: FORD TRUCK Model: BRONCO II

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Brake Rotor/Disc: All Technical Service Bulletins Brake Rotor - Machining Equipment/Warranty Information

Article No. 94-25-2

12/12/94

^ BRAKES - AVAILABILITY OF ON-VEHICLE CALIPER - MOUNTED BRAKE ROTOR MACHINING EQUIPMENT AND WARRANTY COVERAGE INFORMATION

^ BRAKE ROTOR MACHINING - AVAILABILITY OF ON-VEHICLE CALIPER - MOUNTED BRAKE ROTOR MACHINING EQUIPMENT AND WARRANTY COVERAGE INFORMATION

FORD: 1979-95 MUSTANG 1981-95 ESCORT 1984-94 TEMPO 1986-95 TAURUS 1988-93 FESTIVA 1989-95 PROBE, THUNDERBIRD 1991-95 CROWN VICTORIA 1994-95 ASPIRE 1995 CONTOUR

LINCOLN-MERCURY: 1979-86 CAPRI 1981-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1986-95 SABLE 1988-89 TRACER 1988-95 CONTINENTAL 1989-95 COUGAR 1991-94 CAPRI 1991-95 GRAND MARQUIS, TOWN CAR, TRACER 1993-95 MARK VIII 1995 MYSTIQUE

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1984-90 BRONCO II 1984-95 RANGER 1986-95 AEROSTAR 1990-95 BRONCO, E-150, E-250, F-150, F-250 1991-95 EXPLORER 1993-95 VILLAGER 1995 WINDSTAR

This TSB is being republished in its entirety to include the 1994 and 1995 model years.

ISSUE: On-vehicle caliper-mounted brake rotor machining equipment from Rotunda is now approved for warranty and service use. Brake roughness, pulsation and steering wheel nibble will occur when rotors wear unevenly (thickness variation). This article specifically addresses brake roughness, pulsation and steering wheel nibble resulting from disc brake rotor thickness variation induced by rotor runout.

ACTION: Use Rotunda On-Vehicle Brake Lathes 104-00129, 104-00130, 168-00004, or 168-00005 to service vehicles with brake roughness. This method is more effective because it allows machining of the rotor while it is still mounted on the vehicle. This improves the overall run-out of the assembly.

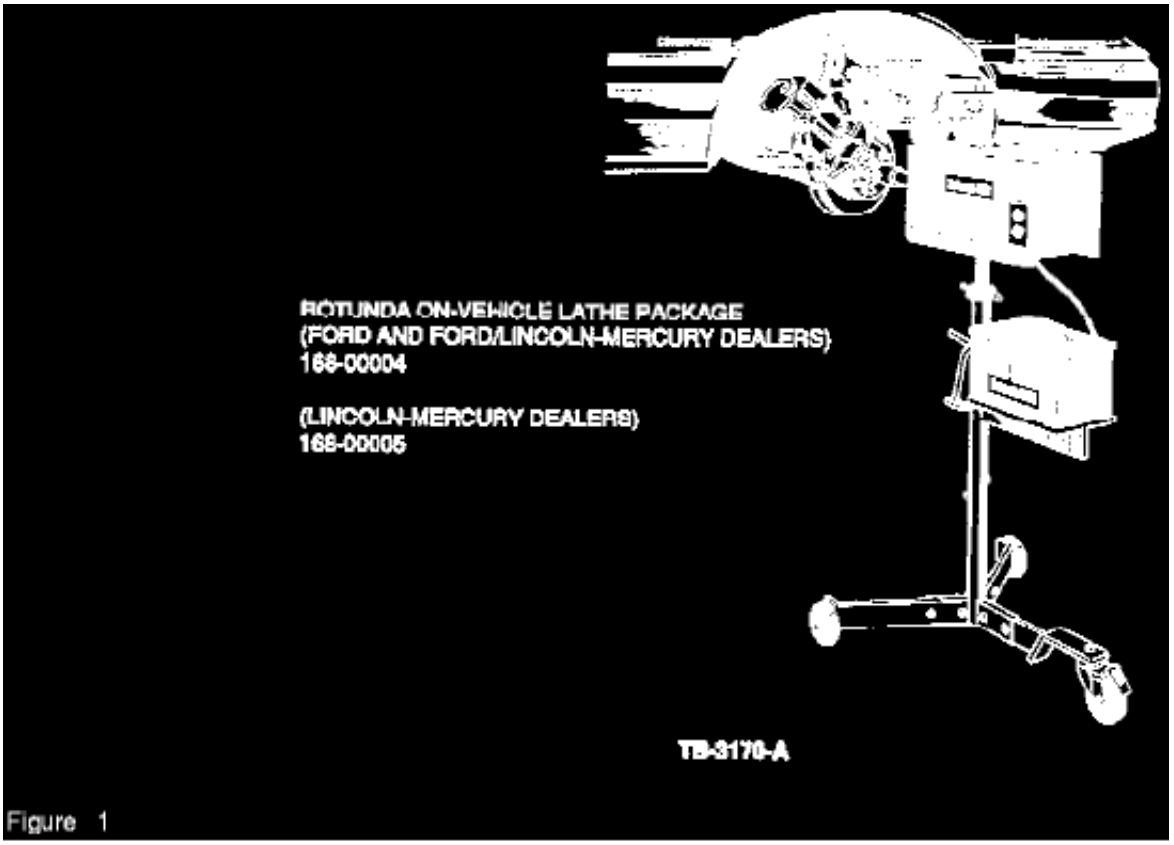

Figure 1

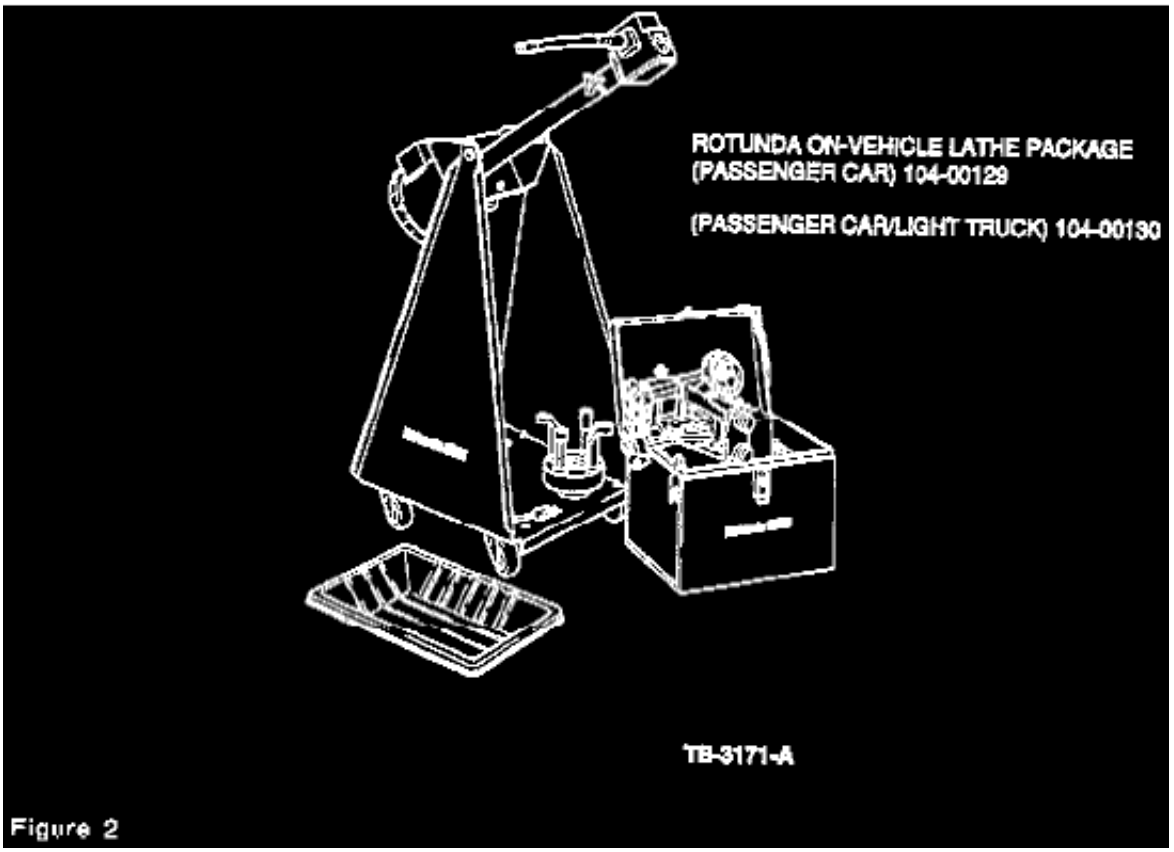

Figure 2

Rotunda on-vehicle caliper-mounted brake rotor machining equipment may correct runout if used according to the equipment manufacturer's instructions. Refer to Figures 1 and 2.

Machining the rotor with the use of a caliper-mounted brake lathe will be an eligible repair under warranty for the vehicles listed.

NOTE:

THERE MAY BE ADDITIONAL MANUFACTURERS OF SIMILAR EQUIPMENT. FORD DOES NOT ENDORSE, INDICATE ANY PREFERENCE FOR, OR ASSUME ANY RESPONSIBILITY FOR EQUIPMENT FROM THESE FIRMS, OR FOR ANY SUCH ITEMS WHICH MAY BE AVAILABLE FROM OTHER SOURCES.

NOTE:

DEALERS THAT HAVE APPROVED ON-VEHICLE BRAKE ROTOR MACHINING EQUIPMENT ARE REQUIRED TO RESURFACE BRAKE ROTORS UNDER THE BUMPER TO BUMPER COVERAGE PERIOD. IF A DEALER HAS THE ON-VEHICLE BRAKE ROTOR MACHINING EQUIPMENT, ROTOR REPLACEMENT WILL ONLY BE ALLOWED WHEN THE ROTOR IS BROKEN OR DOES NOT HAVE ENOUGH MATERIAL TO ALLOW TURNING. SUCH REPLACEMENTS MUST BE AUTHORIZED BY SERVICE MANAGEMENT.

NOTE:

EXCEPTIONS TO THE LAST STATEMENT ARE REAR ROTORS ON THE TOWN CAR, GRAND MARQUIS, CROWN VICTORIA, MUSTANG AND FRONT ROTORS ON F-350, F-47 AND F-53

HEAVY DUTY LIGHT TRUCKS. ON THESE VEHICLES, ROTORS CANNOT BE MACHINED. SERVICE MANAGEMENT AUTHORIZATION IS NOT REQUIRED FOR THESE EXCEPTIONS.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-13-3 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000, 302000, 703000

Brake Rotor/Disc: All Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Brake Rotor/Disc: All Technical Service Bulletins Brake Rotor - Machining Equipment/Warranty Information

Article No. 94-25-2

12/12/94

^ BRAKES - AVAILABILITY OF ON-VEHICLE CALIPER - MOUNTED BRAKE ROTOR MACHINING EQUIPMENT AND WARRANTY COVERAGE INFORMATION

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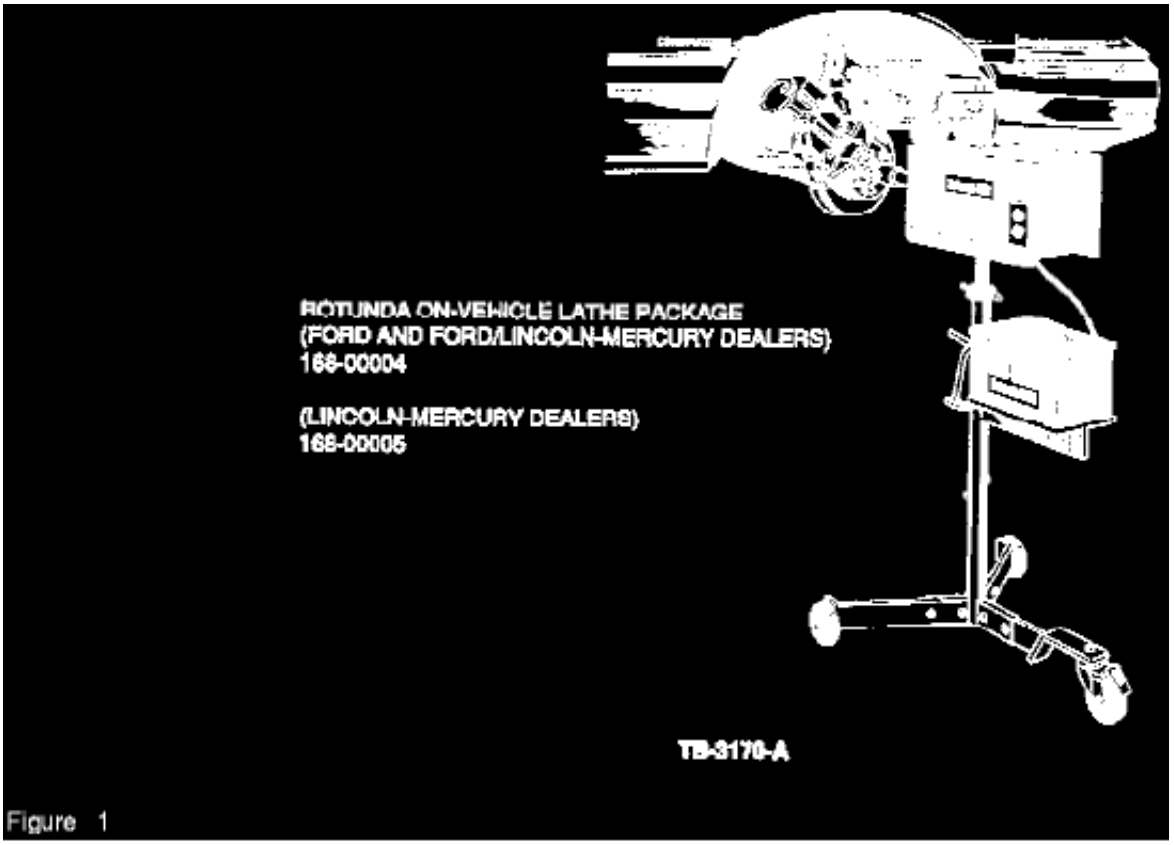
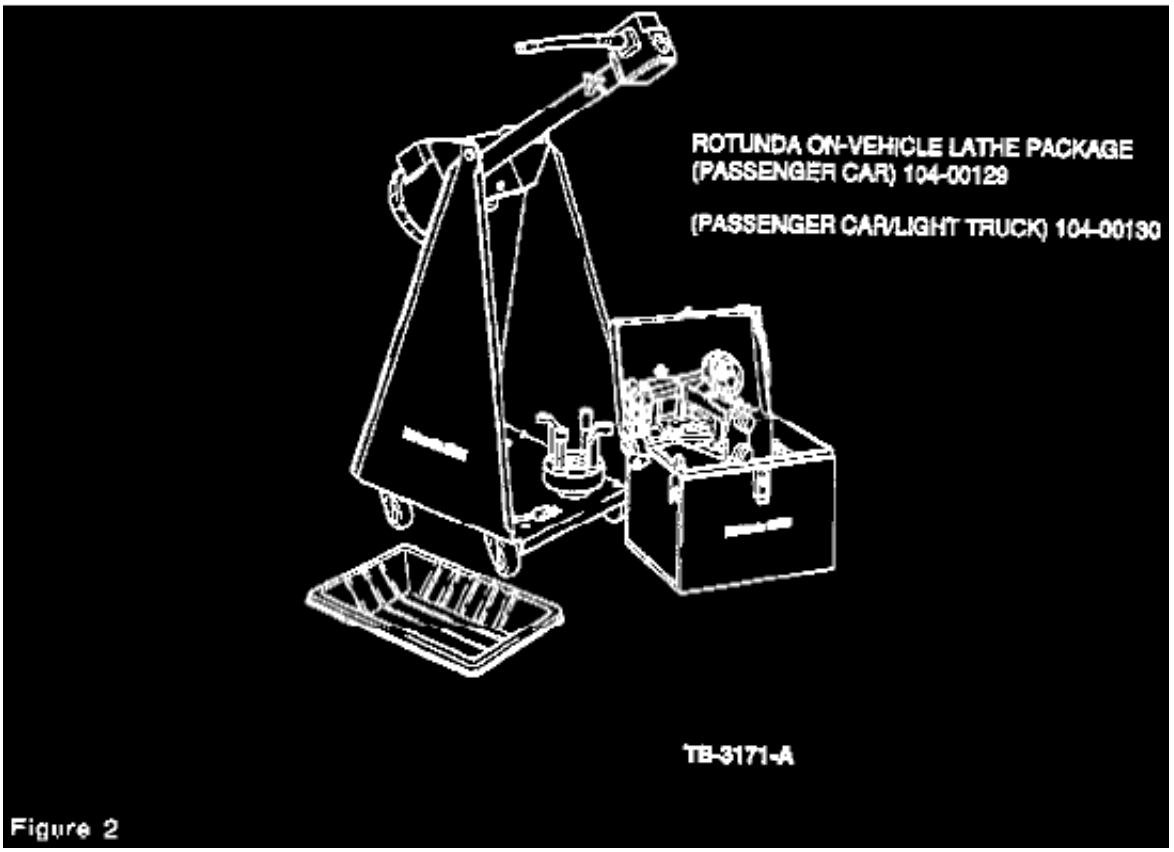


Figure 1



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Brake Rotor/Disc: All Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

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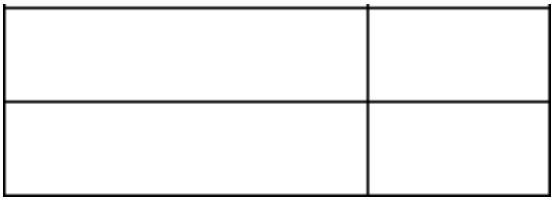
OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

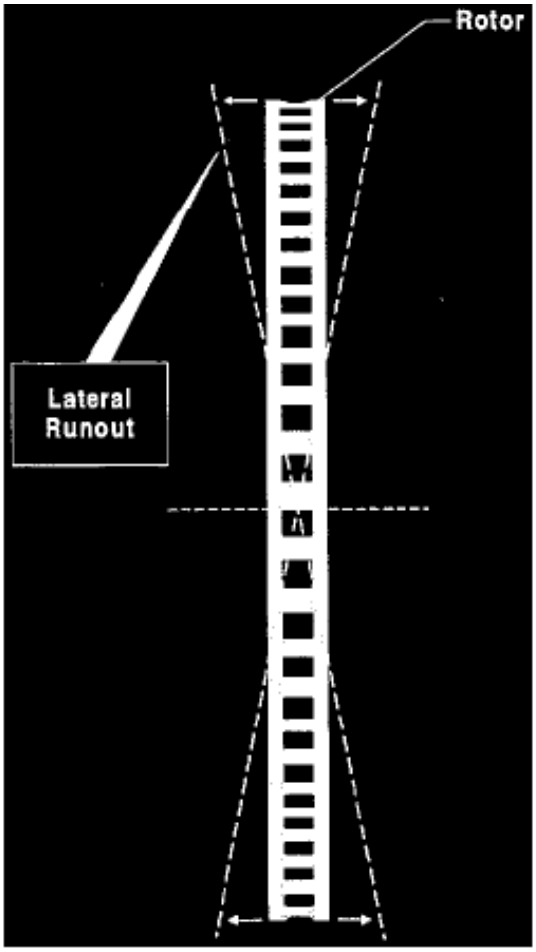
306000, 301000

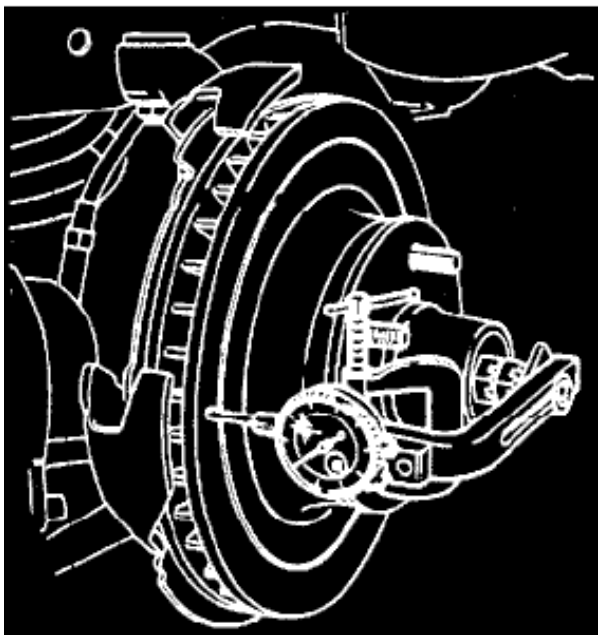


Brake Rotor/Disc: Specifications

Rotor Diameter 10.86 in

Minimum Thickness 0.81 in


Rotor
Lateral Runout



Brake Rotor/Disc: Testing and Inspection

PURPOSE

In the manufacturing of the brake rotor all the tolerances regarding surface finish, parallelism, and lateral runout are held very closely. The maintenance of these tolerances provide the surface necessary to prevent brake roughness.

Light scoring of the rotor surface not in excess of 0.38 mm (0.015-inch) in depth is normal. This condition does not affect the brake operation.

Some discoloration or wear of the disc surface is normal and does not require re-surfacing when linings are replaced.

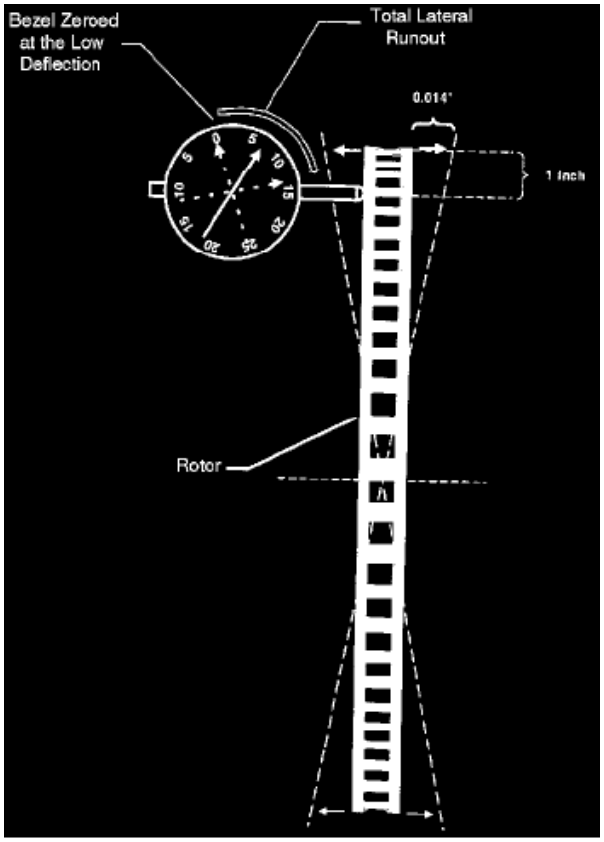
SPECIFICATIONS - See: Specifications

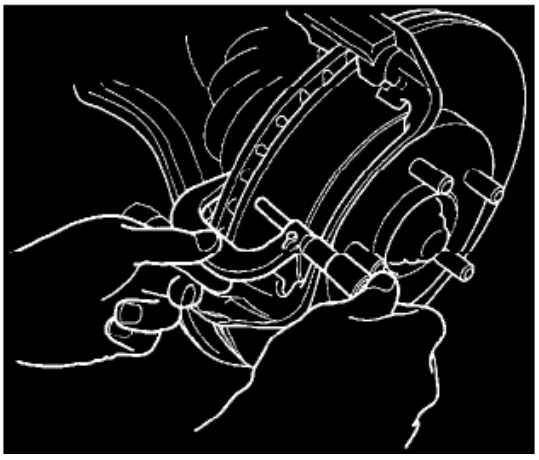
LATERAL RUNOUT

Lateral runout is the movement of the rotor from side to side as it rotates on the spindle. This could also be referred to as "rotor wobble".

This movement causes the brake pad and piston to be knocked back into it's bore. This results in additional pedal travel and a vibration during braking.

Checking Lateral Runout 1. Tighten the wheel bearings to eliminate all freeplay.


Bezel Zeroed at the Low Deflection
Total Lateral Runout
0.014"
1 inch
Rotor



2. Attach a dial indicator to a solid non-rotating portion of the hub assembly or suspension.

- The point of the styles must contact the rotor face about 25 mm (1-inch) from the rotor edge.

3. Move the rotor one complete rotation and observe the dial indicator.

4. Rotate the bezel on the dial indicator such that "0" is at the low deflection point. 5. Again rotate the rotor at least one complete turn and observe the needle deflection. Total needle deflection will equal lateral runout.

- The lateral runout should not exceed 0.254 mm (0.010 inch).

6. Readjust the wheel bearings.

MINIMUM THICKNESS

The thickness of a rotor is important for two reasons: 1. Rotors which are too thin are not able to properly absorb and release heat during heavy braking. This results in reduced braking capacity and

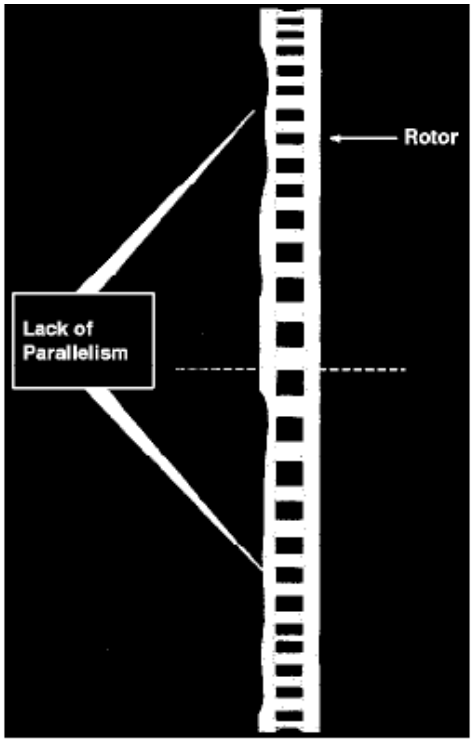
brake fade.

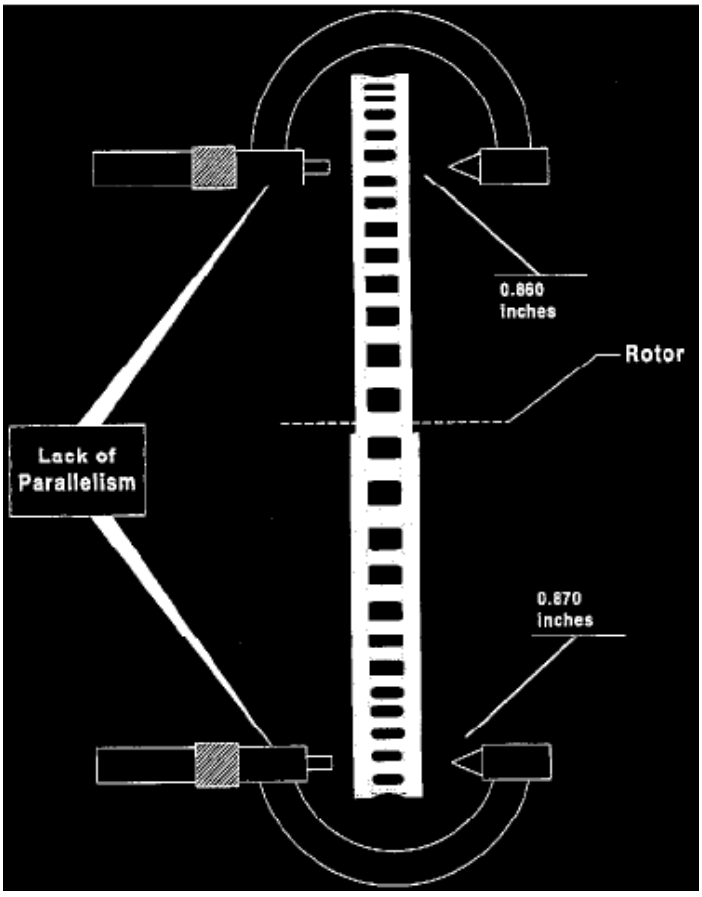
2. Rotors worn below minimum thickness in combination with worn pads/linings can result in the caliper piston extending too far becoming

cocked or jammed.

Rotor thickness should be measured at the thinnest point on the rotor. Any rotor which is worn below its minimum thickness should be replaced.

For accurate measurements, it is best to remove the caliper to allow for complete access to the inboard side of the rotor.


Rotor
Lack of Parallelism


0.860 inches
Rotor
Lack of Parallelism
0.870 inches

For more information on how to use a disc brake micrometer see Fundamentals and Basics.

PARALLELISM

Parallelism is the measurement of the thickness of the rotor at 12 or more points around the circumference of the rotor. All measurements must be made at the same distance in from the edge of the rotor.

Lack Of Parallelism

Lack Of Parallelism

The rotor thickness must not vary more than 0.013 mm (0.0005-inch) from point to point.

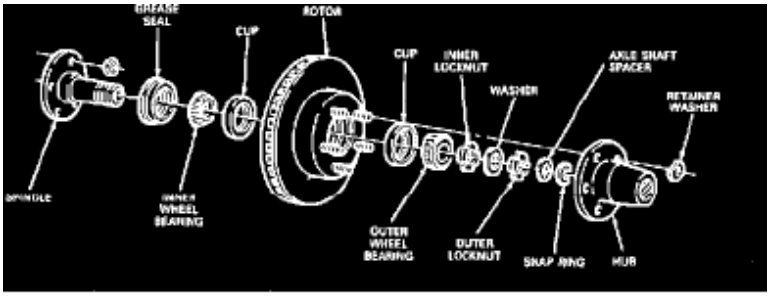
MACHINING

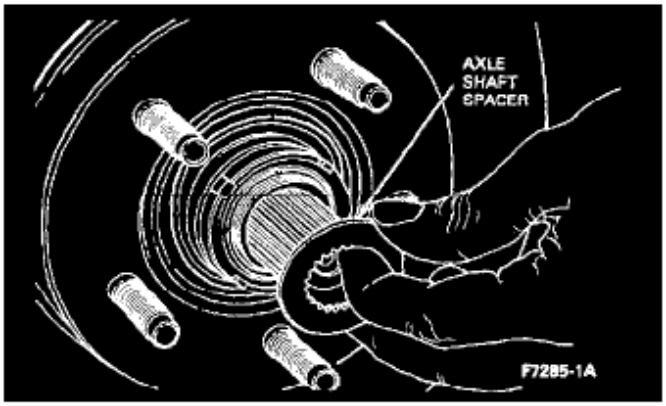
Since accurate control of the rotor tolerances is necessary for proper performance of the disc brakes, machining of the rotor should be done only with precision equipment.

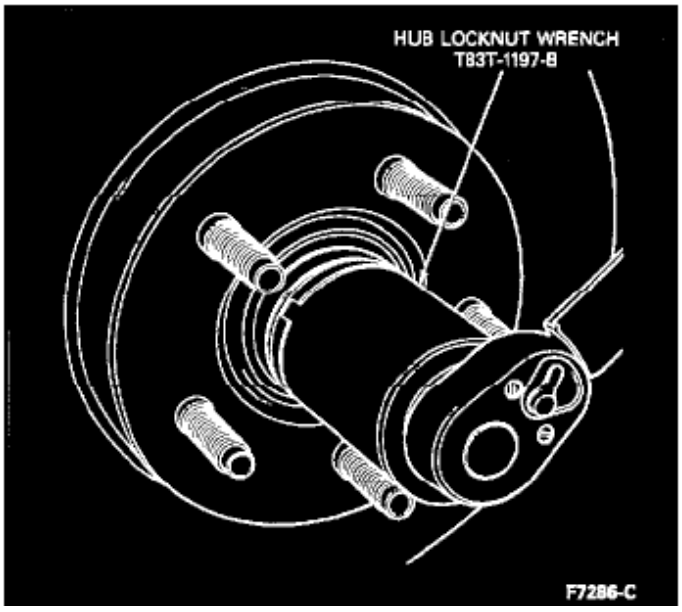
All brake rotors have a minimum thickness dimension cast into them. This dimension is the minimum wear dimension and not a refinish dimension. Do not use a brake rotor that will not meet the specifications, after refinishing. Replace with a new brake rotor.

NOTE: 1 inch = 25.4mm, so if your micrometer measures in inches and the specified thickness on the disc is in millimeters, convert millimeters to inches by dividing the specified number of millimeters by 25.4.

Example: Specification on disc is 17.8 mm. Dividing 17.8mm by 25.4mm/in = 17.8/25.4 = 0.70 inches.


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB


AXLE SHAFT SPACER
F7285-1A


HUB LOCKNUT WRENCH T83T-1197-B
F7286-C

Brake Rotor/Disc: Service and Repair With Manual Locking Hubs

Fig. 5 Manual Locking Hub

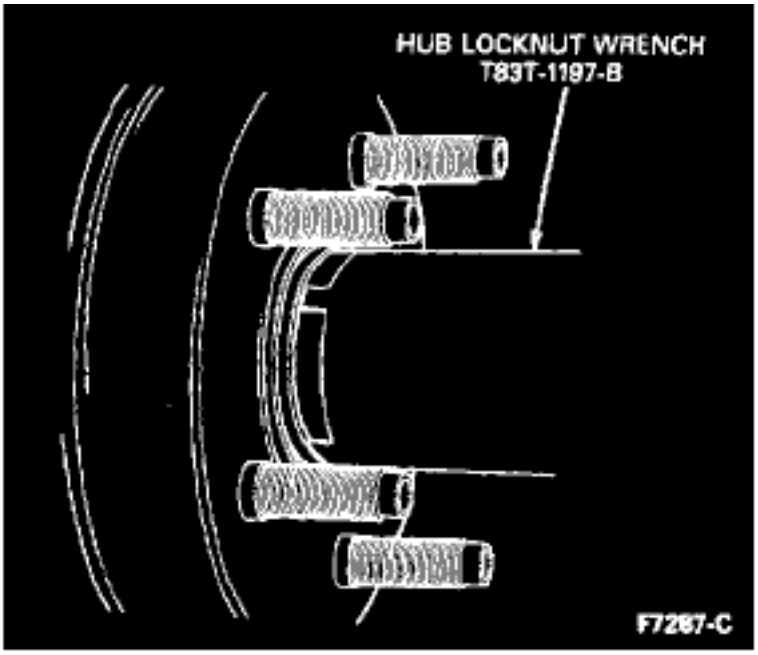
With Manual Locking Hubs

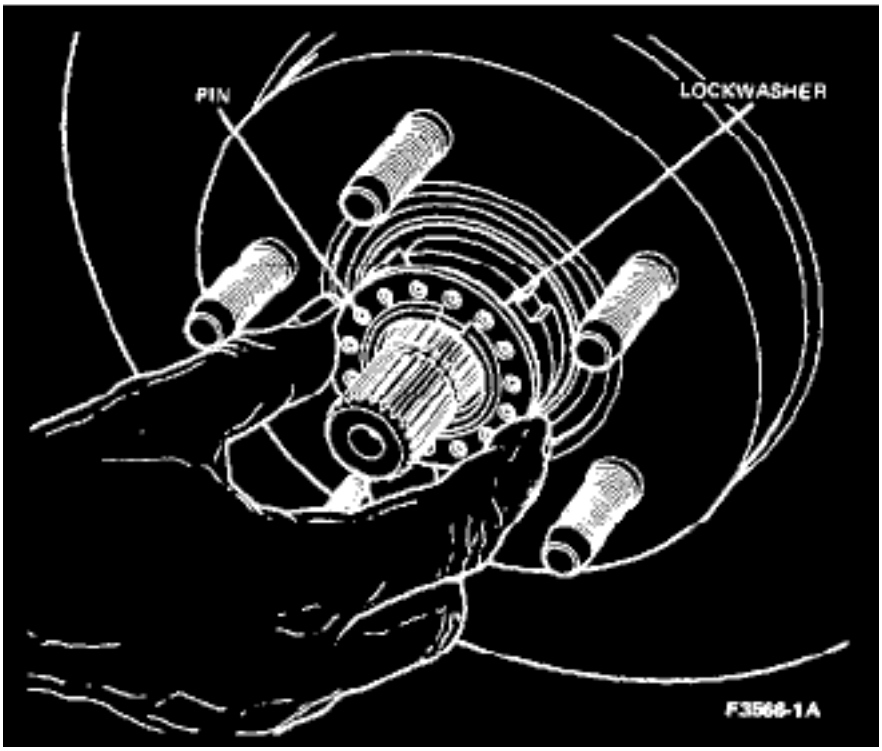
1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

5. Remove the axle shaft spacer. 6. Remove the outer wheel bearing locknut from the spindle using Hub Locknut Wrench T83T-1197-B. Engage tool tabs into locknut slots.

Locknut Wrench

7. Remove locknut washer from spindle.


HUB LOCKNUT WRENCH
T83T-1197-B
F7267-C


PIN
LOCKWASHER
F3568-1A

8. Loosen the inner wheel bearing locknut using Hub Locknut Wrench T83T-1197-B or equivalent. Make sure tool tabs engage in locknut slots.

Make sure tool is centered over the locknut pin.

9. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings.

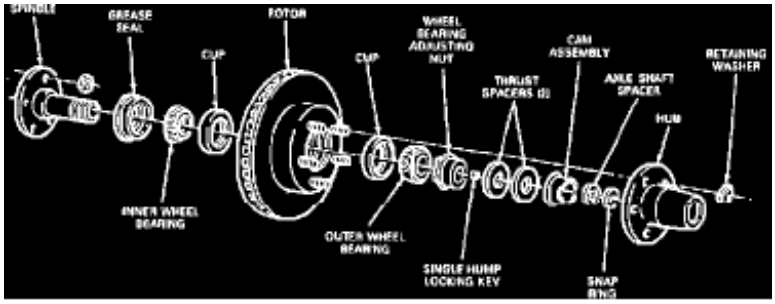
10. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). Install the lockwasher on the

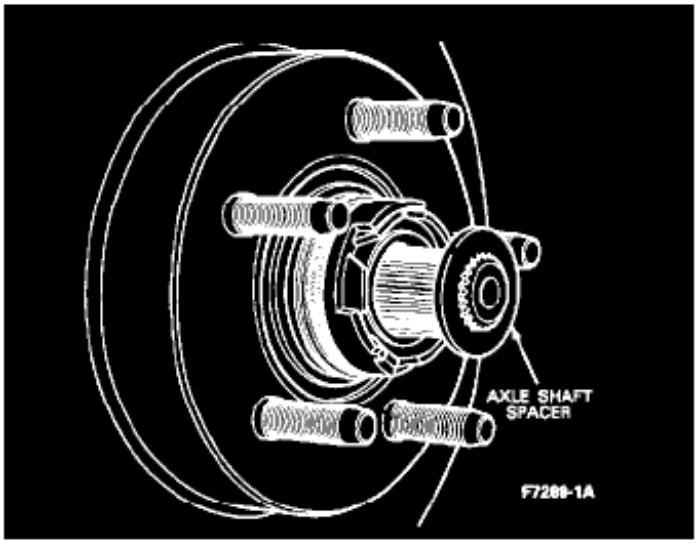
spindle.

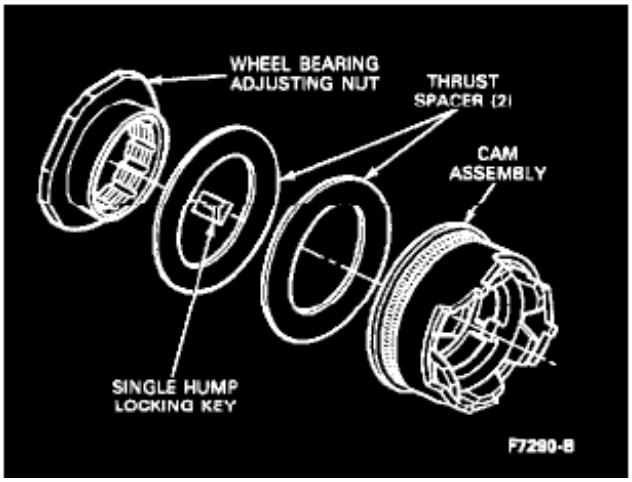
NOTE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

11. Install the outer wheel bearing locknut using using Hub Locknut Wrench T83T-1197-B or equivalent. Tighten locknut to 203 Nm (150 ft lb). 12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 16. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 inch). The maximum

torque to rotate the hub is 2.8 Nm (25 in lb).


SPINDLE
GREASE SEAL
ROTOR
CUP
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
RETAINING WASHER
HUB
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


AXLE SHAFT SPACER
F7288-1A


WHEEL BEARING ADJUSTING NUT
THRUST SPACER (2)
CAM ASSEMBLY
SINGLE HUMP LOCKING KEY
F7290-B

Brake Rotor/Disc: Service and Repair With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

With Automatic Locking Hubs

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

5. Remove the axle shaft spacer.

6. Being careful not to damage the plastic moving cam or thrust spacers, pull cam assembly off the wheel bearing adjusting nut and remove the two

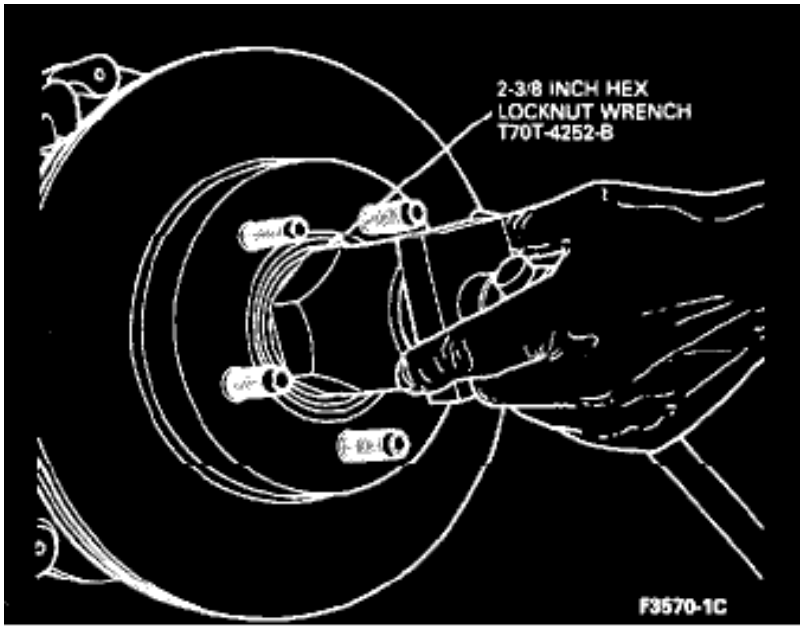
plastic thrust spacers from the adjusting nut.

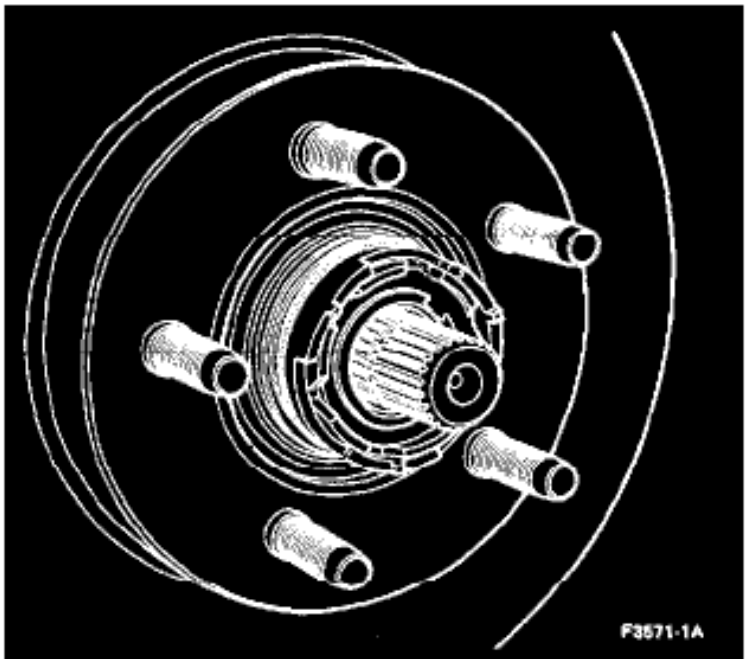
CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

7. Using a magnet, remove the locking key.

NOTE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.


2-3/8 INCH HEX
LOCKNUT WRENCH
T70T-4252-B
F3570-1C


F3571-1A

8. Loosen the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench T70T-4252-B or equivalent.

9. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

10. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 11. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

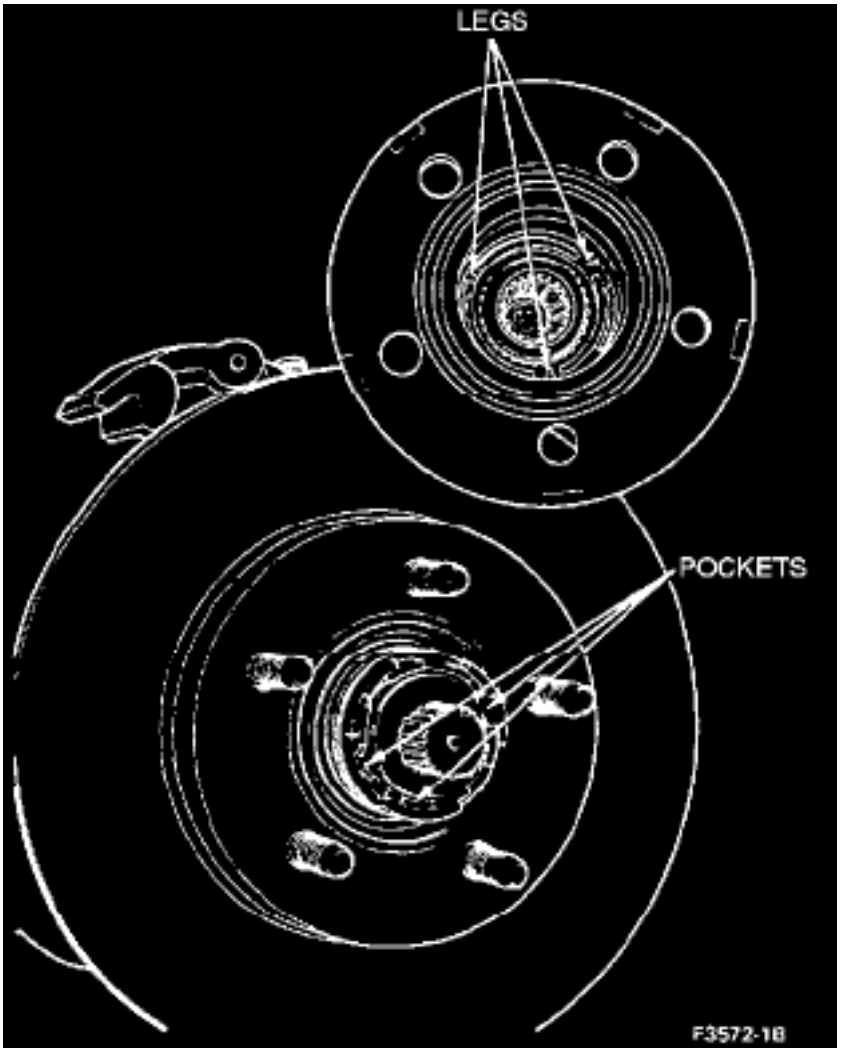
Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

12. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

13. Install the axle shaft spacer. 14. Clip the snap ring onto the end of the spindle shaft.



Automatic Locking Hub Installation

15. Install the automatic locking hub assembly over the spindle by lining up the three hub assembly legs with three pockets in cam assembly. Install

the retainer washers.

16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 inch). the maximum torque to rotate the hub is 2.8 Nm (25

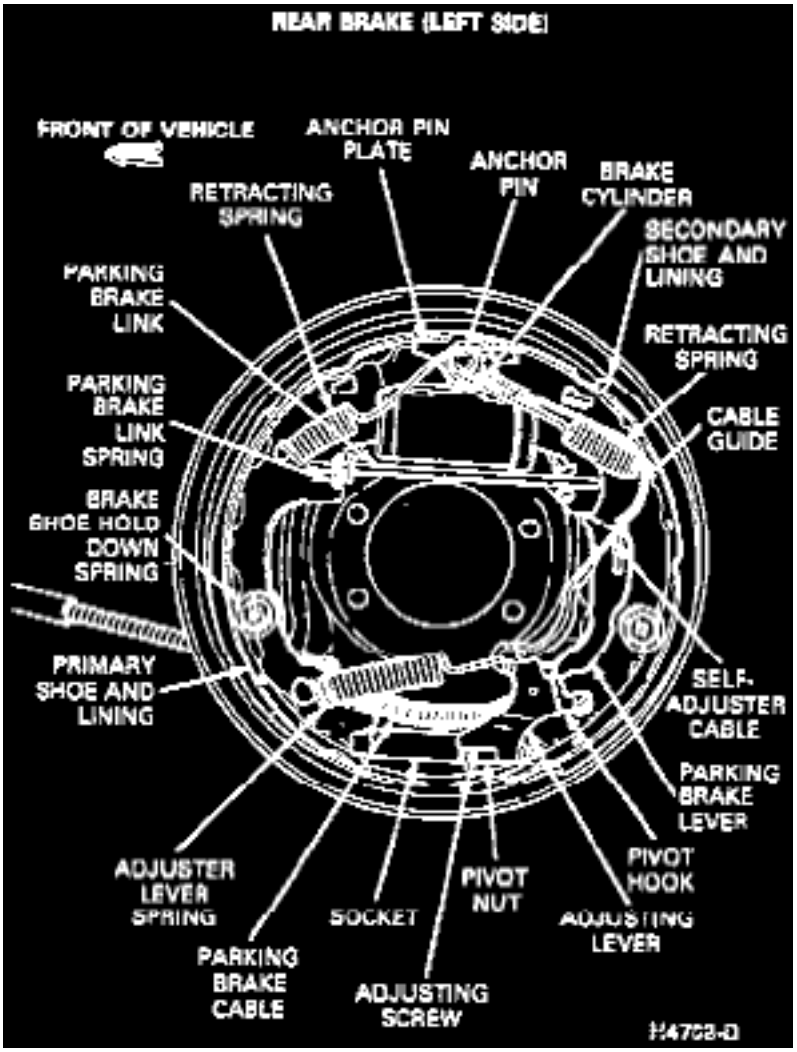
in lb).

Backing Plate: Specifications

Backing plate retaining nuts	34-47 Nm (25-35 ft lb)

Backing Plate: Testing and Inspection

Inspect backing plate shoe contact surface for grooves that may restrict shoe movement and cannot be removed by lightly sanding with emery cloth or other suitable abrasive. If backing plate exhibits above condition, it should be replaced. Also inspect for signs of cracks, warpage and excessive rust, indicating need for replacement.



Backing Plate: Service and Repair

Rear Brakes

REMOVE

1. Raise vehicle and position suitable safety stands under vehicle. 2. Remove the wheel and drum. Disconnect the brake line from the brake cylinder and plug line to prevent air from entering the system. 3. Remove the brake components. See: Brake Shoe/Service and Repair 4. Disconnect the parking brake lever from the cable. 5. Disconnect parking brake cable from backing plate by squeezing locking fingers together using a 9/16-inch flare nut wrench and pulling cable

through plate.

6. Remove the axle shaft.

CAUTION: When removing the axle shaft from the housing be careful not to damage the oil seal.

7. Remove the nuts retaining the backing plate to the housing and remove the backing plate.

INSTALL

1. Position the backing plate on the axle housing assembly. 2. Install the backing plate retaining nuts. Alternately and evenly tighten the nuts to 34-47 Nm (25-35 ft lb).

Backing Plate Lubrication Points

3. Apply a light coating of disc brake caliper slide grease to the ledge pads at the points where the brake shoes contact the backing plates. 4. Feed the parking brake cable through its hole in the backing plate and engage locking fingers. 5. Install the axle shaft. 6. Install the brake cylinder and brake shoes. Connect the parking brake cable to the lever. 7. Connect the brake line to the brake cylinder and install the brake drum and wheel. 8. Perform brake bleeding procedures. 9. Adjust the brake shoes.

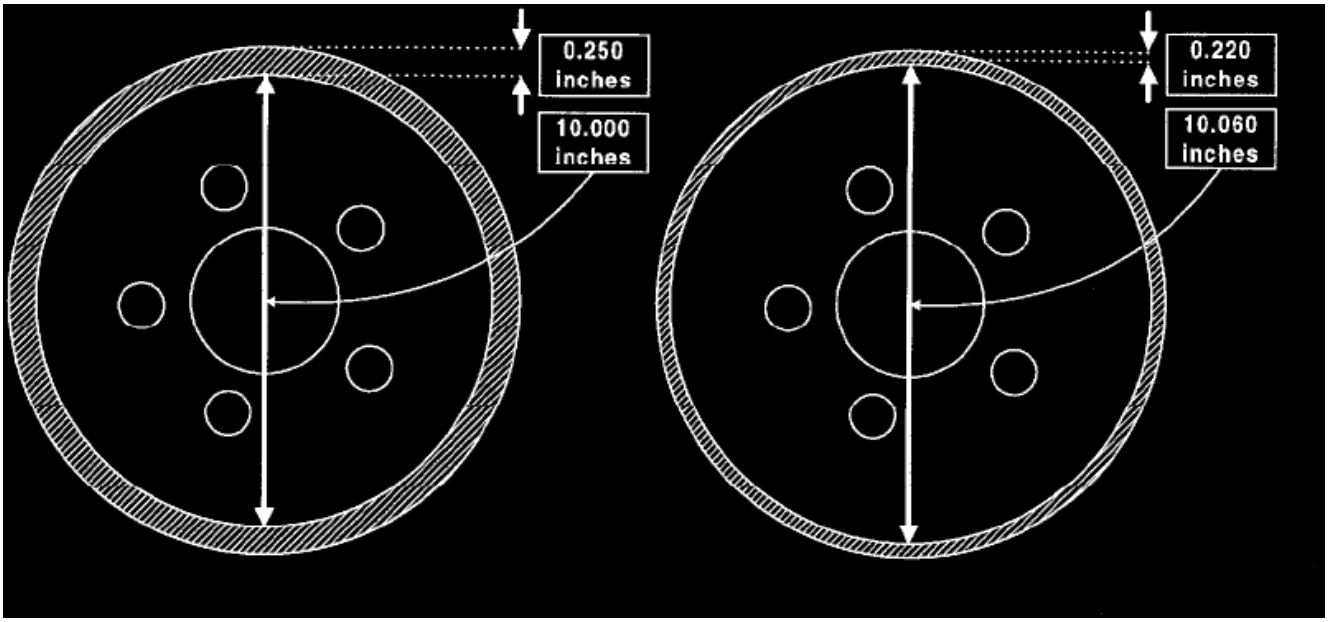
10. Lower vehicle.

Brake Drum: Specifications

Maximum Diameter To refinish the brake drum, refer to the maximum inside

diameter which is stamped on the outer surface of the brake

drum.



Brake Drum: Testing and Inspection

VISUAL INSPECTION

Inspect the drum for cracks. If any large, through-the-drum cracks are located the drum must be replaced.

NOTE: Cracks in drums are often difficult to locate. To quickly determine if a drum is cracked lightly drop the drum (from a height of 4-5 inches) onto a flat hard surface. A cracked drum will make a dull thud sound while a good drum will make a ringing sound.

Inspect for signs of overheating. An overheated drum will often be discolored (blue/gold), warped, or heat checked. Heat checks are small cracks in the drum friction surface. Heat checks can be removed by resurfacing.

NOTE: The cause of the overheating should be determined prior to replacing the shoes/linings or drums.

Inspect for scoring. Any grooves or scores in excess of 0.008 inches should be resurfaced.

SPECIFICATIONS - See: Specifications

MAXIMUM DIAMETER

Purpose

The thickness of the drum friction surface is directly proportional to the drums ability to absorb and release heat during braking. As the drum becomes thinner due to normal wear and resurfacing it looses its ability to absorb and release heat and is more prone to brake fade, distortion, and cracking.

As the drum wears the inside diameter of the drum increases. The amount of drum thickness lost to wear is equal to 1/2 the increase in diameter.

There are two specifications related to drum thickness.

How To Measure

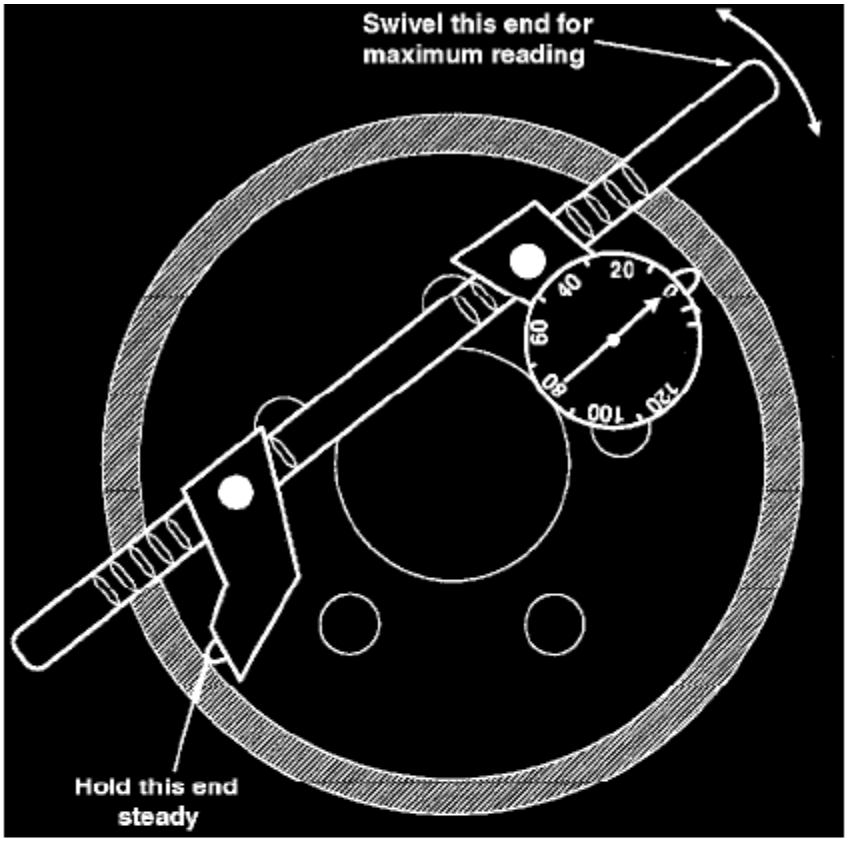
NOTE: For additional information on how to use a drum micrometer see Fundamentals and Basics.

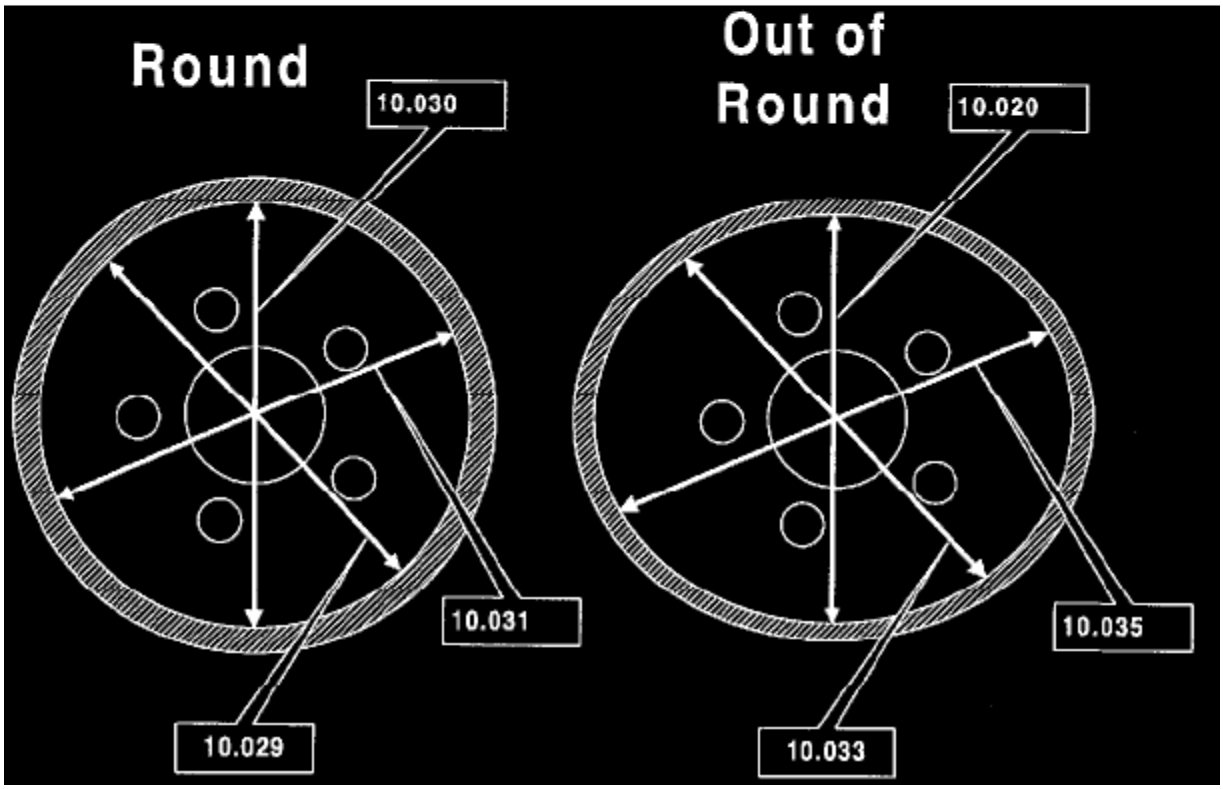
- A drum micrometer is used to measure the drum diameter.

- The micrometer scale should be initially set to the original (new) thickness of the drum.

- The base of the micrometer should be placed in the deepest groove in the drum and held steady while the measuring point is swiveled to find the maximum diameter.

- The base and measuring point should be kept at the same depth in the drum.


Swivel this end for maximum reading
Hold this end steady


Round
10.030
10.031
10.029
Out of Round
10.020
10.035
10.033

Drum Micrometer

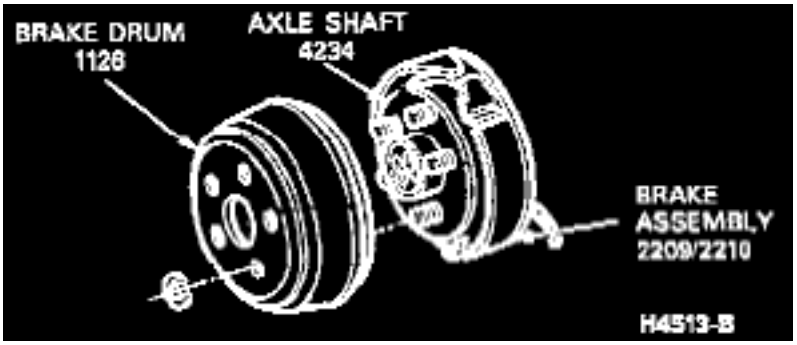
- The measurement should be repeated at 3 or more places around the circumference of the drum to determine if the drum is out of round. If the measurements differ by more than 0.004 inches the drum should be resurfaced.

NOTE: A drum which is out of round will cause a pedal pulsation to be felt upon braking.

- The measurement should also be repeated at various depths of the drum to check for a bellmouth condition. If the measurements differ by more than .004 inches the drum should be resurfaced.

NOTE: 1 inch = 25.4mm, so if your micrometer measures in inches and the specified thickness on the disc is in millimeters, convert millimeters to inches by dividing the specified number of millimeters by 25.4.

Example: Specification on disc is 17.8 mm. Dividing 17.8mm by 25.4mm/in = 17.8/25.4 = 0.70 inches.



Brake Drum: Service and Repair Installation

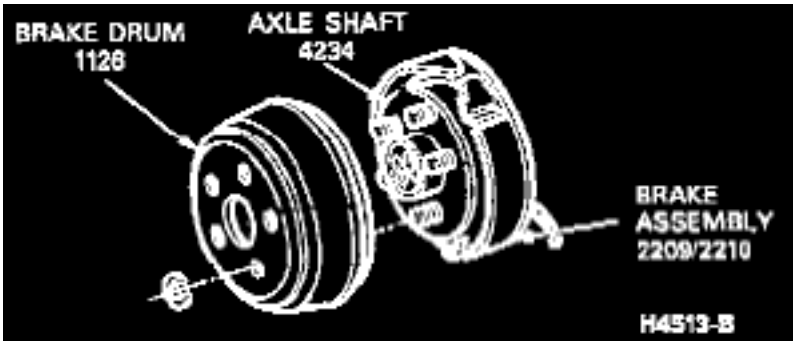
For additional information see Notes, Warnings, and Hints.

Brake Drum Removal/Installation

1. If brake shoes have been replaced or the adjusting screw has been moved the shoes should be adjusted. To do this use a suitable brake drum to

shoe gauge, measure brake drum inside diameter. Adjust brake shoes to dimension obtained on outside portion of gauge.

2. Install the brake drum. 3. Install the brake drum retaining nut. 4. Install the tire and wheel assembly 5. Lower vehicle.



Brake Drum: Service and Repair Removal

For additional information see Notes, Warnings, and Hints.

Brake Drum Removal/Installation

1. Raise and support vehicle. 2. Remove tire and wheel assembly. 3. Remove brake drum retaining nut. 4. Remove brake drum. If brake lining is dragging on brake drum, back off brake adjustment by rotating adjustment screw. If brake drum is rusted or

corroded to axle flange and cannot be removed, lightly tap axle flange to drum mounting surface with a suitable hammer.

Brake Shoe: Customer Interest Rear Brakes - Grab/Stick On First Few Applications

Article No. 98-5A-36

03/18/98

BRAKES - GRABBING AND/OR STICKING DURING FIRST FEW BRAKE APPLICATIONS AFTER A RAINFALL AND/OR WHEN BRAKES ARE COLD

LIGHT TRUCK: 1983-97 RANGER 1991-94 EXPLORER

ISSUE: A grabbing and/or sticking condition during the first few brake applications when the brakes are cold or in the morning after an overnight rain may occur on some vehicles. This may be caused by rear brake lining material that is sensitive to humidity.

ACTION: Install new design rear brake linings that are made from material that is less sensitive to humidity. Refer to the following Service Procedure for details.

SERVICE PROCEDURE

1. Remove the rear brake shoes. Refer to the appropriate Explorer/Ranger Service Manual, Section 06-02, for removal procedure.

2. Clean the brake assembly and drums.

3. Install new rear brake shoe and lining assemblies per the Parts Block. Refer to the Service Manual, Section 06-02, for installation procedure.

4. Adjust the brakes according to the Service Manual.

PART NUMBER PART NAME

F77Z-2200-AA Brake Kit (1995-97, 9" Drum)

F77Z-2200-BA Brake Kit (1995-97, 10" Drum)

F77Z-2200-CA Brake Kit (1983-94, 9" Drum)

F77Z-2200-DA Brake Kit (1983-94, 10" Drum)

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 97-14-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1993-97 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

985A36A Replace Rear Brake Shoes 1.0 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

2200 69

OASIS CODES: 301000, 702000, 702200

Brake Shoe: All Technical Service Bulletins Rear Brakes - Grab/Stick On First Few Applications

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CONDITION

BASIC PART NO. CODE

2200 69

OASIS CODES: 301000, 702000, 702200

Brake Shoe: All Technical Service Bulletins Brakes - Intermittent Brake Squeal

Article No. 90-22-6

^ BRAKES - OCCASIONAL OR INTERMITTENT "SQUEAL"

^ NOISE - BRAKES - OCCASIONAL OR INTERMITTENT SQUEAL"

FORD: 1985-86 LTD 1985-88 EXP

1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-91 TAURUS

LINCOLN-MERCURY: 1985-86 CAPRI, MARQUIS

1985-87 LYNX

1985-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER 1991 CAPRI

MERKUR: 1985-89 XR4TI

LIGHT TRUCK: 1985-90 BRONCO II

1985-91 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1988-91 F SUPER DUTY 1991 EXPLORER

This TSB article is being republished in its entirety to expand the model and model year coverage.

ISSUE: Occasional or intermittent brake squeal may be cause by the brake friction material generating noise and heat in order to dissipate energy. This occasional or intermittent squeal may be a normal condition and requires no corrective action.

ACTION: If a customer is concerned about occasional or intermittent brake squeal, it should be explained that brake friction materials inherently generate noise and heat in order to dissipate energy. As a result, an occasional squeal condition may be normal, and could be affected by cold, heat, wetness, snow, salt, mud etc.

NOTE: THIS OCCASIONAL OR INTERMITTENT SQUEAL IS NOT A FUNCTIONAL PROBLEM AND DOES NOT INDICATE ANY LOSS OF BRAKE EFFECTIVENESS.

OTHER APPLICABLE ARTICLES: None SUPERSEDES:

87-16-7

WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

301000, 702000, 702100

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Drum Brake System > Brake Shoe > Component Information > Technical Service Bulletins > All Other Service Bulletins for Brake Shoe: > 90226 > Oct > 90 > Brakes - Intermittent Brake Squeal

Brake Shoe: All Technical Service Bulletins Brakes - Intermittent Brake Squeal

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87-16-7

WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

301000, 702000, 702100

Brake Shoe: Testing and Inspection

INSPECT

Brake linings for: -

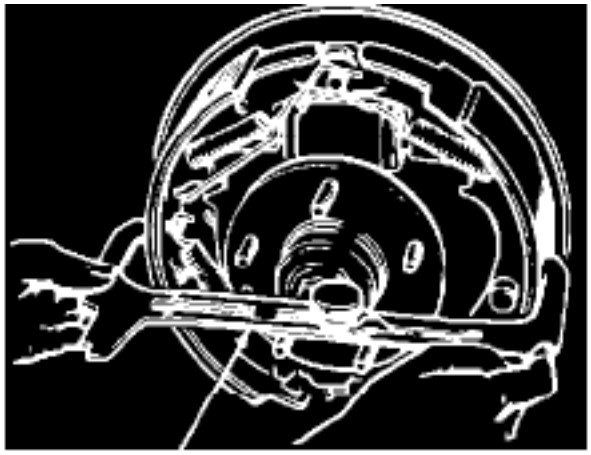
Excessive wear,

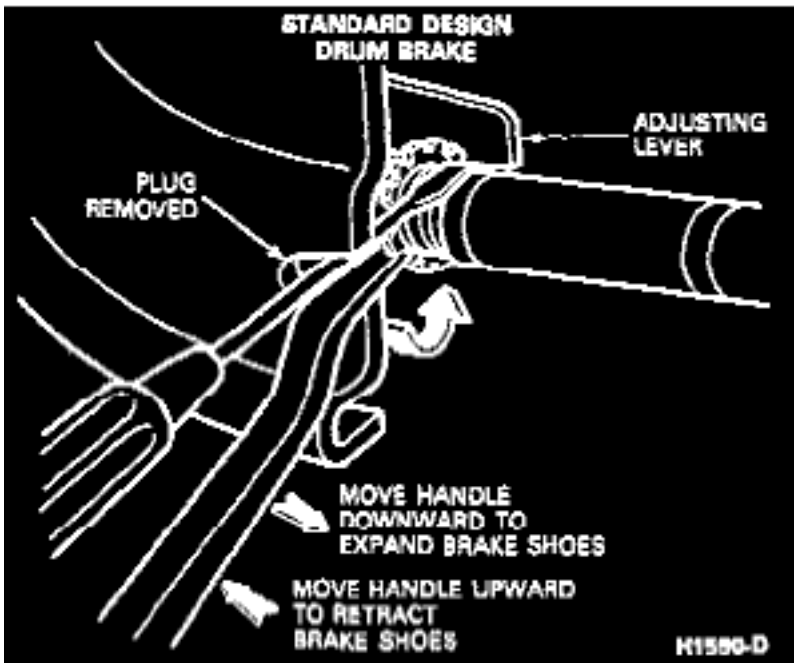
- Damage,

- Oil, grease or brake fluid contamination.

If any of the above conditions exists, brake linings should be replaced. Examine brake shoe webbing, for signs of overheating indicated by a slight blue color. If any component exhibits signs of overheating, replace hold-down and return springs with new ones.

NOTE: Do not attempt to replace only one set of brake shoes; they should be replaced as an axle set only to maintain equal braking forces.




STANDARD DESIGN
DRUM BRAKE
ADJUSTING
LEVER
PLUG
REMOVED
MOVE HANDLE
DOWNWARD TO
EXPAND BRAKE SHOES
MOVE HANDLE UPWARD
TO RETRACT
BRAKE SHOES
H1550-D

Brake Shoe: Adjustments

OVERVIEW

The rear brake shoes adjust automatically when the vehicle is driven forward or reverse and the brakes are applied sharply several times. Manual adjustment is required only when brake shoes are replaced. When adjusting rear brakes, check parking brake cable for proper adjustment and that equalizer is operating freely.

WITH DRUMS REMOVED

1. With drums removed, clean areas where shoes contact backing plate, then apply suitable lubricant to these contact areas, ensuring that lubricant does not contaminate linings.

2. Using suitable brake shoe adjusting gauge, adjust gauge to inside diameter of brake drum.

Fig. 4 Checking Brake Lining Clearance

3. Reverse tool and adjust shoes until they contact gauge, ensuring that gauge is parallel to vehicle and at centerline of axle, Fig. 4. Holding automatic adjusting lever aside, rotate adjusting screw as necessary.

4. Install drums, wheels and retaining nuts, then complete adjustment by applying brakes several times while driving vehicle in reverse.

5. Check brake operation by making several stops in forward gear. Repeat step 4, if necessary.

WITH DRUMS INSTALLED

1. Raise and support rear of vehicle until the rear wheels clear the floor.

2. Remove cover from adjusting hole located at bottom of backing plate.

Brake Adjustment

3. Using a small screwdriver to hold adjusting lever away from star wheel, rotate adjusting screw star wheel until brake shoes are locked against drum, Fig. 5.

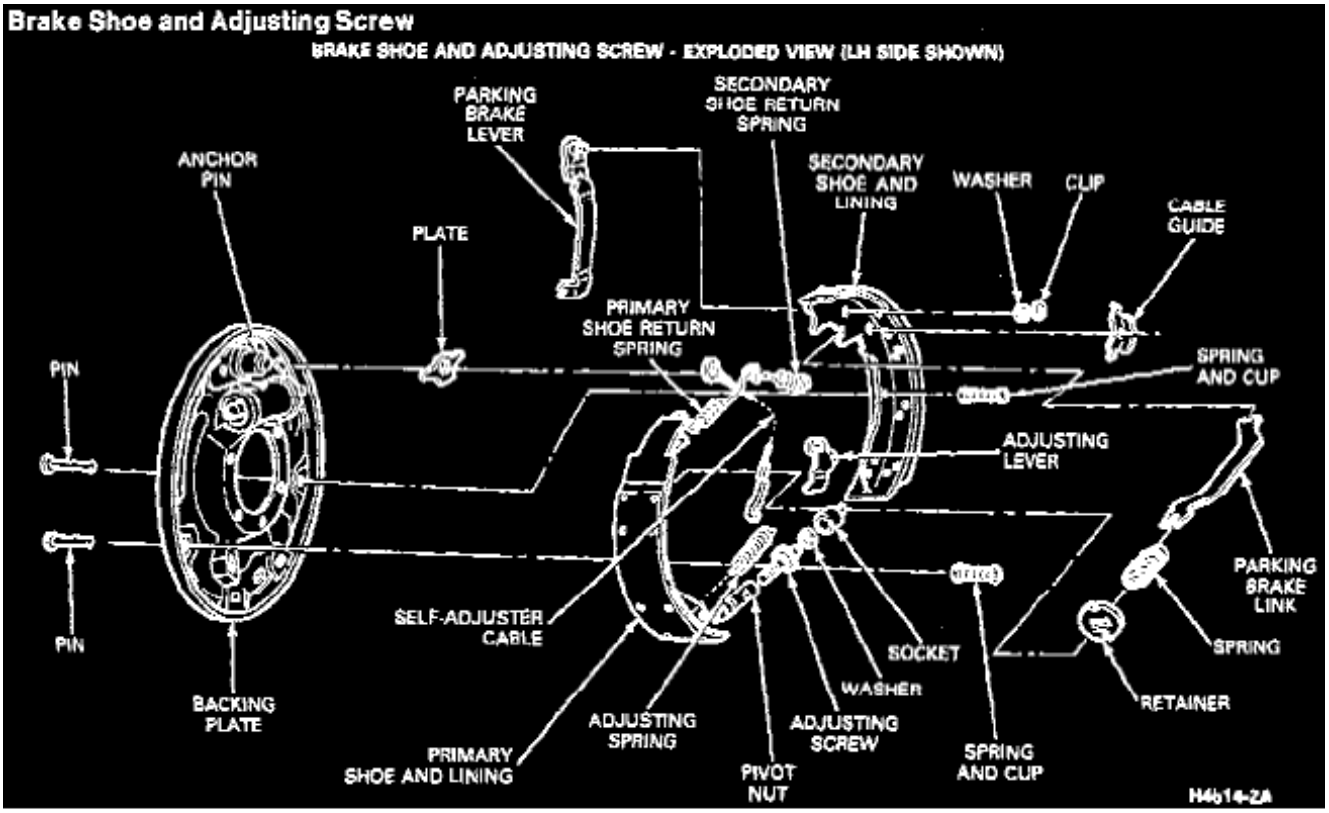
4. Back-off brake adjusting screw approximately 10 to 12 notches so that brake drum rotates freely without drag. If brake drum does not rotate freely, remove drum and clean and inspect drum brake components.

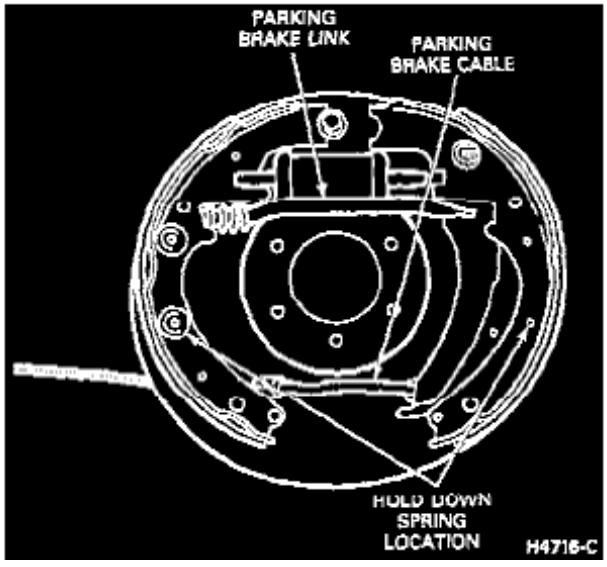
5. After adjusting both drum brakes install adjustment hole covers, lower vehicle and apply brakes several times to position brake shoes.

6. Road test vehicle to ensure brakes operate properly.

WARNING: Perform the road test only when the brakes will apply and the vehicle can be safely stopped.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Drum Brake System > Brake Shoe > Component Information > Service and Repair > Installation





Brake Shoe: Service and Repair Installation

For additional information see Notes, Warnings, and Hints.

Brake Components

1. Clean the ledge pads on the backing plate. Sand lightly to bare metal. 2. Apply a light coating of caliper slide grease at the points where the brake shoes touch the backing plate. 3. Before installing the rear brake shoes, assemble the parking brake lever on the secondary shoe and secure with the spring washer and retaining

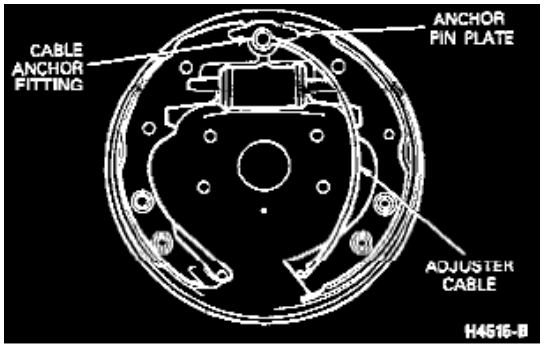
clip.

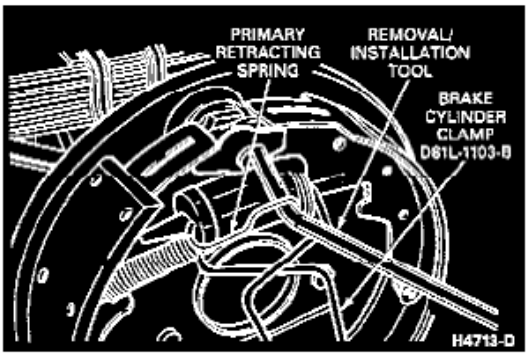
Brake Assembly

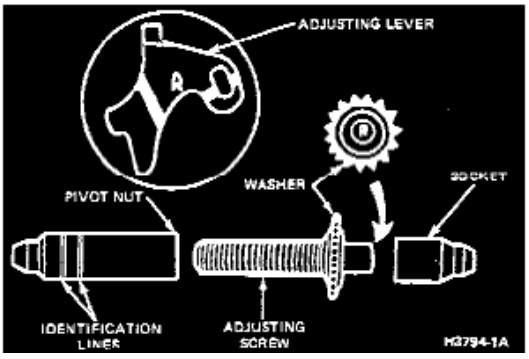
4. Position the brake shoes on the backing plate, and install the hold-down spring pins, springs, and cups using a hold down spring tool. Install the

parking brake link, spring, and washer. Connect the parking brake cable to the parking brake lever.

NOTE: For additional information see Brake Spring Removal and Installation Notes.


ANCHOR PIN PLATE
CABLE ANCHOR FITTING
ADJUSTER CABLE
H4616-B


PRIMARY RETRACTING SPRING
REMOVAL/ INSTALLATION TOOL
BRAKE CYLINDER CLAMP D81L-1103-B
H4713-D


ADJUSTING LEVER
WASHER
SOCKET
PIVOT NUT
IDENTIFICATION LINER
ADJUSTING SCREW
H3794-1A

Installing The Anchor Pin Plate

5. Install the anchor pin plate. if equipped. Place the cable anchor over the anchor pin with the crimped side toward the backing plate.

Installing Springs

6. Install the primary shoe-to-anchor spring using a brake spring removal/installation tool. 7. Install the cable guide on the secondary shoe web with the flanged holes fitted into the hole in the secondary shoe web. Thread the cable around

the cable guide groove.

NOTICE: Make sure the cable is positioned in this groove, and not between the guide and the shoe web.

8. Install the secondary shoe-to-anchor (long) spring.

NOTICE: Make sure the cable end is not cocked or binding on the anchor pin when installed. All parts should be flat on the anchor pin.

9. Remove the brake cylinder clamp.

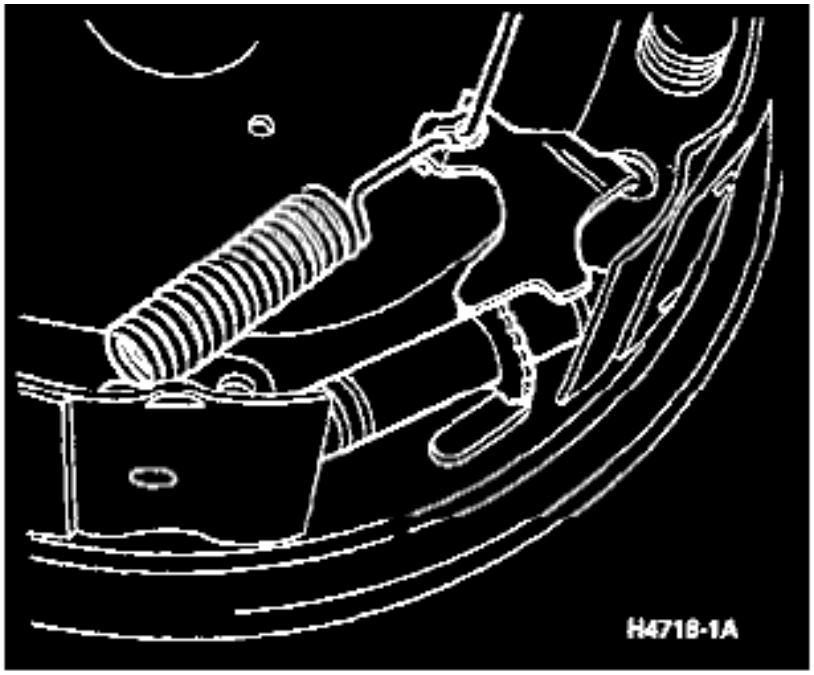
10. Apply a long-life grease to the threads and the socket end of the adjusting screw. Turn the adjusting screw into the adjusting pivot nut to the end of

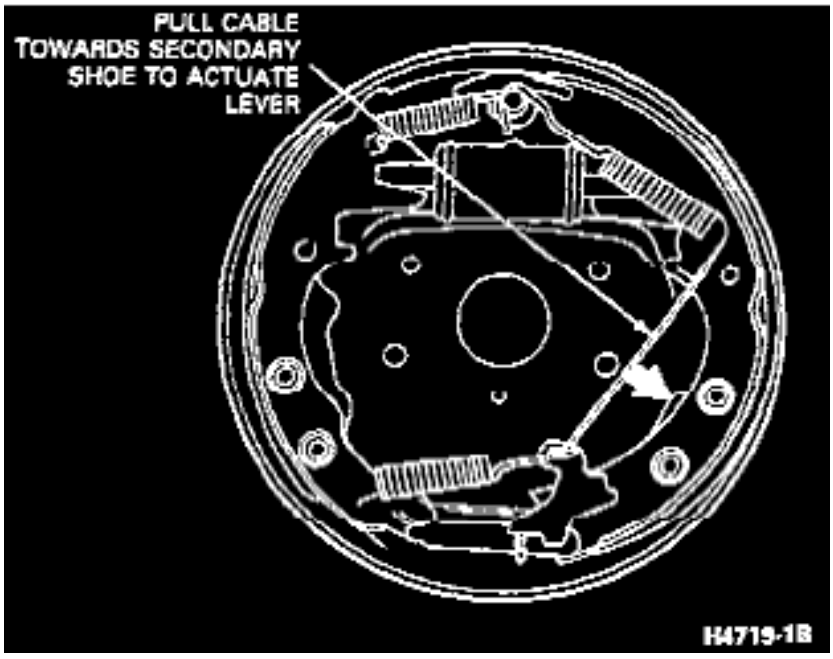
the threads and then loosen it one-half turn.

Adjusting Screw Identification

CAUTION: Install the adjusting screw assembly in the same location from which it was removed. Interchanging the brake shoe adjusting screw assemblies from one side of the vehicle to the other will cause the brake shoes to retract rather than expand each time the automatic adjusting mechanism is operated.

NOTICE: To prevent incorrect installation, the socket end of each adjusting screw is stamped with R or L to indicate their installation on the


H4718-1A


PULL CABLE TOWARDS SECONDARY SHOE TO ACTUATE LEVER
H4719-1B

right or left side of the vehicle. The adjusting pivot nuts can be distinguished by the number of lines machined around the body of the nut. Two lines indicate a right-hand nut; one line indicates a left-hand nut. Another way to identify adjusters is to check thread pitch. The right side adjuster has right-hand threads while the left side adjuster has left-hand threads. The adjuster will also increase in length when the lever is operated if properly installed.

Installing Adjusting Assembly

11. Place the adjusting socket on the screw and install the assembly between the shoe ends with the adjusting screw nearest the secondary shoe. 12. Hook the cable hook into the hole in the adjusting lever from the outboard plate side. The adjusting levers are also stamped with an R or L to

indicate their installation on the right or left hand brake assembly.

13. Place the hooked end of the adjuster spring in the large hole in the primary shoe web. Connect the loop end of the spring to the adjuster lever hole.

Checking Adjustment Lever Operation

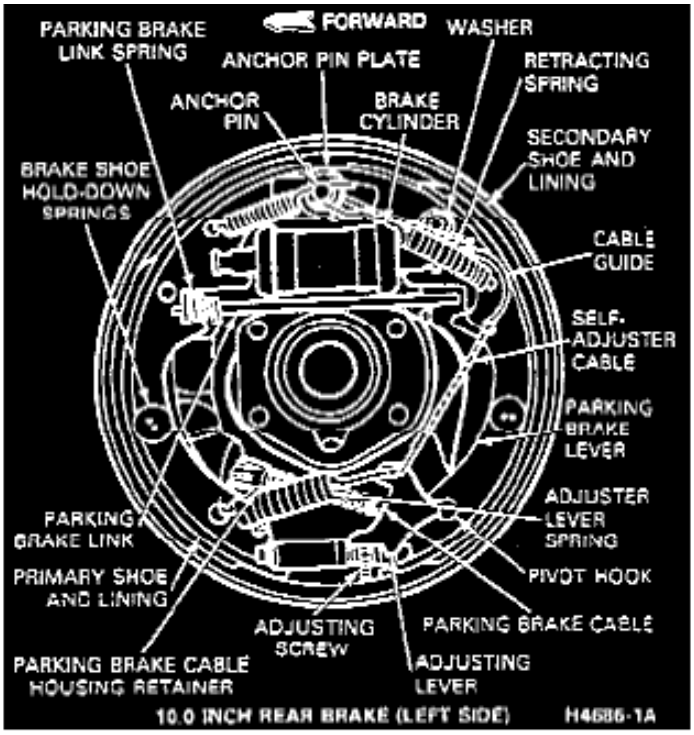
14. Pull the adjuster lever, cable and automatic adjuster spring down toward the rear to engage the pivot hook in the large hole in the secondary shoe

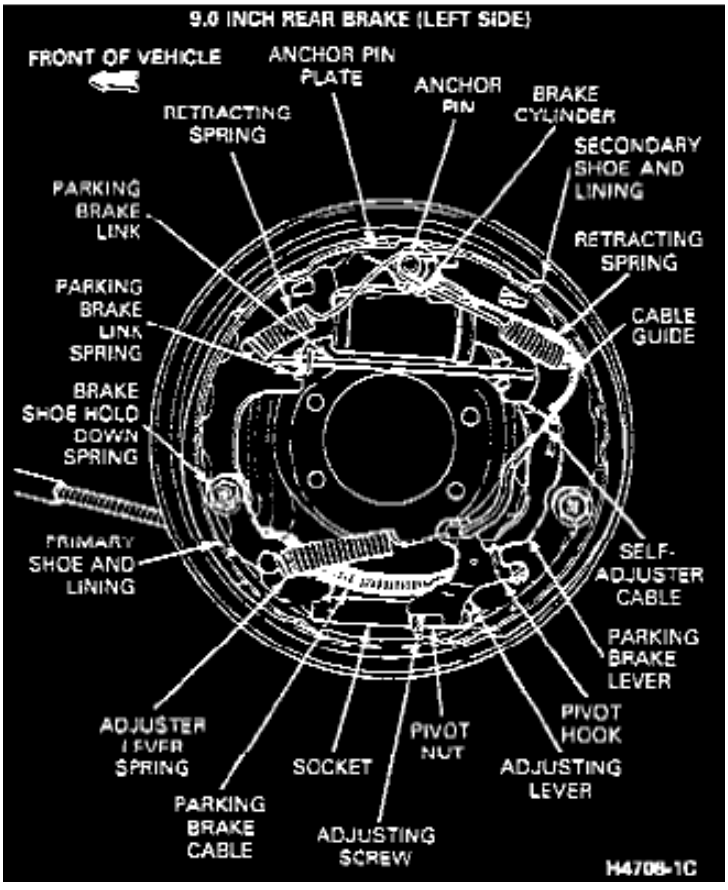
web.

15. Check the action of the adjuster by pulling cable toward secondary shoe, activating lever. Lever should snap in behind the next tooth of adjuster.

Release cable to return adjuster lever to original position and the adjuster should turn one notch.

If pulling the cable does not produce the action described, or if lever action is sluggish instead of positive and sharp, check the position of the lever on the adjusting screw toothed wheel. The lever should contact the adjusting wheel one tooth above the center line of the adjusting screw. If the contact point is below this center line, the lever will not lock on the teeth in the adjusting screw wheel, and the screw will not be turned as the lever is actuated by the cable.


PARKING BRAKE LINK SPRING
FORWARD
WASHER
ANCHOR PIN PLATE
RETRACTING SPRING
ANCHOR PIN
BRAKE CYLINDER
SECONDARY SHOE AND LINING
BRAKE SHOE HOLD-DOWN SPRINGS
CABLE GUIDE
SELF-ADJUSTER CABLE
PARKING BRAKE LEVER
ADJUSTER LEVER SPRING
PARKING BRAKE LINK
PRIMARY SHOE AND LINING
PIVOT HOOK
ADJUSTING SCREW
PARKING BRAKE CABLE
PARKING BRAKE CABLE HOUSING RETAINER
ADJUSTING LEVER
10.0 INCH REAR BRAKE (LEFT SIDE)
H4686-1A


9.0 INCH REAR BRAKE (LEFT SIDE)
FRONT OF VEHICLE
ANCHOR PIN PLATE
ANCHOR PIN
BRAKE CYLINDER
RETRACTING SPRING
SECONDARY SHOE AND LINING
PARKING BRAKE LINK
RETRACTING SPRING
PARKING BRAKE LINK SPRING
CABLE GUIDE
BRAKE SHOE HOLD DOWN SPRING
PRIMARY SHOE AND LINING
SELF-ADJUSTER CABLE
PARKING BRAKE LEVER
PIVOT HOOK
ADJUSTER LEVER SPRING
SOCKET
PIVOT NUT
ADJUSTING LEVER
PARKING BRAKE CABLE
ADJUSTING SCREW
H4709-1C

Brake Shoe: Service and Repair Removal

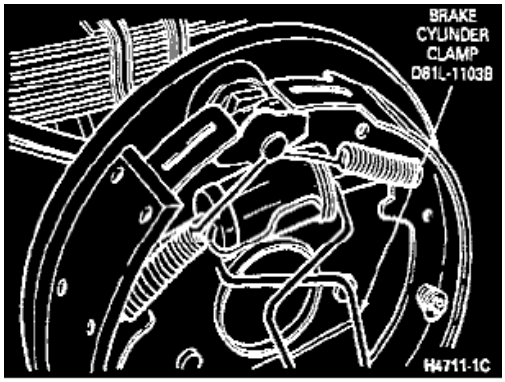
For additional information see Notes, Warnings, and Hints.

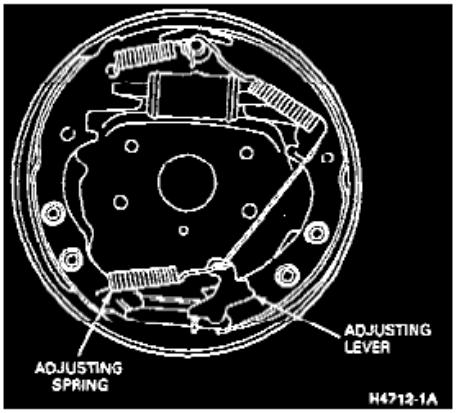
Brake Components - 10 Inch Drum

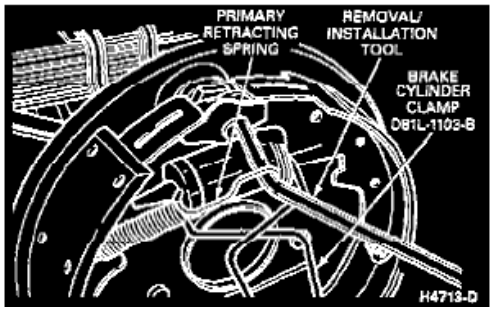
Brake Components - 9 Inch Drum

1. Remove the wheel and drum. 2. Inspect brake cylinder for signs of leaks or presence of rust by removing the boots and inspecting interior surfaces.

NOTICE: Water leaking into the cylinder past the boots will cause rust to form and may cause the cylinder to seize. If the boots are not removed, brake fluid leakage past the cups may go undetected because the boots may seal the fluid in the cylinder. If leaks are found, the brake cylinders must be removed and repaired or replaced.


BRAKE
CYLINDER
CLAMP
D81L-1103B
H4711-1C


ADJUSTING
LEVER
ADJUSTING
SPRING
H4712-1A


PRIMARY
RETRACTING
SPRING
REMOVAL/
INSTALLATION
TOOL
BRAKE
CYLINDER
CLAMP
D81L-1103-B
H4713-D

Compressing The Brake Cylinder

3. If no leaks are found, install a brake cylinder clamp over the ends of the cylinder as shown. 4. Contract the shoes as follows:

a. Disengage the adjusting lever from the adjusting screw by pulling backward on the adjusting lever cable. b. Shorten the length of the adjuster by screwing the threaded rod in. This is done by moving the outward side of the adjusting screw upward until

the pivot nut is backed off as far as it will go.

Adjustment Lever Assembly

5. Pull the adjusting lever, cable and automatic adjuster spring down and toward the rear to unhook the pivot hook from the large hole in the

secondary shoe web.

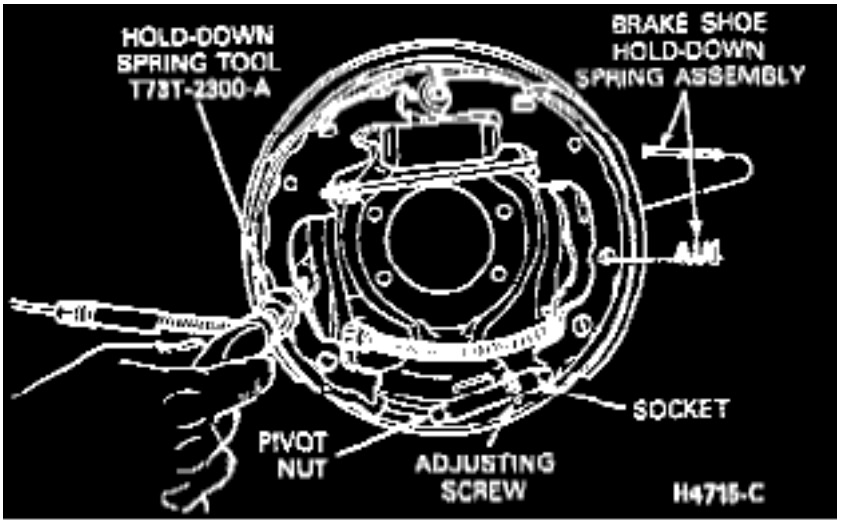
CAUTION: Do not pry the pivot hook out of the hole.

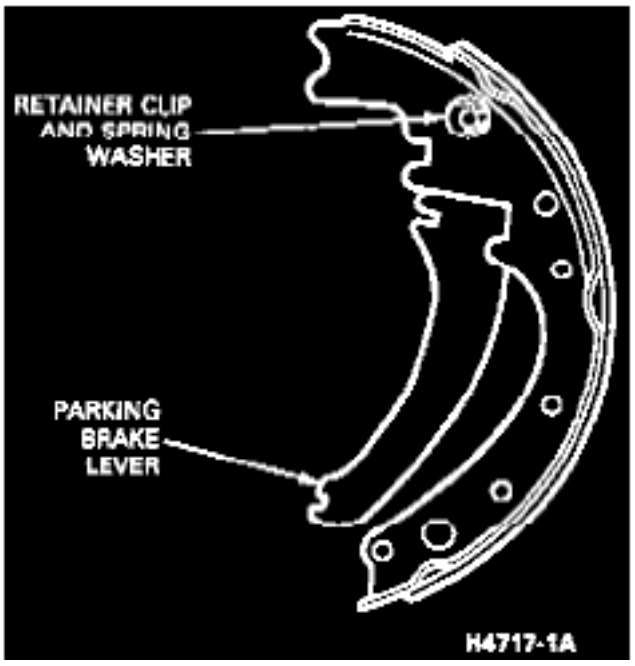
6. Remove the automatic adjuster spring and adjusting lever.

NOTICE: Note the color and position of each spring, they must be re-assembled in same position.

Removing/Installing Brake Springs

7. Remove the secondary shoe-to-anchor spring using a suitable brake spring removal / installation tool. Using the same tool, remove the primary





shoe-to-anchor spring and unhook the cable anchor. Remove the anchor pin plate (if equipped).

NOTE: For additional information see Brake Spring Removal and Installation Notes.

8. Remove the cable guide from the secondary shoe.

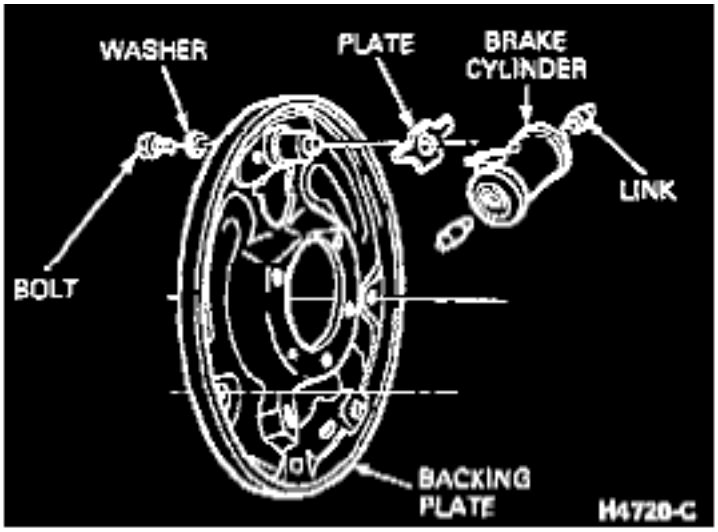
Removing/Installing Shoe Hold Down Springs

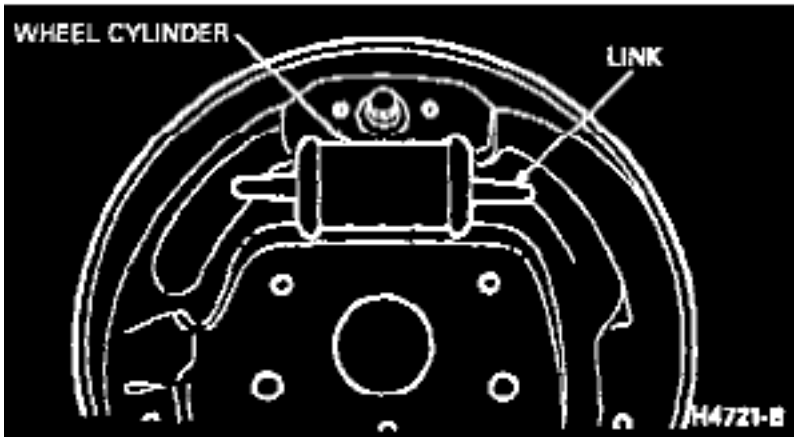
9. Remove the shoe hold-down springs using a hold down spring tool. Remove the shoes, adjusting screw, pivot nut, and socket.

10. Remove the parking brake link and spring. Disconnect the parking brake cable from the parking brake lever.

Park Brake Lever Assembly

11. Remove the brake secondary shoe. Remove the retainer clip and spring washer and remove the parking brake lever.





Wheel Cylinder: Service and Repair Removal

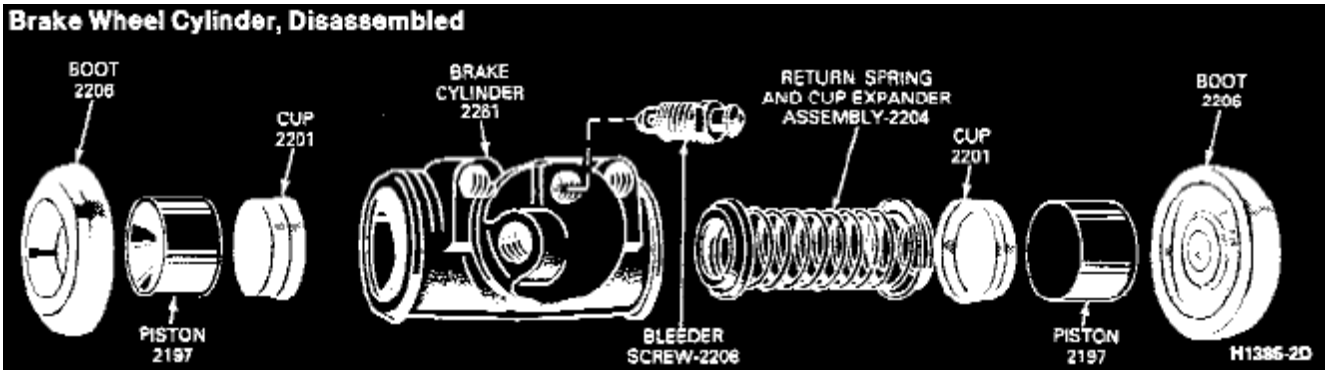
For additional information see Notes, Warnings, and Hints.

Wheel Cylinder And Backing Plate

1. Raise vehicle and position suitable safety stands under vehicle. Remove wheel and tire assembly. 2. Remove the drum, and brake shoes.

Wheel Cylinder Connecting Links

3. Remove the cylinder-to-shoe connecting links (if equipped). 4. Disconnect the brake line from the brake cylinder and plug line to prevent air from entering the system. 5. Remove the brake cylinder retaining bolts and lockwashers, and then remove the cylinder from the backing plate.



Wheel Cylinder: Service and Repair Rebuild

For additional information see Notes, Warnings, and Hints.

Wheel Cylinder Assembly

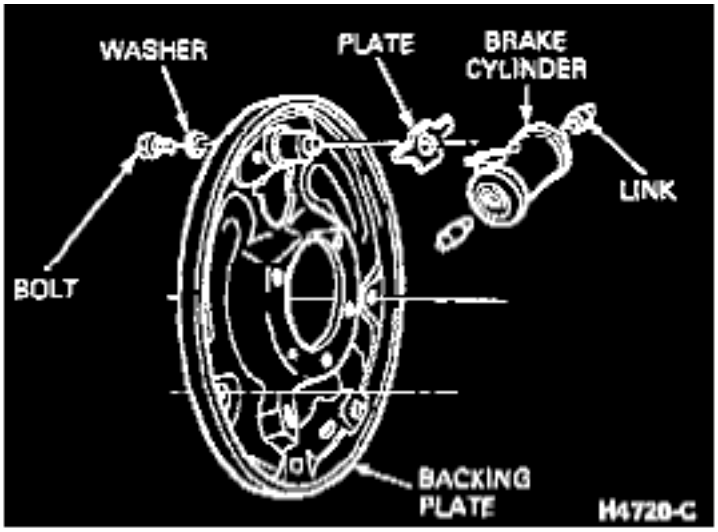
DISASSEMBLY

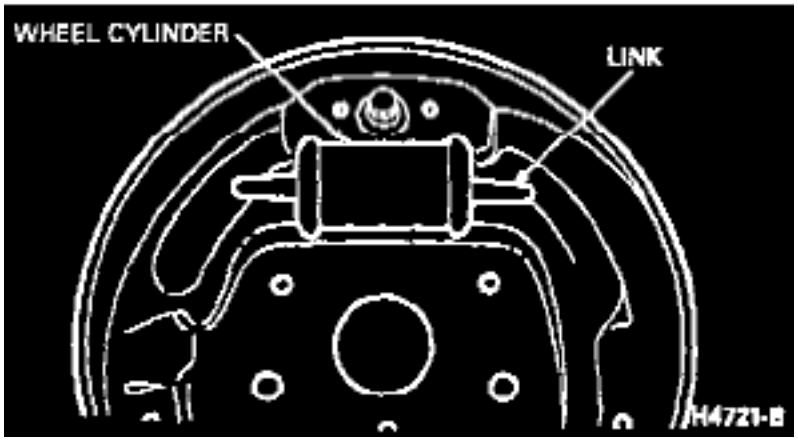
1. With the wheel cylinder removed, remove the rubber boots from the ends of the brake cylinder 2. Remove the pistons, cups, and piston return spring and cup expander assembly from the cylinder. 3. Remove the bleeder screw from the cylinder.

ASSEMBLY

1. Clean the wheel cylinder body with clean isopropyl alcohol or brake parts cleaner to remove any contamination. 2. Coat all brake cylinder parts with clean DOT 3 brake fluid. 3. Install the bleeder screw in the brake cylinder. 4. Place the piston return spring and piston expander assembly, cups, and pistons in the cylinder bore. 5. Clamp the brake cylinder pistons against the ends of the cylinder.

NOTICE: When using a brake cylinder repair kit, follow the instructions in the kit and use all of the parts provided.





Wheel Cylinder: Service and Repair Installation

For additional information see Notes, Warnings, and Hints.

Wheel Cylinder And Backing Plate

1. Place the brake cylinder on the backing plate and install the retaining bolts and lockwashers. 2. Connect the brake line to the brake cylinder.

Wheel Cylinder Connecting Links

3. Install the brake shoes and the connecting links (if equipped). 4. Install the drum. 5. Install the wheel and tire assembly. 6. Adjust the brakes and perform system brake bleeding procedures.

Brake Bleeding: Service and Repair Manual Bleeding

Bleed the primary and secondary hydraulic brake systems separately.

NOTICE: Do not allow the reservoir to run dry during the bleeding operation. Keep the master cylinder reservoirs filled with the specified brake fluid. Never reuse the fluid that has been drained from the hydraulic system.

1. Loosen the master cylinder to hydraulic line nut. 2. Wrap a shop cloth around the tubing below the fitting to absorb escaping brake fluid. 3. Push the brake pedal down slowly by hand to the floor of the cab. This will force air trapped in the master cylinder to escape at the fitting. 4. Hold the pedal down and tighten the fitting. Release the brake pedal.

NOTICE: Do not release the brake pedal until the fitting is tightened or air will re-enter the master cylinder.

5. Repeat this procedure until air ceases to excape at the fitting and the brake pedal is firm. 6. Place a box wrench on the bleeder fitting on the Rear Antilock Brake System (RABS) valve. Attach a rubber drain tube to the bleeder fitting

making sure the end of the tube fits snugly around the bleeder fitting.

7. Submerge the free end of the tube in a container partially filled with clean brake fluid. Loosen the bleeder fitting approximately three-quarters of a

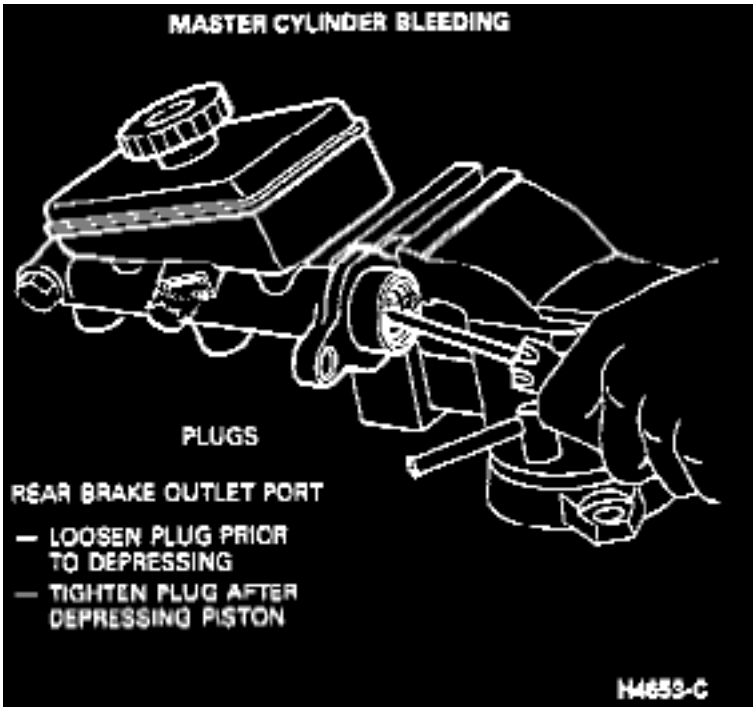
turn.

8. Slowly press the brake pedal all the way down. Close the bleeder fitting, and return the pedal to the fully released position. Repeat this operation

until air bubbles no longer appear at the submerged end of the bleeder tube.

9. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the bleeder tube.

10. Repeat this procedure at the RR, LR, RF and LF wheels. 11. When the bleeding procedure is complete, fill the master cylinder to the maximum level line of the master cylinder reservoir.



Brake Bleeding: Service and Repair Master Cylinder Bleeding

Bench Bleeding Master Cylinder

1. Support the master cylinder body in a vise, and fill both fluid reservoirs with heavy duty DOT 3 brake fluid. 2. Install plugs in the front and rear brake outlet ports. Bleed the rear brake outlet system first. 3. Loosen the plug in the rear brake outlet port. Depress the primary piston slowly to force the air out of the master cylinder. Tighten plug while

piston is depressed or air will enter the master cylinder.

4. Repeat this procedure until air ceases to exit at the outlet port. 5. Repeat steps 3 and 4 for the front brake outlet port with the rear brake outlet plugged. 6. Tighten the plugs and try to depress the piston. Depressing the piston should be harder after all air is expelled. 7. Install the cover and diaphragm assembly making sure the cover retainer is tightened securely. Remove the plugs.

For additional information see Bench Bleeding Notes.

Brake Bleeding: Service and Repair Pressure Bleeding

Be sure the bleeder tank contains enough of the specified brake fluid to complete the bleeding operation. Charge the tank with approximately 69-206 kPa (10-30 psi). Never exceed 345 kPa (50 psi). Never use brake fluid that has been drained from the hydraulic system. Bleed the longest lines first.

1. Clean all dirt from the master cylinder reservoir cap. 2. Remove the master cylinder reservoir cap and fill the master cylinder reservoir with the specified brake fluid. Install the pressure bleeder adapter

tool on the master cylinder, and attach the bleeder tank hose to the fitting on the adapter.

NOTE: Master cylinder pressure bleeder adapter tools are available from the manufacturers of pressure bleeding equipment. Follow the manufacturer's instructions when installing the adapter.

3. Place a 3/8 inch box wrench on the bleeder fitting on the right rear brake wheel cylinder. Attach a bleeder tube snugly to the bleeder fitting. 4. Open the valve on the bleeder tank and admit pressurized brake fluid to the master cylinder reservoir. 5. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting. 6. When air bubbles no longer appear in the fluid at the submerged end of the bleeder tube, close the bleeder fitting and remove the tube. 7. Repeat Steps 3 through 6 at the opposite wheel cylinder. On front brakes, bleed the right front caliper first. 8. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting. 9. Remove the pressure bleeder adapter tool. Fill the master cylinder reservoirs with the specified brake fluid to within 3 mm (1/8 in) from the top of

the filler neck. Install the master cylinder cover.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Hydraulic System, Brakes > Brake Caliper > Component Information > Technical Service Bulletins > Customer Interest for Brake Caliper: > 93117 > May > 93 > Brakes - Sticking/Binding/Grabbing

Brake Caliper: Customer Interest Brakes - Sticking/Binding/Grabbing

Article No. 93-11-7

05/26/93

BRAKES - STICK/BIND/GRAB - FRONT CALIPER PINS CORRODED

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

This TSB article is being republished in its entirety to include F Super Duty vehicles.

ISSUE: Sticking, binding or grabbing of the brakes may be caused by brake caliper slide pins that are corroded. The corrosion does not allow the brake caliper assembly to move freely.

ACTION: Install the new improved caliper pins that are corrosion resistant. Refer to the following Service Procedure for service details.

SERVICE PROCEDURE

1. Remove the caliper and pins. Refer to the applicable Light Truck Service Manual for service details.

NOTE: IF PADS ARE DAMAGED OR WORN, PAD REPLACEMENT IS REQUIRED.

2. Clean the upper and lower knuckle pin grooves, upper and lower knuckle inner pad grooves, and the upper and lower caliper pin grooves with a wire brush or portable wire wheel.

WARNING: USE SAFETY GLASSES AND AN AIR RESPIRATOR WHEN CLEANING THE GROOVES.

3. Apply a light coat of lubricant (D7AZ-19590-A) to the upper and lower knuckle inner pad grooves and upper and lower caliper pin grooves.

CAUTION: LUBRICANT SHOULD NOT BE USED ON ROTORS, LININGS OR CALIPER PISTON BOOTS.

4. Re-assemble the caliper using the new pins, (F2TZ-2C150-A) for all vehicles except F Super Duty. Use new pins (F2TZ-2C150-B) for F Super Duty vehicles.

NOTE: NORMAL BRAKE MAINTENANCE REQUIREMENTS LISTED IN THE OWNER MANUAL SHOULD BE PERFORMED EVERY 15,000 MILES.

PART NUMBER PART NAME CLASS

D7AZ-19590-A Lubricant-Disc Brake AM

F2TZ-2C150-A Pin-Brake Caliper B

F2TZ-2C150-B Pin-Brake Caliper (F Super B

Duty)

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 92-12-14

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models And Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

931107A Aerostar/Ranger/Bronco II, 0.8 Hr.

(Through 1990), Explorer (Starting 1991), F-Series Under 8500 GVW, Bronco And Econoline Under 8500

931107B F-Series Over 8500 GVW 0.9 Hr.

And Econoline Over 8500 GVW Through 1991

931107C F Super Duty Front 1.2 Hr.

931107D F Super Duty Rear 1.2 Hr.

931107E F Super Duty Front And 2.1 Hr.

Rear

DEALER CODING

BASIC PART NO. CONDITION CODE

2C150 41

OASIS CODES: 301000

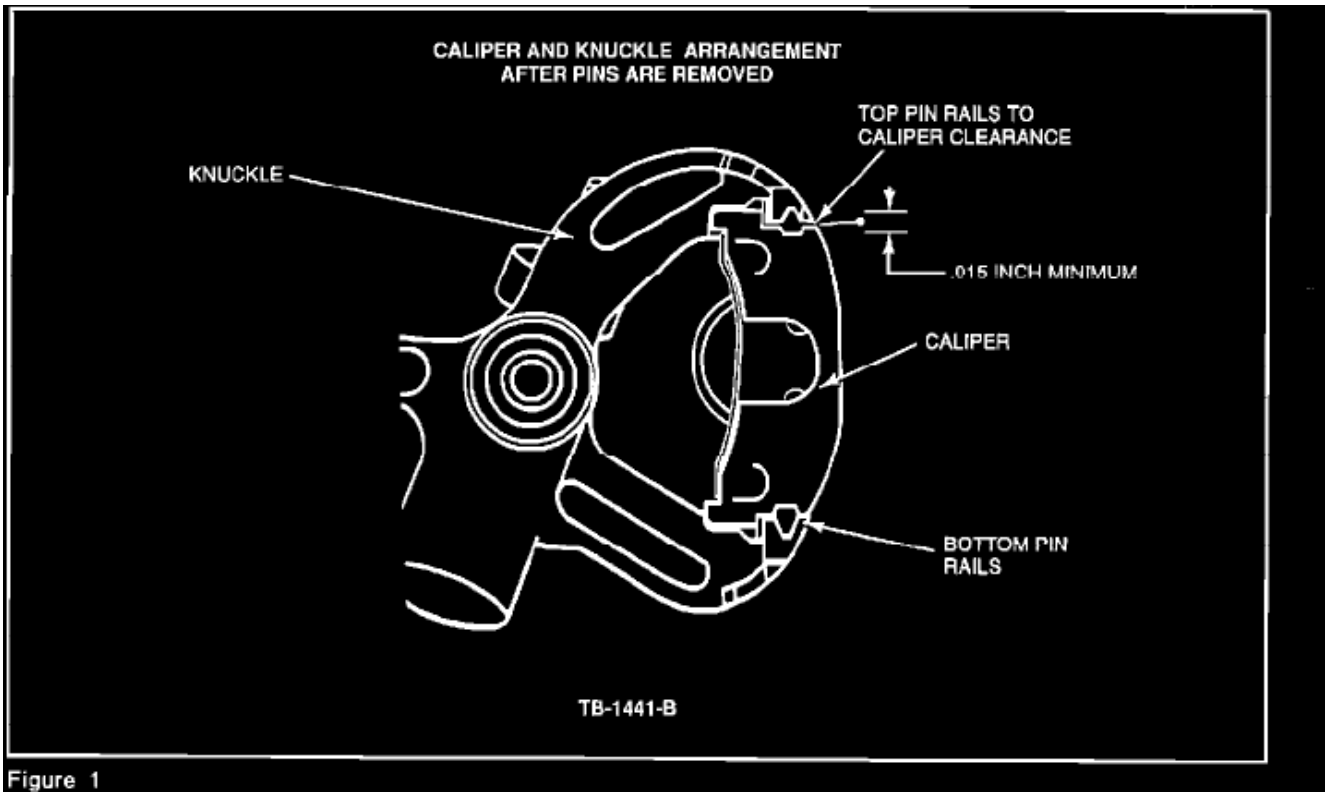


Figure 1

Brake Caliper: Customer Interest Front Brakes - Popping or Clunking Noise

Article No. 92-14-7

07/01/92

^ BRAKES - FRONT DISC - "POPPING" OR "CLUNKING" SOUND DURING BRAKING

^ NOISE - "POPPING" OR "CLUNKING" SOUND WHEN BRAKING

^ VIBRATION THROUGH FLOOR BOARD WHEN BRAKING

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 AEROSTAR, RANGER 1991-92 EXPLORER

See TSB # 93-20-11 for additional information.

ISSUE: A "popping" or "clunking" noise and a floor board vibration may occur during braking. The noise and/or vibration may be caused by the front brake caliper suddenly springing away from the caliper abutment and returning.

ACTION: Check and adjust the brake pads and caliper knuckle clearance by using the following service procedure.

1. Road test to confirm that the "popping" or "clunking" noise occurs only during braking at the initial part of the stop.

2. Raise the front of the vehicle.

a. Remove the front wheels.

b. Remove the pins from the caliper.

3. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

NOTE:

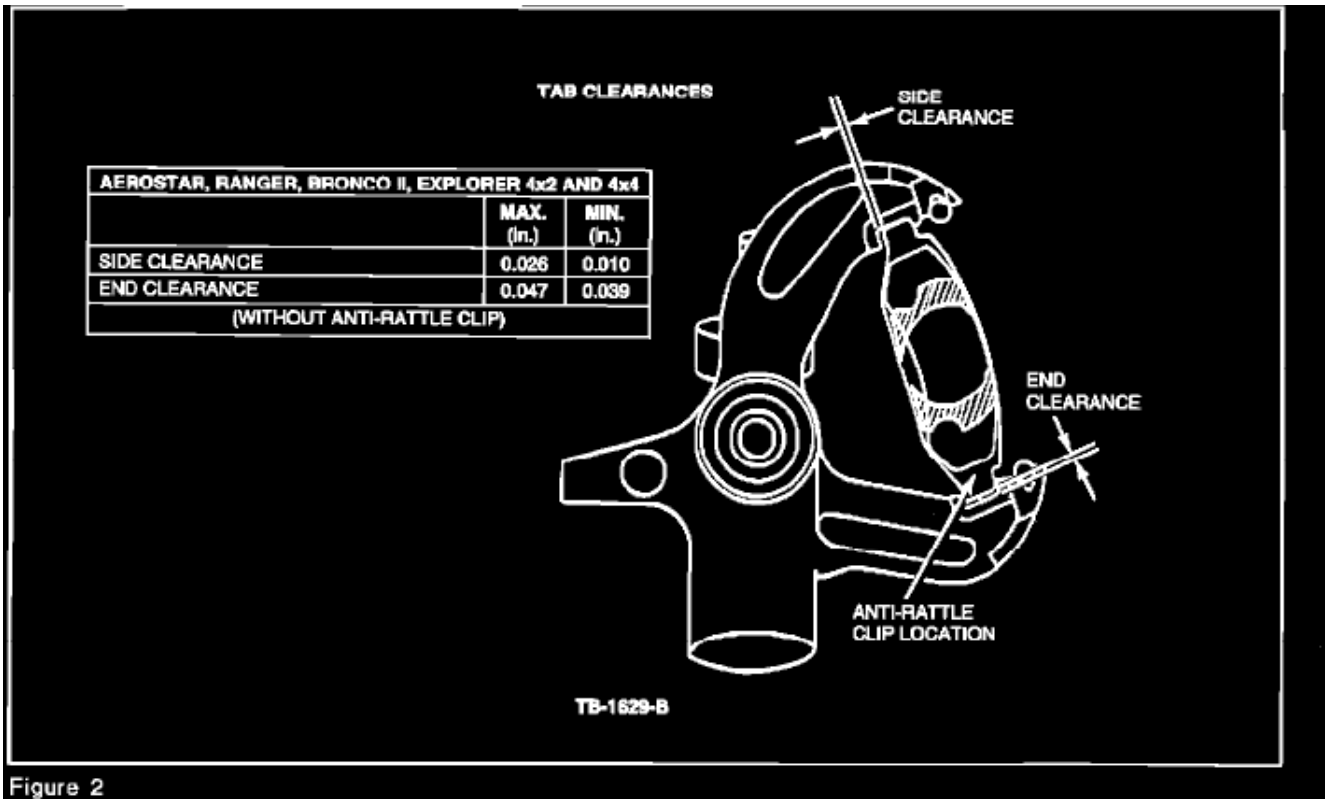


Figure 2

THE CLEARANCE SHOULD BE A MINIMUM OF .015" (.381 MM).

a. If the caliper clearance is less than .015" (.381 mm) on either caliper, replace the caliper and repeat the measurements.

b. If the caliper clearance is less than .015" (.381 mm) on both calipers, replace both calipers and recheck clearance.

c. If the caliper clearance is still less than .015" (.381 mm) on both calipers, replace both spindles (4X2) or knuckles (4X4) and recheck clearance.

NOTE: CHECK THE CLEARANCE OF THE NEW KNUCKLE BEFORE INSTALLATION.

4. After measuring the caliper/knuckle for proper clearance, remove both calipers and brake pad assemblies. Refer to the appropriate Light Truck Service Manual, Section 06-03, for the removal procedure.

5. Replace the caliper piston (FOTZ-2196-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for the replacement procedure.

6. Install the new lining kit (FO9Z-2001-A).

a. Check the side and end clearances with a feeler gauge.

b. Refer to Figure 2 for clearance dimensions.

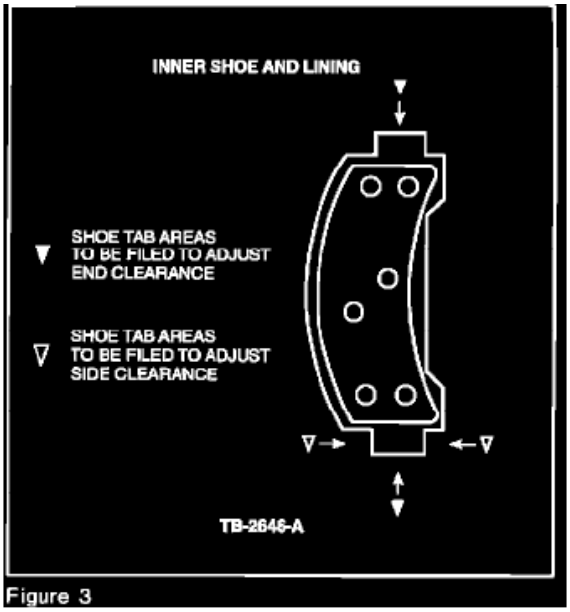


Figure 3

PART NUMBER	PART NAME	CLASS
F0TZ-2196-A	Caliper Piston	B
E8TZ-2C150-B	Caliper Pin	B
F09Z-2001-A	Brake Lining Kit	B
D7AZ-19590-A	Disc Brake Lubricant	AM
F09Z-2B120-A	Caliper, RH	B
F09Z-2B121-A	Caliper, LH	B
E9TZ-3105-B	Spindle Assembly, RH - (Ranger, Bronco II, Explorer)	B
E9TZ-3106-B	Spindle Assembly, LH - (Ranger, Bronco II, Explorer)	B
E79Z-3105-A	Spindle Assembly, RH - (Aerostar)	B
E79Z-3106-A	Spindle Assembly, LH - (Aerostar)	B
F09Z-3130-A	Knuckle, RH (AWD Aerostar)	C
F09Z-3131-A	Knuckle, LH (AWD Aerostar)	C
F0TZ-3130-A	Arm Assembly, RH (4X4 Explorer)	B
F0TZ-3131-A	Arm Assembly, LH (4X4 Explorer)	B
E8TZ-3130-A	Arm Assembly, RH (4X4 Bronco II)	B
E8TZ-3131-A	Arm Assembly, LH (4X4 Bronco II)	B

7. If the lining clearance is not to the required dimensions, file the shoe tab. Remove equal amounts from both sides and ends, Figure 3.

WARNING: USE SAFETY GLASSES WHEN FILING THE BACKING PLATES.

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

8. Assemble the brakes and caliper pins (E8TZ-2C150-B). Lubricate the caliper pins with disc brake lubricant (D7AZ-19590-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for assembling details.

9. Apply a light coat of disc brake lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove. Also apply a light coat of disc brake lubricant (D7AZ-19590-A) to the caliper rails.

CAUTION: PREVENT LUBRICANT FROM STICKING TO ROTORS, LININGS OR CALIPER PISTON BOOTS.

PART NUMBER

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models

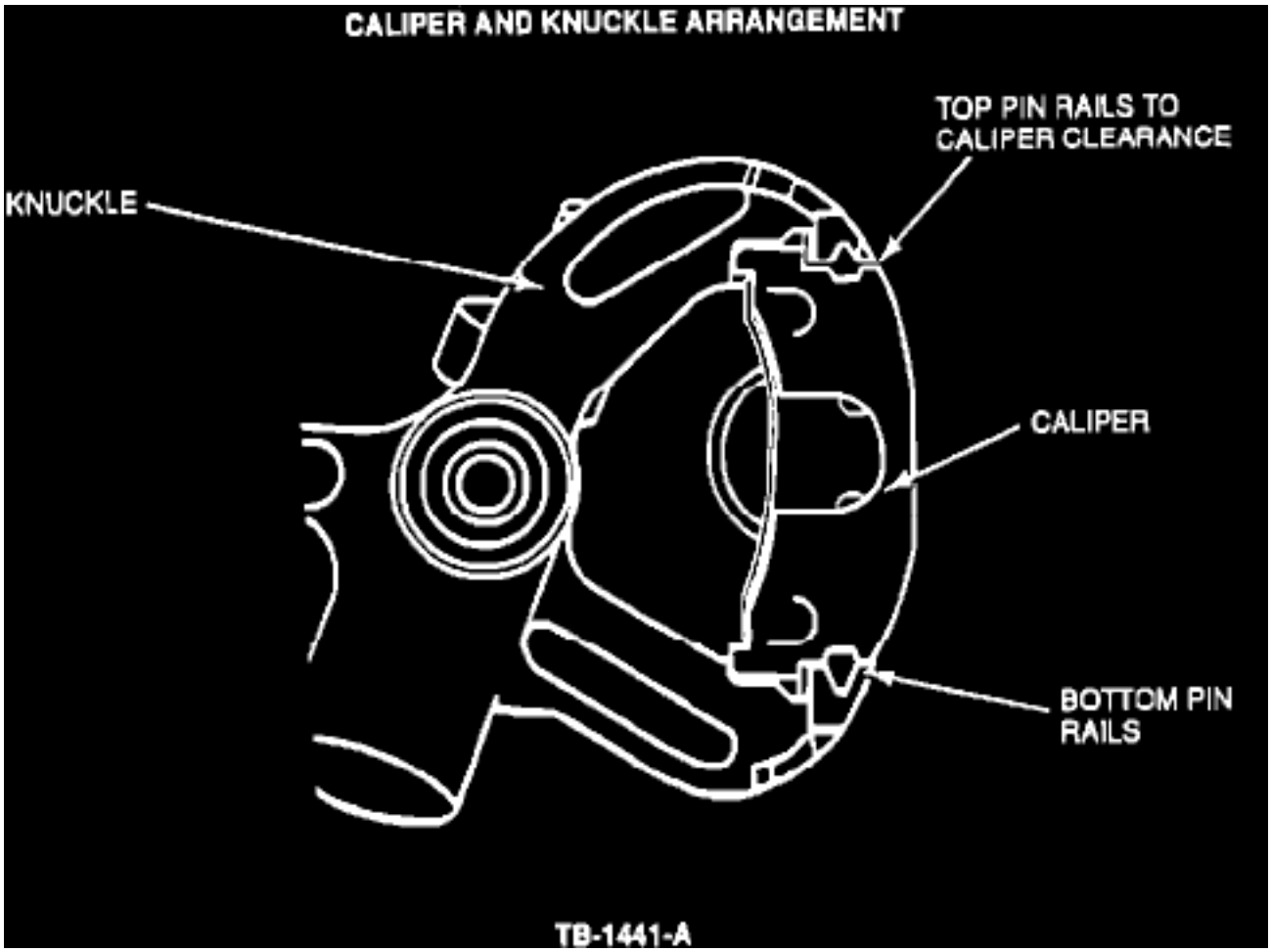
OPERATION	DESCRIPTION	TIME
921407A	Check Clearance/Replace Caliper Pistons/Replace Pads/File Pads to Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.3 Hrs.
921407B	Check Clearance/Replace Caliper Assembly/Replace One Caliper Piston/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.7 Hrs.
921407C	Check Clearance/Replace Both Caliper Assemblies/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.9 Hrs.
921407D	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.9 Hrs.
921407E	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/ Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Explorer 4X4	3.1 Hrs.
921407F	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	2.6 Hrs.
921407G	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	2.7 Hrs.
921407H	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.0 Hrs.
921407I	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	3.4 Hrs.
921407J	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.0 Hrs.
921407K	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Both Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.0 Hrs.
921407L	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	3.3 Hrs.
921407M	Replace Both Caliper Assemblies/Replace Both Knuckles/ Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	4.3 Hrs.
921407N	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.3 Hrs.
921407O	Replace Both Caliper Assemblies/Replace Both Knuckles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.6 Hrs.

DEALER CODING

BASIC PART NO.	CONDITION CODE
2C150	56

OASIS CODES: 301000, 702100, 703000

WARRANTY STATUS AND OPERATION DESCRIPTION



Technical Service Bulletin # 9097 Date: 900427

Steering/Suspension - Pull/Drift Diagnostic Procedure

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

Article No. 90-9-7

LIGHT TRUCK: 1988-90 BRONCO II, RANGER 1991 EXPLORER

ISSUE: A comprehensive, pull and drift diagnostic procedure has been developed to assist techicians with truck service.

ACTION: Use the following service procedure to resolve drift and pull concerns.

This is the same basic procedure as published in TSB 90-7-16 for the 1988-90 Bronco and F-150, 4x4 models. However, you should note that there are some differences such as replacing radius arm bushings instead of installing a radius arm bracket kit, etc.

Proceed with the Pull and Drift Diagnostic Procedure if the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE: THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

Service Procedure

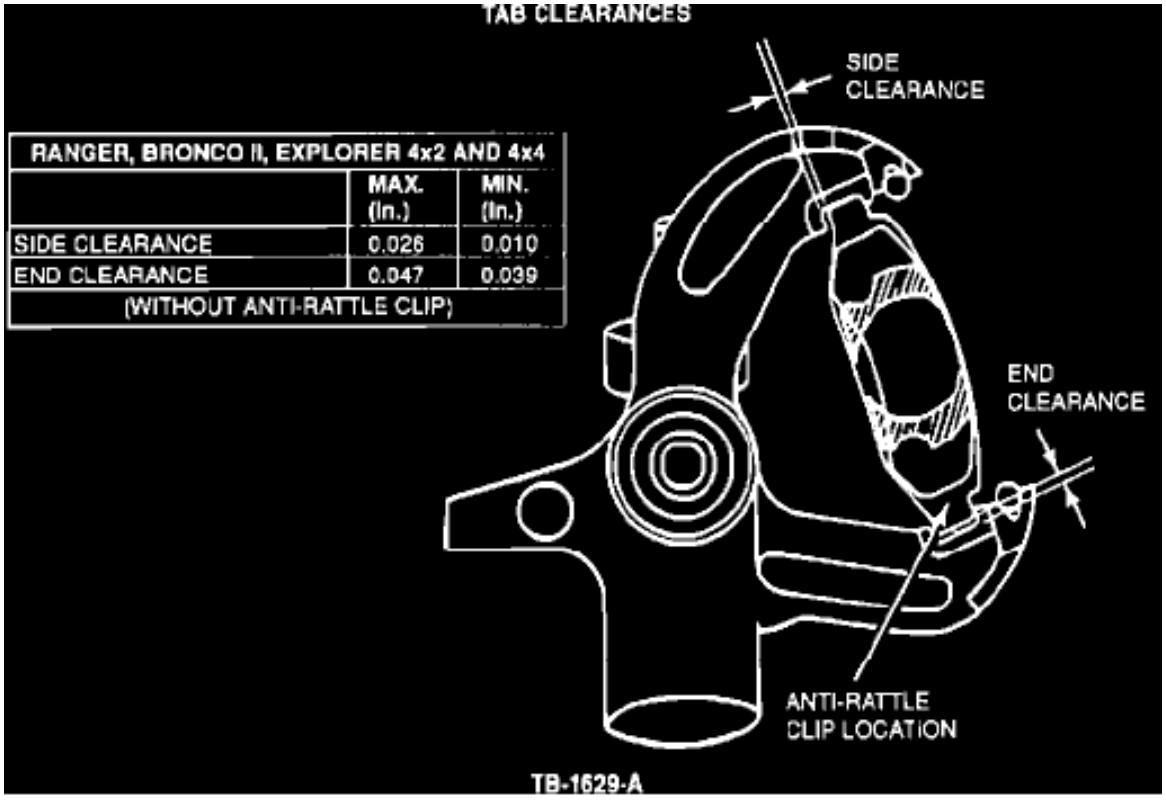
Figure 1

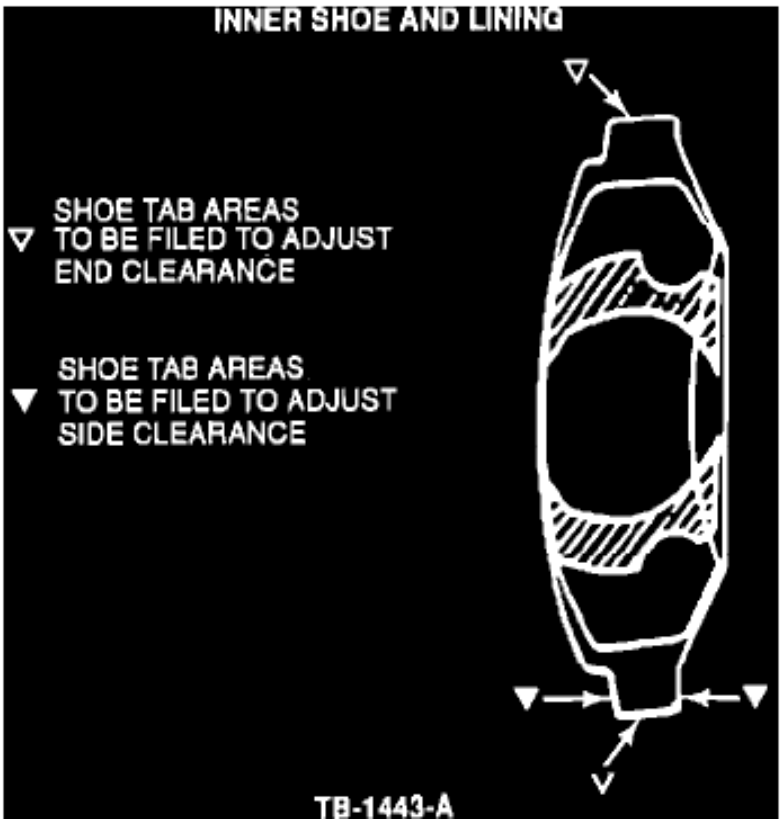
1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

Clearance should be a minimum of .015 ".





c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE: CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

Figure 2

Figure 3

f. Re-install pad and check the side and end clearances with a feeler gauge. (See Figure 2 for clearance dimensions.)

g. If the pad clearances are within specification, refer to Service Procedure Step 2 - "Caliper Groove Lubrication". If the pad clearances are not to the

required dimensions, file the steel backing plate.

WARNING: USE SAFETY GLASSES WHEN FILING STEEL BACKING PLATES

h. File material, removing equal amounts from both sides or ends. (See Figure 3.)

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

i. Check the tab clearances and install anti-rattle clip on the lower pad tab, Figure

2.

2. Apply a light coat of lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove and caliper rails. CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

3. Replace the right and left side arm bushings with new bushings (FITZ-3B203-A). Refer to the appropriate Light Truck Shop Manual, Section 04-OIC

for service details.

NOTE: THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

Pull Drift Diagnostic Procedure

The Pull Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the truck with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) are present.

The Road Test

It is important to test drive the truck with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind.

^ Tire pressure should be checked and adjusted, if necessary.

^ A second person in the truck during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location.

^ On trucks with automatic locking hubs, it is necessary to drive (20) feet forward and then backwards to unlock the hubs.

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 50-55 mph (80-89 km/h). DO NOT BRAKE	Is there a steady state pull? If no, go to the next step.	**See Diagnostic Procedure 1.** Tire mismatch or tire pressure concern
While stopped, have second person move to the left hand rear passenger location. Maintaining 50-55 mph (80-89 km/h).	Any change in pull? If no change, go to next step.	**See Diagnostic Procedure 2** Caster split
Make sure front hubs are unlocked (if equipped*). Accelerate the truck - decelerate the truck using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next step.	**See Diagnostic Procedure 3.** Possible limited slip rear axle and tire circumference
Maintain a steady speed of 50-55 mph (80-89 km/h). Put the vehicle in neutral and shut off the engine.	Does the pull go away? If no, go to the next step.	**See Diagnostic Procedure 4.** Steering gear valve off center
Stop the truck along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the truck; rotate the wheel full right. Does the pull change - better or worse? If no, go to next step.	**See Diagnostic Procedure 5.** Possible Rubber Ball Socket (RBS) memory steer
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging RABS.	Does the trucks heading change during brake application? If no, go to next step.	**See Diagnostic Procedure 6.** Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the truck from 50 mph (80 km/h).	Does the vehicle pull with A/L disconnected? If no, go to next step.	**See Diagnostic Procedure 6** Possible inadequate rear brake application
Brake the truck hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** Possible unequal rear brake application

NOTE: IT IS POSSIBLE THAT THE TRUCK MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART FOLLOWS.

NOTE: RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO (regular production option) list and set tire psi to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side to side and road test. If the concern is not corrected, continue with next step.

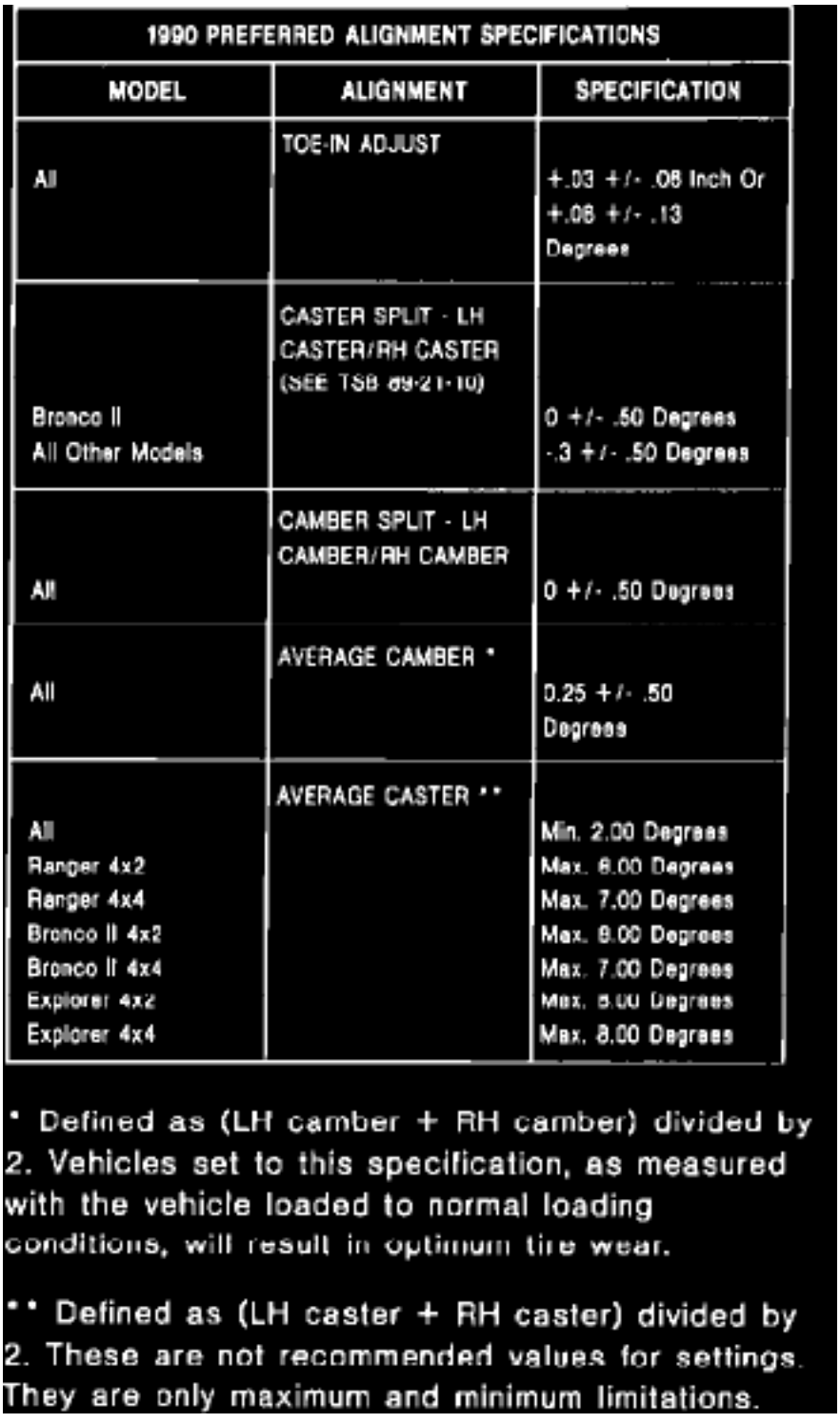
3. Tire Pull - Swap rear tires from side to side and road test. If the concern is not corrected, continue with next step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE: ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE

CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1990 PREFERRED ALIGNMENT SPECIFICATIONS

MODEL	ALIGNMENT	SPECIFICATION
All	TOE-IN ADJUST	+.03 +/- .08 Inch Or +.08 +/- .13 Degrees
Bronco II All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0 +/- .50 Degrees -.3 +/- .50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 +/- .50 Degrees
All	AVERAGE CAMBER *	0.25 +/- .50 Degrees
All Ranger 4x2 Ranger 4x4 Bronco II 4x2 Bronco II 4x4 Explorer 4x2 Explorer 4x4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out of specification vehicles, align to the "1990 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked, if hubs are unlocked, the axle shaft will not rotate with the wheels.

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications.

^ Set the tire pressure to the specification on the certification label.

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to HPO (regular production option) list and set tire pressure to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Drive vehicle after alignment is performed. ^

Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns.

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns.

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Shop Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four tires; put the two closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The truck should be raised so that there is no interference with the steering linkage.

^ The front wheels should also spin freely.

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,789 kPa (0-2000 psi) pressure-gauge (Tool D79L-33610-A, Power Steering Analyzer) in the pressure line between the power steering

pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premimum Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and

re-check the fluid level. Add Premium Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach an lb.in. torque wrench to the steering wheel nut. Apply

sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 6 lb.in. (0.68

N-m), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - Rbs Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greasable steel linkage.

NOTE: ALL SERVICE PART STEERING LINKAGE IS THE GREASABLE STEEL SOCKET TYPE.

Diagnostic Procedure # 6 - Brake Imbalance

Spin the front tires make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 30 mph (48 km/h).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull

concern.

c. Raise the front end of the truck so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE: FOR ALL 4 WHEEL DRIVE TRUCKS, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occurring. Some brake drag will naturally be present for each size of truck.

3. If the truck has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out the bleeder

screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Light Truck Shop Manual, Section 06-06 for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a "C" clamp and wooden block. The piston should easily move back into the bore under the

force of the clamp. Re-build or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side to side.

NOTE: SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. SEE FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 40 mph before evaluating for brake drift. If there is no change in drift while braking, it may be

assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminates (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables and improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out of specification, check for proper

function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums.

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel.

^ Re-apply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder.

^ Re-install the drum and repeat the procedure for the other rear brake.

8. If the condition still exists, swap rear shoes from side to side and drive the truck. If the drift is significantly reduced, replace the rear linings. If the

drift/pull is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

PART NUMBER PART NAME CLASS

E6AZ-19582-AA Steering Fluid V

D7AZ-19690-A Lubricant AW

F1TZ-3B203-A Radius Arm Bushings, 2 B

required

Diagnostic Check List

NOTE: THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances.

_ Caliper to knuckle clearance.

_ Inner shoe side and end clearance.

2. Lubrication of components.

_ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings.

_ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE:

1. Tire mismatch.

_ Unlocked hubs check.

_ Front tires swapped side to side.

_ Rear tires swapped side to side.

_ Front to rear tire swap.

2. Alignment.

_ Unlocked hubs check.

_ Toe changed to _.

_ Caster changed and split is _.

_ Camber changed and split is _.

3. Tire circumference.

_ Unlocked hubs check.

_ Tire circumference checked and two closest circumference tires swapped to rear axle.

4. Steering gear valve.

_ Unlocked hubs check.

_ Install pressure gauge.

_ Check fluid level with engine off and on.

_ Apply torque to the steering wheel nut and check gauge readings.

_ Replaced the shaft and control assembly.

_ Removed the pressure gauge.

5. RABS linkage.

_ Replaced the RBS linkage.

6. Brake imbalance.

_ Unlocked hubs check.

_ Front wheel rotational drag check.

_ Master cylinder check.

_ Piston retraction check.

_ Rotors and linings swapped from side to side.

_ Rear brakes checked.

_ Rear drums and shoes swapped from side to side.

7. Miscellaneous.

_ Check for loose, damaged or worn parts.

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 WARRANTY STATUS:

Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

900907A Service Procedure 1.3 Hr.

900907B Road Test 0.3 Hr.

900907C Procedure 1 1.9 Hr.

900907D Procedure 2 2.4 Hr.

900907E Procedure 3 0.5 Hr.

900907F Procedure 4 0.9 Hr.

900907G Procedure 6 2.3 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

FRONT W2

OASIS CODES: 3050, 3051, 3100, 3200, 3300

Brake Caliper: All Technical Service Bulletins Brakes - Sticking/Binding/Grabbing

Article No. 93-11-7

05/26/93

BRAKES - STICK/BIND/GRAB - FRONT CALIPER PINS CORRODED

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-92 F SUPER DUTY 1991-92 EXPLORER

This TSB article is being republished in its entirety to include F Super Duty vehicles.

ISSUE: Sticking, binding or grabbing of the brakes may be caused by brake caliper slide pins that are corroded. The corrosion does not allow the brake caliper assembly to move freely.

ACTION: Install the new improved caliper pins that are corrosion resistant. Refer to the following Service Procedure for service details.

SERVICE PROCEDURE

1. Remove the caliper and pins. Refer to the applicable Light Truck Service Manual for service details.

NOTE: IF PADS ARE DAMAGED OR WORN, PAD REPLACEMENT IS REQUIRED.

2. Clean the upper and lower knuckle pin grooves, upper and lower knuckle inner pad grooves, and the upper and lower caliper pin grooves with a wire brush or portable wire wheel.

WARNING: USE SAFETY GLASSES AND AN AIR RESPIRATOR WHEN CLEANING THE GROOVES.

3. Apply a light coat of lubricant (D7AZ-19590-A) to the upper and lower knuckle inner pad grooves and upper and lower caliper pin grooves.

CAUTION: LUBRICANT SHOULD NOT BE USED ON ROTORS, LININGS OR CALIPER PISTON BOOTS.

4. Re-assemble the caliper using the new pins, (F2TZ-2C150-A) for all vehicles except F Super Duty. Use new pins (F2TZ-2C150-B) for F Super Duty vehicles.

NOTE: NORMAL BRAKE MAINTENANCE REQUIREMENTS LISTED IN THE OWNER MANUAL SHOULD BE PERFORMED EVERY 15,000 MILES.

PART NUMBER PART NAME CLASS

D7AZ-19590-A Lubricant-Disc Brake AM

F2TZ-2C150-A Pin-Brake Caliper B

F2TZ-2C150-B Pin-Brake Caliper (F Super B

Duty)

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 92-12-14

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models And Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

931107A Aerostar/Ranger/Bronco II, 0.8 Hr.

(Through 1990), Explorer (Starting 1991), F-Series Under 8500 GVW, Bronco And Econoline Under 8500

931107B F-Series Over 8500 GVW 0.9 Hr.

And Econoline Over 8500 GVW Through 1991

931107C F Super Duty Front 1.2 Hr.

931107D F Super Duty Rear 1.2 Hr.

931107E F Super Duty Front And 2.1 Hr.

Rear

DEALER CODING

BASIC PART NO. CONDITION CODE

2C150 41

OASIS CODES: 301000

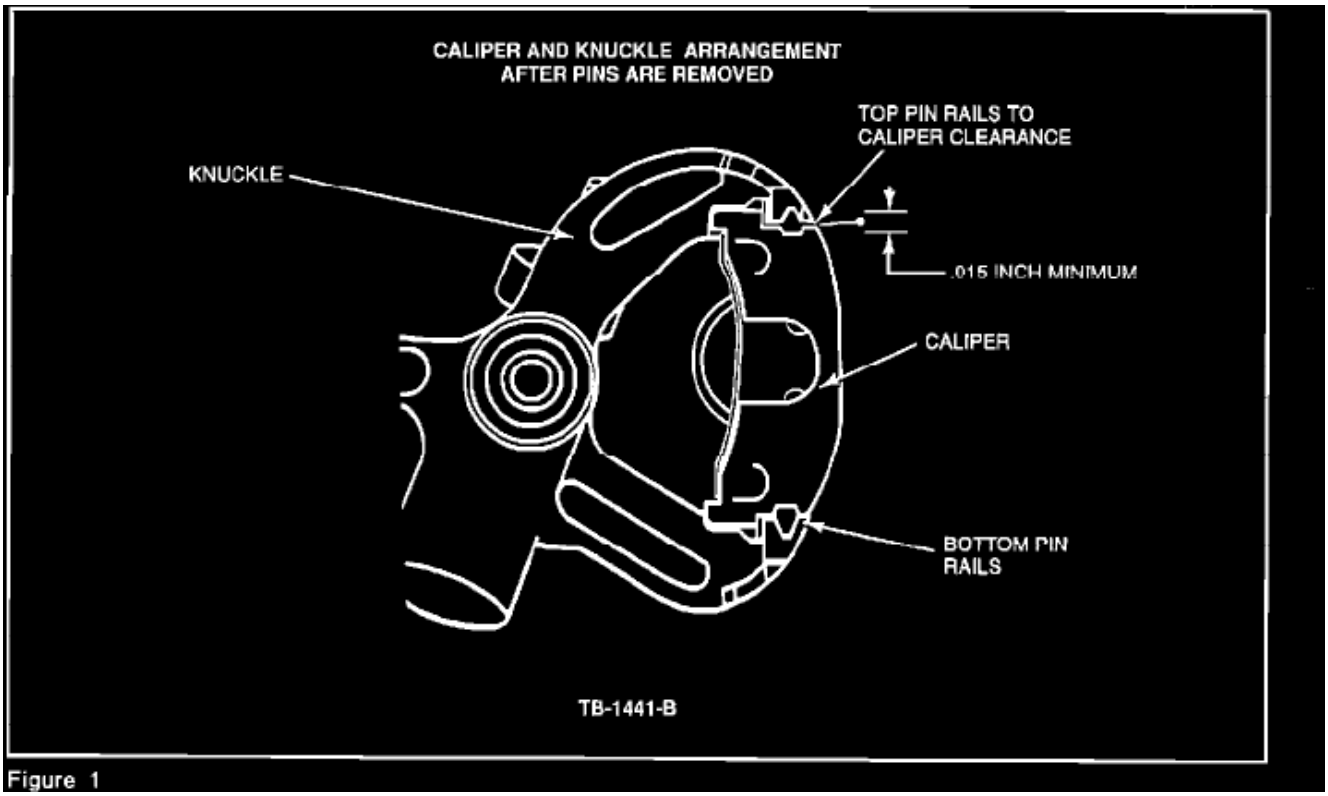


Figure 1

Brake Caliper: All Technical Service Bulletins Front Brakes - Popping or Clunking Noise

Article No. 92-14-7

07/01/92

^ BRAKES - FRONT DISC - "POPPING" OR "CLUNKING" SOUND DURING BRAKING

^ NOISE - "POPPING" OR "CLUNKING" SOUND WHEN BRAKING

^ VIBRATION THROUGH FLOOR BOARD WHEN BRAKING

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 AEROSTAR, RANGER 1991-92 EXPLORER

See TSB # 93-20-11 for additional information.

ISSUE: A "popping" or "clunking" noise and a floor board vibration may occur during braking. The noise and/or vibration may be caused by the front brake caliper suddenly springing away from the caliper abutment and returning.

ACTION: Check and adjust the brake pads and caliper knuckle clearance by using the following service procedure.

1. Road test to confirm that the "popping" or "clunking" noise occurs only during braking at the initial part of the stop.

2. Raise the front of the vehicle.

a. Remove the front wheels.

b. Remove the pins from the caliper.

3. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

NOTE:

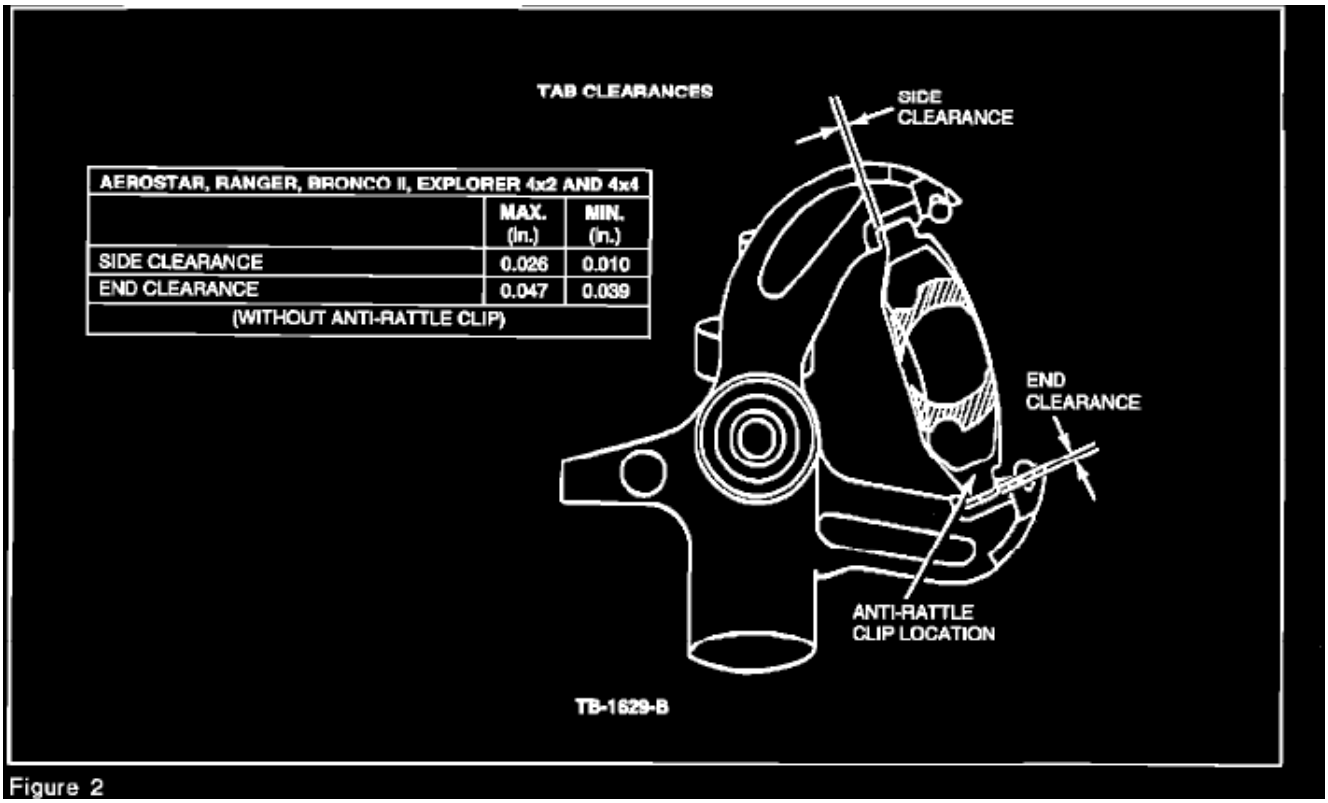


Figure 2

THE CLEARANCE SHOULD BE A MINIMUM OF .015" (.381 MM).

a. If the caliper clearance is less than .015" (.381 mm) on either caliper, replace the caliper and repeat the measurements.

b. If the caliper clearance is less than .015" (.381 mm) on both calipers, replace both calipers and recheck clearance.

c. If the caliper clearance is still less than .015" (.381 mm) on both calipers, replace both spindles (4X2) or knuckles (4X4) and recheck clearance.

NOTE: CHECK THE CLEARANCE OF THE NEW KNUCKLE BEFORE INSTALLATION.

4. After measuring the caliper/knuckle for proper clearance, remove both calipers and brake pad assemblies. Refer to the appropriate Light Truck Service Manual, Section 06-03, for the removal procedure.

5. Replace the caliper piston (FOTZ-2196-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for the replacement procedure.

6. Install the new lining kit (FO9Z-2001-A).

a. Check the side and end clearances with a feeler gauge.

b. Refer to Figure 2 for clearance dimensions.

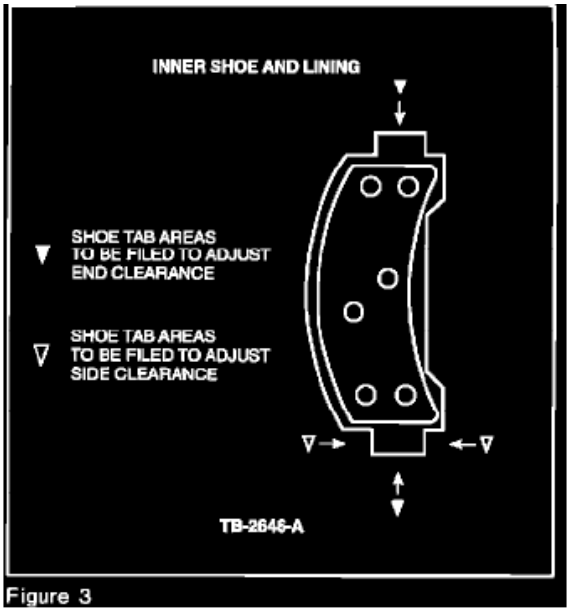


Figure 3

PART NUMBER	PART NAME	CLASS
F0TZ-2196-A	Caliper Piston	B
E8TZ-2C150-B	Caliper Pin	B
F09Z-2001-A	Brake Lining Kit	B
D7AZ-19590-A	Disc Brake Lubricant	AM
F09Z-2B120-A	Caliper, RH	B
F09Z-2B121-A	Caliper, LH	B
E9TZ-3105-B	Spindle Assembly, RH - (Ranger, Bronco II, Explorer)	B
E9TZ-3106-B	Spindle Assembly, LH - (Ranger, Bronco II, Explorer)	B
E79Z-3105-A	Spindle Assembly, RH - (Aerostar)	B
E79Z-3106-A	Spindle Assembly, LH - (Aerostar)	B
F09Z-3130-A	Knuckle, RH (AWD Aerostar)	C
F09Z-3131-A	Knuckle, LH (AWD Aerostar)	C
F0TZ-3130-A	Arm Assembly, RH (4X4 Explorer)	B
F0TZ-3131-A	Arm Assembly, LH (4X4 Explorer)	B
E8TZ-3130-A	Arm Assembly, RH (4X4 Bronco II)	B
E8TZ-3131-A	Arm Assembly, LH (4X4 Bronco II)	B

7. If the lining clearance is not to the required dimensions, file the shoe tab. Remove equal amounts from both sides and ends, Figure 3.

WARNING: USE SAFETY GLASSES WHEN FILING THE BACKING PLATES.

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

8. Assemble the brakes and caliper pins (E8TZ-2C150-B). Lubricate the caliper pins with disc brake lubricant (D7AZ-19590-A). Refer to the appropriate Light Truck Service Manual, Section 06-03, for assembling details.

9. Apply a light coat of disc brake lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove. Also apply a light coat of disc brake lubricant (D7AZ-19590-A) to the caliper rails.

CAUTION: PREVENT LUBRICANT FROM STICKING TO ROTORS, LININGS OR CALIPER PISTON BOOTS.

PART NUMBER

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under Bumper To Bumper For 1992 Models, Basic Warranty Coverage For All Other Models

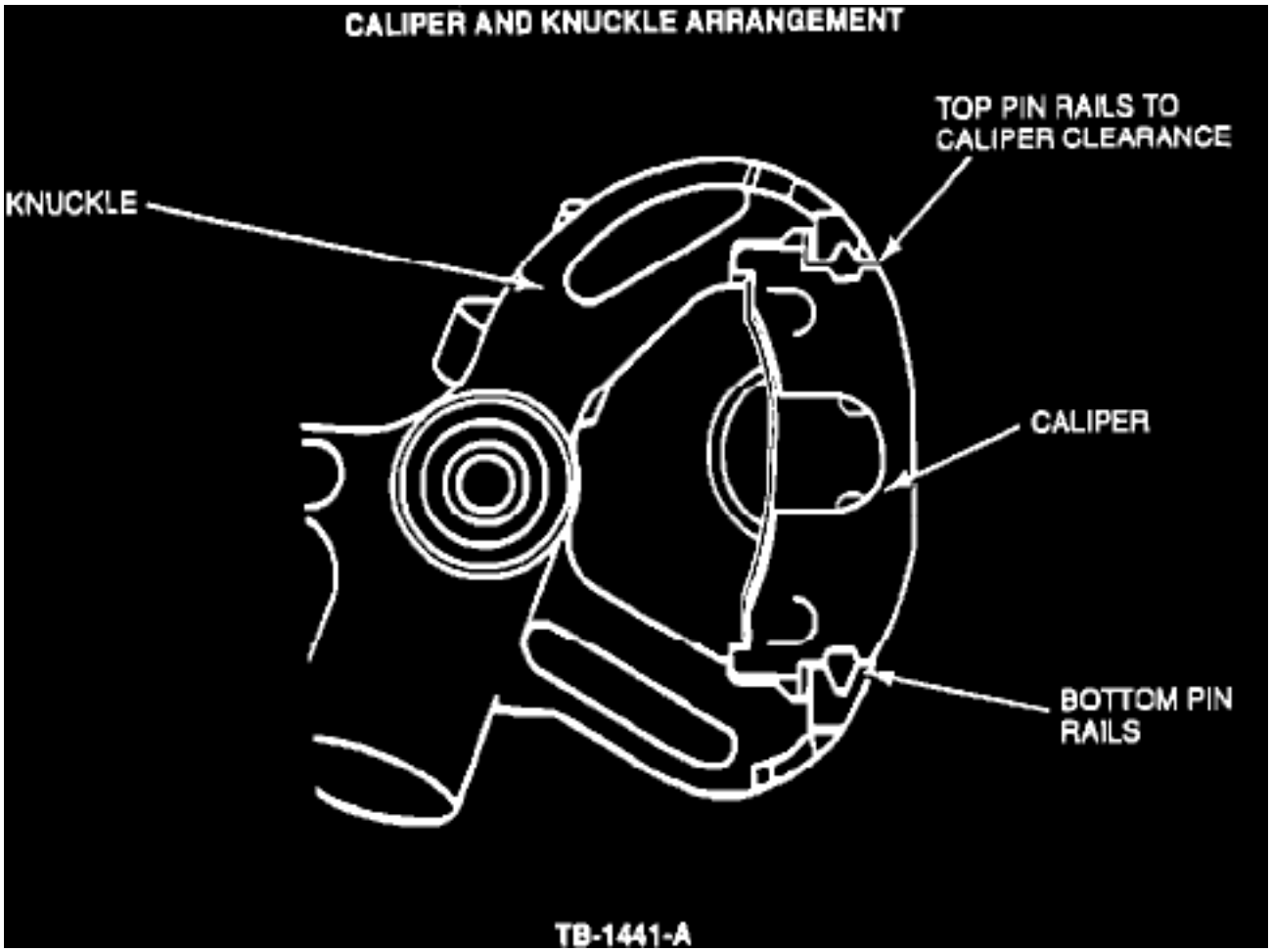
OPERATION	DESCRIPTION	TIME
921407A	Check Clearance/Replace Caliper Pistons/Replace Pads/File Pads to Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.3 Hrs.
921407B	Check Clearance/Replace Caliper Assembly/Replace One Caliper Piston/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.7 Hrs.
921407C	Check Clearance/Replace Both Caliper Assemblies/Replace Pads/File Pads To Fit/Reassemble - Ranger, Bronco II, Aerostar, Explorer	1.9 Hrs.
921407D	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.9 Hrs.
921407E	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/ Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Explorer 4X4	3.1 Hrs.
921407F	Check Caliper To Spindle Clearance/Replace One Caliper Assembly/Replace One Spindle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	2.6 Hrs.
921407G	Check Caliper To Knuckle Clearance/Replace One Caliper Assembly/Replace One Knuckle Assembly/Replace Other Caliper Assembly Piston/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	2.7 Hrs.
921407H	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	2.0 Hrs.
921407I	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	3.4 Hrs.
921407J	Check Caliper To Spindle Clearance/Replace Both Caliper Assemblies/Replace One Spindle Assembly/Replace Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.0 Hrs.
921407K	Check Caliper To Knuckle Clearance/Replace Both Caliper Assemblies/Replace One Knuckle Assembly/Replace Both Brake Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.0 Hrs.
921407L	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X2	3.3 Hrs.
921407M	Replace Both Caliper Assemblies/Replace Both Knuckles/ Replace Pads On Both Sides And File To Fit/Reassemble - Ranger, Bronco II, Explorer 4X4	4.3 Hrs.
921407N	Replace Both Caliper Assemblies/Replace Both Spindles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X2	3.3 Hrs.
921407O	Replace Both Caliper Assemblies/Replace Both Knuckles/Replace Pads On Both Sides And File To Fit/Reassemble - Aerostar 4X4	3.6 Hrs.

DEALER CODING

BASIC PART NO.	CONDITION CODE
2C150	56

OASIS CODES: 301000, 702100, 703000

WARRANTY STATUS AND OPERATION DESCRIPTION



Technical Service Bulletin # 9097 Date: 900427

Steering/Suspension - Pull/Drift Diagnostic Procedure

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

Article No. 90-9-7

LIGHT TRUCK: 1988-90 BRONCO II, RANGER 1991 EXPLORER

ISSUE: A comprehensive, pull and drift diagnostic procedure has been developed to assist techicians with truck service.

ACTION: Use the following service procedure to resolve drift and pull concerns.

This is the same basic procedure as published in TSB 90-7-16 for the 1988-90 Bronco and F-150, 4x4 models. However, you should note that there are some differences such as replacing radius arm bushings instead of installing a radius arm bracket kit, etc.

Proceed with the Pull and Drift Diagnostic Procedure if the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE: THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

Service Procedure

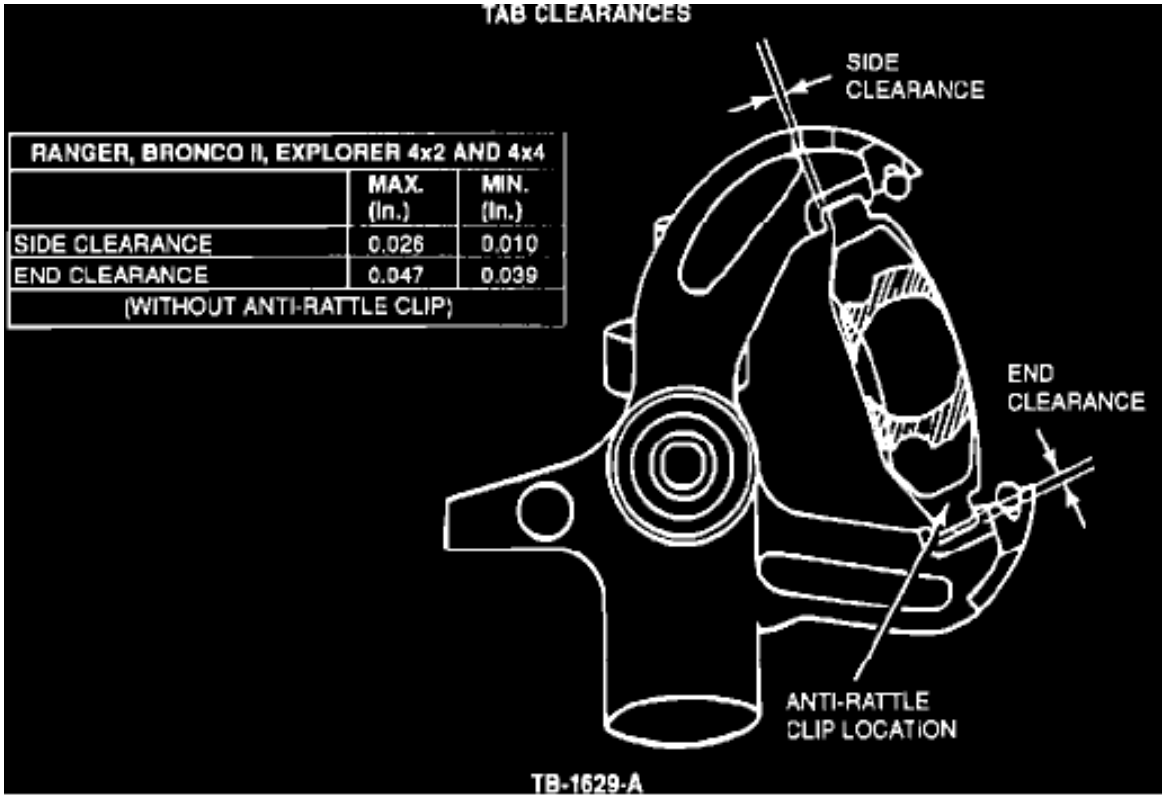
Figure 1

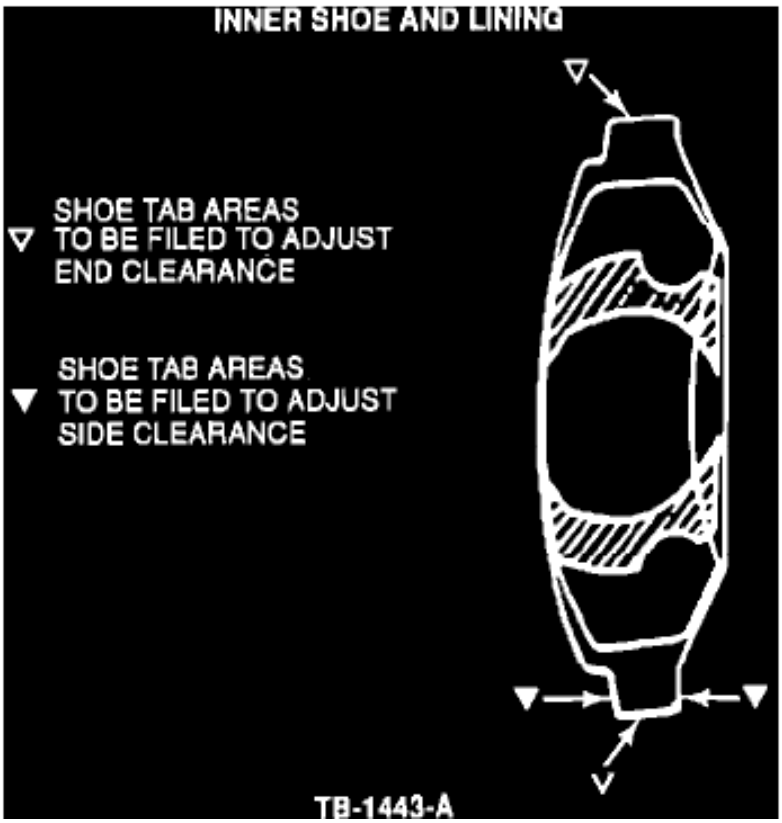
1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails.

Clearance should be a minimum of .015 ".





c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE: CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

Figure 2

Figure 3

f. Re-install pad and check the side and end clearances with a feeler gauge. (See Figure 2 for clearance dimensions.)

g. If the pad clearances are within specification, refer to Service Procedure Step 2 - "Caliper Groove Lubrication". If the pad clearances are not to the

required dimensions, file the steel backing plate.

WARNING: USE SAFETY GLASSES WHEN FILING STEEL BACKING PLATES

h. File material, removing equal amounts from both sides or ends. (See Figure 3.)

CAUTION: DO NOT GRIND. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

i. Check the tab clearances and install anti-rattle clip on the lower pad tab, Figure

2.

2. Apply a light coat of lubricant (D7AZ-19590-A) to the inner knuckle top and bottom pad groove and caliper rails. CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

3. Replace the right and left side arm bushings with new bushings (FITZ-3B203-A). Refer to the appropriate Light Truck Shop Manual, Section 04-OIC

for service details.

NOTE: THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

Pull Drift Diagnostic Procedure

The Pull Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the truck with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) are present.

The Road Test

It is important to test drive the truck with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind.

^ Tire pressure should be checked and adjusted, if necessary.

^ A second person in the truck during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location.

^ On trucks with automatic locking hubs, it is necessary to drive (20) feet forward and then backwards to unlock the hubs.

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 50-55 mph (80-89 km/h). **DO NOT BRAKE**	Is there a steady state pull? If no, go to the next step.	**See Diagnostic Procedure 1.** Tire mismatch or tire pressure concern
While stopped, have second person move to the left hand rear passenger location. Maintaining 50-55 mph (80-89 km/h).	Any change in pull? If no change, go to next step.	**See Diagnostic Procedure 2** Caster split
Make sure front hubs are unlocked (if equipped*). Accelerate the truck - decelerate the truck using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next step.	**See Diagnostic Procedure 3.** Possible limited slip rear axle and tire circumference
Maintain a steady speed of 50-55 mph (80-89 km/h). Put the vehicle in neutral and shut off the engine.	Does the pull go away? If no, go to the next step.	**See Diagnostic Procedure 4.** Steering gear valve off center
Stop the truck along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the truck; rotate the wheel full right. Does the pull change - better or worse? If no, go to next step.	**See Diagnostic Procedure 5.** Possible Rubber Ball Socket (RBS) memory steer
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging RABS.	Does the trucks heading change during brake application? If no, go to next step.	**See Diagnostic Procedure 6.** Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the truck from 50 mph (80 km/h).	Does the vehicle pull with A/L disconnected? If no, go to next step.	**See Diagnostic Procedure 6** Possible inadequate rear brake application
Brake the truck hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** Possible unequal rear brake application

NOTE: IT IS POSSIBLE THAT THE TRUCK MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART FOLLOWS.

NOTE: RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO (regular production option) list and set tire psi to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side to side and road test. If the concern is not corrected, continue with next step.

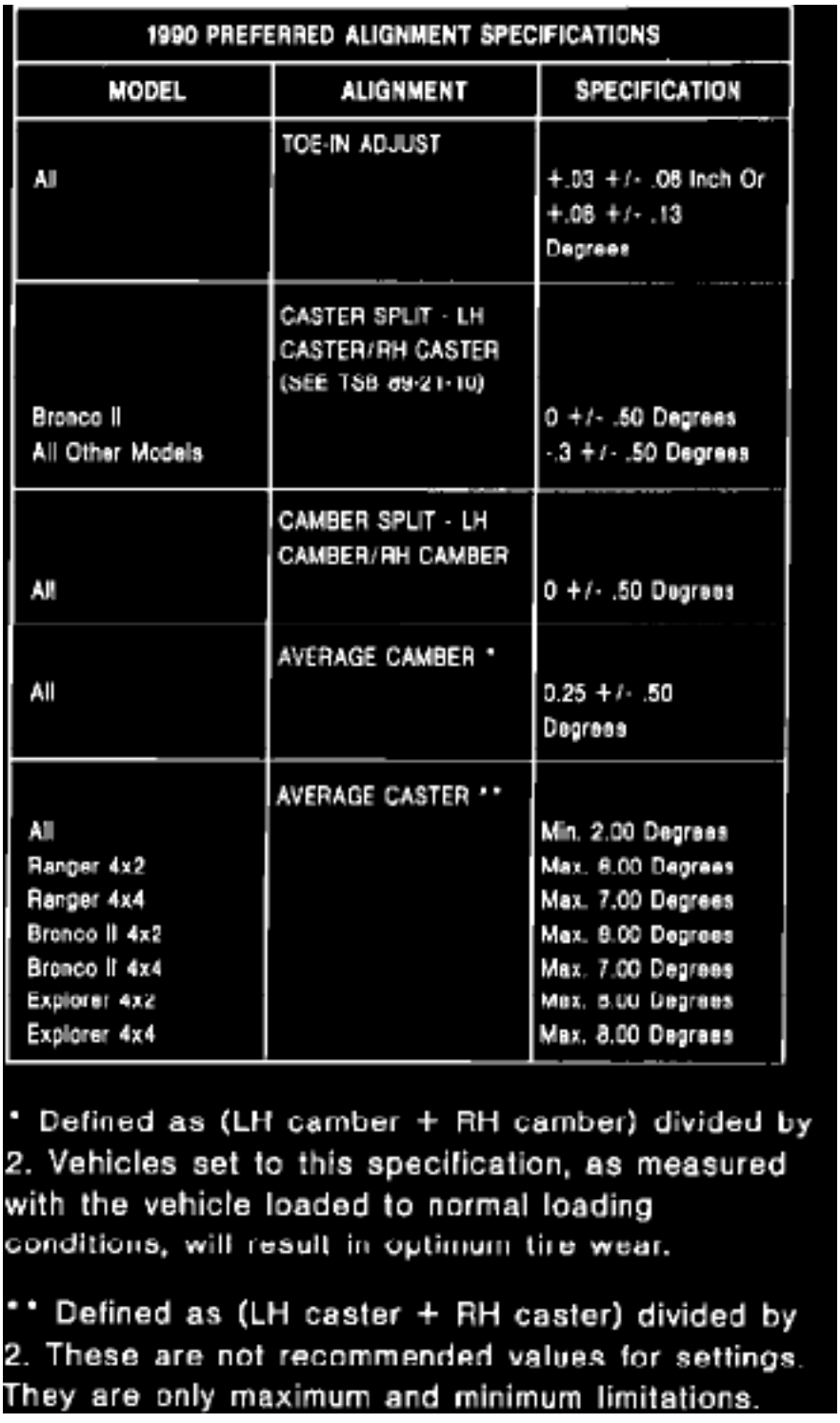
3. Tire Pull - Swap rear tires from side to side and road test. If the concern is not corrected, continue with next step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE: ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE

CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1990 PREFERRED ALIGNMENT SPECIFICATIONS		
MODEL	ALIGNMENT	SPECIFICATION
All	TOE-IN ADJUST	+.03 +/- .08 Inch Or +.08 +/- .13 Degrees
Bronco II All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0 +/- .50 Degrees -.3 +/- .50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 +/- .50 Degrees
All	AVERAGE CAMBER *	0.25 +/- .50 Degrees
All Ranger 4x2 Ranger 4x4 Bronco II 4x2 Bronco II 4x4 Explorer 4x2 Explorer 4x4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out of specification vehicles, align to the "1990 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked, if hubs are unlocked, the axle shaft will not rotate with the wheels.

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications.

^ Set the tire pressure to the specification on the certification label.

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the diagnostic procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to HPO (regular production option) list and set tire pressure to the correct value.

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only.

Drive vehicle after alignment is performed. ^

Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns.

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns.

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Shop Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four tires; put the two closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The truck should be raised so that there is no interference with the steering linkage.

^ The front wheels should also spin freely.

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,789 kPa (0-2000 psi) pressure-gauge (Tool D79L-33610-A, Power Steering Analyzer) in the pressure line between the power steering

pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premimum Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and

re-check the fluid level. Add Premium Power Steering Fluid - E6AZ-19582-AA (ESW-M2C33-F) or equivalent, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach an lb.in. torque wrench to the steering wheel nut. Apply

sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 6 lb.in. (0.68

N-m), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - Rbs Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greasable steel linkage.

NOTE: ALL SERVICE PART STEERING LINKAGE IS THE GREASABLE STEEL SOCKET TYPE.

Diagnostic Procedure # 6 - Brake Imbalance

Spin the front tires make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 30 mph (48 km/h).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull

concern.

c. Raise the front end of the truck so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE: FOR ALL 4 WHEEL DRIVE TRUCKS, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occurring. Some brake drag will naturally be present for each size of truck.

3. If the truck has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out the bleeder

screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Light Truck Shop Manual, Section 06-06 for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a "C" clamp and wooden block. The piston should easily move back into the bore under the

force of the clamp. Re-build or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side to side.

NOTE: SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. SEE FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 40 mph before evaluating for brake drift. If there is no change in drift while braking, it may be

assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminates (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables and improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out of specification, check for proper

function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums.

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel.

^ Re-apply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder.

^ Re-install the drum and repeat the procedure for the other rear brake.

8. If the condition still exists, swap rear shoes from side to side and drive the truck. If the drift is significantly reduced, replace the rear linings. If the

drift/pull is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

PART NUMBER PART NAME CLASS

E6AZ-19582-AA Steering Fluid V

D7AZ-19690-A Lubricant AW

F1TZ-3B203-A Radius Arm Bushings, 2 B

required

Diagnostic Check List

NOTE: THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances.

_ Caliper to knuckle clearance.

_ Inner shoe side and end clearance.

2. Lubrication of components.

_ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings.

_ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE:

1. Tire mismatch.

_ Unlocked hubs check.

_ Front tires swapped side to side.

_ Rear tires swapped side to side.

_ Front to rear tire swap.

2. Alignment.

_ Unlocked hubs check.

_ Toe changed to _.

_ Caster changed and split is _.

_ Camber changed and split is _.

3. Tire circumference.

_ Unlocked hubs check.

_ Tire circumference checked and two closest circumference tires swapped to rear axle.

4. Steering gear valve.

_ Unlocked hubs check.

_ Install pressure gauge.

_ Check fluid level with engine off and on.

_ Apply torque to the steering wheel nut and check gauge readings.

_ Replaced the shaft and control assembly.

_ Removed the pressure gauge.

5. RABS linkage.

_ Replaced the RBS linkage.

6. Brake imbalance.

_ Unlocked hubs check.

_ Front wheel rotational drag check.

_ Master cylinder check.

_ Piston retraction check.

_ Rotors and linings swapped from side to side.

_ Rear brakes checked.

_ Rear drums and shoes swapped from side to side.

7. Miscellaneous.

_ Check for loose, damaged or worn parts.

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 WARRANTY STATUS:

Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

900907A Service Procedure 1.3 Hr.

900907B Road Test 0.3 Hr.

900907C Procedure 1 1.9 Hr.

900907D Procedure 2 2.4 Hr.

900907E Procedure 3 0.5 Hr.

900907F Procedure 4 0.9 Hr.

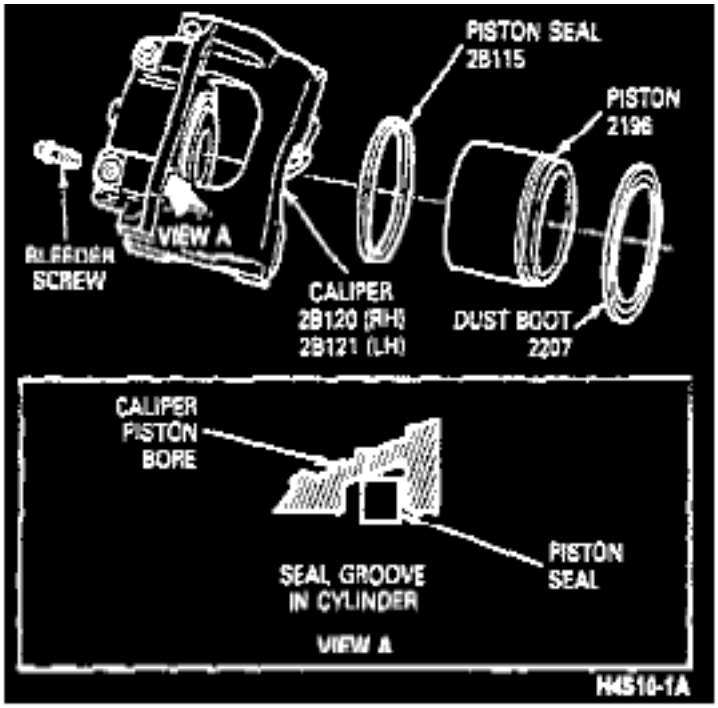
900907G Procedure 6 2.3 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

FRONT W2

OASIS CODES: 3050, 3051, 3100, 3200, 3300


PISTON SEAL
2B115
PISTON
2196
VIEW A
BLEEDER
SCREW
CALIPER
2B120 (RH)
2B121 (LH)
DUST BOOT
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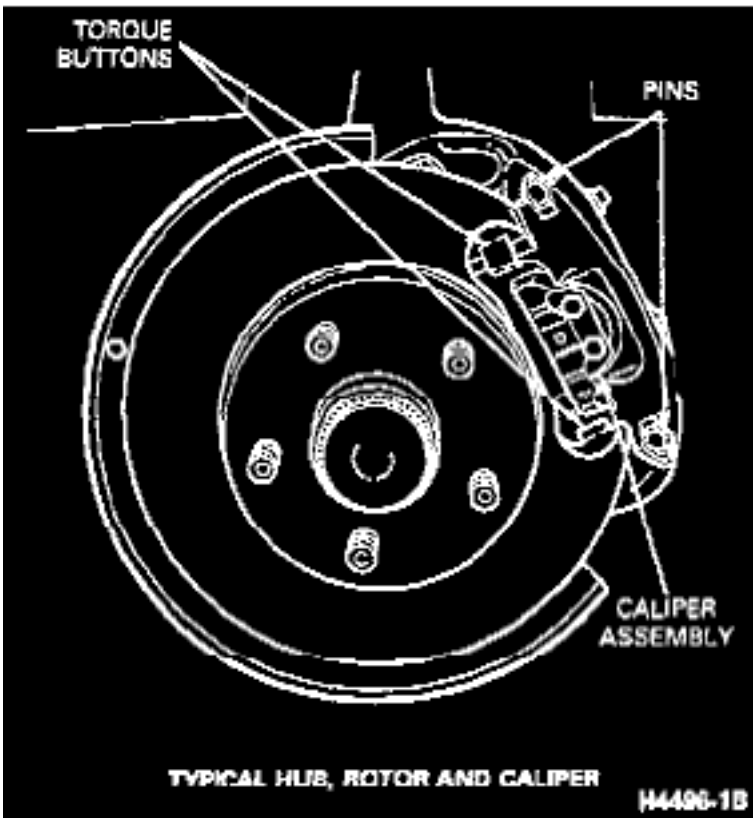
CALIPER
PISTON
BORE
PISTON
SEAL
SEAL GROOVE
IN CYLINDER
VIEW A
H4510-1A


TORQUE
BUTTONS
PINS
CALIPER
ASSEMBLY
TYPICAL HUB, ROTOR AND CALIPER
H4496-1B

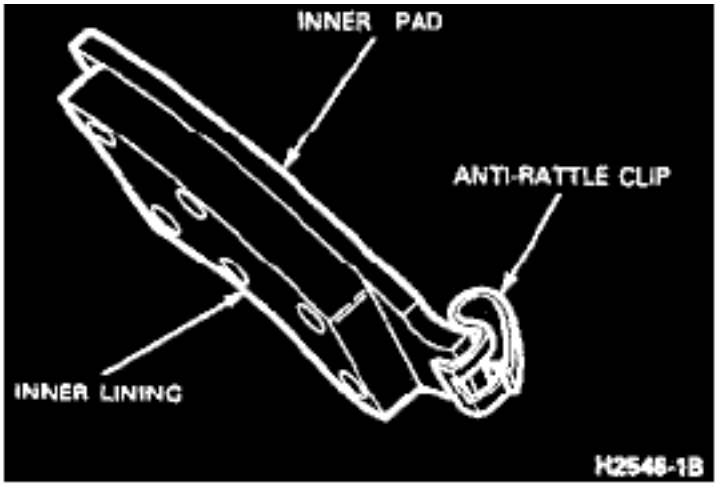
Brake Caliper: Description and Operation

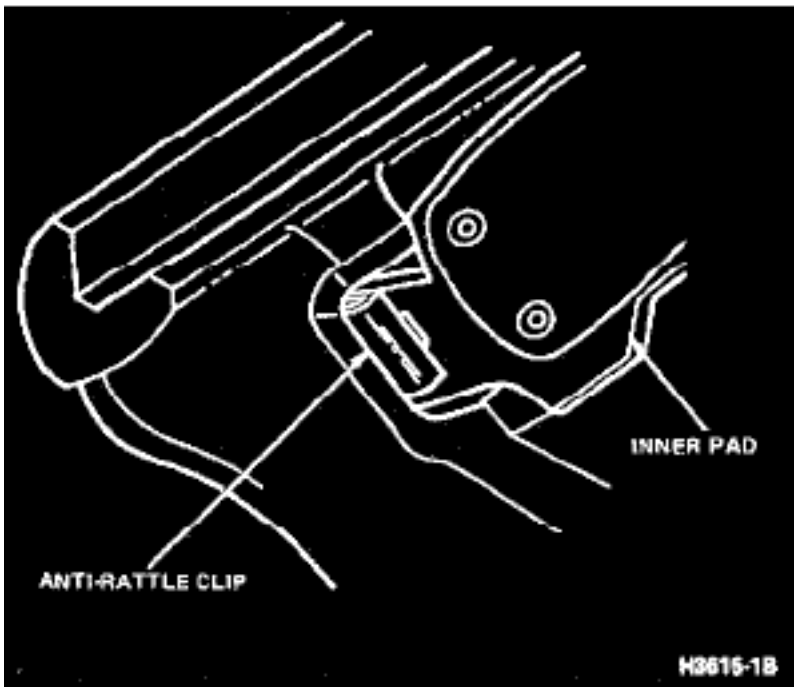
Caliper Assembly

Brake Caliper

The caliper assembly consists of a pin slider caliper housing, inner and outer pad and lining assemblies, and a single piston. The caliper assembly slides on two pins which also attach the caliper to the spindle.

The caliper housing contains a piston. The piston has a molded rubber dust boot on its outer end that is pressed into a cylinder bore groove to prevent cylinder contamination. There is also a rectangular section rubber piston seal located in the cylinder bore providing sealing between the cylinder and piston. This seal also causes the piston to retract once the brakes are released.





Brake Caliper: Service and Repair Inspection

For additional information see Installation Notes. See: Fundamentals and Basics

1. The caliper piston must be "bottomed out" when replacing pad and lining assemblies with new parts. "Bottom out" the caliper piston with an eight

inch c-clamp using a worn out inner pad or a block of wood to push against the piston. Never attempt to "bottom out" piston with outer pad installed.

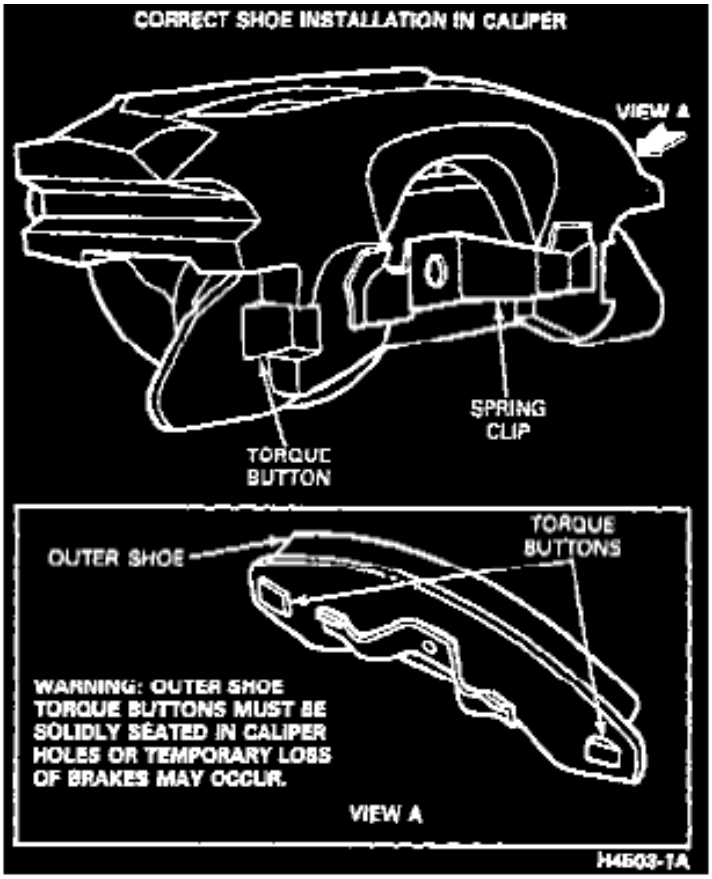
Installing Anti-Rattle Clip

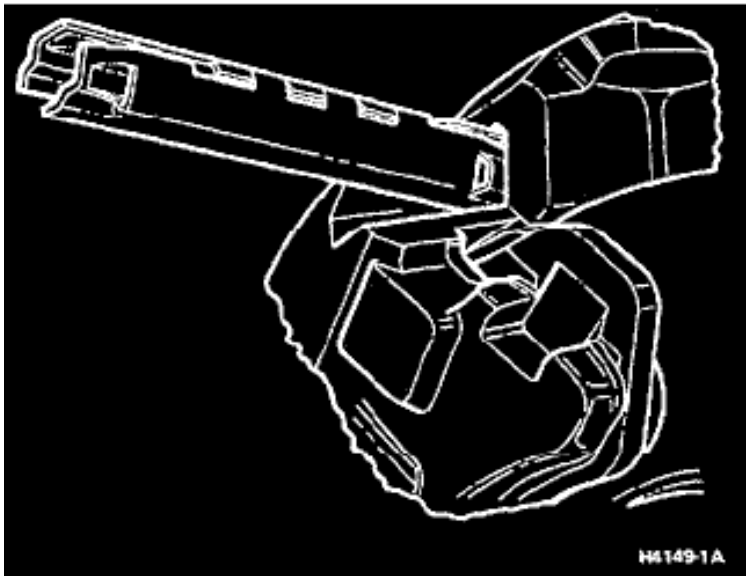
2. Place a new anti-rattle clip on the lower end of the inner pad. Be sure the tabs on the clip are positioned properly and the clip is fully seated.

Installing Inner Shoe And Anti-Rattle Clip

3. Position the inner pad and anti-rattle clip in the pad abutment with the anti-rattle clip tab against the pad abutment and the loop-type spring away

from the rotor. Compress the anti-rattle clip and slide the upper end of the pad in position.


CORRECT SHOE INSTALLATION IN CALIPER
VIEW A
SPRING CLIP
TORQUE BUTTON
TORQUE BUTTONS
OUTER SHOE
WARNING: OUTER SHOE TORQUE BUTTONS MUST BE SOLIDLY SEATED IN CALIPER HOLES OR TEMPORARY LOSS OF BRAKES MAY OCCUR.
VIEW A
H4503-1A


H4149-1A

Outer Pad Installation

4. Install the outer pad, making sure the torque buttons on the pad are seated solidly in the matching holes in the caliper. 5. Install the caliper on the spindle, making sure the mounting surfaces are free of dirt and lubricate the caliper grooves with disc brake caliper

grease.

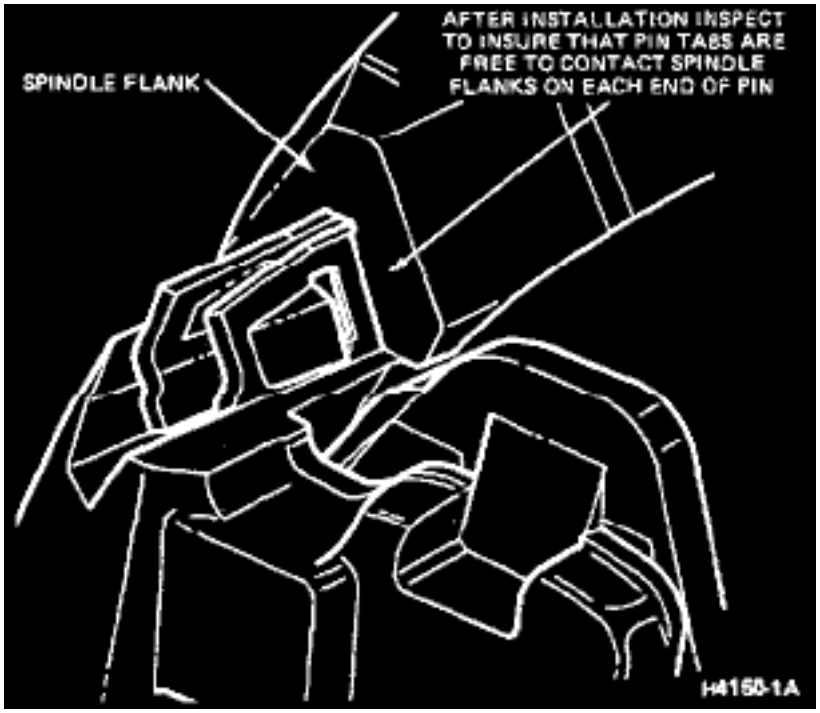
Caliper Pin Installation

6. Position pin with the pin retention tabs oriented adjacent to the spindle groove.

NOTE: Do not use the bolt and nut with the new pin.

7. Tap the pin on the outboard end with a hammer. Continue tapping the pin inward until the retention tabs on the sides of the pin contact the spindle

face. Repeat procedure for the lower pin.



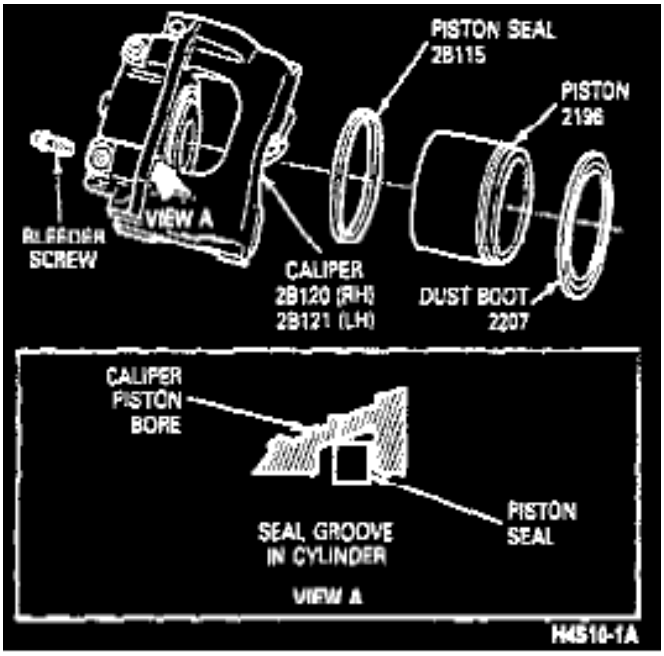
Correct Caliper Pin Installation

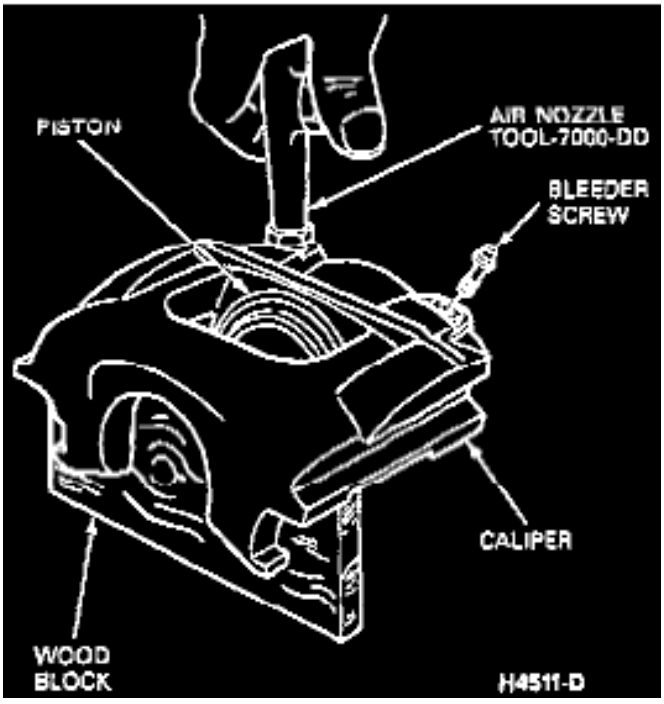
CAUTION: During the installation procedure do not allow the tabs of the caliper pin to be tapped too far into the spindle groove. If this happens it will be necessary to tap the other end of the caliper pin until the tabs snap into place. The tabs on each end of the caliper pin must be free to catch on the spindle flanks.

8. If removed, install the brake hose to the caliper and perform brake bleeding procedures.

Lower the vehicle, check the brake fluid level and fill as necessary. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.


PISTON SEAL
2B115
PISTON
2196
VIEW A
BLEEDER
SCREW
CALIPER
2B120 (RH)
2B121 (LH)
DUST BOOT
2207
CALIPER
PISTON
BORE
PISTON
SEAL
SEAL GROOVE
IN CYLINDER
VIEW A
H4510-1A


PISTON
AIR NOZZLE
TOOL-7000-DD
BLEEDER
SCREW
CALIPER
WOOD
BLOCK
H4511-D

Brake Caliper: Service and Repair Rebuild

Caliper Assembly

NOTE: Do not use a screwdriver or any similar tool to pry piston into or out of the bore to prevent chipping or scuffing damage to the phenolic piston.

DISASSEMBLY

1. Remove the caliper assembly. Place a block of wood over the piston before applying air pressure to prevent damage to the piston.

Removing Piston

WARNING: Do not place fingers in front of piston in an attempt to catch or protect it when applying compressed air. This could result in serious injury.

2. Apply air pressure to the fluid port in the caliper with a rubber-tipped nozzle to remove the piston. If the piston is seized and cannot be forced

from the caliper, tap lightly around the piston while applying air pressure.

3. Remove the dust boot from the caliper assembly. 4. Remove the rubber piston seal from the cylinder and discard it.

CLEANING AND INSPECTION

^ Clean all metal parts with isopropyl alcohol or brake parts cleaner. Then, clean out and dry the grooves and passageways with compressed air. Make sure caliper bore and component parts are thoroughly clean.

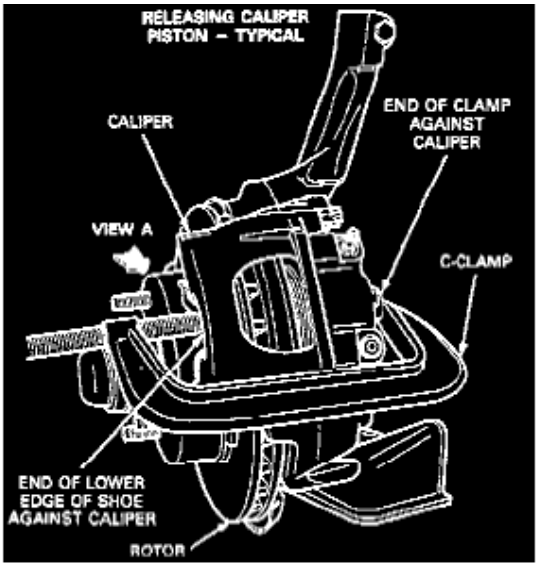
^ Check the cylinder bore and piston for damage or excessive wear. Replace the piston if it shows signs of pitting, scoring or cracks.

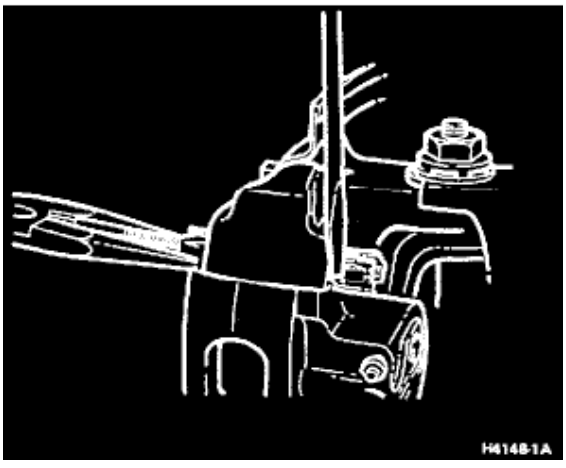
ASSEMBLY

1. Apply a film of clean brake fluid to the new caliper piston seal, and install it in the cylinder bore. Be sure the seal does not become twisted but is

firmly seated in the groove.

2. Install a new dust boot by setting the flange squarely in the outer groove of the caliper bore. 3. Coat the piston with brake fluid, and install the piston in the cylinder bore. 4. Spread the dust boot over the piston as it is installed. Seat the dust boot in the piston groove. 5. Install the caliper.


RELEASING CALIPER PISTON – TYPICAL
CALIPER
END OF CLAMP AGAINST CALIPER
VIEW A
C-CLAMP
END OF LOWER EDGE OF SHOE AGAINST CALIPER
ROTOR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Brake Caliper: Service and Repair Removal

For additional information see Removal Notes. See: Fundamentals and Basics

1. Use a clean siphon or suction hose to remove a portion of the fluid from the master cylinder. Discard the removed fluid.

CAUTION: System contamination may result if anything other than a clean device is used to remove fluid from master cylinder.

2. Raise the vehicle and install safety stands. Remove wheel and tire assembly.

Compressing Caliper

3. Use an eight-inch C-clamp to move the piston back into its bore as follows:

a. Place the head of the C-clamp against the caliper, and the screw end of the C-clamp against the outer pad below the spring clip.

CAUTION: Do not position C-clamp on the spring clip. Also, do not compress piston further than is required to disengage torque buttons from caliper. Damage to the spring clip will result. Replace pad if spring clip is bent or damaged.

CAUTION: Do not attempt to "bottom" the piston in the bore at this time. Use an old, worn out brake pad or block of wood and the C-clamp to bottom the piston once caliper is removed from rotor, and the pads are removed from the caliper.

b. Tighten the clamp until the torque buttons just clear the caliper (about 3 mm [1/8 in]). Remove the C-clamp.

CAUTION: Do not use a screwdriver or similar tool to pry piston away from the rotor.

4. Clean excess dirt from area around pin tabs. 5. Tap upper caliper pin towards inboard side until pin locking tabs touch the spindle face. 6. Insert a screwdriver into the slot provided behind the pin tabs on the inboard side of the pin.

Compressing Pin Tabs

7. Use needle nose pliers to compress the outboard end of the pin while prying at the same time with the screwdriver, until tabs slip into the spindle

groove.

8. Place one end of a punch (approximately 7/16 inch diameter) against the end of the caliper pin and drive the caliper pin out of the caliper slide

groove.

9. Repeat removal procedure for lower pin.

10. Remove the caliper from the rotor. If the caliper is to be removed for service, disconnect the brake hose from the caliper. If not, secure the caliper

with wire.

CAUTION: Do not let the caliper hang with its weight on the brake hose.

11. Compress the anti-rattle clip and remove the inner pad from the caliper.

Brake Caliper: Fundamentals and Basics Removal Notes

When Removing the Caliper, Remember...

- Prior to removing the calipers, remove/siphon brake fluid from master-cylinder until the reservoir is only 1/3 full.

- Brake fluid will remove paint and damage electrical connections. Use a drip pan and fender covers to protect the vehicle's finish and electrical system.

- Always replace all brake linings on an axle. Never replace only one wheel. Unequal lining thickness between wheels on the same axle will result in a strong steering pull when the brakes are applied.

- Work on one side at a time. If you forget how to reassemble the parts you can always use the other side as a model.

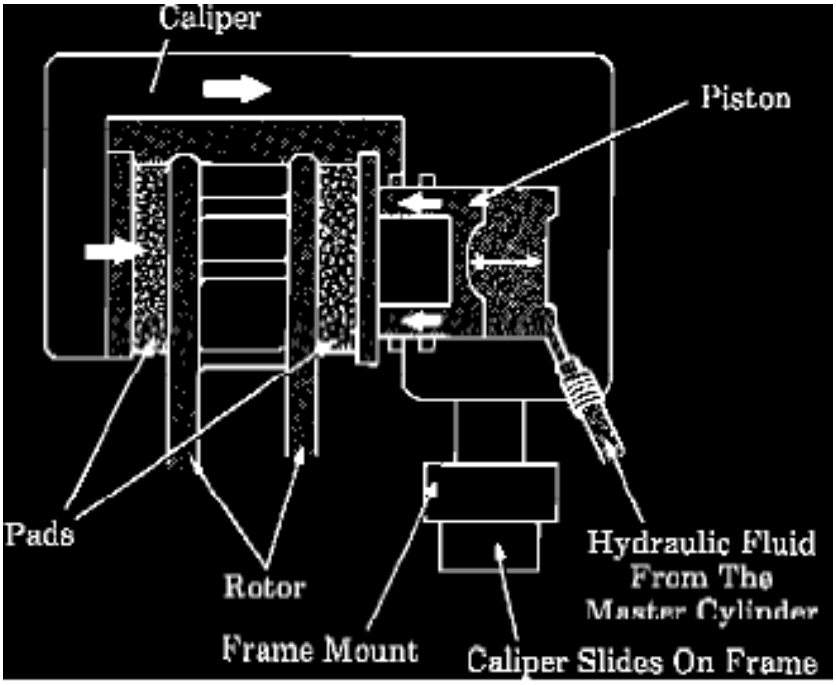
- When forcing the piston back into the caliper, open the bleeder valve first. Corrosion and other deposits accumulate inside of the caliper. If the bleeder valve is not opened when the piston is forced back into the caliper, these deposits will be forced back through the brake lines and into the master-cylinder.

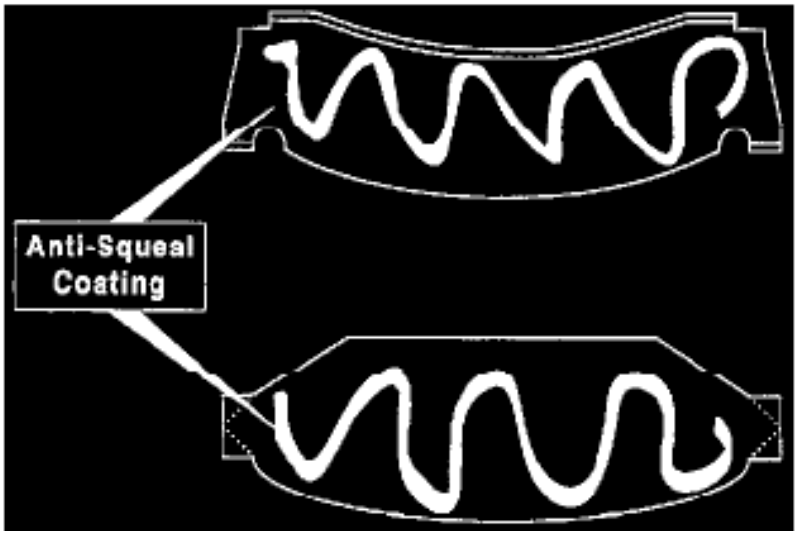
-

When pushing the pistons back into the caliper with the bleeder screw open, a stream of brake fluid will be expelled from the bleeder screw for 2-3 feet. Use a drip pan and be careful not to "shoot" brake fluid onto the vehicle's finish. A cleaner method is to use a piece of clear plastic hose and a glass or plastic jar to catch the expelled fluid.

- Upon removal, Do Not allow the calipers to hang by the flexible brake hoses. The brake hoses can be damaged easily by this practice. These hoses are double walled, damage to the interior pressure hose will not be visible.

- Do not depress the brake pedal with either caliper removed from the rotor. The caliper pistons will be inadvertently expelled from the caliper. If this occurs rebuild or replace the caliper, do not attempt to insert the piston back into the caliper.


Caliper
Piston
Pads
Rotor
Frame Mount
Hydraulic Fluid
From The
Caliper Slides On Frame


Anti-Squeal
Coating

Brake Caliper: Fundamentals and Basics Installation Notes

WHEN INSTALLING CALIPERS AND PADS, REMEMBER...

- Clean and lubricate caliper slide joint/pins with high temperature silicone grease:

Unlike drum brakes, disc brakes do not utilize a spring to withdraw the pads/linings when the brake pedal is released. Disc brakes rely on the elasticity of the piston seals, and the unrestricted movement of the caliper slide assemblies to release the brakes.

If the slide joints/pins are not cleaned and lubricated properly the disc brake linings will drag upon the release of the brake pedal. This will result in overheated brakes and premature brake wear.

Disc Brake Mechanical Force Diagram

NOTE: Floating calipers require free and unrestricted movement on the caliper mounting. Floating or sliding calipers have pistons only on one side of the rotor. The first part of the piston's travel forces the inner pad against the rotor, then further travel forces the movable part of the caliper to pull the outer pad against the rotor.

High temperature silicone lubricant must be used. Low temperature grease can melt and contaminate the pads and rotors, or can bake into a very hard substance which binds the slides. Petroleum based grease can cause the slide boots to soften and swell.

-

Work on one side at a time. If you forget how to reassemble the parts you can always use the other side as a model.

Anti-squeal Coating

- Apply an anti-squeal coating to the back side of the pads/linings. This coatings acts as an insulator to dampen high frequency vibrations that are generated during normal braking. These compounds are highly effective in preventing brake squeal.

- Many professional repair shops recommend always rebuilding or replacing the calipers when replacing the brake linings, because:

When the pistons are forced back into the calipers, the piston seals are dragged across any corrosion or abrasives that may be deposited on the inside of the caliper.

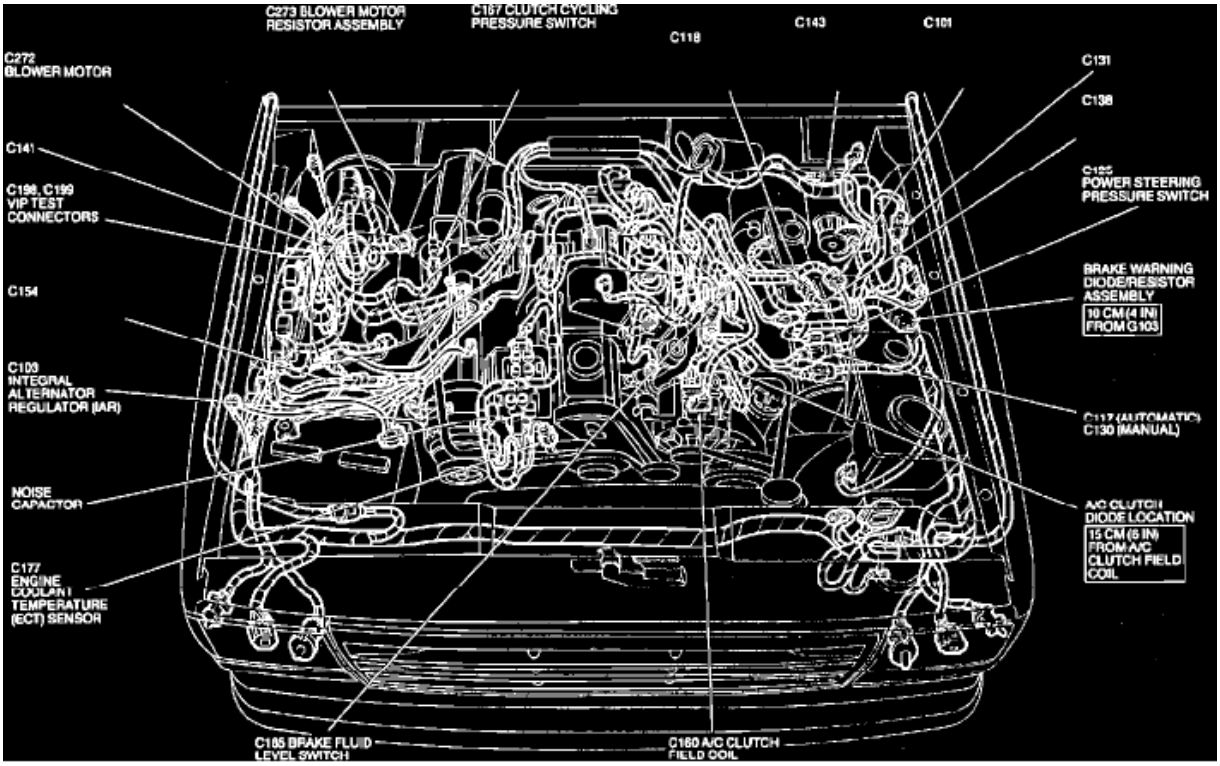
Damage to the seals may not be initially evident. As the new brake linings begin to wear, the piston is gradually withdrawn from the caliper.

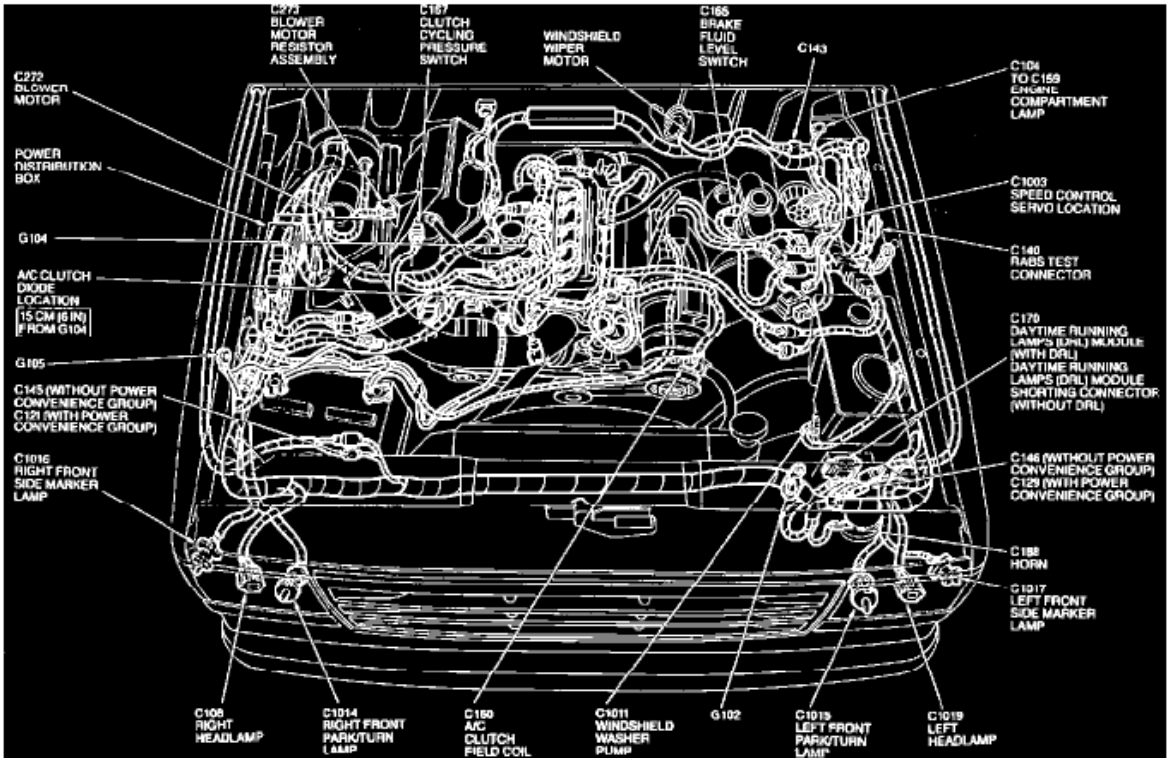
This results in the piston seals again being dragged across the layer of corrosion and deposits.

Calipers which are not rebuilt or replaced have a higher probability of sticking or leaking.

- Check to ensure the bleeder screw is not frozen prior to reinstalling caliper. Freeing a stuck bleeder screw is much easier with the caliper removed from the vehicle.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Hydraulic System, Brakes > Brake Fluid Level Sensor/Switch > Component Information > Locations





Brake Fluid Level Sensor/Switch: Locations

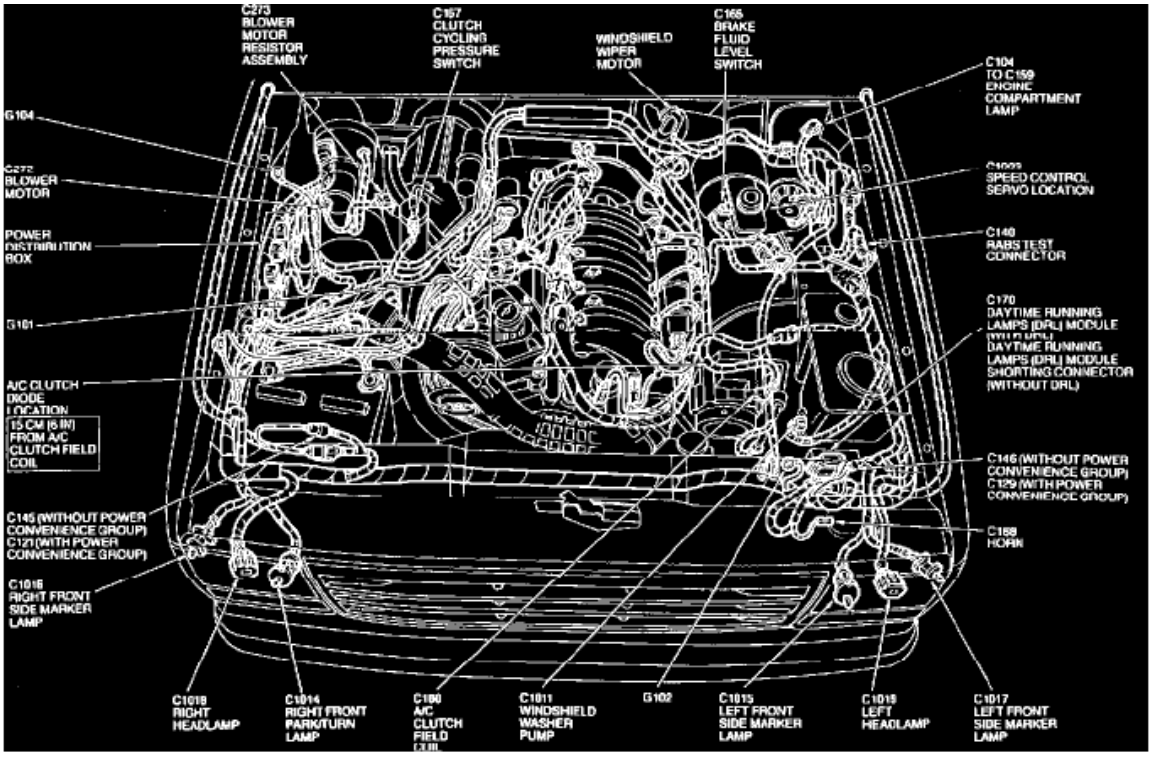
Engine Compartment Components.

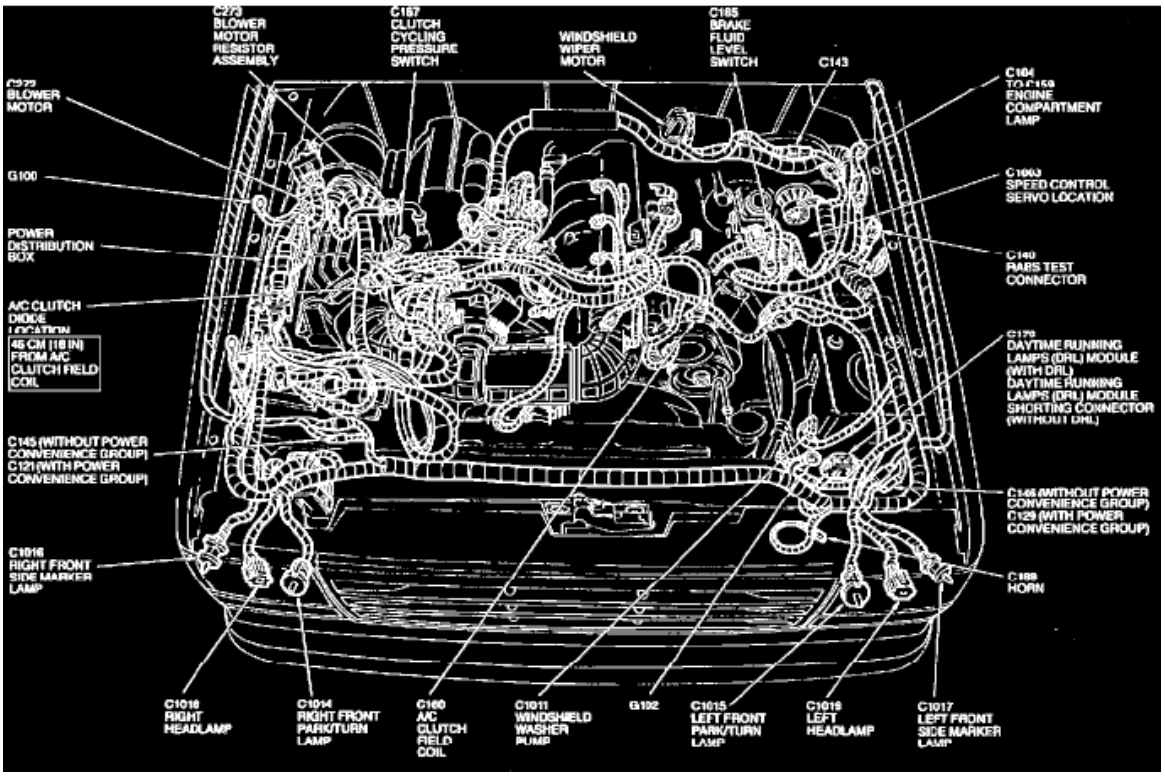
Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 2.3L/4-140

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir


C273
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C157
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C104
TO C159
ENGINE
COMPARTMENT
LAMP
G104
C272
BLOWER
MOTOR
SPEED CONTROL
SERVO LOCATION
POWER
DISTRIBUTION
BOX
C140
RABS TEST
CONNECTOR
G101
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM A/C
CLUTCH FIELD
COIL
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C1018
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C160
A/C
CLUTCH
FIELD
COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
SIDE MARKER
LAMP
C1019
LEFT
HEADLAMP
C1017
LEFT FRONT
SIDE MARKER
LAMP


C273
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C157
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C143
C104
TO C159
ENGINE
COMPARTMENT
LAMP
BLOWER
MOTOR
G100
C1003
SPEED CONTROL
SERVO LOCATION
POWER
DISTRIBUTION
BOX
C140
RABS TEST
CONNECTOR
A/C CLUTCH
DIODE
LOCATION
45 CM (18 IN)
FROM A/C
CLUTCH FIELD
COIL
C179
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C188
HORN
C1018
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C160
A/C
CLUTCH
FIELD
COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
PARK/TURN
LAMP
C1019
LEFT
HEADLAMP
C1017
LEFT FRONT
SIDE MARKER
LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 3.0L/V6-181

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 4.0L/V6-244

Brake Hose/Line: Technical Service Bulletins Brake Hoses - Wet Appearance

Article No. 91-18-9 09/05/91

^ BRAKES-HYDRAULIC-RUBBER BRAKE HOSES ARE WET FROM SWEATING

^ BRAKES-HYDRAULIC-RUBBER HOSES-FLUID LEAK TESTING PROCEDURE

LIGHT TRUCK: 1985-90 BRONCO II 1985-92 BRONCO, ECONOLINE, F-150, F-250, F-350, RANGER 1986-92 AEROSTAR 1988-92 F SUPER DUTY, F-47, F-63, F-59 1991-92 EXPLORER

This TSB article is being republished in its entirety to include 1992 model vehicles.

ISSUE: The wet appearance of the outer cover of rubber brake hoses is called "sweating." This is a normal condition for neoprene rayon braid hose. The "sweating" condition is not evidence of a brake fluid leak and will not result in a loss of pressure in the system.

ACTION: No action is required for a normal "sweating" brake hose. However, to test for a hydraulic fluid leak, proceed as follows:

1. Check the brake fluid level in the master cylinder. If necessary, add brake fluid.

2. Wipe off the hose(s) in question with a clean cloth and an all purpose cleaner, then dry.

3. With the engine running, fully depress the brake twice and hold for two (2) minutes. ^

If the pedal goes down, check all of the connections for leaks and repair as required.

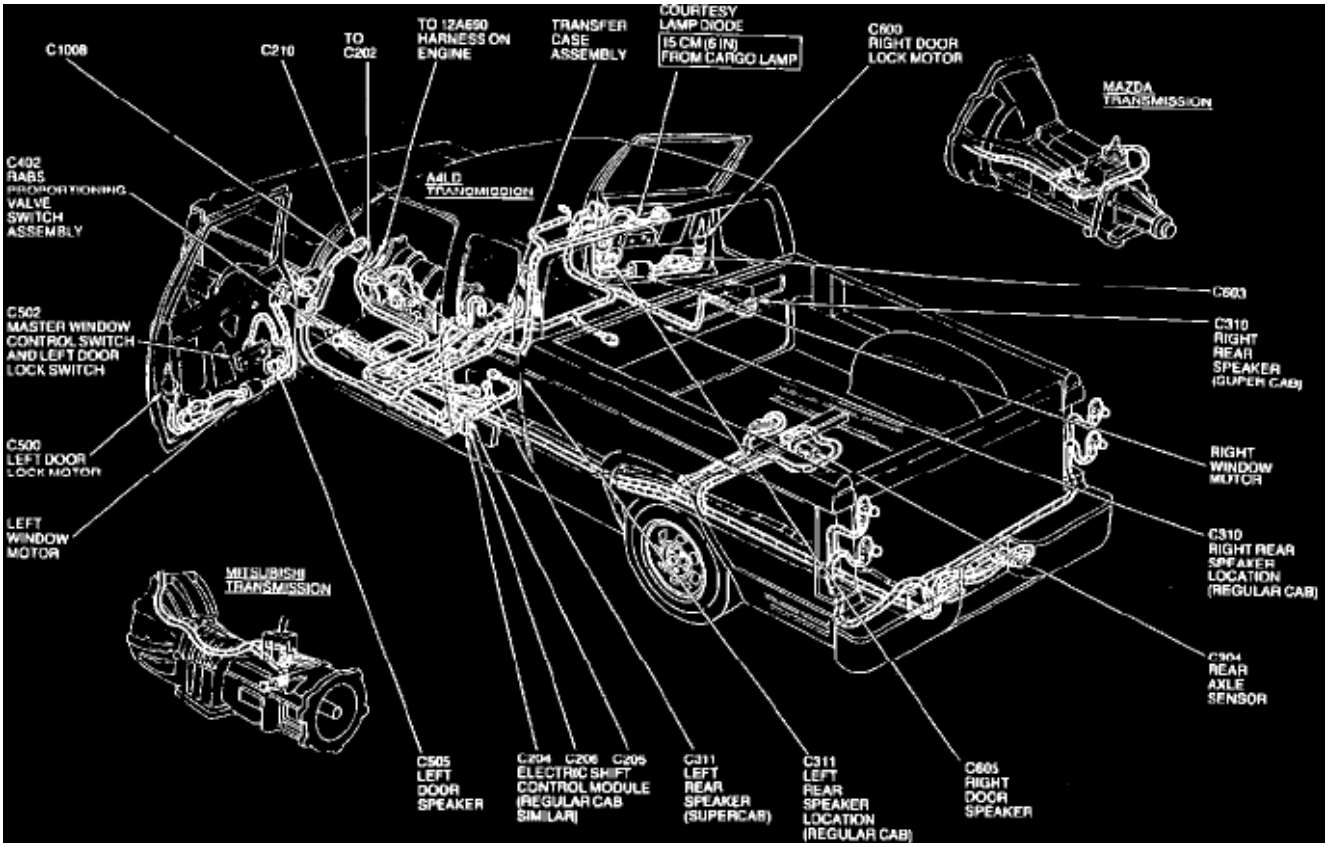
^ If the pedal goes down and no visible leaks are seen, then the master cylinder is leaking internally and must be replaced or rebuilt. Refer to the appropriate Light Truck or Medium/Heavy Truck Shop Manual, Section 6 or 12 (Light Truck) and Section 12 (Med./Hvy Truck) for service details.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

90-11-9

WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

301000



Brake Proportioning/Combination Valve: Locations

Body Components

Below LH Side Of Vehicle, On LH Frame Rail

Brake Proportioning/Combination Valve: Description and Operation

This multi-function hydraulic control unit consists primarily of a pressure differential valve, brake lamp warning switch and a proportioning valve. A pressure differential shuttle and/or metering valve are also incorporated with some valve applications. The metering valve delays front disc brake effectiveness until the rear brake shoes contact the brake drums. The proportioning valve regulates rear hydraulic system pressure to prevent rear brake lock-up. The pressure differential valve senses hydraulic system pressure and will activate the brake lamp warning switch if a pressure loss occurs. The pressure differential shuttle bypass feature provides full rear brake application if front hydraulic system pressure is significantly reduced.

Hydraulic Control Assembly - Antilock Brakes: Service and Repair

1. Disconnect and plug brake lines from valve.

2. Disconnect wiring harness, then remove valve attaching nuts and valve from frame rail.

3. Position new valve onto frame rail, then install and torque attaching nuts to 30-40 inch lbs on Aerostar models, 11-14 ft. lbs. on Bronco II, Explorer and Ranger models, 19-24 ft. lbs. on E-Series models or 12-17 ft. lbs. on Bronco and F-Series models.

4. Reconnect wiring harness and brake lines, torque brake lines to valve, 1/2 20 threaded fitting to 10-17 ft. lbs., 7/16 24 threaded fitting to 10-15 ft. lbs. and 3/8 24 threaded fitting to 10-15 ft. lbs.

5. Perform system brake bleeding procedures as required.

Brake Master Cylinder: Recalls Recall 96V024001: Brake Master Cylinder Stud Cracking

THE STUDS WHICH ATTACH THE BRAKE MASTER CYLINDER TO THE POWER BRAKE VACUUM BOOSTER ASSEMBLY CAN DEVELOP STRESS CORROSION CRACKING AFTER BEING OPERATED FOR AN EXTENDED PERIOD OF TIME IN THE SOUTHERN CALIFORNIA LOCATION. IF A CRACK OCCURS, IT COULD RESULT IN ONE OR BOTH STUDS FRACTURING. THE MASTER CYLINDER COULD THEN SEPARATE FROM THE VACUUM BOOSTER, WHEN THE BRAKES ARE APPLIED, PREVENTING THE SERVICE BRAKES FROM ACTIVATING INCREASING THE RISK OF A VEHICLE ACCIDENT. DEALERS WILL REPLACE THE POWER BRAKE VACUUM BOOSTER ASSEMBLY.

SYSTEM: BRAKES; POWER ASSIST; PRIMARY; BOOSTER.

VEHICLE DESCRIPTION: MULTI-PURPOSE VEHICLES AND LIGHT DUTY TRUCKS ORIGINALLY SOLD OR CURRENTLY REGISTERED IN THE SOUTHERN CALIFORNIA COUNTIES OF LOS ANGELES, ORANGE, SAN BERNADINO, SAN DIEGO, RIVERSIDE, VENTURA, SANTA BARBARA, SAN LUIS OBISPO, IMPERIAL, AND KERN.

NOTE: OWNERS WHO TAKE THEIR VEHICLES TO AN AUTHORIZED DEALER ON AN AGREED UPON SERVICE DATE AND DO NOT RECEIVE THE FREE REMEDY WITHIN A REASONABLE TIME, SHOULD CONTACT FORD AT 1-800-392-3673. ALSO CONTACT THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION'S AUTO SAFETY HOTLINE AT 1-800-424-9393.

1991 FORD TRUCK EXPLORER 1991 FORD TRUCK RANGER 1992 FORD TRUCK EXPLORER 1992 FORD TRUCK RANGER 1993 FORD TRUCK EXPLORER 1993 FORD TRUCK RANGER 1994 FORD TRUCK EXPLORER 1994 FORD TRUCK RANGER

Brake Master Cylinder: Recalls Recall 96V024000: Master Cylinder Stud Cracking

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1991 FORD TRUCK EXPLORER 1991 FORD TRUCK RANGER 1991 MAZDA TRUCK NAVAJO 1992 FORD TRUCK EXPLORER 1992 FORD TRUCK RANGER 1992 MAZDA TRUCK NAVAJO 1993 FORD TRUCK EXPLORER 1993 FORD TRUCK RANGER 1993 MAZDA TRUCK NAVAJO 1994 FORD TRUCK EXPLORER 1994 FORD TRUCK RANGER 1994 MAZDA TRUCK B2300 1994 MAZDA TRUCK B3000 1994 MAZDA TRUCK B4000 1994 MAZDA TRUCK NAVAJO

Brake Master Cylinder: All Technical Service Bulletins Recall 96V024001: Brake Master Cylinder Stud Cracking

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Brake Master Cylinder: All Technical Service Bulletins Recall 96V024000: Master Cylinder Stud Cracking

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1991 FORD TRUCK EXPLORER 1991 FORD TRUCK RANGER 1991 MAZDA TRUCK NAVAJO 1992 FORD TRUCK EXPLORER 1992 FORD TRUCK RANGER 1992 MAZDA TRUCK NAVAJO 1993 FORD TRUCK EXPLORER 1993 FORD TRUCK RANGER 1993 MAZDA TRUCK NAVAJO 1994 FORD TRUCK EXPLORER 1994 FORD TRUCK RANGER 1994 MAZDA TRUCK B2300 1994 MAZDA TRUCK B3000 1994 MAZDA TRUCK B4000 1994 MAZDA TRUCK NAVAJO

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

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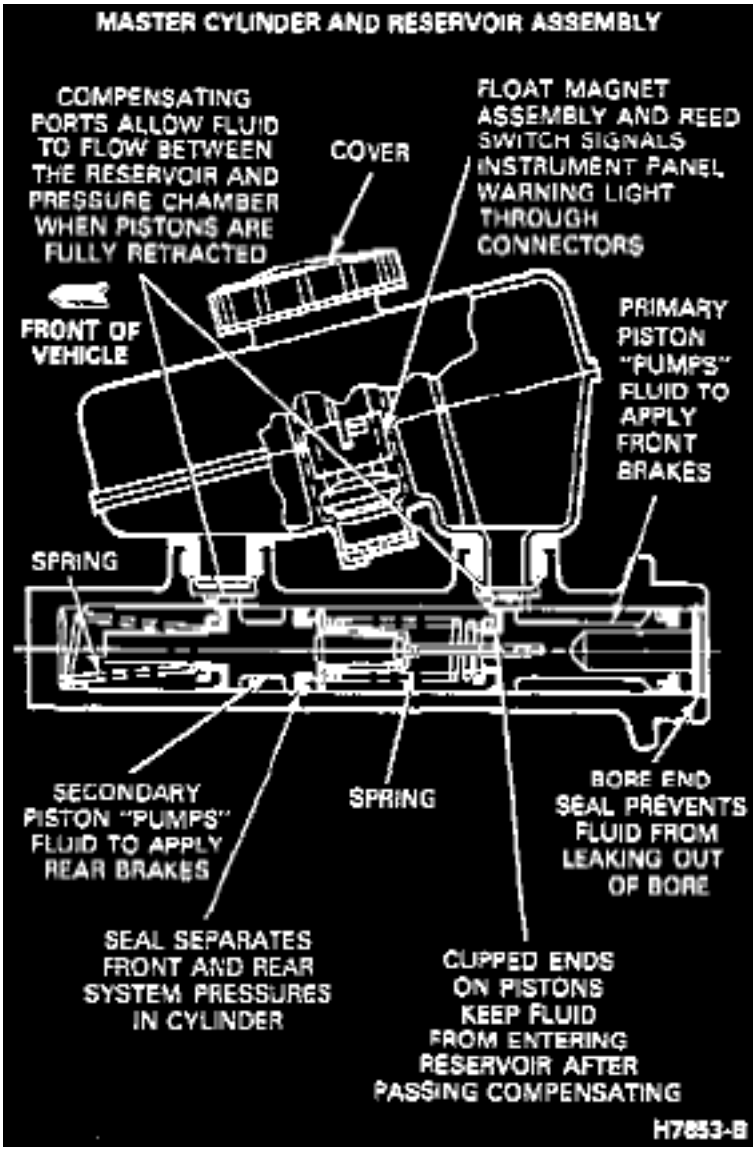
Brake Master Cylinder: Specifications

Master cylinder retaining bolts	18-33 Nm (13-25 ft lb)

Brake Master Cylinder: Description and Operation Master Cylinder, ABS

The master cylinder consists primarily of a hydraulic cylinder, primary and secondary hydraulic pistons and a single or dual chamber fluid reservoir. The front brakes are connected to the primary outlet port(s) and are actuated by the primary piston assembly. The rear brakes are connected to the secondary outlet port and are actuated by the secondary piston assembly.



Brake Master Cylinder: Description and Operation Master Cylinder, Brakes

Master Cylinder

The dual master cylinder contains a double hydraulic cylinder with two fluid reservoirs as well as primary and secondary hydraulic pistons. The rear wheel brakes are connected to the secondary outlet port and are actuated by the secondary piston assembly. The front wheel brakes are connected to the primary outlet port(s), nearest the dash panel, and are actuated by the primary piston assembly.

Brake Master Cylinder: Testing and Inspection

INSPECTION

Inspect for Leakage

NOTE: The master-cylinder should be cleaned thoroughly prior to inspection (several days preferably). Spilled brake fluid can be easily confused with leakage.

Piston Seals -

Leakage around the piston seals will seep out from the end of the cylinder and leak down the outside of the brake booster.

- Inspect for signs of seepage or bubbled paint on the brake booster.

- If any leakage is detected the master-cylinder should be replaced or overhauled

Brake Line Fittings -

While someone is applying pressure to the brake pedal, inspect the brake line fittings on the master-cylinder for leakage.

- If the fittings are leaking they should be disassembled and inspected.

Reservoir to Cylinder Gasket -

Inspect the gasket for signs of leakage or hardening and cracking.

-

Overhaul or replace the master-cylinder if any leakage is indicated.

Inspect for Oil Contamination.

- Inspect the rubber gasket on the inside of the master-cylinder lid. If the gasket is swollen or bloated, the brake fluid is contaminated with oil.

- Siphon or scoop a small amount of brake fluid out of the master-cylinder and place into a styrofoam cup filled 2/3 of the way with water. Brake fluid will mix with the water while oil contaminants will float on the surface and dissolve the styrofoam.

NOTE: If any oil contamination is present ALL brake components containing rubber seals will need to be replaced or overhauled. This includes the master-cylinder, both front calipers, both rear wheel cylinders, and all flexible brake hoses.

Verify Hold-Down Bolts Are Tight

- While someone is applying and releasing pressure to the brake pedal, verify the the master-cylinder is tightly secured to the brake booster.

-

Retighten hold-down bolts if necessary.

Functional Checks

WARNING: Always bleed the entire brake system and verify the rear brakes are properly adjusted prior to diagnosing a master-cylinder as defective. For additional information on master-cylinder / brake pedal relationship see Fundamentals and Basics.

Check Related Systems -

Check for proper brake booster operation 1. With the engine "OFF", depress and release the brake pedal 4-5 times (this bleeds off the vacuum reserve in the booster). 2. Depress the brake pedal firmly and start the engine.

If the pedal goes down slightly the brake booster is assisting in brake operation. If the pedal does not go down slightly the brake booster is not assisting in brake operation and should be diagnosed for problems.

- Check and adjust rear brakes.

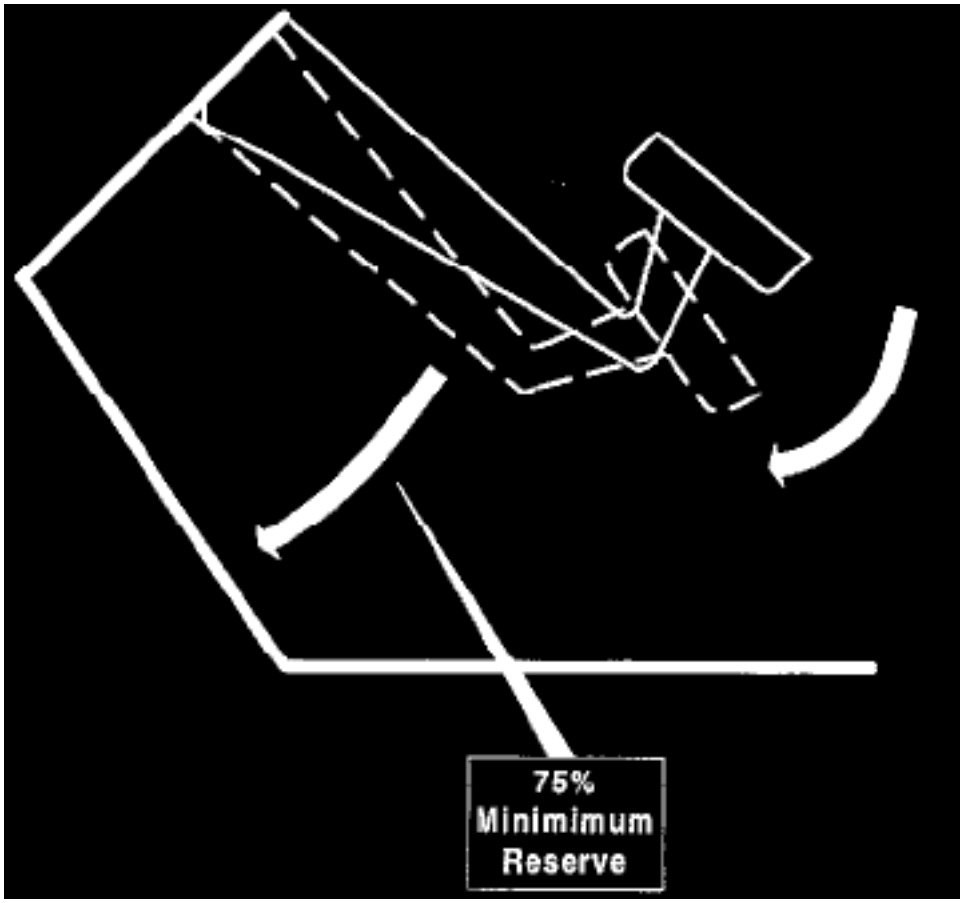
- Check all brake lines and brake assemblies for leakage.

Repair all deficiencies with related systems prior to diagnosing the master-cylinder as defective.

Check Brake Pedal Travel (Non-Antilock Brake Systems Only) -

Fully depress the brake pedal and check for the following: -

The pedal should have a 75% reserve.



Pedal Reserve Checks

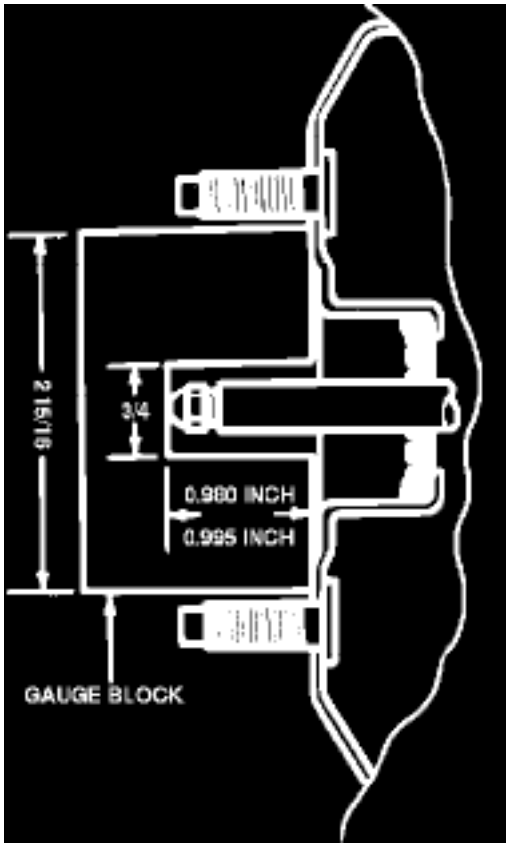
- The pedal should be firm and not leak down.

Prior to replacing a master-cylinder for poor pedal travel or feel verify the following: -

There were no problems with any of the related systems.

- The entire brake system has been bled.

- Rear brakes are properly adjusted.



Brake Master Cylinder: Adjustments

PUSHROD ADJUSTMENT

Fig. 1 Adjusting Piston Rod

To check adjustment of pushrod, fabricate a gauge and position it against master cylinder mounting surface as shown in Fig. 1. Adjust pushrod screw by turning it until the end just touches inner edge of slot in gauge.

For additional information see Push Rod Adjustment Notes.

Brake Master Cylinder: Service and Repair Master Cylinder, ABS

WITH POWER BRAKES

1. With engine off, depress brake pedal to expel vacuum from brake booster system.

2. Disconnect hydraulic lines from master cylinder.

3. Remove brake booster to master cylinder retaining nuts and remove master cylinder from brake booster.

4. Reverse procedure to install and perform system brake bleeding procedures, then refill master cylinder and bleed it.

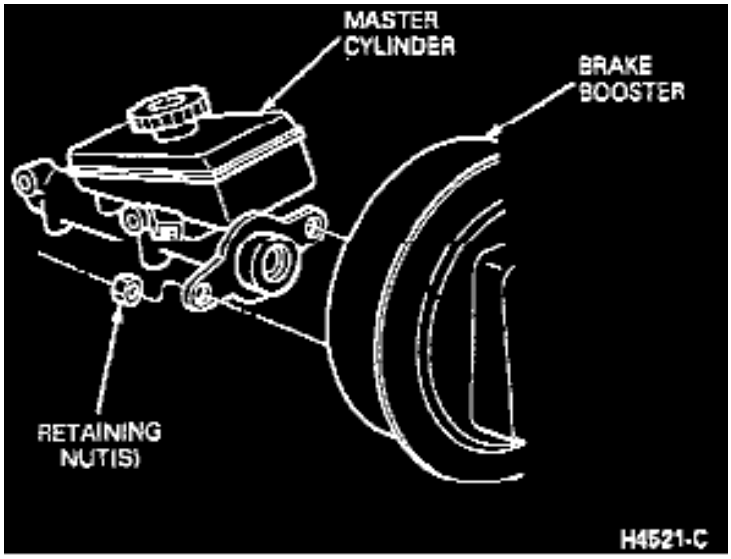
LESS POWER BRAKES

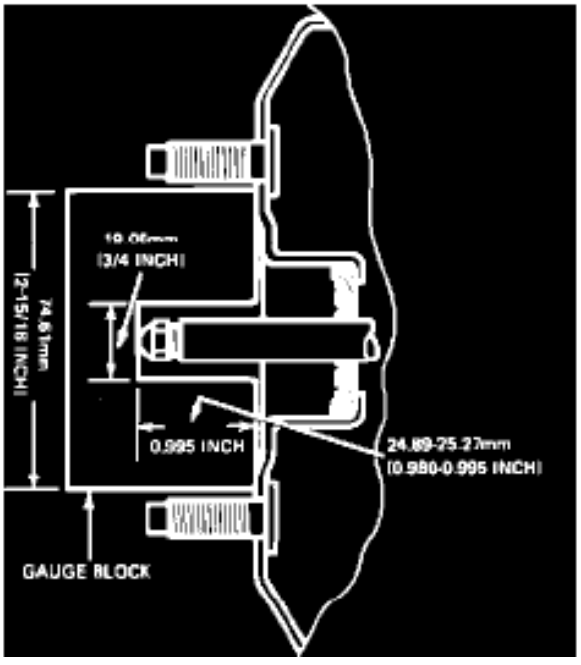
1. Disconnect wires from stop light switch inside cab below instrument panel.

2. Remove retaining nut, shoulder bolt and spacers which secure master cylinder pushrod to brake pedal assembly, then remove stop light switch from pedal.

3. Disconnect hydraulic brake lines from master cylinder, then remove master cylinder to dash panel retaining nuts, master cylinder, and boot from master cylinder pushrod.

4. Reverse procedure to install and perform system brake bleeding procedures, then refill and bleed master cylinder.


MASTER CYLINDER
BRAKE BOOSTER
RETAINING NUT(S)
H4521-C


19.06mm (3/4 INCH)
74.61mm (2-15/16 INCH)
0.995 INCH
24.89-25.27mm (0.980-0.995 INCH)
GAUGE BLOCK

Brake Master Cylinder: Service and Repair Master Cylinder, Brakes

Removal

For additional information see Notes, Warnings, and Hints.

CAUTION: Brake fluid will damage electrical connections and painted surfaces. Use shop cloths, drip pans and fender covers to prevent brake fluid from contacting these areas.

1. Disconnect the brake warning lamp indicator wire from the plastic reservoir low fluid level warning switch socket. 2. With the engine turned off, push the brake pedal down to expel vacuum from the brake booster system. 3. Disconnect the hydraulic lines from the brake master cylinder. Cover the ends of the lines to prevent dirt from entering system. 4. Remove the wrap around clip and attaching nut from the booster master cylinder mounting stud.

Master Cylinder

5. Remove the brake booster-to-master cylinder retaining nuts. Remove the master cylinder from the brake booster.

Installation

For additional information see Notes, Warnings, and Hints.

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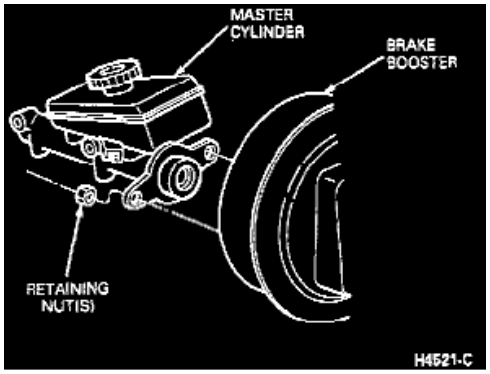
1. Bench bleed the master cylinder. Refer to Brake Bleeding.

Fig.1 Checking Master Cylinder Pushrod Length

2. Before installing the master cylinder, check the distance from the outer end of the booster assembly push rod to the face of the brake booster

assembly. Turn the push rod adjusting screw in or out as required to obtain the specified length (see second image).


MASTER CYLINDER
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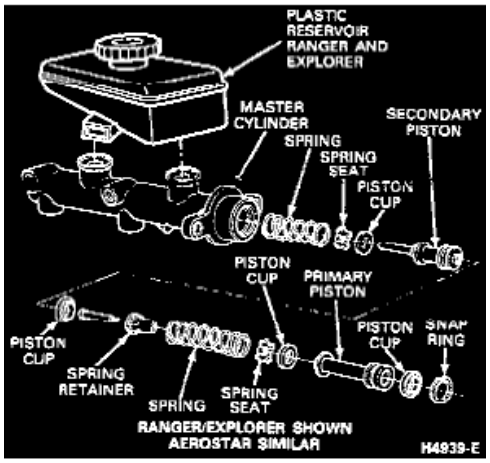
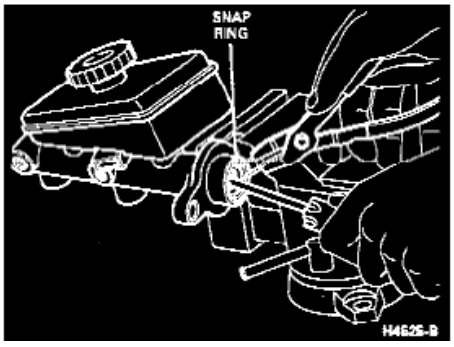
RETAINING NUT(S)
H4521-C


PLASTIC RESERVOIR RANGER AND EXPLORER
MASTER CYLINDER
SPRING
SPRING SEAT
SECONDARY PISTON
PISTON CUP
PISTON CUP
PRIMARY PISTON
PISTON CUP
SNAP RING
SPRING RETAINER
SPRING
SPRING SEAT
RANGER/EXPLORER SHOWN AEROSTAR SIMILAR
H4939-E


SNAP RING
H4625-B

Master Cylinder

3. Position the master cylinder assembly over the booster push rod and onto the two studs on the booster assembly. Install the attaching nuts and

tighten to 18-33 Nm (13-25 ft lb).

4. Loosely connect the hydraulic brake system lines to the master cylinder. 5. Position the wrap-around clip on the mounting stud. Install and tighten the attaching nut. 6. Tighten the tube nuts to 14-20 Nm (10-15 ft lb). 7. Connect fluid level indicator switch. 8. Install the gasket and plastic cap assembly. 9. Bleed the hydraulic brake system. Refer to Brake Bleeding.

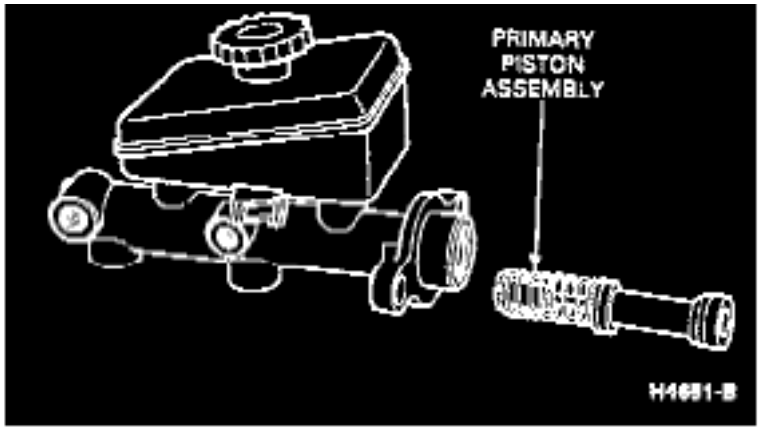
Rebuild

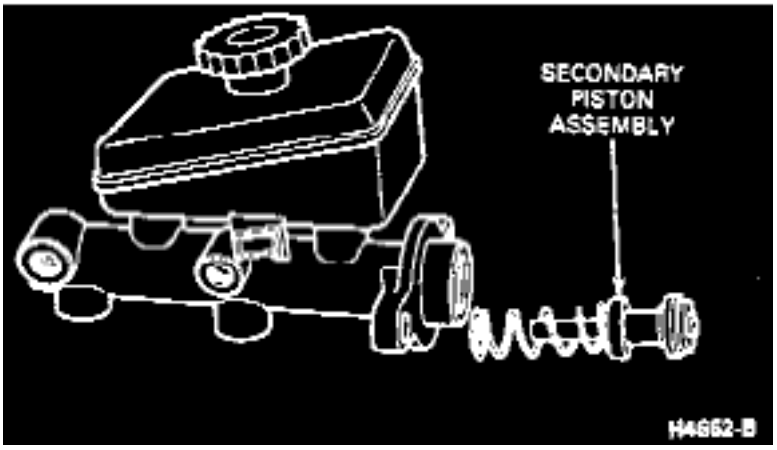
Master Cylinder

DISASSEMBLY

1. Clean the outside of the master cylinder and remove the filler cap and diaphragm. Drain and discard any brake fluid that remains in the cylinder.

Removing/Installing Snap Ring





2. Depress the primary piston and remove snap ring from retaining groove at the rear of the master cylinder bore.

3. Remove primary piston assembly from the master cylinder bore. Inspect for seal damage or twisting. Discard assembly.

4. Remove the secondary piston assembly by directing compressed air into the outlet port at the blind end of the bore while plugging the other port.

Inspect for seal damage or twisting. Discard assembly.

5. Inspect the master cylinder bore for signs of etching, pitting, scoring or other damage.

CAUTION: Thoroughly inspect bore of master cylinder for signs of etching, pitting, scoring or other damage. Do not attempt to hone a master cylinder bore if damage is found.

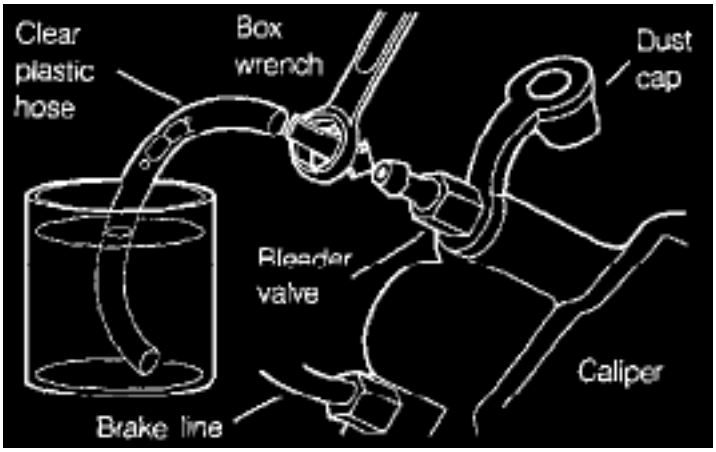
ASSEMBLY

1. Clean the master cylinder body with clean isopropyl alcohol or brake parts cleaner to remove any contamination. 2. Dip the repair kit piston assemblies in clean DOT 3 brake fluid to lubricate the seals. 3. Carefully insert the complete secondary piston assembly in the master cylinder bore.

4. Carefully insert the primary piston assembly in the master cylinder bore. 5. Depress the primary piston and install the snap ring in the cylinder bore groove. On vehicles with manual brakes, install the push rod retainer

onto the push rod and install into the primary piston. Make sure the retainer is properly seated and holding the push rod securely.

6. Install the cap and diaphragm on the master cylinder reservoir.



Brake Master Cylinder: Tools and Equipment

BASIC SERVICE (Removal and Installation)

- Fender cover (servicing and bleeding a master-cylinder can be a messy process)

WARNING: DOT 3 or 4 brake fluid is very corrosive to the vehicles finish and electrical connections.

- Drip pan. - Complete set of combination wrenches or sockets. - Brake bleeding device:

- Pressure bleeder or

- Vacuum bleeder or

- One-man brake bleeder kit or

- Length of clear plastic hose (3/16 inch ID) and a glass jar.

Brake Bleeding Setup

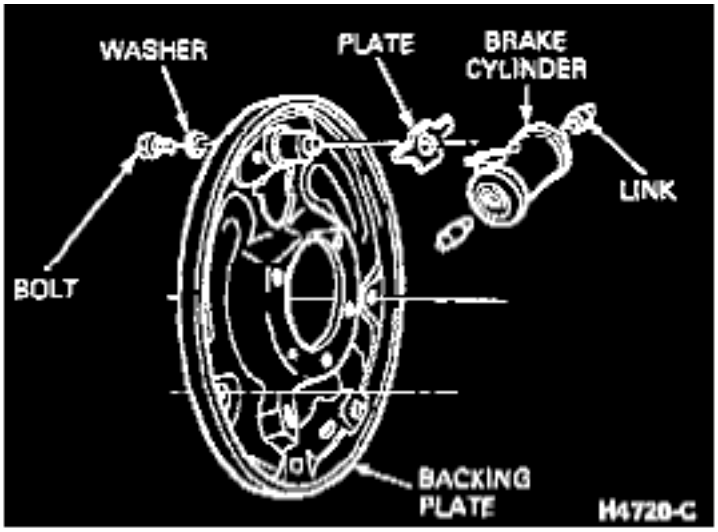
- Small ruler or depth gauge (for adjusting the pushrod) - Brake adjusting tool (rear brake adjustment should be checked) - Clean shop towels.

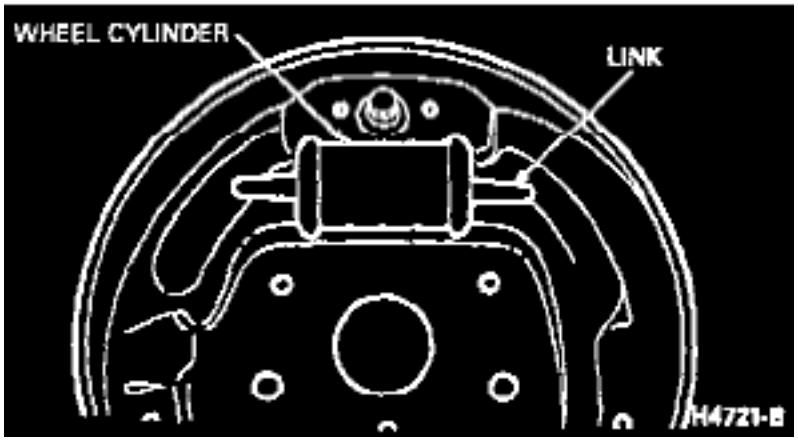
OPTIONAL

- Master Cylinder brake bleeding kit (contains plastic fittings and hoses used for bleeding master cylinders) - Suction bulb (for removing brake fluid from reservoir)

IF MASTER-CYLINDER IS OVERHAULED

- Snap-ring pliers - Small pry bar (for separating the reservoir from the cylinder) - Feeler gauges (for checking piston to cylinder clearance).





Wheel Cylinder: Service and Repair Removal

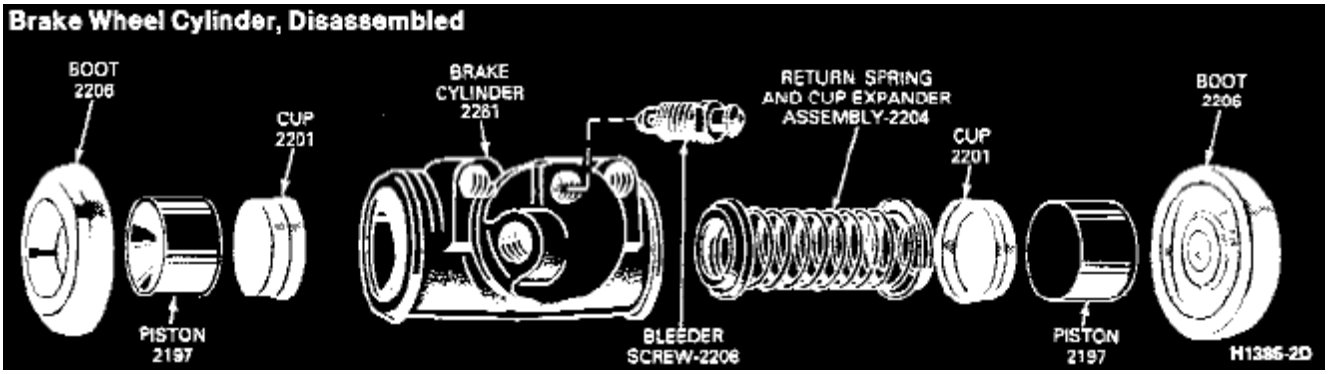
For additional information see Notes, Warnings, and Hints.

Wheel Cylinder And Backing Plate

1. Raise vehicle and position suitable safety stands under vehicle. Remove wheel and tire assembly. 2. Remove the drum, and brake shoes.

Wheel Cylinder Connecting Links

3. Remove the cylinder-to-shoe connecting links (if equipped). 4. Disconnect the brake line from the brake cylinder and plug line to prevent air from entering the system. 5. Remove the brake cylinder retaining bolts and lockwashers, and then remove the cylinder from the backing plate.



Wheel Cylinder: Service and Repair Rebuild

For additional information see Notes, Warnings, and Hints.

Wheel Cylinder Assembly

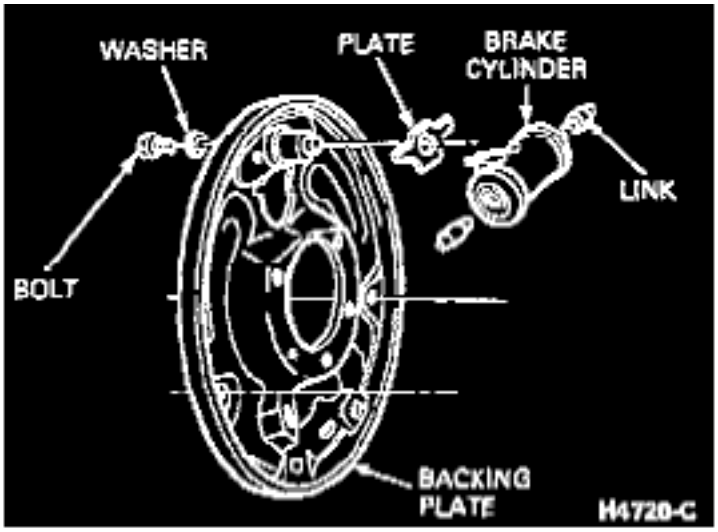
DISASSEMBLY

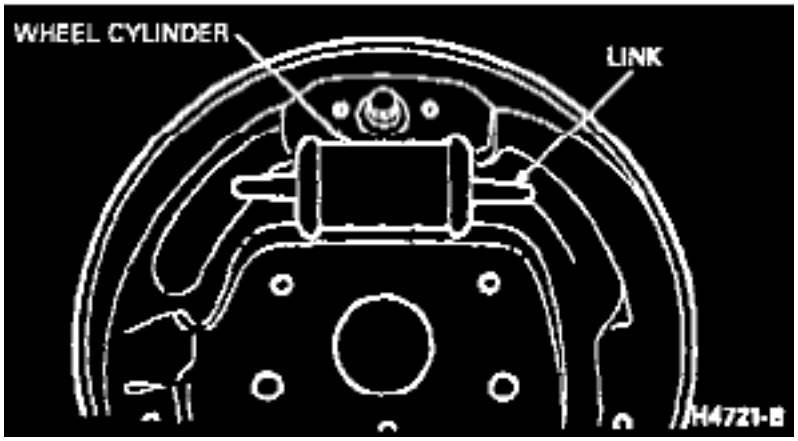
1. With the wheel cylinder removed, remove the rubber boots from the ends of the brake cylinder 2. Remove the pistons, cups, and piston return spring and cup expander assembly from the cylinder. 3. Remove the bleeder screw from the cylinder.

ASSEMBLY

1. Clean the wheel cylinder body with clean isopropyl alcohol or brake parts cleaner to remove any contamination. 2. Coat all brake cylinder parts with clean DOT 3 brake fluid. 3. Install the bleeder screw in the brake cylinder. 4. Place the piston return spring and piston expander assembly, cups, and pistons in the cylinder bore. 5. Clamp the brake cylinder pistons against the ends of the cylinder.

NOTICE: When using a brake cylinder repair kit, follow the instructions in the kit and use all of the parts provided.





Wheel Cylinder: Service and Repair Installation

For additional information see Notes, Warnings, and Hints.

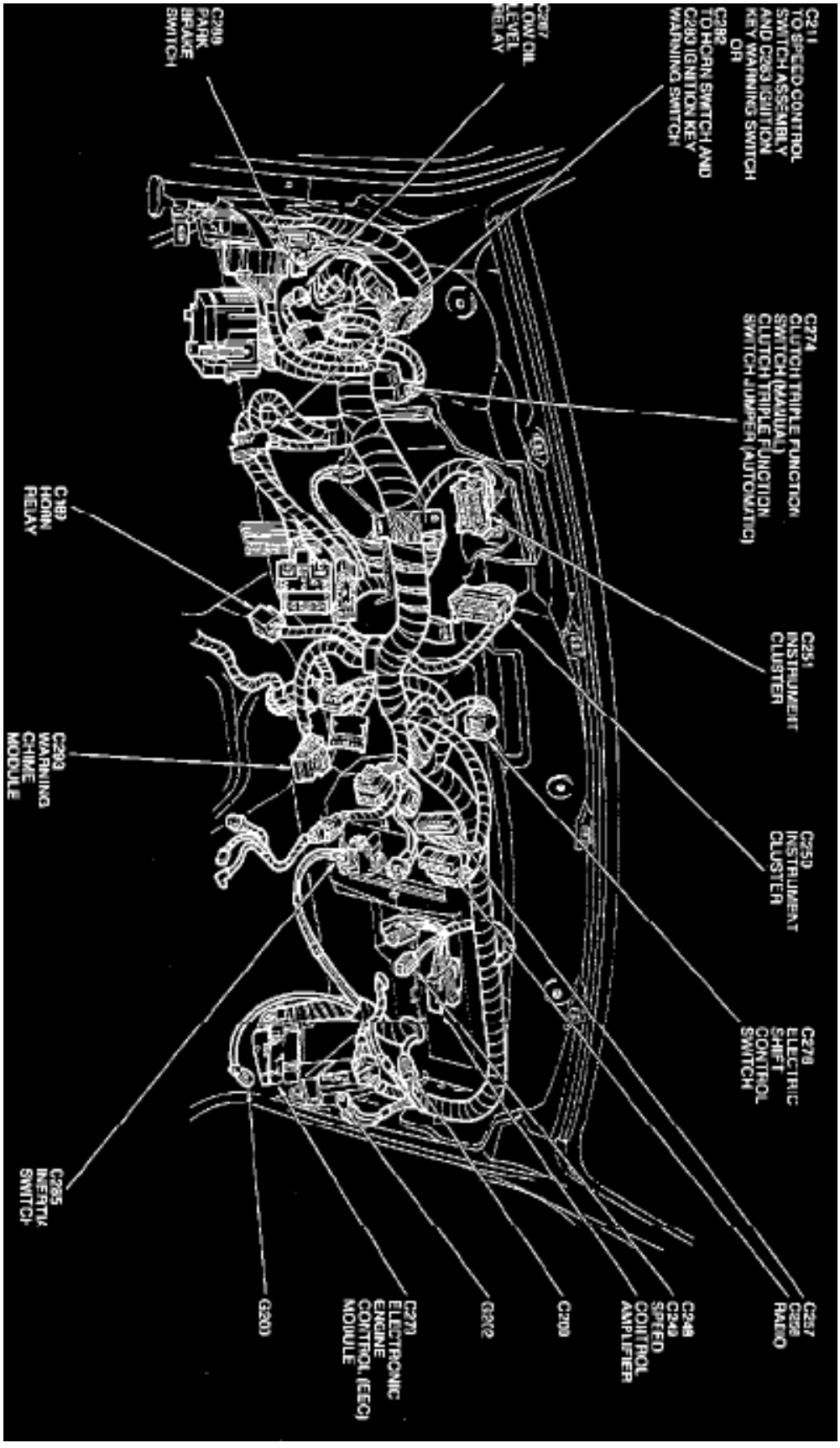
Wheel Cylinder And Backing Plate

1. Place the brake cylinder on the backing plate and install the retaining bolts and lockwashers. 2. Connect the brake line to the brake cylinder.

Wheel Cylinder Connecting Links

3. Install the brake shoes and the connecting links (if equipped). 4. Install the drum. 5. Install the wheel and tire assembly. 6. Adjust the brakes and perform system brake bleeding procedures.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Parking Brake System > Parking Brake Warning Switch > Component Information > Locations



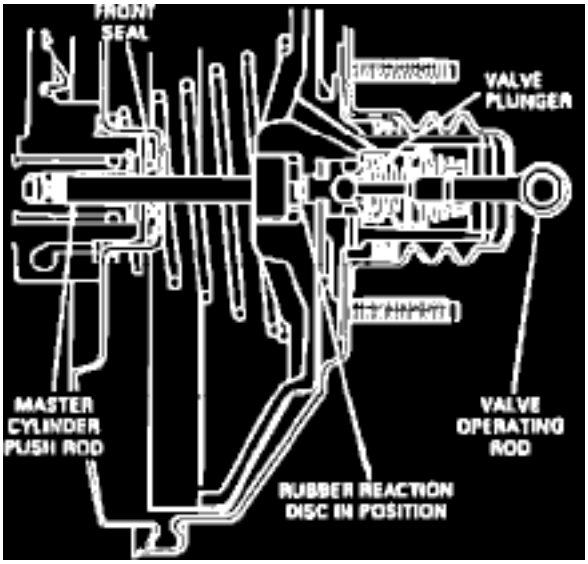
Parking Brake Warning Switch: Locations

I/P Components

Below LH Side Of I/P, On Park Brake Assembly

Vacuum Brake Booster: Description and Operation

The single and tandem vacuum boosters are self contained vacuum hydraulic power braking units. These are vacuum suspended units that use vacuum and atmospheric pressure for their power. On gasoline engine vehicles, vacuum is supplied through a fitting in the intake manifold. On diesel engine vehicles, vacuum is supplied through a vacuum pump. The three basic elements of the booster are the vacuum power chamber, mechanically actuated booster check valve and a hydraulic dual master cylinder which supplies hydraulic pressure to the brake system. The vacuum power chamber consists of a front and rear shell, diaphragm, diaphragm plate, hydraulic pushrod and vacuum diaphragm return spring. The mechanically actuated booster check valve controls degree of power brake application in accordance with foot pressure applied to valve operating rod through brake pedal linkage. This valve is integral with the vacuum power diaphragm.



Vacuum Brake Booster: Service and Repair

Fig. 2 Checking Reaction Disc Installation

Make sure booster rubber reaction disc is properly installed as shown in Fig. 2, if the master cylinder pushrod is removed or accidentally pulled out. A dislodged disc may cause excessive pedal travel and extreme operation sensitivity. The disc is black compared to the silver colored valve plunger that will be exposed after pushrod and front seal are removed. The booster unit is serviced as an assembly and must be replaced if the reaction disc cannot be properly installed and aligned, or if it cannot be located within the unit itself.

1. Disconnect battery ground cable.

2. Disconnect stop lamp switch electrical connectors.

3. Support underside of master cylinder, then remove power brake unit-to-master cylinder attaching nuts.

4. Remove vacuum hose between manifold and power brake unit, or power brake unit check valve. Remove check valve, if equipped.

5. Separate power brake unit and master cylinder, leaving master cylinder supported far enough away to allow removal of power brake unit.

6. On models equipped with pushrod mounted stop lamp switch, remove retaining pin, then slide switch, pushrod, spacers and bushing off brake pedal pin.

7. On models equipped with brake pedal mounted stop lamp switch, remove attaching bolt, nut and plastic bushing, then disconnect power brake unit pushrod from brake pedal.

8.

On all models, remove power brake unit attaching bolts and the power brake unit.

9. Reverse procedure to install.

RABS MODULE (ECU) SERVICE CHART

MODEL YEAR	VEHICLE LINE	SERVICE PART NUMBER
1987-91	F-SRW	F3PZ-2C018-A
1992-93	F-SRW	F3PZ-2C018-C
1987-91	F-DRW	F3PZ-2C018-B
1992-93	F-DRW	F3PZ-2C018-D
1987-91	BRONCO	F3PZ-2C018-A
1992 ONLY	BRONCO	F3PZ-2C018-C
1990-91	E-SRW	F3PZ-2C018-E
1992-93	E-SRW	F3UZ-2C018-A
1990-91	E-DRW	F3PZ-2C018-F
1992-93	E-DRW	F3UZ-2C018-B
1990-93	AEROSTAR	F29Z-2C018-A
1989-93	RANGER	F29Z-2C018-A
1991-92	EXPLORER	F29Z-2C018-A
1987-88	BRONCO II	F3PZ-2C018-G
1989-90	BRONCO II	F29Z-2C018-A

PART NUMBER	PART NAME	CLASS
F3PZ-2C018-A	RABS Module	B
F3PZ-2C018-B	RABS Module	B
F3PZ-2C018-C	RABS Module	B
F3PZ-2C018-D	RABS Module	B
F3PZ-2C018-E	RABS Module	B
F3UZ-2C018-A	RABS Module	B
F3PZ-2C018-F	RABS Module	B
F3UZ-2C018-B	RABS Module	B
F29Z-2C018-A	RABS Module	B
F3PZ-2C018-G	RABS Module	B

Electronic Brake Control Module: Technical Service Bulletins Antilock Brakes - Service Tips

Article No. 93-15-16

07/21/93

^ BRAKES - REAR ANTI-LOCK BRAKE SYSTEM (RABS) - ADVERSE BRAKING CHARACTERISTICS - RABS WARNING LIGHT NOT ON, MAY OCCUR WHEN INCORRECT RABS MODULE IS INSTALLED - SERVICE TIP

^ BRAKES - REAR ANTI-LOCK BRAKE SYSTEM (RABS) - INCORRECT (RABS I) ELECTRONIC CONTROL UNIT INSTALLED IN RABS II EQUIPPED VEHICLES - SERVICE TIP

LIGHT TRUCK: 1987-90 BRONCO II 1987-92 BRONCO 1987-93 F-150 1989-93 RANGER 1990-93 AEROSTAR, E SERIES 1991-92 EXPLORER

ISSUE: Adverse braking characteristics and failure of the RABS light to indicate a RABS failure may be caused by improper servicing of RABS II equipped vehicles with RABS I electronic control units.

ACTION:

When replacing a RABS electronic control unit, refer to the following RABS Module Chart for correct parts usage.

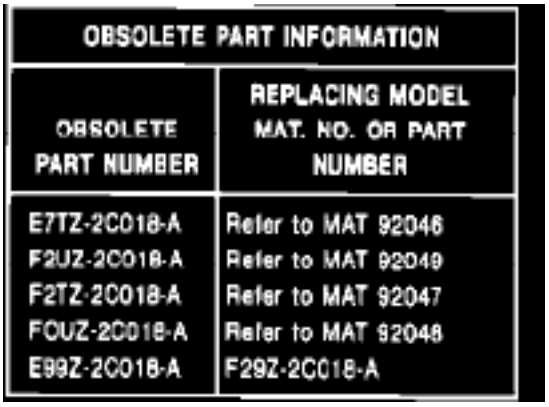
RABS II modules have been designed with Keep Alive Memory and are to be used to service all prior year RABS I systems, except for 1987 and 1988 Bronco II vehicles.

SRW = SINGLE REAR WHEEL; DRW = DUAL REAR WHEEL

Parts Block

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000



OBSOLETE PART INFORMATION	
OBSOLETE PART NUMBER	REPLACING MODEL MAT. NO. OR PART NUMBER
E7TZ-2C018-A	Refer to MAT 92046
F2UZ-2C018-A	Refer to MAT 92049
F2TZ-2C018-A	Refer to MAT 92047
FOUZ-2C018-A	Refer to MAT 92048
E99Z-2C018-A	F29Z-2C018-A

Electronic Brake Control Module: Technical Service Bulletins Brake Computer Module - Obsolete Service Part Return

Article No. 93-17-13

08/18/93

SERVICE PARTS RETURN OF BRAKE COMPUTER MODULE

LIGHT TRUCK: 1987-93 F-150-350 SERIES 1989-93 BRONCO, RANGER 1990-93 AEROSTAR 1991-92 EXPLORER

ISSUE: The subject Module - Brake Computer (E7TZ-2C018-A, F2UZ-2C018-A, F2TZ-2C018-A, FOUZ-2C018-A and E99Z-2C018-A) are being replaced by different part numbers. They should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

ACTION: Remove and return the obsolete parts from your dealership's inventory.

1. Return obsolete parts (Noted above) to your facing PDC using the least expensive transportation.

2. If claim is processed electronically via DOES II use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

3. In the Remarks Section write "Returned per TSB 93-17-13".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

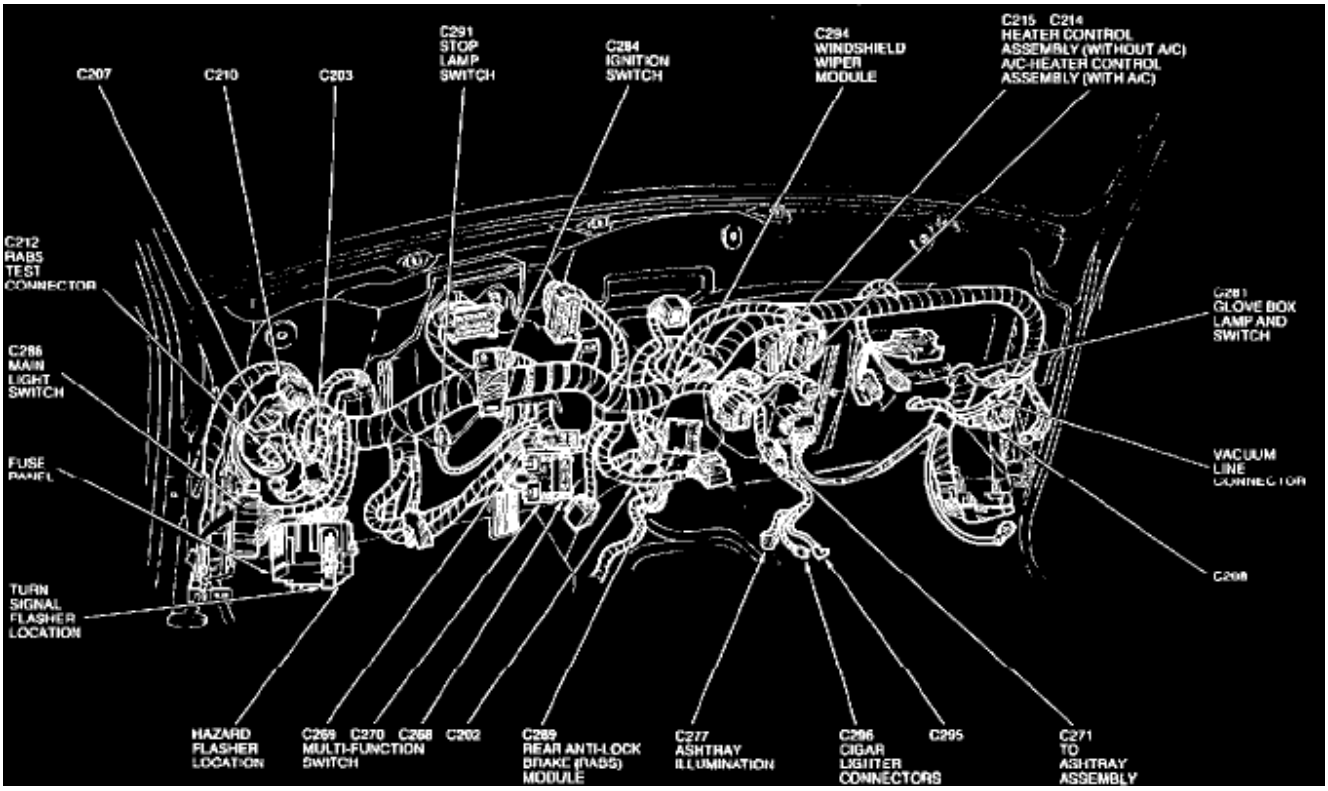
^ The parts returned must have been purchased from FPSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 301000



Electronic Brake Control Module: Locations

I/P Components

Behind Center Of I/P, LH Side Of Ashtray

Electronic Brake Control Module: Service and Repair

1. Disconnect battery ground cable.

2. Disconnect wiring harness from RABS module.

3. On Bronco, Bronco II, F-Series, Ranger and Explorer models, remove module to instrument panel retaining screws behind center of instrument panel.

4. On Aerostar models, remove module to instrument panel anti-skid plate retaining screws on lefthand side of engine cover under instrument panel.

5.

On E-Series models, remove parking brake actuator assembly as follows: a.

Loosen adjusting nut at equalizer.

b. From inside engine compartment, remove nuts attaching actuator assembly to cowl.

c. From under instrument panel, remove one bolt attaching actuator assembly to lower flange of instrument panel.

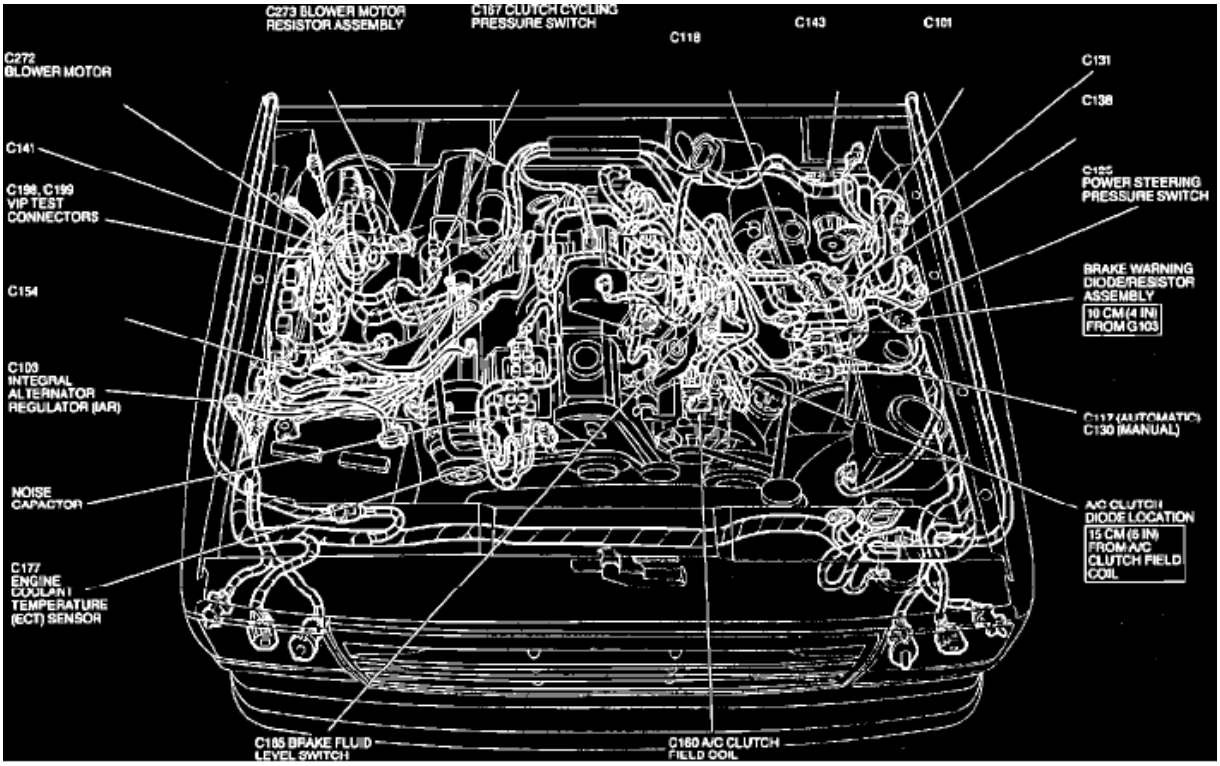
d. Remove parking brake cable from actuator assembly by compressing conduit end fitting prongs using a 1/2 inch box wrench.

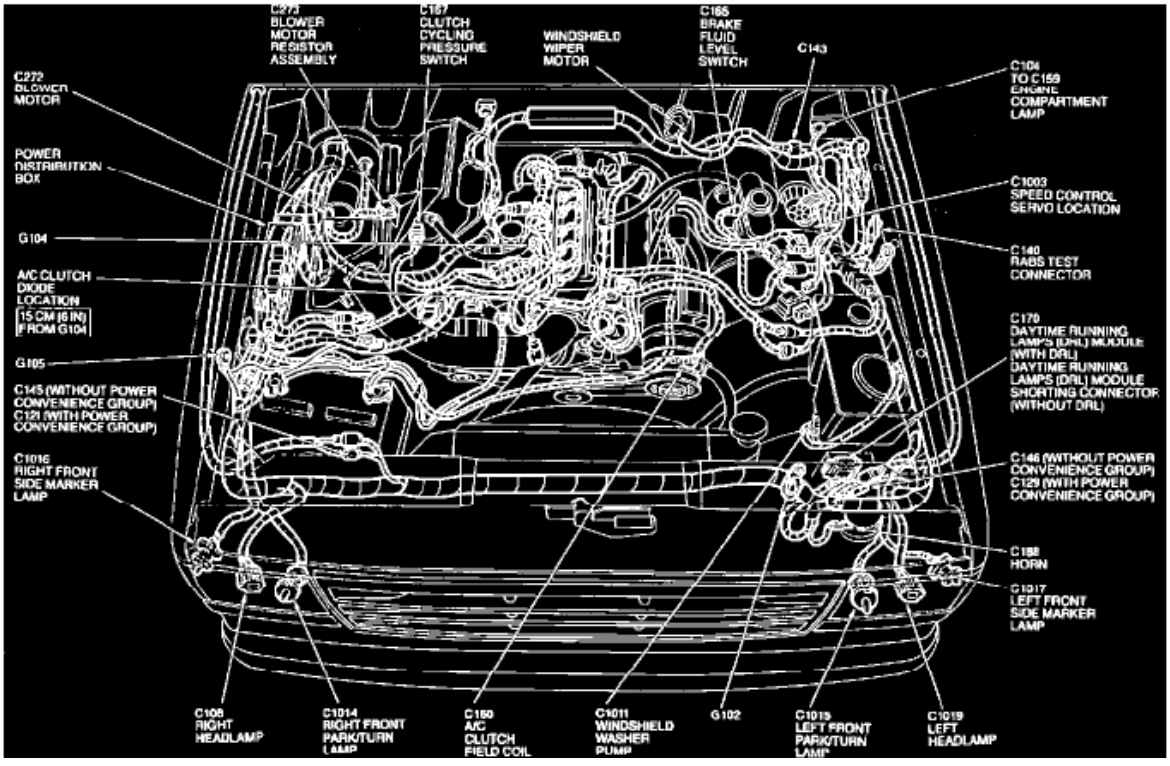
e. Remove actuator assembly.

6. On Aerostar and E-Series models, remove two module attaching screws, then the module.

7. On all models, reverse procedure to install, then check system for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Sensors and Switches - Brakes and Traction Control > Brake Fluid Level Sensor/Switch > Component Information > Locations





Brake Fluid Level Sensor/Switch: Locations

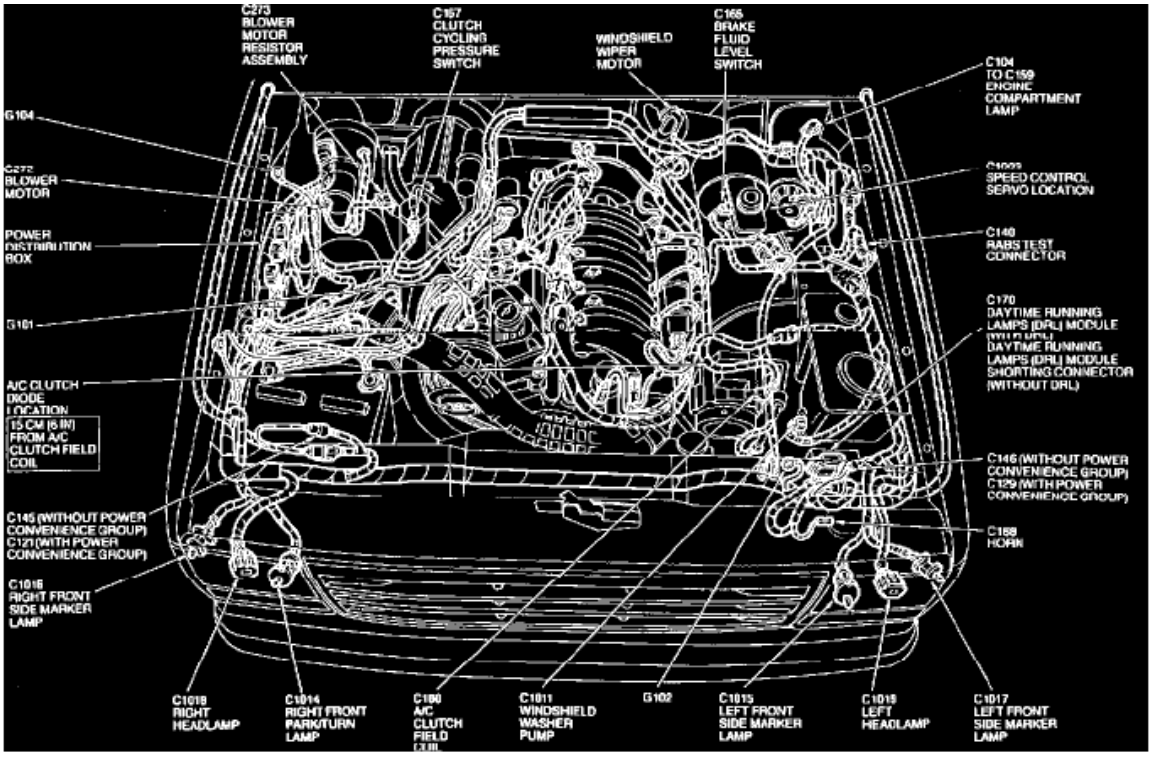
Engine Compartment Components.

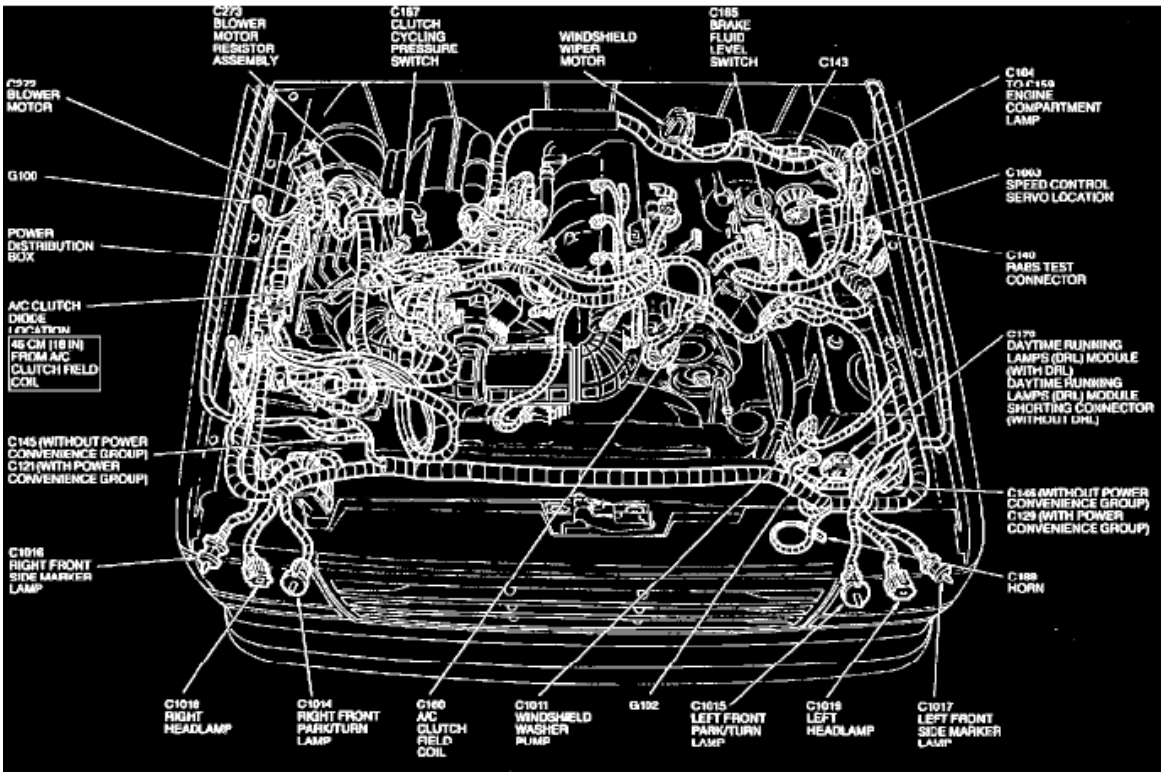
Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 2.3L/4-140

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C104
TO C159
ENGINE COMPARTMENT LAMP
C272
BLOWER MOTOR
G100
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
45 CM (18 IN) FROM A/C CLUTCH FIELD COIL
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

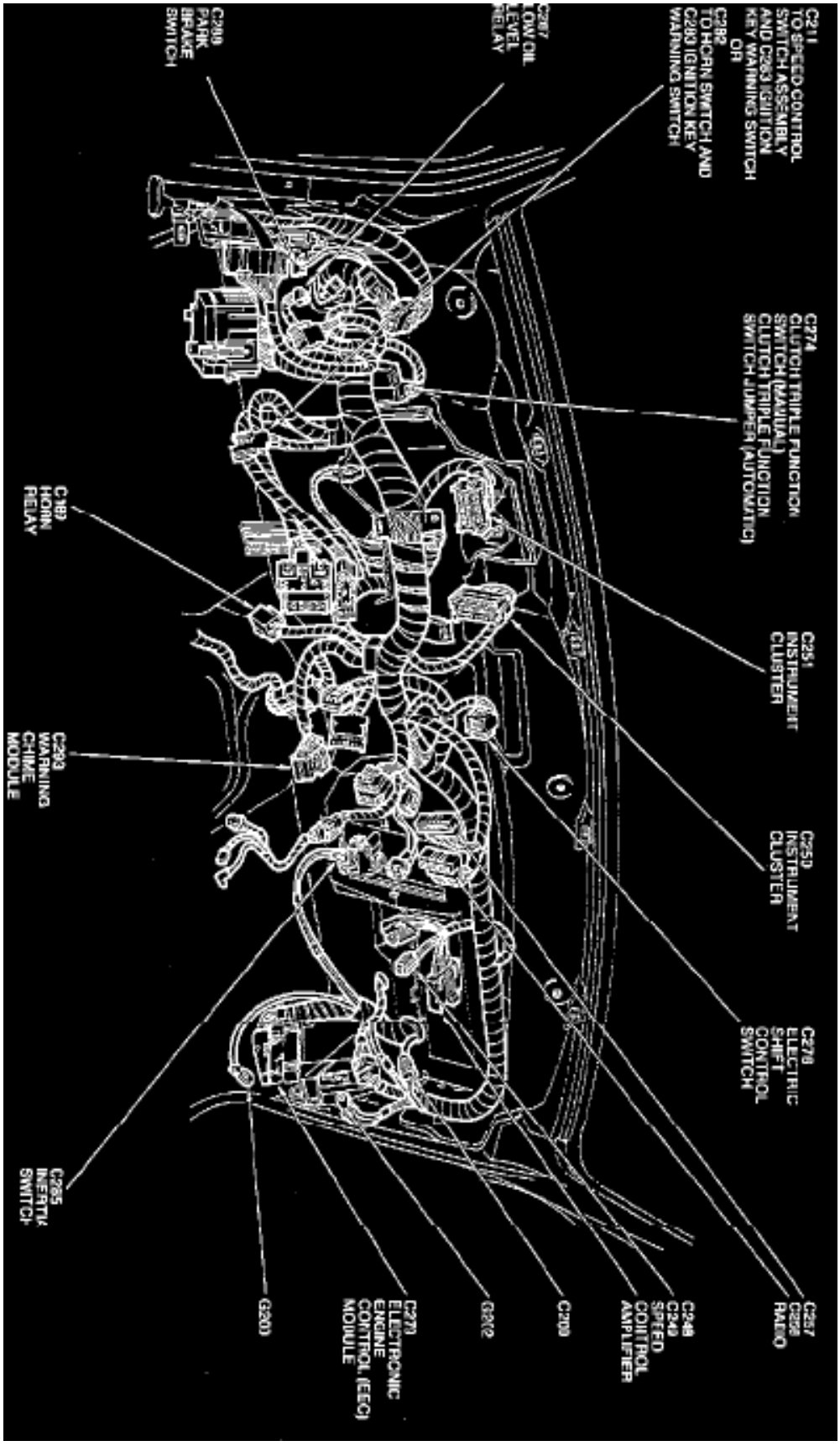
Applicable to: 3.0L/V6-181

Engine Compartment Components.

Rear LH Side Of Engine Compartment, On Brake Fluid Reservoir

Applicable to: 4.0L/V6-244

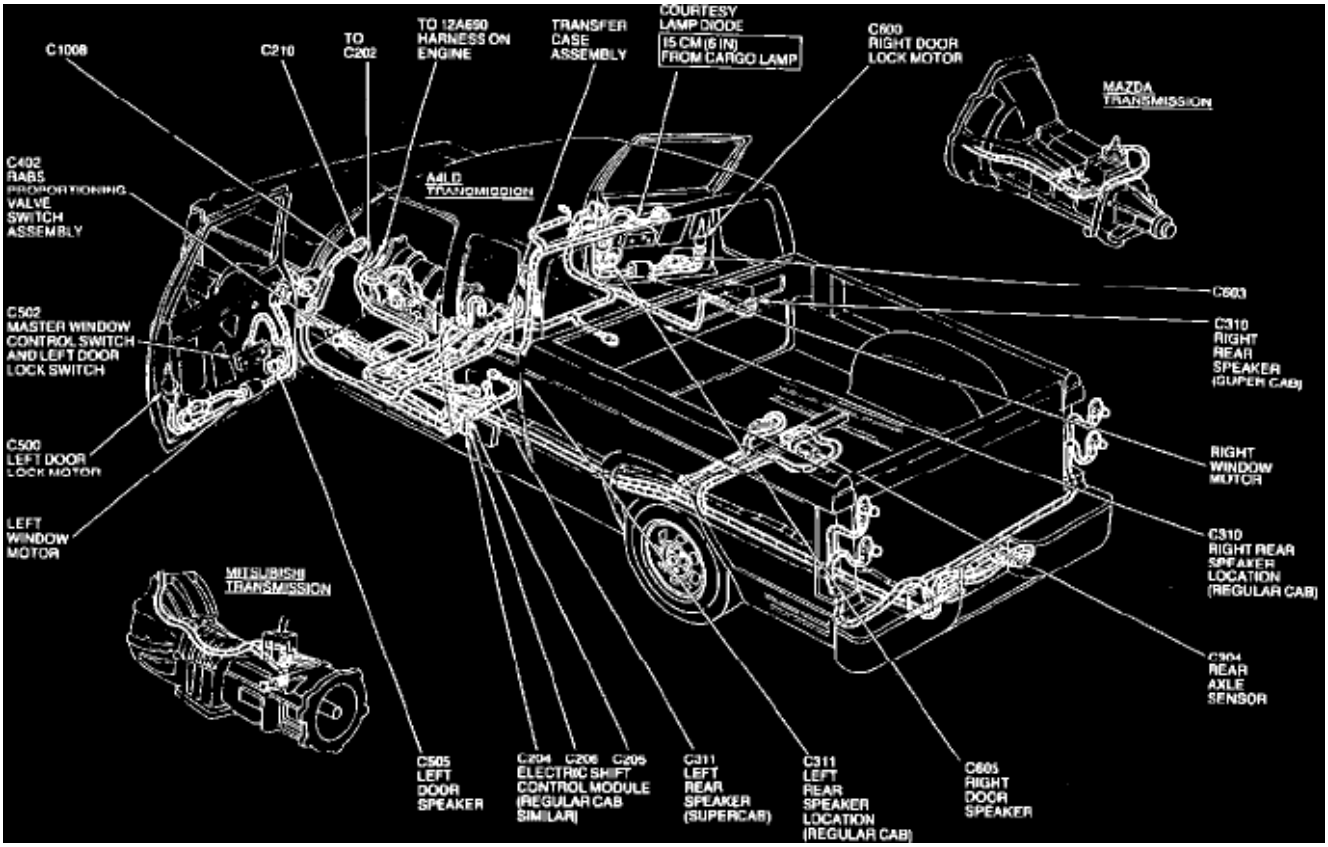
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Brakes and Traction Control > Sensors and Switches - Brakes and Traction Control > Parking Brake Warning Switch > Component Information > Locations



Parking Brake Warning Switch: Locations

I/P Components

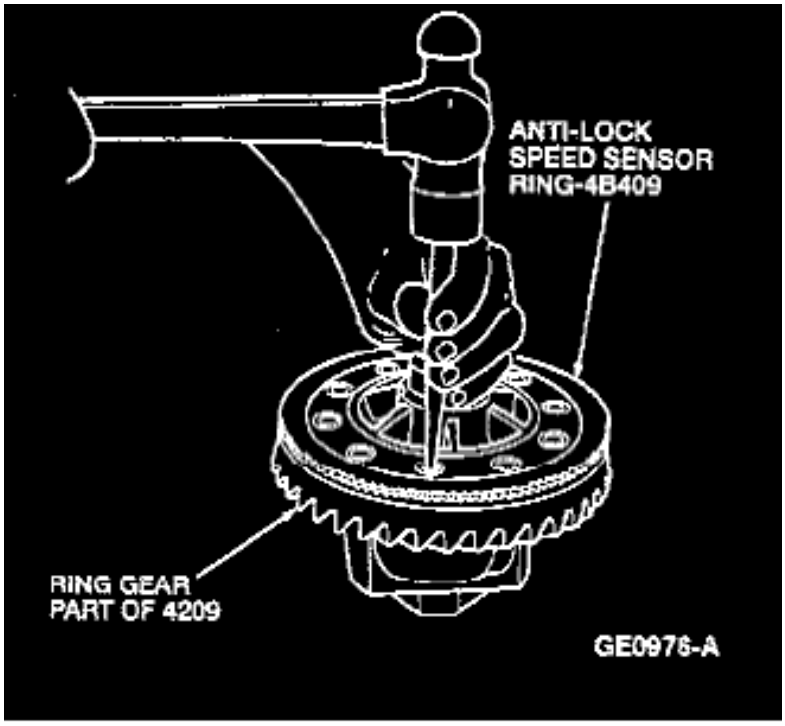
Below LH Side Of I/P, On Park Brake Assembly

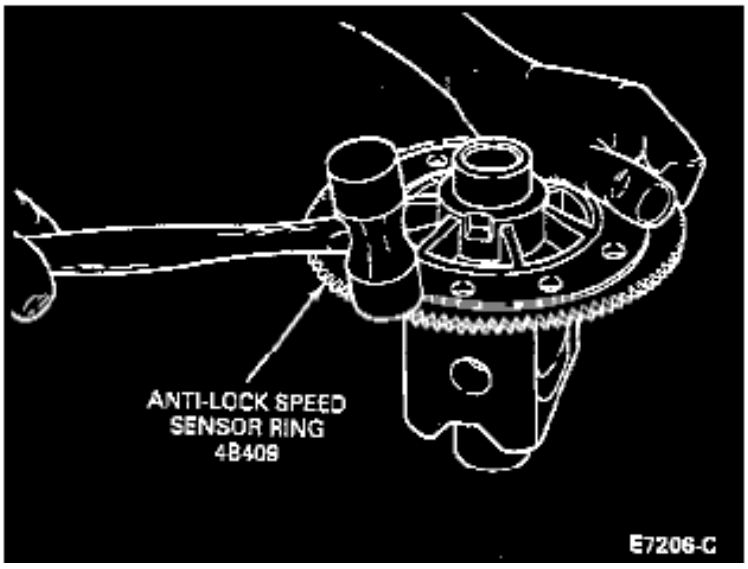


Wheel Speed Sensor: Locations

Body Components

Top Of Rear Differential


ANTI-LOCK
SPEED SENSOR
RING-4B409
RING GEAR
PART OF 4209
GE0976-A


ANTI-LOCK SPEED
SENSOR RING
4B409
E7206-C

Wheel Speed Sensor: Service and Repair Toothed Ring

NOTE: To service the speed sensor ring, the differential case must be removed from the axle housing.

REMOVAL

1. Remove the bolts retaining the ring gear to the differential case. Remove the ring gear by striking at alternate holes around the gear.

CAUTION: Extreme care should be taken not to scratch, dent, chip or otherwise cause damage to anti-lock brake sensor ring teeth while handling or during assembly.

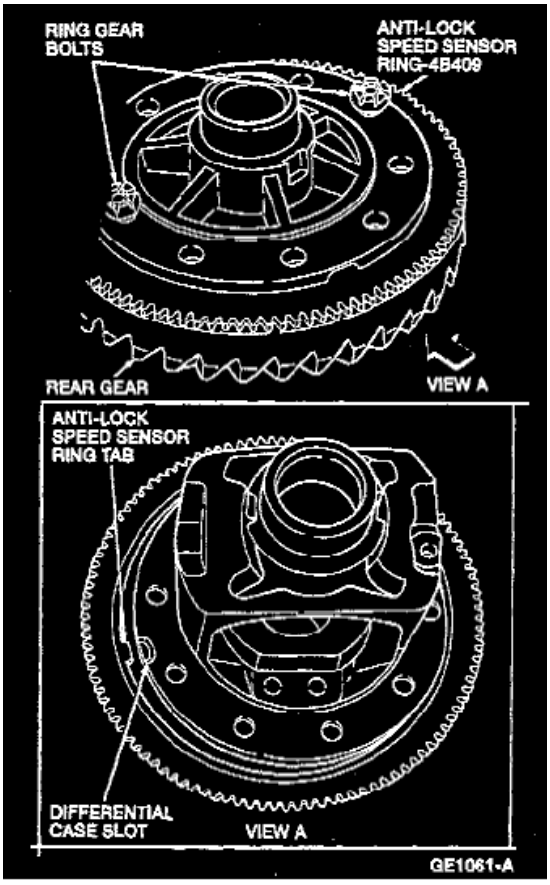
NOTE:

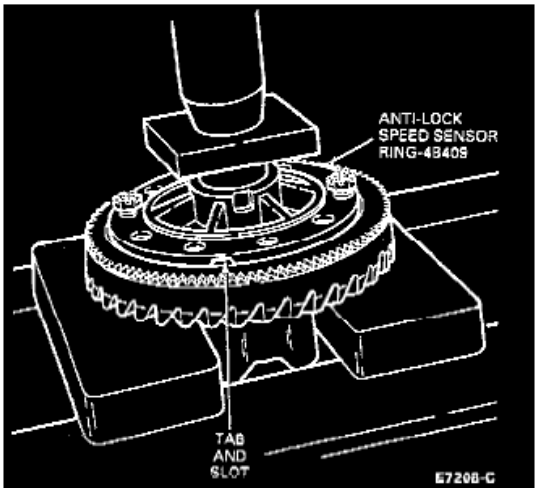
^ Before removing ring gear inspect it and determine if ring runout check is necessary.

^ Do not remove anti-lock speed sensor ring unless replacement is required. It does not have to be removed for ring gear replacement.

2. If replacement is required remove the anti-lock brake sensor ring by tapping with a soft-faced hammer. Discard the anti-lock speed sensor ring.

CAUTION: The anti-lock speed sensor ring must be discarded upon removal. If removed, a new anti-lock brake sensor ring must be installed.


RING GEAR BOLTS
ANTI-LOCK SPEED SENSOR RING-4B409
REAR GEAR
VIEW A
ANTI-LOCK SPEED SENSOR RING TAB
DIFFERENTIAL CASE SLOT
VIEW A
GE1061-A


ANTI-LOCK SPEED SENSOR RING-4B409
TAB AND SLOT
E7208-C

INSTALLATION

1. Position the ring gear and anti-lock speed sensor ring on the differential case. The tab on the anti-lock speed sensor ring must be aligned with the

slot in the differential case as shown. Start two ring gear retaining bolts through the differential case into the ring gear to make sure case-to-ring gear bolt hole alignment is achieved.

CAUTION:

^ Extreme care should be taken not to scratch, dent, chip or otherwise cause damage to anti-lock speed sensor ring teeth while handling or during assembly.

^ The tab on the anti-lock speed sensor ring must be aligned with the slot in the differential case.

2. Press the ring gear and anti-lock speed sensor ring on the differential case using the ring gear as a pilot.

3. Coat the threads of the ring gear retaining bolts with Stud and Bearing Mount EOAZ-19554-BA or equivalent meeting Ford specification

WSK-M2G349-A1. Install the bolts and alternately and evenly tighten to 95-115 Nm (70-85 ft. lbs.).

Wheel Speed Sensor: Service and Repair Wheel Speed Sensor

REMOVAL

1. At the rear axle housing pull the wiring harness connector from the speed sensor. 2. Remove the speed sensor hold down bolt and remove the speed sensor from the rear axle housing.

INSTALLATION

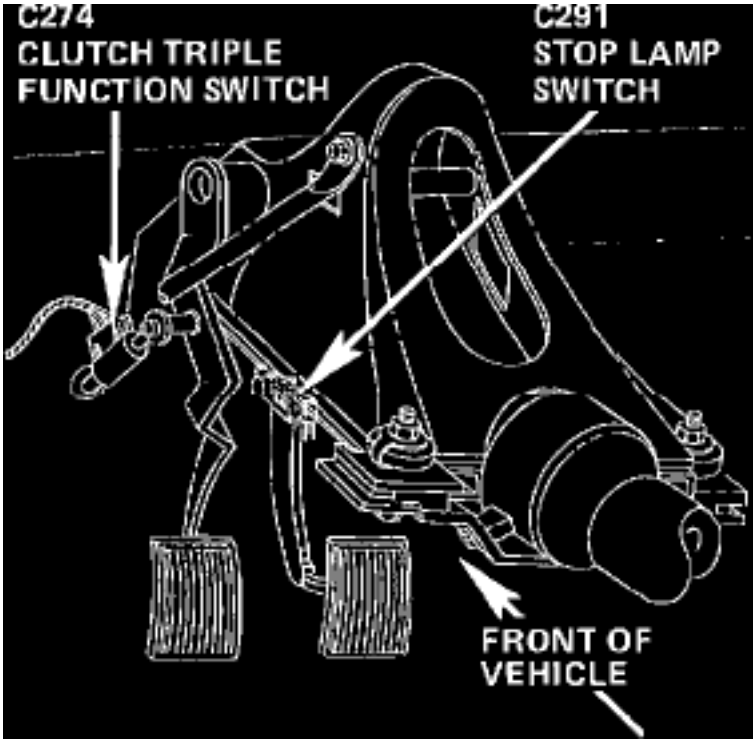
1. Clean the rear axle housing mounting surface. Use care to prevent dirt from entering the rear axle housing. 2. Inspect and clean the magnetized sensor pole piece to make sure that it is free from loose metal particles which could cause erratico■ system

operation. Inspect the speed sensor O-ring for damage and replace if necessary.

3. Lightly lubricate the speed sensor O-ring with motor oil, align the bolt hole, and install.

NOTE: Do not apply force to the plastic sensor connector. The sensor flange should slide to the mounting surface. This will make sure the air gap setting is between 0.127-1.143 mm (0.005-0.045 inches).

4. Install the speed sensor hold-down bolt and tighten to 34-40 Nm (25-29 ft. lbs.). 5. Push the connector on the speed sensor.



Brake And Clutch Switches

Clutch Pedal Position Switch: Testing and Inspection

This switch functions magnetically. Do not use magnetized tools near this switch.

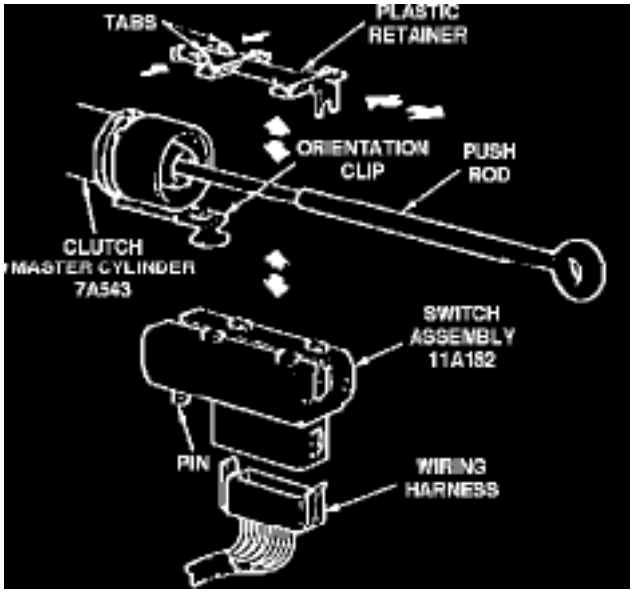
1. If the switch is open when the clutch pedal is released, speed control will not operate. This must be corrected before making any other tests. Use only a multimeter of 5000 ohm/volt rating or higher when performing the clutch switch test.

2. On all except 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, disconnect switch pigtail connector from speed control harness connector and connect an ohmmeter to the two switch connector terminals.

3. On all 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, connect suitable ohmmeter between two middle switch connector terminals.

4. On all models, with clutch pedal in the fully released position, the resistance should be less than 5 ohms. With clutch pedal fully depressed, the circuit should be open.

5. If switch does not function as described, remove and replace switch.



Clutch Pedal Position Switch: Service and Repair

Fig. 8 Clutch Interlock 3-way Switch

REMOVAL

1. Disconnect electrical connector from switch located on clutch master cylinder push rod, Fig. 8.

2. Pull orientation clip away from switch to separate pin, then rotate switch to expose plastic retainer.

3. Push tabs together to allow retainer to slide rearward and separate from switch.

4. Remove switch from push rod.

INSTALLATION

1. Install switch onto master cylinder push rod, ensuring that switch is properly seated.

2. Install plastic retainer, then rotate switch into position and attach orientation clip.

3. Connect electrical connector.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

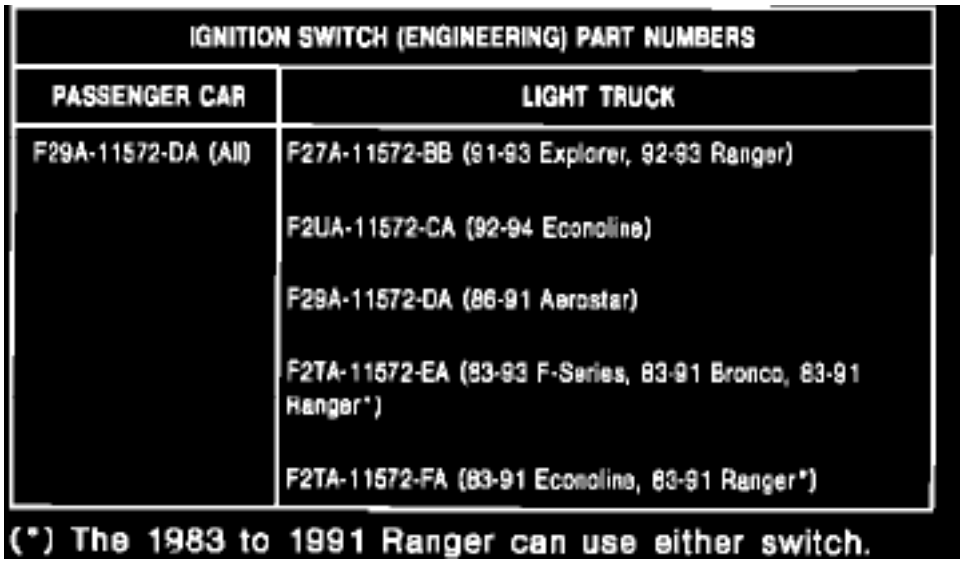
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

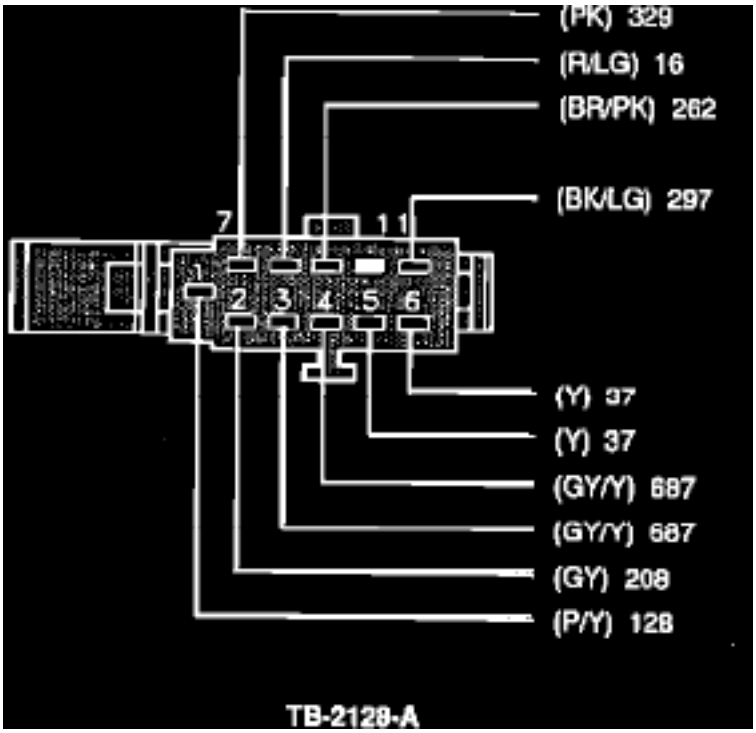
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: Customer Interest Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

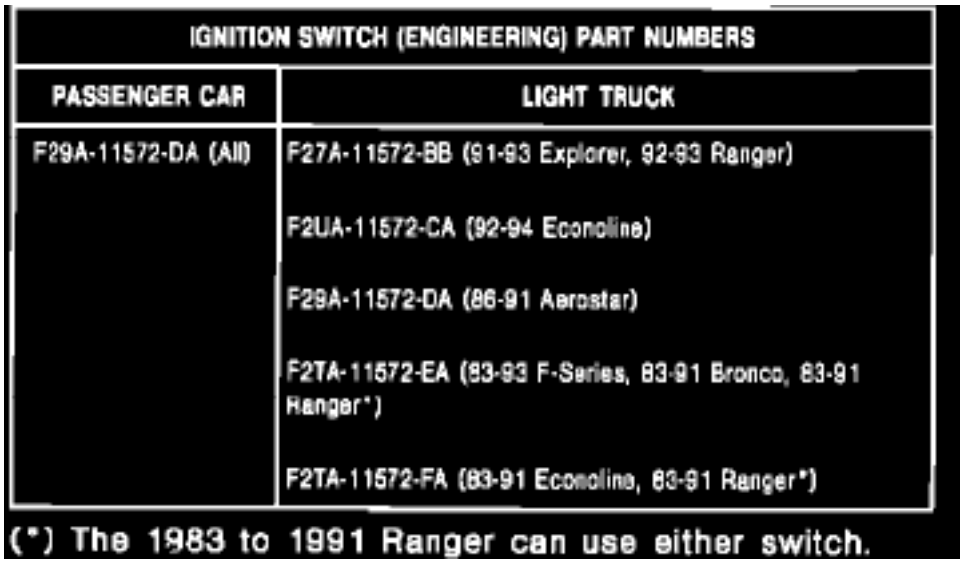
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

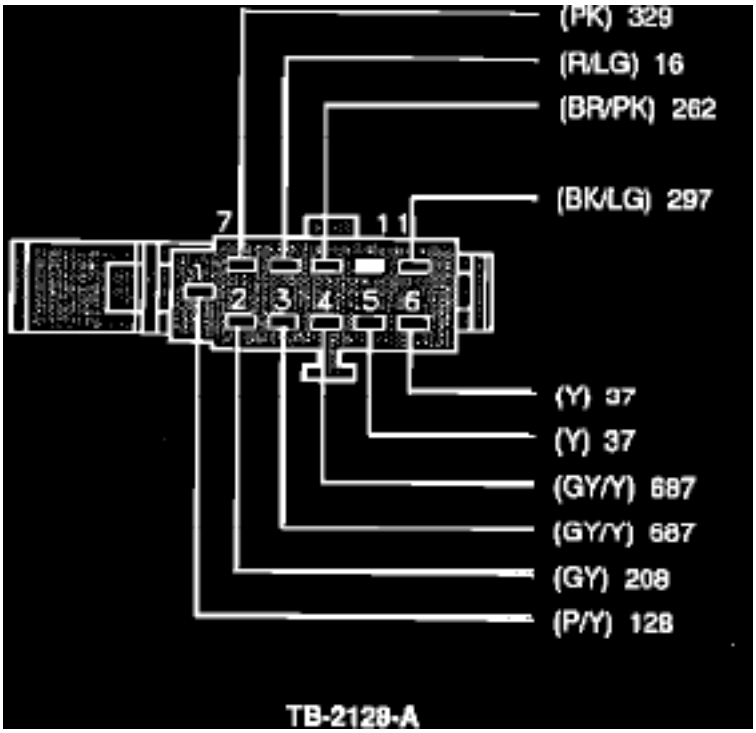
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

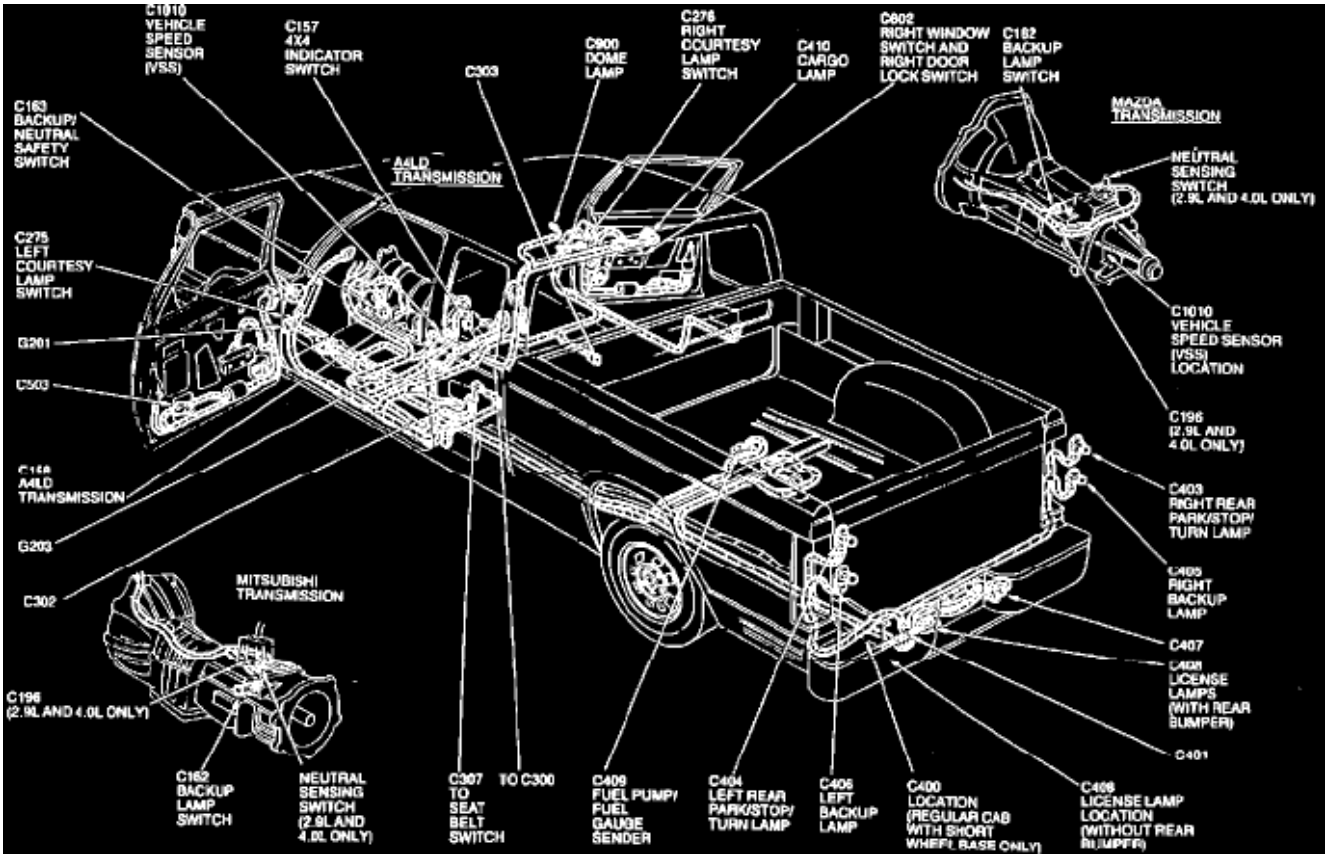
911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

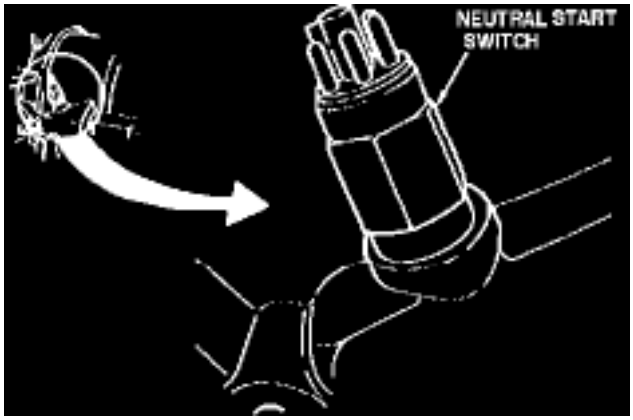
OASIS CODES: 602300, 603300



Neutral Safety Switch: Locations

Body Components

LH Side Of Transmission



Neutral Safety Switch: Service and Repair

Fig. 9 Neutral Start Switch

REMOVAL

1. Disconnect battery ground cable, then raise and support vehicle.

2. Disconnect electrical connector from switch, Fig. 9, then remove switch and O-ring using neutral start switch socket T74P-77247-A or equivalent. Neutral start switch socket is a thin wall socket, other types of sockets could puncture walls of switch.

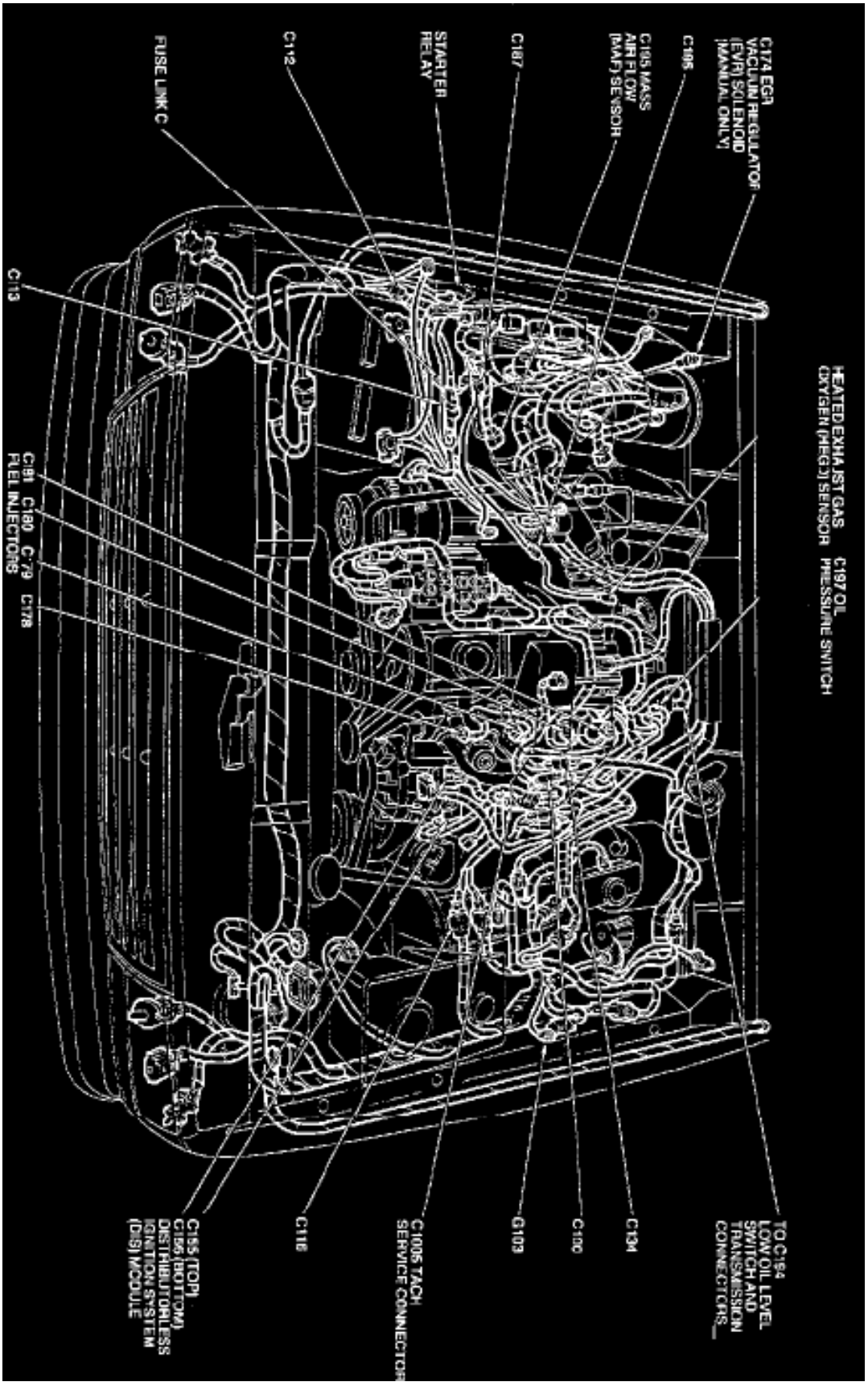
INSTALLATION

1. Install neutral start switch using socket and torque to 7-10 ft. lbs.

2. Connect electrical connector to switch, then lower vehicle.

3. Connect battery ground cable, then check operation of switch with parking brake engaged. Engine should start with selector lever in N or P only, and back-up lamps should illuminate with selector lever in R only.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Starting and Charging > Relays and Modules - Starting and Charging > Starter Relay > Component Information > Locations



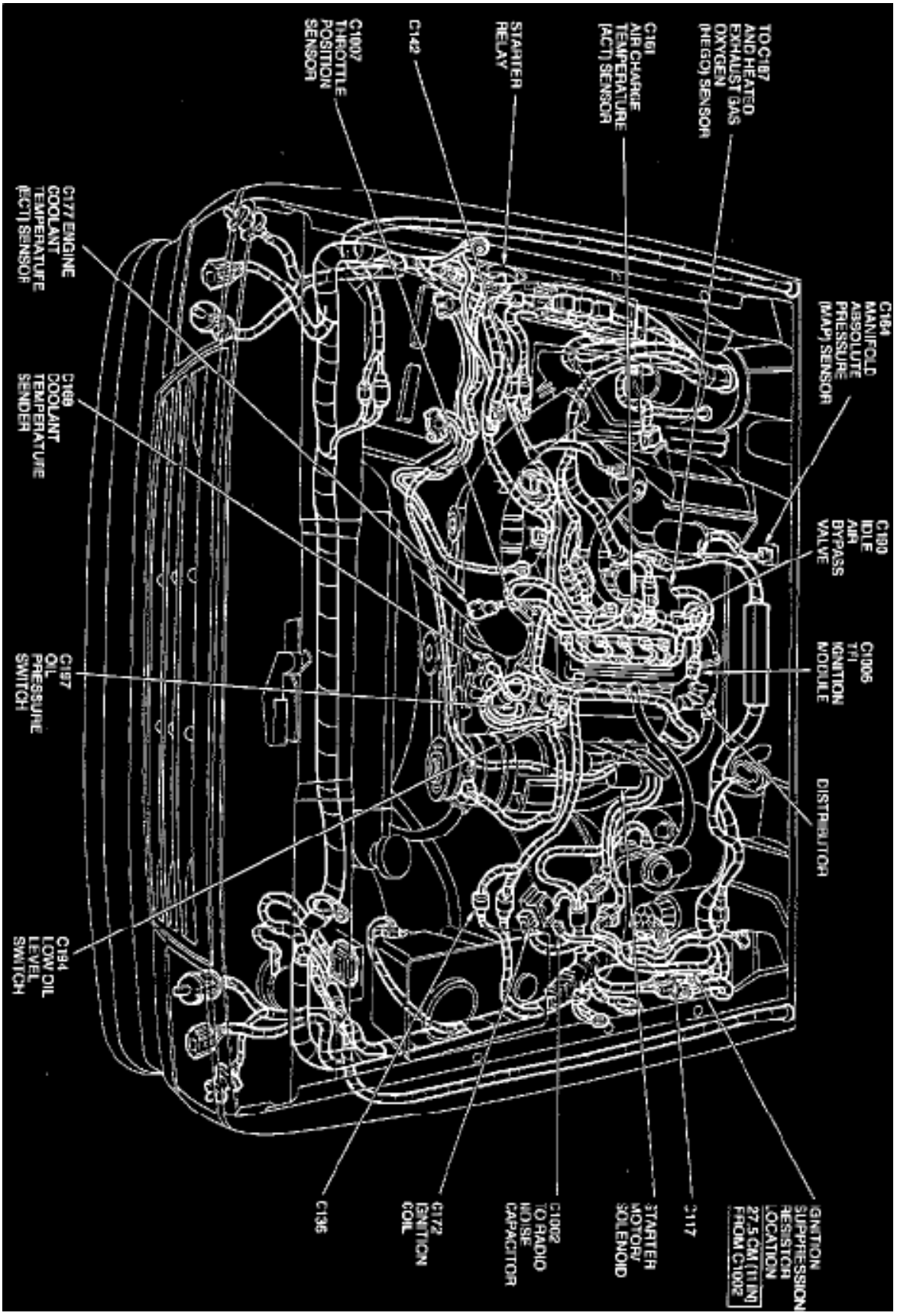
Starter Relay: Locations

Engine Compartment Components.

RH Fender Apron, Near Battery

Applicable to: 2.3L/4-140

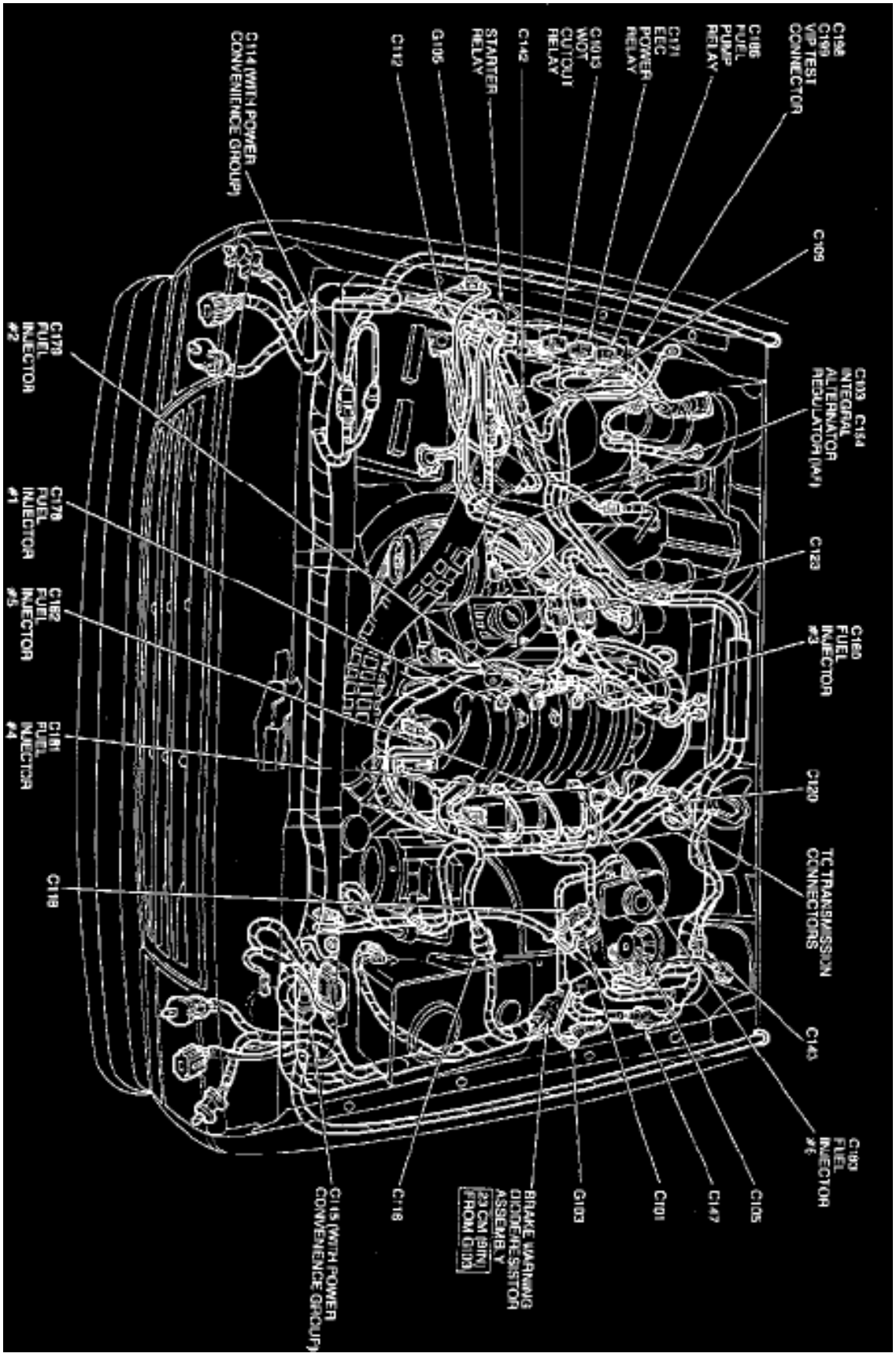
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Starting and Charging > Relays and Modules - Starting and Charging > Starter Relay > Component Information > Locations > Page 5329



Engine Compartment Components.

RH Fender Apron, Near Battery

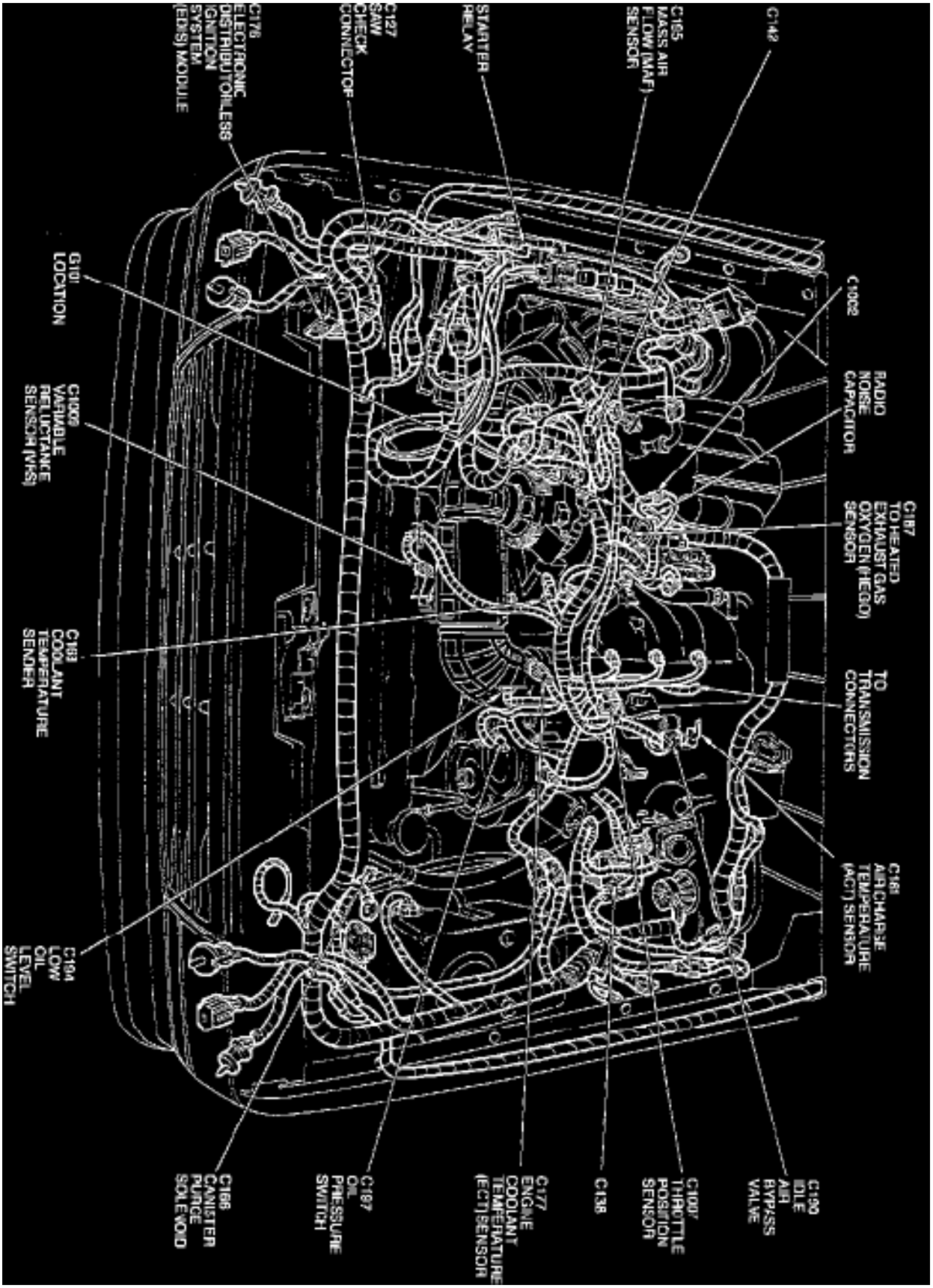
Applicable to: 2.9L/V6-179


C158
C199
VIP TEST
CONNECTOR
C106
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
WOT
CUTOUT
RELAY
C142
STARTER
RELAY
G105
C112
C114 (WITH POWER
CONVENIENCE GROUP)
C109
C103 C154
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
C123
C160
FUEL
INJECTOR
#3
C120
TC TRANSMISSION
CONNECTORS
C145
C193
FUEL
INJECTOR
#6
C178
FUEL
INJECTOR
#2
C179
FUEL
INJECTOR
#1
C182
FUEL
INJECTOR
#5
C181
FUEL
INJECTOR
#4
C118
C105
C147
C101
G103
C115 (WITH POWER
CONVENIENCE GROUP)
C118
BRAKE WARNING
DIODE/RESISTOR
ASSEMBLY
23 CM (9IN)
FROM G103

Engine Compartment Components.

RH Fender Apron, Near Battery

Applicable to: 3.0L/V6-181


C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
TO
TRANSMISSION
CONNECTORS
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C163
COOLANT
TEMPERATURE
SENDER
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C190
LOW
OIL
LEVEL
SWITCH
C190
IDLE
AIR
BYPASS
VALVE
C100
THROTTLE
POSITION
SENSOR
C138
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C187
OIL
PRESSURE
SWITCH
C166
CANISTER
PURGE
SOLENOID

Engine Compartment Components.

RH Fender Apron, Near Battery

Applicable to: 4.0L/V6-244

Battery Cable: Technical Service Bulletins EEC IV Quick Test - Code 16 Set

Article No. 91-14-10

07/11/91

^ EEC IV QUICK TEST - SERVICE CODE 16 EXPERIENCED DURING KOEO VIP TEST - VEHICLES USED IN CANADA

^ WIRING - BATTERY GROUND CABLE TOO LONG - INTERACTION BETWEEN DRL AND EDIS MODULE/VRS SENSOR - VEHICLES USED IN CANADA

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A service code 16 may be experienced during the KOEO (Key-On/Engine-Off) VIP test. This is caused by the battery ground cable being too long which creates an interaction between the Daytime Running Light (DRL) and the EDIS module/VRS sensor.

ACTION: Confirm the condition and install a shorter battery ground cable. Refer to the following procedure for service details.

INSPECTION AND IDENTIFICATION

1. Perform the KOEO (Key-On/Engine-Off) VIP Self Test with the parking brake OFF and the headlights OFF. This should produce a sequence like 16-10-11.

NOTE: DURING THE TEST, THE HEADLIGHTS WILL BE ILLUMINATED AT 40% INTENSITY (PER CANADIAN LAW FOR DAYTIME DRIVING).

2. Set the parking brake and rerun the KOEO VIP Self Test. The headlights will be off with the parking brake set during this test. The codes should now be 11-10-11.

3. Check the battery cable to see that it shows a 10 gauge wire running along the negative battery cable from the frame ground to the chassis ground at G101 (body ground near the negative battery post). This cable will only have three wires connected directly at the negative battery clamp.

BATTERY GROUND CABLE REPLACEMENT

1. Remove the battery ground cable assembly and engine block heater wire, if so equipped.

2. Install a new battery ground cable (F1TZ-14301-C).

NOTE: ON THE NEW CABLE, THE CHASSIS GROUND WIRE COMES DIRECTLY FROM THE NEGATIVE BATTERY CABLE AND ATTACHES TO THE CHASSIS IN THE ORIGINAL LOCATION.

3. After all electrical connections are secured and the engine block heater is connected (if so equipped), rerun the KOEO VIP Self Test with the parking brake OFF. The DRL's should be on and the codes should read 11-10-11.

4. Check other electrical components for proper operation (i.e., radio, fan and lights) to be certain that the cables were reconnected correctly.

NOTE: VERIFY THE OPERATION OF THE TAIL AND BRAKE LIGHTS TO BE SURE THAT THE FRAME GROUND CONNECTION IS GOOD.

PART NUMBER PART NAME CLASS

F1TZ-14301-C Battery Cable C

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

911410A Perform KOEO Test 0.3 Hr.

911410B Perform KOEO Test, 0.7 Hr.

Replace Ground Cable And Rerun KOEO Test

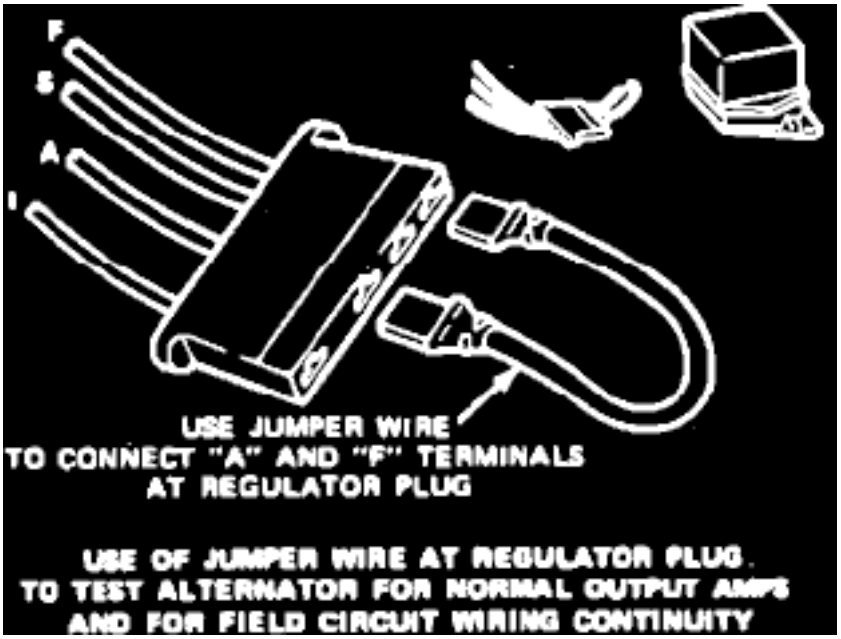
DEALER CODING BASIC PART NO. CONDITION CODE

14301 89

OASIS CODES: 690000

Alternator Lamp/Indicator: Description and Operation

When the ignition switch is in Start or Run position, battery current flows through the alternator warning indicator into regulator at terminal 1 and to ground through the indicator switch. The electronic control measures a low voltage at terminal A and closes the field switch. This applies battery voltage to the field through alternator terminal F. With current in the field and the rotor turning, alternator stator produces a voltage at terminals B and S. A predetermined voltage at terminal S operates the electronic control to open indicator switch, which removes ground from alternator warning indicator. Alternator current output is controlled by current in the field. Average field current depends on length of time field switch is closed. The electronic control closes field switch when voltage at terminal A is low and opens switch when voltage is high.



Diode Trio: Testing and Inspection

TEST PROCEDURES

Fig. 9 Regulator Plug. Jumper Wire Connector

1. Disconnect electric choke, if equipped.

2. Disconnect voltage regulator wiring connector.

3. Connect a jumper wire between the ``A'' and ``F'' terminals of voltage regulator wiring connector, Fig. 9.

4. Connect voltmeter to battery clamps. Then start and idle engine.

5. Observe and note voltmeter reading.

6. Move voltmeter positive lead to the alternator ``S'' terminal and note voltage reading.

TEST RESULTS

1. If voltmeter reading is within 1/2 of battery voltage, diodes are satisfactory.

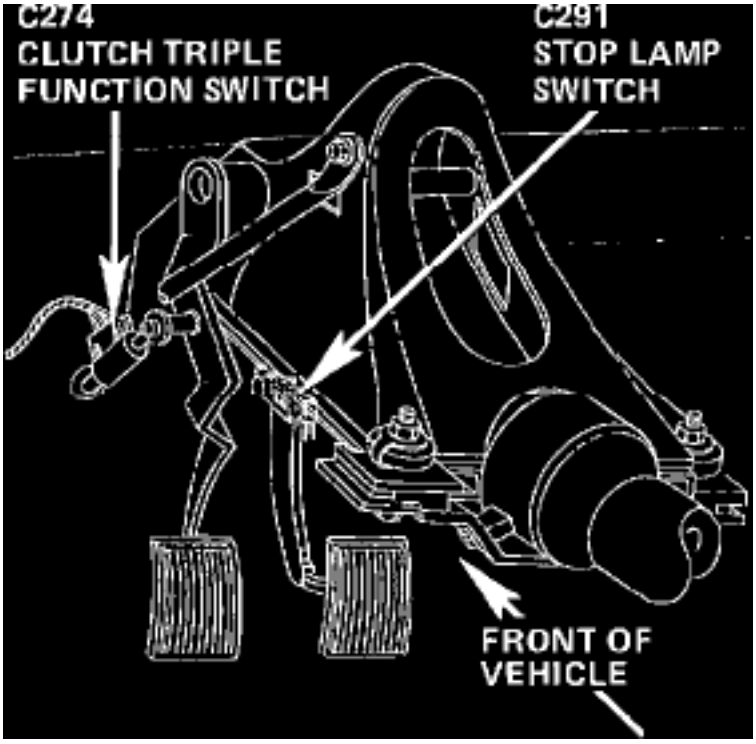
2. If voltmeter reading is approximately 1.5 volts, the alternator has a shorted negative diode or a grounded stator winding.

3. If voltmeter reading is approximately 1.5 volts less than battery voltage, the alternator has a shorted positive diode.

4. If voltage reading is approximately 1 to 1.5 volts less than 1/2 battery voltage, the alternator has an open positive diode.

5. If voltage reading is 1 to 1.5 volts above 1/2 battery voltage, the alternator has an open negative diode.

6. Reconnect electric choke into circuit after tests are completed, if equipped.



Brake And Clutch Switches

Clutch Pedal Position Switch: Testing and Inspection

This switch functions magnetically. Do not use magnetized tools near this switch.

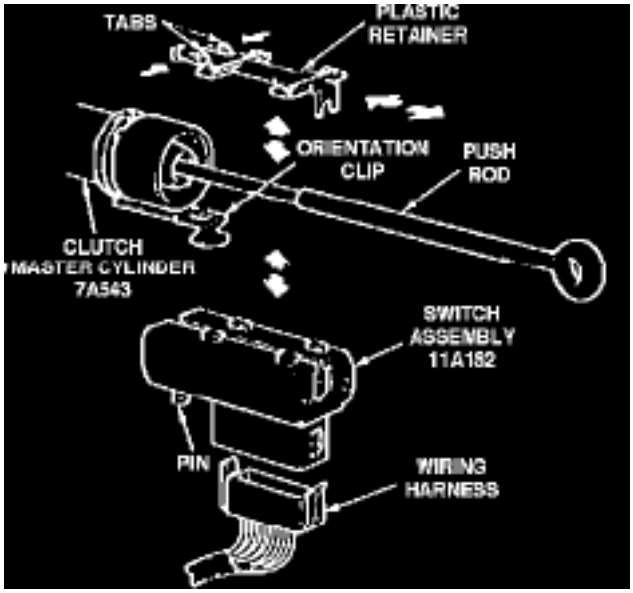
1. If the switch is open when the clutch pedal is released, speed control will not operate. This must be corrected before making any other tests. Use only a multimeter of 5000 ohm/volt rating or higher when performing the clutch switch test.

2. On all except 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, disconnect switch pigtail connector from speed control harness connector and connect an ohmmeter to the two switch connector terminals.

3. On all 1990-91 Aerostar, Bronco II, Explorer and Ranger and 1992 Bronco & F150-350 models, connect suitable ohmmeter between two middle switch connector terminals.

4. On all models, with clutch pedal in the fully released position, the resistance should be less than 5 ohms. With clutch pedal fully depressed, the circuit should be open.

5. If switch does not function as described, remove and replace switch.



Clutch Pedal Position Switch: Service and Repair

Fig. 8 Clutch Interlock 3-way Switch

REMOVAL

1. Disconnect electrical connector from switch located on clutch master cylinder push rod, Fig. 8.

2. Pull orientation clip away from switch to separate pin, then rotate switch to expose plastic retainer.

3. Push tabs together to allow retainer to slide rearward and separate from switch.

4. Remove switch from push rod.

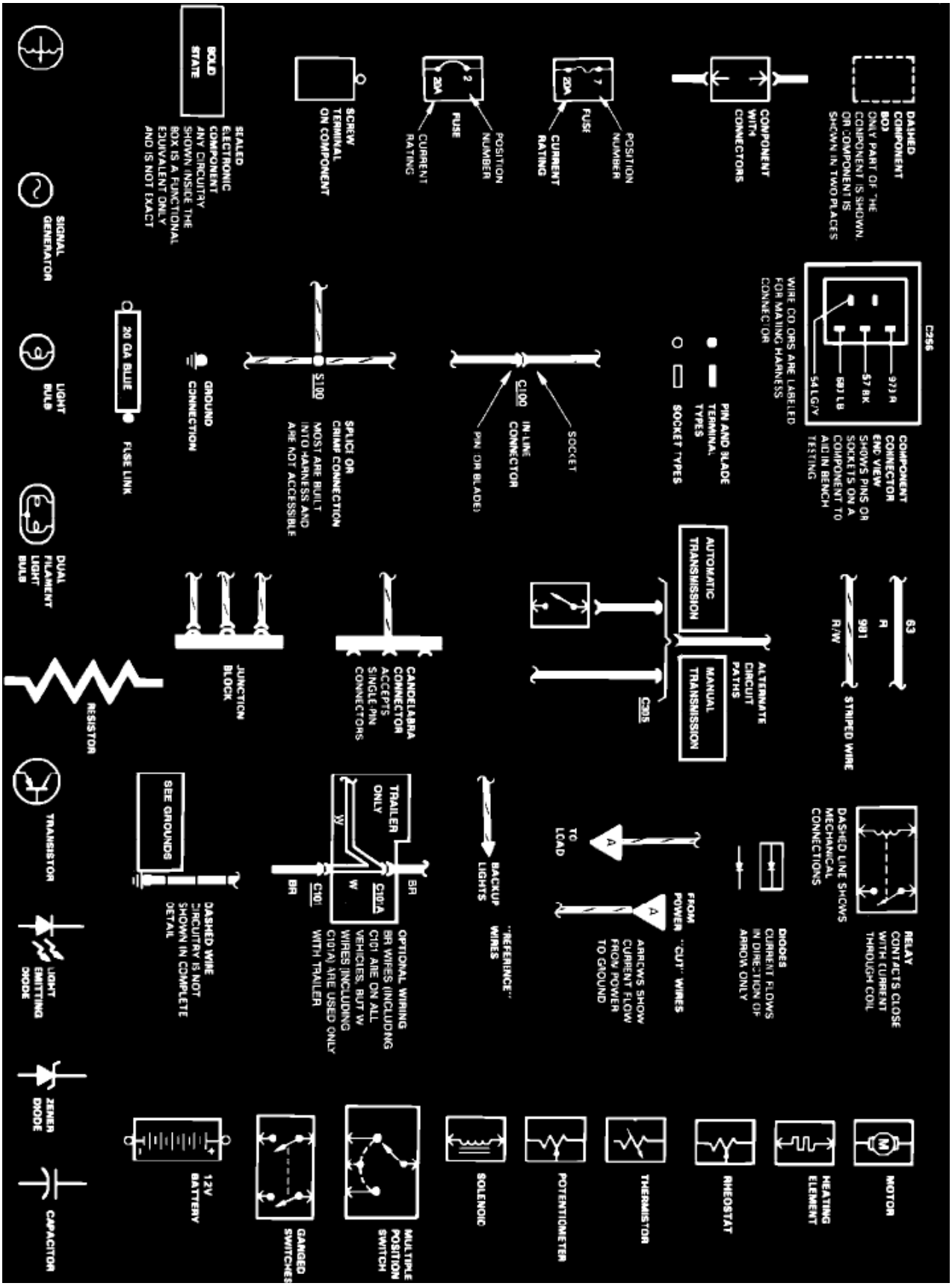
INSTALLATION

1. Install switch onto master cylinder push rod, ensuring that switch is properly seated.

2. Install plastic retainer, then rotate switch into position and attach orientation clip.

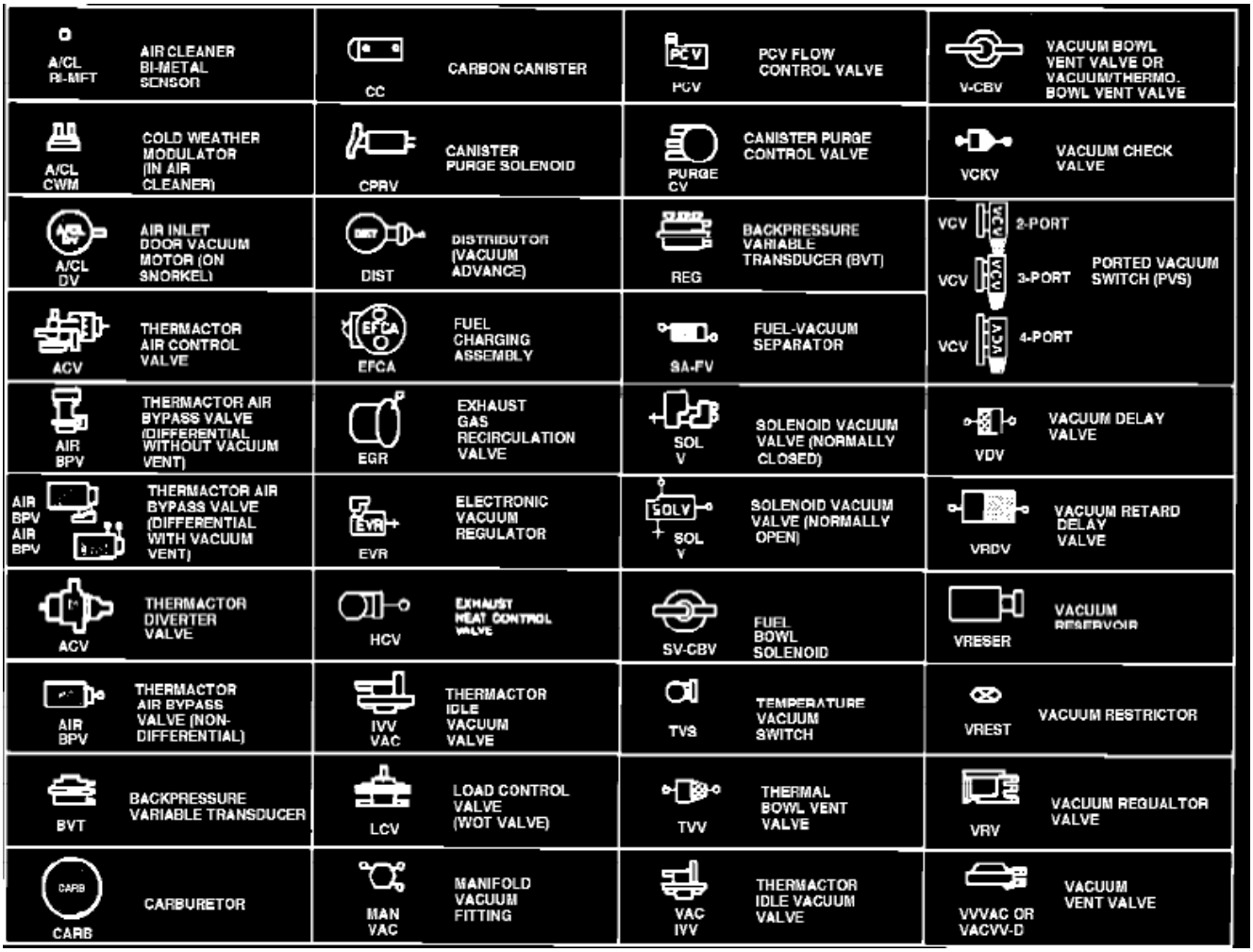
3. Connect electrical connector.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Starting and Charging > Starting System > Ignition Lock > Component Information > Diagrams > Diagram Information and Instructions

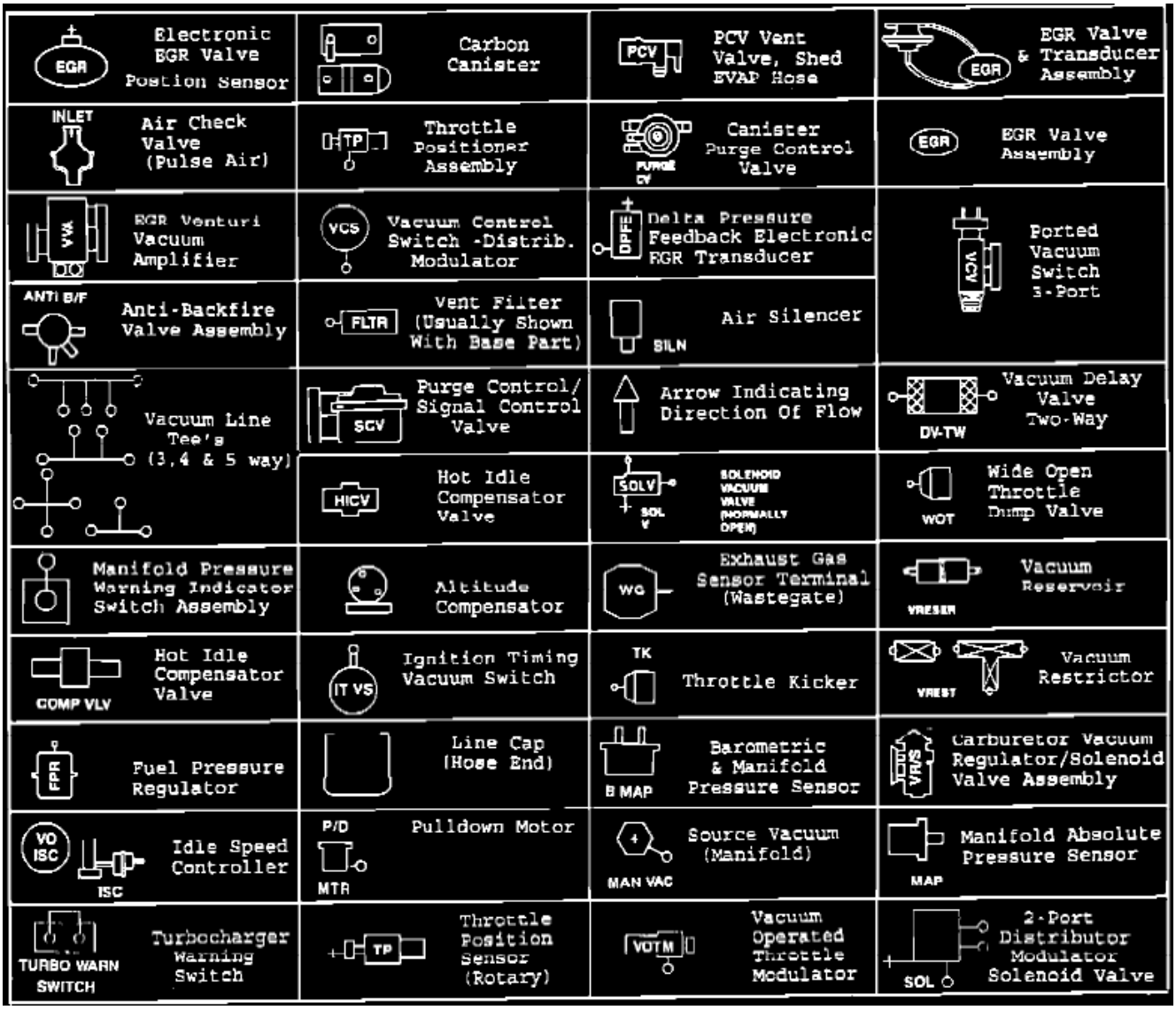


Ignition Lock: Diagram Information and Instructions

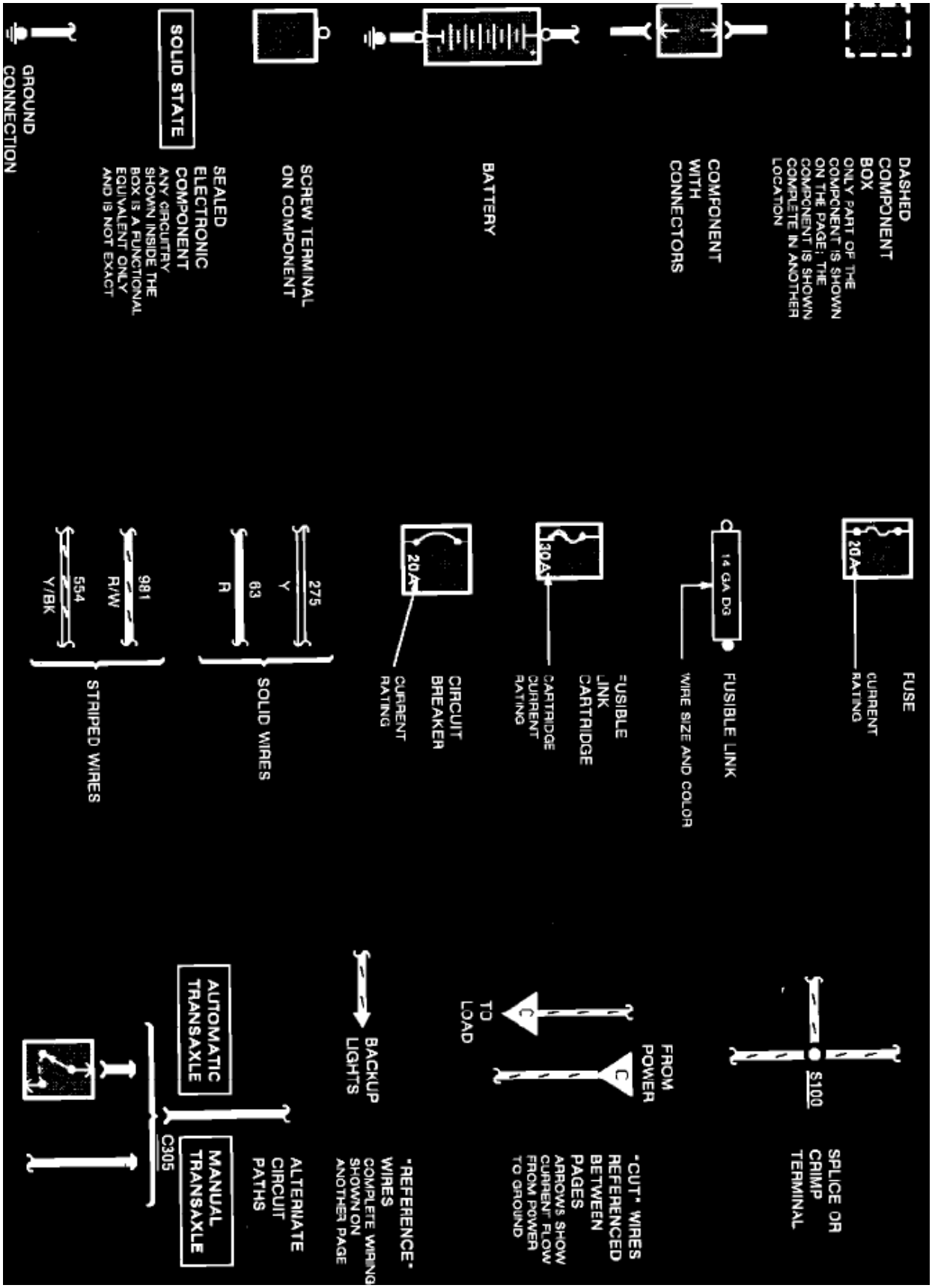
Symbol Identification



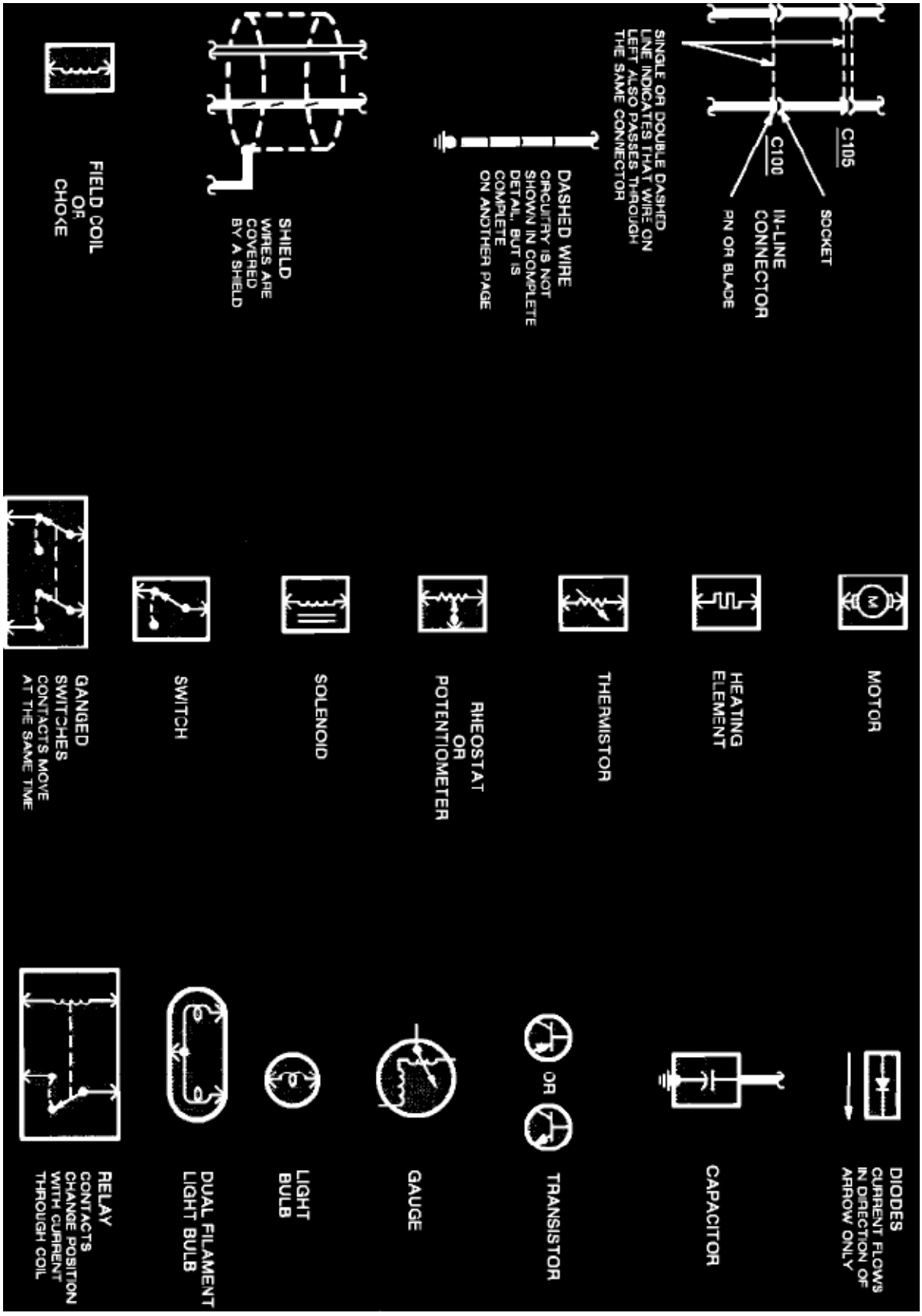
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

T: Tan

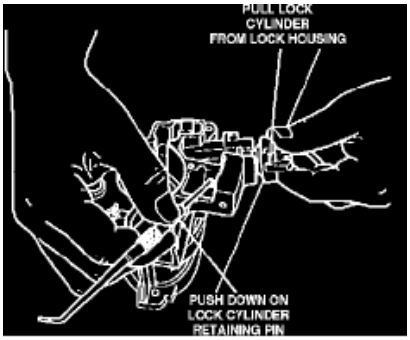
V: Violet

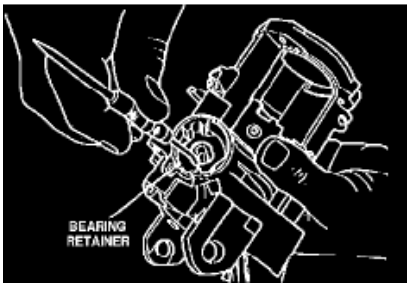
W: White

Y: Yellow

Ignition Lock: Connector Views

For Connector Views, please refer to: Ignition Switch/Diagrams,


PULL LOCK CYLINDER FROM LOCK HOUSING
PUSH DOWN ON LOCK CYLINDER RETAINING PIN


BEARING RETAINER

Ignition Lock: Service and Repair

Fig. 4 Removing Ignition Lock Cylinder

WITH KEY

The following procedure applies to vehicles that have functional lock cylinders, ignition keys available for the vehicle, or ignition key numbers that are known and the proper key can be made.

Removal

1. Disconnect battery ground cable, then remove steering wheel. Ensure steering wheel is in full up position on models with tilt steering.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Turn lock cylinder with key to ON position. Selector lever must be placed in PARK position on vehicles with automatic transmission.

7. Push down on lock cylinder retaining pin using a {1/8} inch diameter wire pin or small punch, then pull lock cylinder from column housing, Fig. 4.

8. Disconnect lock cylinder electrical connector from horn brush electrical connector.

Installation

1. Lubricate lock cylinder with suitable grease, then turn lock cylinder to ON position and depress retaining pin.

2. Insert lock cylinder into housing in flange casting, ensuring that tab at end of cylinder aligns with slot in ignition drive gear.

3. Turn key to OFF position, allowing cylinder retaining pin to extend into cylinder casting housing hole.

4. Rotate lock cylinder to all positions, ensuring cylinder is operating properly.

5. Connect lock cylinder electrical connector to horn brush electrical connector.

6. Position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

7. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

8. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

9. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

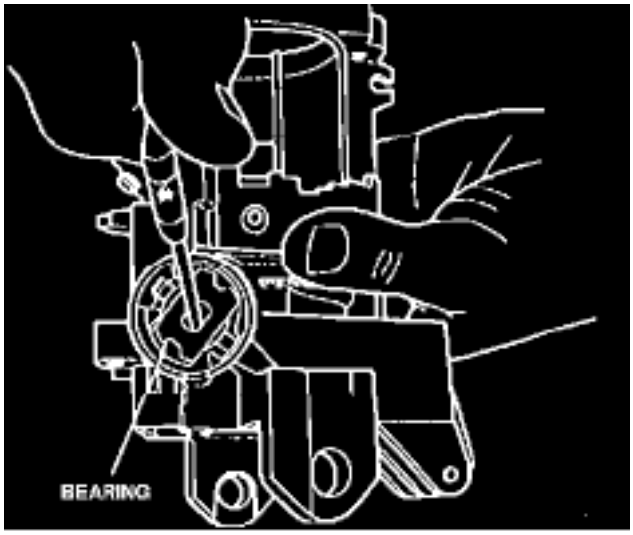
10. Install tilt lever and torque to 2.2-3.6 ft. lbs.

11. On all models, install steering wheel.

12. Install lower dash panel trim cover, then connect battery ground cable.

13. Check for proper start in P and N, and ensure that vehicle cannot be started in D or R positions and steering wheel locks in LOCK position.

Fig. 5 Removing Ignition Lock Bearing Retainer



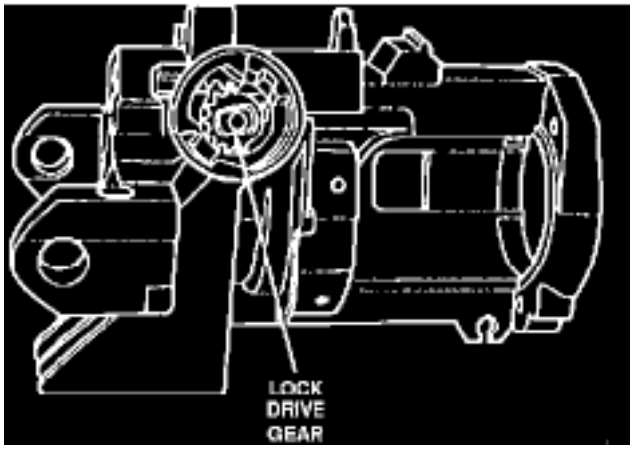


Fig. 6 Removing Ignition Lock Bearing

Fig. 7 Ignition Lock Drive Gear

LESS KEY

The following procedure applies to vehicles where the ignition lock is inoperative or lock cylinder cannot be rotated due to broken or missing ignition key and the key number is unknown, or the lock cylinder cap is damaged and/or broken so that lock cylinder cannot be rotated.

Removal

1. Disconnect battery ground cable, then remove steering wheel. Ensure steering wheel is in full up position on models with tilt steering.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Punch lock cylinder retaining pin using a 1/8 inch maximum diameter prick punch, then drill out retaining pin using a 1/8 inch diameter drill, to a depth of 1/2 inch maximum. Use care not to damage cast housing when drilling out retaining pin.

7. Place a chisel at base of ignition lock cylinder cap, then strike chisel with sharp blows using a suitable hammer to break cap away from lock cylinder.

8. Using a 3/8 inch diameter drill, drill down middle of ignition lock key slot approximately 1 3/4 inch until lock cylinder breaks loose from steering column cover casting, then remove lock cylinder and drill shavings from base of cover cast housing.

9. Remove white plastic bearing retainer by inserting a suitable tool with a 90° bend on tip between bearing retainer and bearing and prying upward, Fig. 5. Note position of bearing retainer prior to removal.

10. Insert tip of a suitable screwdriver into double-D slot of bearing, Fig. 6, rotate 90°, then remove bearing.

11. Remove lock drive gear, Fig. 7, noting relationship of lock drive gear to rack teeth.

Installation

1. Lubricate and position lock drive gear in base of lock cylinder housing in same position as noted during removal. Position of lock drive gear is correct if last tooth on drive gear is meshed with last groove on rack.

2. Position bearing in lock cylinder housing, insert tip of screwdriver into double-D slot of bearing, then rotate bearing 90°.

3. Press white plastic bearing retainer into lock cylinder housing, ensuring retainer is in original position, then press firmly to snap into place.

4. Line up flats of drive gear with flats of washer by pulling down on column lock actuator. This will place actuator in RUN position.

5. Lubricate lock cylinder with suitable grease, then turn lock cylinder to ON position and depress retaining pin.

6. Insert lock cylinder into housing in flange casting, ensuring that tab at end of cylinder aligns with slot in ignition drive gear.

7. Turn key to OFF position, allowing cylinder retaining pin to extend into cylinder casting housing hole.

8. Rotate lock cylinder to all positions, ensuring cylinder is operating properly.

9. Connect lock cylinder electrical connector to horn brush electrical connector.

10. Position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

11. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

12. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

13. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

14. Install tilt lever and torque to 2.2-3.6 ft. lbs.

15. On all models, install steering wheel.

16. Install lower dash panel trim cover, then connect battery ground cable.

17. Check for proper start in P and N, and ensure that vehicle cannot be started in D or R positions and steering wheel locks in LOCK position.

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

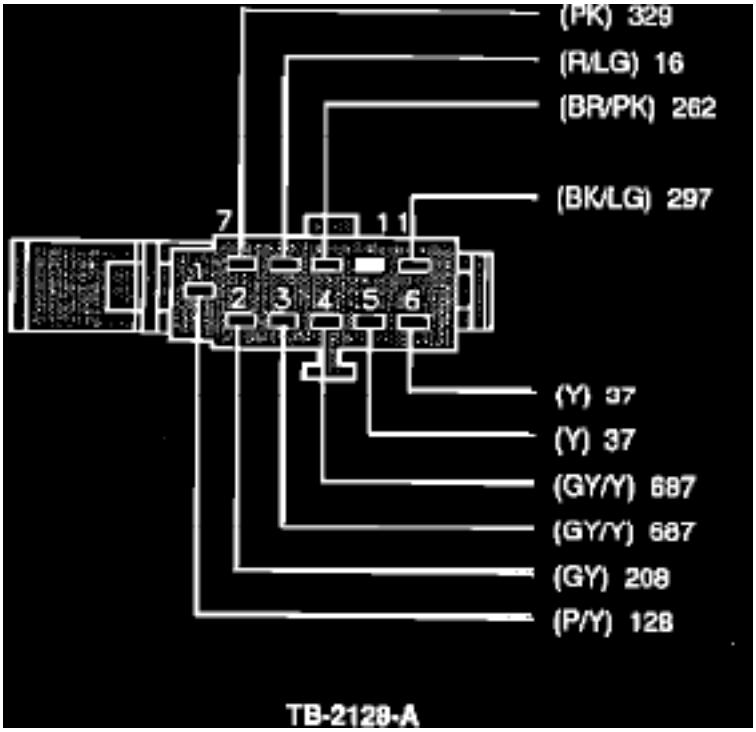
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: Customer Interest Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

OASIS CODES: 602300, 603300

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Ignition Switch: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.

IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

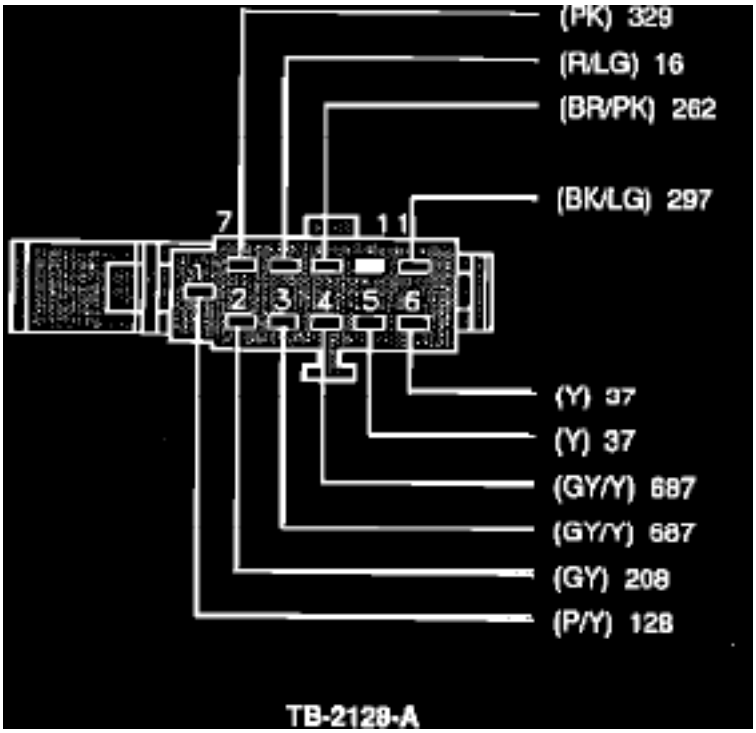
All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000



Ignition Switch: All Technical Service Bulletins Engine - Hard Start/No Start When Cold

Article No. 91-13-9

06/26/91

^ HARD START - 4.0L - COLD ENGINE

^ NO START - 4.0L - COLD ENGINE

^ IGNITION SWITCH BOUNCE - HARD OR NO START - 4.0L COLD ENGINE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A hard start or no start condition may occur when the engine is cold. The engine may not start without cycling the key to the OFF position and back to START. Ignition switch bounce (loss of electrical continuity between contacts) may cause the EDIS module to recycle several times or to lock-up and not allow a start at all.

ACTION: Install a new ignition switch containing synthetic lubricant which reduces the amount of bounce. Also, install a new wiring connector containing a new material that is compatible with the new synthetic lubricant. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery power.

2. Remove the trim panel. Refer to the 1990-91 Ranger/Explorer Shop Manual, Section 11-04B, for removal procedure.

3. Turn the lock cylinder to the RUN position.

4. Remove the two (2) nuts on the ignition switch.

5. Separate the connector from ignition switch by gently prying on the ears of the connector and pulling apart firmly.

6. Disengage the terminals from the existing connector. Discard the connector.

Figure 1

7. Insert terminal into proper locations in new connector (F2TZ-14489-A), Figure 1.

INSTALLATION

1. Remove the spring clip from the new switch (F2TZ-11572-A). This clip keeps the switch in the correct position during shipment.

2. Press the new connector (F2TZ-14489-A) onto the terminals of the ignition switch. Be sure the tabs lock securely.

3. Locate the switch on the weld studs on the steering column.

NOTE: THE END OF THE ACTUATOR ROD MUST FIT IN THE HOLE ON THE SLIDER.

4. Install the nuts on the weld stud. Tighten to 4.45-7.24 N-m (39-64 lb.in.).

5. Connect the battery terminal.

6. Check the switch operation. If necessary, adjust it. Refer to the 1990-91 Aerostar, Explorer, Ranger Truck Shop Manual, Section 11-04B, for adjustment procedure.

7. Install the trim panel.

PART NUMBER PART NAME CLASS

F2TZ-11572-A Ignition Switch B

F2TZ-14489-A Wiring Connector B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

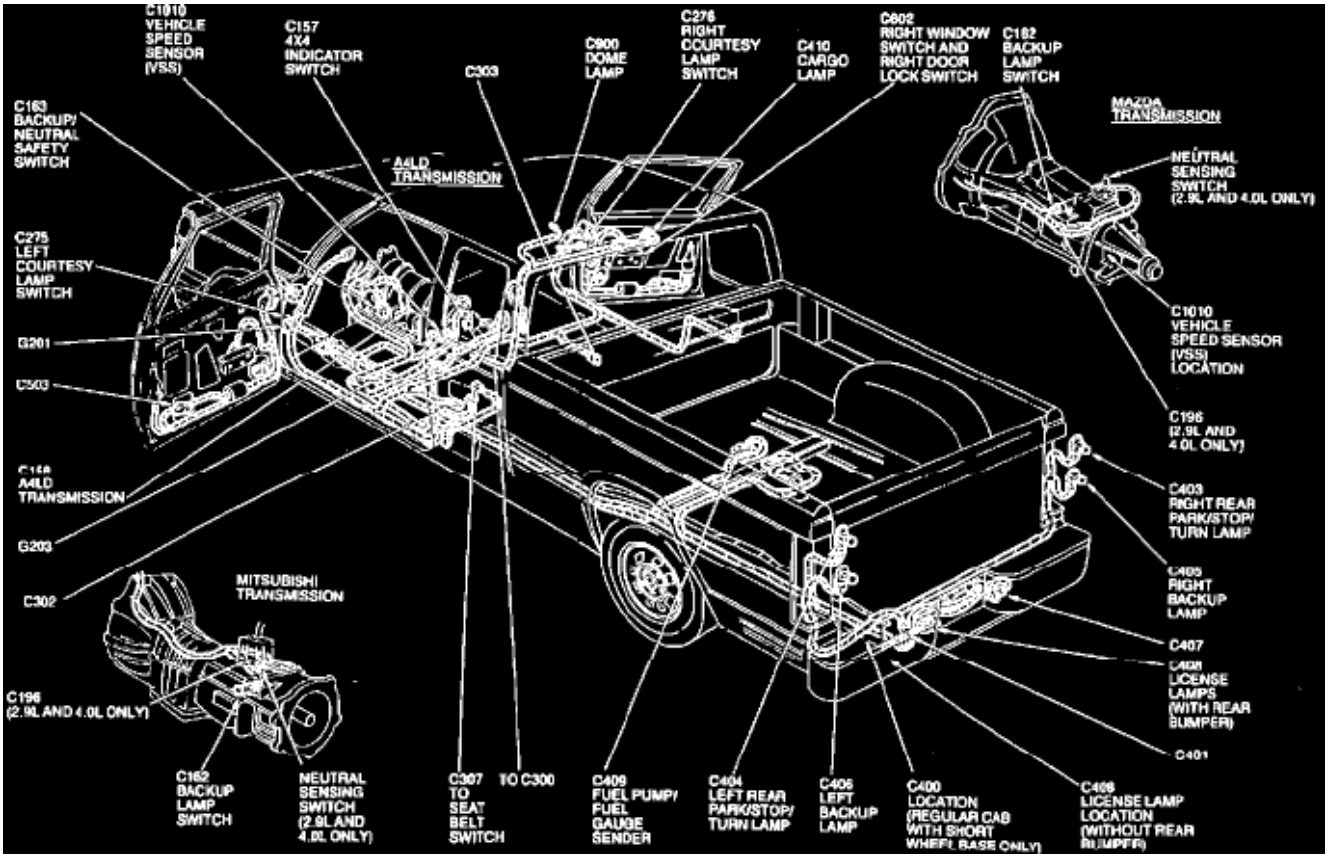
911309A Install Ignition Switch 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 44

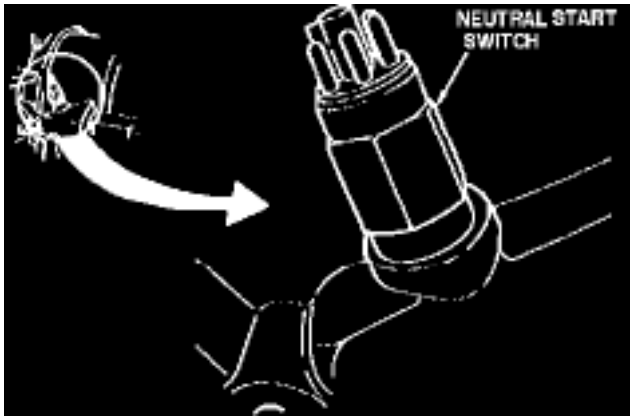
OASIS CODES: 602300, 603300



Neutral Safety Switch: Locations

Body Components

LH Side Of Transmission



Neutral Safety Switch: Service and Repair

Fig. 9 Neutral Start Switch

REMOVAL

1. Disconnect battery ground cable, then raise and support vehicle.

2. Disconnect electrical connector from switch, Fig. 9, then remove switch and O-ring using neutral start switch socket T74P-77247-A or equivalent. Neutral start switch socket is a thin wall socket, other types of sockets could puncture walls of switch.

INSTALLATION

1. Install neutral start switch using socket and torque to 7-10 ft. lbs.

2. Connect electrical connector to switch, then lower vehicle.

3. Connect battery ground cable, then check operation of switch with parking brake engaged. Engine should start with selector lever in N or P only, and back-up lamps should illuminate with selector lever in R only.

Technical Service Bulletin # 9211B1 Date: 920605

Starter Motor Brushes - Replacement Revision

Article No. 92-11B-1

06/05/92

^ SHOP MANUAL - 1982 THROUGH 1991 AS APPLICABLE - STARTER - POSITIVE ENGAGEMENT - STARTER MOTOR BRUSHES REPLACEMENT PROCEDURE FOR 4-INCH STARTERS REVISED/ADDED

^ SHOP MANUAL - 1990 AND 1991 AS APPLICABLE - STARTER - POSITIVE ENGAGEMENT - STARTER SIZE SPECFICATION REVISED

FORD: 1989 CROWN VICTORIA, ESCORT, TEMPO 1989-90 THUNDERBIRD 1989-91 MUSTANG, TAURUS

LINCOLN-MERCURY: 1989 CONTINENTAL, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1989-90 COUGAR 1989-91 SABLE

LIGHT TRUCK: 1982-91 BRONCO, ECONOLINE, F-150-350 SERIES 1983-91 RANGER 1984-90 BRONCO II 1986-91 AEROSTAR 1988-91 F SUPER DUTY

ISSUE: The procedure for Starter Motor Brushes Replacement applicable to vehicles with 4-inch starters only is missing or incorrect in the "Starter-Positive Engagement" section of certain Shop Manuals. Additionally, the 1990 and 1991 Light Truck Shop Manuals incorrectly show a 3-inch starter in the Specifications Chart; the correct size is 4-inch. The following Shop Manuals are affected in the Sections indicated:

^ 1989 Domestic Car Lines: Section 28-02

^ 1990 Mustang, Taurus/Sable, Thunderbird/Cougar: Section 28-02

^ 1991 Mustang, Taurus/Sable: Section 28-02

^ 1986 through 1988 Aerostar: Section 11-02

^ 1989 Aerostar, Ranger, Bronco II: Section 03-06

^ 1990 and 1991 Aerostar, Ranger, Bronco II: Section 03-06A

^ 1983 Ranger/1984 Bronco II (Reprint), 1984 through 1988 Ranger/Bronco II, 1982 through 1990 Light Truck-Engine: Section 28-02

^ 1991 Light Truck-Engine: Section 03-06A

ACTION: Refer to Disassembly and Assembly in this TSB article for the additional information.

NOTE: THIS TSB ARTICLE INCLUDES REVISED PAGES FROM THE 1989, 1990 AND 1991 CAR SHOP MANUALS LISTED ABOVE, THE 1991 COMPACT TRUCK SHOP MANUAL AND THE 1990 AND 1991 LIGHT TRUCK SHOP MANUALS. ALTHOUGH NOT SHOWN, THE REVISIONS APPLY TO ALL LIGHT TRUCK AND COMPACT TRUCK MANUALS LISTED ABOVE.

NOTE: THE PROCEDURE IN THIS TSB ARTICLE APPLIES TO VEHICLES WITH 4-INCH STARTERS ONLY.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

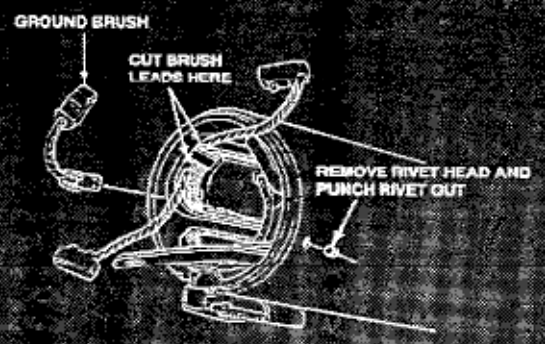
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

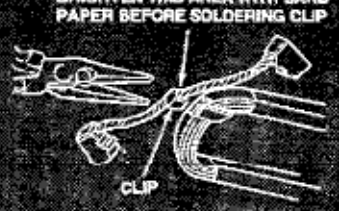
1. Remove plunger lever cover.
2. Remove pivot pin retaining starter drive plunger lever.
3. Loosen through bolts enough to allow removal of drive end housing, starter drive plunger lever and return spring.
4. Remove drive gear stop ring retainer and stop ring from groove in armature shaft, and remove drive gear assembly.
5. Apply a thin coating of Lubriplate 777 or equivalent on armature shaft splines. Install new drive gear assembly on armature shaft. Install a new stop ring.
6. Position starter gear plunger lever on starter frame. **Ensure that plunger lever properly engages starter drive assembly.**
7. Install a new stop ring retainer. Partially fill drive end housing bearing bore with grease (approximately one-quarter full). Position starter drive plunger lever return spring and drive end housing to starter frame. Tighten through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
8. Position starter drive plunger lever cover on starter. Tighten retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.



12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove plunger lever cover.
2. Remove through bolts, pivot pin, drive end housing, drive plunger lever return spring and brush end plate.
3. Remove starter gear plunger lever. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive gear assembly is being reused, remove stop ring retainer and stop ring from end of armature shaft. Remove drive gear assembly.
5. Place drive gear assembly on new armature with a new stop ring, thrust washer and retainer.

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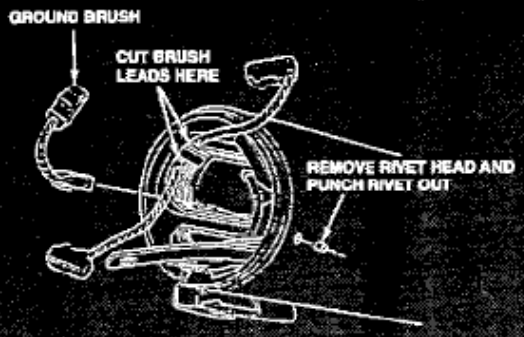
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature and drive plunger return spring.
3. Remove the drive gear stop ring retainer and stop ring from the groove in the armature shaft and remove the drive gear assembly.
4. Apply a thin coating of Lubriplate 777 or equivalent, on the armature shaft splines. Install the new drive gear assembly on the armature shaft and install a new stop ring.
5. Position the starter gear plunger lever on the starter frame. **Ensure that the plunger lever properly engages the starter drive assembly.**
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.

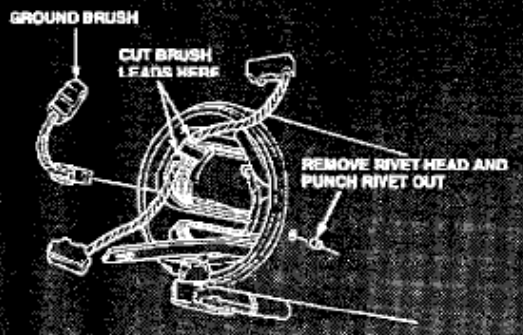
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature and drive plunger return spring.
3. Remove the drive gear stop ring retainer and stop ring from the groove in the armature shaft and remove the drive gear assembly.
4. Apply a thin coating of Lubriplate 777 or equivalent, on the armature shaft splines. Install the new drive gear assembly on the armature shaft and install a new stop ring.
5. Position the starter gear plunger lever on the starter frame. **Ensure that the plunger lever properly engages the starter drive assembly.**
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes. Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

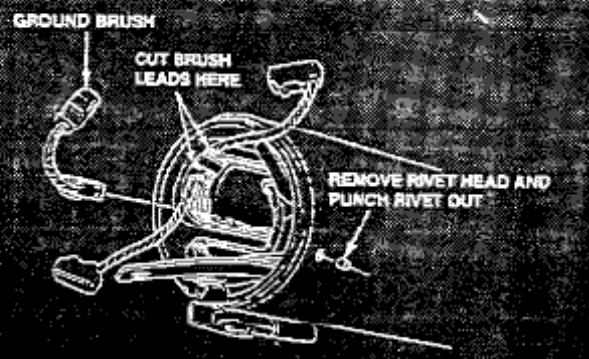
Armature Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove plunger lever cover.
2. Remove through bolts, pivot pin, drive end housing, drive plunger lever return spring and brush end plate.
3. Remove starter gear plunger lever. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive gear assembly is being reused, remove stop ring retainer and stop ring from end of armature shaft. Remove drive gear assembly.
5. Place drive gear assembly on new armature with a new stop ring, thrust washer and retainer.
6. Install armature in starter frame.
7. Position drive gear plunger lever to frame and drive gear assembly.
8. Partially fill drive end housing bearing bore with grease (approximately one-quarter full). Position drive plunger lever return spring, and drive end housing to starter frame. Ensure stop ring retainer is seated properly in drive housing. Install pivot pin.
9. Install brush holder and insert brushes in holder. Install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
10. Install brush end plate. (Be certain end plate insulator is positioned properly on end plate).
11. Install two through bolts to starter frame. Tighten to 6-9 N·m (55-80 lb-in).
12. Install plunger lever cover and tighten retaining screw.
13. Check the starter no-load current draw. The starter no-load current draw specification is 80 amps.

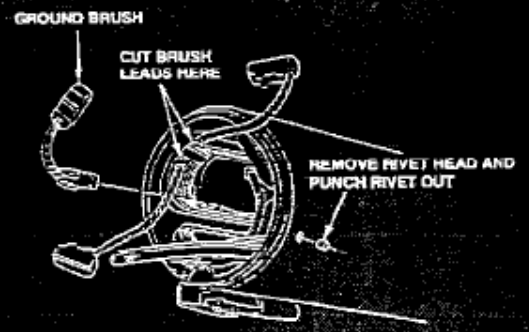
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature and drive plunger return spring.
3. Remove the drive gear stop ring retainer and stop ring from the groove in the armature shaft and remove the drive gear assemby.
4. Apply a thin coating of Lubriplate 777 or equivalent, on the armature shaft splines. Install the new drive gear assembly on the armature shaft and install a new stop ring.
5. Position the starter gear plunger lever on the starter frame. **Ensure that the plunger lever properly engages the starter drive assembly.**
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

Armature Replacement (Continued)

7. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the drive plunger lever return spring, and the drive end housing to the starter frame. Be sure that the stop ring retainer is seated properly in the drive housing. Install pivot pin.
8. Install brush holder and insert brushes in holder and install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
9. Install the brush end plate. (Be certain end plate insulator is positioned properly on end plate).
10. Install the two through bolts to the starter frame and tighten to 6-9 N·m (55-80 lb-in).
11. Install plunger lever cover and tighten retaining screw.
12. Check the starter no-load current draw. Starter no-load current draw specification is 80 amps.

SPECIFICATIONS

Starter

Positive Engagement Starter Motor								Starter Brushes				Torque Specifications					
Diameter		Current Draw Under Normal Load	Normal Engine Cranking Speed	Min. Stall Torque @ 5 Volts		Max. Load	No Load	Mfg. Length		Spring Tension		Through Bolt		Mounting Bolt		Cable Attaching Screw	
mm	Inches	Amps	RPM	N-m	Lb-Ft	Amps	Amps	mm	Inches	N	oz.	N-m	Lb-In	N-m	Lb-Ft	N-m	Lb-In
102	4	150-250	180-250	12.9	9.5	500	80	11.4	.45	22	80	6-9	55-80	20-27	15-20	8.0-12.4	70-110

Maximum Commutator runout is 0.12 mm (0.005 inch) Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

CJ2175-G

SPECIAL SERVICE TOOLS

Tool Number	Description
T00L-4201-C	Dial Indicator
T00L-10044-A	Starter Polescrew Wrench

CJ2259-D

ROTUNDA EQUIPMENT

Model	Description
078-00005	Starting and Charging Tester

CJ2672-B

1989 TOWN CAR/CROWN VICTORIA/GRAND MARQUIS

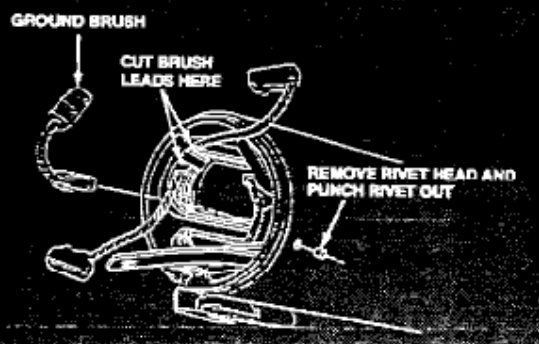
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature and drive plunger return spring.
3. Remove the drive gear stop ring retainer and stop ring from the groove in the armature shaft and remove the drive gear assembly.
4. Apply a thin coating of Lubriplate 777 or equivalent, on the armature shaft splines. Install the new drive gear assembly on the armature shaft and install a new stop ring.
5. Position the starter gear plunger lever on the starter frame. **Ensure that the plunger lever properly engages the starter drive assembly.**
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.

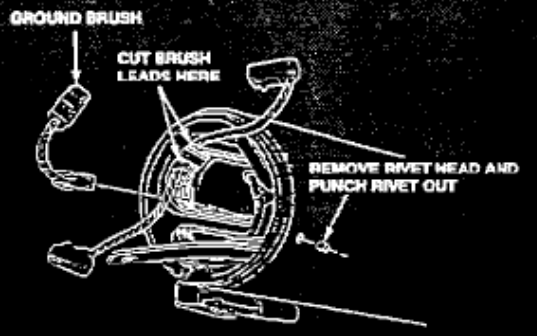
1989 TEMPO/TOPAZ, ESCORT

DISASSEMBLY AND ASSEMBLY (Continued)

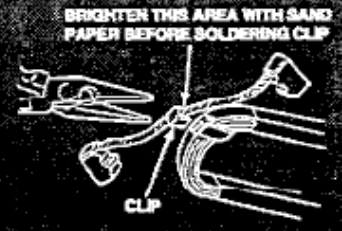
6. Position starter gear plunger lever on starter frame. **Ensure that plunger lever properly engages starter drive assembly.**
7. Install a new stop ring, retainer and thrust washer. Partially fill drive end housing bearing bore with grease (approximately 1/4 full). Position starter drive plunger lever return spring and drive end housing to starter frame. Tighten through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
8. Position starter drive plunger lever cover on starter. Tighten retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.



12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove plunger lever cover.
2. Remove through bolts, pivot pin, drive end housing, drive plunger lever return spring and brush end plate.
3. Remove starter gear plunger lever. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive gear assembly is being reused, remove stop ring retainer and stop ring from end of armature shaft. Remove drive gear assembly.
5. Place drive gear assembly on new armature with a new stop ring and retainer.
6. Install armature in starter frame.
7. Position drive gear plunger lever to frame and drive gear assembly.
8. Partially fill drive end housing bearing bore with grease (approximately 1/4 full). Position drive plunger lever return spring, and drive end housing to starter frame. Ensure stop ring retainer is seated properly in drive housing. Install pivot pin.
9. Install brush holder and insert brushes in holder. Install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
10. Install brush end plate. (Be certain end plate insulator is positioned properly on end plate).

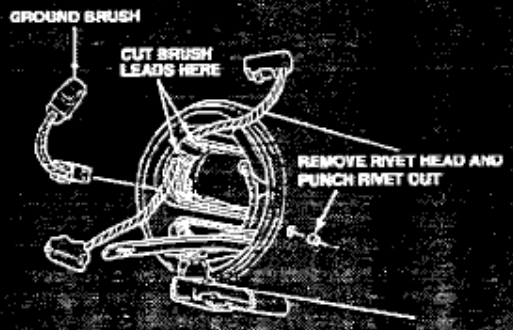
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature and drive plunger return spring.
3. Remove the drive gear stop ring retainer and stop ring from the groove in the armature shaft and remove the drive gear assembly.
4. Apply a thin coating of Lubriplate 777 or equivalent, on the armature shaft splines. Install the new drive gear assembly on the armature shaft and install a new stop ring.
5. Position the starter gear plunger lever on the starter frame. Ensure that the plunger lever properly engages the starter drive assembly.
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes. Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

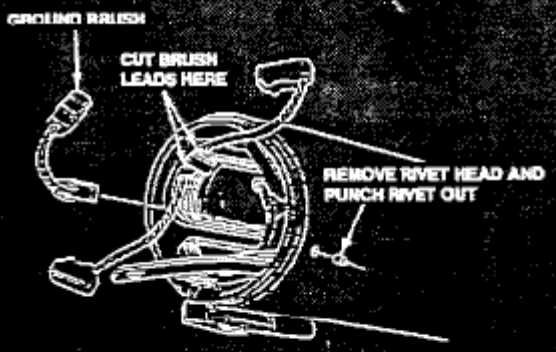
Armature Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove plunger lever cover.
2. Remove through bolts, pivot pin, drive end housing, drive plunger lever return spring and brush end plate.
3. Remove starter gear plunger lever. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive gear assembly is being reused, remove stop ring retainer and stop ring from end of armature shaft. Remove drive gear assembly.
5. Place drive gear assembly on new armature with a new stop ring, thrust washer and retainer.
6. Install armature in starter frame.
7. Position drive gear plunger lever to frame and drive gear assembly.
8. Partially fill drive end housing bearing bore with grease (approximately one-quarter full). Position drive plunger lever return spring, and drive end housing to starter frame. Ensure stop ring retainer is seated properly in drive housing. Install pivot pin.
9. Install brush holder and insert brushes in holder. Install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
10. Install brush end plate. (Be certain end plate insulator is positioned properly on end plate).
11. Install two through bolts to starter frame. Tighten to 6-9 N·m (55-80 lb-in).
12. Install plunger lever cover and tighten retaining screw.
13. Check the starter no-load current draw. The starter no-load current draw specification is 80 amps.

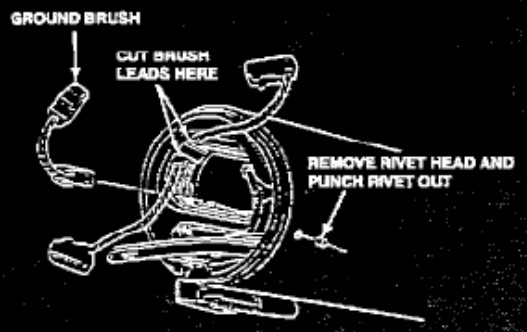
DISASSEMBLY AND ASSEMBLY (Continued)

Starter Drive Replacement

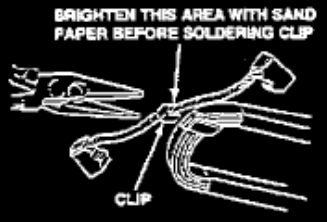
1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature and drive plunger return spring.
3. Remove the drive gear stop ring retainer and stop ring from the groove in the armature shaft and remove the drive gear assemby.
4. Apply a thin coating of Lubriplate 777 or equivalent, on the armature shaft splines. Install the new drive gear assembly on the armature shaft and install a new stop ring.
5. Position the starter gear plunger lever on the starter frame. **Ensure that the plunger lever properly engages the starter drive assembly.**
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.



7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.



12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

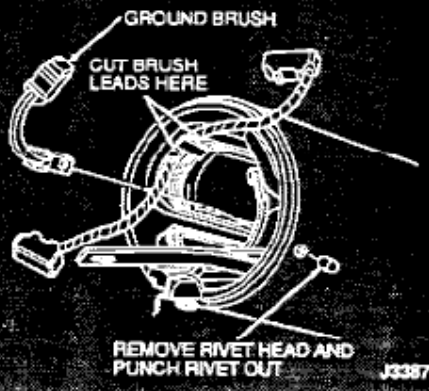
1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

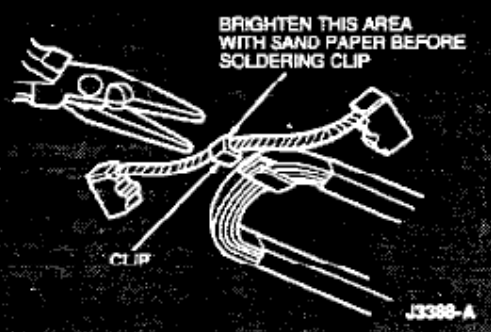
6. Install a new stop ring retainer and thrust washer. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the starter drive plunger lever return spring and drive end housing to the starter frame, and then tighten the through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
7. Position the starter drive plunger lever cover on the starter. Tighten the retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove two through bolts from starter.
3. Remove brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove drive end housing and plunger lever return spring.



7. Remove starter drive plunger lever pivot pin and lever and remove armature.
8. Ground brushes. Remove rivet head with file or chisel and remove rivet with 1/8 inch punch.
9. Cut brush leads from field coils as close to field connection point as possible.
10. Clean and inspect starter motor.
11. Position new field brush lead on field coil connection. Position and crimp clip provided with brushes to hold brush lead to connection. Solder lead clip and connection together using rosin core solder. Use a 300 watt iron.



12. Rivet ground brush leads to frame with rivets provided in brush kit.
13. Clean commutator with 00 or 000 sandpaper.
14. Install armature in starter frame.
15. Install starter drive gear plunger lever to frame and starter drive assembly and install pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install brush end plate.
18. Install two through bolts to starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect starter to a battery to check operation.

Armature Replacement

1. Remove cover screw, cover and through bolts.
2. Remove pivot pin retaining starter gear plunger lever and remove lever, starter drive end housing, armature, and drive plunger return spring.
3. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and stop ring from the end of the armature shaft, and remove the drive.
4. Place the drive gear assembly on the new armature with a new stop ring and retainer.
5. Install the armature in the starter frame.
6. Position the drive gear plunger lever to the frame and drive gear assembly.
7. Partially fill the drive end housing bearing bore with grease (approximately one-quarter full). Position the drive plunger lever return spring, and the drive end housing to the starter frame. Be sure that the stop ring retainer is seated properly in the drive housing. Install pivot pin.
8. Install brush holder and insert brushes in holder and install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
9. Install the brush end plate. (Be certain end plate insulator is positioned properly on end plate).

DISASSEMBLY AND ASSEMBLY (Continued)

10. Install the two through bolts to the starter frame and tighten to 6-9 N·m (55-80 lb-in).
11. Install plunger lever cover and tighten retaining screw.
12. Check the starter no-load current draw. Starter no-load current draw specification is 80 amps.

SPECIFICATIONS

Starter

Positive Engagement Starter Motor								Starter Brushes				Torque Specifications					
Diameter		Current Draw Under Normal Load	Normal Engine Cranking Speed	Min. Stall Torque @ 5 Volts		Max. Load	No Load	Mfg. Length		Spring Tension		Through Bolt		Mounting Bolt		Cable Attaching Screw	
mm	Inches	Amps	RPM	N-m	Lb-Ft	Amps	Amps	mm	Inches	N	oz.	N-m	Lb-in	N-m	Lb-Ft	N-m	Lb-in
102	4	150-250	160-250	12.9	9.5	800	80 ± 10	11.4	.45	22	80	6-9	55-80	20-27	15-20	8.0-12.4	70-110

Maximum Commutator runout is 0.12 mm (0.005 inch). Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt. CJ2178-H

TORQUE SPECIFICATIONS

Description	N-m	Lb-Ft
Starter Retaining Bolts	21-27	15-20
Starter Cable-to-Motor Retaining Screw	8-12	70-110 (Lb-in)
Starter Through Bolts	6-9	55-80 (Lb-in)

ROTUNDA EQUIPMENT

Model	Description
078-00005	Starting and Charging Tester

SPECIAL SERVICE TOOLS

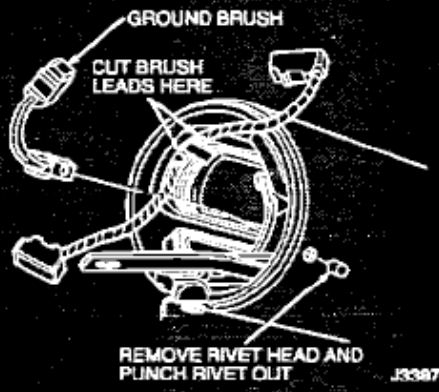
Tool Number	Description
TOOL-4201-C	Dial Indicator
TOOL-10044-A	Starter Polescrew Wrench

DISASSEMBLY AND ASSEMBLY (Continued)

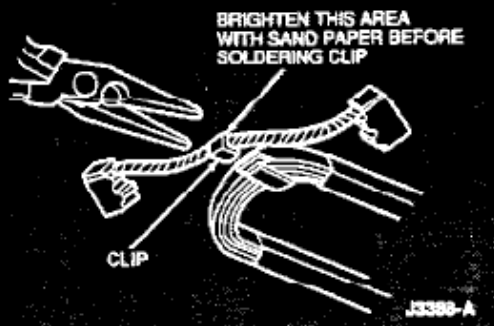
7. Install a new stop ring retainer and thrust washer. Partially fill drive end housing bearing bore with grease (approximately 1/4 full). Position starter drive plunger lever return spring and drive end housing to starter frame. Tighten through bolts to 6-9 N·m (55-80 lb-in). Install pivot pin.
8. Position starter drive plunger lever cover on starter. Tighten retaining screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove two through bolts from starter.
3. Remove brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove drive end housing and plunger lever return spring.



7. Remove starter drive plunger lever pivot pin and lever and remove armature.
8. Ground brushes. Remove rivet head with file or chisel and remove rivet with 1/8 inch punch.
9. Cut brush leads from field coils as close to field connection point as possible.
10. Clean and inspect starter motor.
11. Position new field brush lead on field coil connection. Position and crimp clip provided with brushes to hold brush lead to connection. Solder lead clip and connection together using rosin core solder. Use a 300 watt iron.



12. Rivet ground brush leads to frame with rivets provided in brush kit.
13. Clean commutator with 00 or 000 sandpaper.
14. Install armature in starter frame.
15. Install starter drive gear plunger lever to frame and starter drive assembly and install pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install brush end plate.
18. Install two through bolts to starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect starter to a battery to check operation.

Armature Replacement

1. Remove plunger lever cover.
2. Remove through bolts, pivot pin, drive end housing, drive plunger lever return spring and brush end plate.
3. Remove starter gear plunger lever. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive gear assembly is being reused, remove stop ring retainer and stop ring from end of armature shaft. Remove drive gear assembly.
5. Place drive gear assembly on new armature with a new stop ring, thrust washer and retainer.
6. Install armature in starter frame.
7. Position drive gear plunger lever to frame and drive gear assembly.
8. Partially fill drive end housing bearing bore with grease (approximately 1/4 full). Position drive plunger lever return spring, and drive end housing to starter frame. Ensure stop ring retainer is seated properly in drive housing. Install pivot pin.
9. Install brush holder and insert brushes in holder. Install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.

DISASSEMBLY AND ASSEMBLY (Continued)

10. Install brush end plate. (Be certain end plate insulator is positioned properly on end plate).
11. Install two through bolts to starter frame. Tighten to 6-9 N·m (55-80 lb-in).
12. Install plunger lever cover and tighten retaining screw.
13. Check the starter no-load current draw. The starter no-load current draw specification is 80 amps.

SPECIFICATIONS

Starter

Positive Engagement Starter Motor								Starter Brushes				Torque Specifications					
Diameter		Current Draw Under Normal Load	Normal Engine Cranking Speed	Min. Stall @ 5 Volts		Max. Load	No Load	Mfg. Length		Spring Tension		Through Bolt		Mounting Bolt		Cable Attaching Screw	
mm	in	Amps	RPM	N·m	Lb-Ft	Amps	Amps	mm	in	N	oz.	N·m	Lb-in	N·m	Lb-Ft	N·m	Lb-in
102	4	150-250	190-260	12.9	9.5	800	80 ± 10	11.4	.45	22	80	5.1-9.6	45-85	41-54	30-40	8.0-12.4	70-110

Maximum Commutator runout is 0.12 mm (0.005 inch). Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

CJ2258-D

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Starter Retaining Bolts	21-27	15-20
Starter Relay Retaining Nuts	5-10	45-89 (Lb-In)
Starter Through Bolts	6-9	55-80 (Lb-In)

ROTUNDA EQUIPMENT

Model	Description
078-00005	Starting and Charging Tester

SPECIAL SERVICE TOOLS

Tool Number	Description
TOOL-4201-C	Dial Indicator
TOOL-10044-A	Starter Polescrew Wrench

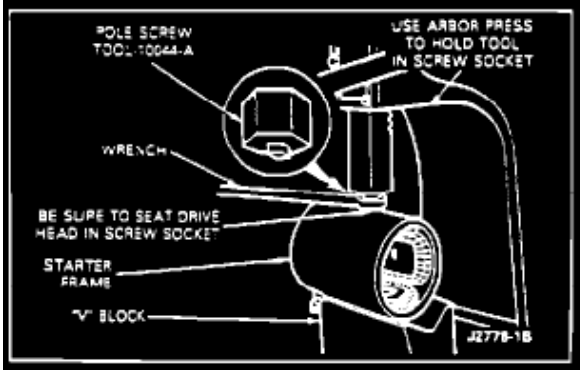


FIG. 9 Pole Shoe Screw Removal

9. Install brush end plate. Ensure end plate insulator is positioned properly on end plate.
10. Install two through bolts to starter frame. Tighten to 6.21-8.47 N·m (55-75 in-lb).
11. Secure starter in a vise. Connect starter to a battery to check its operation.

Starter Motor Brushes Replacement — 4-Inch Starter

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.

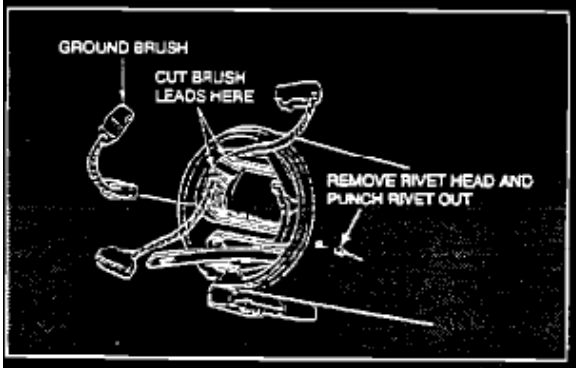


FIG. 10 Brush Removal

7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Ground brushes: Remove rivet head with file or chisel and remove rivet with 1/8" punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.
10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.

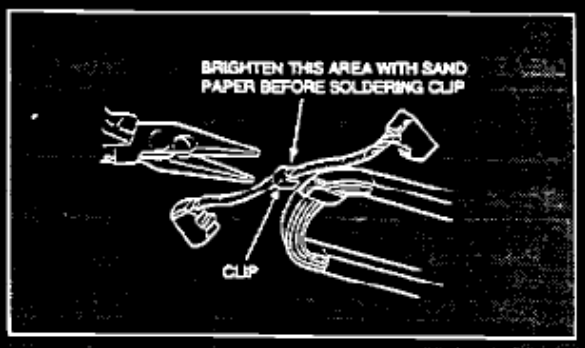


FIG. 11 Brush Installation

12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery and check operation.

Armature Replacement

1. Remove starter drive plunger lever cover retainer screw and remove cover.
2. Remove pivot pin retaining starter plunger lever.
3. Remove through bolts, drive end housing, plunger lever, drive plunger lever return spring, and brush end plate. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive assembly is being reused, remove stop ring from end of armature shaft, and remove drive.

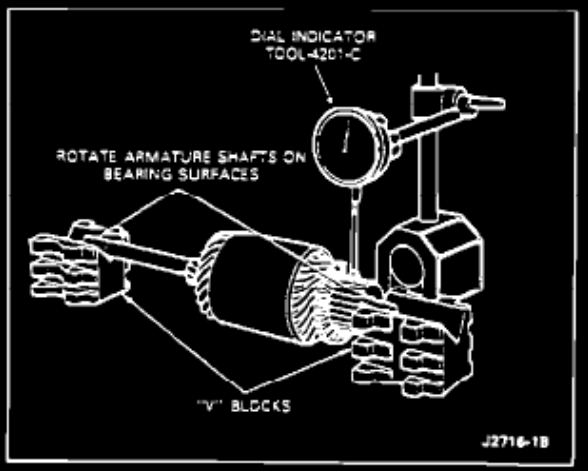


FIG. 12 Commutator Runout Check

SPECIFICATIONS

Starter Motor								Starter Brushes			
Motor Diameter		Current Draw Under Normal Load	Normal Engine Cranking Speed	Min. Stall Torque @ 5 Volts		Max. Load	No Load	Mfg. Length		Spring Tension	
mm	Inches	Amps	RPM	N-m	Lb-Ft	Amps	Amps	mm	Inches	N	oz.
102	4	130-220	100-230	14.7	11.0	800	70 ± 10	16.8	0.66	18	64

Maximum Commutator runout is 0.12mm (0.005 inch) Maximum starting circuit voltage drop (battery positive terminal to start terminal) at normal engine temperature is 0.5 volt.

SPECIAL SERVICE TOOLS

Tool No.	Description
TOOL-10044-A	Starter Pole Screw Wrench
TOOL-4201-C	Dial Indicator

CJ4735-2A

ROTUNDA EQUIPMENT

Model	Description
078-00005	Starting and Charging Tester

CJ3668-1B

DISASSEMBLY AND ASSEMBLY (Continued)

11. Position end plate to frame. Install and tighten through bolts to 6.21-8.47 N·m (55-75 in-lb). Do not pinch brush leads when installing end plate. Install pivot pin.
12. Position drive plunger lever cover and fasten to frame with cover screw.
13. Check starter no-load current draw.

Starter Drive Replacement

1. Remove starter plunger cover.
2. Remove pivot pin retaining starter plunger lever.
3. Loosen through bolts enough to allow removal of drive end housing and lever return spring. Remove lever.
4. Remove thrust washer, drive stop ring retainer and stop ring from end of armature shaft and remove drive assembly.
5. Apply a thin coating of Lubriplate 777 or equivalent on armature shaft splines. Install drive assembly on armature shaft and install a new stop ring.
6. Position starter gear plunger lever on the starter frame. **Ensure lever properly engages drive flange.**
7. Install a new stop ring retainer and thrust washer. Partially fill drive end housing bearing bore with Grease ESB-M1C63-A or equivalent (approximately 1/4 full). Position lever return spring and drive end housing to starter frame. Tighten through bolts to 6.21-8.47 N·m (55-75 in-lb). Install pivot pin.
8. Position starter drive plunger lever cover on starter. Tighten attaching screw.

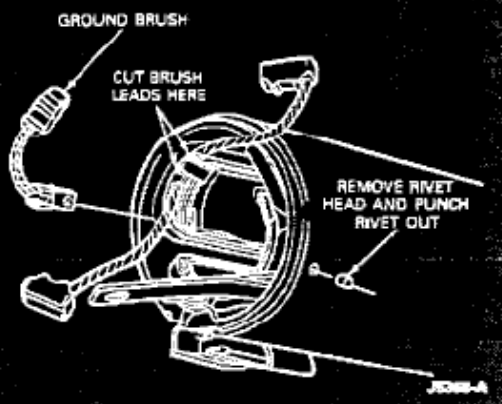
Brush Replacement

Replace starter brushes when they are worn to 6.35mm (1/4 inch). Always install a complete set of new brushes.

1. Remove the two through-bolts from starter frame.
2. Remove brush end plate, brush springs and brushes from holder.
3. Remove ground brush attaching screws or rivets from frame and remove brushes.
4. Cut insulated brush leads from field coils, as close to field connection point as possible.
5. Check plastic brush holder for cracks or broken mounting pads. Replace if necessary.
6. Position new insulated field brush lead on field coil connection. Position and crimp clip provided with brushes to hold brush lead to connection. Solder lead, clip, and connection together using a 300-watt iron and rosin core solder.
7. Install ground brush leads to frame with attaching screws or rivets.
8. Install brush holder and insert brushes in holder. Install brush springs. Positive brush leads should be positioned in their respective slots in brush holder to prevent potential grounding.
9. Install brush end plate. Ensure end plate insulator is positioned properly on end plate.
10. Install two through bolts to starter frame. Tighten to 6.21-8.47 N·m (55-75 in-lb).
11. Secure starter in a vise. Connect starter to a battery to check its operation.

Starter Motor Brushes Replacement

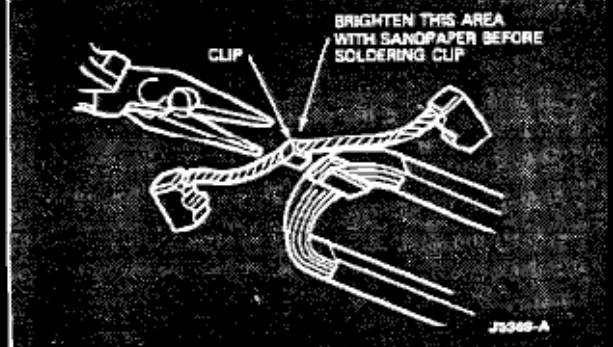
1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.
7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Remove ground brush rivet head with the file or chisel and remove rivet with 1/8 inch punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.



10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.
12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.

DISASSEMBLY AND ASSEMBLY (Continued)

18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery to check operation.



Armature Replacement

1. Remove starter drive plunger lever cover retainer screw and remove cover.
2. Remove pivot pin retaining starter plunger lever.
3. Remove through bolts, drive end housing, plunger lever, drive plunger lever return spring, and brush end plate. Remove brushes and lift out brush holder.
4. Remove armature. If starter drive assembly is being reused, remove stop ring from end of armature shaft, and remove drive.
5. Place drive assembly on new armature with a new stop ring, retainer and thrust washer.
6. Install armature in starter frame.
7. Position drive plunger lever to frame and drive assembly. Ensure lever properly engages drive flange.
8. Partially fill drive end housing bearing bore with Grease ESB-M1C83-A or equivalent (approximately 1/4 full). Position drive lever return spring, and drive end housing to starter frame. Ensure stop ring retainer is seated properly in drive housing.
9. Install brush holder and insert brushes in holder. Install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
10. Install brush end plate. Ensure end plate insulator is positioned properly on end plate.
11. Install two through bolts to starter frame. Tighten to 6.21-6.47 N·m (55-75 in-lb). Install pivot pin.
12. Install starter drive plunger lever cover and tighten retaining screw.
13. Check starter no-load current draw with starter secure in vise during test.

SPECIFICATIONS

Refer to the following chart.

Starter Motor								Starter Brushes			
Motor Diameter		Current Draw Under Normal Load	Normal Engine Cranking Speed	Min. Stall Torque @ 5 Volts		Max. Load	No Load	Mfg. Length		Spring Tension	
mm	Inches	Amps	RPM	N·m	Lb-Ft	Amps	Amps	mm	Inches	N	oz.
101.60	4	130-220	100-230	14.7	11.0	600	70 ± 10	16.0	0.66	16	54

Maximum Commutator runout is 0.12mm (0.005 inch) Maximum starting circuit voltage drop (battery positive terminal to start terminal) at normal engine temperture is 0.5 volt.

SPECIAL SERVICE TOOLS

Tool No.	Description
TOOL-10044-A	Starter Pole Screw Wrench
TOOL 4201 C	Dial Indicator

CJ4735-B

ROTUNDA EQUIPMENT

Model	Description
078-00006	Starting and Charging Tester

CJ3689-1B

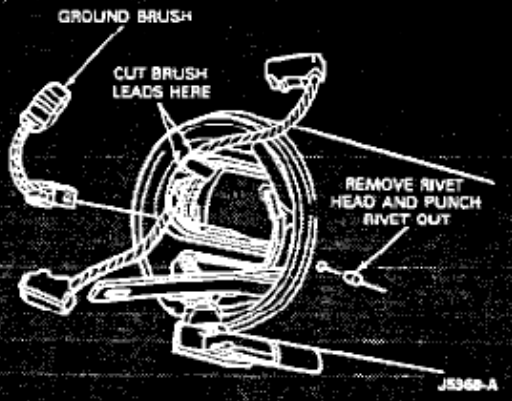
Revised 5/92

DISASSEMBLY AND ASSEMBLY (Continued)

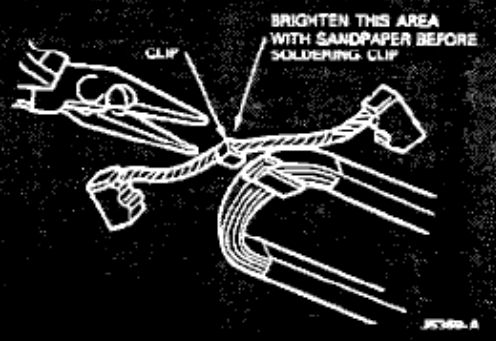
7. Install a new stop-ring retainer. Partially fill the drive end housing bearing bore with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A or ESB-M1C93-A) or equivalent (approximately 1/4 full). Position the starter drive plunger lever return spring and drive end housing to the starter frame. Tighten the through bolts to 6.21-8.47 N·m (55-75 in-lb).
8. Position the starter drive plunger lever cover, with its gasket, on the starter. Tighten the attaching screw.

Starter Motor Brushes Replacement

1. Remove starter drive plunger lever cover.
2. Remove the two through bolts from the starter.
3. Remove the brush end plate.
4. Remove brush spring and pull brushes loose from brush holder.
5. Remove brush holder.
6. Remove the drive end housing and the plunger lever return spring.
7. Remove the starter drive plunger lever pivot pin and lever and remove the armature.
8. Remove ground brush rivet head with the file or chisel and remove rivet with 1/8 inch punch.
9. Cut the brush leads from the field coils as close to the field connection point as possible.



10. Clean and inspect the starter motor.
11. Position the new field brush lead on the field coil connection. Position and crimp the clip provided with the brushes to hold the brush lead to the connection. Solder the lead clip and connection together using rosin core solder. Use a 300 watt iron.
12. Rivet the ground brush leads to the frame with rivets provided in the brush kit.
13. Clean the commutator with 00 or 000 sandpaper.
14. Install the armature in the starter frame.
15. Install the starter drive gear plunger lever to the frame and starter drive assembly and install the pivot pin.
16. Install brush holder and insert brushes in holder and install brush springs.
17. Install the brush end plate.
18. Install the two through bolts to the starter frame.
19. Install starter drive plunger lever cover and tighten retainer screw.
20. Connect the starter to a battery to check operation.



Armature Replacement

1. Remove starter drive plunger lever cover and retaining screw.
2. Remove the through bolts, pivot pin, drive end housing, drive plunger lever return spring, and brush end plate.
3. Remove starter gear plunger lever. Remove brushes and lift out brush holder.
4. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring from the end of the armature shaft, and remove the drive gear assembly.
5. Place the drive gear assembly on the new armature with a new stop ring.
6. Install the armature in the starter frame.
7. Position the drive gear plunger lever to the frame and drive gear assembly.
8. Partially fill the drive end housing bearing bore with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A or ESB-M1C93-A) or equivalent (approximately 1/4 full). Position the drive plunger lever return spring and the drive end housing to the starter frame. Ensure the stop ring retainer is seated properly in the drive housing.
9. Install brush holder. Insert brushes in holder and install brush springs. Positive brush leads should be positioned in their respective slots to prevent grounding.
10. Install the brush end plate (be certain end plate insulator is positioned properly on end plate).
11. Install the two through bolts to the starter frame. Tighten to 6.21-8.47 N·m (55-75 in-lb). Install pivot pin.
12. Install starter drive plunger lever cover and tighten retaining screw.

DISASSEMBLY AND ASSEMBLY (Continued)

13. Check the starter no-load current draw.

SPECIFICATIONS

Refer to the following chart.

POSITIVE ENGAGEMENT STARTER

Positive Engagement Starter Motor				Starter Brushes				
Dia. mm (Inches)	Current Draw Under Normal Load (Amps)	Normal Engine Cranking Speed (RPM)	Current Draw No. Load (Amps)	Mfg. Length mm (Inches)	Wear Limit mm (Inches)	Spring Tension kg (Ounces)	Through Bolt Torque N-m (In-Lbs)	Mounting Bolt Torque N-m (Ft-Lbs)
101.60 (4)	150-200	180-250	80	12.2 (0.50)	6.35 (0.25)	2.27 (80)	6.21-8.47 (55-75)	21.27 (15-20)

Maximum Commutator runout is 0.1270mm (0.005 inch). Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

SPECIAL SERVICE TOOLS

Tool Number	Description
TOOL 10044-A	Generator Pole Screw Wrench
TOOL 4201-C	Dial Indicator

CJ3169-2A

SPECIAL SERVICE TOOLS

Refer to the following chart.

ROTUNDA EQUIPMENT

Tool Number	Description
078-00005	Starting and Charging Tester

CJ3683-1A

Starter Drive/Bendix: Technical Service Bulletins Starter Solenoids and Drives - Obsolete Parts Return

Article No. 93-26-12

^ SERVICE PARTS RETURN OF OBSOLETE STARTER SOLENOIDS AND STARTER MOTOR DRIVES - ALL SOLENOIDS, BUT ONLY STARTER DRIVES WITH PACKAGING DATE CODES BEFORE "01 1693"

^ SERVICE STARTER - SERVICE PARTS RETURN OF OBSOLETE STARTER SOLENOIDS AND STARTER MOTOR DRIVES - ALL SOLENOIDS, BUT ONLY STARTER DRIVES WITH PACKAGING DATE CODES BEFORE "011693"

FORD: 1989-94 THUNDERBIRD 1990-94 CROWN VICTORIA, TAURUS 1991-94 TEMPO

LINCOLN-MERCURY: 1989-94 COUGAR, TOWN CAR 1990 MARK VII 1990-94 GRAND MARQUIS, SABLE 1991 TOPAZ

LIGHT TRUCK: 1990 BRONCO 1990-94 AEROSTAR, F-150-350 SERIES 1991-94 RANGER 1992-94 ECONOLINE

ISSUE: Improved starter solenoid and starter drives replace the obsolete parts.

ACTION: Remove the obsolete parts from your dealership's inventory. All of the starter solenoids (E90Z-11390-B) regardless of build date and the obsolete starter drives (F2TZ-11002-A and F2TZ-11002-C) with packaging date codes before "011693" should be returned to your facing PDC within thirty

(30) days of this TSB.

1. Sort dealership stock of F2TZ-11002-A and F2TZ-11002-C. Receivals with a packaging date code of 011693 or later will contain OK stock and may be released for normal sale.

2. Packaging date codes before 011693 are suspect and should be rejected and returned to your facing PDC using the least expensive transportation.

3. If claim is processed electronically using DOES II, use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

4. In the "Remarks" section, write "Returned Per TSB 93-26-12".

5. Issue Form 291 to reject suspect stock.

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts must have been purchased from FCSD in accordance with Policy And Procedure Bulletin 4000.

CREDIT Credit for parts and prepaid freight costs will be issued.

NOTE: THE PART NUMBER HAS NOT BEEN CHANGED. OBSOLETE STOCK CAN ONLY BE DETERMINED VIA PACKAGING DATE

CODE. DO NOT RETURN PARTS HAVING PACKAGING DATE CODES OF "011693" OR LATER.

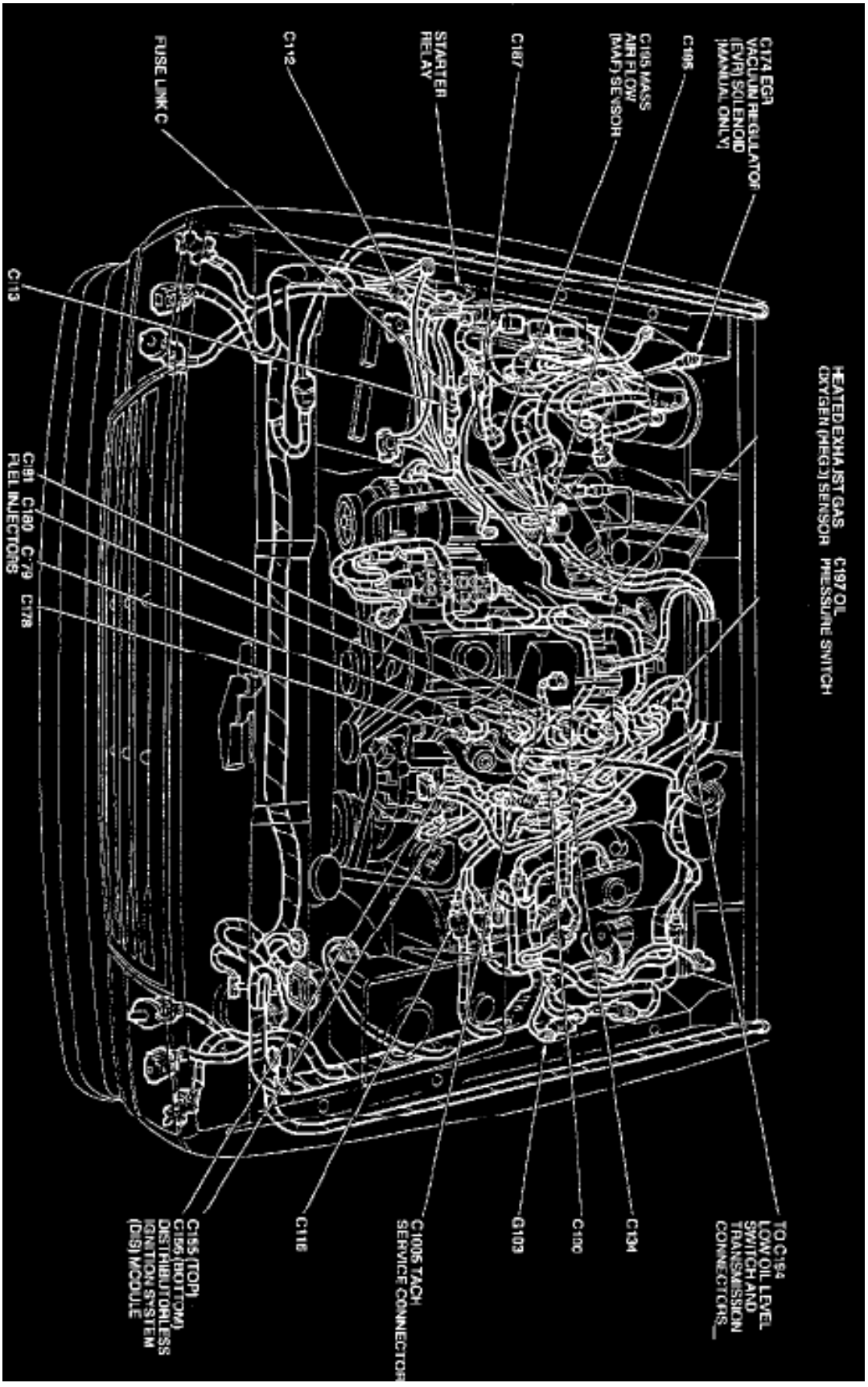
NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

OTHER APPLICABLE ARTICLES:NONE WARRANTY STATUS:

INFORMATION ONLY

OASIS CODES: 203100

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Starting and Charging > Starting System > Starter Relay > Component Information > Locations

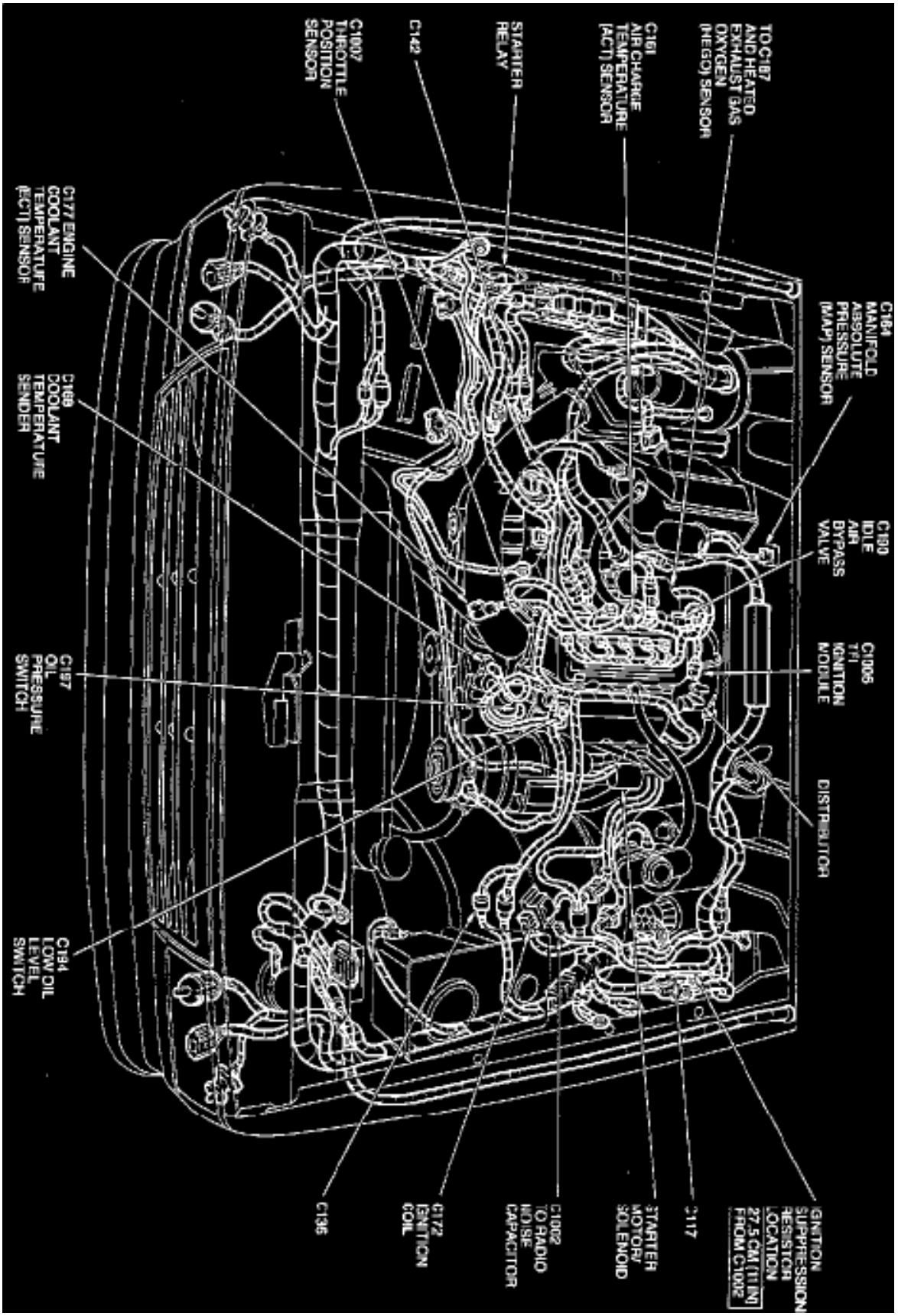


Starter Relay: Locations

Engine Compartment Components.

RH Fender Apron, Near Battery

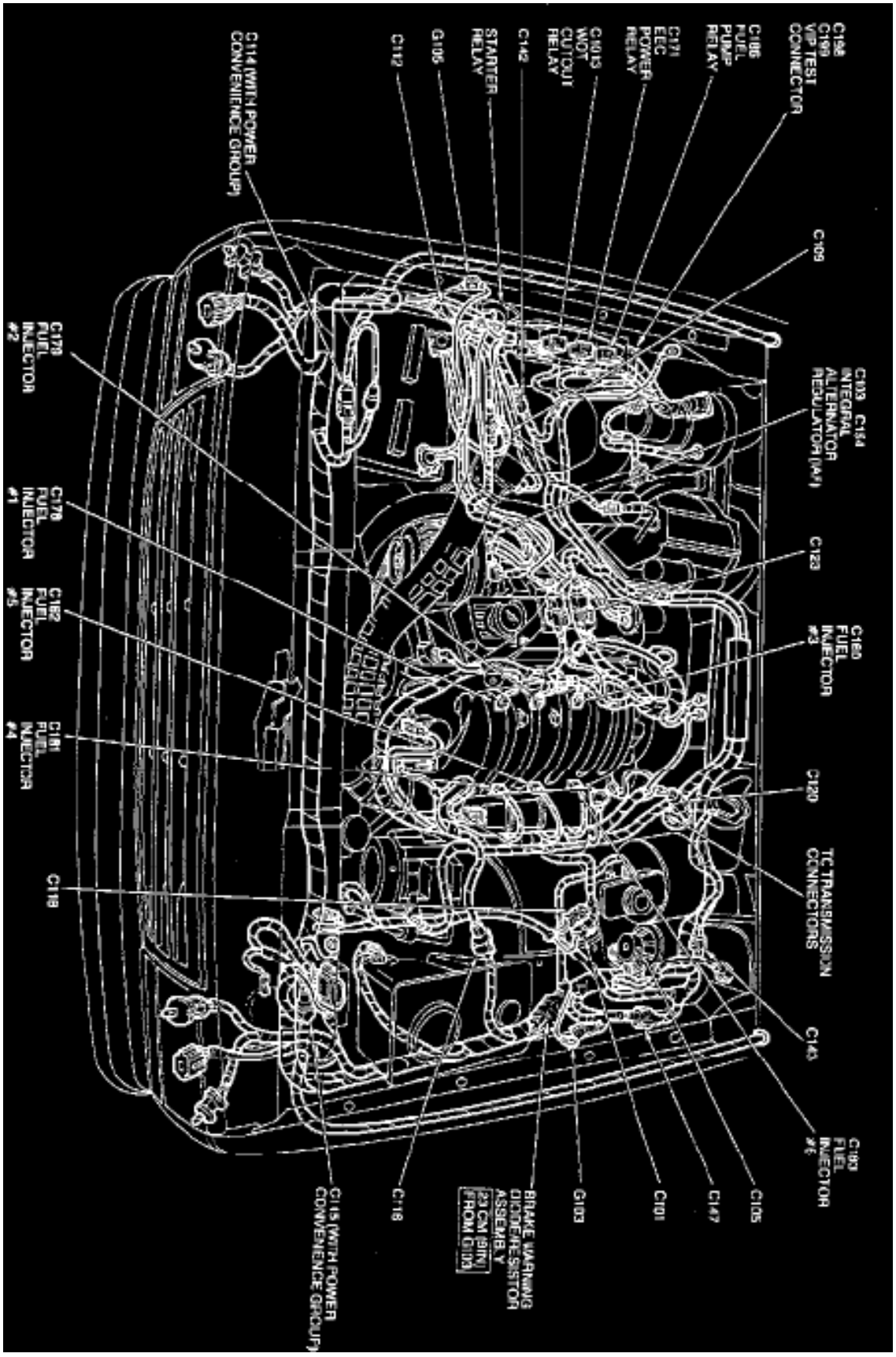
Applicable to: 2.3L/4-140


C184 MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
C180 IDLE AIR BYPASS VALVE
C1005 TFI IGNITION MODULE
DISTRIBUTOR
TO C187 AND HEATED EXHAUST GAS OXYGEN (HEGO) SENSOR
C161 AIR CHARGE TEMPERATURE (ACT) SENSOR
STARTER RELAY
C142
C1007 THROTTLE POSITION SENSOR
C177 ENGINE COOLANT TEMPERATURE (ECT) SENSOR
C189 COOLANT TEMPERATURE SENDER
C197 OIL PRESSURE SWITCH
C194 LOW OIL LEVEL SWITCH
C136
C172 IGNITION COIL
C1002 TO RADIO NOISE CAPACITOR
C117
STARTER MOTOR SOLENOID
IGNITION SUPPRESSION RESISTOR LOCATION 27.5 CM (11 IN) FROM C1002

Engine Compartment Components.

RH Fender Apron, Near Battery

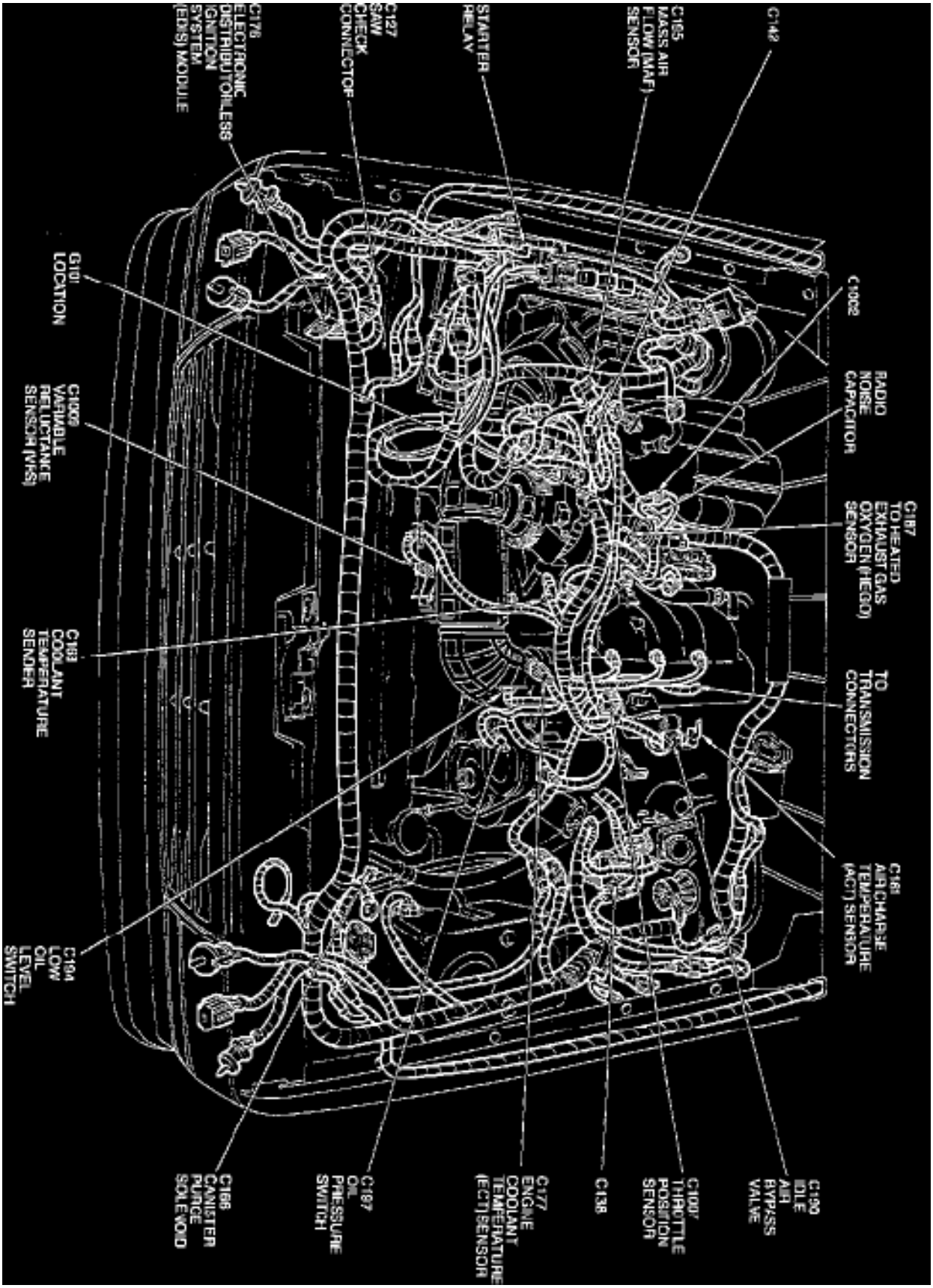
Applicable to: 2.9L/V6-179


C158
C199
VIP TEST
CONNECTOR
C186
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C161
NOT
CUTOUT
RELAY
C142
STARTER
RELAY
G105
C112
C114 (WITH POWER
CONVENIENCE GROUP)
C109
C103 C154
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
C123
C160
FUEL
INJECTOR
#3
C120
TC TRANSMISSION
CONNECTORS
C145
C193
FUEL
INJECTOR
#6
C105
C147
C101
G103
BRAKE WARNING
DIODE/RESISTOR
ASSEMBLY
23 CM (9IN)
FROM G103
C118
C115 (WITH POWER
CONVENIENCE GROUP)
C179
FUEL
INJECTOR
#2
C178
FUEL
INJECTOR
#1
C182
FUEL
INJECTOR
#5
C181
FUEL
INJECTOR
#4
C118

Engine Compartment Components.

RH Fender Apron, Near Battery

Applicable to: 3.0L/V6-181


C142
C165
MASS AIR
FLOW (MAF)
SENSOR
STARTER
RELAY
C127
SAW
CHECK
CONNECTOR
C176
ELECTRONIC
DISTRIBUTORLESS
IGNITION
SYSTEM
(EDIS) MODULE
G101
LOCATION
C1002
RADIO
NOISE
CAPACITOR
C187
TO HEATED
EXHAUST GAS
OXYGEN (HEGO)
SENSOR
C1009
VARIABLE
RELUCTANCE
SENSOR (VRS)
C163
COOLANT
TEMPERATURE
SENDER
TO
TRANSMISSION
CONNECTORS
C168
AIR CHARGE
TEMPERATURE
(ACT) SENSOR
C194
LOW
OIL
LEVEL
SWITCH
C166
CANISTER
PURGE
SOLENOID
C187
OIL
PRESSURE
SWITCH
C177
ENGINE
COOLANT
TEMPERATURE
(ECT) SENSOR
C138
C1007
THROTTLE
POSITION
SENSOR
C190
IDLE
AIR
BYPASS
VALVE

Engine Compartment Components.

RH Fender Apron, Near Battery

Applicable to: 4.0L/V6-244

Starter Solenoid: Technical Service Bulletins Starter Solenoids and Drives - Obsolete Parts Return

Article No. 93-26-12

^ SERVICE PARTS RETURN OF OBSOLETE STARTER SOLENOIDS AND STARTER MOTOR DRIVES - ALL SOLENOIDS, BUT ONLY STARTER DRIVES WITH PACKAGING DATE CODES BEFORE "01 1693"

^ SERVICE STARTER - SERVICE PARTS RETURN OF OBSOLETE STARTER SOLENOIDS AND STARTER MOTOR DRIVES - ALL SOLENOIDS, BUT ONLY STARTER DRIVES WITH PACKAGING DATE CODES BEFORE "011693"

FORD: 1989-94 THUNDERBIRD 1990-94 CROWN VICTORIA, TAURUS 1991-94 TEMPO

LINCOLN-MERCURY: 1989-94 COUGAR, TOWN CAR 1990 MARK VII 1990-94 GRAND MARQUIS, SABLE 1991 TOPAZ

LIGHT TRUCK: 1990 BRONCO 1990-94 AEROSTAR, F-150-350 SERIES 1991-94 RANGER 1992-94 ECONOLINE

ISSUE: Improved starter solenoid and starter drives replace the obsolete parts.

ACTION: Remove the obsolete parts from your dealership's inventory. All of the starter solenoids (E90Z-11390-B) regardless of build date and the obsolete starter drives (F2TZ-11002-A and F2TZ-11002-C) with packaging date codes before "011693" should be returned to your facing PDC within thirty

(30) days of this TSB.

1. Sort dealership stock of F2TZ-11002-A and F2TZ-11002-C. Receivals with a packaging date code of 011693 or later will contain OK stock and may be released for normal sale.

2. Packaging date codes before 011693 are suspect and should be rejected and returned to your facing PDC using the least expensive transportation.

3. If claim is processed electronically using DOES II, use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

4. In the "Remarks" section, write "Returned Per TSB 93-26-12".

5. Issue Form 291 to reject suspect stock.

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts must have been purchased from FCSD in accordance with Policy And Procedure Bulletin 4000.

CREDIT Credit for parts and prepaid freight costs will be issued.

NOTE: THE PART NUMBER HAS NOT BEEN CHANGED. OBSOLETE STOCK CAN ONLY BE DETERMINED VIA PACKAGING DATE

CODE. DO NOT RETURN PARTS HAVING PACKAGING DATE CODES OF "011693" OR LATER.

NOTE: REPLACEMENT STOCK IS AVAILABLE FOR ORDERING IMMEDIATELY.

OTHER APPLICABLE ARTICLES:NONE WARRANTY STATUS:

INFORMATION ONLY

OASIS CODES: 203100

Starter Solenoid: Specifications Solenoid Specifications

Solenoid Specifications

Hold-In Windings Pull-in Windings

Identification Number 1998440 13-18 A 11-18 A

1998559 13-19 A 23-30 A

1998583 13-19 A 23-30 A

1998584 13-19 A 23-30 A

1998588 14-18 A 26-30 A

1998589 14-18 A 26-30 A

9000735 13-15 A 31-36 A

10455016 13-19 A 23-30 A

10455017 13-19 A 23-30 A

10455018 13-19 A 23-30 A

10455024 10-20 A 50-65 A

10455025 10-20 A 50-65 A

10455048 10-20 A 50-65 A

Circuit Breaker: Testing and Inspection

The 6 amp circuit breaker is located in the fuse panel. Two separate tests are necessary to check for correct circuit breaker operation. Remove circuit breaker from fuse panel and connect tester leads to circuit breaker.

TEST 1

1. Short tester leads together and adjust current draw until it equals circuit breaker rating.

2. Connect circuit breaker to tester.

3. Leave circuit breaker connected to tester for ten minutes, holding current reading on tester at rated current. If circuit breaker opens before ten minutes has elapsed, replace circuit breaker.

TEST 2

1. Short tester leads together and adjust current draw until it is twice the rated current.

2. Connect circuit breaker to tester, holding current reading on tester at twice the rated current.

3. If tester reading does not drop to zero within 30 seconds, replace circuit breaker.

Diode: Technical Service Bulletins Electrical Diode - Identification and Replacement

Article No. 96-24-6

11/18/96

WIRING - ELECTRICAL DIODE IDENTIFICATION AND SERVICE REPLACEMENTS

FORD: 1984-86 LTD 1984-88 EXP 1984-94 TEMPO 1984-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

LINCOLN-MERCURY: 1984-86 MARQUIS 1984-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1984-97 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1986-97 SABLE 1987-89 TRACER 1991-94 CAPRI 1991-97 TRACER 1995-97 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1983-97 RANGER 1984-90 BRONCO II 1984-97 ECONOLINE, F-150-350 SERIES 1986-97 AEROSTAR 1991-97 EXPLORER 1995-97 WINDSTAR

MEDIUM/HEAVY TRUCK: 1984-91 C SERIES, CL-CLT-9000 SERIES 1984-97 F & B SERIES, L SERIES 1986-97 CARGO SERIES 1996-97 AEROMAX, LOUISVILLE

This TSB article is being republished in its entirety to update the applicable model years.

ISSUE: Electrical system concerns that are due to diode failure may be serviced with an approved Ford service diode. Some electrical diodes used in early production vehicles are color coded for the purpose of size identification while others are stamped with a manufacture number. All Ford service diodes and current production diodes are identified by manufacture number.

ACTION: If service is required, refer to the appropriate model/year Electrical and Vacuum Troubleshooting Manual (EVTM) to determine the size and location of the diode(s). Refer to the following Electrical Diode Application Chart for the correct service part number.

NOTE:

IF THE DIODE REQUIRING REPLACEMENT DOES NOT HAVE THE SAME RATING AS LISTED IN THE APPLICATION CHART, USE THE NEXT HIGHER RATED DIODE.

PRODUCTION IDENTIFICATION		
Old Design	Current Design	Service Part Identification
1.0 Amp-200V (color gray)	1.0 Amp-200V (stamped 1N4003)	1.0 Amp-400V E8DZ-10C912-A (stamped 1N4004)
1.0 Amp-50V (color black)	1.0 Amp-400V (stamped 1N4004)	1.0 Amp 400V E8DZ-10C912-A (stamped 1N4004)
3.0 Amp-50V (color orange)	6.0 Amp-400V (stamped MR754)	6.0 Amp-400V E8DZ-10C912-B (stamped MR754)
6.0 Amp-400V (color blue)	6.0 Amp-400V (stamped MR754)	6.0 Amp-400V E8DZ-10C912-B (stamped MR754)

ELECTRICAL DIODE APPLICATION CHART

PART NUMBER PART NAME

E8DZ-10C912-A Diode - 1.0 Amp - 400V

E8DZ-10C912-B Diode - 6.0 Amp - 400V

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 89-2-8

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203000, 203200, 2770

Diode: Locations Courtesy Lamp Diode (Regular Cab)

Top LH Corner Of Cab Roof, Near Cargo Lamp

Diode: Locations Courtesy Lamp Diode (Supercab)

Center Rear Of Cab Roof, Near Cargo Lamp

Audio System - Whining/Buzzing Noise From Speakers

Article No. 02-16-4

08/19/02

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO-WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO-WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994 TEMPO 1990-1997 ESCORT, PROBE, THUNDERBIRD 1990-1998 MUSTANG 1990-1999 TAURUS 1990-2002 CROWN VICTORIA 1997-1999 CONTOUR 2001 TAURUS 1990 BRONCO II 1990-1996 BRONCO 1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350 1990-1999 F-250 LD 1990-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2003 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION, EXPLORER SPORT TRAC, EXPLORER SPORT 2001-2002 ESCAPE

LINCOLN: 1990-1992 MARK VII 1990-1994 CONTINENTAL 1990-2002 TOWN CAR 1998-2003 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1990-1994 TOPAZ 1990-1997 COUGAR 1990-1999 SABLE 1990-2002 GRAND MARQUIS 1991-1997 TRACER 1997-1999 MYSTIQUE 2001 SABLE 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

TSB 01-7-3 is being republished in its entirety to update the model year coverage and vehicle line coverage.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists, then refer to the Service Procedure for repair details.

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

NOTE

IF THE VEHICLE HAS AN ELECTRONIC RETURNLESS FUEL SYSTEM, DO NOT INSTALL A RFI FILTER INLINE TO THE FUEL PUMP . ONLY VEHICLES WITH MECHANICAL RETURNLESS FUEL SYSTEMS (PRESSURE REGULATOR IN THE TANK), OR SYSTEMS WITH THE PRESSURE REGULATOR ON THE FUEL RAIL SHOULD BE APPROVED FOR THE RFI FILTER INSTALLATION.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

Parts Block

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 01-7-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

021604AA Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1997 Thunderbird/Cougar

021604BA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1999 And 2001 Taurus/Sable

021604CA Diagnose And Install RFI 1.2 Hrs.

Filter 1992-1997 Crown Victoria/Grand Marquis/Town Car

021604CB Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1991 Crown Victoria/Grand Marquis/Town Car

021604CC Diagnose And Install RFI 2.2 Hrs.

Filter 1998-2002 Crown Victoria/Grand Marquis

021604DA Diagnose And Install RFI 1.9 Hrs.

Filter 1998-2002 Town Car

021604EA Diagnose And Install RFI 1.7 Hrs.

Filter 1990-1998 Mustang

021604FA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1998 Mustang

021604GA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1994 Continental

021604HA Diagnose And Install RFI 1.6 Hrs.

Filter 1990 Escort

021604IA Diagnose And Install RFI 0.8 Hr.

Filter 1991-1996 Escort Tracer

021604IB Diagnose And Install RFI 1.6 Hrs.

Filter 1997 Escort/Tracer

021604JA Diagnose And Install RFI 0.8 Hr.

Filter 1997 Contour/Mystique

021604JB Diagnose And Install RFI 1.8 Hrs.

Filter 1998-1999 Contour/Mystique

021604KA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1992 Mark VII

021604LA Diagnose And Install RFI 0.8 Hr.

Filter 1990-1992 Probe

021604LB Diagnose And Install RFI 1.8 Hrs.

Filter 1993-1997 Probe

021604MA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-2002 Econoline Single Fuel Tank

021604MB Diagnose And Install RFI 2.6 Hrs.

Filter 1990-1991 Econoline Both Fuel Tanks

021604NA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1996 Bronco

0216040A Diagnose And Install RFI 1.8 Hrs.

Filter 1991-1994 Explorer

0216040B Diagnose And Install RFI 1.5 Hrs.

Filter 1995-2002 Explorer

021604PA Diagnose And Install RFI 1.5 Hrs.

Filter 1997-2002 Mountaineer

0216040A Diagnose And Install RFI 1.4 Hrs.

Filter 1995-2002 Windstar

021604RA Diagnose And Install RFI 1.9 Hrs.

Filter 1993-2002 Villager

021604SA Diagnose And Install RFI 1.7 Hrs.

Filter 1997-2003 Expedition/Navigator

021604TA Diagnose And Install RFI 1.3 Hrs.

Filter 1990-1997 Ranger Standard Cab

021604TB Diagnose And Install RFI 1.8 Hrs.

Filter 1990-1997 Ranger Super Cab

021604TC Diagnose And Install RFI 1.8 Hrs.

Filter 1998-2002 Ranger 4X4

021604TD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 Ranger 4X2

021604UA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1997 Aerostar

021604VA Diagnose And Install RFI 1.9 Hrs.

Filter 1990 Bronco II

021604WA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Rear

021604WB Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Front

021604WC Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Both Tanks

021604WD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 F-150

021604XA Diagnose And Install RFI 1.6 Hrs.

Filter 2000-2002 Excursion

021604XB Diagnose And Install RFI 1.6 Hrs.

Filter 1999-2002 Super Duty F-Series: Front Tank

021604XC Diagnose And Install RFI 1.5 Hrs.

Filter 1999-2002 Super Duty F-Series: Rear Tank

021604XD Diagnose And Install RFI 2.7 Hrs.

Filter 1999-2002 Super Duty F-Series: Both Tanks

021604YA Diagnose And Install RFI 0.8 Hr.

Filter 2001-2002 Escape

021604ZA Diagnose And Install RFI 1.9 Hrs.

Filter 2002 Blackwood

DEALER CODING

CONDITION

BASIC PART NO. CODE

18B925 42

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Service Procedure

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

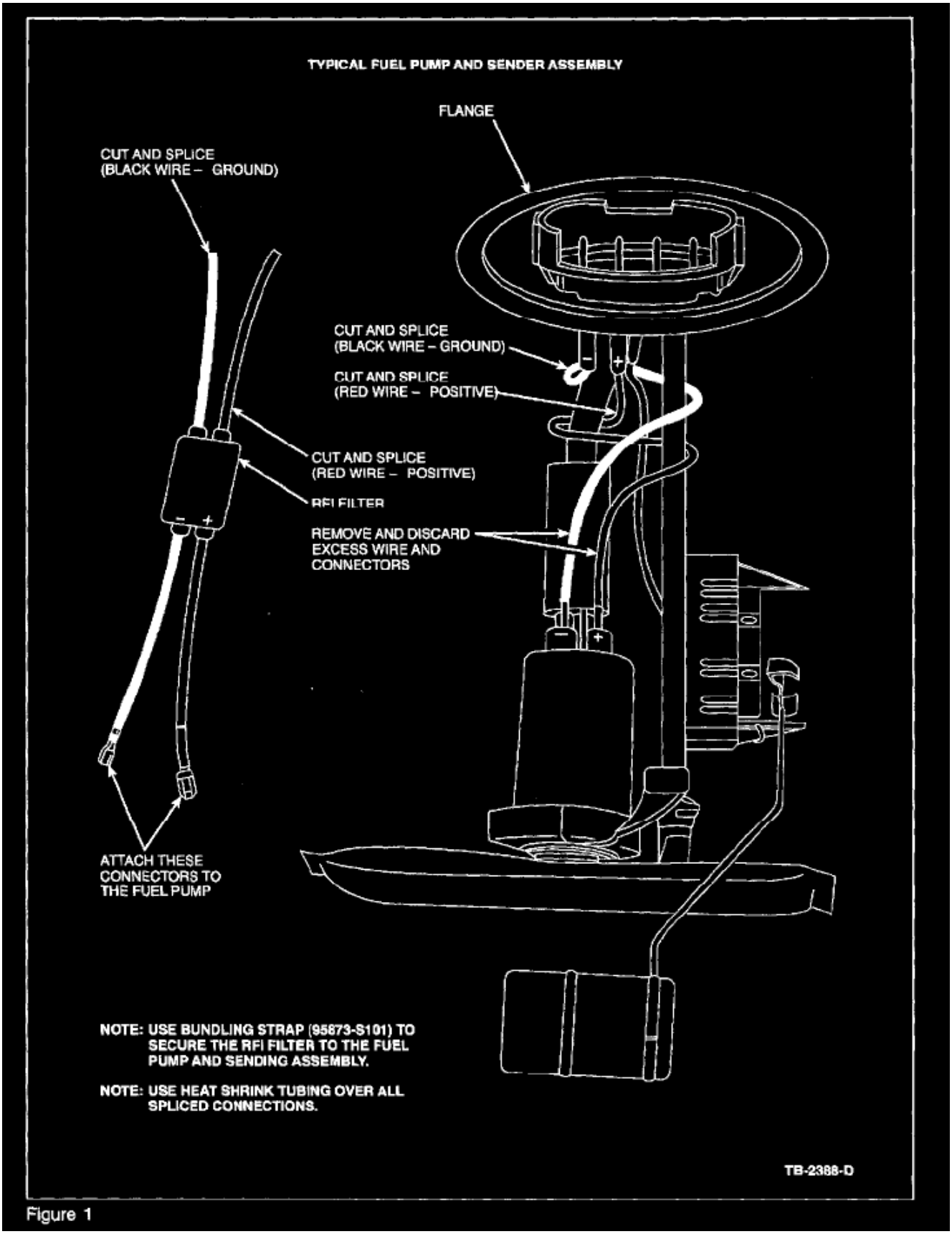


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-AA) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

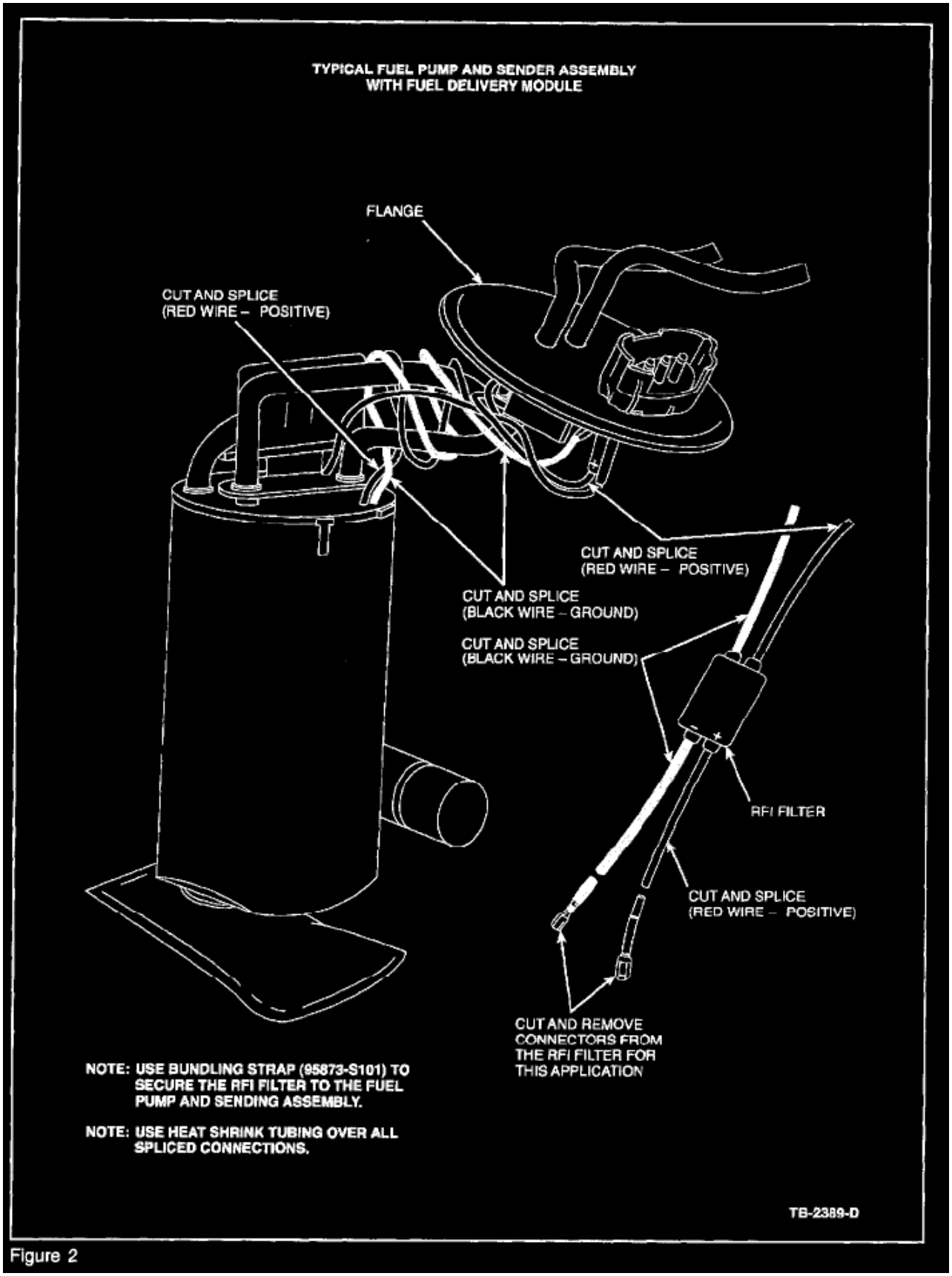


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over solder connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and Vacuum Troubleshooting Manual (EVTM) (or other service literature) for the location of the fuel pump ground. If ground is more than 0.9m (3 ') from the tank, cut wire and ground fuel pump end within 0.9m (3 ') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop Manual.

Audio System - Whining/Buzzing Noise From Speakers

Article No. 02-16-4

08/19/02

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO-WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO-WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994 TEMPO 1990-1997 ESCORT, PROBE, THUNDERBIRD 1990-1998 MUSTANG 1990-1999 TAURUS 1990-2002 CROWN VICTORIA 1997-1999 CONTOUR 2001 TAURUS 1990 BRONCO II 1990-1996 BRONCO 1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350 1990-1999 F-250 LD 1990-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2003 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION, EXPLORER SPORT TRAC, EXPLORER SPORT 2001-2002 ESCAPE

LINCOLN: 1990-1992 MARK VII 1990-1994 CONTINENTAL 1990-2002 TOWN CAR 1998-2003 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1990-1994 TOPAZ 1990-1997 COUGAR 1990-1999 SABLE 1990-2002 GRAND MARQUIS 1991-1997 TRACER 1997-1999 MYSTIQUE 2001 SABLE 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

TSB 01-7-3 is being republished in its entirety to update the model year coverage and vehicle line coverage.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists, then refer to the Service Procedure for repair details.

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

NOTE

IF THE VEHICLE HAS AN ELECTRONIC RETURNLESS FUEL SYSTEM, DO NOT INSTALL A RFI FILTER INLINE TO THE FUEL PUMP . ONLY VEHICLES WITH MECHANICAL RETURNLESS FUEL SYSTEMS (PRESSURE REGULATOR IN THE TANK), OR SYSTEMS WITH THE PRESSURE REGULATOR ON THE FUEL RAIL SHOULD BE APPROVED FOR THE RFI FILTER INSTALLATION.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

Parts Block

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 01-7-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

021604AA Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1997 Thunderbird/Cougar

021604BA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1999 And 2001 Taurus/Sable

021604CA Diagnose And Install RFI 1.2 Hrs.

Filter 1992-1997 Crown Victoria/Grand Marquis/Town Car

021604CB Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1991 Crown Victoria/Grand Marquis/Town Car

021604CC Diagnose And Install RFI 2.2 Hrs.

Filter 1998-2002 Crown Victoria/Grand Marquis

021604DA Diagnose And Install RFI 1.9 Hrs.

Filter 1998-2002 Town Car

021604EA Diagnose And Install RFI 1.7 Hrs.

Filter 1990-1998 Mustang

021604FA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1998 Mustang

021604GA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1994 Continental

021604HA Diagnose And Install RFI 1.6 Hrs.

Filter 1990 Escort

021604IA Diagnose And Install RFI 0.8 Hr.

Filter 1991-1996 Escort Tracer

021604IB Diagnose And Install RFI 1.6 Hrs.

Filter 1997 Escort/Tracer

021604JA Diagnose And Install RFI 0.8 Hr.

Filter 1997 Contour/Mystique

021604JB Diagnose And Install RFI 1.8 Hrs.

Filter 1998-1999 Contour/Mystique

021604KA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1992 Mark VII

021604LA Diagnose And Install RFI 0.8 Hr.

Filter 1990-1992 Probe

021604LB Diagnose And Install RFI 1.8 Hrs.

Filter 1993-1997 Probe

021604MA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-2002 Econoline Single Fuel Tank

021604MB Diagnose And Install RFI 2.6 Hrs.

Filter 1990-1991 Econoline Both Fuel Tanks

021604NA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1996 Bronco

0216040A Diagnose And Install RFI 1.8 Hrs.

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0216040A Diagnose And Install RFI 1.4 Hrs.

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Filter 1990-1997 Ranger Super Cab

021604TC Diagnose And Install RFI 1.8 Hrs.

Filter 1998-2002 Ranger 4X4

021604TD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 Ranger 4X2

021604UA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1997 Aerostar

021604VA Diagnose And Install RFI 1.9 Hrs.

Filter 1990 Bronco II

021604WA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Rear

021604WB Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Front

021604WC Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Both Tanks

021604WD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 F-150

021604XA Diagnose And Install RFI 1.6 Hrs.

Filter 2000-2002 Excursion

021604XB Diagnose And Install RFI 1.6 Hrs.

Filter 1999-2002 Super Duty F-Series: Front Tank

021604XC Diagnose And Install RFI 1.5 Hrs.

Filter 1999-2002 Super Duty F-Series: Rear Tank

021604XD Diagnose And Install RFI 2.7 Hrs.

Filter 1999-2002 Super Duty F-Series: Both Tanks

021604YA Diagnose And Install RFI 0.8 Hr.

Filter 2001-2002 Escape

021604ZA Diagnose And Install RFI 1.9 Hrs.

Filter 2002 Blackwood

DEALER CODING

CONDITION

BASIC PART NO. CODE

18B925 42

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Service Procedure

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

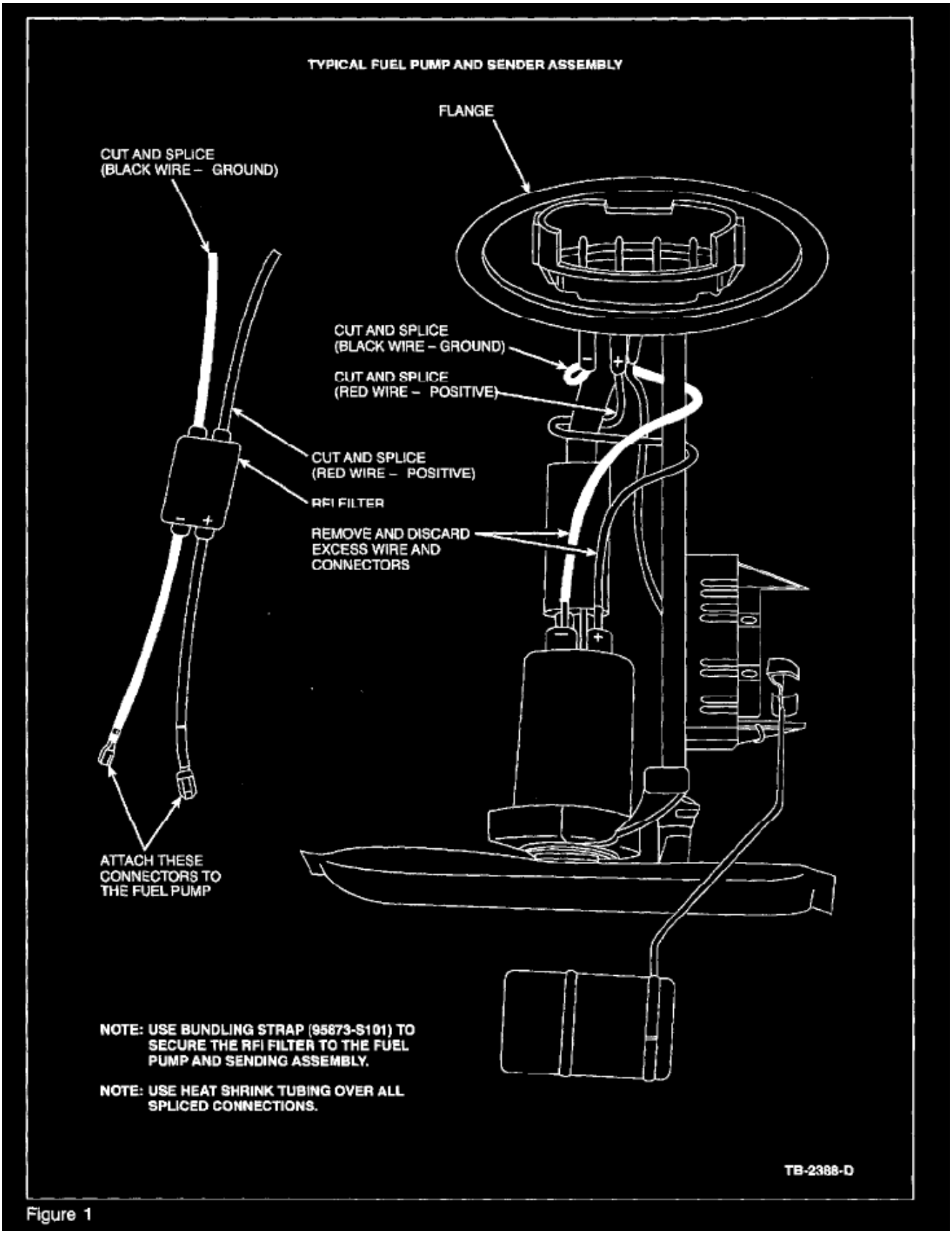

Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-AA) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

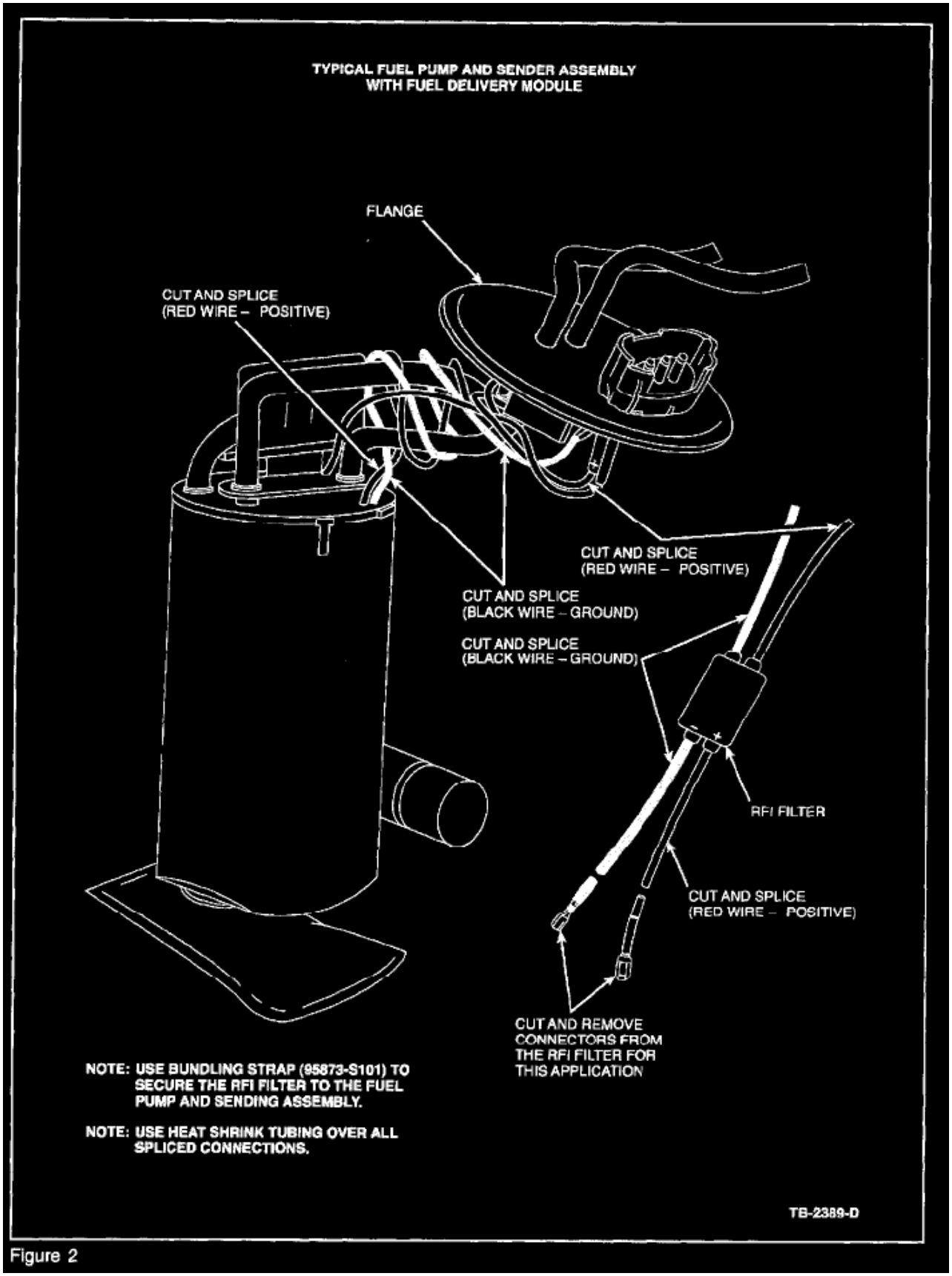

Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over solder connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

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WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

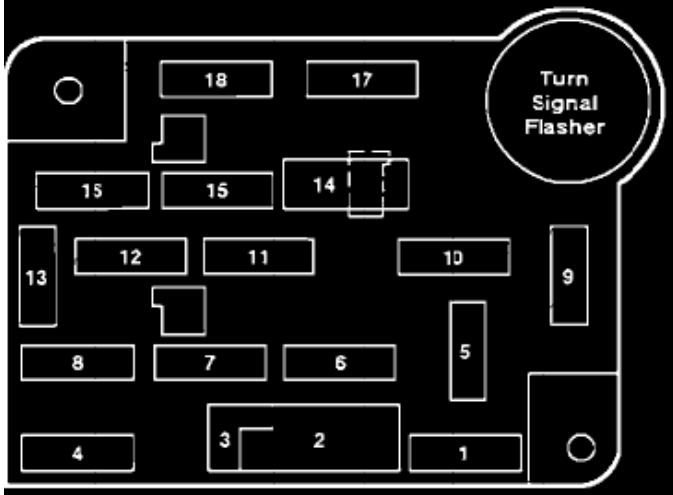
INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and Vacuum Troubleshooting Manual (EVTM) (or other service literature) for the location of the fuel pump ground. If ground is more than 0.9m (3 ') from the tank, cut wire and ground fuel pump end within 0.9m (3 ') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop Manual.

Electronic Noise Suppressor: Locations

RH Side Of Engine, Near Ignition Coil



Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Fuse Position	Amps	Circuits Protected
1	15	Radio, Dome/Cargo Lamps
2	6 c.b.	Windshield Wipers
4	15	Stop/Hazard Lamps
5	15	Turn Lamps, Backup Lamps, Brake Fluid Level Sensor
6	—	Not Used
7	10	A/C Compressor Control
8	20	Horn
9	30	Air Conditioner/Heater
10	15	Lamps on Warning, Park/License Lamps
11	15	Radio, Electric Shift Control, Speed Contro
12	20 c.b.	Multi-Function Switch, Cigar Lighter, Power Lumbar Seats
13	10	Instrument Illumination
14	30 c.b.	Power Windows
15	20	Rear Anti-Lock Brakes
16	—	Not Used
17	15	Electric Shift Control, Warning Chime Module, Low Oil Level Relay, Instrument Cluster
18	10	HEGO

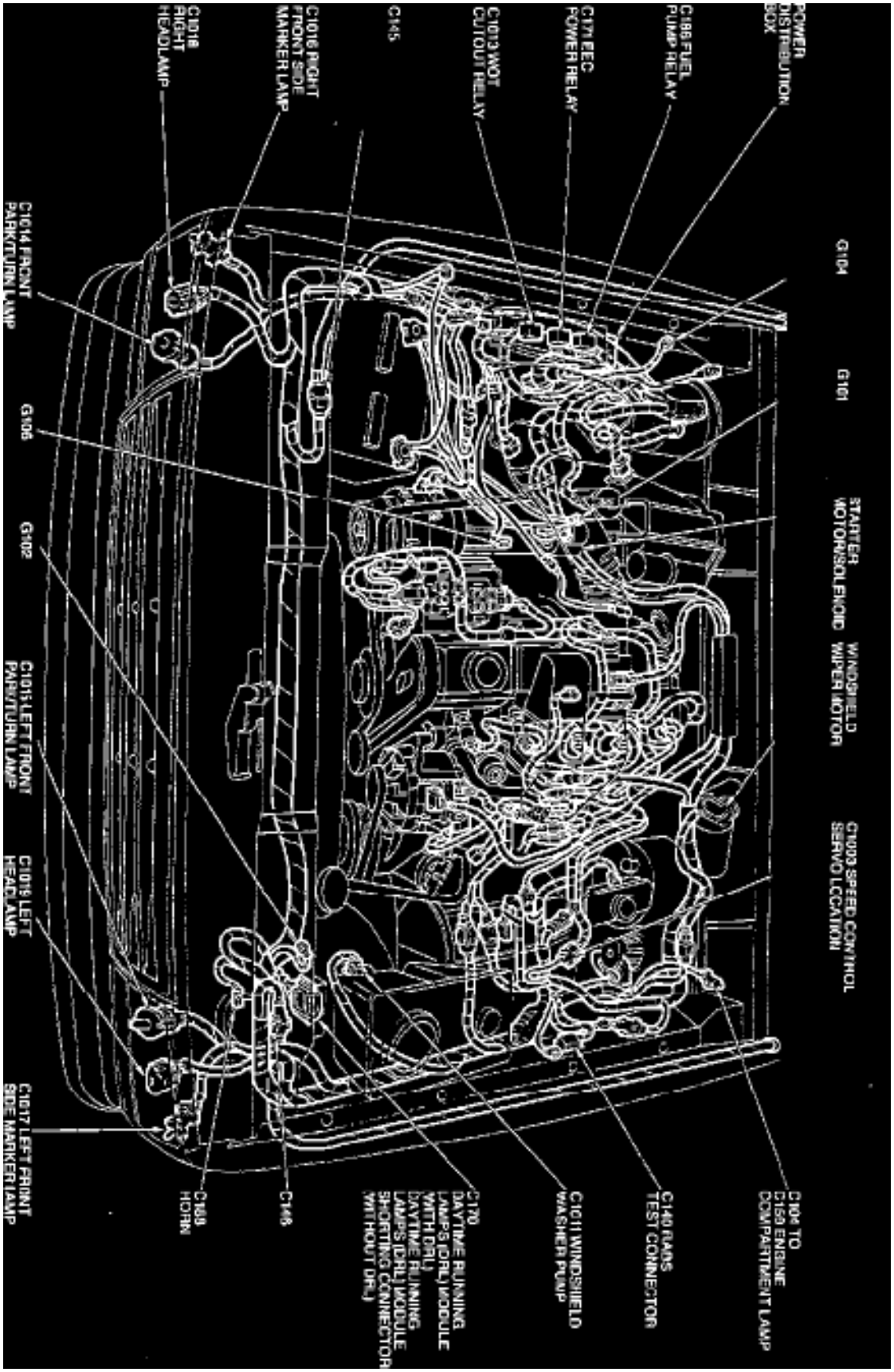
Power Distribution

The alternator is connected to maxi-fuses within the power distribution box which is then connected together with the Battery at the starter relay hot terminal. Circuits and components are protected by maxi-fuses. Low power circuits are also protected by fuses.

The Ignition Switch and Main Light Switch are powered at all times, as are Fuses 1, 4, 8, 10 and Circuit Breaker 12 in the Fuse Panel. The other fuses are powered through the Ignition Switch or the Main Light Switch.

Position 3 is not used and is covered by Circuit Breaker 2.

Fuse Panel Details

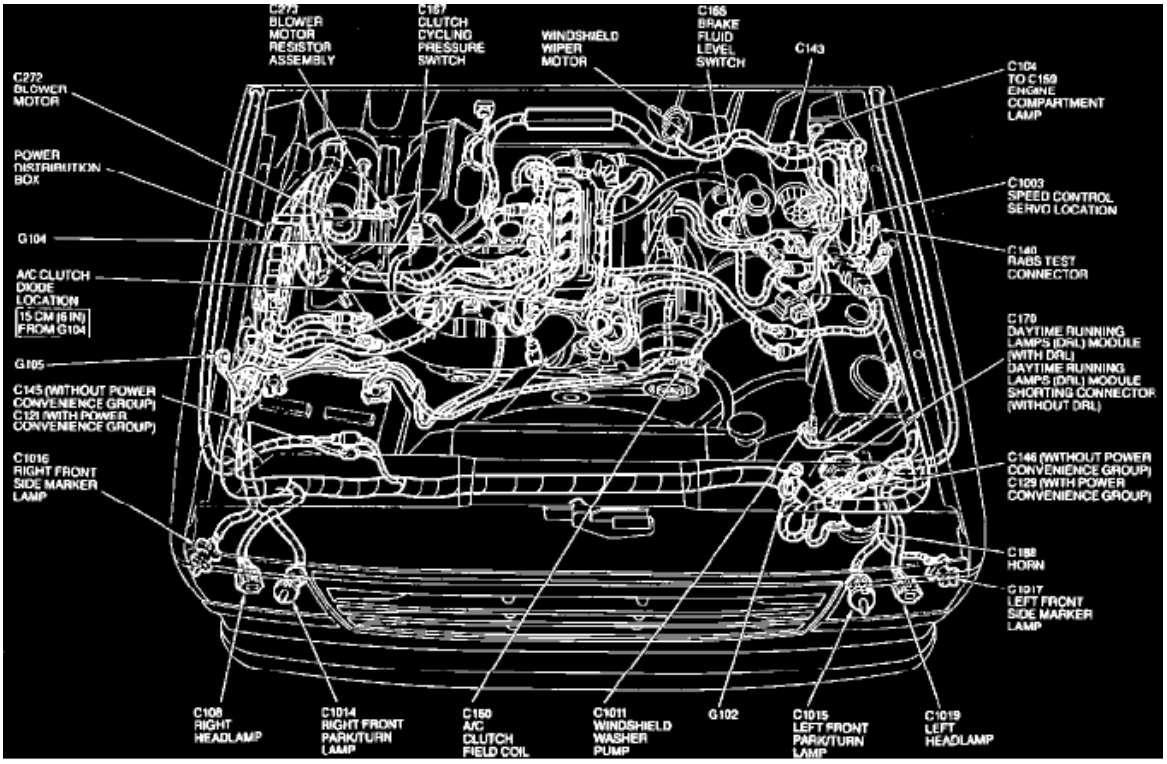

G104
G101
STARTER MOTOR/SOLENOID
WINDSHIELD WIPER MOTOR
C1003 SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C188 FUEL PUMP RELAY
C171 EEC POWER RELAY
C1013 WOT CUTOUT RELAY
C145
C1016 RIGHT FRONT SIDE MARKER LAMP
C1018 RIGHT HEADLAMP
C1014 FRONT PARK/TURN LAMP
G106
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP
C1017 LEFT FRONT SIDE MARKER LAMP
C169 HORN
C146
C170 DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL) DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C1011 WINDSHIELD WASHER PUMP
C140 RAINS TEST CONNECTOR
C104 TO C150 ENGINE COMPARTMENT LAMP

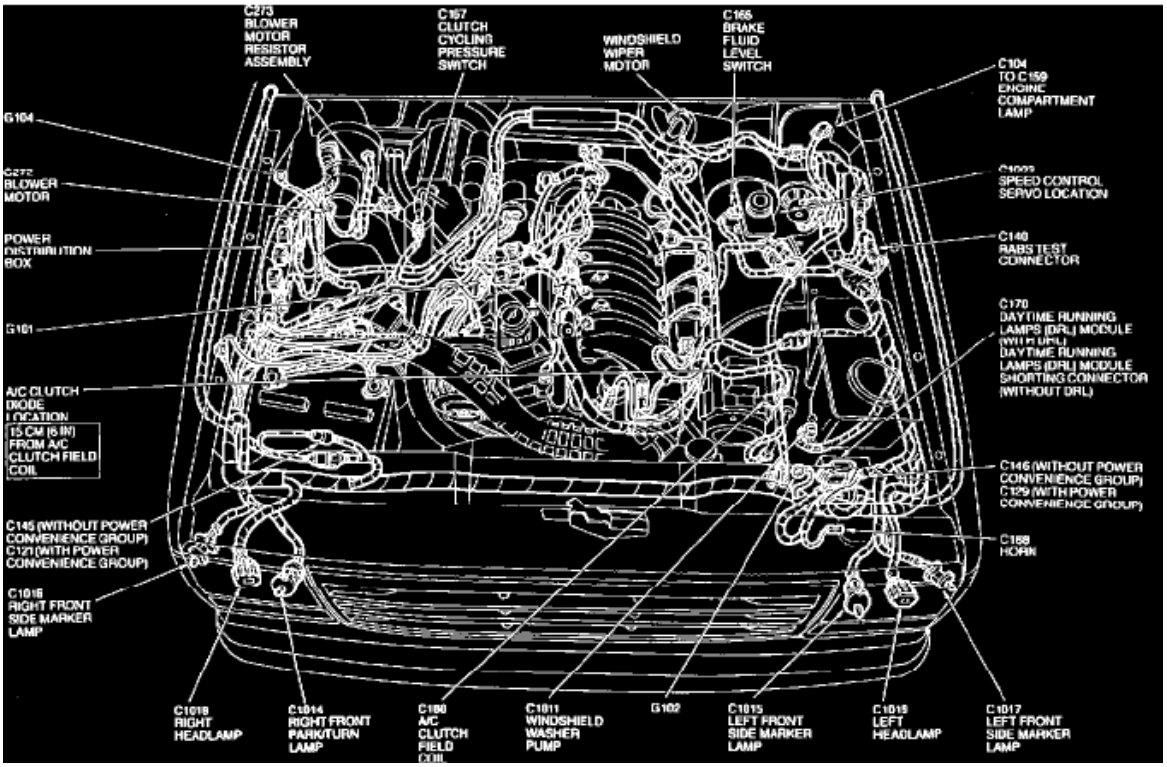
Fuse Block: Locations Power Distribution Box

Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

Applicable to: 2.3L/4-140


C272
BLOWER
MOTOR
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C143
C272
BLOWER
MOTOR
POWER
DISTRIBUTION
BOX
G104
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM G104
G105
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C104
TO C159
ENGINE
COMPARTMENT
LAMP
C1003
SPEED CONTROL
SERVO LOCATION
C140
RABS TEST
CONNECTOR
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C188
HORN
C1017
LEFT FRONT
SIDE MARKER
LAMP
C108
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
PARK/TURN
LAMP
C1019
LEFT
HEADLAMP


C272
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
G104
C272
BLOWER
MOTOR
POWER
DISTRIBUTION
BOX
G101
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM A/C
CLUTCH FIELD
COIL
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C104
TO C159
ENGINE
COMPARTMENT
LAMP
SPEED CONTROL
SERVO LOCATION
C140
RABS TEST
CONNECTOR
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C188
HORN
C1018
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD
COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
SIDE MARKER
LAMP
C1019
LEFT
HEADLAMP
C1017
LEFT FRONT
SIDE MARKER
LAMP

Engine Compartment Components.

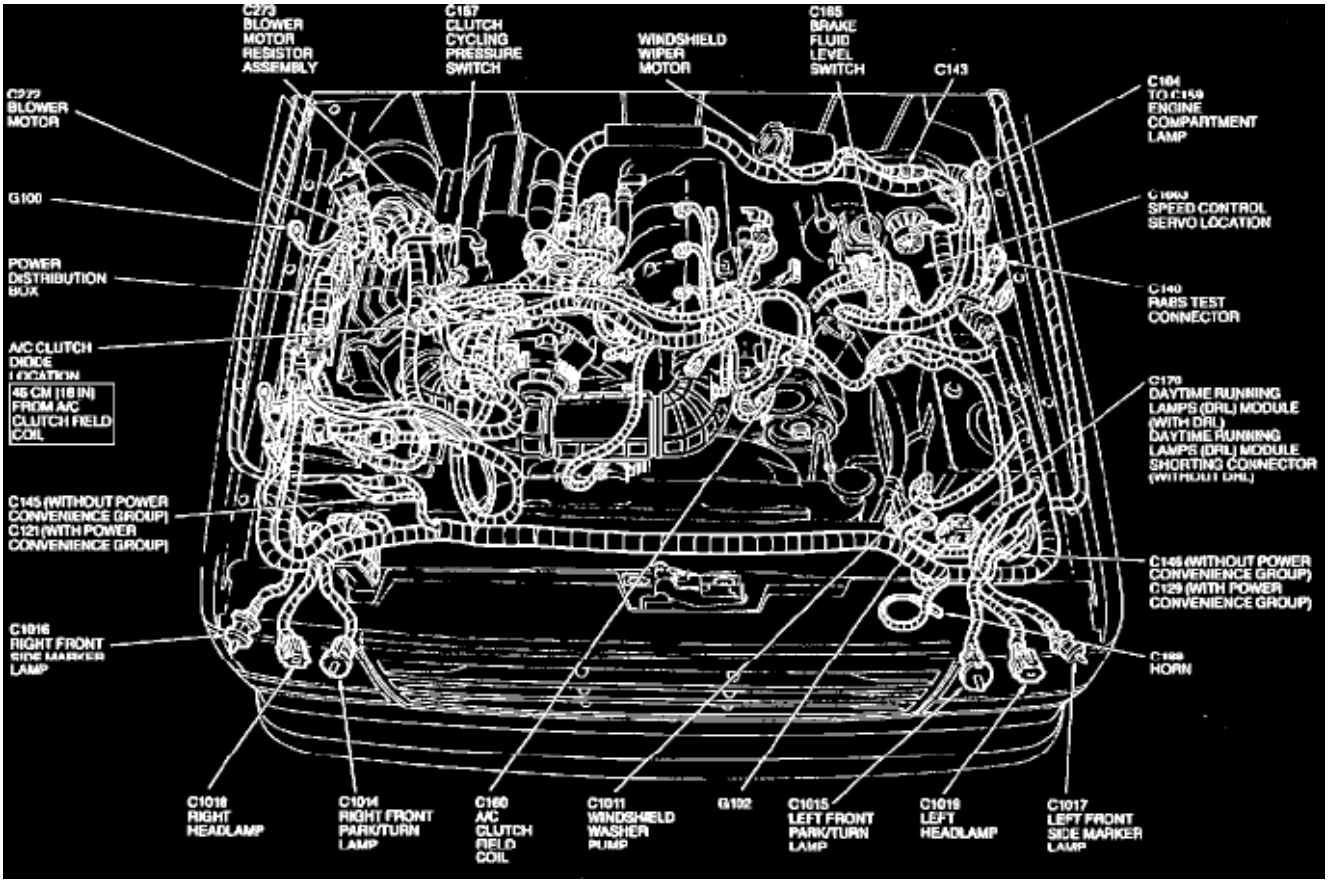
Center Of RH Fender Apron, Above Wheelwell

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

Applicable to: 3.0L/V6-181

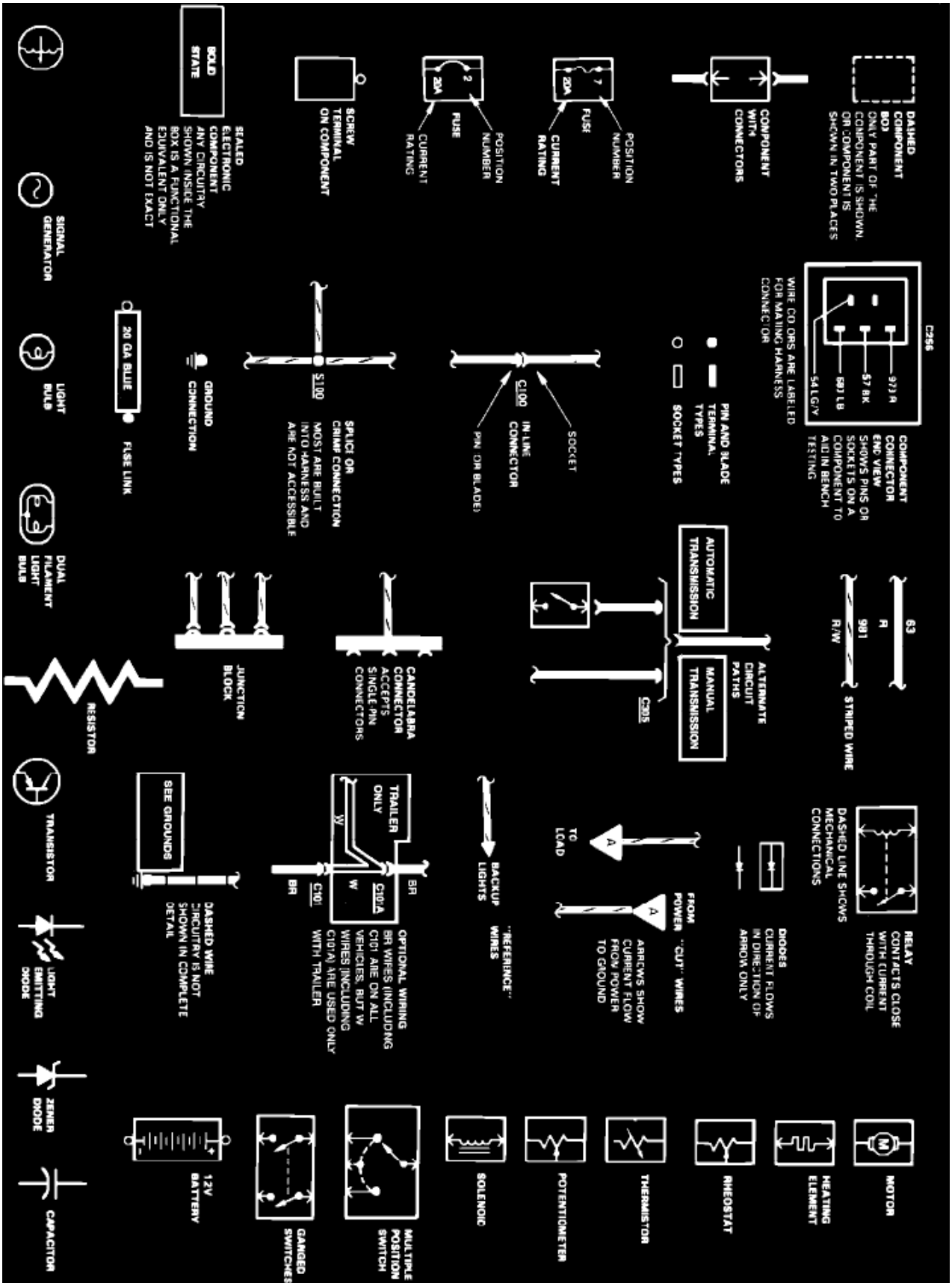


Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

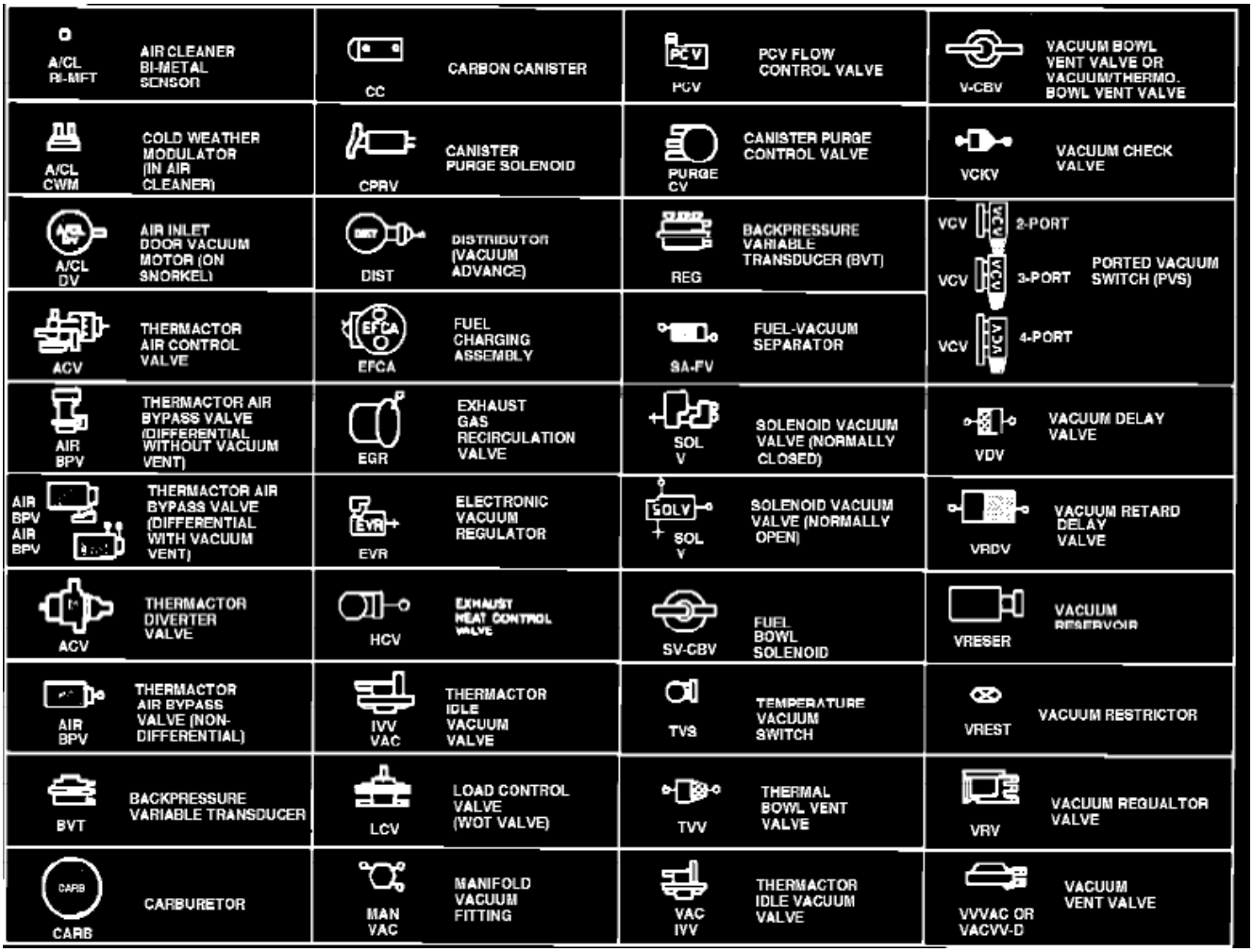
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Starting and Charging > Power and Ground Distribution > Fuse Block > Component Information > Diagrams > Diagram Information and Instructions

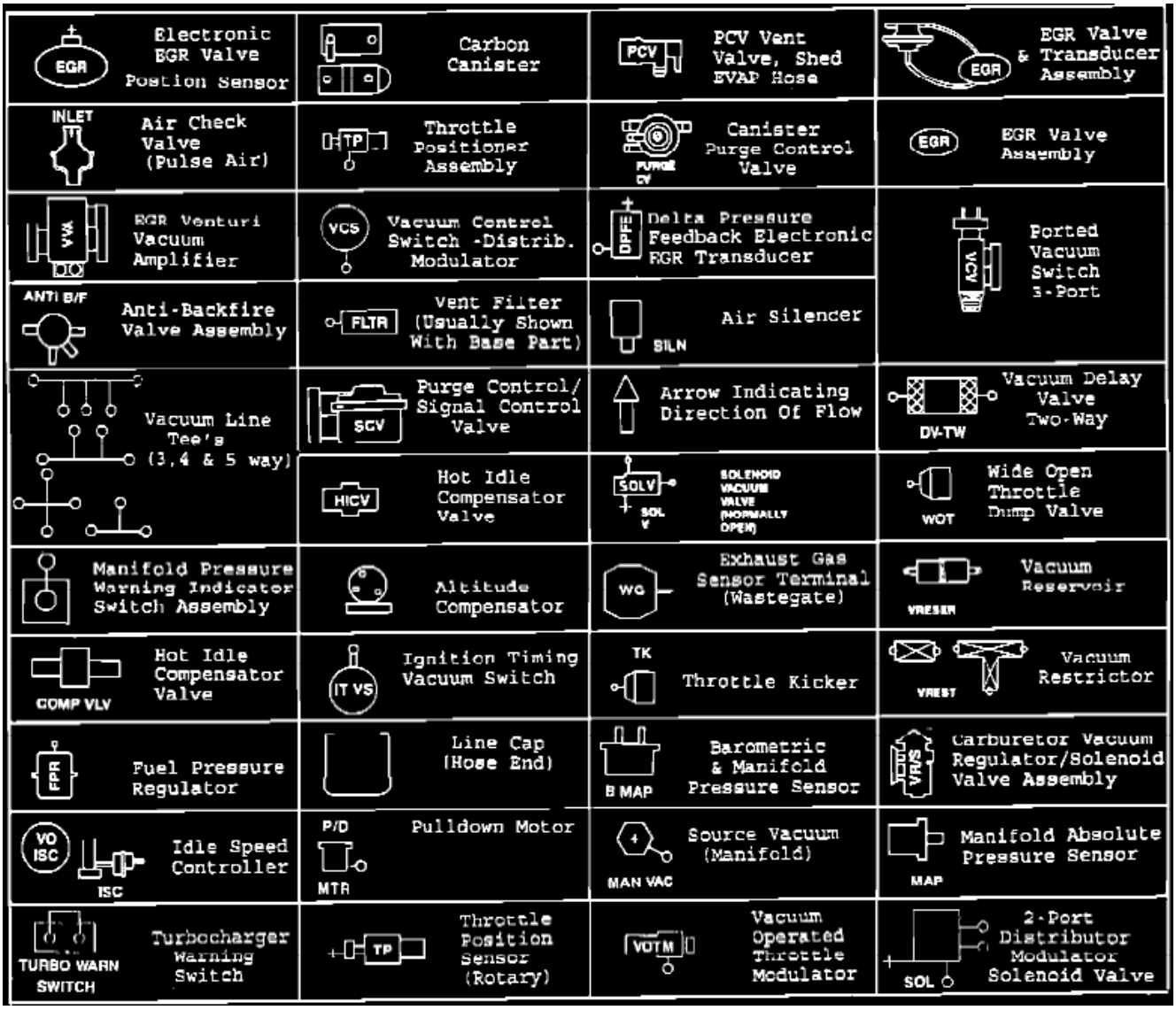


Fuse Block: Diagram Information and Instructions

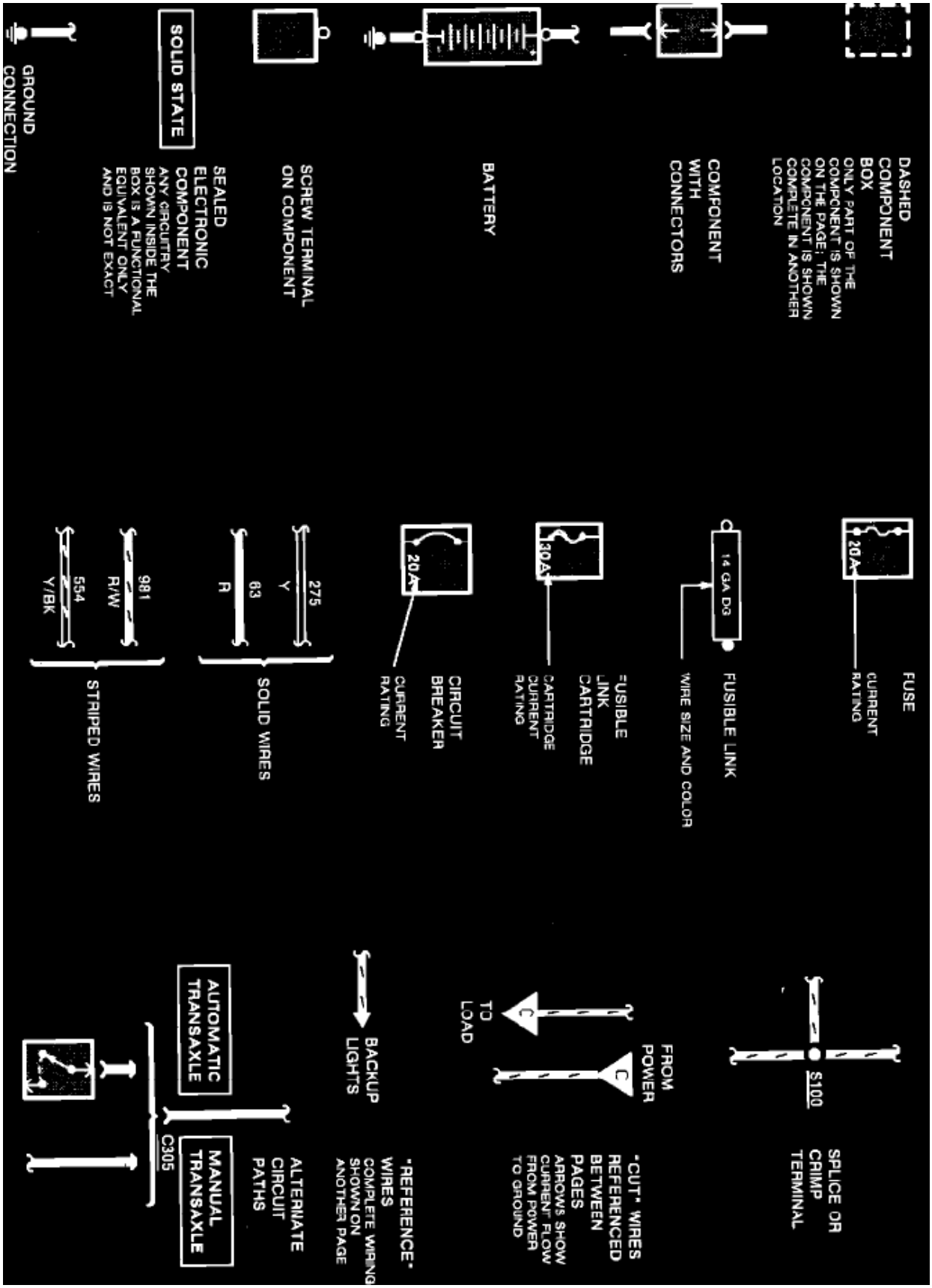
Symbol Identification



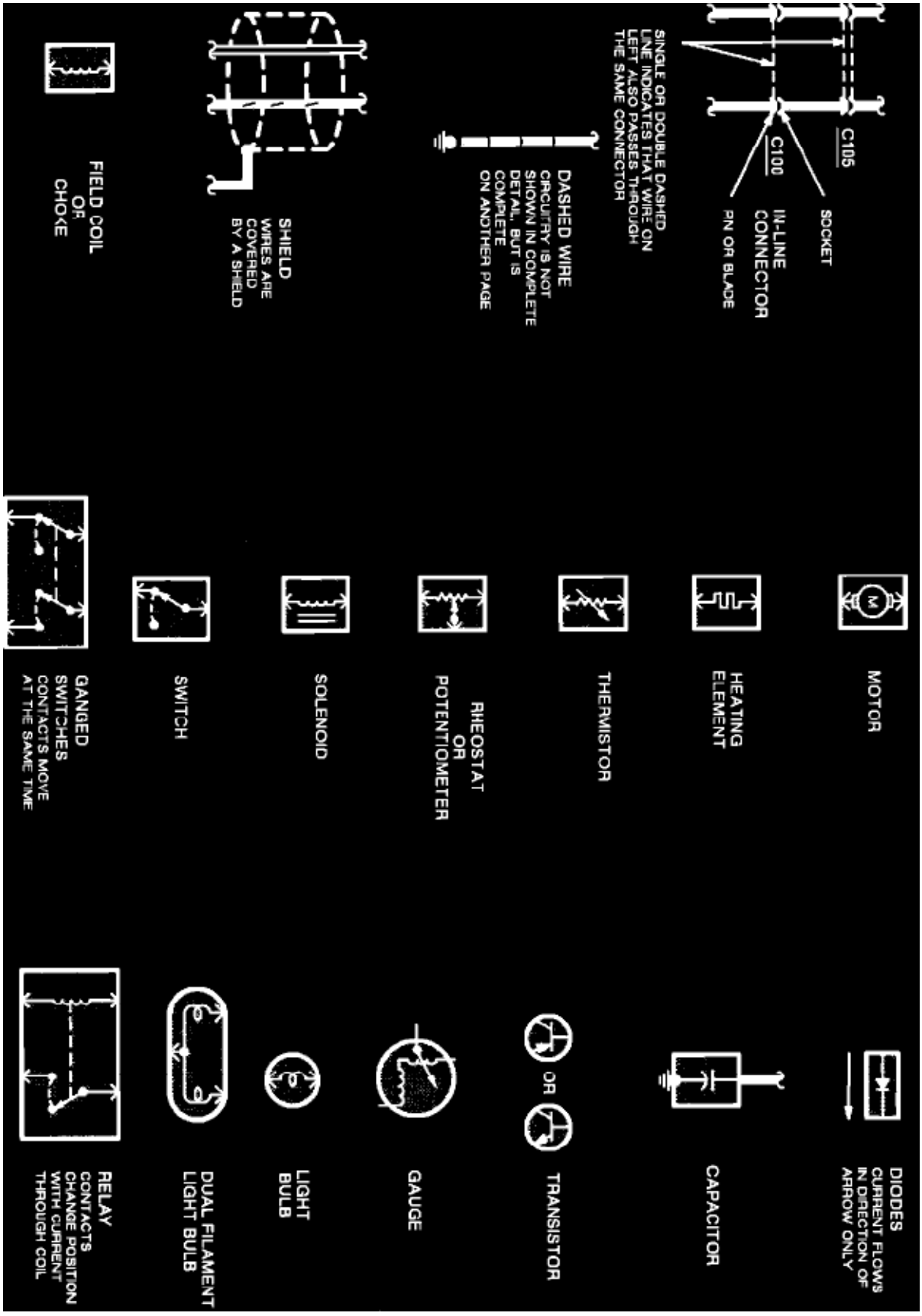
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

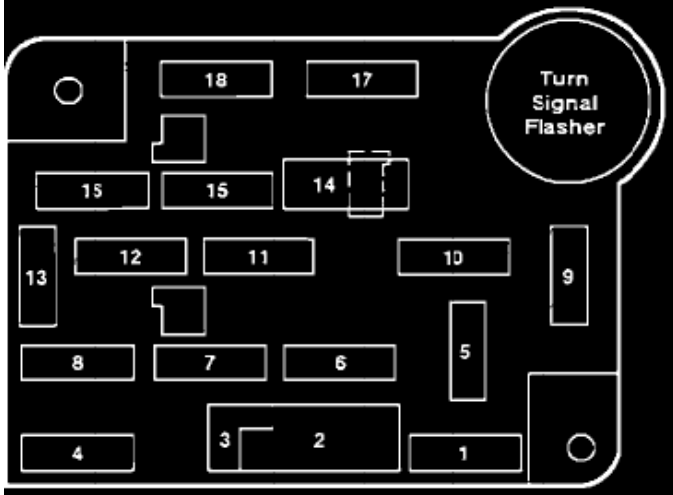
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Fuse Position	Amps	Circuits Protected
1	15	Radio, Dome/Cargo Lamps
2	6 c.b.	Windshield Wipers
4	15	Stop/Hazard Lamps
5	15	Turn Lamps, Backup Lamps, Brake Fluid Level Sensor
6	—	Not Used
7	10	A/C Compressor Control
8	20	Horn
9	30	Air Conditioner/Heater
10	15	Lamps on Warning, Park/License Lamps
11	15	Radio, Electric Shift Control, Speed Contro
12	20 c.b.	Multi-Function Switch, Cigar Lighter, Power Lumbar Seats
13	10	Instrument Illumination
14	30 c.b.	Power Windows
15	20	Rear Anti-Lock Brakes
16	—	Not Used
17	15	Electric Shift Control, Warning Chime Module, Low Oil Level Relay, Instrument Cluster
18	10	HEGO

Power Distribution

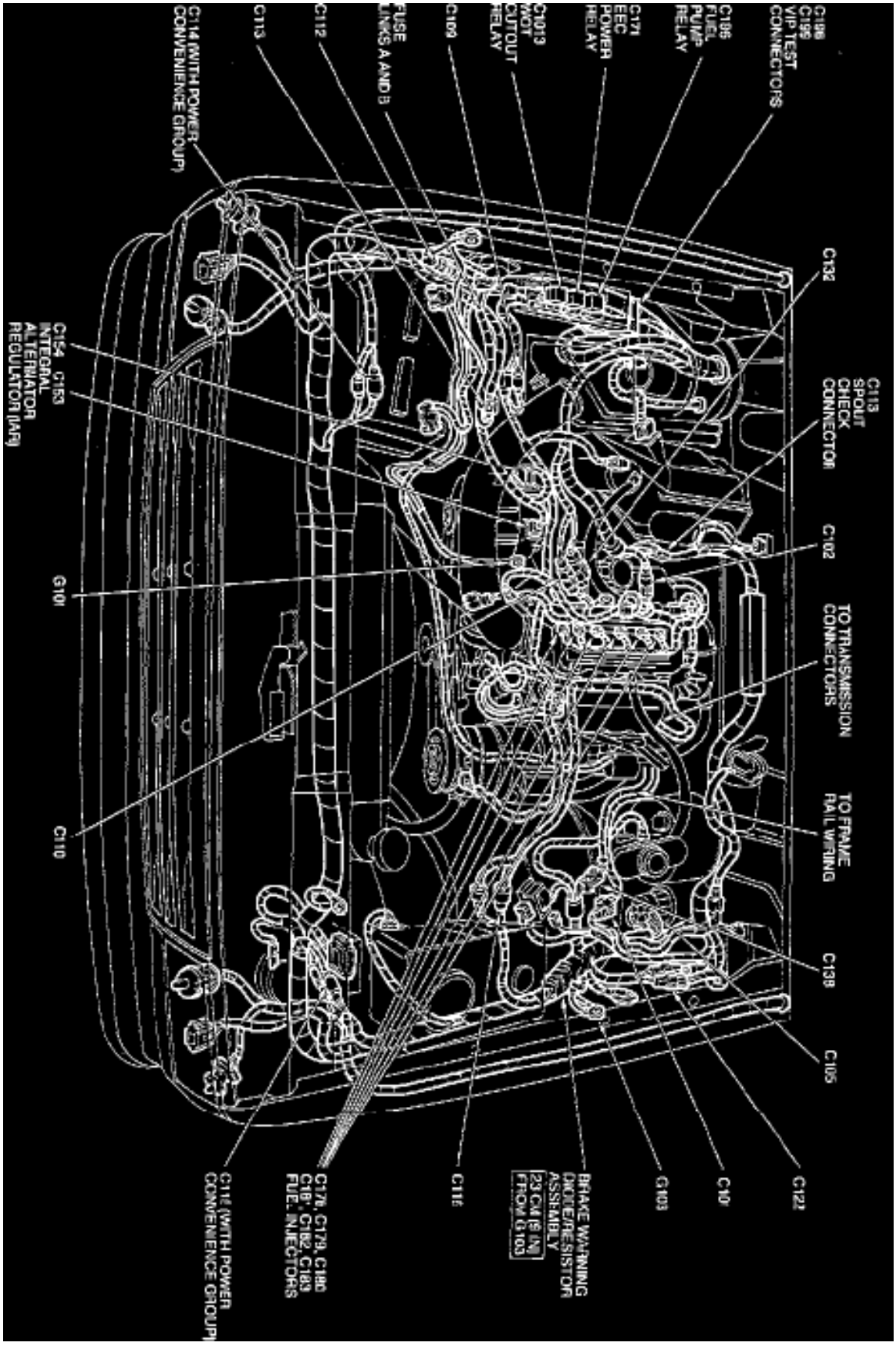
The alternator is connected to maxi-fuses within the power distribution box which is then connected together with the Battery at the starter relay hot terminal. Circuits and components are protected by maxi-fuses. Low power circuits are also protected by fuses.

The Ignition Switch and Main Light Switch are powered at all times, as are Fuses 1, 4, 8, 10 and Circuit Breaker 12 in the Fuse Panel. The other fuses are powered through the Ignition Switch or the Main Light Switch.

Position 3 is not used and is covered by Circuit Breaker 2.

Fuse Panel Details

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Starting and Charging > Power and Ground Distribution > Fusible Link > Component Information > Locations > Fuse Link A

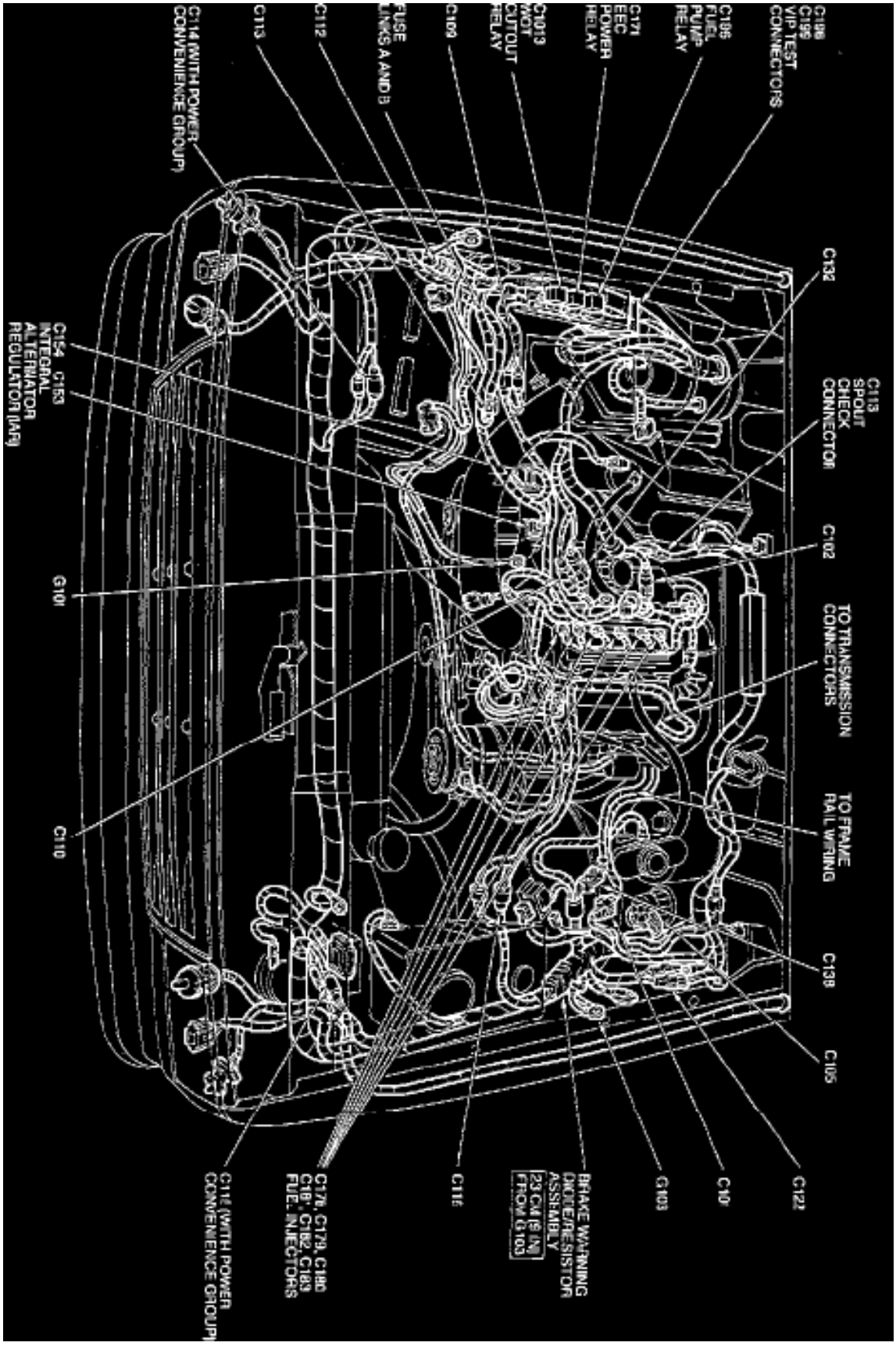


Fusible Link: Locations Fuse Link A

Engine Compartment Components.

RH Fender Apron, At Starter Relay

Applicable to: 2.9L/V6-179


C198
C196
VIP TEST
CONNECTORS
C196
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
SHOT
CUTOUT
RELAY
C109
FUSE
LINKS A AND B
C112
C113
C114 (WITH POWER
CONVENIENCE GROUP)
C154 C153
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
G101
C110
C134
C113
SPOUT
CHECK
CONNECTOR
C102
TO TRANSMISSION
CONNECTORS
TO FRAME
RAIL WIRING
C138
C105
C122
C107
G103
BRAKE WARNING
(MUTE) RESISTOR
ASSEMBLY
23 CM (9 IN)
FROM G103
C116
C178, C179, C180
C181, C182, C183
FUEL INJECTORS
C114 (WITH POWER
CONVENIENCE GROUP)

Fusible Link: Locations Fuse Link B

Engine Compartment Components.

RH Fender Apron, At Starter Relay

Applicable to: 2.9L/V6-179

Circuit Breaker: Testing and Inspection

The 6 amp circuit breaker is located in the fuse panel. Two separate tests are necessary to check for correct circuit breaker operation. Remove circuit breaker from fuse panel and connect tester leads to circuit breaker.

TEST 1

1. Short tester leads together and adjust current draw until it equals circuit breaker rating.

2. Connect circuit breaker to tester.

3. Leave circuit breaker connected to tester for ten minutes, holding current reading on tester at rated current. If circuit breaker opens before ten minutes has elapsed, replace circuit breaker.

TEST 2

1. Short tester leads together and adjust current draw until it is twice the rated current.

2. Connect circuit breaker to tester, holding current reading on tester at twice the rated current.

3. If tester reading does not drop to zero within 30 seconds, replace circuit breaker.

Diode: Technical Service Bulletins Electrical Diode - Identification and Replacement

Article No. 96-24-6

11/18/96

WIRING - ELECTRICAL DIODE IDENTIFICATION AND SERVICE REPLACEMENTS

FORD: 1984-86 LTD 1984-88 EXP 1984-94 TEMPO 1984-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

LINCOLN-MERCURY: 1984-86 MARQUIS 1984-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1984-97 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1986-97 SABLE 1987-89 TRACER 1991-94 CAPRI 1991-97 TRACER 1995-97 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1983-97 RANGER 1984-90 BRONCO II 1984-97 ECONOLINE, F-150-350 SERIES 1986-97 AEROSTAR 1991-97 EXPLORER 1995-97 WINDSTAR

MEDIUM/HEAVY TRUCK: 1984-91 C SERIES, CL-CLT-9000 SERIES 1984-97 F & B SERIES, L SERIES 1986-97 CARGO SERIES 1996-97 AEROMAX, LOUISVILLE

This TSB article is being republished in its entirety to update the applicable model years.

ISSUE: Electrical system concerns that are due to diode failure may be serviced with an approved Ford service diode. Some electrical diodes used in early production vehicles are color coded for the purpose of size identification while others are stamped with a manufacture number. All Ford service diodes and current production diodes are identified by manufacture number.

ACTION: If service is required, refer to the appropriate model/year Electrical and Vacuum Troubleshooting Manual (EVTM) to determine the size and location of the diode(s). Refer to the following Electrical Diode Application Chart for the correct service part number.

NOTE:

IF THE DIODE REQUIRING REPLACEMENT DOES NOT HAVE THE SAME RATING AS LISTED IN THE APPLICATION CHART, USE THE NEXT HIGHER RATED DIODE.

PRODUCTION IDENTIFICATION		
Old Design	Current Design	Service Part Identification
1.0 Amp-200V (color gray)	1.0 Amp-200V (stamped 1N4003)	1.0 Amp-400V E8DZ-10C912-A (stamped 1N4004)
1.0 Amp-50V (color black)	1.0 Amp-400V (stamped 1N4004)	1.0 Amp 400V E8DZ-10C912-A (stamped 1N4004)
3.0 Amp-50V (color orange)	6.0 Amp-400V (stamped MR754)	6.0 Amp-400V E8DZ-10C912-B (stamped MR754)
6.0 Amp-400V (color blue)	6.0 Amp-400V (stamped MR754)	6.0 Amp-400V E8DZ-10C912-B (stamped MR754)

ELECTRICAL DIODE APPLICATION CHART

PART NUMBER PART NAME

E8DZ-10C912-A Diode - 1.0 Amp - 400V

E8DZ-10C912-B Diode - 6.0 Amp - 400V

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 89-2-8

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203000, 203200, 2770

Diode: Locations Courtesy Lamp Diode (Regular Cab)

Top LH Corner Of Cab Roof, Near Cargo Lamp

Diode: Locations Courtesy Lamp Diode (Supercab)

Center Rear Of Cab Roof, Near Cargo Lamp

Audio System - Whining/Buzzing Noise From Speakers

Article No. 02-16-4

08/19/02

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO-WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO-WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994 TEMPO 1990-1997 ESCORT, PROBE, THUNDERBIRD 1990-1998 MUSTANG 1990-1999 TAURUS 1990-2002 CROWN VICTORIA 1997-1999 CONTOUR 2001 TAURUS 1990 BRONCO II 1990-1996 BRONCO 1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350 1990-1999 F-250 LD 1990-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2003 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION, EXPLORER SPORT TRAC, EXPLORER SPORT 2001-2002 ESCAPE

LINCOLN: 1990-1992 MARK VII 1990-1994 CONTINENTAL 1990-2002 TOWN CAR 1998-2003 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1990-1994 TOPAZ 1990-1997 COUGAR 1990-1999 SABLE 1990-2002 GRAND MARQUIS 1991-1997 TRACER 1997-1999 MYSTIQUE 2001 SABLE 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

TSB 01-7-3 is being republished in its entirety to update the model year coverage and vehicle line coverage.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists, then refer to the Service Procedure for repair details.

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

NOTE

IF THE VEHICLE HAS AN ELECTRONIC RETURNLESS FUEL SYSTEM, DO NOT INSTALL A RFI FILTER INLINE TO THE FUEL PUMP . ONLY VEHICLES WITH MECHANICAL RETURNLESS FUEL SYSTEMS (PRESSURE REGULATOR IN THE TANK), OR SYSTEMS WITH THE PRESSURE REGULATOR ON THE FUEL RAIL SHOULD BE APPROVED FOR THE RFI FILTER INSTALLATION.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

Parts Block

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 01-7-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

021604AA Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1997 Thunderbird/Cougar

021604BA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1999 And 2001 Taurus/Sable

021604CA Diagnose And Install RFI 1.2 Hrs.

Filter 1992-1997 Crown Victoria/Grand Marquis/Town Car

021604CB Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1991 Crown Victoria/Grand Marquis/Town Car

021604CC Diagnose And Install RFI 2.2 Hrs.

Filter 1998-2002 Crown Victoria/Grand Marquis

021604DA Diagnose And Install RFI 1.9 Hrs.

Filter 1998-2002 Town Car

021604EA Diagnose And Install RFI 1.7 Hrs.

Filter 1990-1998 Mustang

021604FA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1998 Mustang

021604GA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1994 Continental

021604HA Diagnose And Install RFI 1.6 Hrs.

Filter 1990 Escort

021604IA Diagnose And Install RFI 0.8 Hr.

Filter 1991-1996 Escort Tracer

021604IB Diagnose And Install RFI 1.6 Hrs.

Filter 1997 Escort/Tracer

021604JA Diagnose And Install RFI 0.8 Hr.

Filter 1997 Contour/Mystique

021604JB Diagnose And Install RFI 1.8 Hrs.

Filter 1998-1999 Contour/Mystique

021604KA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1992 Mark VII

021604LA Diagnose And Install RFI 0.8 Hr.

Filter 1990-1992 Probe

021604LB Diagnose And Install RFI 1.8 Hrs.

Filter 1993-1997 Probe

021604MA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-2002 Econoline Single Fuel Tank

021604MB Diagnose And Install RFI 2.6 Hrs.

Filter 1990-1991 Econoline Both Fuel Tanks

021604NA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1996 Bronco

0216040A Diagnose And Install RFI 1.8 Hrs.

Filter 1991-1994 Explorer

0216040B Diagnose And Install RFI 1.5 Hrs.

Filter 1995-2002 Explorer

021604PA Diagnose And Install RFI 1.5 Hrs.

Filter 1997-2002 Mountaineer

0216040A Diagnose And Install RFI 1.4 Hrs.

Filter 1995-2002 Windstar

021604RA Diagnose And Install RFI 1.9 Hrs.

Filter 1993-2002 Villager

021604SA Diagnose And Install RFI 1.7 Hrs.

Filter 1997-2003 Expedition/Navigator

021604TA Diagnose And Install RFI 1.3 Hrs.

Filter 1990-1997 Ranger Standard Cab

021604TB Diagnose And Install RFI 1.8 Hrs.

Filter 1990-1997 Ranger Super Cab

021604TC Diagnose And Install RFI 1.8 Hrs.

Filter 1998-2002 Ranger 4X4

021604TD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 Ranger 4X2

021604UA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1997 Aerostar

021604VA Diagnose And Install RFI 1.9 Hrs.

Filter 1990 Bronco II

021604WA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Rear

021604WB Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Front

021604WC Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Both Tanks

021604WD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 F-150

021604XA Diagnose And Install RFI 1.6 Hrs.

Filter 2000-2002 Excursion

021604XB Diagnose And Install RFI 1.6 Hrs.

Filter 1999-2002 Super Duty F-Series: Front Tank

021604XC Diagnose And Install RFI 1.5 Hrs.

Filter 1999-2002 Super Duty F-Series: Rear Tank

021604XD Diagnose And Install RFI 2.7 Hrs.

Filter 1999-2002 Super Duty F-Series: Both Tanks

021604YA Diagnose And Install RFI 0.8 Hr.

Filter 2001-2002 Escape

021604ZA Diagnose And Install RFI 1.9 Hrs.

Filter 2002 Blackwood

DEALER CODING

CONDITION

BASIC PART NO. CODE

18B925 42

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Service Procedure

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

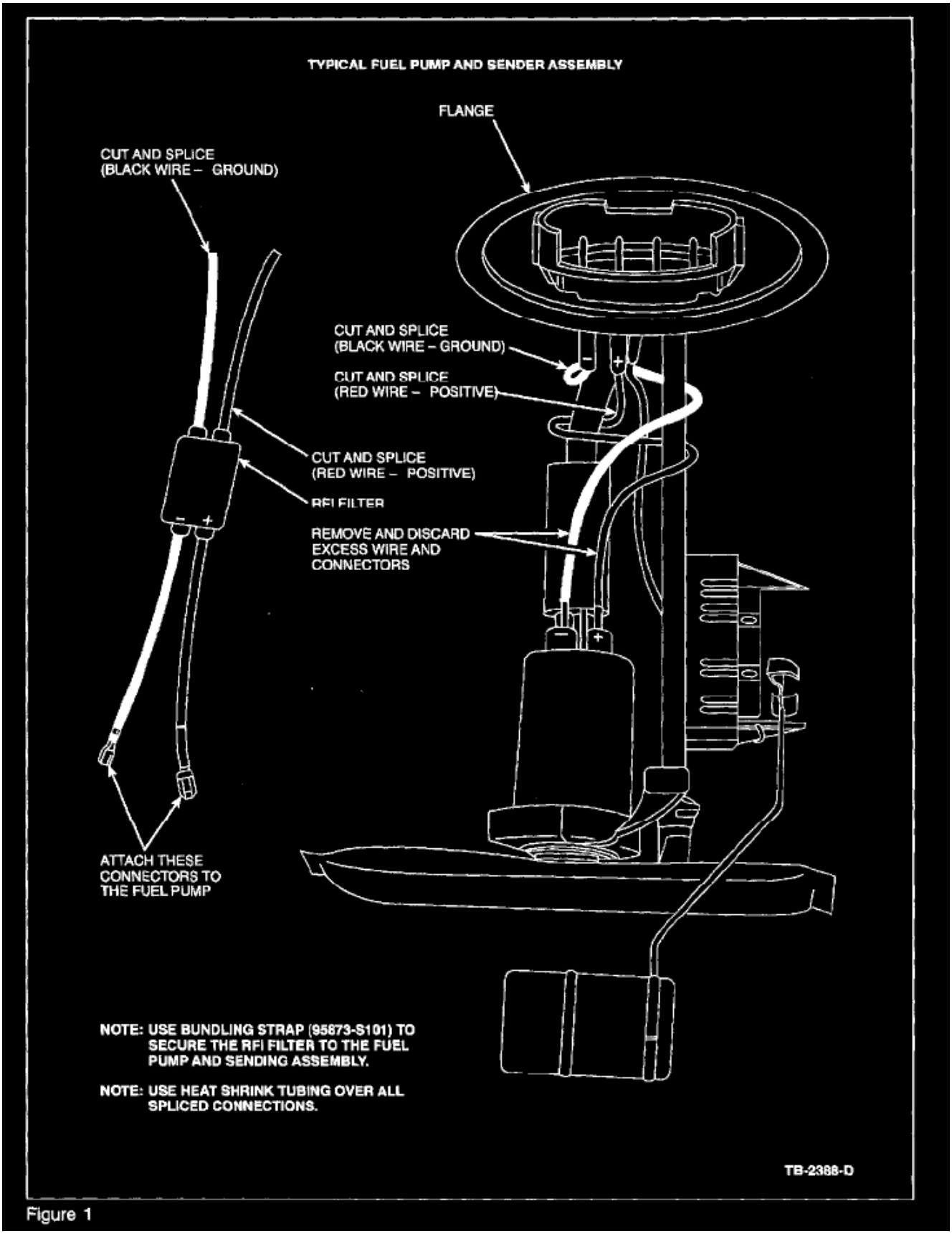


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-AA) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

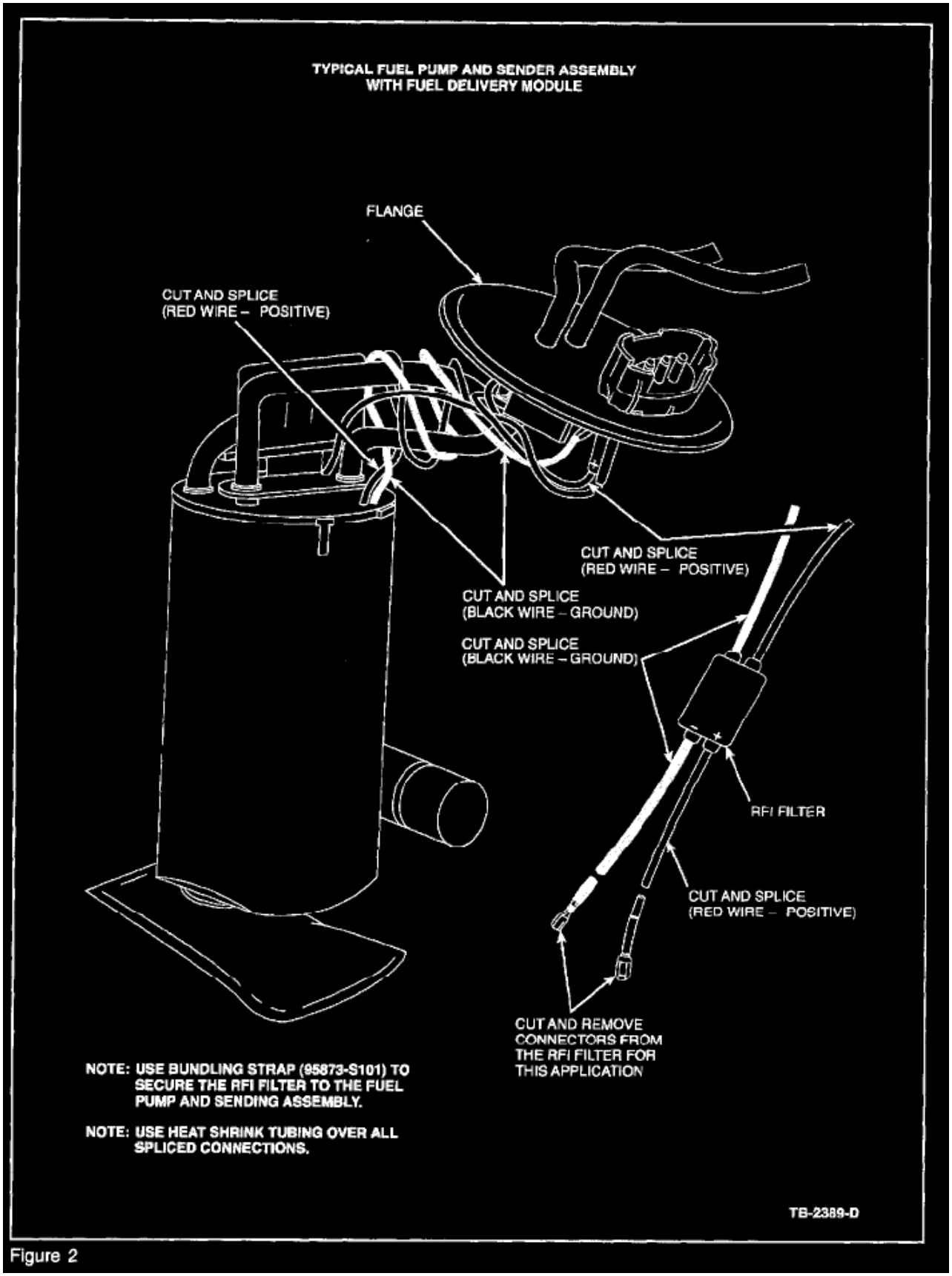


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over solder connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and Vacuum Troubleshooting Manual (EVTM) (or other service literature) for the location of the fuel pump ground. If ground is more than 0.9m (3 ') from the tank, cut wire and ground fuel pump end within 0.9m (3 ') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop Manual.

Audio System - Whining/Buzzing Noise From Speakers

Article No. 02-16-4

08/19/02

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO-WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO-WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994 TEMPO 1990-1997 ESCORT, PROBE, THUNDERBIRD 1990-1998 MUSTANG 1990-1999 TAURUS 1990-2002 CROWN VICTORIA 1997-1999 CONTOUR 2001 TAURUS 1990 BRONCO II 1990-1996 BRONCO 1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350 1990-1999 F-250 LD 1990-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2003 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION, EXPLORER SPORT TRAC, EXPLORER SPORT 2001-2002 ESCAPE

LINCOLN: 1990-1992 MARK VII 1990-1994 CONTINENTAL 1990-2002 TOWN CAR 1998-2003 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1990-1994 TOPAZ 1990-1997 COUGAR 1990-1999 SABLE 1990-2002 GRAND MARQUIS 1991-1997 TRACER 1997-1999 MYSTIQUE 2001 SABLE 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

TSB 01-7-3 is being republished in its entirety to update the model year coverage and vehicle line coverage.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists, then refer to the Service Procedure for repair details.

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

NOTE

IF THE VEHICLE HAS AN ELECTRONIC RETURNLESS FUEL SYSTEM, DO NOT INSTALL A RFI FILTER INLINE TO THE FUEL PUMP . ONLY VEHICLES WITH MECHANICAL RETURNLESS FUEL SYSTEMS (PRESSURE REGULATOR IN THE TANK), OR SYSTEMS WITH THE PRESSURE REGULATOR ON THE FUEL RAIL SHOULD BE APPROVED FOR THE RFI FILTER INSTALLATION.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

Parts Block

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 01-7-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

021604AA Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1997 Thunderbird/Cougar

021604BA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1999 And 2001 Taurus/Sable

021604CA Diagnose And Install RFI 1.2 Hrs.

Filter 1992-1997 Crown Victoria/Grand Marquis/Town Car

021604CB Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1991 Crown Victoria/Grand Marquis/Town Car

021604CC Diagnose And Install RFI 2.2 Hrs.

Filter 1998-2002 Crown Victoria/Grand Marquis

021604DA Diagnose And Install RFI 1.9 Hrs.

Filter 1998-2002 Town Car

021604EA Diagnose And Install RFI 1.7 Hrs.

Filter 1990-1998 Mustang

021604FA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1998 Mustang

021604GA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1994 Continental

021604HA Diagnose And Install RFI 1.6 Hrs.

Filter 1990 Escort

021604IA Diagnose And Install RFI 0.8 Hr.

Filter 1991-1996 Escort Tracer

021604IB Diagnose And Install RFI 1.6 Hrs.

Filter 1997 Escort/Tracer

021604JA Diagnose And Install RFI 0.8 Hr.

Filter 1997 Contour/Mystique

021604JB Diagnose And Install RFI 1.8 Hrs.

Filter 1998-1999 Contour/Mystique

021604KA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1992 Mark VII

021604LA Diagnose And Install RFI 0.8 Hr.

Filter 1990-1992 Probe

021604LB Diagnose And Install RFI 1.8 Hrs.

Filter 1993-1997 Probe

021604MA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-2002 Econoline Single Fuel Tank

021604MB Diagnose And Install RFI 2.6 Hrs.

Filter 1990-1991 Econoline Both Fuel Tanks

021604NA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1996 Bronco

0216040A Diagnose And Install RFI 1.8 Hrs.

Filter 1991-1994 Explorer

0216040B Diagnose And Install RFI 1.5 Hrs.

Filter 1995-2002 Explorer

021604PA Diagnose And Install RFI 1.5 Hrs.

Filter 1997-2002 Mountaineer

0216040A Diagnose And Install RFI 1.4 Hrs.

Filter 1995-2002 Windstar

021604RA Diagnose And Install RFI 1.9 Hrs.

Filter 1993-2002 Villager

021604SA Diagnose And Install RFI 1.7 Hrs.

Filter 1997-2003 Expedition/Navigator

021604TA Diagnose And Install RFI 1.3 Hrs.

Filter 1990-1997 Ranger Standard Cab

021604TB Diagnose And Install RFI 1.8 Hrs.

Filter 1990-1997 Ranger Super Cab

021604TC Diagnose And Install RFI 1.8 Hrs.

Filter 1998-2002 Ranger 4X4

021604TD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 Ranger 4X2

021604UA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1997 Aerostar

021604VA Diagnose And Install RFI 1.9 Hrs.

Filter 1990 Bronco II

021604WA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Rear

021604WB Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Front

021604WC Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Both Tanks

021604WD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 F-150

021604XA Diagnose And Install RFI 1.6 Hrs.

Filter 2000-2002 Excursion

021604XB Diagnose And Install RFI 1.6 Hrs.

Filter 1999-2002 Super Duty F-Series: Front Tank

021604XC Diagnose And Install RFI 1.5 Hrs.

Filter 1999-2002 Super Duty F-Series: Rear Tank

021604XD Diagnose And Install RFI 2.7 Hrs.

Filter 1999-2002 Super Duty F-Series: Both Tanks

021604YA Diagnose And Install RFI 0.8 Hr.

Filter 2001-2002 Escape

021604ZA Diagnose And Install RFI 1.9 Hrs.

Filter 2002 Blackwood

DEALER CODING

CONDITION

BASIC PART NO. CODE

18B925 42

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Service Procedure

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

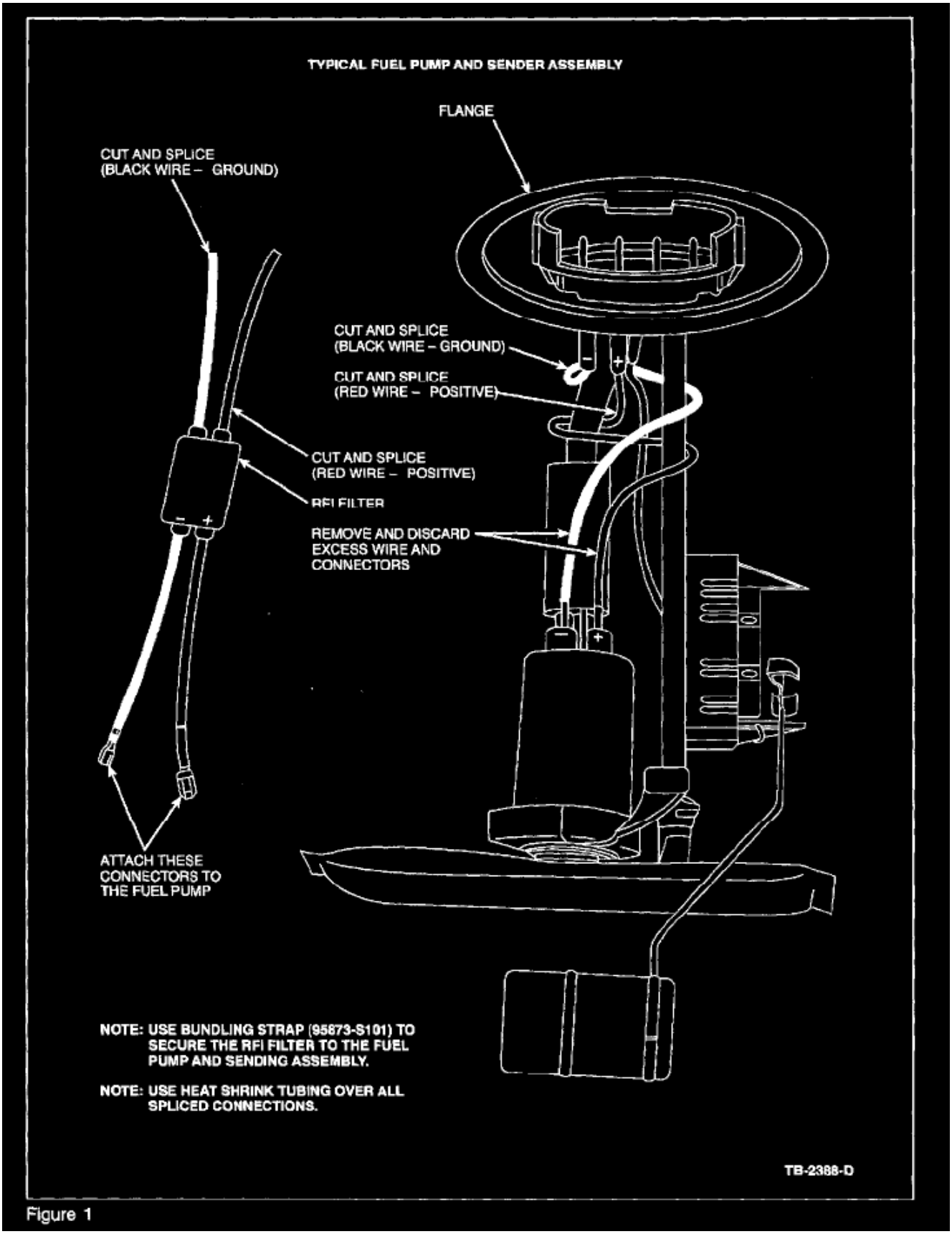


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-AA) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

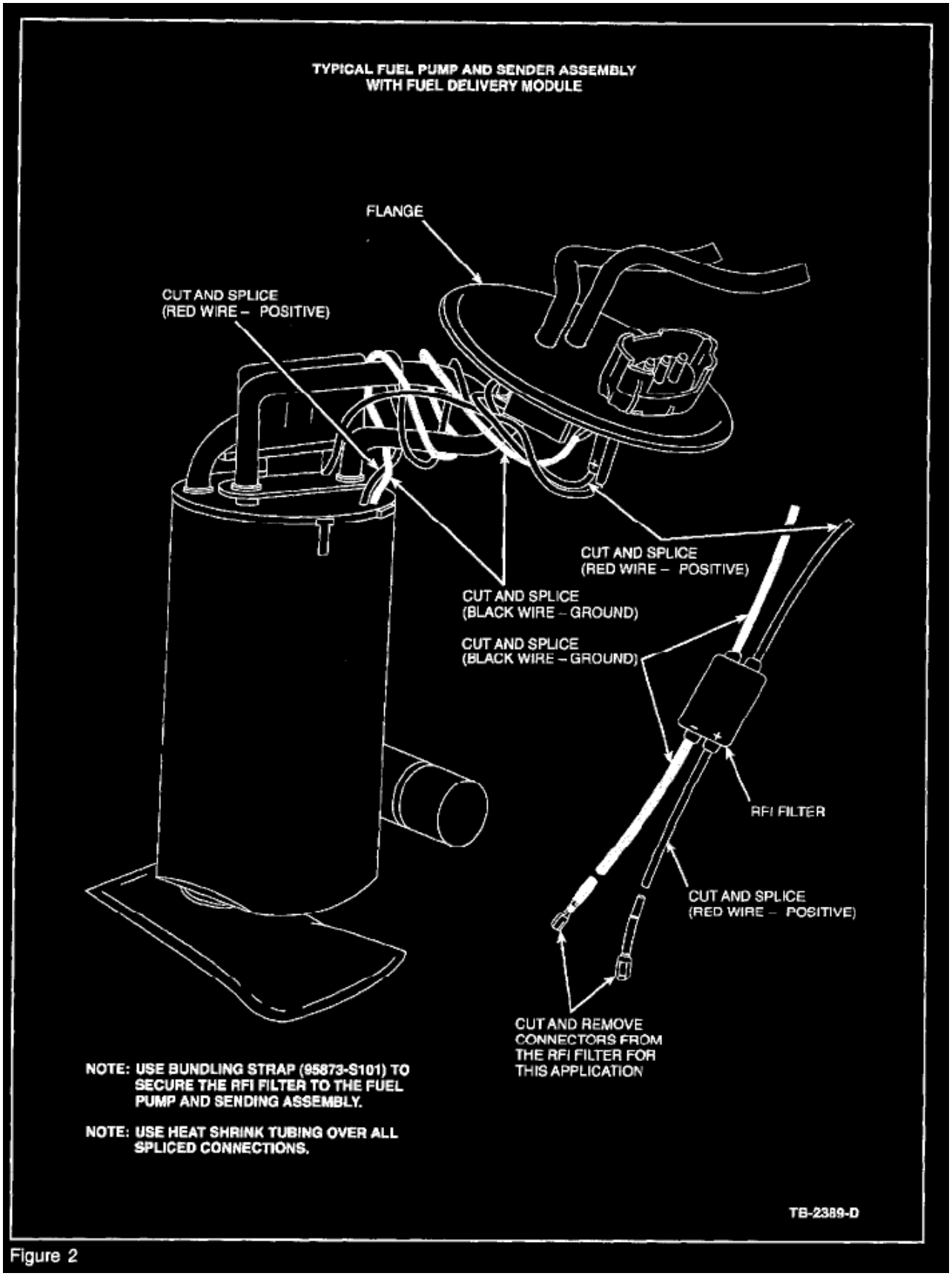


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over solder connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and Vacuum Troubleshooting Manual (EVTM) (or other service literature) for the location of the fuel pump ground. If ground is more than 0.9m (3 ') from the tank, cut wire and ground fuel pump end within 0.9m (3 ') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop Manual.

Audio System - Whining/Buzzing Noise From Speakers

Article No. 02-16-4

08/19/02

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO-WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO-WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994 TEMPO 1990-1997 ESCORT, PROBE, THUNDERBIRD 1990-1998 MUSTANG 1990-1999 TAURUS 1990-2002 CROWN VICTORIA 1997-1999 CONTOUR 2001 TAURUS 1990 BRONCO II 1990-1996 BRONCO 1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350 1990-1999 F-250 LD 1990-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2003 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION, EXPLORER SPORT TRAC, EXPLORER SPORT 2001-2002 ESCAPE

LINCOLN: 1990-1992 MARK VII 1990-1994 CONTINENTAL 1990-2002 TOWN CAR 1998-2003 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1990-1994 TOPAZ 1990-1997 COUGAR 1990-1999 SABLE 1990-2002 GRAND MARQUIS 1991-1997 TRACER 1997-1999 MYSTIQUE 2001 SABLE 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

TSB 01-7-3 is being republished in its entirety to update the model year coverage and vehicle line coverage.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists, then refer to the Service Procedure for repair details.

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

NOTE

IF THE VEHICLE HAS AN ELECTRONIC RETURNLESS FUEL SYSTEM, DO NOT INSTALL A RFI FILTER INLINE TO THE FUEL PUMP . ONLY VEHICLES WITH MECHANICAL RETURNLESS FUEL SYSTEMS (PRESSURE REGULATOR IN THE TANK), OR SYSTEMS WITH THE PRESSURE REGULATOR ON THE FUEL RAIL SHOULD BE APPROVED FOR THE RFI FILTER INSTALLATION.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

Parts Block

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 01-7-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

021604AA Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1997 Thunderbird/Cougar

021604BA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1999 And 2001 Taurus/Sable

021604CA Diagnose And Install RFI 1.2 Hrs.

Filter 1992-1997 Crown Victoria/Grand Marquis/Town Car

021604CB Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1991 Crown Victoria/Grand Marquis/Town Car

021604CC Diagnose And Install RFI 2.2 Hrs.

Filter 1998-2002 Crown Victoria/Grand Marquis

021604DA Diagnose And Install RFI 1.9 Hrs.

Filter 1998-2002 Town Car

021604EA Diagnose And Install RFI 1.7 Hrs.

Filter 1990-1998 Mustang

021604FA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1998 Mustang

021604GA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1994 Continental

021604HA Diagnose And Install RFI 1.6 Hrs.

Filter 1990 Escort

021604IA Diagnose And Install RFI 0.8 Hr.

Filter 1991-1996 Escort Tracer

021604IB Diagnose And Install RFI 1.6 Hrs.

Filter 1997 Escort/Tracer

021604JA Diagnose And Install RFI 0.8 Hr.

Filter 1997 Contour/Mystique

021604JB Diagnose And Install RFI 1.8 Hrs.

Filter 1998-1999 Contour/Mystique

021604KA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1992 Mark VII

021604LA Diagnose And Install RFI 0.8 Hr.

Filter 1990-1992 Probe

021604LB Diagnose And Install RFI 1.8 Hrs.

Filter 1993-1997 Probe

021604MA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-2002 Econoline Single Fuel Tank

021604MB Diagnose And Install RFI 2.6 Hrs.

Filter 1990-1991 Econoline Both Fuel Tanks

021604NA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1996 Bronco

0216040A Diagnose And Install RFI 1.8 Hrs.

Filter 1991-1994 Explorer

0216040B Diagnose And Install RFI 1.5 Hrs.

Filter 1995-2002 Explorer

021604PA Diagnose And Install RFI 1.5 Hrs.

Filter 1997-2002 Mountaineer

0216040A Diagnose And Install RFI 1.4 Hrs.

Filter 1995-2002 Windstar

021604RA Diagnose And Install RFI 1.9 Hrs.

Filter 1993-2002 Villager

021604SA Diagnose And Install RFI 1.7 Hrs.

Filter 1997-2003 Expedition/Navigator

021604TA Diagnose And Install RFI 1.3 Hrs.

Filter 1990-1997 Ranger Standard Cab

021604TB Diagnose And Install RFI 1.8 Hrs.

Filter 1990-1997 Ranger Super Cab

021604TC Diagnose And Install RFI 1.8 Hrs.

Filter 1998-2002 Ranger 4X4

021604TD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 Ranger 4X2

021604UA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1997 Aerostar

021604VA Diagnose And Install RFI 1.9 Hrs.

Filter 1990 Bronco II

021604WA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Rear

021604WB Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Front

021604WC Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Both Tanks

021604WD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 F-150

021604XA Diagnose And Install RFI 1.6 Hrs.

Filter 2000-2002 Excursion

021604XB Diagnose And Install RFI 1.6 Hrs.

Filter 1999-2002 Super Duty F-Series: Front Tank

021604XC Diagnose And Install RFI 1.5 Hrs.

Filter 1999-2002 Super Duty F-Series: Rear Tank

021604XD Diagnose And Install RFI 2.7 Hrs.

Filter 1999-2002 Super Duty F-Series: Both Tanks

021604YA Diagnose And Install RFI 0.8 Hr.

Filter 2001-2002 Escape

021604ZA Diagnose And Install RFI 1.9 Hrs.

Filter 2002 Blackwood

DEALER CODING

CONDITION

BASIC PART NO. CODE

18B925 42

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Service Procedure

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

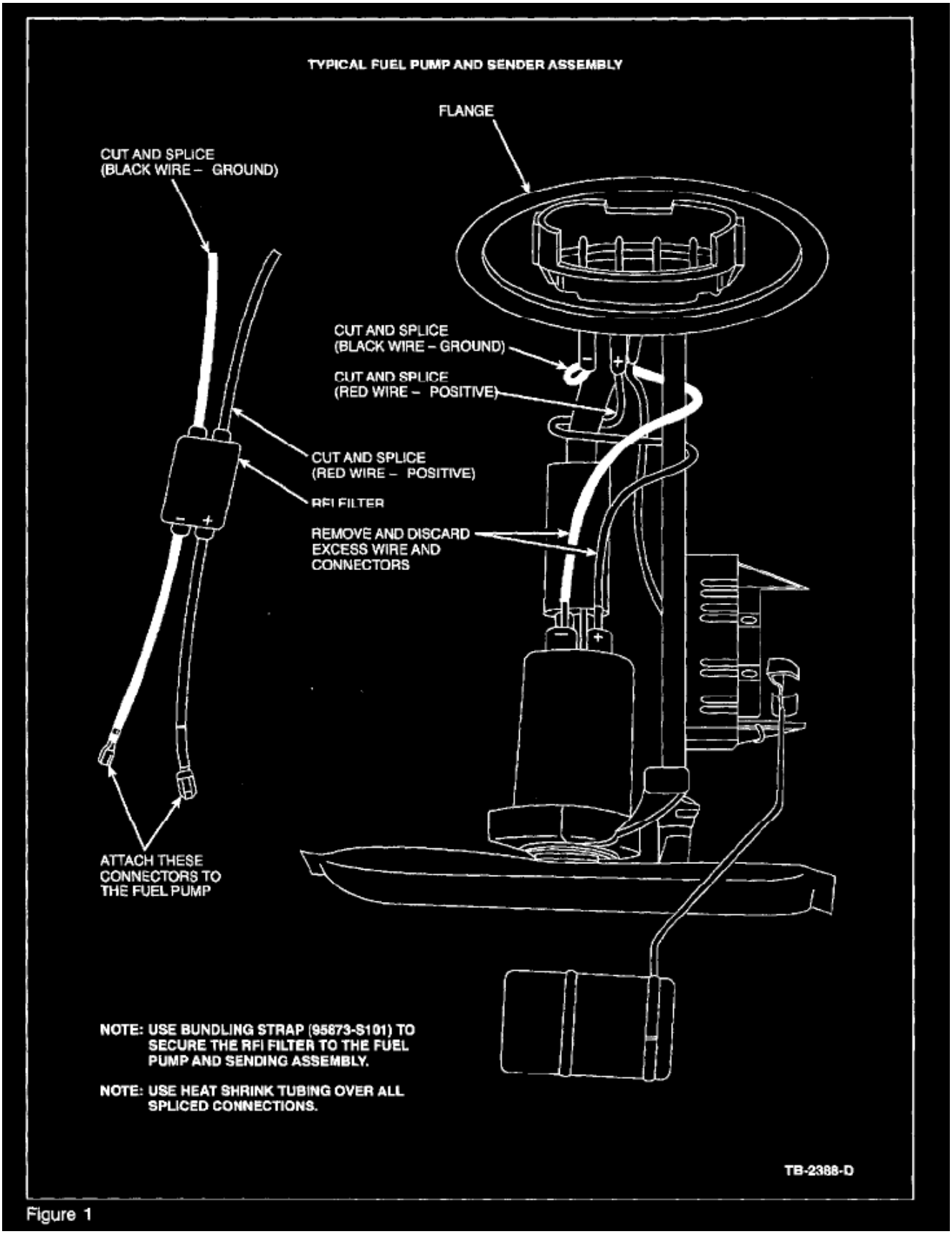


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-AA) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

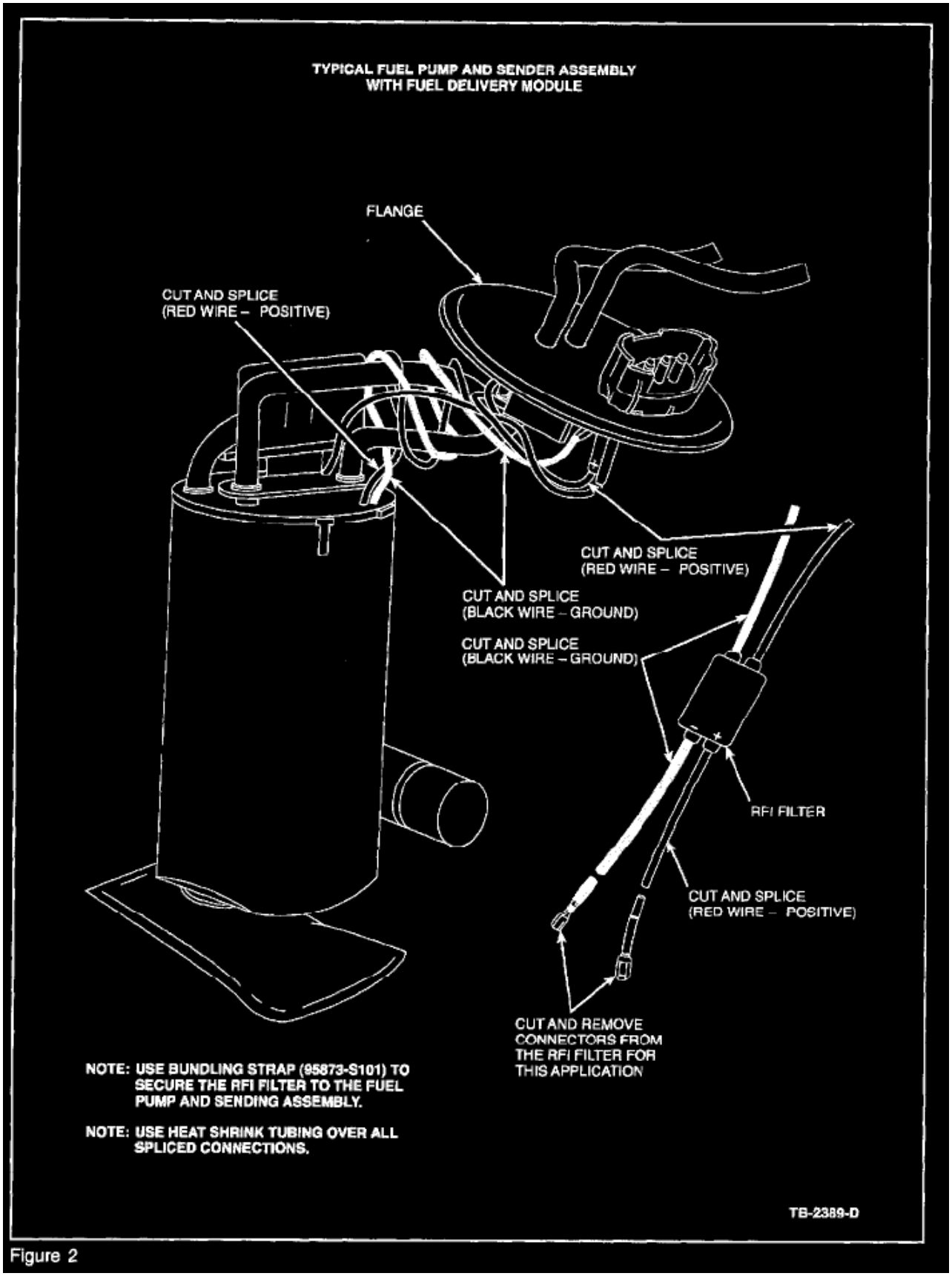


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over solder connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and Vacuum Troubleshooting Manual (EVTM) (or other service literature) for the location of the fuel pump ground. If ground is more than 0.9m (3 ') from the tank, cut wire and ground fuel pump end within 0.9m (3 ') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop Manual.

Audio System - Whining/Buzzing Noise From Speakers

Article No. 02-16-4

08/19/02

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO-WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO-WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994 TEMPO 1990-1997 ESCORT, PROBE, THUNDERBIRD 1990-1998 MUSTANG 1990-1999 TAURUS 1990-2002 CROWN VICTORIA 1997-1999 CONTOUR 2001 TAURUS 1990 BRONCO II 1990-1996 BRONCO 1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350 1990-1999 F-250 LD 1990-2002 ECONOLINE, F-150, RANGER 1991-2002 EXPLORER 1995-2002 WINDSTAR 1997-2003 EXPEDITION 1999-2002 SUPER DUTY F SERIES 2000-2002 EXCURSION, EXPLORER SPORT TRAC, EXPLORER SPORT 2001-2002 ESCAPE

LINCOLN: 1990-1992 MARK VII 1990-1994 CONTINENTAL 1990-2002 TOWN CAR 1998-2003 NAVIGATOR 2002 BLACKWOOD

MERCURY: 1990-1994 TOPAZ 1990-1997 COUGAR 1990-1999 SABLE 1990-2002 GRAND MARQUIS 1991-1997 TRACER 1997-1999 MYSTIQUE 2001 SABLE 1993-2002 VILLAGER 1997-2002 MOUNTAINEER

TSB 01-7-3 is being republished in its entirety to update the model year coverage and vehicle line coverage.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists, then refer to the Service Procedure for repair details.

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

NOTE

IF THE VEHICLE HAS AN ELECTRONIC RETURNLESS FUEL SYSTEM, DO NOT INSTALL A RFI FILTER INLINE TO THE FUEL PUMP . ONLY VEHICLES WITH MECHANICAL RETURNLESS FUEL SYSTEMS (PRESSURE REGULATOR IN THE TANK), OR SYSTEMS WITH THE PRESSURE REGULATOR ON THE FUEL RAIL SHOULD BE APPROVED FOR THE RFI FILTER INSTALLATION.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

Parts Block

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 01-7-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

021604AA Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1997 Thunderbird/Cougar

021604BA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1999 And 2001 Taurus/Sable

021604CA Diagnose And Install RFI 1.2 Hrs.

Filter 1992-1997 Crown Victoria/Grand Marquis/Town Car

021604CB Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1991 Crown Victoria/Grand Marquis/Town Car

021604CC Diagnose And Install RFI 2.2 Hrs.

Filter 1998-2002 Crown Victoria/Grand Marquis

021604DA Diagnose And Install RFI 1.9 Hrs.

Filter 1998-2002 Town Car

021604EA Diagnose And Install RFI 1.7 Hrs.

Filter 1990-1998 Mustang

021604FA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-1998 Mustang

021604GA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1994 Continental

021604HA Diagnose And Install RFI 1.6 Hrs.

Filter 1990 Escort

021604IA Diagnose And Install RFI 0.8 Hr.

Filter 1991-1996 Escort Tracer

021604IB Diagnose And Install RFI 1.6 Hrs.

Filter 1997 Escort/Tracer

021604JA Diagnose And Install RFI 0.8 Hr.

Filter 1997 Contour/Mystique

021604JB Diagnose And Install RFI 1.8 Hrs.

Filter 1998-1999 Contour/Mystique

021604KA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1992 Mark VII

021604LA Diagnose And Install RFI 0.8 Hr.

Filter 1990-1992 Probe

021604LB Diagnose And Install RFI 1.8 Hrs.

Filter 1993-1997 Probe

021604MA Diagnose And Install RFI 1.6 Hrs.

Filter 1990-2002 Econoline Single Fuel Tank

021604MB Diagnose And Install RFI 2.6 Hrs.

Filter 1990-1991 Econoline Both Fuel Tanks

021604NA Diagnose And Install RFI 2.0 Hrs.

Filter 1990-1996 Bronco

0216040A Diagnose And Install RFI 1.8 Hrs.

Filter 1991-1994 Explorer

0216040B Diagnose And Install RFI 1.5 Hrs.

Filter 1995-2002 Explorer

021604PA Diagnose And Install RFI 1.5 Hrs.

Filter 1997-2002 Mountaineer

0216040A Diagnose And Install RFI 1.4 Hrs.

Filter 1995-2002 Windstar

021604RA Diagnose And Install RFI 1.9 Hrs.

Filter 1993-2002 Villager

021604SA Diagnose And Install RFI 1.7 Hrs.

Filter 1997-2003 Expedition/Navigator

021604TA Diagnose And Install RFI 1.3 Hrs.

Filter 1990-1997 Ranger Standard Cab

021604TB Diagnose And Install RFI 1.8 Hrs.

Filter 1990-1997 Ranger Super Cab

021604TC Diagnose And Install RFI 1.8 Hrs.

Filter 1998-2002 Ranger 4X4

021604TD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 Ranger 4X2

021604UA Diagnose And Install RFI 1.5 Hrs.

Filter 1990-1997 Aerostar

021604VA Diagnose And Install RFI 1.9 Hrs.

Filter 1990 Bronco II

021604WA Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Rear

021604WB Diagnose And Install RFI 1.4 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Front

021604WC Diagnose And Install RFI 2.1 Hrs.

Filter 1990-1996 F-150/250/350/Super Duty And 1997 F-350/Superduty Both Tanks

021604WD Diagnose And Install RFI 1.6 Hrs.

Filter 1998-2002 F-150

021604XA Diagnose And Install RFI 1.6 Hrs.

Filter 2000-2002 Excursion

021604XB Diagnose And Install RFI 1.6 Hrs.

Filter 1999-2002 Super Duty F-Series: Front Tank

021604XC Diagnose And Install RFI 1.5 Hrs.

Filter 1999-2002 Super Duty F-Series: Rear Tank

021604XD Diagnose And Install RFI 2.7 Hrs.

Filter 1999-2002 Super Duty F-Series: Both Tanks

021604YA Diagnose And Install RFI 0.8 Hr.

Filter 2001-2002 Escape

021604ZA Diagnose And Install RFI 1.9 Hrs.

Filter 2002 Blackwood

DEALER CODING

CONDITION

BASIC PART NO. CODE

18B925 42

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Service Procedure

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

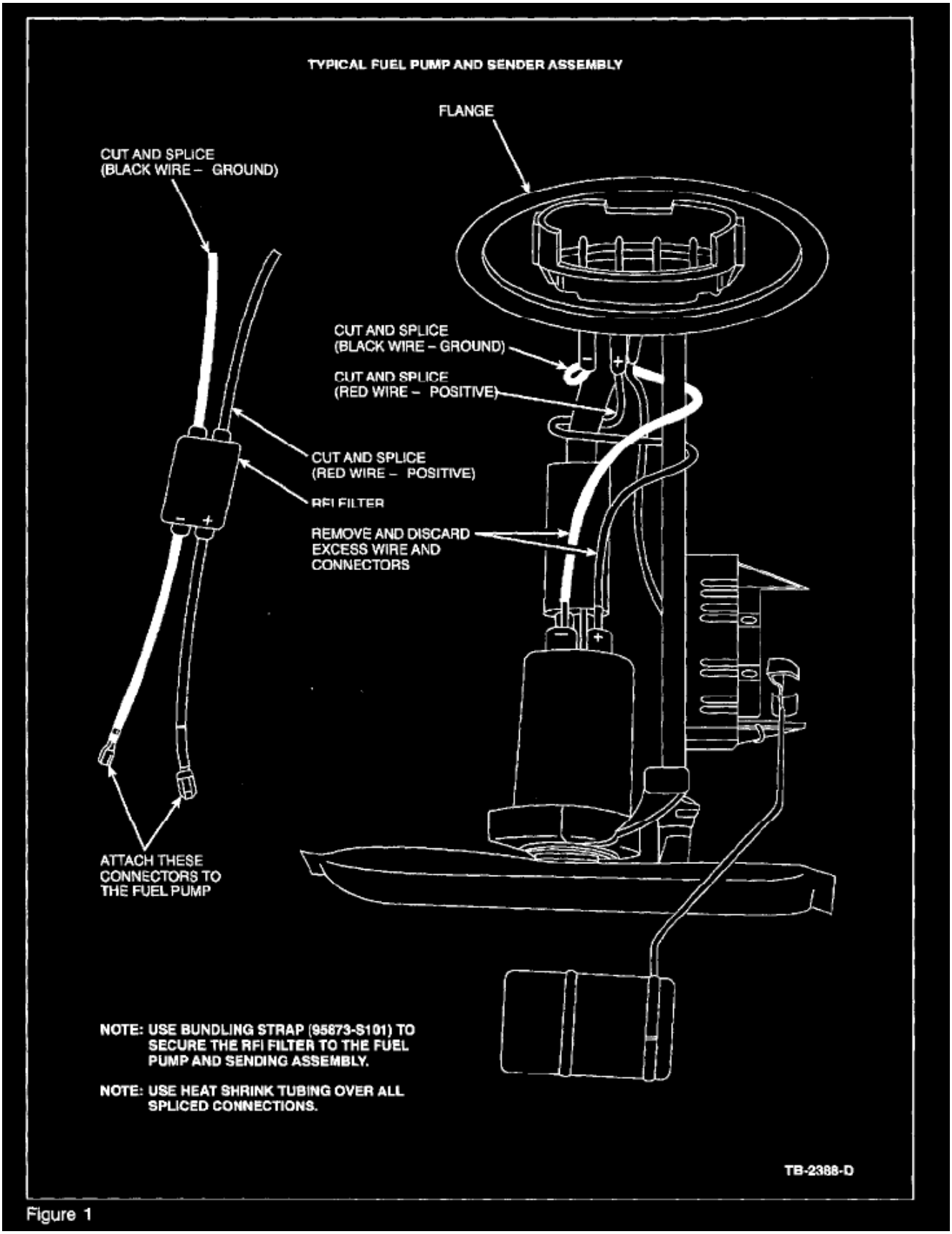


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-AA) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

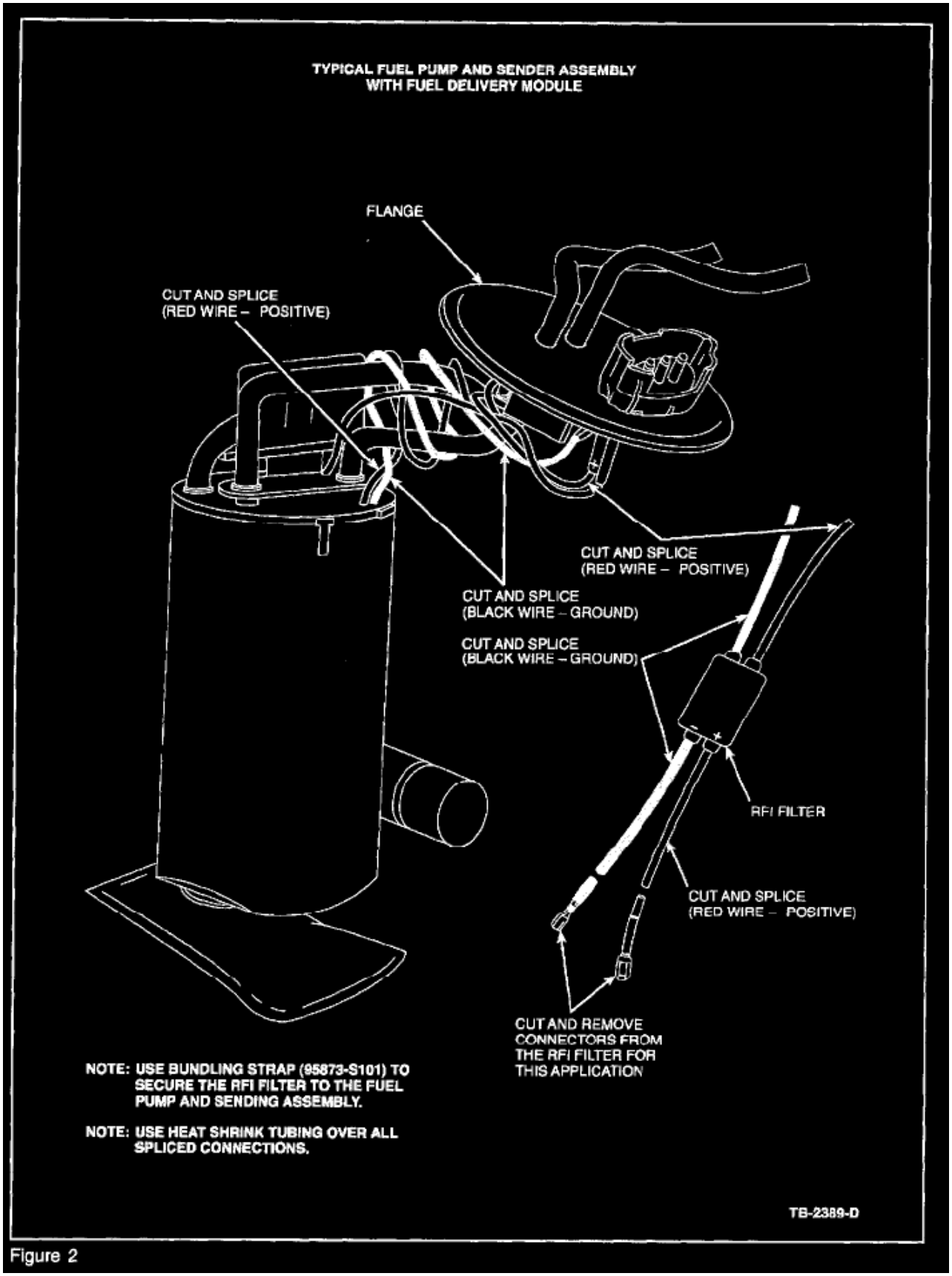


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over solder connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PER THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2 ")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

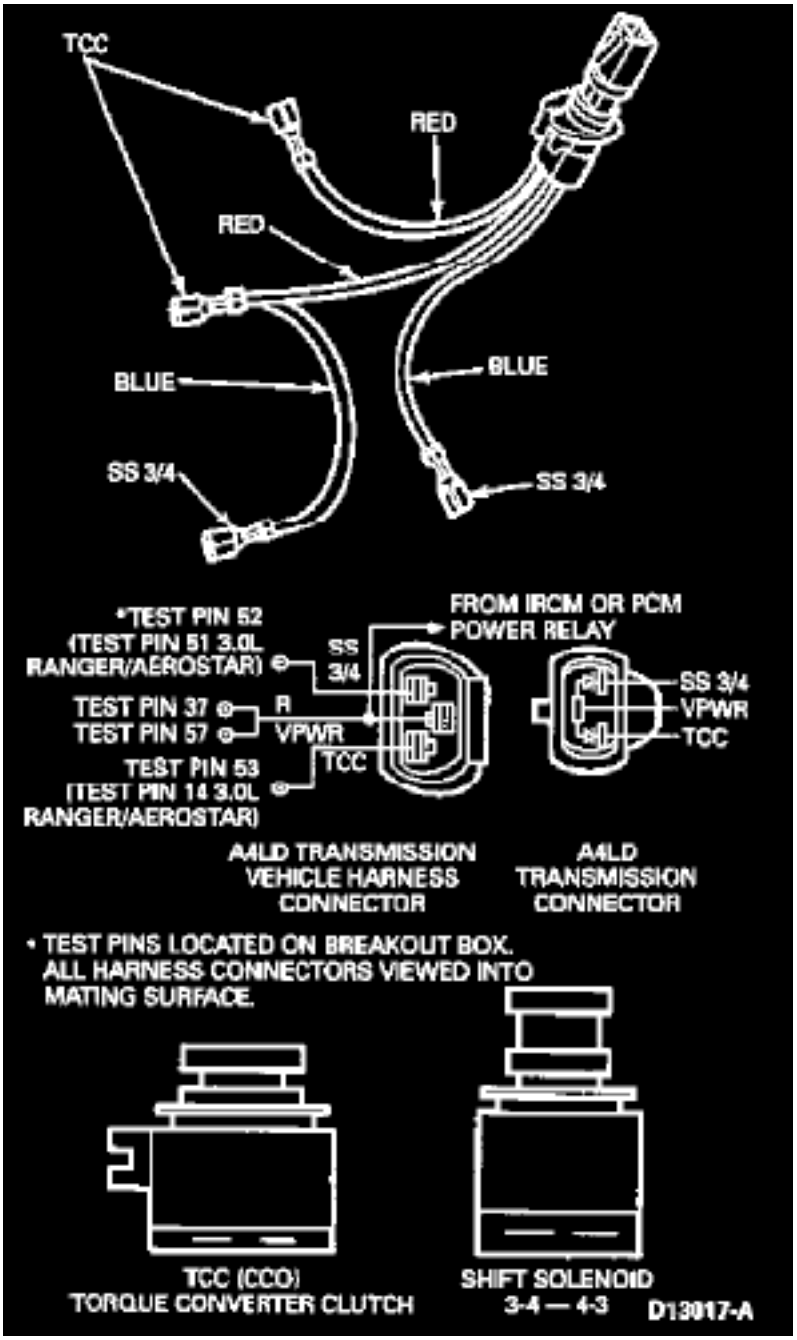
INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and Vacuum Troubleshooting Manual (EVTM) (or other service literature) for the location of the fuel pump ground. If ground is more than 0.9m (3 ') from the tank, cut wire and ground fuel pump end within 0.9m (3 ') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop Manual.

Electronic Noise Suppressor: Locations

RH Side Of Engine, Near Ignition Coil

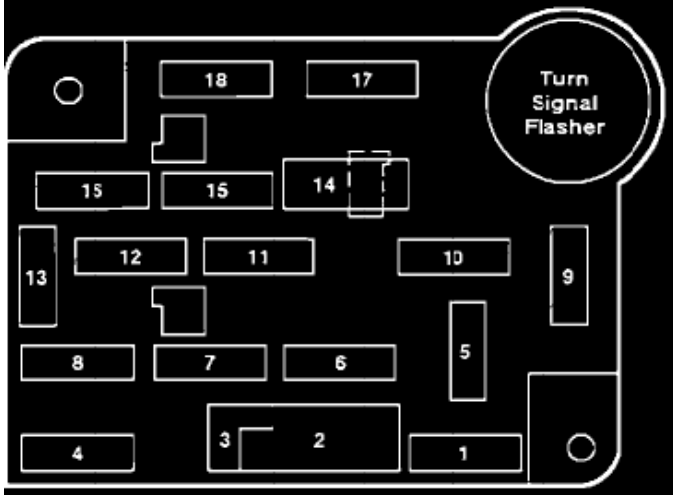


Shift Solenoid: Description and Operation

Shift Solenoid 3-4 (SS 3-4)

The 3-4 shift solenoid is used to control the 3-4/4-3 shift valve.

Transmission Function: Used to shift from third gear to fourth gear, and fourth gear to third gear.



Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Fuse Position	Amps	Circuits Protected
1	15	Radio, Dome/Cargo Lamps
2	6 c.b.	Windshield Wipers
4	15	Stop/Hazard Lamps
5	15	Turn Lamps, Backup Lamps, Brake Fluid Level Sensor
6	—	Not Used
7	10	A/C Compressor Control
8	20	Horn
9	30	Air Conditioner/Heater
10	15	Lamps on Warning, Park/License Lamps
11	15	Radio, Electric Shift Control, Speed Contro
12	20 c.b.	Multi-Function Switch, Cigar Lighter, Power Lumbar Seats
13	10	Instrument Illumination
14	30 c.b.	Power Windows
15	20	Rear Anti-Lock Brakes
16	—	Not Used
17	15	Electric Shift Control, Warning Chime Module, Low Oil Level Relay, Instrument Cluster
18	10	HEGO

Power Distribution

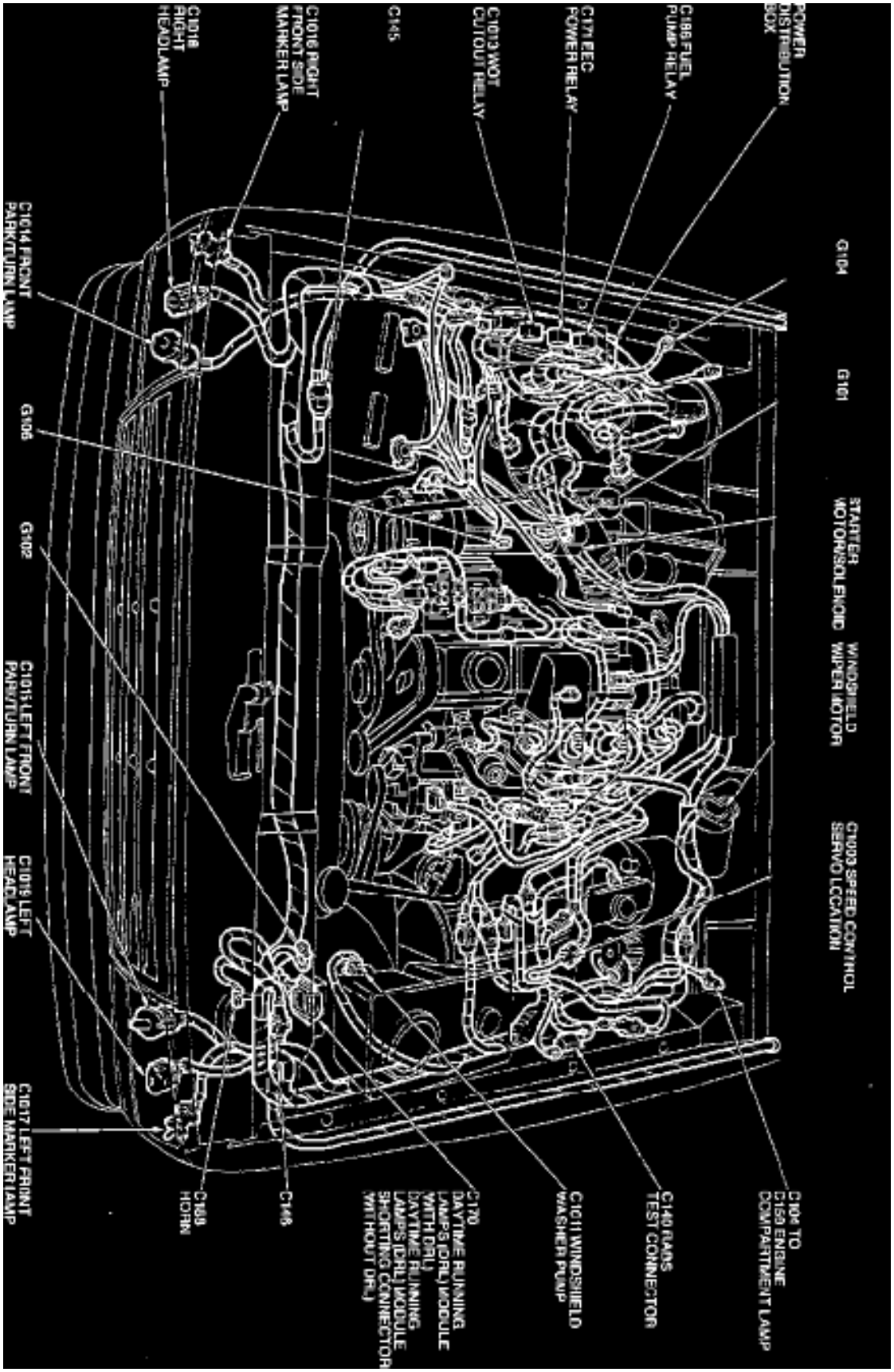
The alternator is connected to maxi-fuses within the power distribution box which is then connected together with the Battery at the starter relay hot terminal. Circuits and components are protected by maxi-fuses. Low power circuits are also protected by fuses.

The Ignition Switch and Main Light Switch are powered at all times, as are Fuses 1, 4, 8, 10 and Circuit Breaker 12 in the Fuse Panel. The other fuses are powered through the Ignition Switch or the Main Light Switch.

Position 3 is not used and is covered by Circuit Breaker 2.

Fuse Panel Details

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Power and Ground Distribution > Fuse Block > Component Information > Locations > Fuse Panel > Page 5578

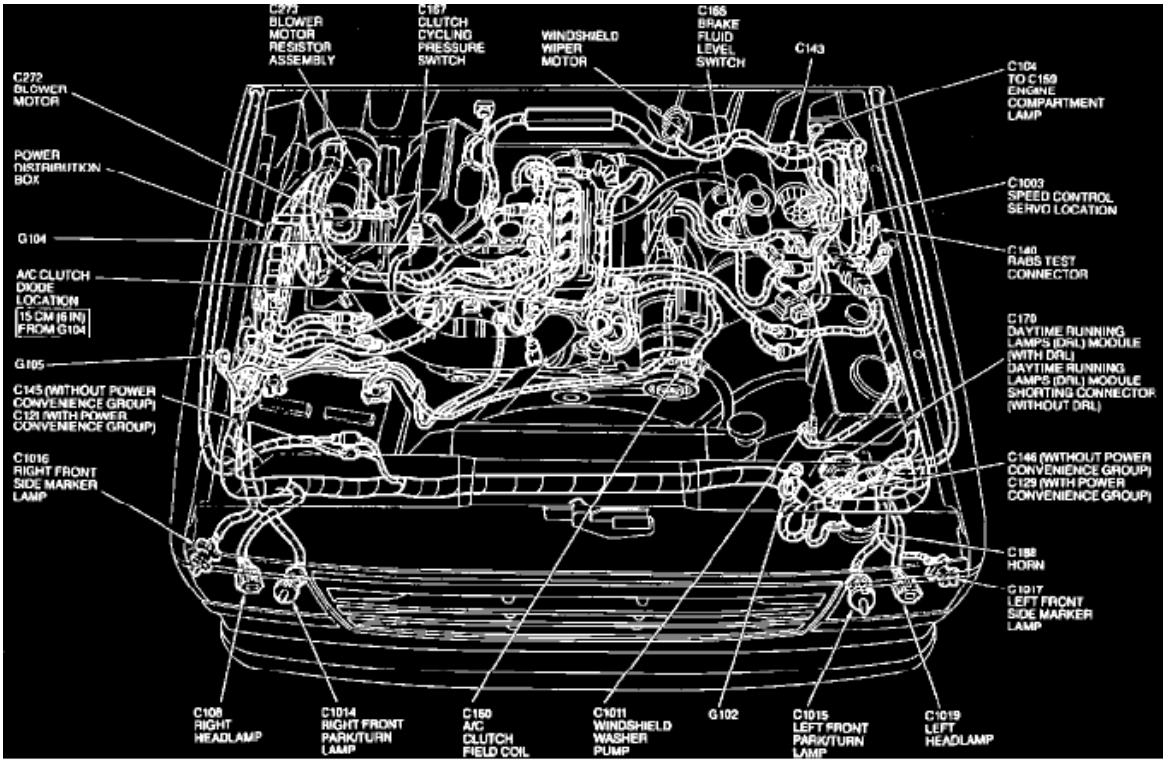


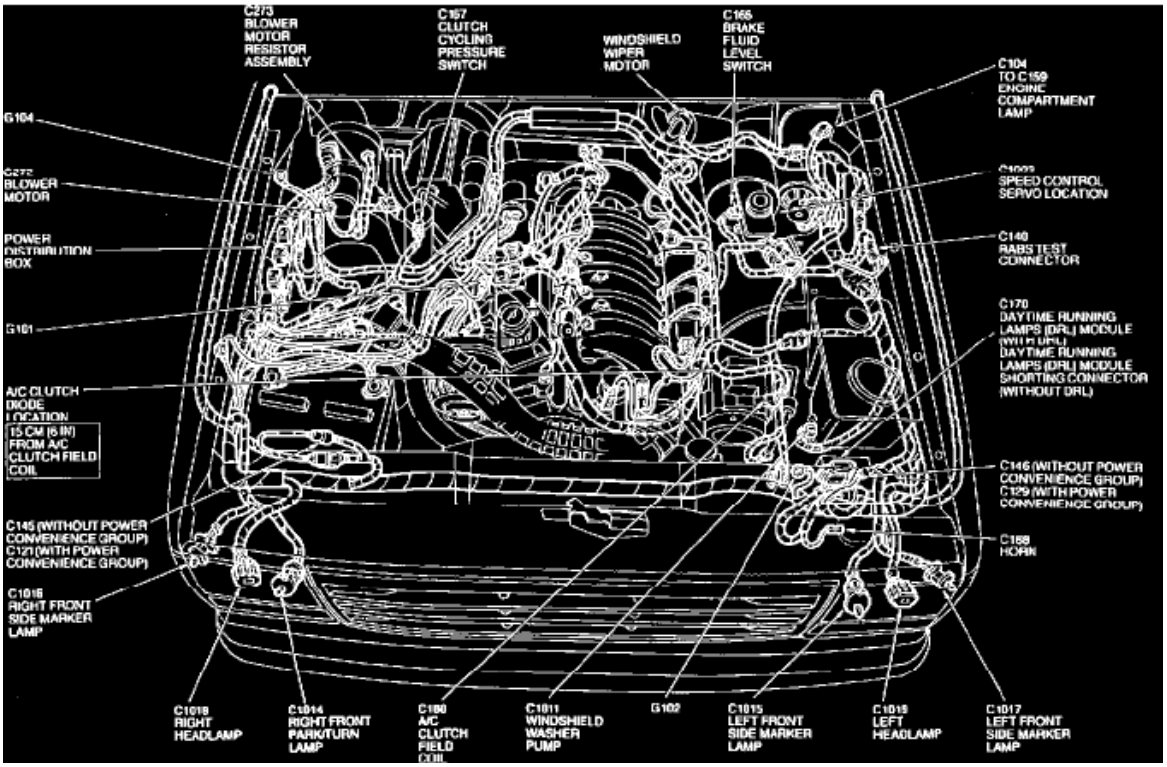
Fuse Block: Locations Power Distribution Box

Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

Applicable to: 2.3L/4-140


C272
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C143
C272
BLOWER
MOTOR
C104
TO C159
ENGINE
COMPARTMENT
LAMP
POWER
DISTRIBUTION
BOX
C1003
SPEED CONTROL
SERVO LOCATION
G104
C140
RABS TEST
CONNECTOR
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM G104
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
G105
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C158
HORN
C1017
LEFT FRONT
SIDE MARKER
LAMP
C108
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
PARK/TURN
LAMP
C1019
LEFT
HEADLAMP


C273
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C104
TO C159
ENGINE
COMPARTMENT
LAMP
G104
C272
BLOWER
MOTOR
SPEED CONTROL
SERVO LOCATION
POWER
DISTRIBUTION
BOX
C140
RABS TEST
CONNECTOR
G101
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM A/C
CLUTCH FIELD
COIL
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C158
HORN
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C1018
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD
COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
SIDE MARKER
LAMP
C1019
LEFT
HEADLAMP
C1017
LEFT FRONT
SIDE MARKER
LAMP

Engine Compartment Components.

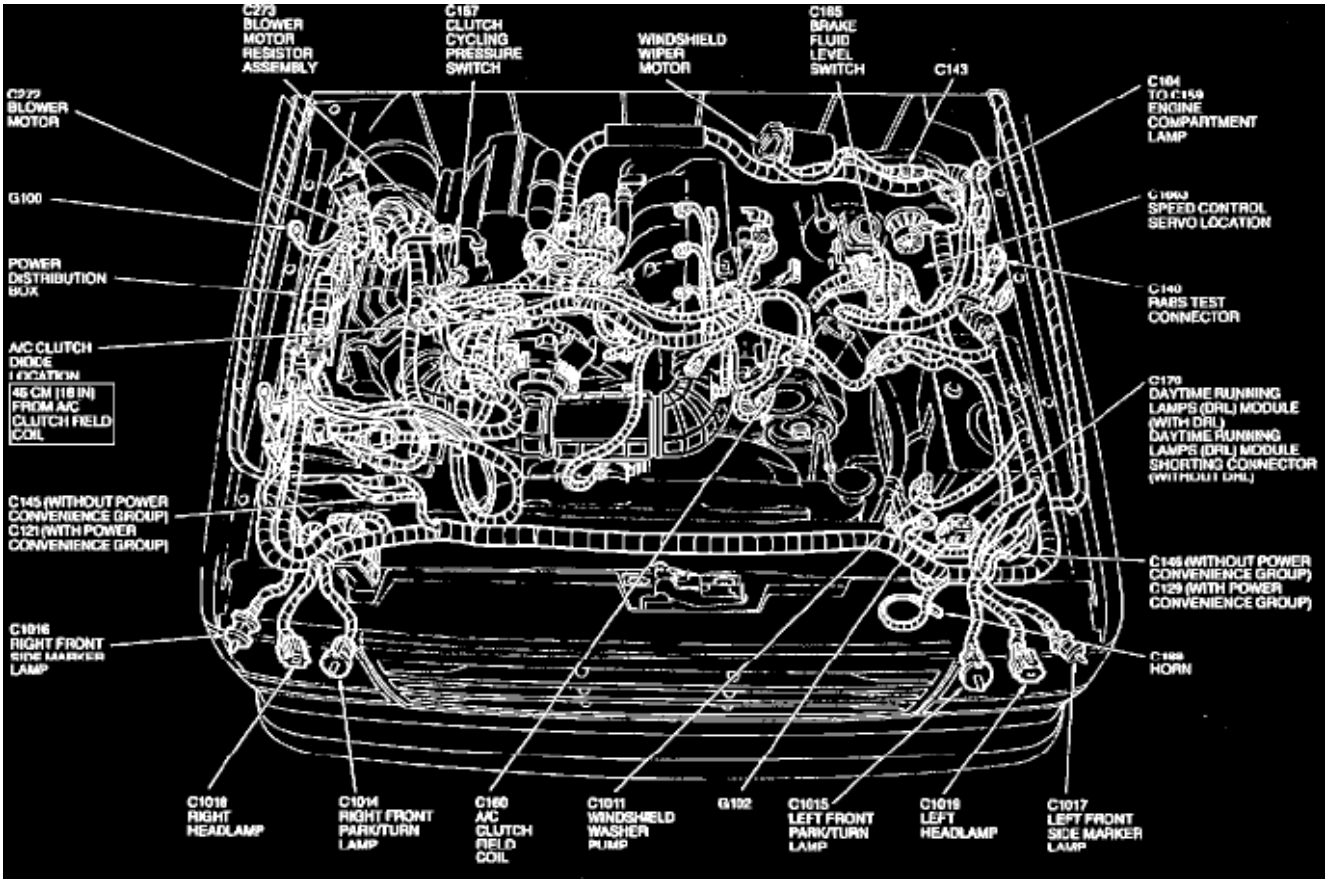
Center Of RH Fender Apron, Above Wheelwell

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

Applicable to: 3.0L/V6-181

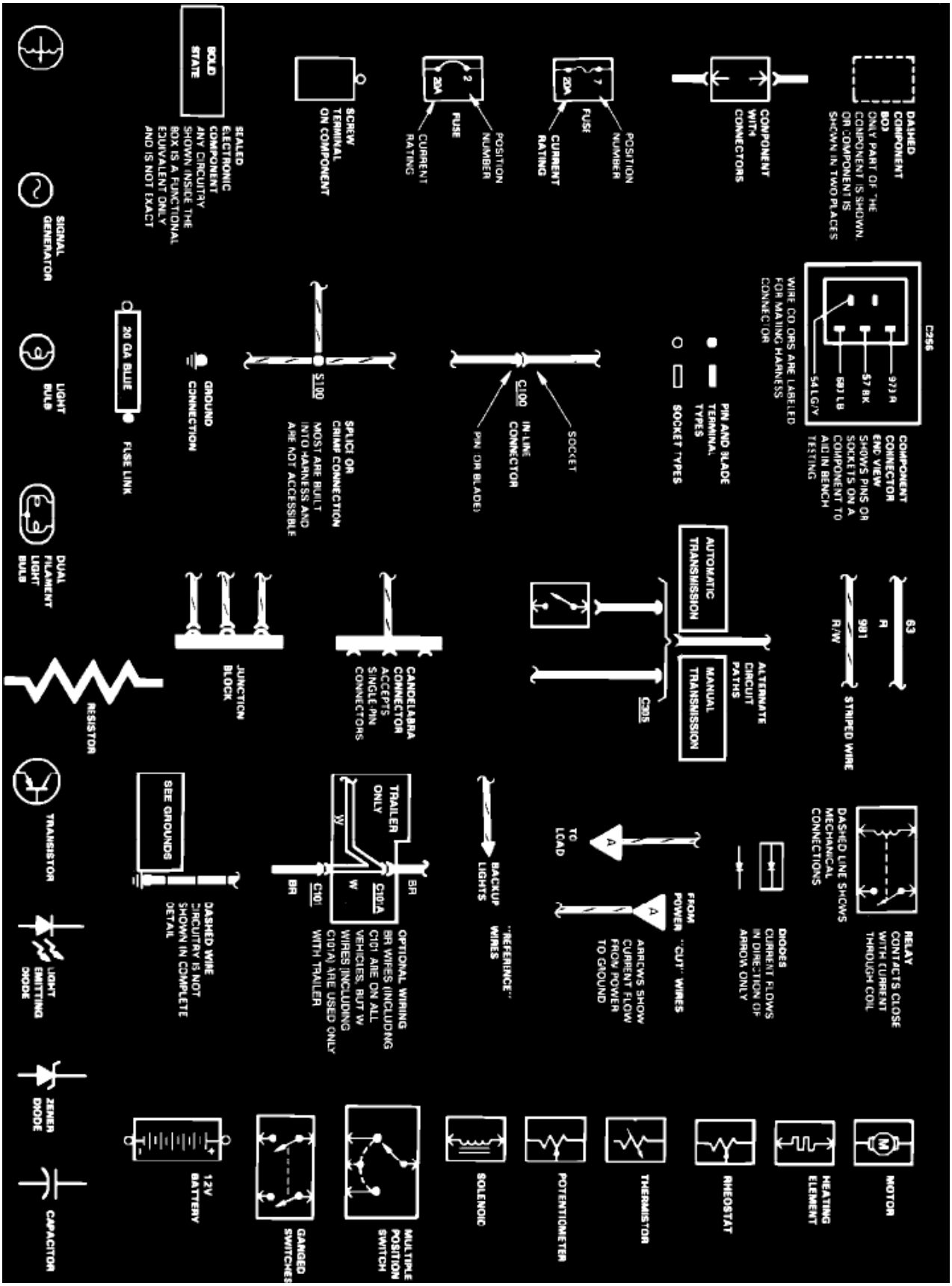


Engine Compartment Components.

Center Of RH Fender Apron, Above Wheelwell

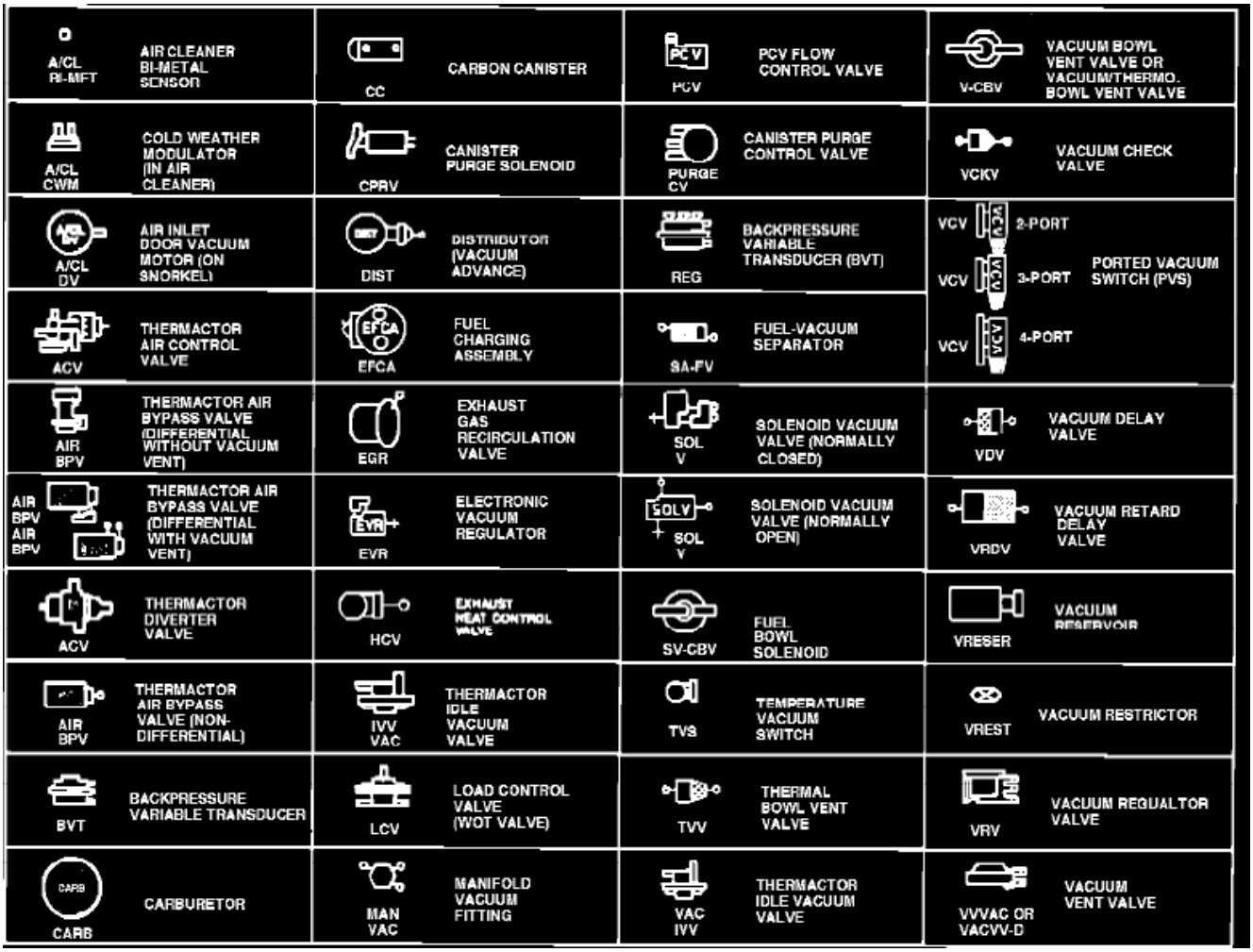
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Power and Ground Distribution > Fuse Block > Component Information > Diagrams > Diagram Information and Instructions

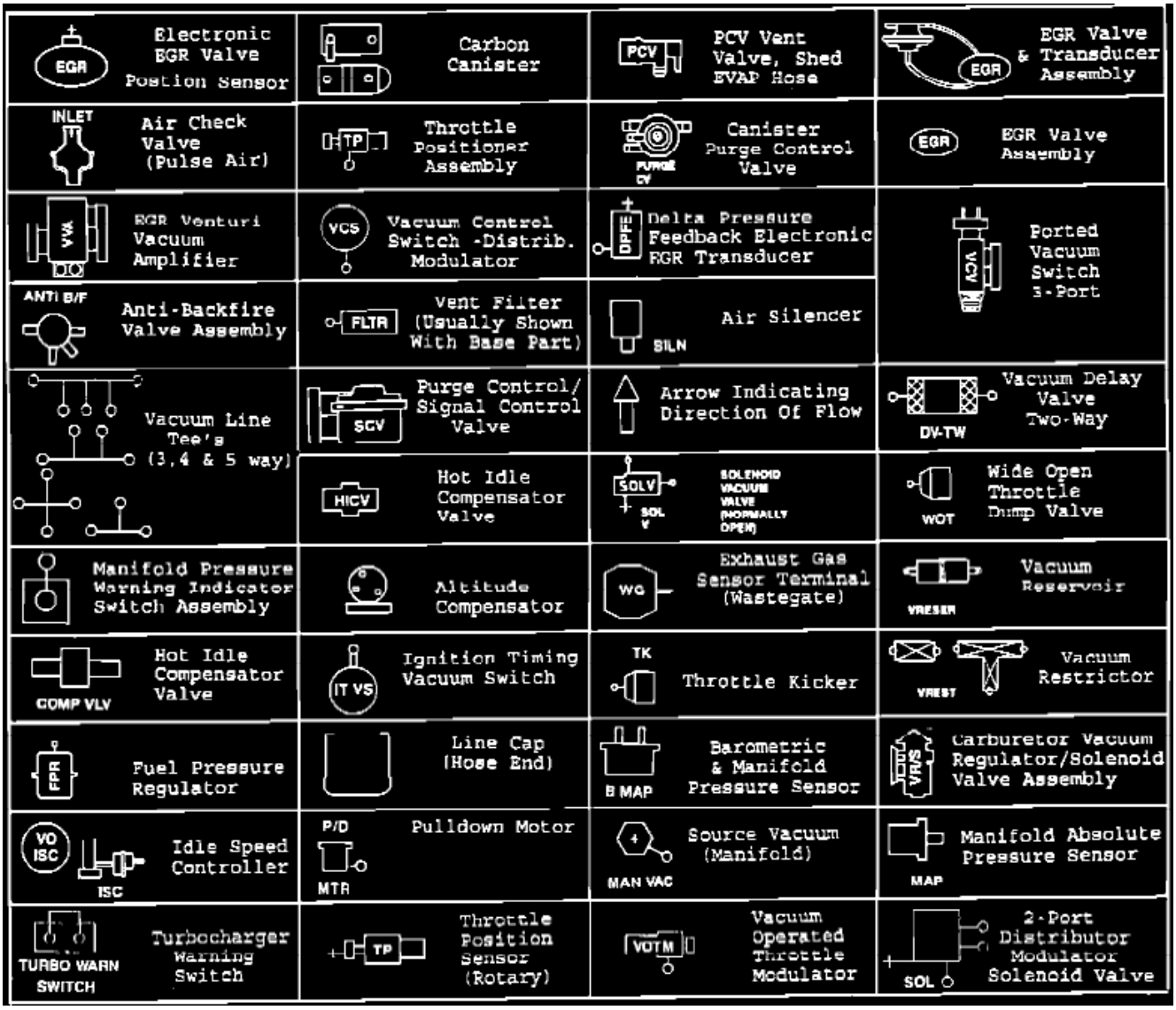


Fuse Block: Diagram Information and Instructions

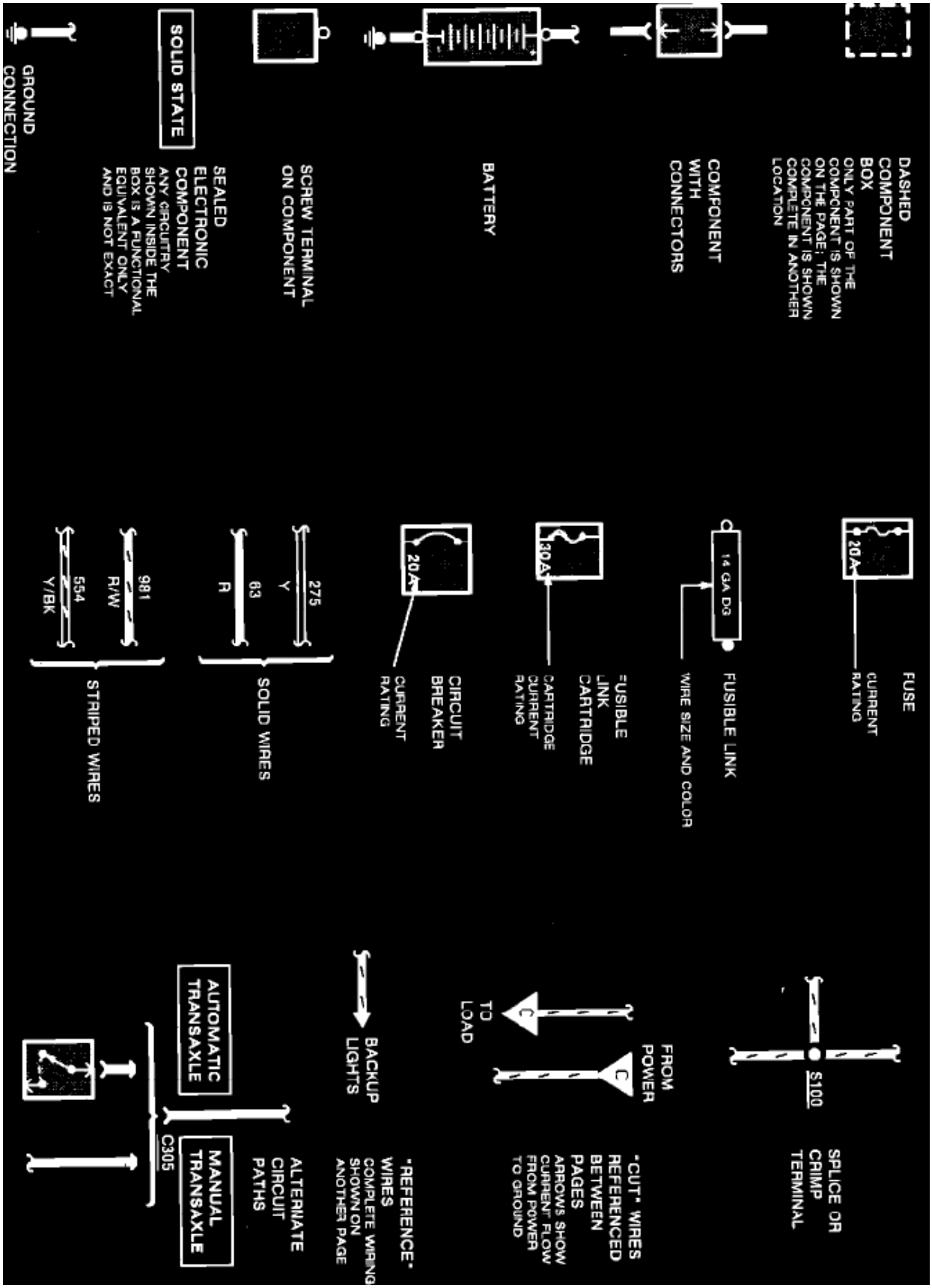
Symbol Identification



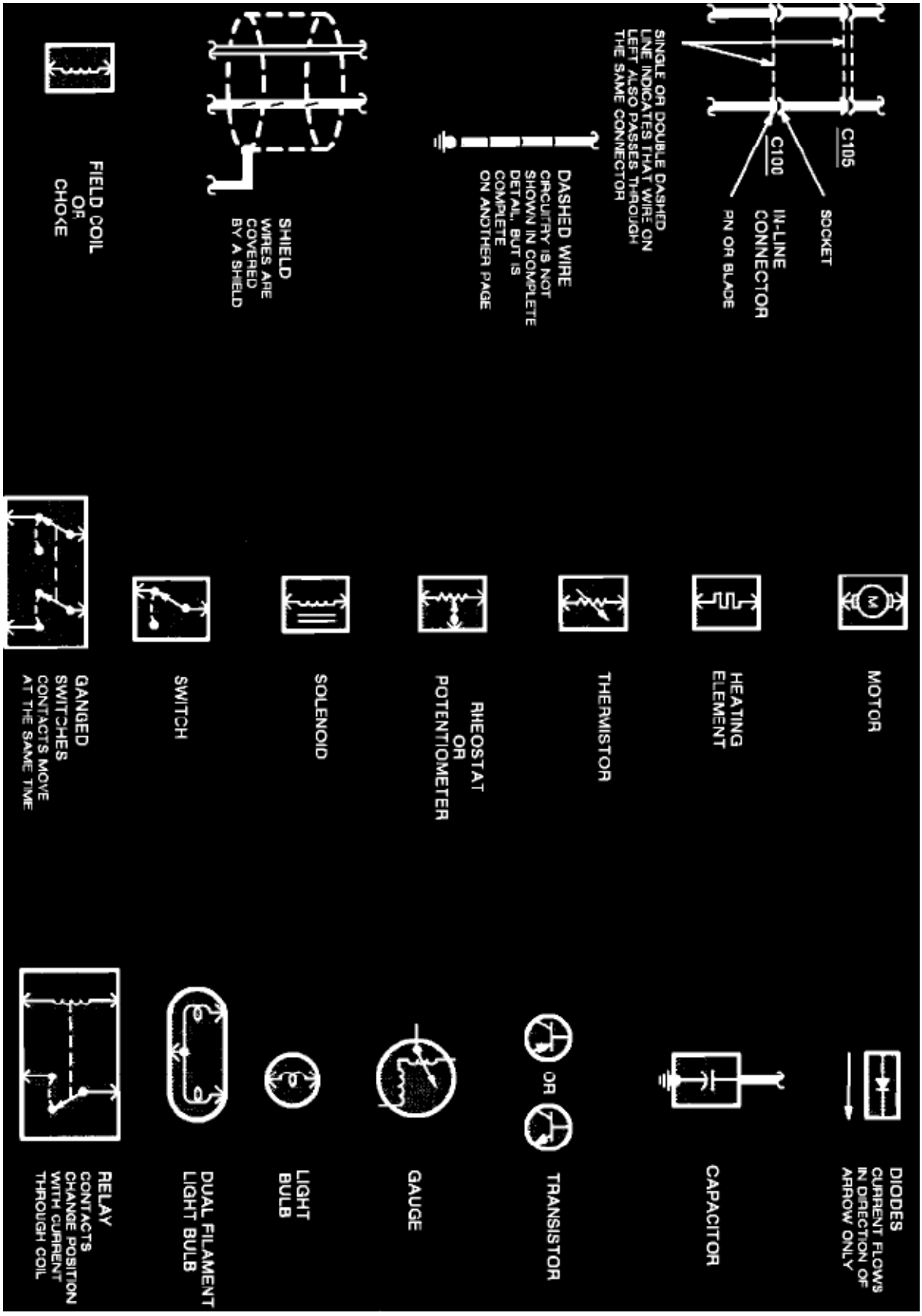
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
TO LOAD
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

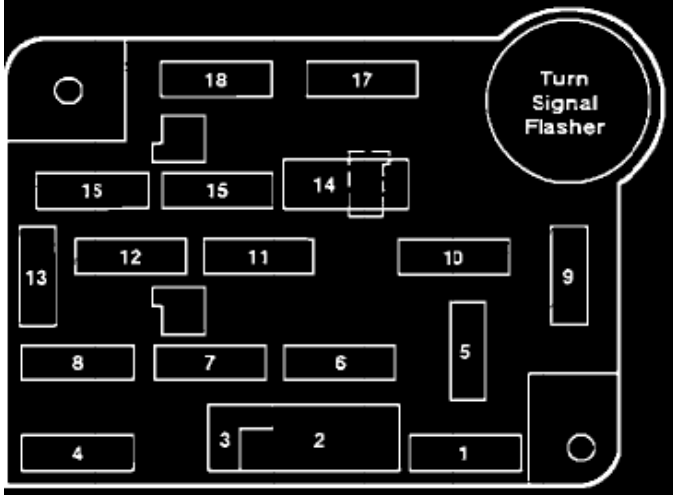
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Fuse Position	Amps	Circuits Protected
1	15	Radio, Dome/Cargo Lamps
2	6 c.b.	Windshield Wipers
4	15	Stop/Hazard Lamps
5	15	Turn Lamps, Backup Lamps, Brake Fluid Level Sensor
6	—	Not Used
7	10	A/C Compressor Control
8	20	Horn
9	30	Air Conditioner/Heater
10	15	Lamps on Warning, Park/License Lamps
11	15	Radio, Electric Shift Control, Speed Contro
12	20 c.b.	Multi-Function Switch, Cigar Lighter, Power Lumbar Seats
13	10	Instrument Illumination
14	30 c.b.	Power Windows
15	20	Rear Anti-Lock Brakes
16	—	Not Used
17	15	Electric Shift Control, Warning Chime Module, Low Oil Level Relay, Instrument Cluster
18	10	HEGO

Power Distribution

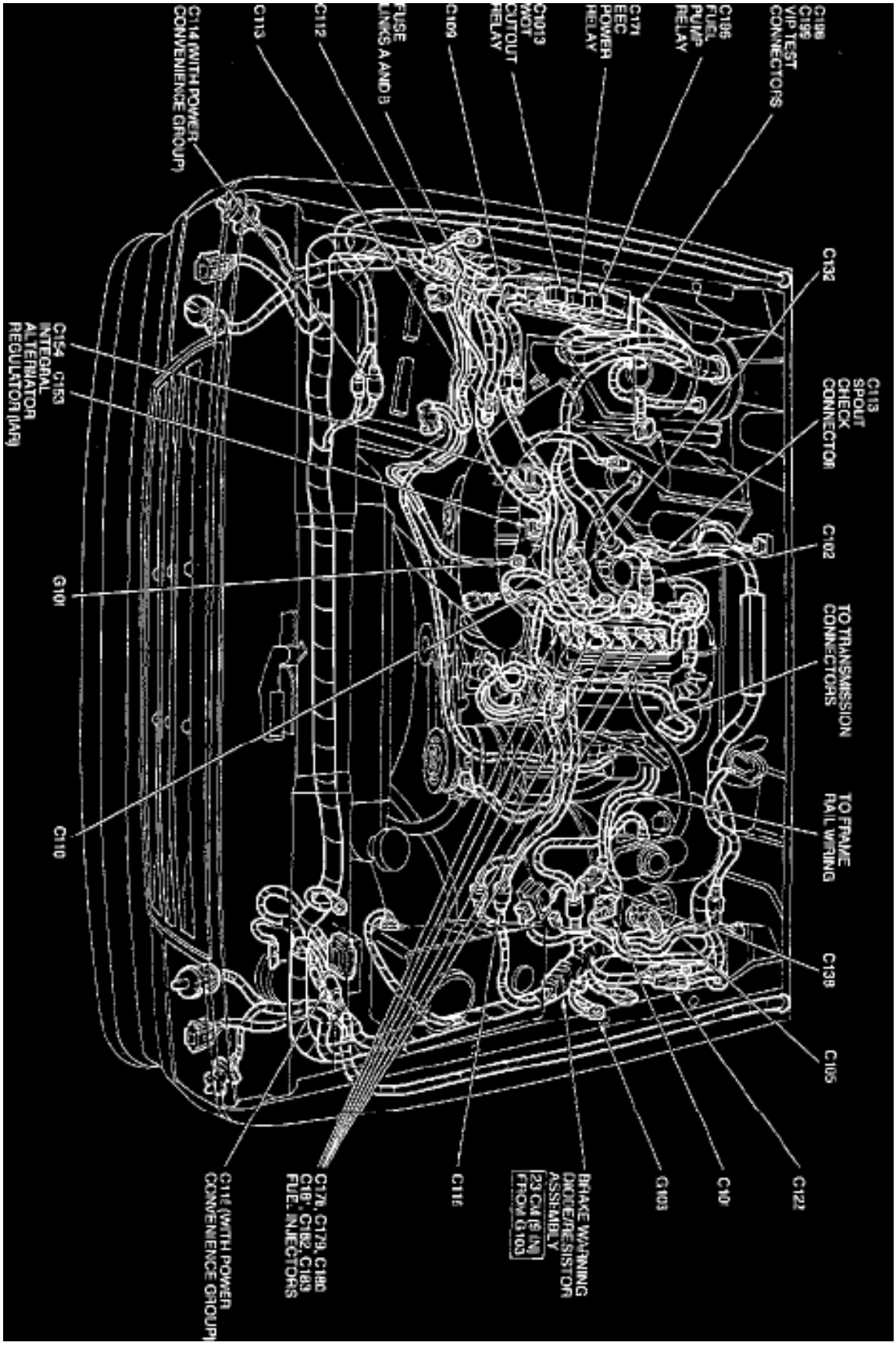
The alternator is connected to maxi-fuses within the power distribution box which is then connected together with the Battery at the starter relay hot terminal. Circuits and components are protected by maxi-fuses. Low power circuits are also protected by fuses.

The Ignition Switch and Main Light Switch are powered at all times, as are Fuses 1, 4, 8, 10 and Circuit Breaker 12 in the Fuse Panel. The other fuses are powered through the Ignition Switch or the Main Light Switch.

Position 3 is not used and is covered by Circuit Breaker 2.

Fuse Panel Details

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Power and Ground Distribution > Fusible Link > Component Information > Locations > Fuse Link A

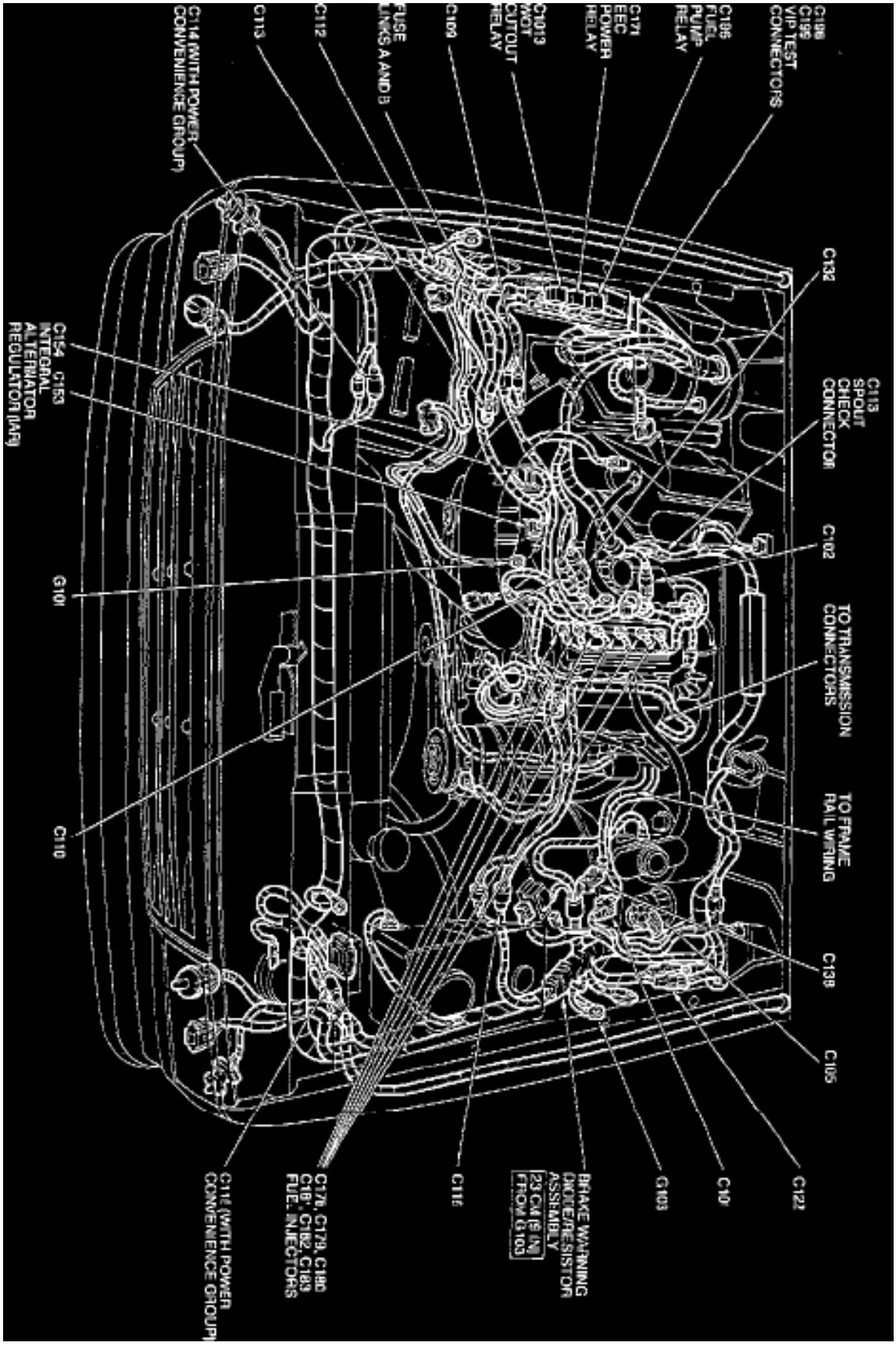


Fusible Link: Locations Fuse Link A

Engine Compartment Components.

RH Fender Apron, At Starter Relay

Applicable to: 2.9L/V6-179


C198
C196
VIP TEST CONNECTORS
C196
FUEL PUMP RELAY
C171
EEC POWER RELAY
C1013
KNOT CUTOUT RELAY
C109
FUSE LINKS A AND B
C112
C113
C114 (WITH POWER CONVENIENCE GROUP)
C154
C153
INTEGRAL ALTERNATOR REGULATOR (IAR)
G101
C110
C134
C113
SPOUT CHECK CONNECTOR
C102
TO TRANSMISSION CONNECTORS
TO FRAME RAIL WIRING
C138
C105
C122
C107
G103
BRAKE WARNING (MUTE) RESISTOR ASSEMBLY
23 CM (9 IN) FROM G103
C11E
C178, C179, C180
C181, C182, C183
FUEL INJECTORS
C114 (WITH POWER CONVENIENCE GROUP)

Fusible Link: Locations Fuse Link B

Engine Compartment Components.

RH Fender Apron, At Starter Relay

Applicable to: 2.9L/V6-179

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER 1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

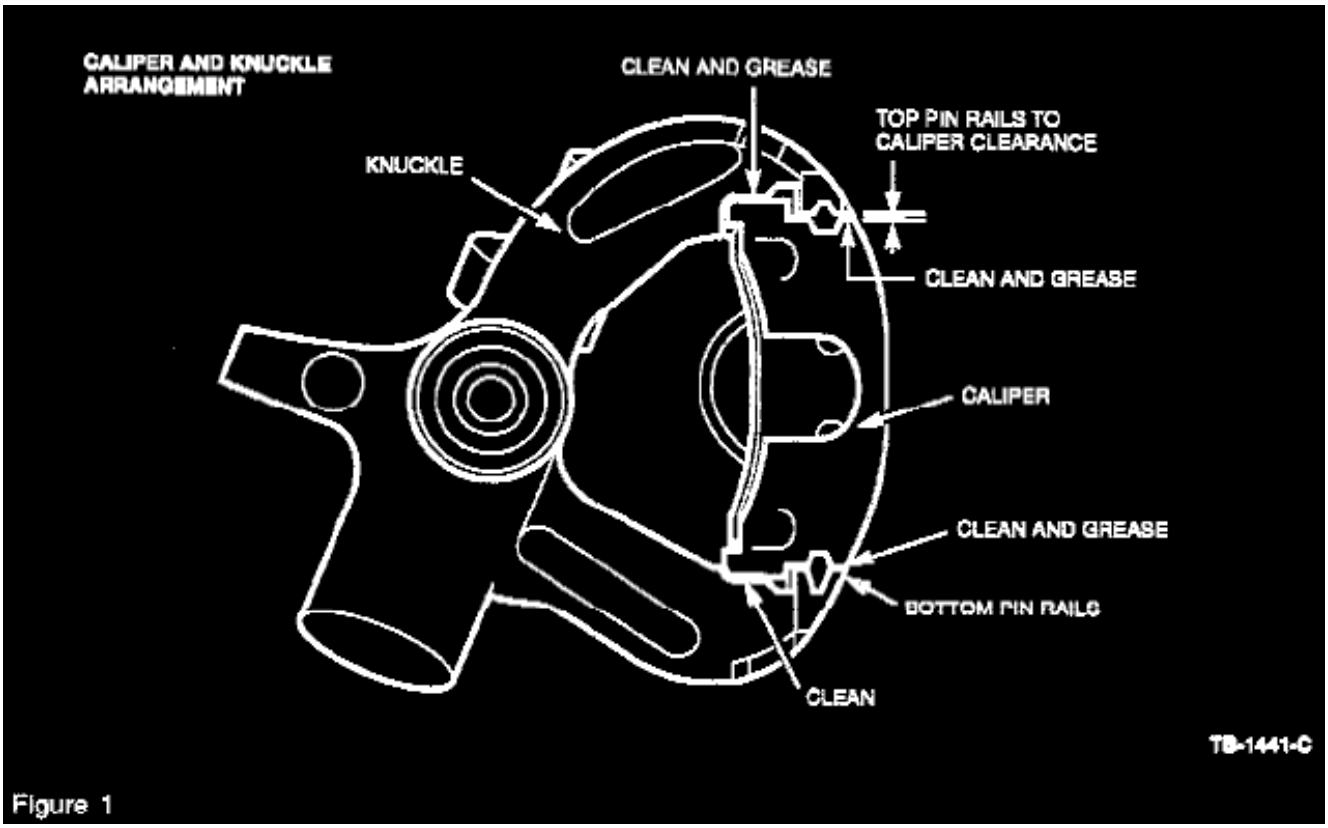


Figure 1

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

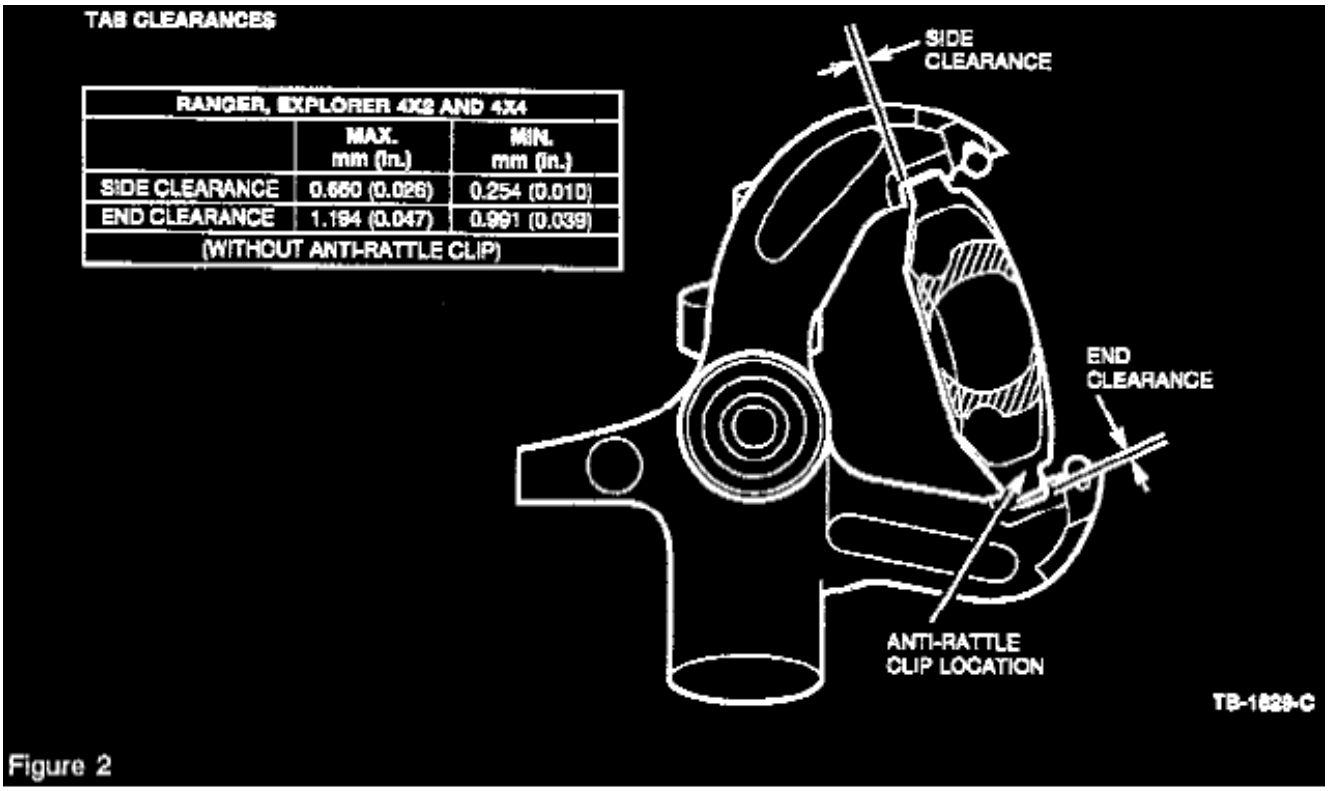


Figure 2

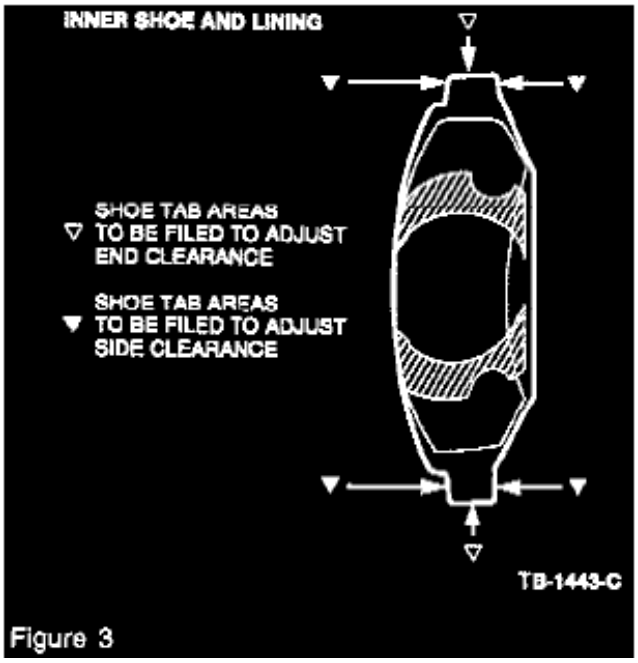


Figure 3

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application.
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

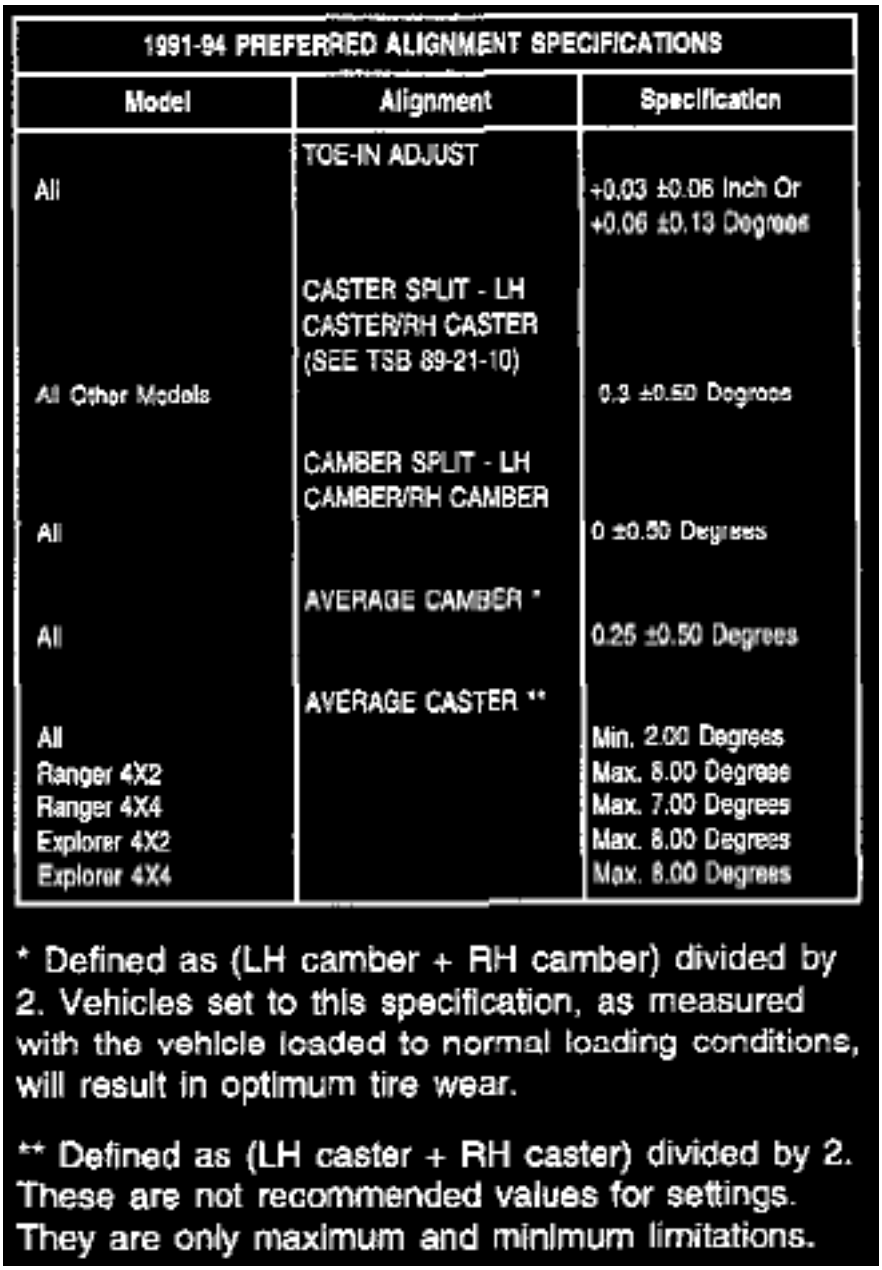
3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS

Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All	AVERAGE CASTER **	Min. 2.00 Degrees
Ranger 4X2		Max. 8.00 Degrees
Ranger 4X4		Max. 7.00 Degrees
Explorer 4X2		Max. 8.00 Degrees
Explorer 4X4		Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of

the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

7. Miscellaneous

___ Check for loose, damaged or worn parts.

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER 1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

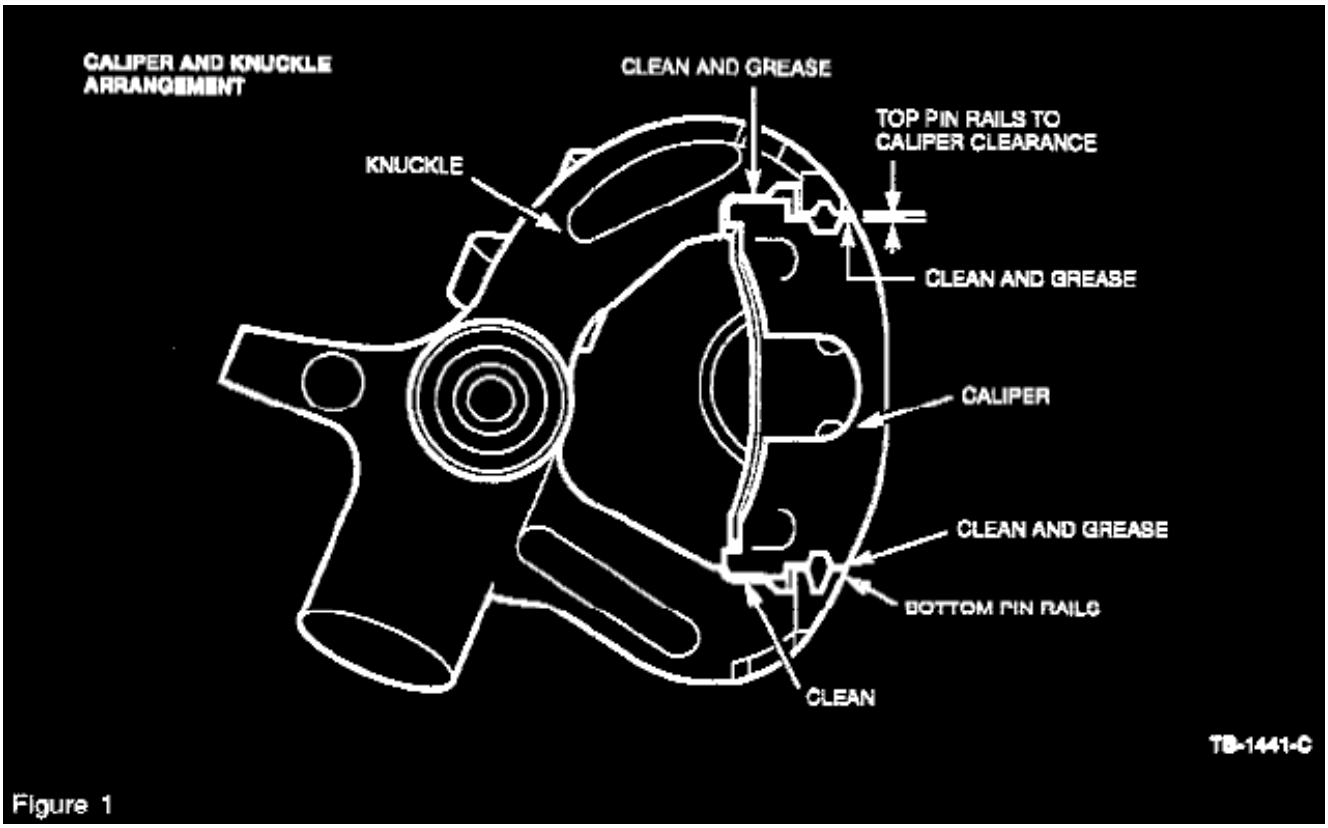


Figure 1

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

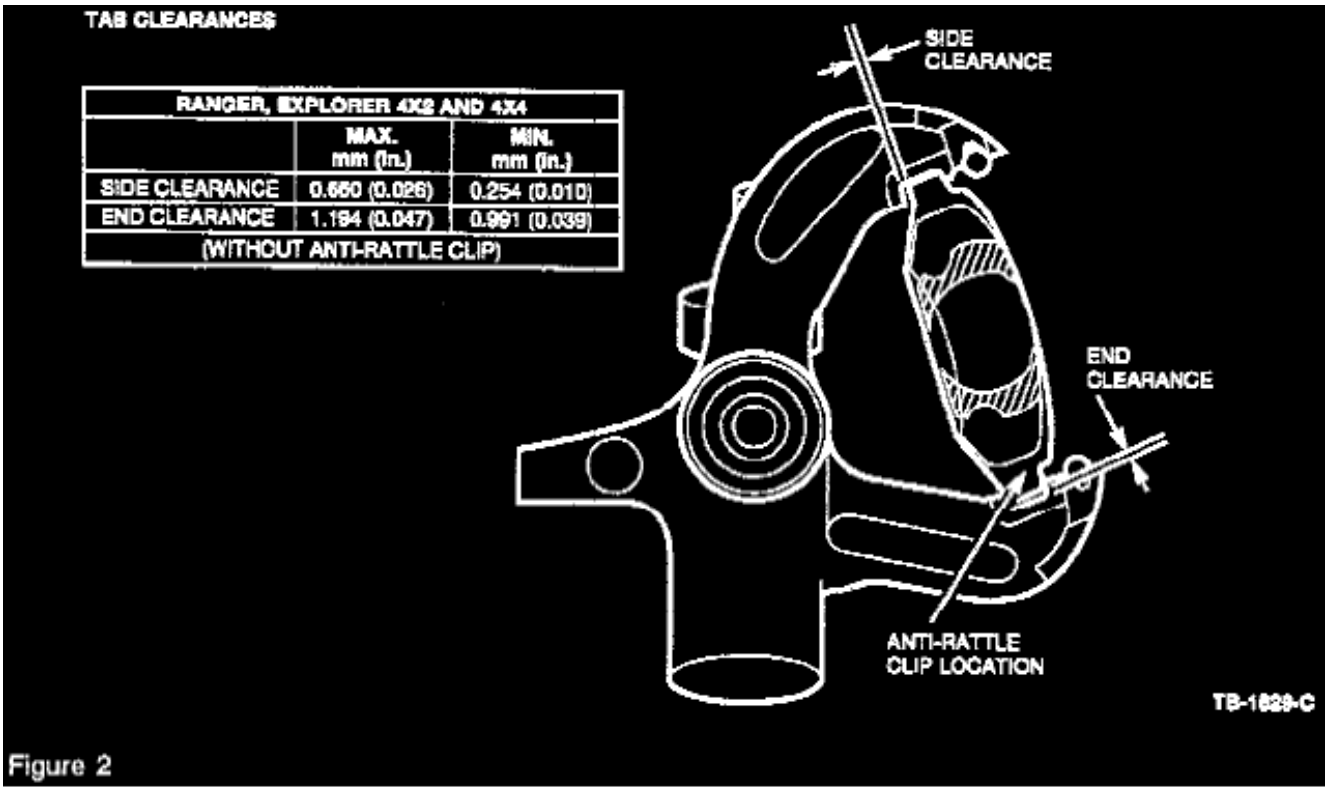


Figure 2

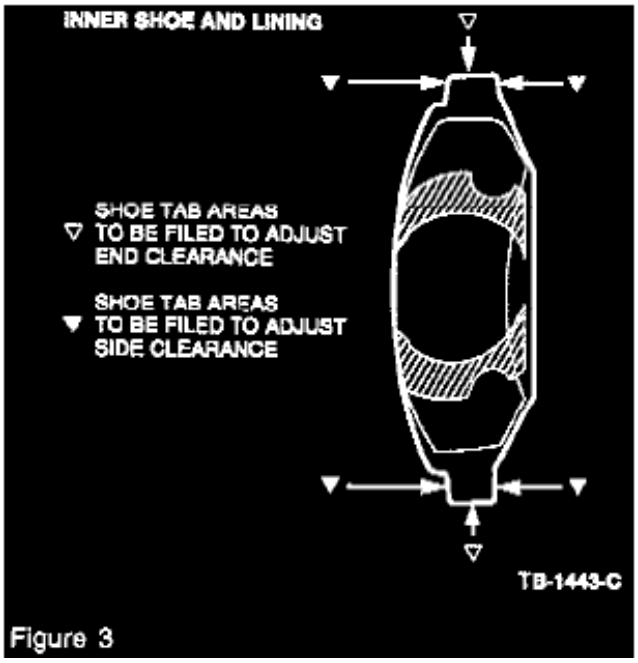


Figure 3

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application.
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

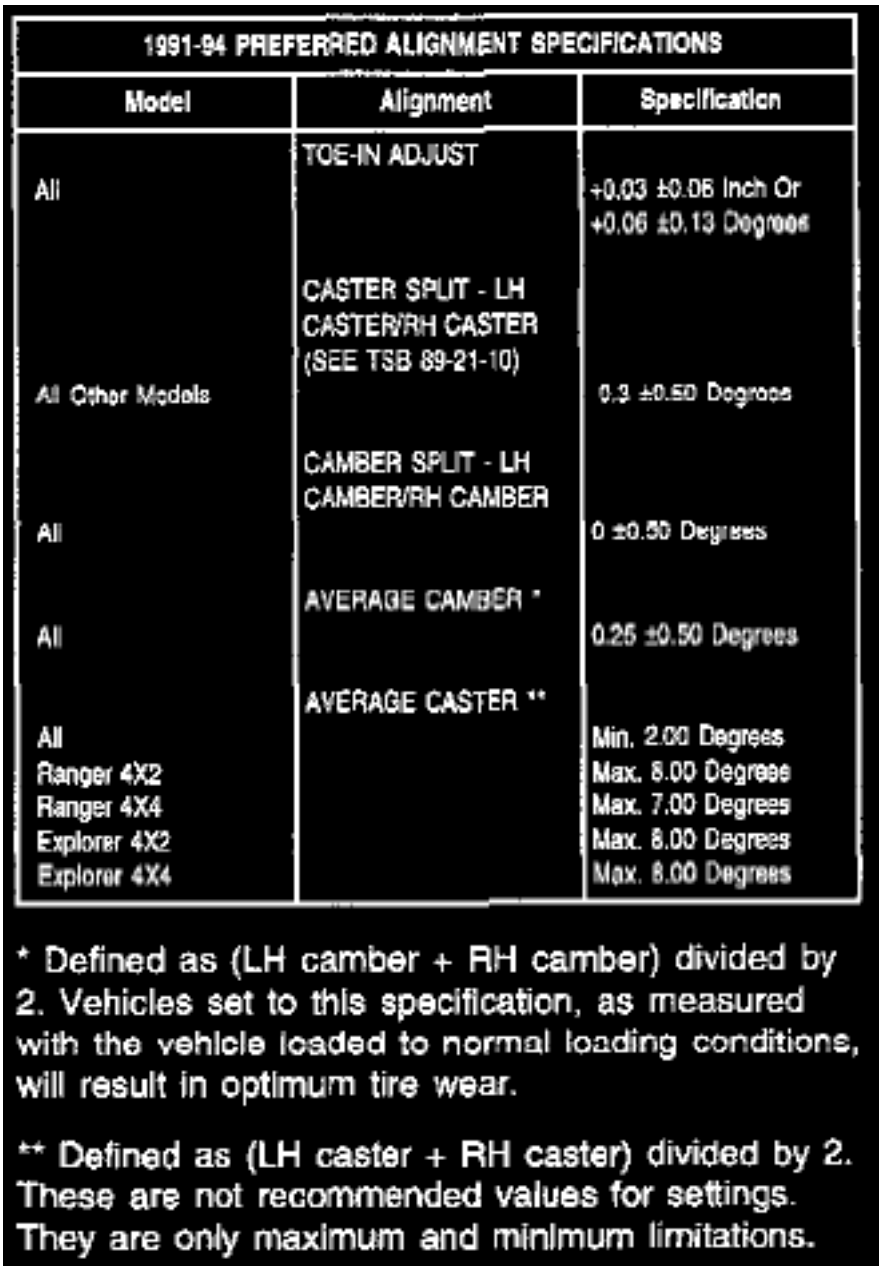
3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS

Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All	AVERAGE CASTER **	Min. 2.00 Degrees
Ranger 4X2		Max. 8.00 Degrees
Ranger 4X4		Max. 7.00 Degrees
Explorer 4X2		Max. 8.00 Degrees
Explorer 4X4		Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of

the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

7. Miscellaneous

___ Check for loose, damaged or worn parts.

Alignment: By Symptom

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER 1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

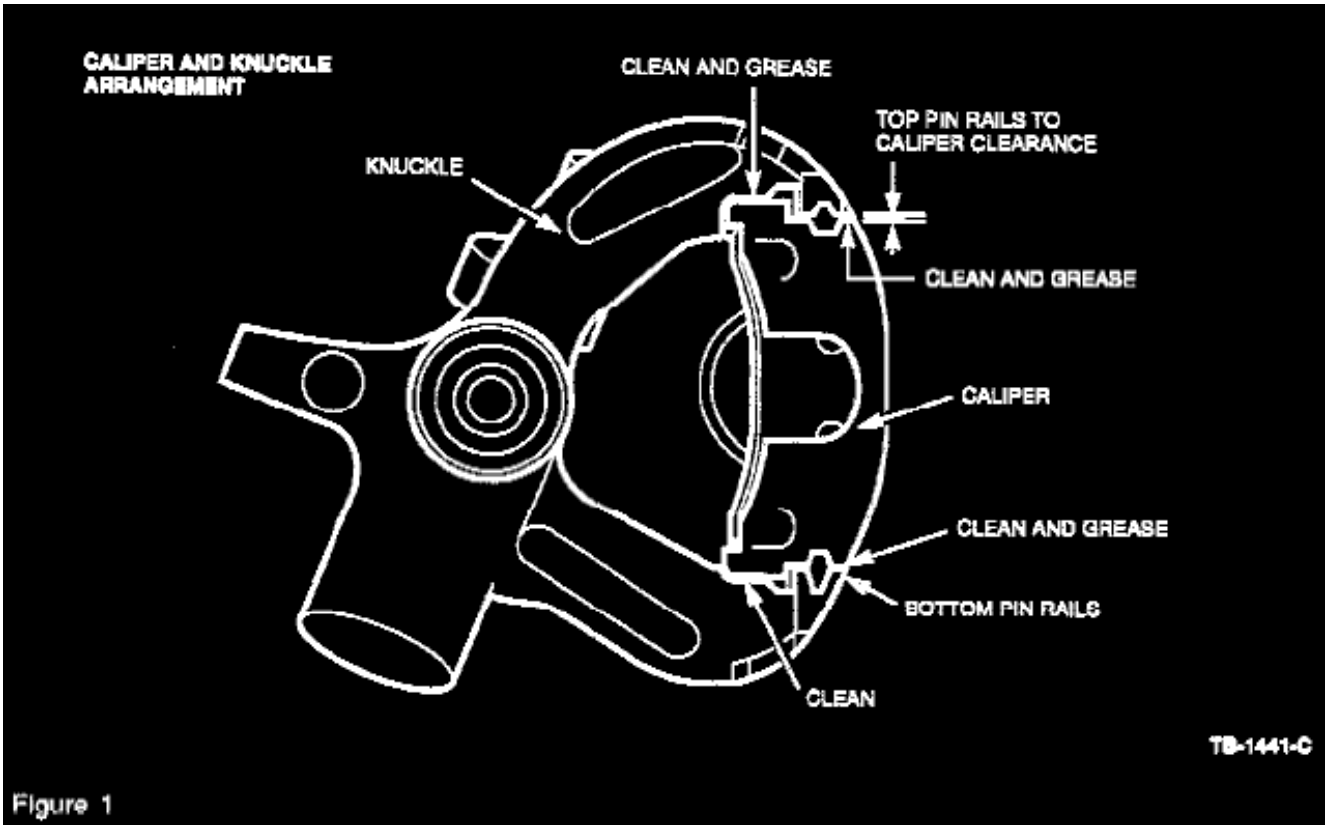


Figure 1

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

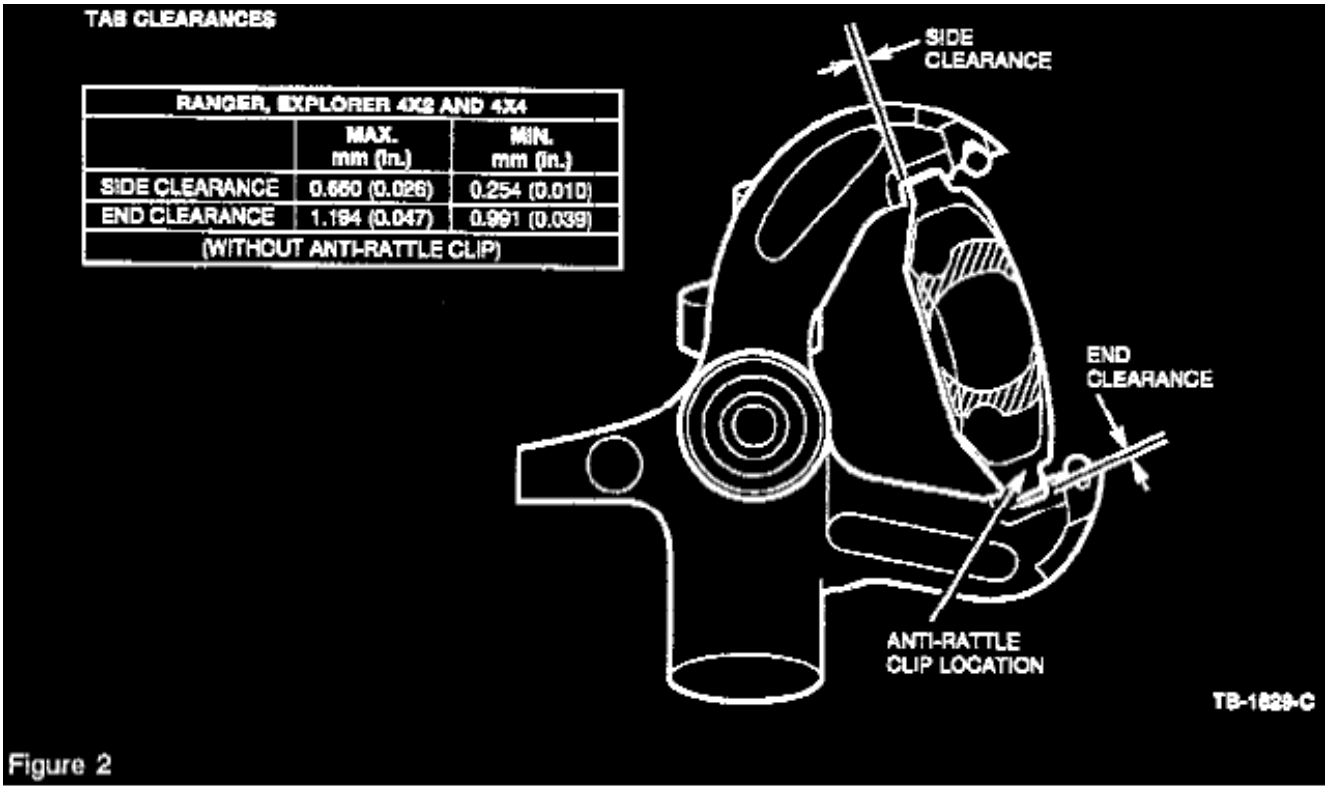


Figure 2

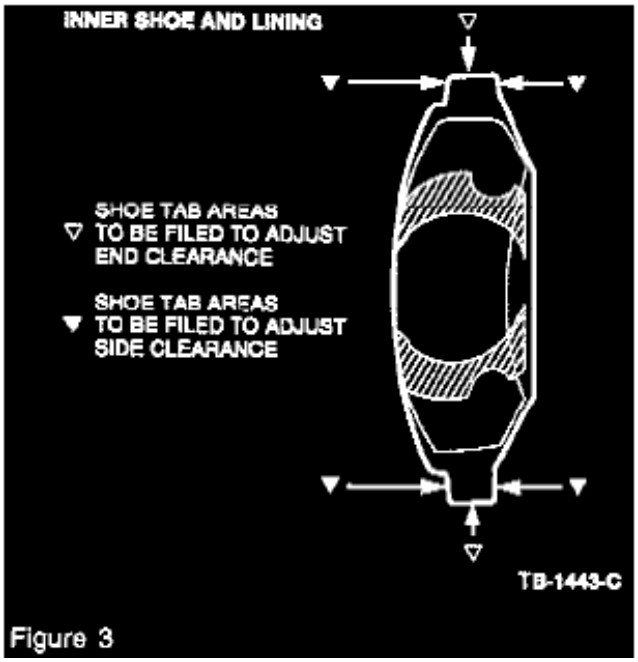


Figure 3

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application.
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment

1991-94 PREFERRED ALIGNMENT SPECIFICATIONS

Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All Ranger 4X2 Ranger 4X4 Explorer 4X2 Explorer 4X4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

7. Miscellaneous

___ Check for loose, damaged or worn parts.

Technical Service Bulletin # 98-5A-22 Date: 980318

Vehicle - Pull Or Drift Diagnostics/Service Procedures

Article No. 98-5A-22

03/18/98

^ BRAKES - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

^ STEERING - PULL OR DRIFT - DIAGNOSTIC AND SERVICE PROCEDURE

LIGHT TRUCK: 1988-94 RANGER

1991-94 EXPLORER

ISSUE: A comprehensive pull and drift diagnostic procedure has been developed to assist technicians with vehicle service.

ACTION: Use the following Service Procedure to resolve drift and pull concerns.

Proceed with the Pull and Drift Diagnostic Procedure it the pull or drift is not significantly reduced or where there is a case of steady state drift (no braking).

A Diagnostic Check List has been provided at the end of this article to use with this procedure.

NOTE:

THIS TSB ARTICLE SHOULD BE READ COMPLETELY BEFORE PERFORMING DIAGNOSTICS OR REPAIRS.

PART NUMBER PART NAME

F7AZ-3F823-A Premium Power Steering Fluid

D7AZ-19A331-A Silicone Brake caliper Grease And Dielectric Compound

F1TZ-3B203-B Radius Arm Bushing (2 Req'd.)

F2TZ-2C15O-A Caliper Pin (4 Req'd.)

OTHER APPLICABLE ARTICLES: 90-7-16, 89-21-10 SUPERSEDES:98-1-16 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Years

OPERATION DESCRIPTION TIME

985A22A Service Procedure 1.3 Hr.

985A22B Road Test 0.3 Hr.

985A22C Procedure 1 1.9 Hr.

985A22D Procedure 2 2.4 Hr.

985A22E Procedure 3 0.5 Hr.

985A22F Procedure 4 0.9 Hr.

985A22G Procedure 6 2.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

PROCEDURE 1 - TIRE 07

PROCEDURE 2 - FRONT W6

PROCEDURE 3 - TIRE 07

PROCEDURE 4 - 3524 07

PROCEDURE 5 - FRONT W6

PROCEDURE 6 - 2005 42

PROCEDURE 7 - FRONT W6

ROAD TEST - FRONT W6

OASIS CODES: 301000, 303000

Service Procedure

1. Check and adjust brake pad clearances and caliper knuckle clearances as follows:

a. Remove the pins from the caliper.

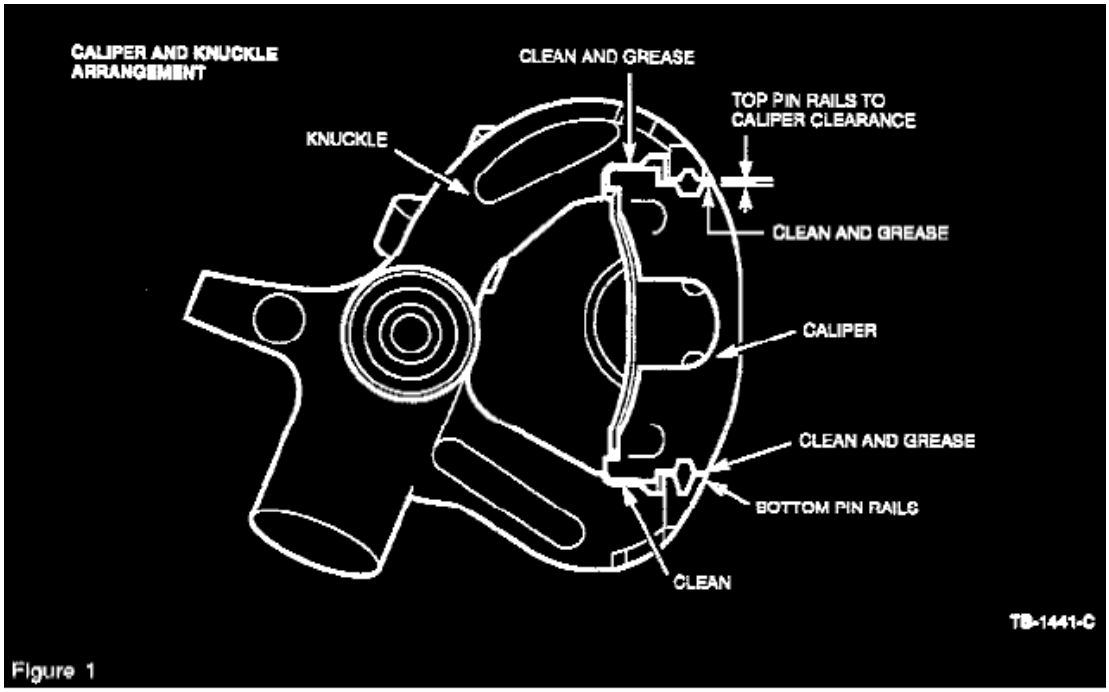


Figure 1

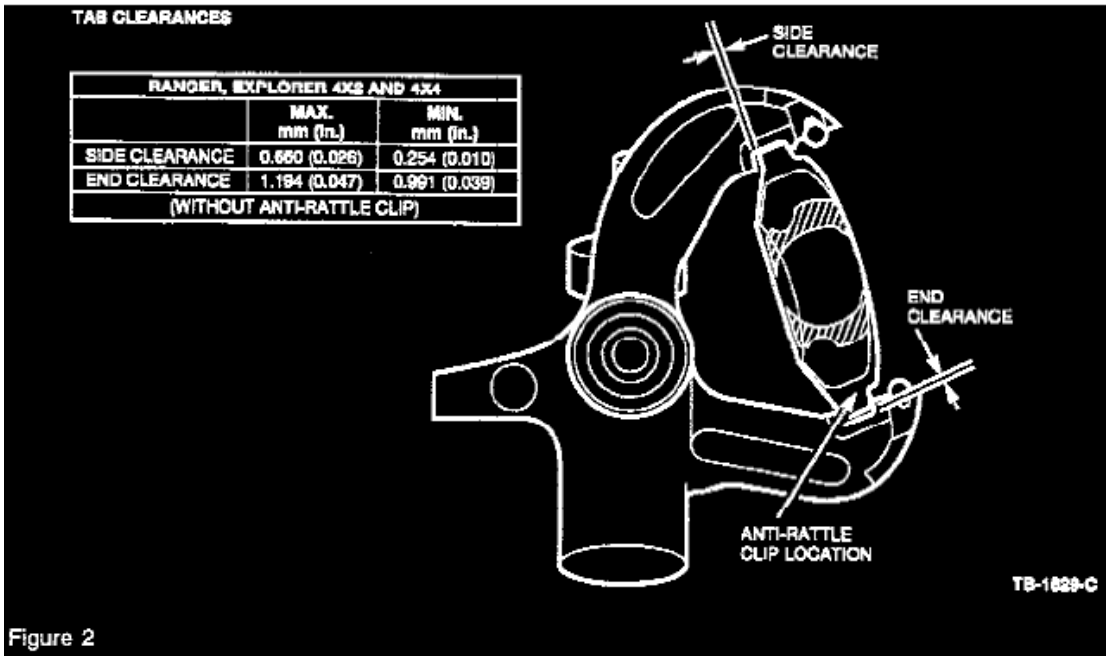


Figure 2

b. While holding the caliper in place against the bottom pin rails, Figure 1, measure the clearance between the caliper and the top pin rails. Clearance should be a minimum of 0.3B mm (0.015").

c. If the clearance is insufficient, replace the caliper and measure again. If clearance concern still exists, replace the knuckle.

NOTE:

CHECK THE CLEARANCE ON THE NEW KNUCKLE BEFORE INSTALLATION.

d. After measuring the caliper/knuckle for proper clearances, remove both calipers and inner pad assemblies.

e. Remove the anti-rattle clip from the inner pad.

f. Reinstall pad and check the side and end clearances with a feeler gauge (Figure 2).

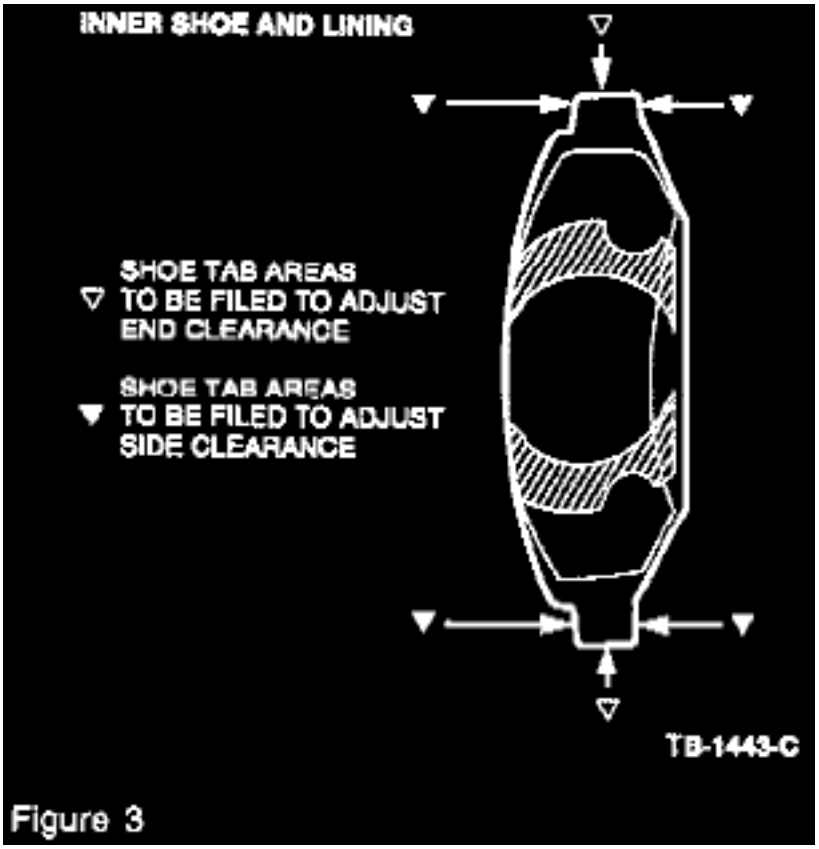


Figure 3

g. If the pad clearances are within specification, go to Step 1h. If the pad clearances are not to the required dimensions, file the steel backing plate. File material at ends of shoes, removing equal amounts from both sides or ends (Figure 3).

CAUTION:

DO NOT GRIND THE STEEL BACKING PLATE. IT IS POSSIBLE TO REMOVE TOO MUCH MATERIAL WHEN GRINDING.

h. Check the tab clearances and install anti-rattle clip on the lower pad tab (Figure 2).

CAUTION:

MAKE SURE THE LUBRICANT DOES NOT GET ON THE ROTORS, LININGS, OR ON THE CALIPER PISTON BOOTS.

2. During reassembly:

^ Clean the caliper slide surfaces of corrosion, contamination, and burrs with a wire brush or portable wire wheel

^ Polish with crocus cloth

^ Lubricate and corrosion protect by applying a light coat of Silicone Brake Caliper Grease and Dielectric Compound (D7AZ-19A331-A), or equivalent meeting Ford specification ESE-M1C171-A, to the inner knuckle top and bottom pad groove and caliper rails (Figure 1)

^ Replace the caliper pins with new Caliper Pins (F2TZ-2C150-A)

NOTE:

THE EXPLORER IS ALREADY EQUIPPED WITH THE NEW RADIUS ARM BUSHINGS.

3. Inspect the right and left side radius arm bushings for cracking, splitting, or wear. Replace the right and left side arm bushings with new Radius Arm Bushings (F1TZ-3B203-B), medium brown color, if necessary. Refer to the appropriate Service Manual, Section 04-01C, for service details.

Pull/Drift Diagnostic Procedure

The Pull/Drift Diagnostic Procedure should be used if the pull or drift is not significantly reduced with the service procedure or in cases of a steady state drift (no braking).

Test drive the vehicle with the customer to understand his/her pull or drift concern. Many customers will call a clear vision concern a pull or drift because the steering wheel is not straight.

Pull or drifts come from various sources, each with a particular set of symptoms. Careful road test evaluation usually will pinpoint which cause (or causes) is present.

Road Test

It is important to test drive the vehicle with the customer to UNDERSTAND HIS OR HER CONCERN.

Complete the road test before beginning any repairs since you may have multiple causes that need to be identified.

^ The road test should be done on a flat, straight road and should be done in both directions to account for wind

^ Tire pressure should be checked and adjusted, if necessary

ROAD TEST	RESULT	ACTION
Maintain a steady speed of 80-89 km/h (50-55 mph). **DO NOT BRAKE.**	Is there a steady state pull? If no, go to the next Step.	**See Diagnostic Procedure 1** - Tire mismatch or tire pressure concern.
While stopped, have second person move to the LH rear passenger location. Maintain 80-89 km/h (50-55 mph).	Any change in pull? If no change, go to next Step.	**See Diagnostic Procedure 2** - Caster split.
Make sure front hubs are unlocked (if equipped). Accelerate the vehicle - decelerate the vehicle using **engine braking only.**	Any changes in the pull? Does it pull one way on acceleration and another way on deceleration? If no, go to next Step.	**See Diagnostic Procedure 3** - Possible limited slip rear axle and tire circumference.
Maintain a steady speed of 80-89 km/h (50-55 mph). Put the vehicle in Neutral and shut off the engine.	Does the pull go away? If no, go to the next Step.	**See Diagnostic Procedure 4** - Steering gear valve off center.
Stop the vehicle along the highway. Rotate the wheel full left. Proceed with road test.	Does the pull get better or worse? Stop the vehicle; rotate the wheel full right. Does the pull change - better or worse? If no, go to next Step.	**See Diagnostic Procedure 5** - Possible Rubber Ball Socket (RBS) memory steer.
In a safe clear area, while firmly holding the steering wheel, apply the brakes moderately hard, but not to the point of engaging Rear Anti-lock Brake System (RABS).	Does the vehicle's heading change during brake application? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible brake imbalance.
Disconnect the fluid level sensor (disable RABS). Brake the vehicle from 80 km/h (50 mph).	Does the vehicle pull with anti-lock disconnected? If no, go to next Step.	**See Diagnostic Procedure 6** - Possible inadequate rear brake application
Brake the vehicle hard, to the point of lock-up (RABS disabled).	Do both rears lock? Do both wheels lock at the same time?	**See Diagnostic Procedure 6** - Possible unequal rear brake application.

^ A second person in the vehicle during the road test is helpful. Unless otherwise directed, the second person must remain in the front RH passenger location

^ On vehicles with automatic locking hubs, it is necessary to drive 6 meters (20 feet) forward and then backward to unlock the hubs

NOTE:

IT IS POSSIBLE THAT THE VEHICLE MAY HAVE MULTIPLE SYMPTOMS. A ROAD TEST/CAUSE CHART.

NOTE:

RECONNECT THE FLUID LEVEL SENSOR AFTER ROAD TEST.

Diagnostic Procedure # 1 - Tire Mismatch

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to Regular Production Option (RPO) list and set tire psi to the correct value

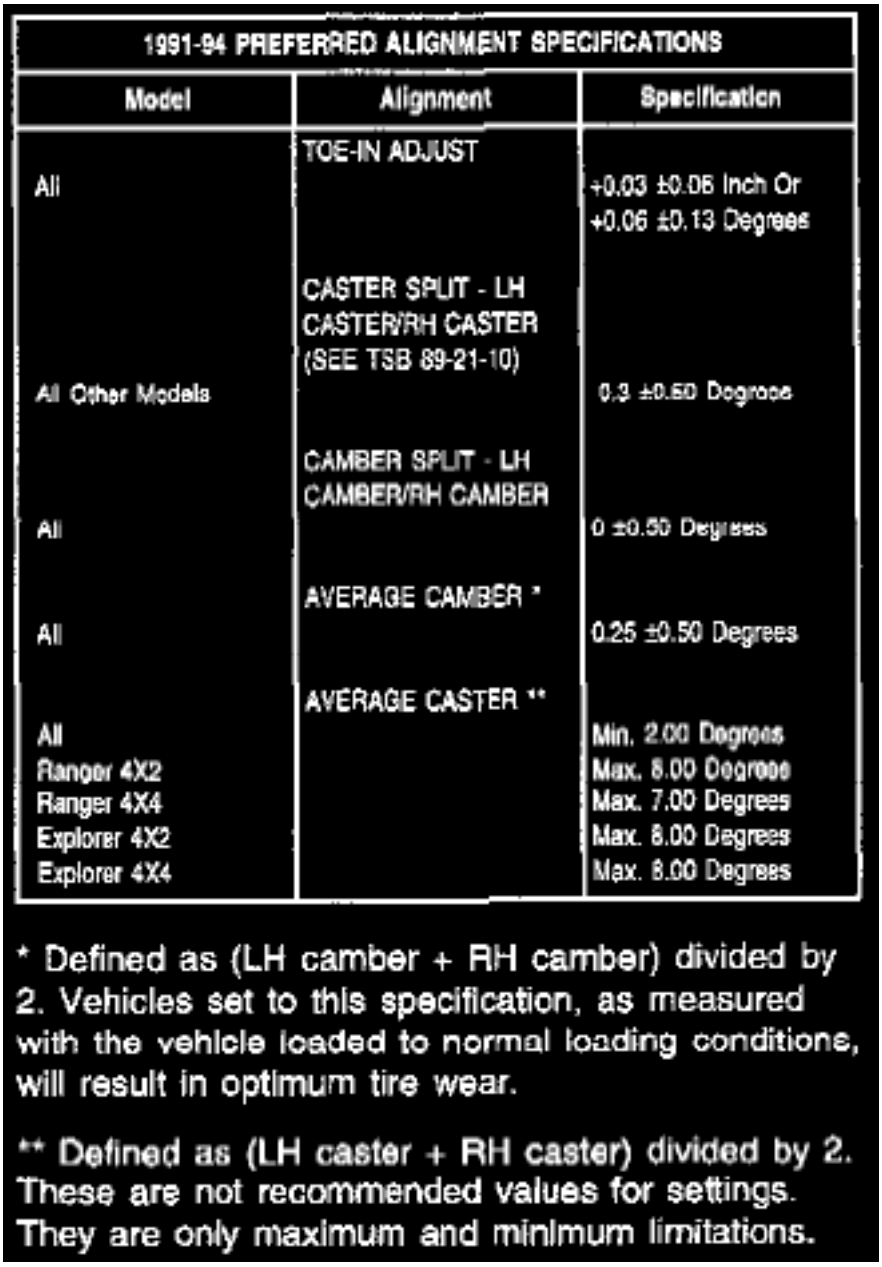
^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Set tire pressure to value on the certification label.

1. Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Tire Pull - Swap the front tires from side-to-side and road test. If the concern is not corrected, continue with next Step.

3. Tire Pull - Swap rear tires from side-to-side and road test. If the concern is not corrected, continue with next Step.



1991-94 PREFERRED ALIGNMENT SPECIFICATIONS		
Model	Alignment	Specification
All	TOE-IN ADJUST	+0.03 ±0.06 Inch Or +0.06 ±0.13 Degrees
All Other Models	CASTER SPLIT - LH CASTER/RH CASTER (SEE TSB 89-21-10)	0.3 ±0.50 Degrees
All	CAMBER SPLIT - LH CAMBER/RH CAMBER	0 ±0.50 Degrees
All	AVERAGE CAMBER *	0.25 ±0.50 Degrees
All Ranger 4X2 Ranger 4X4 Explorer 4X2 Explorer 4X4	AVERAGE CASTER **	Min. 2.00 Degrees Max. 8.00 Degrees Max. 7.00 Degrees Max. 8.00 Degrees Max. 8.00 Degrees

* Defined as (LH camber + RH camber) divided by 2. Vehicles set to this specification, as measured with the vehicle loaded to normal loading conditions, will result in optimum tire wear.

** Defined as (LH caster + RH caster) divided by 2. These are not recommended values for settings. They are only maximum and minimum limitations.

4. Tire Pull - Swap front tires from front to rear. Set the tire pressure to the required pressure for the new front and rear positions, then road test.

NOTE:

ON REAR LIMITED SLIP AXLE (FRONT HUB UNLOCKED) DRIFT CONCERNS, IT MAY BE NECESSARY TO MEASURE TIRE CIRCUMFERENCE AND PLACE A MATCHED SET OF TIRES ON THE REAR AXLE.

Diagnostic Procedure # 2 - Alignment

Wheel Alignment - Measure the front wheel alignment. For out-of-specification vehicles, align to the "1991-94 Preferred Alignment Specifications" stated in this article.

^ Spin the front tires to be sure that the front hubs are unlocked. If hubs are unlocked, the axle shaft will not rotate with the wheels

^ Do not adjust wheel alignment to correct for brake pull if the vehicle does not have pull during non-brake applications

^ Set the tire pressure to the specification on the certification label

Compare the installed tires and wheels to the certification label. If the tires and wheels match, continue with the Diagnostic Procedure.

^ IF THE TIRES AND WHEELS DO NOT MATCH THE CERTIFICATION LABEL, compare tires and wheels to RPO list and set tire pressure to the correct value

^ IF THE TIRES AND WHEELS DO NOT MATCH CERTIFICATION LABEL OR RPO AVAILABILITY, swap known good tires and wheels (as called for by the certification label or RPO list) for the purposes of evaluation only

Drive vehicle after alignment is performed.

^ Vehicles which exceed the maximum average caster value shown above may result in shimmy concerns

^ Vehicles operated below the minimum average caster value shown can result in wander and poor steering returnability concerns

If the vehicle is not within these minimum and maximum average caster values, or if the vehicle has experienced any of these listed steering/handling concerns, the average caster should be set in accordance with ride height/caster chart in the Service Manual.

Diagnostic Procedure # 3 - Tires

1. Spin the front tires to be sure that the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Measure tire circumference of all four (4) tires; put the two (2) closest circumference tires on the rear axle. Tire pressure must be equal on all tires.

Diagnostic Procedure # 4 - Steering Gear Valve Off Center

Rotary Valve Centering Check: To confirm that you are looking at a steering gear valve concern, lift the front wheels off the ground.

^ The vehicle should be raised so that there is no interference with the steering linkage

^ The front wheels should also spin freely

With the wheels in a straight ahead position, start the engine and observe any steering wheel or linkage movement when the engine is started. If any movement is observed, continue with the rotary valve centering check.

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Install a 0-13,790 kPa (0-2000 psi) pressure gauge (Rotunda 014-00207, Power Steering Analyzer) in the pressure line between the power steering pump outlet port 1 and the integral steering gear inlet port. Make sure the valve on the gauge is fully open.

3. Check the fluid level in the reservoir. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

4. Start the engine and turn the steering wheel from stop-to-stop to bring the steering lubricant to normal operating temperature. Turn off the engine and recheck the fluid level. Add Premium Power Steering Fluid F7AZ-3F823-AA or equivalent meeting Ford specification ESW-M2C33-F, if necessary.

5. With the engine running at approximately 1000 rpm and the steering wheel centered, attach a b-in torque wrench to the steering wheel nut. Apply sufficient torque in each direction to get a gauge reading of 1723 kPa (250 psi).

6. The torque wrench readings should be the same in both directions at 1723 kPa (250 psi). If the difference between the readings exceeds 0.68 N.m (6 lb-in), remove the steering gear and replace the shaft and control assembly.

7. Remove the pressure gauge installed in Step 2.

Diagnostic Procedure # 5 - RBS Linkage

If the RBS linkage is determined to have wind up or memory steer, replace RBS linkage with greaseable steel linkage.

NOTE:

ALL SERVICE PART STEERING LINKAGE IS THE GREASEABLE STEEL SOCKET TYPE

Diagnostic Procedure # 6 - Brake Imbalance

1. Spin the front tires to make sure the front hubs are unlocked. If the hubs are unlocked, the axle shaft will not rotate with the wheels.

2. Check for front wheel rotational drag with warm/hot brakes.

a. Make a series of 10 stops from speeds of 48 km/h (30 mph).

b. Make the 10 stops with no more than 30 second intervals between stops. This generally will induce a maximum pull if there is a drift/pull concern.

c. Raise the front end of the vehicle so that both tires are off the ground.

d. Rotate the front wheels by hand.

NOTE:

FOR ALL 4-WHEEL-DRIVE VEHICLES, MAKE SURE THE HUBS ARE DISENGAGED.

Both tires should rotate about the same amount, with little brake drag occuring. Some brake drag will naturally be present for each size of vehicle.

3. If the vehicle has excess brake drag, proceed as follows:

a. Open the bleed screw on the affected wheel to check for residual pressure in the brake lines. If there is a squirt of brake fluid out of the bleeder screw and the drag is reduced or eliminated, the master cylinder may not be allowing the brake fluid to return to the reservoir.

b. Check the master cylinder push rod adjustment. Refer to the appropriate Service Manual, Section 06-06, for service details.

c. Check the brake pedal to determine if it is fully returning.

4. Remove both calipers and check piston retraction using a C-clamp and wooden block. The piston should easily move back into the bore under the force of the clamp. Rebuild or replace as needed.

5. If Steps 1 through 4 have not determined the concern, swap rotors and linings from side-to-side.

NOTE:

SHOE TAB CLEARANCES SHOULD BE CHECKED AND MODIFIED IF NEEDED. REFER TO FIGURE 2.

6. Test drive the vehicle with 10 or more stops from 64 km/h (40 mph) before evaluating for brake drift. If there is no change in drift while braking, it may be assumed the concern is not the result of the front brakes.

7. Check the rear brakes. Remove the rear wheels and brake drums.

a. Check for contaminants (i.e., grease, axle lube, leaking brake fluid, etc.).

b. Check for broken components, frozen parking brake cables or improperly installed parts.

c. Check the cage diameter using the Brake Shoe Adjustment Gauge (D81L-1103-A). If either side is out-of-specification, check for proper function of the adjusting mechanism and repair or replace as required.

d. Check the rear wheel cylinders by the following method.

^ Replace one of the brake drums

^ Have another person apply the brakes and watch for movement of one of the brake shoes on the other wheel

^ Reapply the brakes while holding in place the shoe that moved. The opposite shoe should now move. If no movement is observed, repair or replace the wheel cylinder

^ Reinstall the drum and repeat the procedure for the other rear brake

8. If the condition still exists, swap rear shoes from side-to-side and drive the vehicle. If the drift is significantly reduced, replace the rear linings. If the pull/drift is not significantly reduced, go to Service Procedure # 7.

Diagnostic Procedure # 7 - Miscellaneous

Check for loose, damaged or excessively worn parts. Visually inspect the front suspension for loose or worn components (i.e., ball joints, radius arm bushings, radius arm attachments at the axle and frame, alignment adjusters, steering linkage, etc.). Repair or replace as required.

Diagnostic Check List

NOTE:

THE FOLLOWING CHECK LIST SHOULD BE COMPLETED AFTER EACH STEP OF THE DIAGNOSTIC WHERE APPLICABLE.

SERVICE PROCEDURE

1. Checking clearances

___ Caliper-to-knuckle clearance.

___ Inner shoe side and end clearance.

2. Lubrication of components

___ Lubrication of the caliper rails and inner knuckle pad grooves.

3. Radius arm bushings

___ Replacement of right and left side radius arm bushings.

DIAGNOSTIC PROCEDURE

1. Tire mismatch

____ Unlocked hubs check.

____ Front tires swapped side-to-side.

____ Rear tires swapped side-to-side.

____ Front-to-rear tire swap.

2. Alignment

____ Unlocked hubs check.

____ Toe changed to ____.

___ Caster changed and split is ____.

___ Camber changed and split is ____.

3. Tire circumference

____ Unlocked hubs check.

___ Tire circumference checked and two (2) closest circumference tires swapped to rear axle.

4. Steering gear valve

____ Unlocked hubs check.

____ Install pressure gauge.

____ Check fluid level with engine off and on.

___ Apply torque to the steering wheel nut and check gauge readings.

___ Replaced the shaft and control assembly.

____ Removed the pressure gauge.

5. RABS linkage

____ Replaced the RBS linkage.

6. Brake imbalance

____ Unlocked hubs check.

____ Front wheel rotational drag check.

____ Master cylinder check.

____ Piston retraction check.

____ Rotors and linings swapped from side-to-side.

____ Rear brakes checked.

___ Rear drums and shoes swapped from side-to-side.

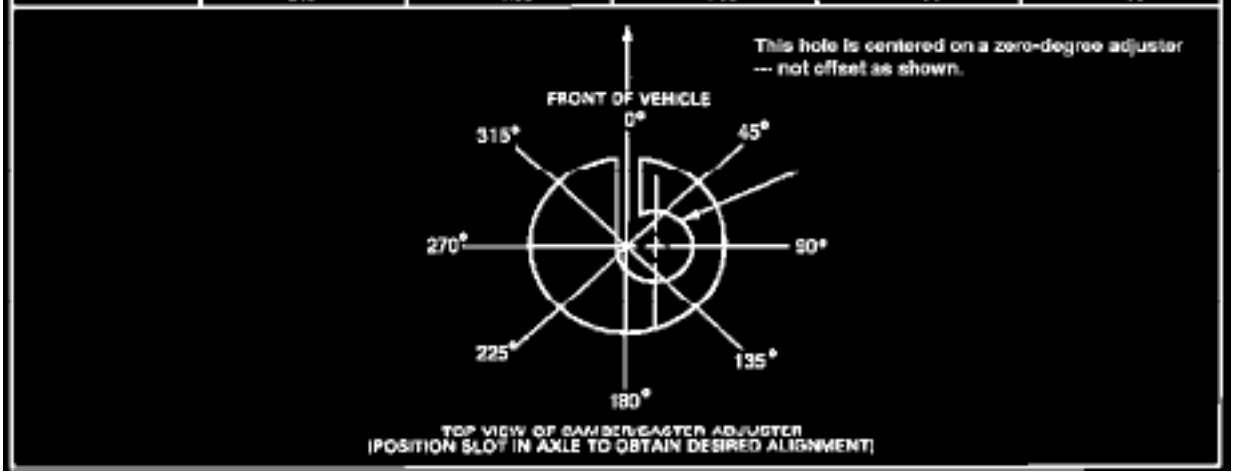
7. Miscellaneous

___ Check for loose, damaged or worn parts.

Make & Model	Caster	Camber	Toe-In Inch
Explorer 4X2	+4 to +6	-¾ to +1¼	0
Explorer 4X4	+2½ to +6	-¾ to +1¼	0
Ranger 4X2	+3½ to +6	-¾ to +1¼	0
Ranger 4X4	+2½ to +6	-¾ to +1¼	0

Wheel Alignment Specifications

Service Adjuster Type (Degrees)	Position Slot in Axle (Degrees)	LH Axle		RH Axle	
		Camber Change (Degrees)	Caster Change (Degrees)	Camber Change (Degrees)	Caster Change (Degrees)
1/2	0	−0.5	0	+0.5	0
1	0	−1.0	0	+1.0	0
1-1/2	0	−1.5	0	+1.5	0
1/2	45	−0.25	+0.25	+0.25	+0.25
1	45	−0.75	+0.75	+0.75	+0.75
1-1/2	45	−1.00	+1.00	+1.00	+1.00
1/2	90	0	+0.5	0	+0.5
1	90	0	+1.0	0	+1.0
1-1/2	90	0	+1.5	0	+1.5
1/2	135	+0.25	+0.25	−0.25	+0.25
1	135	+0.75	+0.75	−0.75	+0.75
1-1/2	135	+1.00	+1.00	−1.00	+1.00
1/2	180	+0.5	0	−0.5	0
1	180	+1.0	0	−1.0	0
1-1/2	180	+1.5	0	−1.5	0
1/2	225	+0.25	−0.25	−0.25	−0.25
1	225	+0.75	−0.75	−0.75	−0.75
1-1/2	225	+1.00	−1.00	−1.00	−1.00
1/2	270	0	−0.5	0	−0.5
1	270	0	−1.0	0	−1.0
1-1/2	270	0	−1.5	0	−1.5
1/2	315	−0.25	−0.25	+0.25	−0.25
1	315	−0.75	−0.75	+0.75	−0.75
1-1/2	315	−1.00	−1.00	+1.00	−1.00



TOP VIEW OF CAMBER/CASTER ADJUSTER
(POSITION SLOT IN AXLE TO OBTAIN DESIRED ALIGNMENT)

Alignment: Service and Repair Camber

Fig. 2 Caster/Camber Variation Chart.

Caster and camber adjustment is possible with adjusters available in 1/2°, 1° and 1-1/2° increments. One adjuster is used to adjust both caster and camber.

1. Measure caster and camber, noting difference between specification and actual measurement.

2. Select correct service adjuster, Fig. 2. Select adjuster that will bring alignment to specifications with the smallest side to side variation.

3. Remove front wheel and tire assembly.

4. On 4 x 4 models equipped with Dana 35 axle, remove caster/camber adjuster snap ring.

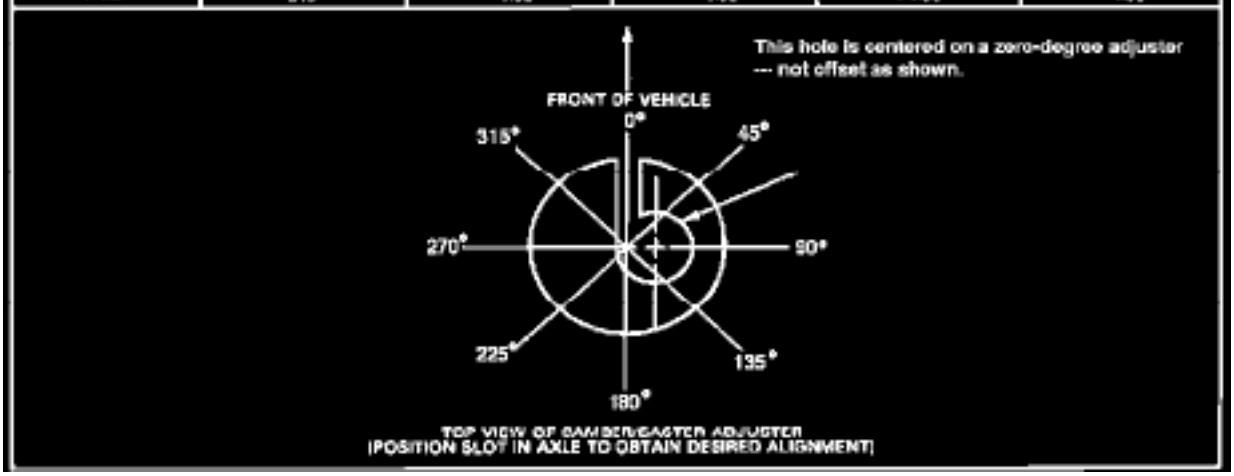
5. On all models, Remove upper ball joint pinch bolt, then using removal tool No. T64P-3590-F or D81T-3010-B or equivalent, remove adjuster.

6. Install new adjuster, then using suitable 1-1/2 inch socket rotate adjuster to specified position.

7. Install ball joint pinch bolt torquing to 48-65 ft. lbs., install snap ring.

8. Install front wheel and tire assembly, then recheck alignment.

Service Adjuster Type (Degrees)	Position Slot in Axle (Degrees)	LH Axle		RH Axle	
		Camber Change (Degrees)	Caster Change (Degrees)	Camber Change (Degrees)	Caster Change (Degrees)
1/2	0	−0.5	0	+0.5	0
1	0	−1.0	0	+1.0	0
1-1/2	0	−1.5	0	+1.5	0
1/2	45	−0.25	+0.25	+0.25	+0.25
1	45	−0.75	+0.75	+0.75	+0.75
1-1/2	45	−1.00	+1.00	+1.00	+1.00
1/2	90	0	+0.5	0	+0.5
1	90	0	+1.0	0	+1.0
1-1/2	90	0	+1.5	0	+1.5
1/2	135	+0.25	+0.25	−0.25	+0.25
1	135	+0.75	+0.75	−0.75	+0.75
1-1/2	135	+1.00	+1.00	−1.00	+1.00
1/2	180	+0.5	0	−0.5	0
1	180	+1.0	0	−1.0	0
1-1/2	180	+1.5	0	−1.5	0
1/2	225	+0.25	−0.25	−0.25	−0.25
1	225	+0.75	−0.75	−0.75	−0.75
1-1/2	225	+1.00	−1.00	−1.00	−1.00
1/2	270	0	−0.5	0	−0.5
1	270	0	−1.0	0	−1.0
1-1/2	270	0	−1.5	0	−1.5
1/2	315	−0.25	−0.25	+0.25	−0.25
1	315	−0.75	−0.75	+0.75	−0.75
1-1/2	315	−1.00	−1.00	+1.00	−1.00



TOP VIEW OF CAMBER/CASTER ADJUSTER (POSITION SLOT IN AXLE TO OBTAIN DESIRED ALIGNMENT)

Alignment: Service and Repair Caster

Fig. 2 Caster/Camber Variation Chart.

Caster and camber adjustment is possible with adjusters available in 1/2°, 1° and 1-1/2° increments. One adjuster is used to adjust both caster and camber.

1. Measure caster and camber, noting difference between specification and actual measurement.

2. Select correct service adjuster, Fig. 2. Select adjuster that will bring alignment to specifications with the smallest side to side variation.

3. Remove front wheel and tire assembly.

4. On 4 x 4 models equipped with Dana 35 axle, remove caster/camber adjuster snap ring.

5. On all models, Remove upper ball joint pinch bolt, then using removal tool No. T64P-3590-F or D81T-3010-B or equivalent, remove adjuster.

6. Install new adjuster, then using suitable 1 1/2 inch socket rotate adjuster to specified position.

7. Install ball joint pinch bolt torquing to 48-65 ft. lbs., install snap ring.

8. Install front wheel and tire assembly, then recheck alignment.

Alignment: Service and Repair Preliminary Inspection

Inspect the following components, adjust, repair or replace as required prior to performing front wheel alignment.

1. Inflate tires to cold specifications.

2. Ensure front tires are of same size, ply rating and load rating.

3. Inspect for excessive wheel bearing endplay.

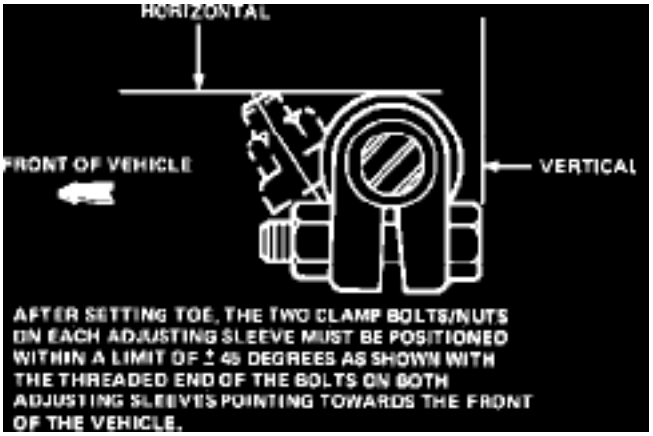
4. Inspect for worn or damaged spindle ball joints.

5. Inspect steering gear mounting bolts for proper torque.

6. Inspect radius arm or bent or damaged condition.

7. Inspect radius arm to frame bushings for looseness or wear.

8. Inspect suspension components for wear or damage.



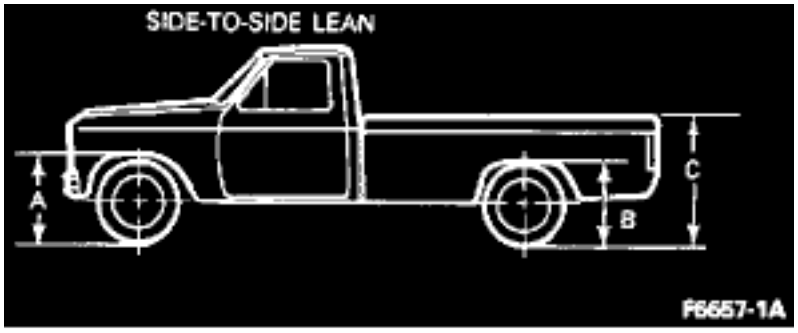
Alignment: Service and Repair Toe

Fig. 4 Toe-In Adjustment

1. Loosen clamp bolts at each end of spindle connecting rod tube, then rotate the sleeve until correct toe alignment of {1/32} inch is obtained.

2. Center clamps between adjustment sleeve nibs, then position bolts horizontally with clamps nuts positioned as shown in Fig. 4.

3. Recheck toe-in adjustment, then check that steering wheel spokes are properly positioned and adjust as necessary.



EXAMPLES

Ranger 4x2 Vehicle	Ranger 4x4 and Explorer Vehicle
Measured LH Ride Height 4-1/2"	Measured LH Ride Height 4-1/2"
Measured RH Ride Height 4"	Measured RH Ride Height 4-5/8"
Revised RH Ride Height 4-1/4"	—
Side to Side Difference 1/4"	Side to Side Difference 1/8"
Since the difference is larger than 1/8", one suspension shim would be added to the low right shim.	Since the difference does not exceed 1/8", no shim is to be used on the front suspension. The front lean may be caused by a rear lean condition.

CF3559-C

Alignment: Service and Repair Vehicle Lean Correction

Front Lean

Measure the left and right front ride heights as shown in the illustration.

Compute the difference between left and right ride heights as shown with the examples. If the difference exceeds 3-9 mm (1/8-3/8 inch) and is LESS than 19 mm (3/4 inch), measured at the wheel house opening to ground, add one shim to the side of the vehicle that is low. The shim is to be placed under the lower spring seat; service shim (part number 389117-S2) can be used without a front stabilizer bar. If there is a computed side-to-side difference of 19 mm (3/4 inch) or MORE in the left/right wheel house openings, remove the high side spring from the vehicle and compare it with a service replacement part having the same part number.

If the free height of the original equipment spring exceeds the free height of the service part by 13 mm (1/2 inch), install the service part in this location. If the free height is less than 13 mm (1/2 inch), remove the low side spring. Compare the service spring to both of the original springs and select the two springs most evenly matched. Install the higher spring at the low side.

NOTE: Changing front ride height by adding the service shim also affects caster angles. Adding the 4.5 mm thick shim (Part 389117-S2 or equivalent) may reduce caster by up to 0.40 degrees on the side the shim is added.

Rear Lean

A side-to-side lean at the rear of the vehicle can be adjusted by approximately 6 mm (1/4 inch) by installing a shim between the rear spring and axle on the low side of the vehicle. A "low at the rear" vehicle can be raised approximately 6 mm (1/4 inch) by installation of one shim on each side. Use the following procedure to install the shim (E37A-5742-AA). 1. Raise the vehicle until the weight is off the rear springs but with the tires still touching the floor. 2. Loosen the spring U-bolts to allow the axle to separate from the spring approximately 13 mm (1/2 inch). 3. Position the shim (E37A-5742-AA) between the spring and the spring seat with the tie bolt head through the hole in the shim.

Position the shim between the rear spring and axle spacer. Tape may be used to hold the shim in position.

4. Make sure the spring leaves are properly aligned and the spring U-bolts contact the edges of the spring assembly or axle seat. 5. Tighten the spring U-bolt sufficiently and make sure the spring bolt head extends through shim into axle seat hole. 6. Tighten the U-bolt nuts to 88-102 N.m (65-75 ft-lb).

Front Steering Knuckle: Service and Repair

1. Remove spindle then the shaft and joint assembly as described previously.

2. If tie rod has not been removed, remove cotter pin and nut and disconnect tie rod from steering arm.

3. Remove cotter pin and loosen nut on top ball joint stud. Loosen bottom nut inside knuckle, then remove top nut.

4. Break spindle loose from ball stud, then remove camber adjuster. Mark position of adjuster for assembly reference.

5. Install steering knuckle in suitable soft jawed vise, then remove snap ring from lower ball joint socket.

6. Press ball joints from steering knuckle using C-Frame tool No. T74P-4635-C with ball joint remover tool No. T83T-3050-A, or equivalent.

7. Reverse procedure to install. The lower ball joint must be installed first. Install spindle to steering knuckle, and tighten nuts to 54-68 N-m (40-50 ft-lbs). Tighten attaching bolts to specifications.

Year	Component	Torque/Ft. Lbs.
1987-90	Axle Arm Bracket To Frame Nut	77-110
	Axle Arm To Bracket Nut	120-150
	Axle To Radius Arm	160-220
	Bumper To Spring Seat Bolt	11-19
	Front Shock Absorber To Radius Arm Nut	②
	Front Shock Absorber To Spring Seat Nut	25-35
	Lower Ball Joint Stud Nut	①
	Pitman Arm Drag Link Nut	70-100
	Radius Arm Bracket Connecting Bolts	35-50
	Radius Arm Bracket To Frame Bolt	77-110
	Radius Arm To Frame Nut	81-120
	Stabilizer Bar Link To Axle Arm Bracket Screw	29-44
	Stabilizer Bar To Mounting Bracket Bolt	35-50
	Stabilizer Bar To Mounting Bracket To Axle Arm Screw	48-68
	Stabilizer Bar To Radius Arm Nut	48-64
	Tie Rod Adjusting Sleeve	30-42
	Tie Rod To Spindle Nut	51-75
	Upper Ball Joint Stud Nut	85-110
	Wheel Lug Nut	100
1991-93	Axle Arm Bracket To Frame Nut	77-110
	Axle Arm To Bracket Nut	120-150
	Axle Clamp Bolt	48-65
	Axle To Radius Arm	191-231
	Bumper To Spring Seat Bolt	18-26
	Front Shock Absorber To Radius Arm Nut	③
	Front Shock Absorber To Spring Seat Nut	25-35
	Lower Ball Joint Stud Nut	104-146
	Pitman Arm Drag Link Nut	52-81
	Radius Arm Bracket Connecting Bolts	35-50
	Radius Arm Bracket To Frame Bolt	77-110
	Radius Arm To Frame Nut	81-120
	Stabilizer Bar Link To Axle Arm Bracket Screw	29-44
	Stabilizer Bar To Mounting Bracket Bolt	35-50
	Stabilizer Bar To Mounting Bracket To Axle Arm Screw	40-60
	Tie Rod Adjusting Sleeve	30-42
	Tie Rod To Spindle Nut	52-81
	Wheel Lug Nut	100

① – On 1987-88, 1989 Bronco II & 1990, 104-146 ft. lbs., 1989 Ranger, 95-110 ft. lbs.
② – 1987-89, 42-72 ft. lbs., 1990, 40-63 ft. lbs.
③ – 1991, 40-63 ft. lbs., 1992, 39-53 ft. lbs.

Tightening Specifications

Power Steering Pump: Testing and Inspection

When performing the following test, extreme care must be used. Some system pressures can exceed 1500 psi. Ensure test equipment is in good condition and correctly connected. Installation of the analyzer at the pump outlet is preferred. If it is difficult to attach the analyzer at the pump, it may be installed at any convenient location between the pump and gear. The following test procedure used in conjunction with Power Steering Analyzer tool No. D79L-33610-A (Rotunda Model 014-00207) or equivalent provides a method for checking the complete power steering system. The power steering analyzer can be used to determine the cause of hard steering and/or lack of assist problems. Contamination of the power steering system fluid may cause permanent damage to the gauges and instruments incorporated in the analyzer. The analyzer provides readouts for the following:

a. System backpressure.

b. Pump flow.

c. Steering gear internal leakage.

d. Power steering control valve and cylinder internal leakage.

The interpretation of the above readouts will determine which of the following conditions or components are the cause of the problem:

a. Restriction in hoses or fittings.

b. Control valve and cylinder.

c. Sticking gear valve.

d. Insufficient pump cam pack.

e. Sticking relief valve.

f. Binding condition in suspension system.

To perform the power steering system pressure test, proceed as follows:

1. Connect the analyzer into the steering system by removing the pressure fitting from the pump and connecting it to the appropriate adapter of the analyzer.

2. Thread the other adapter of the analyzer into the pump.

3. Connect the analyzer to the adapters, then torque connections to 15 ft. lbs.

4. Add power steering fluid to pump as necessary, then start engine and run for approximately two minutes with engine at idle.

5. Record the flow, if flow is less than specifications, the power steering pump may require repair.

6. Record the pressure at 170°. If the pressure is above 150 psi, check hoses for restrictions or the steering gear.

7. Partially close the gate valve to build up 740 psi for C2 pumps, 620 psi for Saginaw pumps. Record flow (gallons/min @ 170°). If the flow drops to a level lower than the value specified, disassemble the pump and replace the cam pack. If the pressure plates are cracked and worn, replace them.

8. Completely close and partially open the gate valve three times. Do not allow the valve to remain closed for more than five seconds. Record the pressure and compare to specifications. If the

pressure recorded is lower than the minimum specification, replace the control valve. If the pressure recorded is greater than specified, the flow control valve in the pump should be removed and cleaned or replaced.

9. Increase the engine speed from idle to approximately 1500 RPM. Record the flow (gallons/minute). If the flow varies more than one gallon/minute from the flow recorded in Step 5, the flow control valve in the pump should be removed and cleaned or replaced.

10. Turn the steering wheel to the left and right stops. Record the pressure (psi) and flow (gallons/min.) at the stops. The pressure developed at both stops should be nearly the same as the maximum pump output pressure recorded in Step 8. At the same time, the flow should drop below 0.5 gallons/min. If the pressure does not reach maximum output or the flow does not drop below specified valve, excessive internal leakage is occurring. Remove and disassemble the steering gear and remove the control valve. Repair or replace components as necessary.

11. Turn the steering wheel slightly in both directions and release quickly while watching the pressure gauge. The needle should move from normal backpressure reading and snap back as the wheel is released. If the system is severely contaminated, both gear hoses, control valve, and pump must be completely disassembled and cleaned before reassembly. If problem still exists, check ball joints and steering linkage.

Power Steering Pump: Service and Repair Removal and Installation

1. Disconnect battery ground cable.

2. Drain power steering pump reservoir, disconnect return hose at reservoir, then drain into suitable container.

3. Remove drive belts.

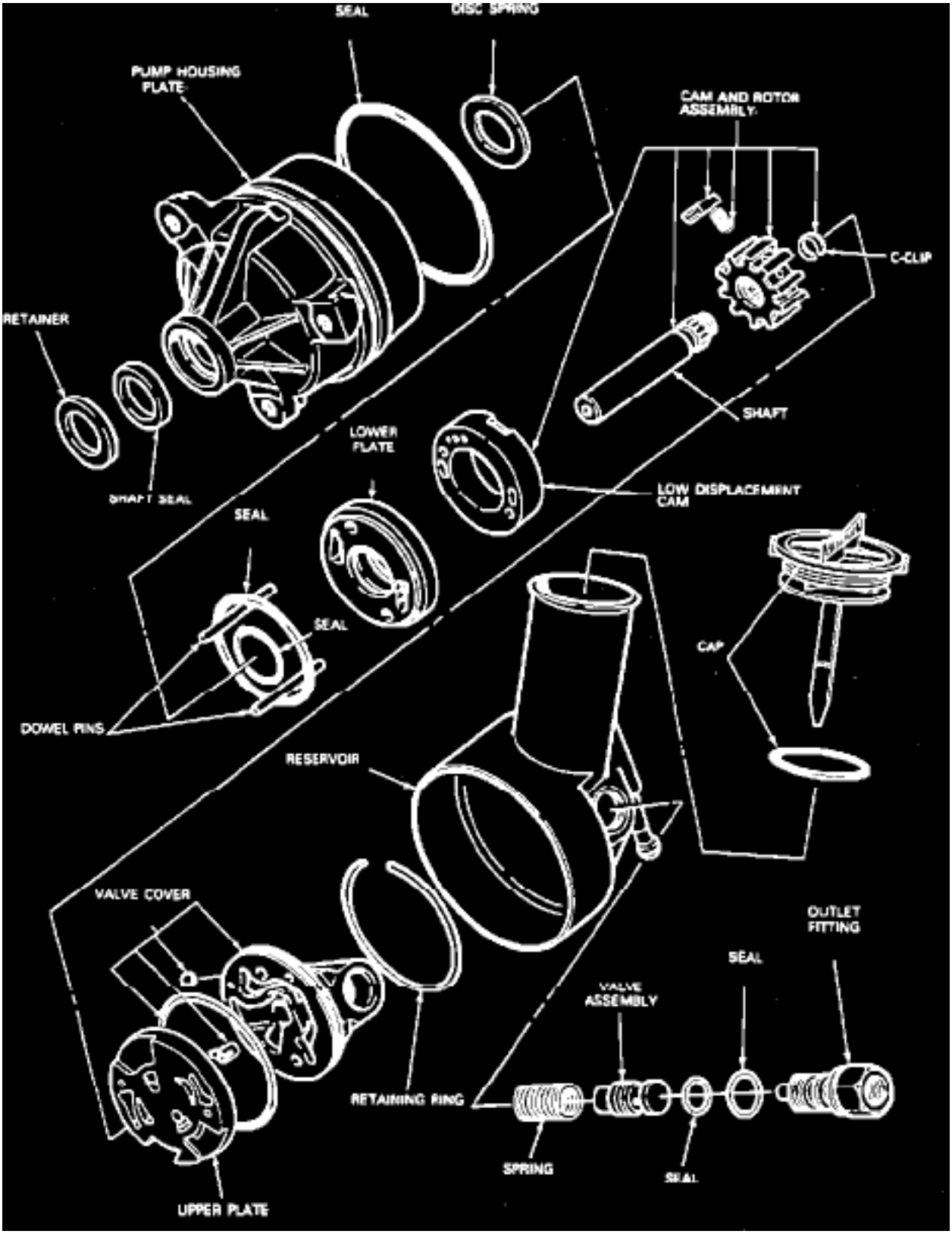
4. Remove oil dipstick tube, as required.

5. Remove power steering pump bracket support brace, if equipped.

6. Using power steering pump pulley removal tool No. T69L-10300-B or equivalent, hold pulley and rotate tool nut counterclockwise to remove. Do not apply in and out pressure as internal thrust area damage may occur.

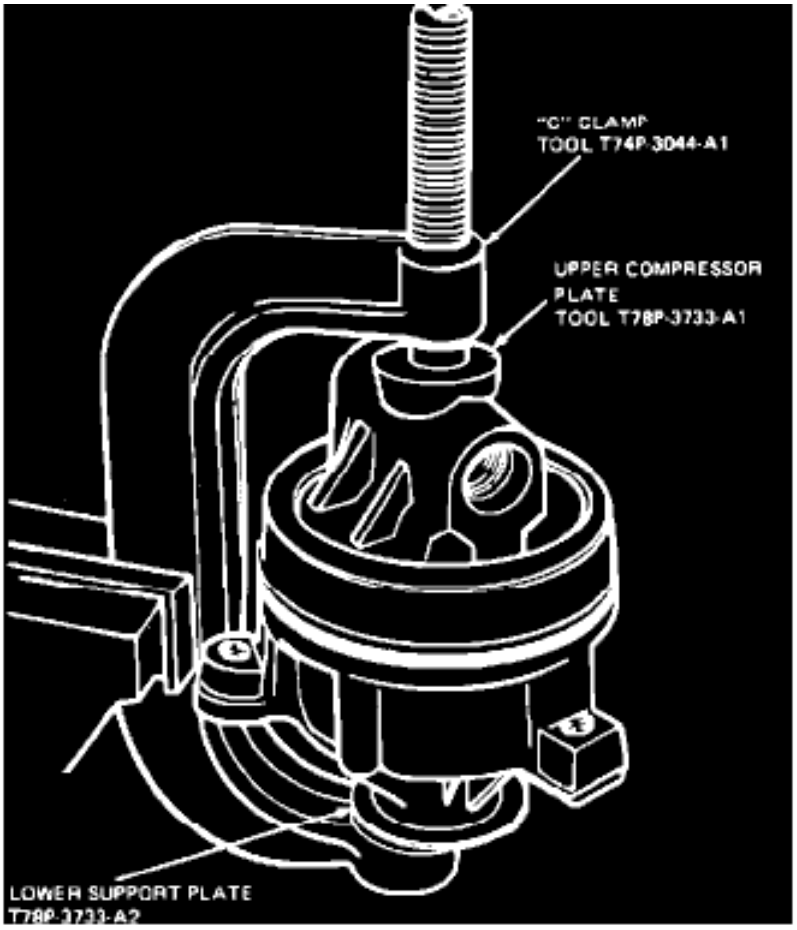
7. Remove pump to bracket attaching bolts, then remove pump.

8. Reverse procedure to install.



Power Steering Pump: Service and Repair Disassembly

Fig. 1 Ford Model CII Power Steering Pump


"C" CLAMP
TOOL T74P-3044-A1
UPPER COMPRESSOR PLATE
TOOL T78P-3733-A1
LOWER SUPPORT PLATE
T78P-3733-A2

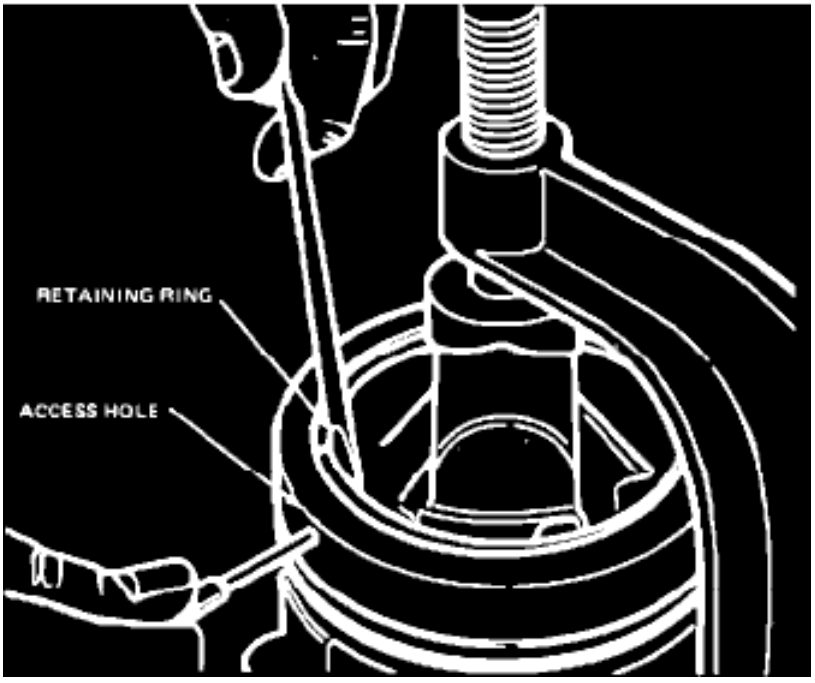

RETAINING RING
ACCESS HOLE

Fig. 2 Positioning Pump In C-Clamp

Fig. 3 Removing Valve Cover Retaining Ring

1. Remove pulley from pump.

2. Remove outlet fitting, flow control valve and flow control valve spring from pump, then remove reservoir, Fig. 1.

3. Place a suitable C-clamp in a vise.

4. Position lower support plate (part No. T78P-3733-A2) over pump rotor shaft.

5. Install upper compressor plate (part No. T78P-3733-A1) into upper portion of C-clamp.

6. While holding compressor tool, place pump assembly into C-clamp with rotor shaft facing downward, Fig. 2.

7. Tighten C-clamp until a slight bottoming of valve cover is observed.

8. Through small hole located on side of pump housing, insert a suitable drift and push inward on valve cover snap ring. While pushing inward on snap ring, place a screwdriver under snap ring edge and remove ring from housing, Fig. 3.

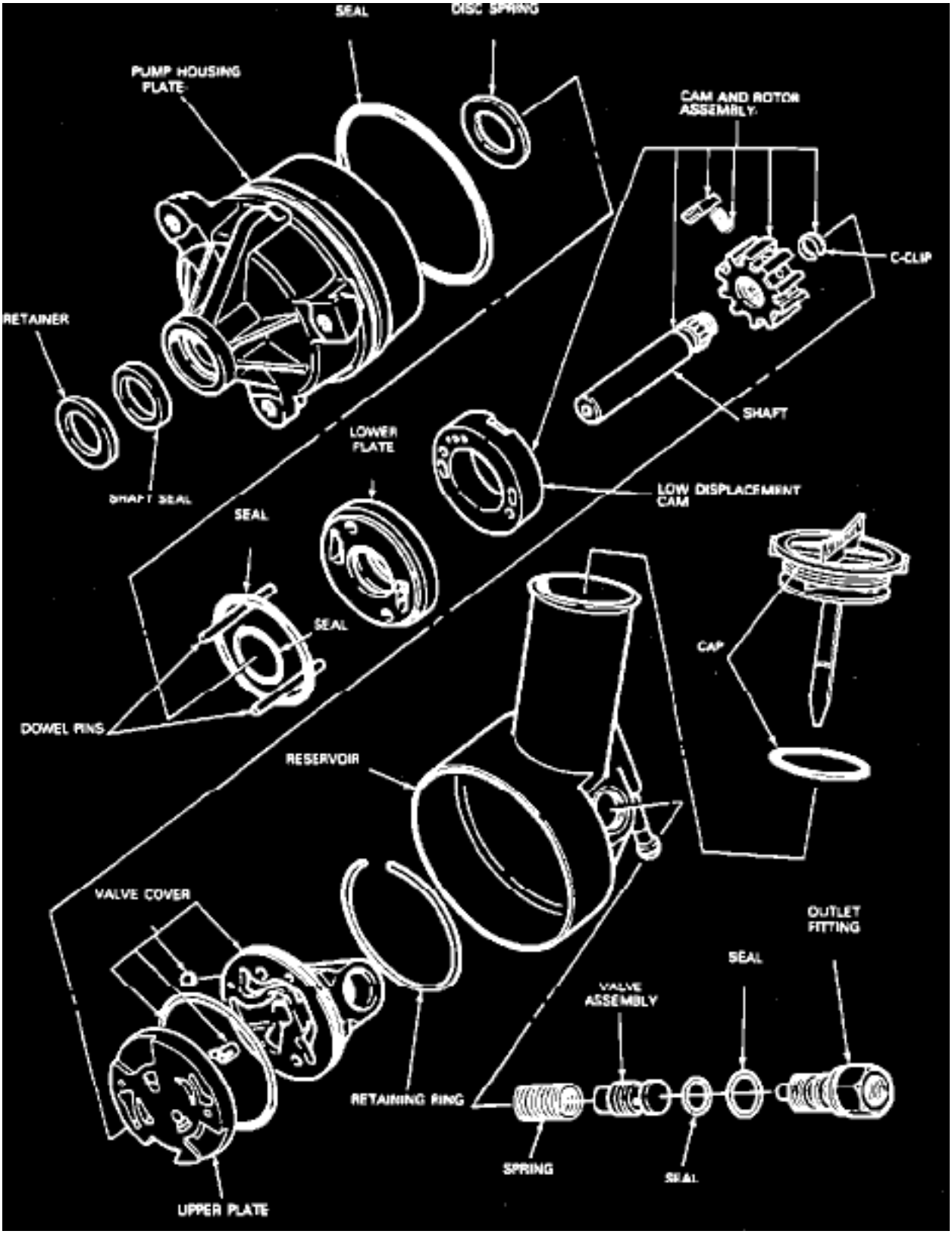
9. Loosen C-clamp and remove upper compressor plate (part No. T78P-3733-A2), then remove pump assembly.

10. Remove pump valve cover and O-ring.

11. Remove rotor shaft, upper plate, cam and rotor assembly and two dowel pins.

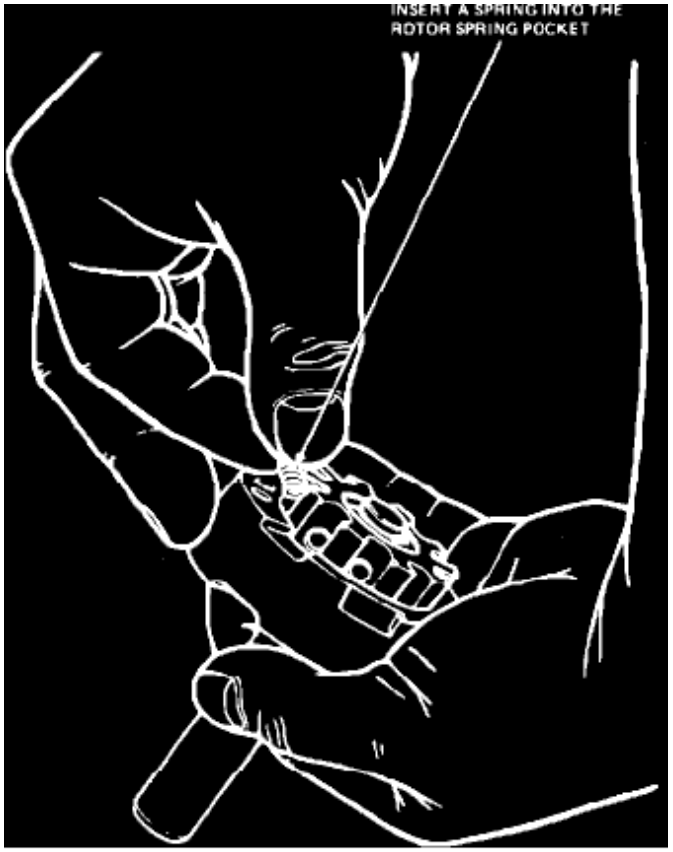
12. Remove lower plate and spring, by tapping housing on a flat surface.

13. Using a suitable screwdriver, remove rotor shaft seal.



Power Steering Pump: Service and Repair Assembly

Fig. 1 Ford Model CII Power Steering Pump


INSERT A SPRING INTO THE
ROTOR SPRING POCKET

USE ONE OF THE SLIPPERS
TO COMPRESS THE SPRING
AND INSTALL THE SLIPPER

Fig. 4 Installing Slipper Springs

Fig. 5 Installing Slippers

1. Position rotor on rotor shaft splines with triangle detent on rotor counterbore facing upward.

2. Install snap ring into groove on end of rotor shaft, Fig. 1.

3. Position insert cam over rotor. Ensure recessed notch on insert cam is facing upward.

4. With rotor extended upward approximately half out of cam, insert spring into rotor picket, Fig. 4.

5. Use a slipper to compress spring, then install slipper with groove facing cam, Fig. 5.

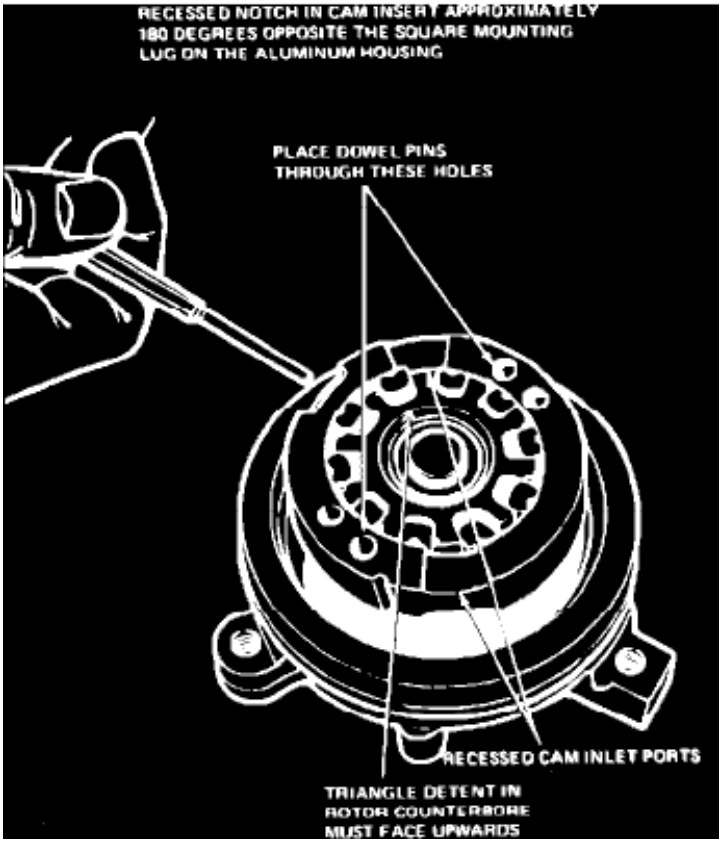
6. Perform steps 4 and 5 on slipper cavity beneath opposite inlet recess.

7. While holding cam stationary, index rotor left or right one space and install another spring and slipper until all ten rotor cavities have been filled. Ensure rotor springs and slippers remain in position while turning.

8. Apply Loctite (part No. 242 or 271) adhesive or equivalent to outside diameter of seal and Lockquick NF or T primer or equivalent to seal bore in housing. Install rotor shaft seal using seal installer tool No. T78P-3733-A3. Using a plastic mallet, drive seal into bore until properly seated.

9. Position pump plate on flat surface with pulley side facing downward.

PRESSURE CHANNEL IN THE VALVE COVER FITS
DIRECTLY OVER THE RECESS IN THE UPPER
PLATE


RECESSED NOTCH IN CAM INSERT APPROXIMATELY
180 DEGREES OPPOSITE THE SQUARE MOUNTING
LUG ON THE ALUMINUM HOUSING
PLACE DOWEL PINS
THROUGH THESE HOLES
RECESSED CAM INLET PORTS
TRIANGLE DETENT IN
ROTOR COUNTERBORE
MUST FACE UPWARDS

10. Install two dowel pins and spring into housing. Spring must be inserted with dished surface facing upward.

11. Lubricate inner and outer O-ring seals with power steering fluid, then install seals on lower pressure plate.

12. Install lower pressure plate into housing and over dowel pin with O-ring seals facing toward front of pump. Position assembly on C-clamp. Place seal installer tool No. T78P-3733-A3 into rotor shaft hole and press on lower plate lightly until it bottoms in pump housing. This will seat outer O-ring seal.

Fig. 6 Assembling Cam, Slippers And Rotor

Fig. 7 Installing Upper Pressure Plate

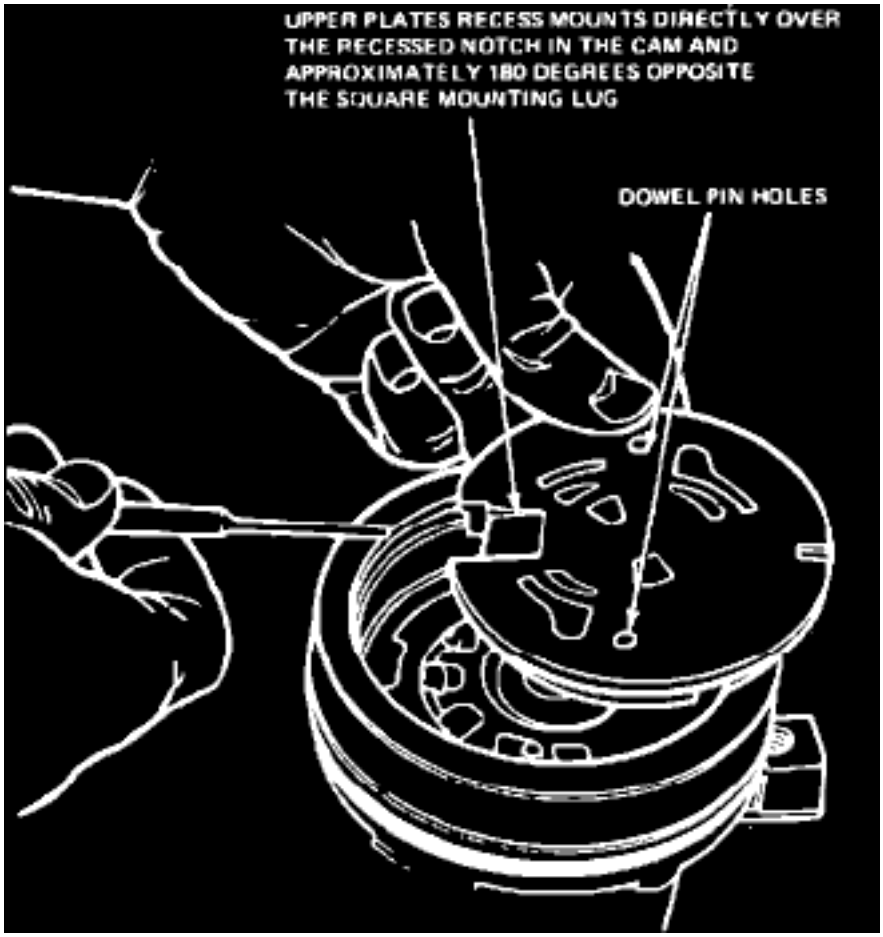


Fig. 8 Installing Valve Cover

13. Install cam, rotor, rotor and slippers and rotor shaft assembly into pump housing over dowel pins. When installing assembly into pump housing, stepped holes must be used for dowel pins and notch in cam insert must be toward reservoir and approximately 180° opposite square mounting lug on housing, Fig. 6.

14. Position upper pressure plate over dowel pins with recess directly over recessed notch on cam insert and approximately 180° opposite square mounting lug, Fig. 7.

15. Lubricate O-ring seal with power steering fluid. Then, position O-ring on valve cover. Ensure plastic baffle is securely in position on valve cover. A coat of petroleum jelly may be used to hold baffle in position.

16. Insert valve cover over dowel pins. Ensure outlet fitting hole in valve cover is aligned with square mounting lug on housing, Fig. 8.

17. Place assembly in C-clamp and compress valve cover into pump housing until snap ring groove on housing is exposed.

18. Install valve cover snap ring in pump housing. Ensure snap ring ends are near access hole in pump housing.

19. Remove pump assembly from C-clamp.

20. Lubricate O-ring seal with power steering fluid, then place seal on pump housing.

21. Install reservoir on pump housing.

22. Install flow control valve and spring into valve cover.

23. Lubricate O-ring seals with power steering fluid, then place seals on outlet fitting.

24. Install outlet fitting on valve cover. Torque outlet fitting to 25-34 ft. lbs. Use care not to cock flow control valve when installing. Do not force valve forward otherwise damage to housing may result.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Steering > Steering Column > Tilt Wheel Pivot > Component Information > Technical Service Bulletins > Customer Interest for Tilt Wheel Pivot: > 911115 > May > 91 > Steering Column - Rattles

Tilt Wheel Pivot: Customer Interest Steering Column - Rattles

Article No. 91-11-15

05/30/91

^ STEERING COLUMN - RATTLES - TILT LEVER

^ RATTLE - STEERING COLUMN - TILT LEVER

LIGHT TRUCK: 1989-90 BRONCO II 1989-91 RANGER 1991 EXPLORER

ISSUE: Rattles in the steering column may be caused by the tilt lever spring becoming dislocated.

ACTION: Install a new tilt lever spring and spring cap. Refer to the following procedure for service details.

REMOVAL

1. Disconnect the battery ground cable.

2. Remove the steering wheel. Refer to the Compact Truck Shop Manual Section 11-04B for service procedure details.

3. Remove the plastic collar from the tilt flange.

4. Move the tilt flange to its upper most position.

5. Remove the tilt lever cap and spring.

INSTALLATION

1. Insert the shaft of the tilt lever cap into the tilt lever spring with a twisting motion, until the spring touches the head of the cap. The barbs on the shaft of the cap will hold the spring in place.

2. Pull the tilt lever up as far as possible. While holding the lever in this position, insert the spring and cap assembly into the hole in the tilt flange below the tilt lever. Release the lever.

3. Actuate the tilt lever several times to ensure the cap and spring assembly are seated correctly.

4. Move the tilt flange to its center position.

5. Install the plastic collar on the tilt flange.

6. Install the steering wheel. Refer to the Compact Truck Shop Manual, Section 11-04B, for service procedure details.

7. Connect the battery cable.

PART NUMBER PART NAME CLASS

E9TZ-3E518-B Cap - Tilt Lever Spring B

E9TZ-3B664-A Spring - Tilt Lever B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty

Coverage

OPERATION DESCRIPTION TIME

911115A Install New Tilt Lever Cap 0.3 Hr.

And Spring Kit

DEALER CODING

BASIC PART NO. CONDITION CODE

3E518 63

OASIS CODES: 303000, 702300

Tilt Wheel Pivot: All Technical Service Bulletins Steering Column - Rattles

Article No. 91-11-15

05/30/91

^ STEERING COLUMN - RATTLES - TILT LEVER

^ RATTLE - STEERING COLUMN - TILT LEVER

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4. Move the tilt flange to its upper most position.

5. Remove the tilt lever cap and spring.

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2. Pull the tilt lever up as far as possible. While holding the lever in this position, insert the spring and cap assembly into the hole in the tilt flange below the tilt lever. Release the lever.

3. Actuate the tilt lever several times to ensure the cap and spring assembly are seated correctly.

4. Move the tilt flange to its center position.

5. Install the plastic collar on the tilt flange.

6. Install the steering wheel. Refer to the Compact Truck Shop Manual, Section 11-04B, for service procedure details.

7. Connect the battery cable.

PART NUMBER PART NAME CLASS

E9TZ-3E518-B Cap - Tilt Lever Spring B

E9TZ-3B664-A Spring - Tilt Lever B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty

Coverage

OPERATION DESCRIPTION TIME

911115A Install New Tilt Lever Cap 0.3 Hr.

And Spring Kit

DEALER CODING

BASIC PART NO. CONDITION CODE

3E518 63

OASIS CODES: 303000, 702300

Sector Shaft: Adjustments Pitman Shaft Overcenter Preload

CHECK

1. Disconnect pitman arm at ball stud and remove horn pad from steering wheel.

2. Turn steering wheel from one extreme to the other while counting total number of turns. Turn wheel back one half the number of turns so gear is centered.

3. Place inch lbs. torque wrench on steering wheel nut. Rotate steering shaft 90° either way across center. Observe highest reading. Overcenter preload should be within specifications listed at end of section.

ADJUST

1. Remove steering gear from vehicle.

2. Torque sector shaft cover bolts to 32-40 ft. lbs.

3. Loosen worm bearing adjuster plug locknut and tighten worm bearing adjuster nut until all endplay has been removed. Lubricate worm shaft seal with drop of power steering fluid.

4. Rotate worm shaft from one extreme to the other while counting total number of turns. Turn worm shaft back halfway to center gear.

5. Using inch pound torque wrench, rotate worm shaft approximately 90° across center. Highest reading should be within specifications listed at end of section. Turn sector shaft adjusting screw until proper specification is obtained.

6. Hold sector shaft adjusting screw and torque locknut to 25 ft. lbs.

Sector Shaft: Adjustments Worm Bearing Preload

CHECK

Before checking worm gear preload, check to ensure intermediate shaft flex coupling is not distorted and steering column is aligned.

1. Remove pitman arm from ball stud.

2. Lubricate worm shaft seal with drop of power steering fluid.

3. Remove horn pad assembly from steering wheel and turn wheel slowly to either stop.

4. Using suitable inch pound wrench on steering wheel nut, measure torque required to turn steering wheel 1-1/2 turns at a constant speed. If required torque exceeds specifications listed at end of section, readjust worm gear preload.

ADJUST

1. Remove steering gear from vehicle.

2. Torque sector shaft cover bolts to 32-40 ft. lbs.

3. Loosen worm bearing adjuster plug locknut and tighten worm bearing adjuster nut until all endplay has been removed. Lubricate worm shaft seal with drop of power steering fluid.

4. Turn worm shaft to full right position. Using inch pound wrench mounted on steering wheel nut, measure left turn torque required to rotate worm shaft 1-1/2 turns. If torque requirements exceed specifications listed at end of section, tighten or loosen adjusting nut until proper preload is obtained. After adjustment is completed, torque locknut to 166-187 ft. lbs.

Steering Wheel: Service and Repair

REMOVAL

1. Disconnect battery ground cable (two ground cables on diesel engines).

2. From underside of steering wheel, remove screws attaching horn pad to steering wheel spokes.

3. Lift up steering wheel pad, then disconnect horn wires and electrical connectors from pad.

4. Remove steering wheel attaching bolt and damper, if equipped.

5. Remove steering wheel using steering wheel remover T67L-3600-A or equivalent, Do not use a knock-off type wheel puller or strike end of steering shaft, as damage will result.

INSTALLATION

1. Position steering wheel on end of steering shaft, aligning mark and flats on steering wheel with mark and flats on steering shaft, and ensuring that straight ahead steering wheel position corresponds with straight ahead position of front wheels.

2. If equipped, install damper and align locators with hole in wheel hub.

3. Install steering wheel attaching bolt and torque to 23-33 ft. lbs.

4. Connect horn wires and electrical connectors, then install horn pad.

5. Connect battery ground cable (two ground cables on diesel engines), then check steering column for proper operation.

Year	Component	Torque/Ft. Lbs.
1987-90	Axle Arm Bracket To Frame Nut	77-110
	Axle Arm To Bracket Nut	120-150
	Axle To Radius Arm	160-220
	Bumper To Spring Seat Bolt	11-19
	Front Shock Absorber To Radius Arm Nut	②
	Front Shock Absorber To Spring Seat Nut	25-35
	Lower Ball Joint Stud Nut	①
	Pitman Arm Drag Link Nut	70-100
	Radius Arm Bracket Connecting Bolts	35-50
	Radius Arm Bracket To Frame Bolt	77-110
	Radius Arm To Frame Nut	81-120
	Stabilizer Bar Link To Axle Arm Bracket Screw	29-44
	Stabilizer Bar To Mounting Bracket Bolt	35-50
	Stabilizer Bar To Mounting Bracket To Axle Arm Screw	48-68
	Stabilizer Bar To Radius Arm Nut	48-64
	Tie Rod Adjusting Sleeve	30-42
	Tie Rod To Spindle Nut	51-75
	Upper Ball Joint Stud Nut	85-110
	Wheel Lug Nut	100
1991-93	Axle Arm Bracket To Frame Nut	77-110
	Axle Arm To Bracket Nut	120-150
	Axle Clamp Bolt	48-65
	Axle To Radius Arm	191-231
	Bumper To Spring Seat Bolt	18-26
	Front Shock Absorber To Radius Arm Nut	③
	Front Shock Absorber To Spring Seat Nut	25-35
	Lower Ball Joint Stud Nut	104-146
	Pitman Arm Drag Link Nut	52-81
	Radius Arm Bracket Connecting Bolts	35-50
	Radius Arm Bracket To Frame Bolt	77-110
	Radius Arm To Frame Nut	81-120
	Stabilizer Bar Link To Axle Arm Bracket Screw	29-44
	Stabilizer Bar To Mounting Bracket Bolt	35-50
	Stabilizer Bar To Mounting Bracket To Axle Arm Screw	48-68
	Tie Rod Adjusting Sleeve	30-42
	Tie Rod To Spindle Nut	52-81
	Wheel Lug Nut	100

① – On 1987-88, 1989 Bronco II & 1990, 104-146 ft. lbs., 1989 Ranger, 95-110 ft. lbs.
② – 1987-89, 42-72 ft. lbs., 1990, 40-63 ft. lbs.
③ – 1991, 40-63 ft. lbs., 1992, 39-53 ft. lbs.

Tie Rod End: Specifications

Tightening Specifications

	Component	Torque/Ft. Lbs.
1987-88	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	11-19
	Radius Arm Front Bracket & Axle Stud	190-230
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	160-220
	Radius Arm To Rear Bracket	80-120
	Shock Absorber ToRadius Arm Nut	42-72
	Shock Absorber To Upper Seat	25-35
	Spring Retainer Nut	70-100
	Stabilizer Bar Bolts	77-110
	Stabilizer Bar U-Bolts	48-68
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100
1989-90	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	11-19
	Radius Arm Front Bracket & Axle Stud	160-220
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	160-220
	Radius Arm to Rear Bracket	80-120
	Shock Absorber to Radius Arm Nut	④
	Shock Absorber to Upper Seat	25-35
	Spring Retainer Nut	70-100
	Stabilizer Bar Bolts	35-50
	Stabilizer Bar Link Nuts	30-44
	Stabilizer Bar U-Bolts	48-68
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100
1991-93	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	18-26
	Radius Arm Front Bracket & Axle Stud	190-230
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	190-230
	Radius Arm To Rear Brackets	80-120
	Shock Absorber to Radius Arm Nut	39-53
	Shock Absorber to Upper Seat	25-35
	Spring Retainer Nuts	70-100
	Stabilizer Bar Link Nut	30-44
	Stabilizer Bar Bolts	35-50
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100

① — On 1987-88, 1989 Bronco II & 1990, 104-146 ft. lbs., 1989 Ranger, 95-110 ft. lbs.
② — 1987-89, 42-72 ft. lbs., 1990, 40-63 ft. lbs.
③ — 1991, 40-63 ft. lbs., 1992, 39-53 ft. lbs.
④ — 1989, 48-68 ft. lbs., 1990, 41-63 ft. lbs.

Tightening Specifications

	Component	Torque/Ft. Lbs.
1987-88	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	11-19
	Radius Arm Front Bracket & Axle Stud	190-230
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	160-220
	Radius Arm To Rear Bracket	80-120
	Shock Absorber ToRadius Arm Nut	42-72
	Shock Absorber To Upper Seat	25-35
	Spring Retainer Nut	70-100
	Stabilizer Bar Bolts	77-110
	Stabilizer Bar U-Bolts	48-68
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100
1989-90	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	11-19
	Radius Arm Front Bracket & Axle Stud	160-220
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	160-220
	Radius Arm to Rear Bracket	80-120
	Shock Absorber to Radius Arm Nut	④
	Shock Absorber to Upper Seat	25-35
	Spring Retainer Nut	70-100
	Stabilizer Bar Bolts	35-50
	Stabilizer Bar Link Nuts	30-44
	Stabilizer Bar U-Bolts	48-68
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100
1991-93	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	18-26
	Radius Arm Front Bracket & Axle Stud	190-230
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	190-230
	Radius Arm To Rear Brackets	80-120
	Shock Absorber to Radius Arm Nut	39-53
	Shock Absorber to Upper Seat	25-35
	Spring Retainer Nuts	70-100
	Stabilizer Bar Link Nut	30-44
	Stabilizer Bar Bolts	35-50
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100

① — On 1987-88, 1989 Bronco II & 1990, 104-146 ft. lbs., 1989 Ranger, 95-110 ft. lbs.
② — 1987-89, 42-72 ft. lbs., 1990, 40-63 ft. lbs.
③ — 1991, 40-63 ft. lbs., 1992, 39-53 ft. lbs.
④ — 1989, 48-68 ft. lbs., 1990, 41-63 ft. lbs.

I-Beam Axle: Specifications Front

Tightening Specifications

Component	Torque/Ft. Lbs.
Axle Pivot Bolt	120–150
Axle Pivot Bracket To Frame Nut	70–92
Axle Stud	190–230
Bearing Cap Bolts	47–67
Carrier To Axle Arm Bolts	35–53
Carrier Shear Bolt	75–95
Front Driveshaft U-Bolt Nuts	8–15
Lower Ball Joint Nut	①
Lower Shock Absorber To Radius Arm Nut	42–72
Lower Spring Seat Nut	70–100
Radius Arm Bracket Front Bolt	27–37
Radius Arm Bracket Lower Bolt	160–220
Ring Gear Bolts	70–90
Upper Ball Joint Nut	①
Wheel Lug Nuts	100

①— On 1987-89, first torque nut on lower stud to 40 ft. lbs., then torque nut on upper stud to 85-100 ft. lbs. Complete tightening sequence by torquing lower nut to 95-110 ft. lbs.; 1990-92, lower joint to 95-110 ft. lbs., upper to 85-100 ft. lbs.

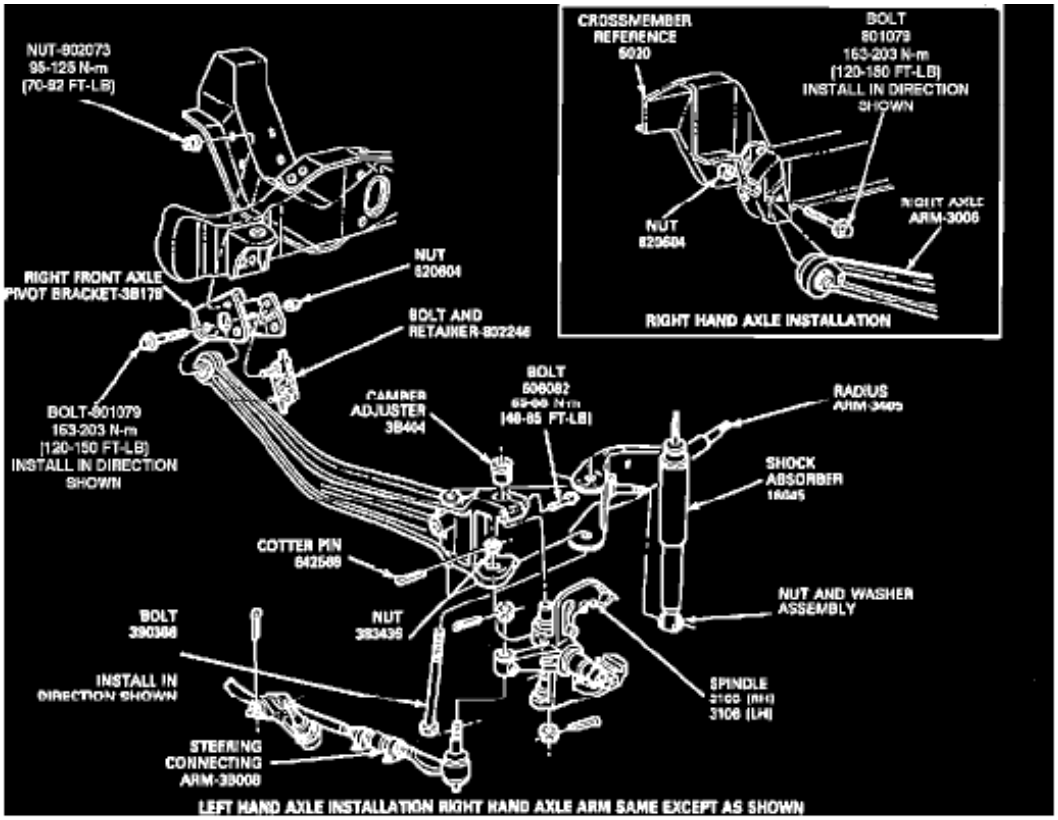
Tightening Specifications

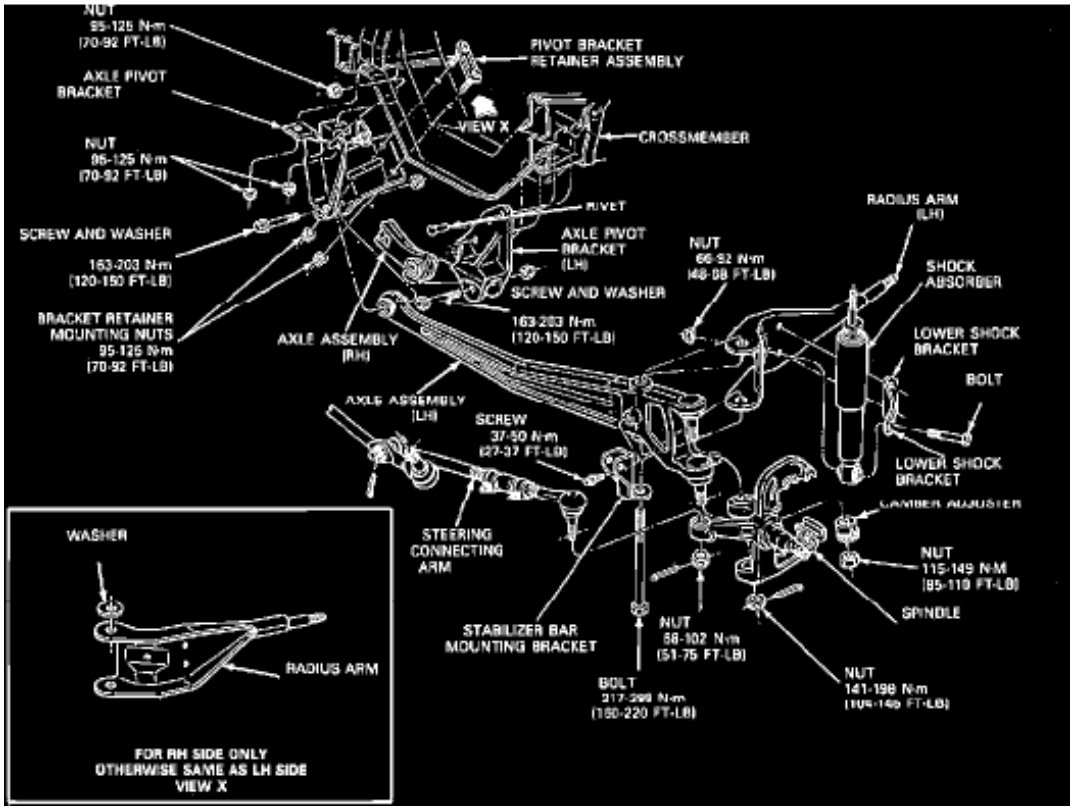
Component	Torque/Ft. Lbs.
Brake Backing Plate	20–40
Differential Bearing Cap Bolts	70–85
Differential Bearing Cap Bolts	95–115
Differential Pinion Shaft Lock Bolt	15–30
Filler Plug	15–30
Driveshaft To Companion Flange	70–95
Lower Shock Absorber Nut	39–53
Lug Nuts	100
Rear Leaf Spring U-Bolt To Plate Nut①	88–108
Rear Leaf Spring U-Bolt To Plate Nut②	66–75
Rear Shock Absorber To Lower Bracket Nut	40–60
Rear Shock Absorber To Upper Bracket Nut	41–63
Rear Shackle To Spring Nut	74–115
Rear Spring To Frame Nut	74–115
Rear Spring To Front Bracket Bolt①	64–91
Rear Spring To Front Bracket Bolt②	74–115
Rear Spring Shackle To Rear Bracket Bolt	74–115
Stabilizer To U-Bolt Nuts	30–42
Stabilizer Link To Bar Nut①	50–68
Stabilizer Link To Bar Nut②	40–63
Stabilizer Link To Frame Nut①	50–68
Stabilizer Link To Frame Nut②	40–60
Upper Shock Absorber Nut	15–21
Wheel Lug Nuts	100

① ——Bronco II & Explorer
② ——Ranger

Tightening Specification

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > I-Beam Axle <--> [Axle Beam] > Component Information > Service and Repair > Axle Pivot Bracket





I-Beam Axle: Service and Repair Axle Pivot Bracket

AXLE PIVOT BRACKET

Fig. 11 Front I-beam axle assembly 4x2 Models. Ranger

Fig. 12 Front I-beam axle assembly 4X2 Bronco II Models.

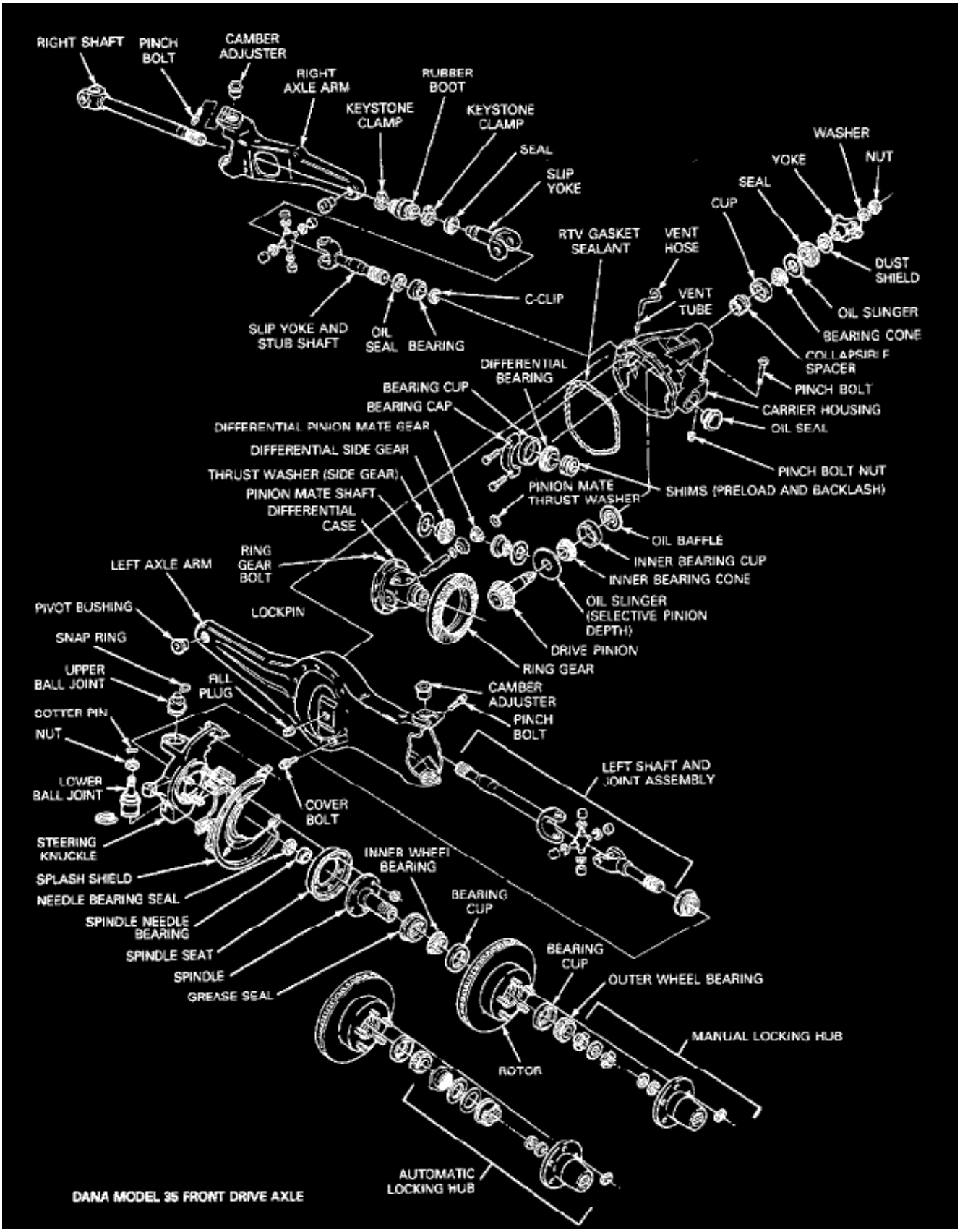
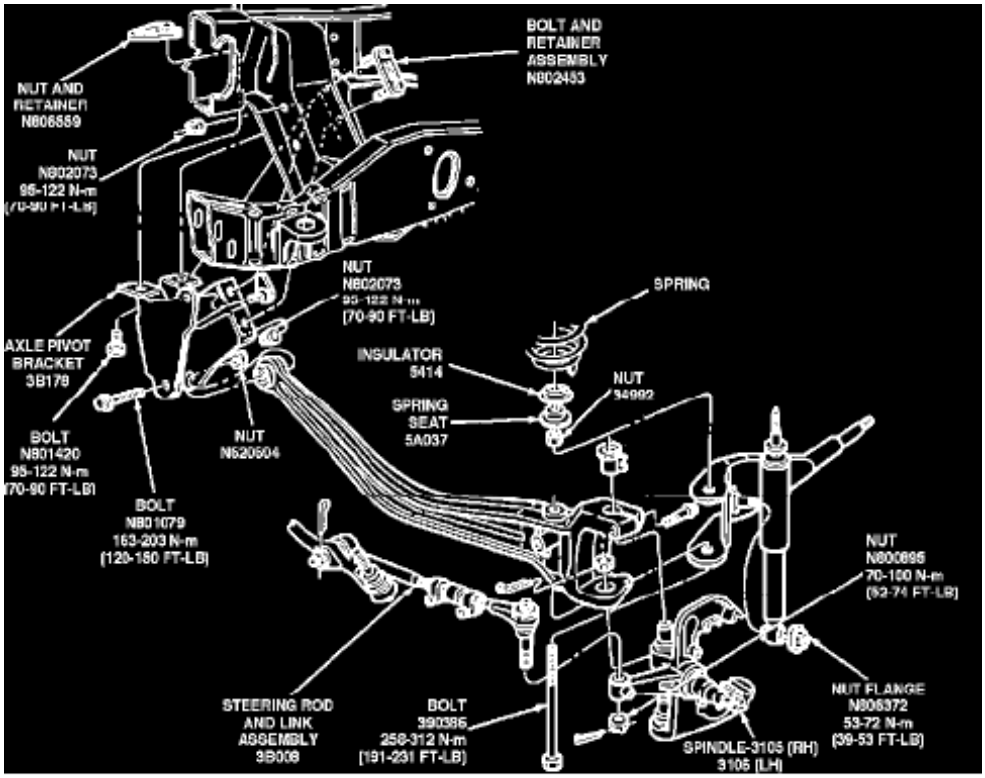

RIGHT SHAFT
PINCH BOLT
CAMBER ADJUSTER
RIGHT AXLE ARM
RUBBER BOOT
KEYSTONE CLAMP
KEYSTONE CLAMP
SEAL
SLIP YOKE
WASHER
YOKE
NUT
SEAL
CUP
DUST SHIELD
OIL SLINGER
BEARING CONE
COLLAPSIBLE SPACER
PINCH BOLT
CARRIER HOUSING
OIL SEAL
PINCH BOLT NUT
SHIMS (PRELOAD AND BACKLASH)
RTV GASKET SEALANT
VENT HOSE
VENT TUBE
C-CLIP
SLIP YOKE AND STUB SHAFT
OIL SEAL
BEARING
DIFFERENTIAL BEARING
BEARING CUP
BEARING CAP
DIFFERENTIAL PINION MATE GEAR
DIFFERENTIAL SIDE GEAR
THRUST WASHER (SIDE GEAR)
PINION MATE SHAFT
DIFFERENTIAL CASE
PINION MATE THRUST WASHER
OIL BAFFLE
INNER BEARING CUP
INNER BEARING CONE
OIL SLINGER (SELECTIVE PINION DEPTH)
DRIVE PINION
RING GEAR
RING GEAR BOLT
LEFT AXLE ARM
LOCKPIN
PIVOT BUSHING
SNAP RING
UPPER BALL JOINT
FILL PLUG
COTTER PIN
NUT
LOWER BALL JOINT
CAMBER ADJUSTER
PINCH BOLT
LEFT SHAFT AND JOINT ASSEMBLY
COVER BOLT
STEERING KNUCKLE
SPLASH SHIELD
NEEDLE BEARING SEAL
SPINDLE NEEDLE BEARING
SPINDLE SEAT
SPINDLE
GREASE SEAL
INNER WHEEL BEARING
BEARING CUP
BEARING CUP
OUTER WHEEL BEARING
MANUAL LOCKING HUB
ROTOR
AUTOMATIC LOCKING HUB
DANA MODEL 35 FRONT DRIVE AXLE

Fig. 13 Front I-beam axle assembly. 4X4 Models


BOLT AND RETAINER ASSEMBLY N802453
NUT AND RETAINER N806859
NUT N802073 95-122 N-m
NUT N802073 95-122 N-m (70-90 FT-LB)
SPRING
AXLE PIVOT BRACKET 3B178
INSULATOR 5414
NUT 34992
SPRING SEAT 5A037
BOLT N801420 95-122 N-m (70-90 FT-LB)
NUT N620604
BOLT N801079 163-203 N-m (120-150 FT-LB)
NUT N806895 70-100 N-m (52-74 FT-LB)
STEERING ROD AND LINK ASSEMBLY 3B008
BOLT 390386 258-312 N-m (191-231 FT-LB)
NUT FLANGE N806372 53-72 N-m (39-53 FT-LB)
SPINDLE-3105 (RH) 3105 (LH)

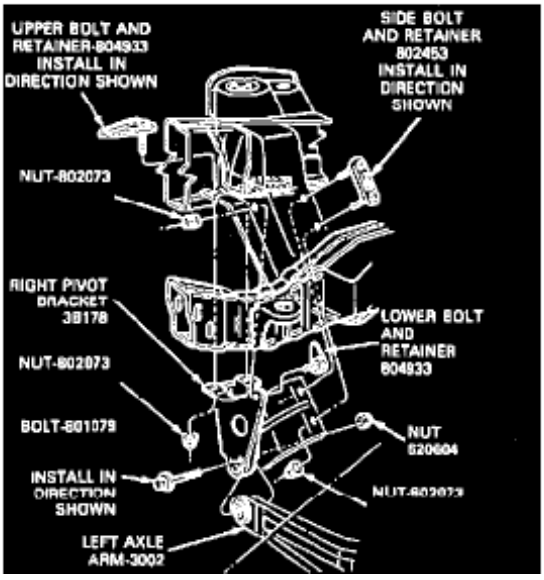

UPPER BOLT AND RETAINER-804933 INSTALL IN DIRECTION SHOWN
SIDE BOLT AND RETAINER 802453 INSTALL IN DIRECTION SHOWN
NUT-802073
RIGHT PIVOT BRACKET 3B178
LOWER BOLT AND RETAINER 804933
NUT-802073
BOLT-801079
NUT 620604
INSTALL IN DIRECTION SHOWN
NUT-802073
LEFT AXLE ARM-3002

Fig. 14 Front I-beam axle assembly 4x2 Explorer

4X2 MODELS

1. Remove front spring, radius arm, wheel spindle and I-beam.

2. Remove four attaching nuts and two bolts and retainer assemblies. Remove axle pivot bracket, Figs. 11 through 14.

3. Reverse procedure to install. Position axle pivot bracket to frame and install forward and rearward bolts and retainer assemblies from inside of pivot bracket out through crossmember. Loosely install four nuts on outside of crossmember (two forward and two rearward). Torque nuts to 70-90 ft. lbs. Use nut N8802073-S2 or install one .20 inch thick hardened washer under each nut if a standard nut is used.

Fig. 15 Right Axle Pivot Bracket Replacement. 4x4 Models

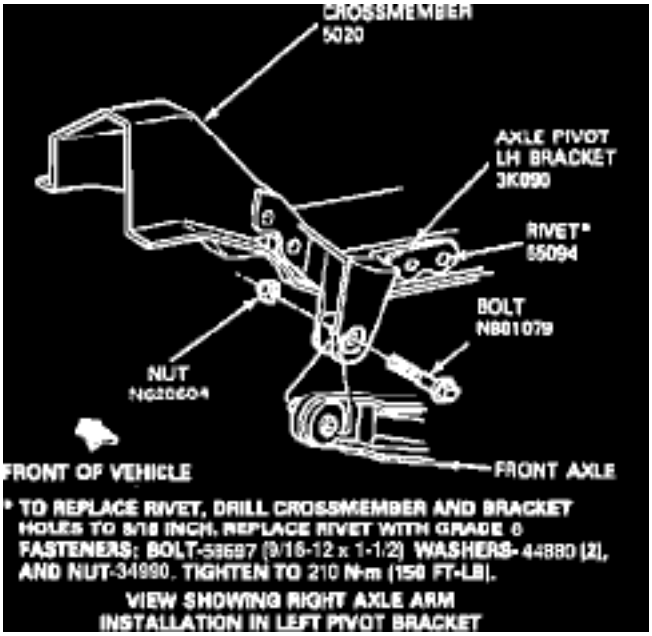


Fig. 16 Left Axle Pivot Bracket Replacement. 4x4 Models

4X4 MODELS

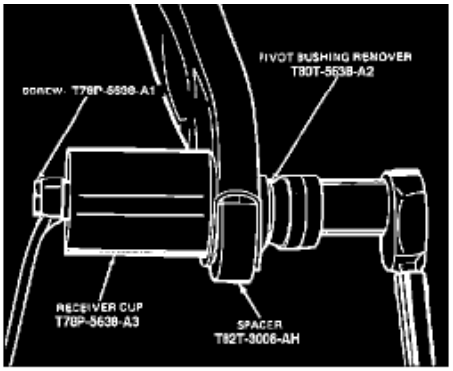
1. Remove coil spring and radius arm as described previously.

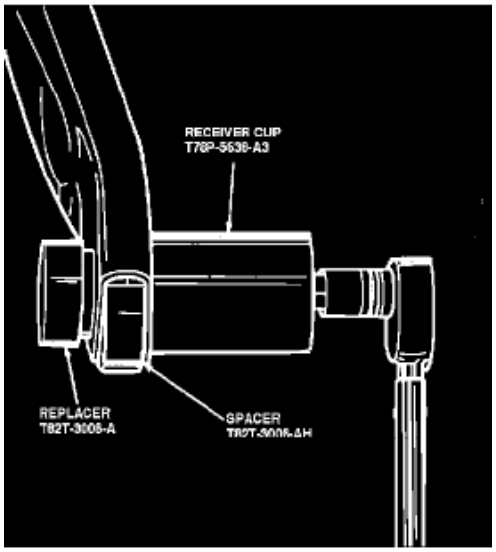
2. Remove front drive axle.

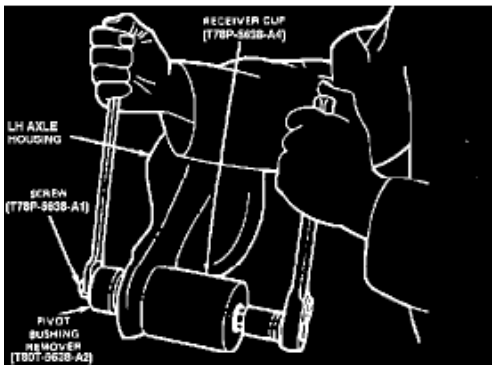
3. To remove right pivot bracket, remove upper bolt and retainer, then the side bolt and retainer, Fig. 15. Remove and discard lower bolt and retainer, then remove pivot bracket from crossmember.

4. To remove left pivot bracket, drill out rivets so that mounting holes in bracket and crossmember are 9/16 inch in diameter, then remove the bracket, Fig. 16.

5. Reverse procedure to install. Refer to Figs. 15 and 16, for replacement hardware.


PIVOT BUSHING REMOVER
T80T-5638-A2
RECEIVER CUP
T78P-5638-A3
SPACER
T82T-3006-AH


RECEIVER CUP
T78P-5638-A3
REPLACER
T82T-3006-A
SPACER


RECEIVER CUP
(T78P-5638-A4)
LH AXLE HOUSING
SCREW
(T78P-5638-A1)
PIVOT BUSHING REMOVER
(T80T-5638-A2)

I-Beam Axle: Service and Repair Axle Pivot Bushing

Fig. 17 Axle Pivot Bushing Removal. 4x2 Models

Fig. 18 Axle Pivot Bushing Installation. 4x2 Models

2X4 MODELS

1. Remove front coil spring as outlined in this chapter.

2. For left I-beam axle, remove axle pivot bolt and nut and pull left I-beam axle down until bushing is exposed. For right I-beam axle, entire right I-beam axle must be removed. Refer to FRONT I-BEAM AXLE.

3. Install forcing screw T78P-5638-A1, bushing remover T80T-5638-A2, spacer T82T-3006-A4 and receiver cup T78P-5638-A3 onto pivot bushing. Turn forcing screw and remove pivot bushing, Fig. 17.

4. Reverse procedure to install. Refer to Fig. 18. Lower vehicle and with weight on suspension and tighten pivot bushing and nut to specifications.

Fig. 3 Axle Pivot Bushing Removal

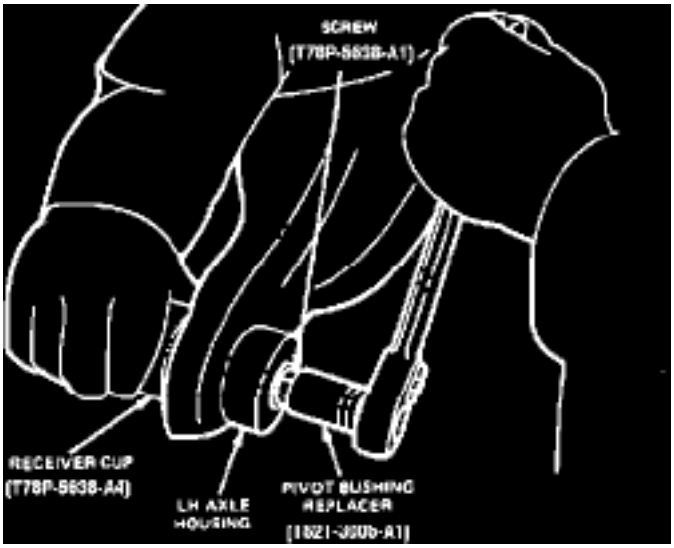


Fig. 4 Axle Pivot Bushing Installation

4X4 MODELS

1. Remove front axle assembly as described previously.

2. Remove pivot bushing from axle housing, Fig. 3.

3. Install bushing in axle housing, Fig. 4, then flare the bushing to prevent movement. Complete installation by crimping bushing lip.

I-Beam Axle: Service and Repair Front Axle Assembly (4X4)

1. Raise and support vehicle. Install jack stands under radius arm brackets.

2. Disconnect driveshaft from front axle yoke, then remove front wheels.

3. Remove disc brake calipers and position aside. Do not let caliper hang down on brake hose.

4. Remove stabilizer bar and links.

5. Disconnect steering linkage from spindle by removing the cotter pin and retaining nut.

6. Place a jack under axle arm assembly and compress the coil spring, then remove nut which retains bottom of spring to axle arm.

7. Lower axle until all spring tension is released, then remove the coil spring, spacer, seat and stud. The axle assembly must be supported when removing spring and not be permitted to hang by the brake hose. If the length of the brake hose is not sufficient to provide adequate clearance for spring removal, the disc brake caliper must be removed. If so, do not suspend caliper by brake hose.

8. Disconnect shock absorber from radius arm bracket, then remove the bracket and radius arm.

9. Remove pivot bolt securing right hand axle arm to crossmember.

10. Remove clamps from axle shaft slip yoke and axle shaft, then slide rubber boot over yoke.

11. Disconnect right driveshaft from slip yoke assembly, then lower jack and remove right axle arm assembly.

12. Position another jack under differential housing, then remove bolt securing left axle arm to crossmember and remove left axle arm assembly.

13. Reverse procedure to install. Tighten attaching nuts and bolts to specifications.

Component	Torque/Ft. Lbs.
Axle Pivot Bolt	120–150
Axle Pivot Bracket To Frame Nut	70–92
Axle Stud	190–230
Bearing Cap Bolts	47–67
Carrier To Axle Arm Bolts	35–53
Carrier Shear Bolt	75–95
Front Driveshaft U-Bolt Nuts	8–15
Lower Ball Joint Nut	①
Lower Shock Absorber To Radius Arm Nut	42–72
Lower Spring Seat Nut	70–100
Radius Arm Bracket Front Bolt	27–37
Radius Arm Bracket Lower Bolt	160–220
Ring Gear Bolts	70–90
Upper Ball Joint Nut	①
Wheel Lug Nuts	100

①— On 1987-89, first torque nut on lower stud to 40 ft. lbs., then torque nut on upper stud to 85-100 ft. lbs. Complete tightening sequence by torquing lower nut to 95-110 ft. lbs.; 1990-92, lower joint to 95-110 ft. lbs., upper to 85-100 ft. lbs.

Tightening Specifications

Component	Torque/Ft. Lbs.
Axle Pivot Bolt	120–150
Axle Pivot Bracket To Frame Nut	70–92
Axle Stud	190–230
Bearing Cap Bolts	47–67
Carrier To Axle Arm Bolts	35–53
Carrier Shear Bolt	75–95
Front Driveshaft U-Bolt Nuts	8–15
Lower Ball Joint Nut	①
Lower Shock Absorber To Radius Arm Nut	42–72
Lower Spring Seat Nut	70–100
Radius Arm Bracket Front Bolt	27–37
Radius Arm Bracket Lower Bolt	160–220
Ring Gear Bolts	70–90
Upper Ball Joint Nut	①
Wheel Lug Nuts	100

①— On 1987-89, first torque nut on lower stud to 40 ft. lbs., then torque nut on upper stud to 85-100 ft. lbs. Complete tightening sequence by torquing lower nut to 95-110 ft. lbs.; 1990-92, lower joint to 95-110 ft. lbs., upper to 85-100 ft. lbs.

Tightening Specifications

Ball Joint: Testing and Inspection Ball Joint, Lower

1. Raise and support vehicle, then place safety stands under I-Beam axle beneath coil spring.

2. Grasp lower edge of tire and move wheel in and out, observe lower spindle arm and lower part of axle jaw.

3. If movement between lower spindle arm and lower spindle jaw is greater than 1/32 inch, replace lower ball joint.

4. Grasp upper edge of tire and move tire in and out, observe movement between upper spindle arm and upper part of axle jaw.

5. If movement is between upper part of axle jaw and upper spindle arm is greater than 1/32 inch, replace upper ball joint.

Ball Joint: Testing and Inspection Ball Joint, Upper

1. Raise and support vehicle, then place safety stands under I-Beam axle beneath coil spring.

2. Grasp lower edge of tire and move wheel in and out, observe lower spindle arm and lower part of axle jaw.

3. If movement between lower spindle arm and lower spindle jaw is greater than 1/32 inch, replace lower ball joint.

4. Grasp upper edge of tire and move tire in and out, observe movement between upper spindle arm and upper part of axle jaw.

5. If movement is between upper part of axle jaw and upper spindle arm is greater than 1/32 inch, replace upper ball joint.

Ball Joint: Service and Repair

1. Remove spindle then the shaft and joint assembly as described previously.

2. If tie rod has not been removed, remove cotter pin and nut and disconnect tie rod from steering arm.

3. Remove cotter pin and loosen nut on top ball joint stud. Loosen bottom nut inside knuckle, then remove top nut.

4. Break spindle loose from ball stud, then remove camber adjuster. Mark position of adjuster for assembly reference.

5. Install steering knuckle in suitable soft jawed vise, then remove snap ring from lower ball joint socket.

6. Press ball joints from steering knuckle using C-Frame tool No. T74P-4635-C with ball joint remover tool No. T83T-3050-A, or equivalent.

7. Reverse procedure to install. The lower ball joint must be installed first. Tighten attaching bolts to specifications in SPECIFICATIONS/MECHANICAL SPECIFICATIONS.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE			
Model Year *	A4LD Trans -4R602-	Mazda R 1 Trans -4R602-	TSB Reference
1989 Models (Excluding Mitsubishi 5-Speed)	E8TZ-U	E9TZ-L	91-13-11
1990 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	F0TZ-F	F0TZ-B	91-13-11
1990-93 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	F37Z-B	F37Z-A	94-2-24
1994 Models			
2.3L Splash 125" WB 4X2	F47Z-DA		
2.3L 125" WB 4X2	F37Z-B		
2.3L 125" WB 4X2		F37Z-A	
3.0L Splash 125" WB 4X2	F47Z-DA		
3.0L 125" WB 4X2	F37Z-B		
3.0L 125" WB 4X4	F37Z-C		
3.0L 125" WB 4X2		F37Z-A	
3.0L 125" WB 4X4		F37Z-C	
4.0L Splash 125" WB 4X2	F47Z-DA		
4.0L 125" WB 4X2	F37Z-B		
4.0L 125" WB 4X4	F37Z-C		
4.0L 125" WB 4X2		F37Z-A	
4.0L 125" WB 4X4		F37Z-C	
*1989 model part numbers are provided for convenience			

Technical Service Bulletin # 97-21-16 Date: 971013

Driveshaft - Boom/Vibration At 20-65 MPH

Article No. 97-21-16

10/13/97

^ NOISE - "BOOM" WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ DRIVESHAFT - "BOOM" VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH)-SUPERCAB MODELS ONLY

LIGHT TRUCK: 1989-97 RANGER

This TSB article is being republished in its entirety to remove mention of build dates in title.

ISSUE: A driveline "boom" or vibration may be experienced when driving 32-105 km/h (20-65 mph) in some vehicles. This may occur because of driveline sensitivity of the vehicle.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1995 Models		
2.3L Splash 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C
1996 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1997 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
2.3L 125" WB 4X2		F77Z-AA
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A

ACTION: Follow the Diagnostic Chart in this TSB article. Install revised design components as required to provide better isolation and improved driveline angles to resolve the concern. Refer to

the following Service Procedure for details.

NOTE:

THE SERVICE REPLACEMENT DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE WILL NOT FIT VEHICLES EQUIPPED WITH A MITSUBISHI MANUAL TRANSMISSION. IF DRIVESHAFT REPLACEMENT IS REQUIRED ON MITSUBISHI EQUIPPED MODELS, REFER TO THE PARTS CATALOG FOR CORRECT APPLICATION.

PARTS BLOCK AND TORQUE SPECIFICATION			
Part Number	**Part Name**	**Torque Spec.**	**Class**
390066-S2	Screw - Transmission Mount-To-Crossmember (Pk/2)	103 N•m (76 lb-ft)	S
N605800-S100	Bolt - Center Bearing Bracket-To-Frame	50 N•m (37 lb-ft)	BS
N802594-S56	Frame Cap Bolts	50 N•m (37 lb-ft)	C
N800594-S100	Cap Screws - Driveshaft-to-Rear Axle	100 N•m (74 lb-ft)	AM
N621945-S2	M12-1.75 Nut (Transmission Mount-To-Crossmember) (Pk/4)	103 N•m (76 lb-ft)	RS
N620482-S2	Frame Cap Nuts (Pk/8)	50 N•m (37 lb-ft)	BG
N801673-S2	Nut (Pk/8)	50 N•m (37 lb-ft)	BS
F37Z-6068-A	Transmission Mount	-	A
F37Z-4831-B	Frame - Crossmember Cap	-	C
E8TZ-4R602-U	Driveshaft - 1989 Models With Automatic Transmission	-	B
E9TZ-4R602-L	Driveshaft - 1989 Models With Manual Transmission	-	C
FOTZ-4R602-F	*Driveshaft - 1990 Models With Automatic Transmission - Vehicles Built Before 12/15/89*	-	B
FOTZ-4R602-B	Driveshaft - 1990 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	-	C
F37Z-4R602-A	Driveshaft - 1990-93 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	-	C
F37Z-4R602-B	Driveshaft - 1990-93 Models With Automatic Transmission - Vehicles Built From 12/15/89 Through 3/30/93	-	C

Parts Block

OTHER APPLICABLE ARTICLES: 91-13-11, 93-18-15

SUPERSEDES: 97-20-16

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

For 1992-97 Models, Basic And Powertrain Warranty Coverage For 1989-91 Models

OPERATION DESCRIPTION TIME

972116A Replace Driveshaft 1.3 Hrs.

Assembly, And Replace Center Bearing Crossmember Cap As Outlined

DEALER CODING

CONDITION

BASIC PART NO. CODE

4R602 D9

OASIS CODES: 304000, 509000, 597997, 703000, 703200

Service Procedure

NOTE:

BEFORE DIAGNOSING A 4-WHEEL-DRIVE VEHICLE, MAKE SURE IT IS IN 2WD AND THE FRONT HUBS ARE UNLOCKED.

1. On smooth pavement, drive the vehicle at a constant speed and feel for the "float" condition:

a. This is the narrow, neutral range where the driveline can be said to "float" because neither accel nor decel forces are being applied to the driveline.

b. It is important to accurately identify vehicle behavior in "float" mode because the diagnostic routine to be used will depend on Noise/Vibration/Harshness (NVH) characteristics during float.

c. It may be necessary to drive the vehicle several minutes before the sensation can be clearly identified.

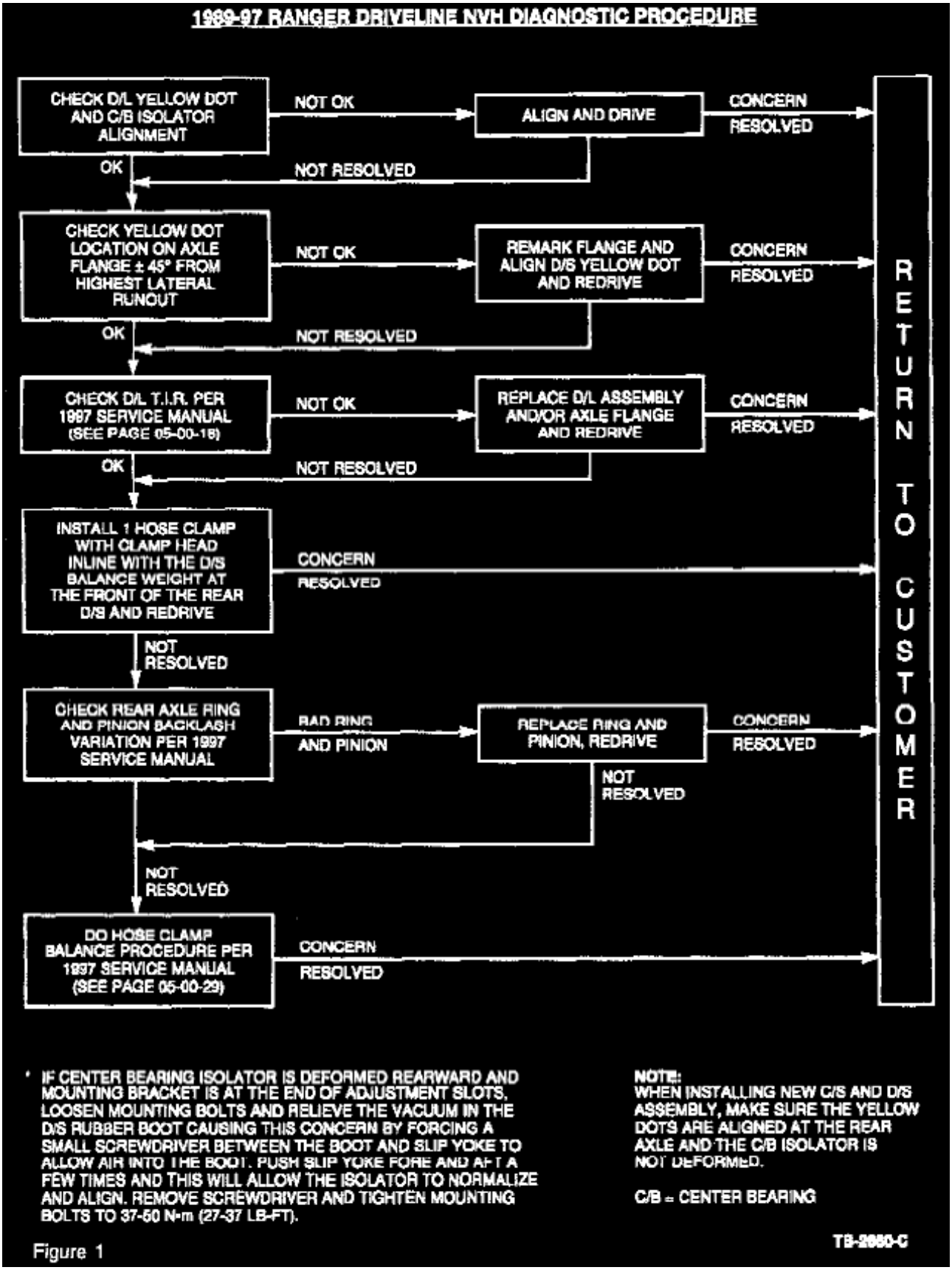


Figure 1

2. Perform the Driveline NVH Diagnostic Procedure shown in Figure 1 BEFORE replacing any components.

Vibration

Vibration, technically, is a high-frequency trembling, shaking or grounding condition, felt or heard, that is constant or variable in level and occurs during a portion of the total operating speed range. The types of vibrations that can be felt in the vehicle can be divided into three groups:

^ Vibrations of various unbalanced rotating parts of the vehicle

^ Body and frame vibrations excited by the powertrain, wind or road inputs

^ Tip-in moans or resonance vibrations from stressed engine or exhaust system mounts

If vibration is gone, check the front driveshaft, transfer case, front axle, or halfshafts for loose components. Refer to the 1997 Ranger Service Manual, Section 05-03B, for details.

NOTE:

DRIVING A 4-WHEEL-DRIVE VEHICLE WITH THE REAR DRIVESHAFT REMOVED FURTHER CONFIRMS ANY VIBRATION CONCERNS WITH THE FRONT DRIVE SYSTEM.

These vehicle vibrations can also be subdivided into those that occur at low speeds and those that are most noticeable at higher speeds. Since the dividing line between low and higher speed vibrations is not clear, there will be vibrations that overlap the two ranges.

Typical Low Speed Vibrations (less than 72 km/h (45 mph))

^ Exhaust vibration

^ Engine harshness

^ Driveline vibration due to improper driveline angles

^ Power steering pump disturbances

^ Air conditioner compressor or drive belt vibrations

^ Takeoff shudder (clutch or driveline problems)

^ Brake roughness or harshness

^ Driveline roughness

^ Clutch torsion vibration

^ Driveline slip-yoke or U-joints

Typical High Speed Vibrations (above than 72 km/h (45 mph))

^ Axle and companion flange runout or imbalance

^ Driveshaft imbalance

^ Excessive tire-wheel and drum assembly imbalance

^ Tire roughness due to high non-uniformity (force variation) or out-of-balance condition

^ Rear axle pinion gear pitch line runout

^ Excessive tire and wheel run out

^ Worn suspension components

^ Front end accessory vibrations

^ Exhaust vibration - Exhaust vibration is greatly reduced in Ranger exhaust systems de-coupled by a flexible coupling and mounted with blade and block hangers

Driveshaft Vibrates

1. Road test vehicle to determine critical vibration points. Note road speed, engine rpm and shift lever positions at which vibration occurs.

2. Stop vehicle and run engine with clutch depressed (automatic transmission in Neutral) through critical speed ranges determined in Step 1 of Driveshaft Vibrates.

3. If vibration is gone, the driveshaft must be balanced as described in the 1997 Ranger Service Manual, Page 05-00-29.

Component Test

Driveline Vibration

^ Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake

^ Driveline vibration is directly related to the speed of the vehicle and is usually noticed at speeds of 72 km/h (45 mph) or higher

^ Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum or boom

^ Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. If the vibration is

particularly noticeable during acceleration or deceleration, especially at lower speeds, then driveline angle should be checked

^ Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jackstands, though the brakes may need to be applied lightly in order to simulate road resistance. Refer to the 1997 Ranger Service Manual, Page 05-00-15, Steps 1-10

Driveshaft Runout and Balance

Vibration or shudder which is noticeable either on fast acceleration, when coasting, or when using the engine for braking, may be caused by the rear axle housing being loose on the rear suspension, improper tire balance, improper driveline installation, or driveline balance.

If driveshaft components are replaced and shaft vibration is encountered after installation, disconnect and remove the driveshaft. Rotate the rear axle companion flange 180 degrees; then, reconnect the driveshaft to the driveshaft slip-yoke and reinstall in vehicle. If the vibration persists, disconnect the driveshaft at the rear axle companion flange. Rotate the rear axle companion flange 180 degrees and reconnect the driveshaft to the rear axle companion flange.

If rotating the driveshaft 180 degrees does not eliminate vibration, the driveshaft may be balanced by referring to the 1997 Ranger Service Manual, Page 05-00-29, Steps 1-9, for details.

Slip-Yoke Spline

Vehicle noise and vibration can be caused by a seized driveshaft slip-yoke spline. The service resolution to minimize driveshaft slip-yoke spline contamination and ultimate seizure can be found in the 1997 Ranger Service Manual, Page 05-00-32, Steps 1-11.

Driveline Angularity

Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height (rear spring) and engine mounts.

Low speed vibration, less than 72 km/h (45 mph), especially when the vehicle is subjected to heavy acceleration or deceleration, is an indication of improper driveline angles. When these conditions exist, check the universal joints for proper seating, mounting and operation.

Center Bearing, Supercab 4X2 and 4X4

1. Unbolt the center bearing mount and spin the bearing. If bearing does not rotate freely it must be replaced.

2. Inspect the rubber insulator for evidence of hardening, cracking or deterioration before removing shaft. Replace if damaged. Refer to the 1997 Ranger Workshop Manual, Pages 05-01-14 and -15, for center bearing and rubber insulator service.

NOTE:

IF DRIVESHAFT AND COUPLING SHAFT ARE REMOVED, MAKE SURE THE YOKE IS REINSTALLED ON THE COUPLING SHAFT IN THE SAME ORIENTATION AS IT WAS ORIGINALLY INSTALLED. THE ORIENTATION IS CRITICAL SO THAT PROPER DRIVESHAFT BALANCE AND UNIVERSAL JOINT PHASING IS MAINTAINED. TORQUE THE ATTACHING NUT TO 136-163 N.m (100-120 LB-FT).

NOTE:

THE DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE ARE THE MOST RECENT RELEASED FOR SERVICE. REFER TO OTHER TSB ARTICLES LISTED FOR 1993 AND PRIOR MODELS.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Cross-Member > Component Information > Technical Service Bulletins > Customer Interest for Cross-Member: > 94813 > Apr > 94 > Frame/Crossmember - Snapping/Popping Noise

Cross-Member: Customer Interest Frame/Crossmember - Snapping/Popping Noise

Article No. 94-8-13

^ FRAME - # 1 CROSSMEMBER - RIVET REPLACEMENT

^ NOISE - "POPPING/CREAKING" SOUNDS - FRAME # 1 CROSSMEMBER

LIGHT TRUCK: 1980-94 BRONCO, F-150-350 SERIES 1988-94 F SUPER DUTY, F-47

This TSB article is being republished in its entirety to add certain 1992/94 model year vehicles, to revise the nut specified in the article and its torque specification, and to expand the diagnostic and repair procedures contained in the article.

ISSUE:

A "popping/creaking" sound may come from the area of the # 1 crossmember attachment to the left frame rail. This occurs because of a slip/stick motion at a loose rivet in the lower flange of the frame near the steering gear. The rivet could be either a standard cold head rivet in light duty applications or a "huck" rivet, which has the appearance of a large "pop" Civet.

ACTION:

Use the following diagnostic procedure to determine if the noise is originating in this rivet area. If so, replace the rivet with a nut, bolt and washer assembly. The revised parts increase the clamp load at the joint, minimizing the motion that causes the noise. Refer to the following procedure for service details.

SOURCES OF VARIOUS FRONT UNDERBODY NOISES:

Various front underbody noises may originate from several different sources. Several noises have been misdiagnosed as # 1 crossmember rivet "pop/creak" because the noise tends to propagate to the shock tower area and the shock tower area acts as an amplifier such that the noises all appear to be coming from that area. Other underbody areas that produce similar noises include:

^ loose or improperly seated shock tower rivets

^ loose or misaligned transmission crossmembers

^ loose radius arm brackets

^ loose axle pivot brackets

Other service bulletins have been published to address the proper repair of these concerns.

DESCRIPTION OF # 1 CROSSMEMBER NOISES:

"Pop/creak" - A metal-to-metal rubbing motion which slip/sticks when a twist is induced into the frame.

DIAGNOSTIC PROCEDURE:

1. INTERVIEW THE CUSTOMER:

a. Understand the customer's description of the noise and of the conditions under which it is heard.

b. Road test the vehicle with the customer to fully understand where, how and when the noise occurs.

2. DUPLICATE THE NOISE CONCERN:

a. Drive the vehicle around for at least 15 minutes to warm-up and stress the frame joints, so that any frame noise is more likely to be repeatable in the garage.

b. Test the following situations:

^ Can the noise be duplicated while stationary and on dry pavement by repeatedly turning the steering wheel from steering stop to steering stop?

^ Can the noise be repeated while on the hoist without the suspension loaded by repeatedly turning the steering wheel from steering stop to steering stop?

Typically, the twist in the frame can be induced by turning the steering wheel back and forth from steering stop to steering stop to duplicate the noise at the # 1 crossmember attachment. IF THE NOISE IS NOT DUPLICATED UNDER ONE OF THESE SITUATIONS, INVESTIGATE OTHER AREAS FOR THE NOISE BEFORE PROCEEDING TO REPAIR THE # 1 CROSSMEMBER RIVET.

3. INSPECT FRAME BOLTS FOR PROPER INSTALLATION TORQUE:

a. Inspect and tighten all front end components which bolt to the frame to confirm they are at the proper torque. This includes, but is not limited to:

^ Radius arm bracket bolts - 135 +/- 20 N-m (100 +/- 15 lb.ft.)

^ Axle pivot bracket bolts (torques vary by model - refer to the appropriate light truck Service Manual for proper torque specifications)

^ Bumper bracket bolts - (refer to the appropriate light truck Service Manual for proper torque specifications)

b. Inspect the transmission crossmember for proper alignment and bolt torques. If misaligned:

^ Loosen all transmission crossmember fasteners (including to the transmission).

^ Lift the transmission to remove any load on the crossmember.

^ Lift and reposition the transmission crossmember to be centered on the frame attachment holes.

^ Tighten all frame fasteners to the 63 +/- 9 N-m (46 +/- 7 lb.ft.).

^ Lower the transmission and tighten fasteners to 95 +/- 15 N-m (70 +/- 11 lb.ft.).

4. TEST DRIVE THE VEHICLE

Road test the vehicle again to duplicate the concern. If the noise is still present, continue.

5. INSPECT THE FRAME RIVETS

a. Repeat Step 2 to duplicate the noise in the garage.

b. Use a stethoscope or chassis ears to isolate the area of the chassis that the noise appears to be originating from. Areas to check include the shock tower rivets and all # 1 crossmember rivets.

6. SERVICE THE VEHICLE

a. If the noise appears to be from the lower left-front # 1 crossmember fastener, follow the procedure outlined below.

b. If the noise appears to be coming from another rivet (other than the lower left front # 1 crossmember rivet), refer to TSB 93-6-10 for the proper rivet repair procedure.

LOWER LEFT FRONT # 1 CROSSMEMBER RIVET REPLACEMENT:

NOTE:

THIS SERVICE PROCEDURE DOES NOT APPLY TO STEERING GEAR LINER REPLACEMENT. REFER TO TSB 90-11-10 FOR STEERING GEAR LINER REPAIR PROCEDURE.

1. Remove damaged or loose COLD HEAD RIVETS:

a. Drill a 1/8" (3.175 mm) hole through the rivet.

b. Redrill the same hole through the shank of the rivet with a 3/8" (9.525 mm) drill.

c. Remove the rivet head with an air chisel.

d. Drive out the rivet with a punch and hammer.

2. Remove damaged or loose "HUCK" RIVETS:

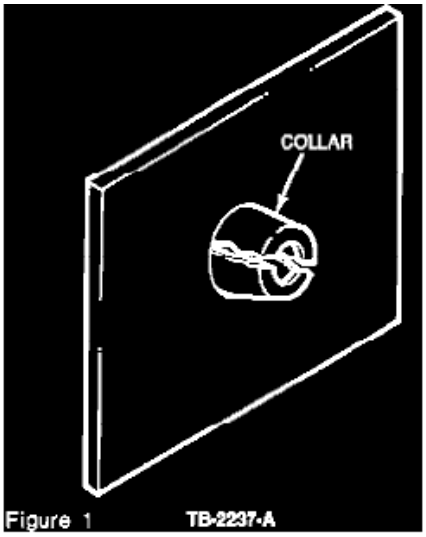


Figure 1 TB-2237-A

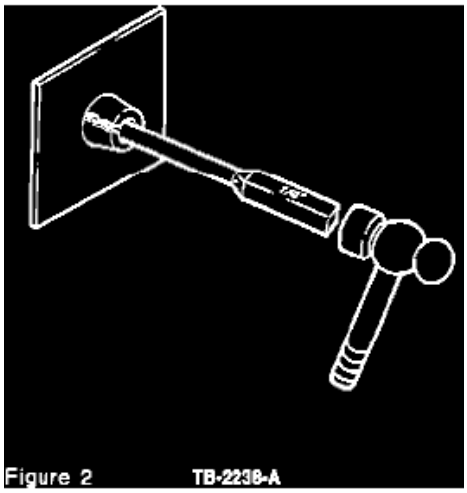


Figure 2 TB-2238-A

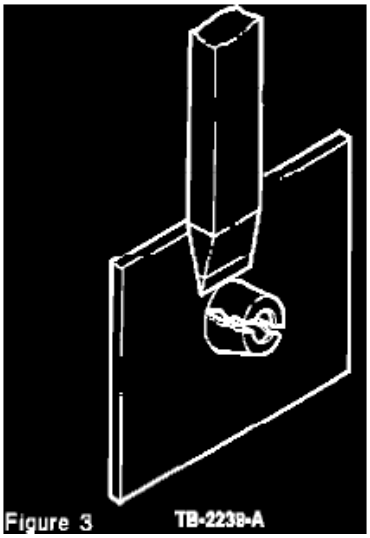
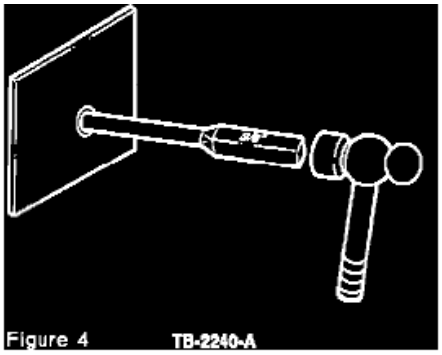


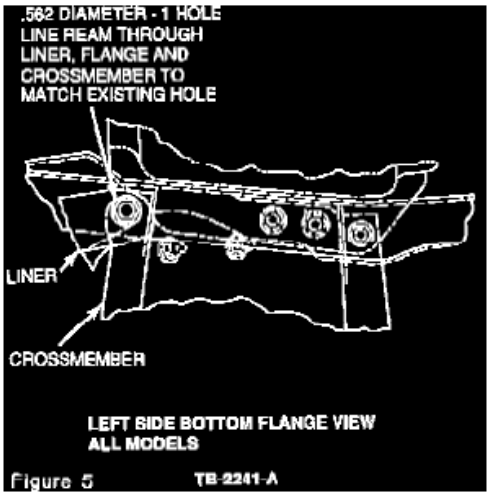
Figure 3 TB-2238-A

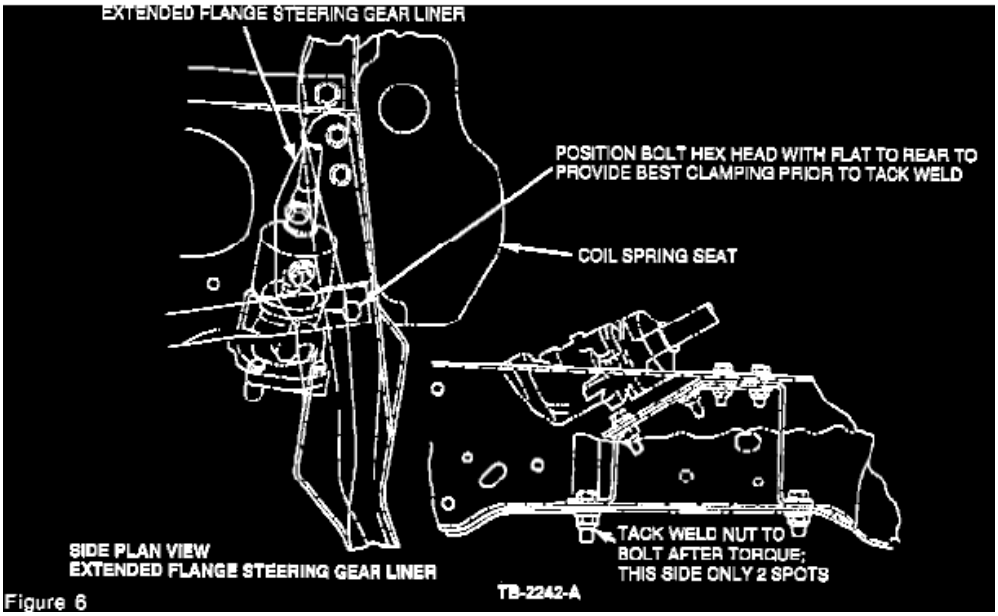
a. Use a flat chisel and hammer (or air chisel) to split the exposed collar of the huck fastener, Figure 1.

b. Knock the rivet pin out of the blind side with a 1/4" (6.35 mm) drift punch and hammer, Figure 2.

c. Cut the rivet's head off with a hammer and flat chisel, Figure 3.







d. Knock the sleeve out of the blind side with a 3/8" (9.525 mm) drift punch and hammer, Figure 4.

CAUTION:

REMOVAL OF THE FASTENER WITH A CUTTING TORCH IS NOT RECOMMENDED BECAUSE OF PROBABLE DAMAGE TO THE FRAME STRUCTURE.

3. Line ream the existing hole through the liner, frame flange and crossmember to 9/16" (14.228 mm), Figure 5.

4. Install a 9/16" Grade 8 nut (34990-S4), bolt (58698-S2) and washer (44880-S2), with nut/washer on the bottom, Figure 6.

a. Push the bolt into place using a brazing rod to hold the bolt.

PART NUMBER	PART NAME	CLASS
34990-S4	Nut 9/16 - 12 Hex (Pkg. 5)	RG
44880-S2	Washer 9/16 (Pkg. 12)	BG
58698-S2	Bolt 9/16-12 x 1.75" (Pkg. 4)	BG

b. Slide the bolt into the opening between the front face of the crossmember and frame liner.

c. Tighten the nut to 140 4-3 lb.ft. (190 4-4 N-m) and tack weld the nut to the bolt after tightening.

CAUTION:

DO NOT WELD THE NUT/WASHER TO THE FRAME.

OTHER APPLICABLE ARTICLES: 91-11-10

SUPERSEDES: 91-25-18

WARRANTY STATUS:

Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 19 2-94 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940813A Perform Diagnostics And 1.9 Hrs.

Replace Rivet

DEALER CODING

BASIC PART NO. CONDITION CODE

5005 56

OASIS CODES: 305000, 390000, 702000, 702100

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE			
Model Year *	A4LD Trans -4R602-	Mazda R 1 Trans -4R602-	TSB Reference
1989 Models (Excluding Mitsubishi 5-Speed)	E8TZ-U	E9TZ-L	91-13-11
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1994 Models			
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2.3L 125" WB 4X2	F37Z-B		
2.3L 125" WB 4X2		F37Z-A	
3.0L Splash 125" WB 4X2	F47Z-DA		
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4.0L Splash 125" WB 4X2	F47Z-DA		
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4.0L 125" WB 4X4	F37Z-C		
4.0L 125" WB 4X2		F37Z-A	
4.0L 125" WB 4X4		F37Z-C	
*1989 model part numbers are provided for convenience			

Technical Service Bulletin # 97-21-16 Date: 971013

Driveshaft - Boom/Vibration At 20-65 MPH

Article No. 97-21-16

10/13/97

^ NOISE - "BOOM" WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ DRIVESHAFT - "BOOM" VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH)-SUPERCAB MODELS ONLY

LIGHT TRUCK: 1989-97 RANGER

This TSB article is being republished in its entirety to remove mention of build dates in title.

ISSUE: A driveline "boom" or vibration may be experienced when driving 32-105 km/h (20-65 mph) in some vehicles. This may occur because of driveline sensitivity of the vehicle.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1995 Models		
2.3L Splash 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C
1996 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1997 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
2.3L 125" WB 4X2		F77Z-AA
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A

ACTION: Follow the Diagnostic Chart in this TSB article. Install revised design components as required to provide better isolation and improved driveline angles to resolve the concern. Refer to

the following Service Procedure for details.

NOTE:

THE SERVICE REPLACEMENT DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE WILL NOT FIT VEHICLES EQUIPPED WITH A MITSUBISHI MANUAL TRANSMISSION. IF DRIVESHAFT REPLACEMENT IS REQUIRED ON MITSUBISHI EQUIPPED MODELS, REFER TO THE PARTS CATALOG FOR CORRECT APPLICATION.

PARTS BLOCK AND TORQUE SPECIFICATION

Part Number	Part Name	Torque Spec.	Class
390066-S2	Screw - Transmission Mount-To-Crossmember (Pk/2)	103 N•m (76 lb-ft)	S
N605800-S100	Bolt - Center Bearing Bracket-To-Frame	50 N•m (37 lb-ft)	BS
N802594-S56	Frame Cap Bolts	50 N•m (37 lb-ft)	C
N800594-S100	Cap Screws - Driveshaft-to-Rear Axle	100 N•m (74 lb-ft)	AM
N621945-S2	M12-1.75 Nut (Transmission Mount-To-Crossmember) (Pk/4)	103 N•m (76 lb-ft)	RS
N620482-S2	Frame Cap Nuts (Pk/8)	50 N•m (37 lb-ft)	BG
N801673-S2	Nut (Pk/8)	50 N•m (37 lb-ft)	BS
F37Z-6068-A	Transmission Mount	-	A
F37Z-4831-B	Frame - Crossmember Cap	-	C
E8TZ-4R602-U	Driveshaft - 1989 Models With Automatic Transmission	-	B
E9TZ-4R602-L	Driveshaft - 1989 Models With Manual Transmission	-	C
FOTZ-4R602-F	*Driveshaft - 1990 Models With Automatic Transmission - Vehicles Built Before 12/15/89*	-	B
FOTZ-4R602-B	Driveshaft - 1990 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	-	C
F37Z-4R602-A	Driveshaft - 1990-93 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	-	C
F37Z-4R602-B	Driveshaft - 1990-93 Models With Automatic Transmission - Vehicles Built From 12/15/89 Through 3/30/93	-	C

Parts Block

OTHER APPLICABLE ARTICLES: 91-13-11, 93-18-15

SUPERSEDES: 97-20-16

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

For 1992-97 Models, Basic And Powertrain Warranty Coverage For 1989-91 Models

OPERATION DESCRIPTION TIME

972116A Replace Driveshaft 1.3 Hrs.

Assembly, And Replace Center Bearing Crossmember Cap As Outlined

DEALER CODING

CONDITION

BASIC PART NO. CODE

4R602 D9

OASIS CODES: 304000, 509000, 597997, 703000, 703200

Service Procedure

NOTE:

BEFORE DIAGNOSING A 4-WHEEL-DRIVE VEHICLE, MAKE SURE IT IS IN 2WD AND THE FRONT HUBS ARE UNLOCKED.

1. On smooth pavement, drive the vehicle at a constant speed and feel for the "float" condition:

a. This is the narrow, neutral range where the driveline can be said to "float" because neither accel nor decel forces are being applied to the driveline.

b. It is important to accurately identify vehicle behavior in "float" mode because the diagnostic routine to be used will depend on Noise/Vibration/Harshness (NVH) characteristics during float.

c. It may be necessary to drive the vehicle several minutes before the sensation can be clearly identified.

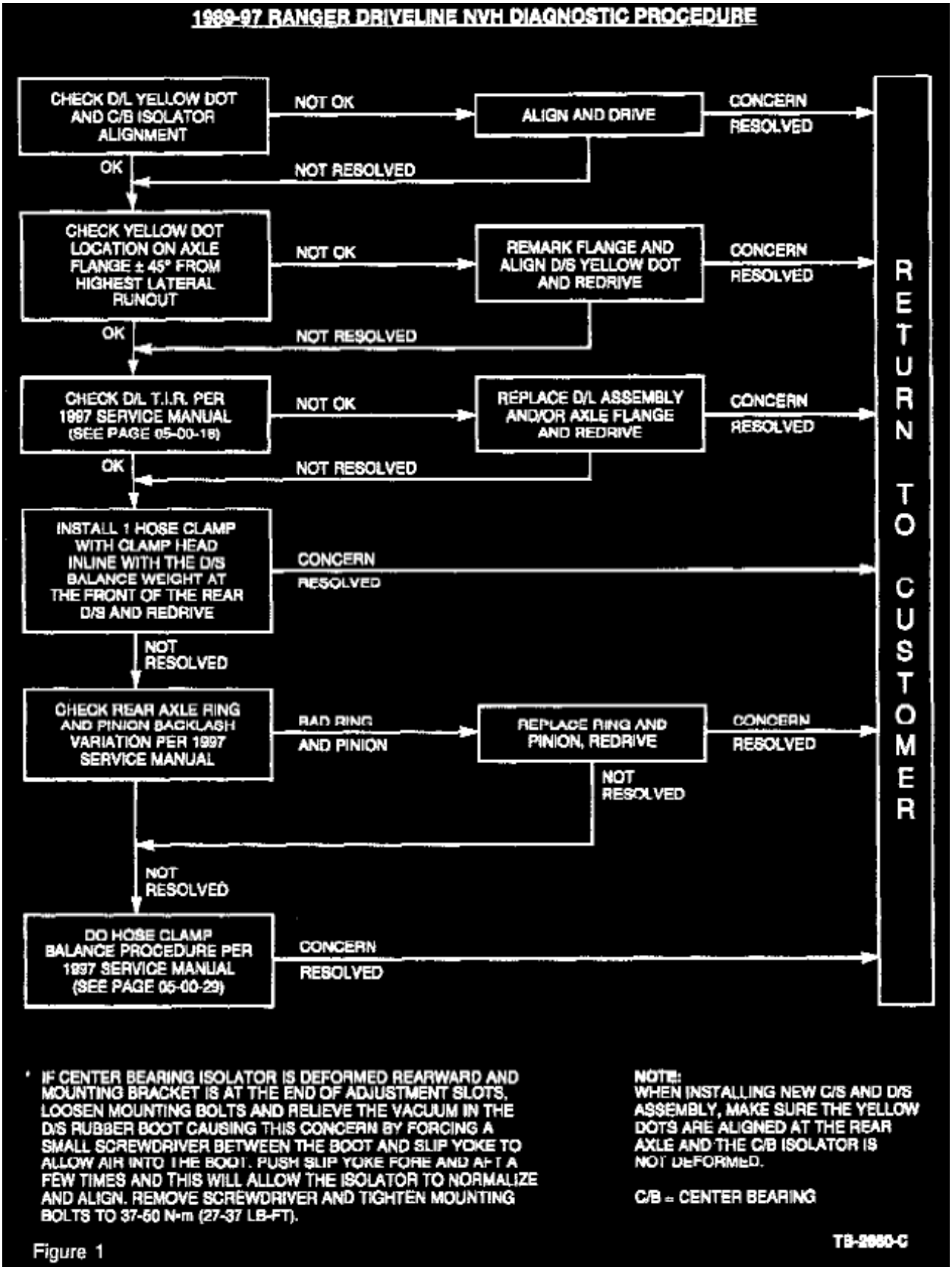


Figure 1

2. Perform the Driveline NVH Diagnostic Procedure shown in Figure 1 BEFORE replacing any components.

Vibration

Vibration, technically, is a high-frequency trembling, shaking or grounding condition, felt or heard, that is constant or variable in level and occurs during a portion of the total operating speed range. The types of vibrations that can be felt in the vehicle can be divided into three groups:

^ Vibrations of various unbalanced rotating parts of the vehicle

^ Body and frame vibrations excited by the powertrain, wind or road inputs

^ Tip-in moans or resonance vibrations from stressed engine or exhaust system mounts

If vibration is gone, check the front driveshaft, transfer case, front axle, or halfshafts for loose components. Refer to the 1997 Ranger Service Manual, Section 05-03B, for details.

NOTE:

DRIVING A 4-WHEEL-DRIVE VEHICLE WITH THE REAR DRIVESHAFT REMOVED FURTHER CONFIRMS ANY VIBRATION CONCERNS WITH THE FRONT DRIVE SYSTEM.

These vehicle vibrations can also be subdivided into those that occur at low speeds and those that are most noticeable at higher speeds. Since the dividing line between low and higher speed vibrations is not clear, there will be vibrations that overlap the two ranges.

Typical Low Speed Vibrations (less than 72 km/h (45 mph))

^ Exhaust vibration

^ Engine harshness

^ Driveline vibration due to improper driveline angles

^ Power steering pump disturbances

^ Air conditioner compressor or drive belt vibrations

^ Takeoff shudder (clutch or driveline problems)

^ Brake roughness or harshness

^ Driveline roughness

^ Clutch torsion vibration

^ Driveline slip-yoke or U-joints

Typical High Speed Vibrations (above than 72 km/h (45 mph))

^ Axle and companion flange runout or imbalance

^ Driveshaft imbalance

^ Excessive tire-wheel and drum assembly imbalance

^ Tire roughness due to high non-uniformity (force variation) or out-of-balance condition

^ Rear axle pinion gear pitch line runout

^ Excessive tire and wheel run out

^ Worn suspension components

^ Front end accessory vibrations

^ Exhaust vibration - Exhaust vibration is greatly reduced in Ranger exhaust systems de-coupled by a flexible coupling and mounted with blade and block hangers

Driveshaft Vibrates

1. Road test vehicle to determine critical vibration points. Note road speed, engine rpm and shift lever positions at which vibration occurs.

2. Stop vehicle and run engine with clutch depressed (automatic transmission in Neutral) through critical speed ranges determined in Step 1 of Driveshaft Vibrates.

3. If vibration is gone, the driveshaft must be balanced as described in the 1997 Ranger Service Manual, Page 05-00-29.

Component Test

Driveline Vibration

^ Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake

^ Driveline vibration is directly related to the speed of the vehicle and is usually noticed at speeds of 72 km/h (45 mph) or higher

^ Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum or boom

^ Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. If the vibration is

particularly noticeable during acceleration or deceleration, especially at lower speeds, then driveline angle should be checked

^ Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jackstands, though the brakes may need to be applied lightly in order to simulate road resistance. Refer to the 1997 Ranger Service Manual, Page 05-00-15, Steps 1-10

Driveshaft Runout and Balance

Vibration or shudder which is noticeable either on fast acceleration, when coasting, or when using the engine for braking, may be caused by the rear axle housing being loose on the rear suspension, improper tire balance, improper driveline installation, or driveline balance.

If driveshaft components are replaced and shaft vibration is encountered after installation, disconnect and remove the driveshaft. Rotate the rear axle companion flange 180 degrees; then, reconnect the driveshaft to the driveshaft slip-yoke and reinstall in vehicle. If the vibration persists, disconnect the driveshaft at the rear axle companion flange. Rotate the rear axle companion flange 180 degrees and reconnect the driveshaft to the rear axle companion flange.

If rotating the driveshaft 180 degrees does not eliminate vibration, the driveshaft may be balanced by referring to the 1997 Ranger Service Manual, Page 05-00-29, Steps 1-9, for details.

Slip-Yoke Spline

Vehicle noise and vibration can be caused by a seized driveshaft slip-yoke spline. The service resolution to minimize driveshaft slip-yoke spline contamination and ultimate seizure can be found in the 1997 Ranger Service Manual, Page 05-00-32, Steps 1-11.

Driveline Angularity

Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height (rear spring) and engine mounts.

Low speed vibration, less than 72 km/h (45 mph), especially when the vehicle is subjected to heavy acceleration or deceleration, is an indication of improper driveline angles. When these conditions exist, check the universal joints for proper seating, mounting and operation.

Center Bearing, Supercab 4X2 and 4X4

1. Unbolt the center bearing mount and spin the bearing. If bearing does not rotate freely it must be replaced.

2. Inspect the rubber insulator for evidence of hardening, cracking or deterioration before removing shaft. Replace if damaged. Refer to the 1997 Ranger Workshop Manual, Pages 05-01-14 and -15, for center bearing and rubber insulator service.

NOTE:

IF DRIVESHAFT AND COUPLING SHAFT ARE REMOVED, MAKE SURE THE YOKE IS REINSTALLED ON THE COUPLING SHAFT IN THE SAME ORIENTATION AS IT WAS ORIGINALLY INSTALLED. THE ORIENTATION IS CRITICAL SO THAT PROPER DRIVESHAFT BALANCE AND UNIVERSAL JOINT PHASING IS MAINTAINED. TORQUE THE ATTACHING NUT TO 136-163 N.m (100-120 LB-FT).

NOTE:

THE DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE ARE THE MOST RECENT RELEASED FOR SERVICE. REFER TO OTHER TSB ARTICLES LISTED FOR 1993 AND PRIOR MODELS.

Cross-Member: All Technical Service Bulletins Frame/Crossmember - Snapping/Popping Noise

Article No. 94-8-13

^ FRAME - # 1 CROSSMEMBER - RIVET REPLACEMENT

^ NOISE - "POPPING/CREAKING" SOUNDS - FRAME # 1 CROSSMEMBER

LIGHT TRUCK: 1980-94 BRONCO, F-150-350 SERIES 1988-94 F SUPER DUTY, F-47

This TSB article is being republished in its entirety to add certain 1992/94 model year vehicles, to revise the nut specified in the article and its torque specification, and to expand the diagnostic and repair procedures contained in the article.

ISSUE:

A "popping/creaking" sound may come from the area of the # 1 crossmember attachment to the left frame rail. This occurs because of a slip/stick motion at a loose rivet in the lower flange of the frame near the steering gear. The rivet could be either a standard cold head rivet in light duty applications or a "huck" rivet, which has the appearance of a large "pop" Civet.

ACTION:

Use the following diagnostic procedure to determine if the noise is originating in this rivet area. If so, replace the rivet with a nut, bolt and washer assembly. The revised parts increase the clamp load at the joint, minimizing the motion that causes the noise. Refer to the following procedure for service details.

SOURCES OF VARIOUS FRONT UNDERBODY NOISES:

Various front underbody noises may originate from several different sources. Several noises have been misdiagnosed as # 1 crossmember rivet "pop/creak" because the noise tends to propagate to the shock tower area and the shock tower area acts as an amplifier such that the noises all appear to be coming from that area. Other underbody areas that produce similar noises include:

^ loose or improperly seated shock tower rivets

^ loose or misaligned transmission crossmembers

^ loose radius arm brackets

^ loose axle pivot brackets

Other service bulletins have been published to address the proper repair of these concerns.

DESCRIPTION OF # 1 CROSSMEMBER NOISES:

"Pop/creak" - A metal-to-metal rubbing motion which slip/sticks when a twist is induced into the frame.

DIAGNOSTIC PROCEDURE:

1. INTERVIEW THE CUSTOMER:

a. Understand the customer's description of the noise and of the conditions under which it is heard.

b. Road test the vehicle with the customer to fully understand where, how and when the noise occurs.

2. DUPLICATE THE NOISE CONCERN:

a. Drive the vehicle around for at least 15 minutes to warm-up and stress the frame joints, so that any frame noise is more likely to be repeatable in the garage.

b. Test the following situations:

^ Can the noise be duplicated while stationary and on dry pavement by repeatedly turning the steering wheel from steering stop to steering stop?

^ Can the noise be repeated while on the hoist without the suspension loaded by repeatedly turning the steering wheel from steering stop to steering stop?

Typically, the twist in the frame can be induced by turning the steering wheel back and forth from steering stop to steering stop to duplicate the noise at the # 1 crossmember attachment. IF THE NOISE IS NOT DUPLICATED UNDER ONE OF THESE SITUATIONS, INVESTIGATE OTHER AREAS FOR THE NOISE BEFORE PROCEEDING TO REPAIR THE # 1 CROSSMEMBER RIVET.

3. INSPECT FRAME BOLTS FOR PROPER INSTALLATION TORQUE:

a. Inspect and tighten all front end components which bolt to the frame to confirm they are at the proper torque. This includes, but is not limited to:

^ Radius arm bracket bolts - 135 +/- 20 N-m (100 +/- 15 lb.ft.)

^ Axle pivot bracket bolts (torques vary by model - refer to the appropriate light truck Service Manual for proper torque specifications)

^ Bumper bracket bolts - (refer to the appropriate light truck Service Manual for proper torque specifications)

b. Inspect the transmission crossmember for proper alignment and bolt torques. If misaligned:

^ Loosen all transmission crossmember fasteners (including to the transmission).

^ Lift the transmission to remove any load on the crossmember.

^ Lift and reposition the transmission crossmember to be centered on the frame attachment holes.

^ Tighten all frame fasteners to the 63 +/- 9 N-m (46 +/- 7 lb.ft.).

^ Lower the transmission and tighten fasteners to 95 +/- 15 N-m (70 +/- 11 lb.ft.).

4. TEST DRIVE THE VEHICLE

Road test the vehicle again to duplicate the concern. If the noise is still present, continue.

5. INSPECT THE FRAME RIVETS

a. Repeat Step 2 to duplicate the noise in the garage.

b. Use a stethoscope or chassis ears to isolate the area of the chassis that the noise appears to be originating from. Areas to check include the shock tower rivets and all # 1 crossmember rivets.

6. SERVICE THE VEHICLE

a. If the noise appears to be from the lower left-front # 1 crossmember fastener, follow the procedure outlined below.

b. If the noise appears to be coming from another rivet (other than the lower left front # 1 crossmember rivet), refer to TSB 93-6-10 for the proper rivet repair procedure.

LOWER LEFT FRONT # 1 CROSSMEMBER RIVET REPLACEMENT:

NOTE:

THIS SERVICE PROCEDURE DOES NOT APPLY TO STEERING GEAR LINER REPLACEMENT. REFER TO TSB 90-11-10 FOR STEERING GEAR LINER REPAIR PROCEDURE.

1. Remove damaged or loose COLD HEAD RIVETS:

a. Drill a 1/8" (3.175 mm) hole through the rivet.

b. Redrill the same hole through the shank of the rivet with a 3/8" (9.525 mm) drill.

c. Remove the rivet head with an air chisel.

d. Drive out the rivet with a punch and hammer.

2. Remove damaged or loose "HUCK" RIVETS:

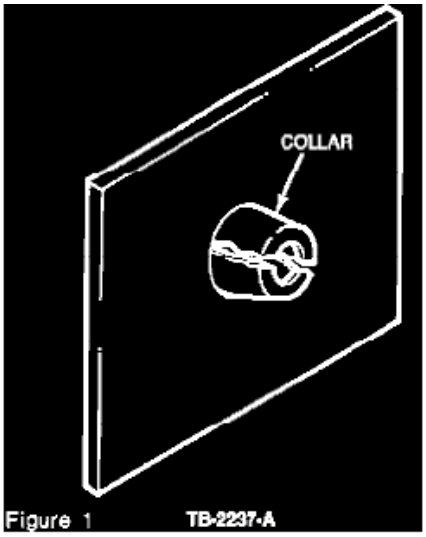


Figure 1 TB-2237-A

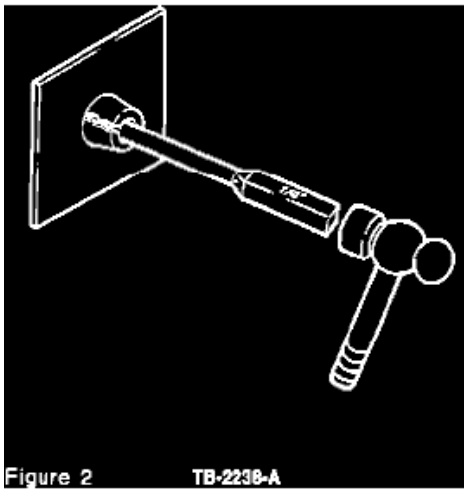


Figure 2 TB-2238-A

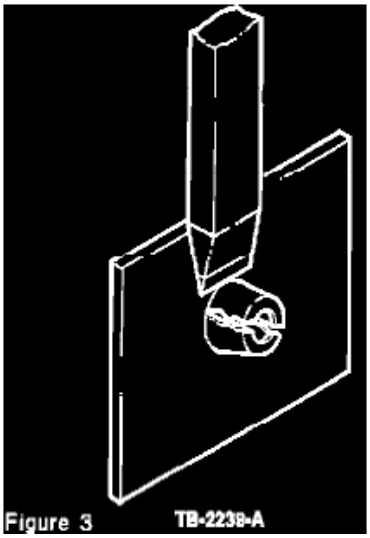
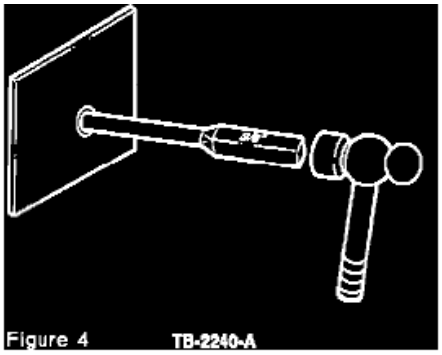


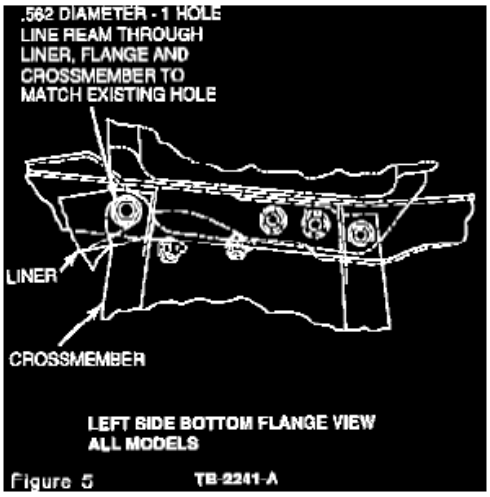
Figure 3 TB-2238-A

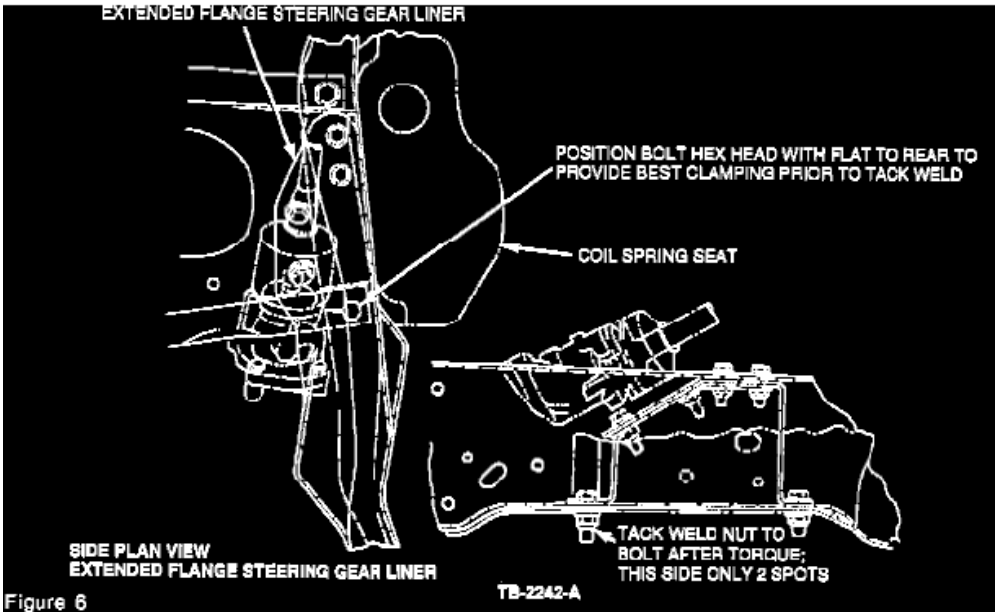
a. Use a flat chisel and hammer (or air chisel) to split the exposed collar of the huck fastener, Figure 1.

b. Knock the rivet pin out of the blind side with a 1/4" (6.35 mm) drift punch and hammer, Figure 2.

c. Cut the rivet's head off with a hammer and flat chisel, Figure 3.







d. Knock the sleeve out of the blind side with a 3/8" (9.525 mm) drift punch and hammer, Figure 4.

CAUTION:

REMOVAL OF THE FASTENER WITH A CUTTING TORCH IS NOT RECOMMENDED BECAUSE OF PROBABLE DAMAGE TO THE FRAME STRUCTURE.

3. Line ream the existing hole through the liner, frame flange and crossmember to 9/16" (14.228 mm), Figure 5.

4. Install a 9/16" Grade 8 nut (34990-S4), bolt (58698-S2) and washer (44880-S2), with nut/washer on the bottom, Figure 6.

a. Push the bolt into place using a brazing rod to hold the bolt.

PART NUMBER	PART NAME	CLASS
34990-S4	Nut 9/16 - 12 Hex (Pkg. 5)	RG
44880-S2	Washer 9/16 (Pkg. 12)	BG
58698-S2	Bolt 9/16-12 x 1.75" (Pkg. 4)	BG

b. Slide the bolt into the opening between the front face of the crossmember and frame liner.

c. Tighten the nut to 140 4-3 lb.ft. (190 4-4 N-m) and tack weld the nut to the bolt after tightening.

CAUTION:

DO NOT WELD THE NUT/WASHER TO THE FRAME.

OTHER APPLICABLE ARTICLES: 91-11-10

SUPERSEDES: 91-25-18

WARRANTY STATUS:

Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 19 2-94 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940813A Perform Diagnostics And 1.9 Hrs.

Replace Rivet

DEALER CODING

BASIC PART NO. CONDITION CODE

5005 56

OASIS CODES: 305000, 390000, 702000, 702100

Front Steering Knuckle: Service and Repair

1. Remove spindle then the shaft and joint assembly as described previously.

2. If tie rod has not been removed, remove cotter pin and nut and disconnect tie rod from steering arm.

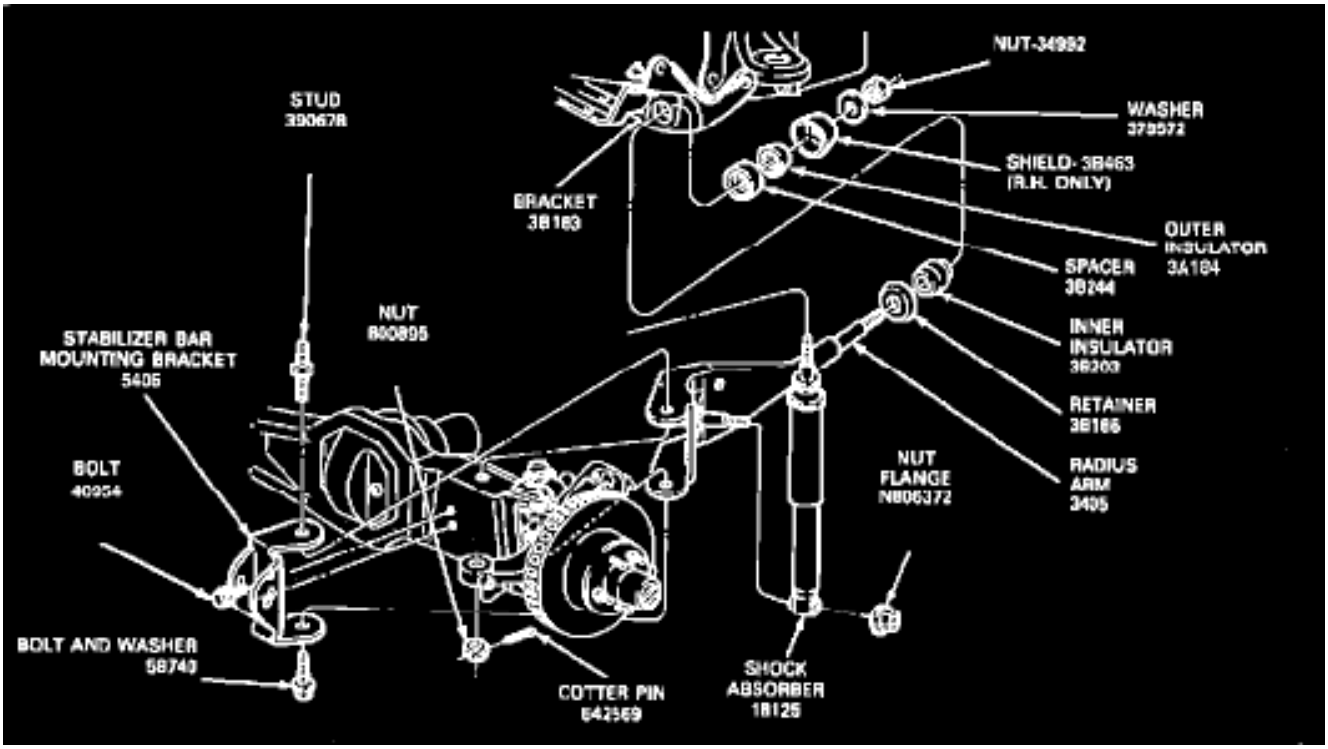
3. Remove cotter pin and loosen nut on top ball joint stud. Loosen bottom nut inside knuckle, then remove top nut.

4. Break spindle loose from ball stud, then remove camber adjuster. Mark position of adjuster for assembly reference.

5. Install steering knuckle in suitable soft jawed vise, then remove snap ring from lower ball joint socket.

6. Press ball joints from steering knuckle using C-Frame tool No. T74P-4635-C with ball joint remover tool No. T83T-3050-A, or equivalent.

7. Reverse procedure to install. The lower ball joint must be installed first. Install spindle to steering knuckle, and tighten nuts to 54-68 N-m (40-50 ft-lbs). Tighten attaching bolts to specifications.



Radius Arm Bushing: Service and Repair

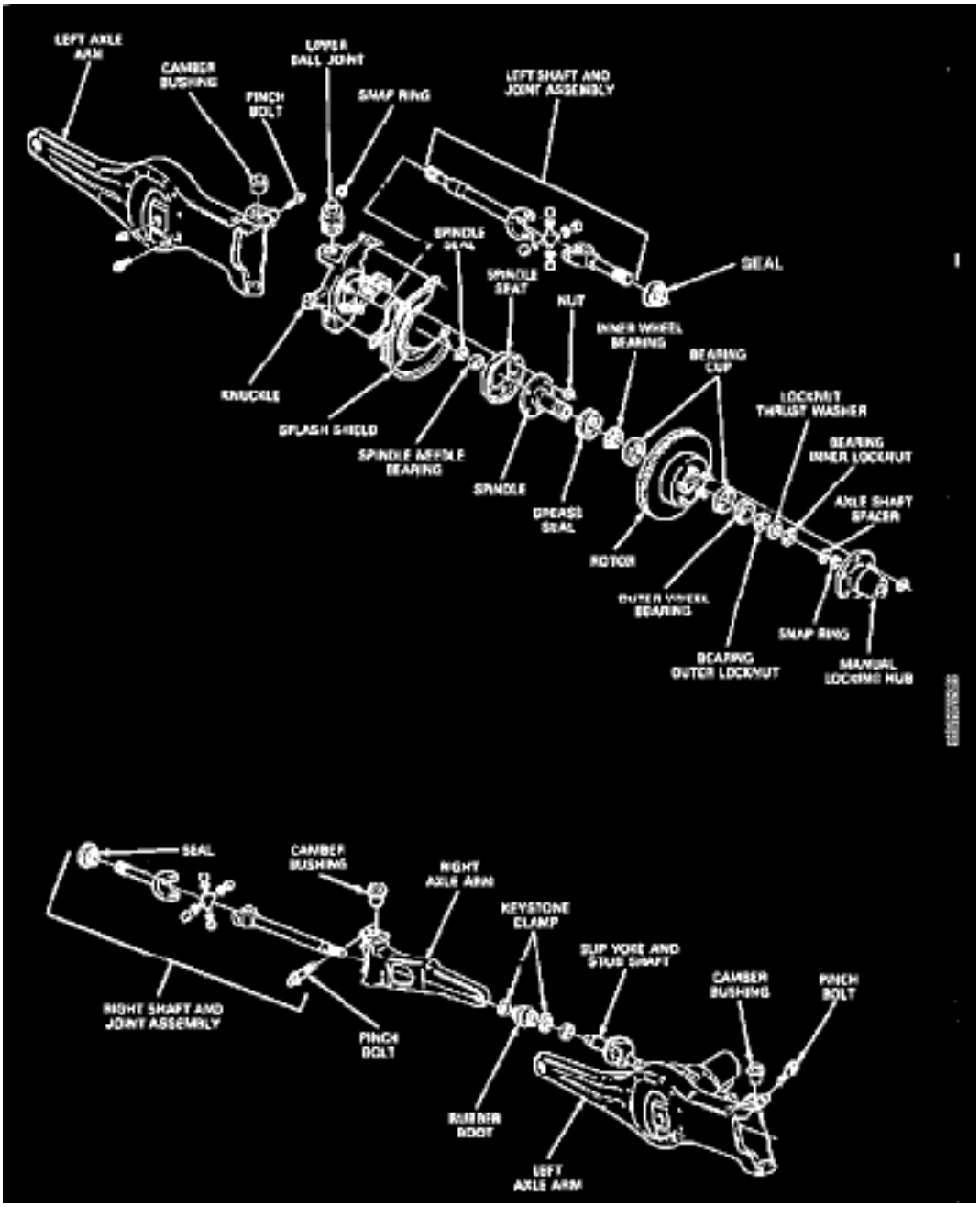
Fig. 10 Radius Arm Replacement. 4x4 Models

1. Loosen axle pivot bolt and upper shock absorber pivot bolt and compress shock.

2. Remove nut and washer attaching radius arm to radius arm bracket. Remove outer insulator and spacer, Fig. 10.

3. Move radius arm and axle assembly forward out of radius arm bracket. Remove inner insulator and retainer.

4. Reverse procedure to install. Tighten upper shock bolt, axle pivot bolt and nut to specifications.



Spindle: Service and Repair

Fig. 1 Exploded View Of Spindle, Shaft & Joint Assembly

1. Raise and support vehicle. Remove front wheels.

2. Remove disc brake caliper, hub locks, wheel bearings and locknuts, then the hub, rotor and outer wheel bearing cone, Fig. 1.

3. Remove and discard grease seal from rotor using slide hammer tool No. T50T-100-A and grease seal remover tool No. 1175-AC or equivalents.

4. Using bearing cup puller tool No. D78P-1225-B or equivalent, remove inner wheel bearing, then the inner and outer bearing cups.

5. Remove spindle to steering knuckle attaching nuts, then break spindle loose from knuckle and remove splash shield.

6. Remove shaft and joint assembly from right side of vehicle by pulling assembly out of carrier.

7. Remove and discard clamp from shaft and joint assembly and the stub shaft on right side of carrier. Slide rubber boot onto stub shaft, then pull shaft and joint assembly from stub shaft splines.

8. Install spindle, on second step, in suitable soft jawed vise.

9. Remove oil seal and needle bearing from spindle using bearing remover tool No. T50T-100-A and grease seal remover tool No. 1175-AC, or equivalent. Remove oil seal from shaft, if necessary.

10. Reverse procedure to install. Tighten spindle to steering knuckle attaching nuts to 54-68 N-m (40-50 ft-lbs).

Component	Torque/Ft. Lbs.
Brake Backing Plate	20–40
Differential Bearing Cap Bolts	70–85
Differential Bearing Cap Bolts	95–115
Differential Pinion Shaft Lock Bolt	15–30
Filler Plug	15–30
Driveshaft To Companion Flange	70–95
Lower Shock Absorber Nut	39–53
Lug Nuts	100
Rear Leaf Spring U-Bolt To Plate Nut①	88–108
Rear Leaf Spring U-Bolt To Plate Nut②	66–75
Rear Shock Absorber To Lower Bracket Nut	40–60
Rear Shock Absorber To Upper Bracket Nut	41–63
Rear Shackle To Spring Nut	74–115
Rear Spring To Frame Nut	74–115
Rear Spring To Front Bracket Bolt①	64–91
Rear Spring To Front Bracket Bolt②	74–115
Rear Spring Shackle To Rear Bracket Bolt	74–115
Stabilizer To U-Bolt Nuts	30–42
Stabilizer Link To Bar Nut①	50–68
Stabilizer Link To Bar Nut②	40–63
Stabilizer Link To Frame Nut①	50–68
Stabilizer Link To Frame Nut②	40–60
Upper Shock Absorber Nut	15–21
Wheel Lug Nuts	100

① ——Bronco II & Explorer
② ——Ranger

Stabilizer Link: Specifications

Tightening Specification

Year	Component	Torque/Ft. Lbs.
1987-90	Axle Arm Bracket To Frame Nut	77-110
	Axle Arm To Bracket Nut	120-150
	Axle To Radius Arm	160-220
	Bumper To Spring Seat Bolt	11-19
	Front Shock Absorber To Radius Arm Nut	②
	Front Shock Absorber To Spring Seat Nut	25-35
	Lower Ball Joint Stud Nut	①
	Pitman Arm Drag Link Nut	70-100
	Radius Arm Bracket Connecting Bolts	35-50
	Radius Arm Bracket To Frame Bolt	77-110
	Radius Arm To Frame Nut	81-120
	Stabilizer Bar Link To Axle Arm Bracket Screw	29-44
	Stabilizer Bar To Mounting Bracket Bolt	35-50
	Stabilizer Bar To Mounting Bracket To Axle Arm Screw	48-68
	Stabilizer Bar To Radius Arm Nut	48-64
	Tie Rod Adjusting Sleeve	30-42
	Tie Rod To Spindle Nut	51-75
	Upper Ball Joint Stud Nut	85-110
	Wheel Lug Nut	100
1991-93	Axle Arm Bracket To Frame Nut	77-110
	Axle Arm To Bracket Nut	120-150
	Axle Clamp Bolt	48-65
	Axle To Radius Arm	191-231
	Bumper To Spring Seat Bolt	18-26
	Front Shock Absorber To Radius Arm Nut	③
	Front Shock Absorber To Spring Seat Nut	25-35
	Lower Ball Joint Stud Nut	104-146
	Pitman Arm Drag Link Nut	52-81
	Radius Arm Bracket Connecting Bolts	35-50
	Radius Arm Bracket To Frame Bolt	77-110
	Radius Arm To Frame Nut	81-120
	Stabilizer Bar Link To Axle Arm Bracket Screw	29-44
	Stabilizer Bar To Mounting Bracket Bolt	35-50
	Stabilizer Bar To Mounting Bracket To Axle Arm Screw	40-60
	Tie Rod Adjusting Sleeve	30-42
	Tie Rod To Spindle Nut	52-81
	Wheel Lug Nut	100

① – On 1987-88, 1989 Bronco II & 1990, 104-146 ft. lbs., 1989 Ranger, 95-110 ft. lbs.
② – 1987-89, 42-72 ft. lbs., 1990, 40-63 ft. lbs.
③ – 1991, 40-63 ft. lbs., 1992, 39-53 ft. lbs.

Tightening Specifications

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Suspension Spring (Coil / Leaf) > Component Information > Technical Service Bulletins > Customer Interest for Suspension Spring (Coil / Leaf): > 92613 > Mar > 92 > Rear Suspension - Low Ride Height When Loaded

Suspension Spring (Coil / Leaf): Customer Interest Rear Suspension - Low Ride Height When Loaded

Article No. 92-6-13

March 11, 1992

SUSPENSION - REAR - LOW ATTITUDE WHEN LOADED AT OR NEAR GVWR - 4X2 REGULAR CAB, SUPER CAB AND 4X4 REGULAR CAB MODELS

LIGHT TRUCK: 1989-91 RANGER

ISSUE: The vehicle may ride low in the rear when loaded at or near GVWR. This condition is caused by poorly computed camber dimensions for the springs.

ACTION: Install a rear spring shim (F1TZ-5W536-A) to each rear spring. Refer to the following procedure for service details.

On 1991 vehicles only, check the part number prefix located on either the bottom side of the last spring leaf near the center bolt or on the bottom side of the spring clip.

^ If the part number prefix is F17A, do NOT add a rear spring shim.

^ Confirm that the height and weight is as specified in the Body Builder's Specification Book and the vehicle is not overloaded.

4X2 MODELS

1. Remove the U-bolts attaching the springs to the axle.

2. Install the rear spring shim (F1TZ-5W536-A) between each spring and the axle.

3. Make sure the tab on the rear spring shim fits into the hole on the axle.

4. Install new longer U-bolts (N807321-S56) and nuts (N620483-S150) to secure the springs to the axle.

5. Tighten the U-bolts to 65-80 lb.ft. (88-108 N-m)

6. Readjust headlights on the vehicle.

4X4 MODELS

1. Remove the U-bolts attaching the springs to the axle.

2. Install the rear spring shims (F1TZ-5W536-A) between each spring and the spacer.

3. Make sure the tab on the rear spring shim fits into the hole on the spacer.

4. Install new longer U-bolts (E9TZ-5705-C) and nuts (N620483-S150) to secure the springs to the axle.

5. Tighten the U-bolts to 65-80 lb.ft. (88-108 N-m).

6. Readjust headlights on the vehicle.

PART NUMBER PART NAME CLASS

F1TZ-5W536-A Shim - Rear Spring (2 req.) B

E9TZ-5705-C U-Bolt (Ranger 4X4) (4 req.) B

N807321-S56 U-Bolt (Ranger 4X2) (4 req.) B

N620483-S150 Nut (Pkg/2, 8 req.) RS

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

920613A Verify Part Number, Install 0.9 Hr.

Shim And Adjust Headlights

DEALER CODING

BASIC PART NO. CONDITION CODE

5560 63

OASIS CODES: 304000, 599997

Suspension Spring (Coil / Leaf): All Technical Service Bulletins Rear Suspension - Low Ride Height When Loaded

Article No. 92-6-13

March 11, 1992

SUSPENSION - REAR - LOW ATTITUDE WHEN LOADED AT OR NEAR GVWR - 4X2 REGULAR CAB, SUPER CAB AND 4X4 REGULAR CAB MODELS

LIGHT TRUCK: 1989-91 RANGER

ISSUE: The vehicle may ride low in the rear when loaded at or near GVWR. This condition is caused by poorly computed camber dimensions for the springs.

ACTION: Install a rear spring shim (F1TZ-5W536-A) to each rear spring. Refer to the following procedure for service details.

On 1991 vehicles only, check the part number prefix located on either the bottom side of the last spring leaf near the center bolt or on the bottom side of the spring clip.

^ If the part number prefix is F17A, do NOT add a rear spring shim.

^ Confirm that the height and weight is as specified in the Body Builder's Specification Book and the vehicle is not overloaded.

4X2 MODELS

1. Remove the U-bolts attaching the springs to the axle.

2. Install the rear spring shim (F1TZ-5W536-A) between each spring and the axle.

3. Make sure the tab on the rear spring shim fits into the hole on the axle.

4. Install new longer U-bolts (N807321-S56) and nuts (N620483-S150) to secure the springs to the axle.

5. Tighten the U-bolts to 65-80 lb.ft. (88-108 N-m)

6. Readjust headlights on the vehicle.

4X4 MODELS

1. Remove the U-bolts attaching the springs to the axle.

2. Install the rear spring shims (F1TZ-5W536-A) between each spring and the spacer.

3. Make sure the tab on the rear spring shim fits into the hole on the spacer.

4. Install new longer U-bolts (E9TZ-5705-C) and nuts (N620483-S150) to secure the springs to the axle.

5. Tighten the U-bolts to 65-80 lb.ft. (88-108 N-m).

6. Readjust headlights on the vehicle.

PART NUMBER PART NAME CLASS

F1TZ-5W536-A Shim - Rear Spring (2 req.) B

E9TZ-5705-C U-Bolt (Ranger 4X4) (4 req.) B

N807321-S56 U-Bolt (Ranger 4X2) (4 req.) B

N620483-S150 Nut (Pkg/2, 8 req.) RS

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

920613A Verify Part Number, Install 0.9 Hr.

Shim And Adjust Headlights

DEALER CODING

BASIC PART NO. CONDITION CODE

5560 63

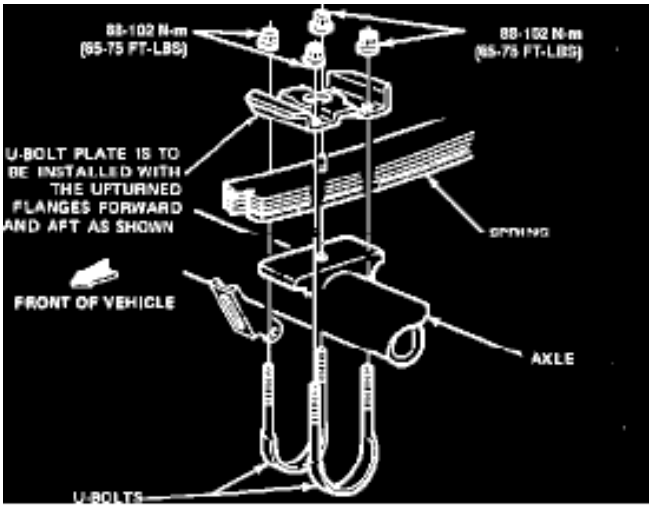
OASIS CODES: 304000, 599997

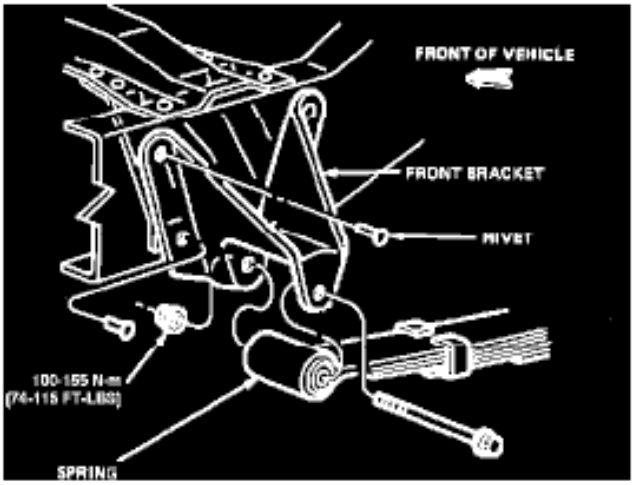
Component	Torque/Ft. Lbs.
Brake Backing Plate	20–40
Differential Bearing Cap Bolts	70–85
Differential Bearing Cap Bolts	95–115
Differential Pinion Shaft Lock Bolt	15–30
Filler Plug	15–30
Driveshaft To Companion Flange	70–95
Lower Shock Absorber Nut	39–53
Lug Nuts	100
Rear Leaf Spring U-Bolt To Plate Nut①	88–108
Rear Leaf Spring U-Bolt To Plate Nut②	66–75
Rear Shock Absorber To Lower Bracket Nut	40–60
Rear Shock Absorber To Upper Bracket Nut	41–63
Rear Shackle To Spring Nut	74–115
Rear Spring To Frame Nut	74–115
Rear Spring To Front Bracket Bolt①	64–91
Rear Spring To Front Bracket Bolt②	74–115
Rear Spring Shackle To Rear Bracket Bolt	74–115
Stabilizer To U-Bolt Nuts	30–42
Stabilizer Link To Bar Nut①	50–68
Stabilizer Link To Bar Nut②	40–63
Stabilizer Link To Frame Nut①	50–68
Stabilizer Link To Frame Nut②	40–60
Upper Shock Absorber Nut	15–21
Wheel Lug Nuts	100

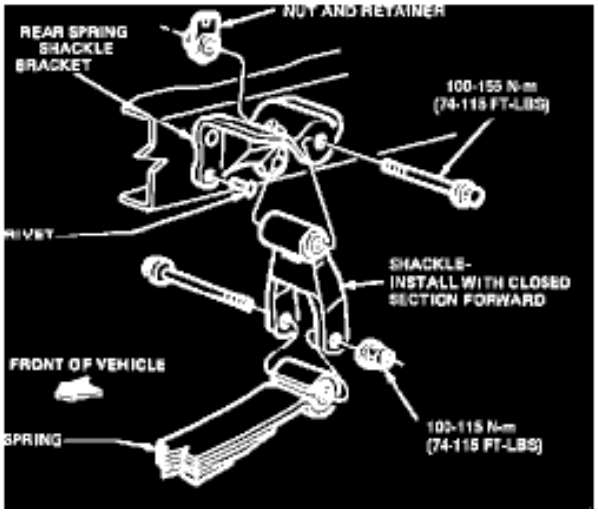
① ——Bronco II & Explorer
② ——Ranger

Tightening Specification

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Suspension Spring (Coil / Leaf) > Component Information > Service and Repair > Rear







Suspension Spring (Coil / Leaf): Service and Repair Rear

Fig. 5 Leaf Spring U-bolt Removal

Fig. 6 Forward Leaf Spring Mounting

Fig. 7 Rear Leaf Spring Mounting

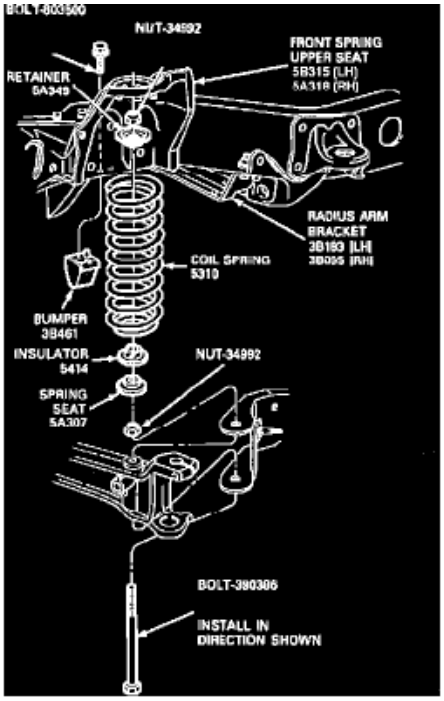
1. Raise rear of vehicle until weight is relieved from spring, with tires remaining in contact with floor.

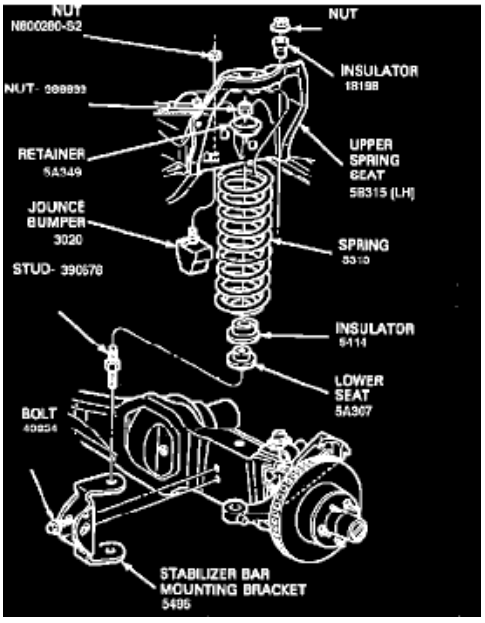
2. Remove U-bolt nuts and the U-bolts, Fig. 5.

3. Remove spring to bracket attaching nut and bolt, Fig. 6.

4. Remove shackle to bracket attaching nuts and bolts, Fig. 7, then the spring and shackle assembly.

5. Reverse procedure to install.


NUT-34992
FRONT SPRING UPPER SEAT
5B315 (LH)
5A318 (RH)
RETAINER
5A349
RADIUS ARM BRACKET
3B193 (LH)
COIL SPRING
5310
BUMPER
3B461
INSULATOR
5414
NUT-34992
SPRING SEAT
5A307
BOLT-380306
INSTALL IN DIRECTION SHOWN


NUT
NUT
INSULATOR
RETAINER
5A349
UPPER SPRING SEAT
5B315 (LH)
JOUNCE BUMPER
3020
SPRING
STUD- 390578
INSULATOR
5414
LOWER SEAT
5A307
BOLT
STABILIZER BAR MOUNTING BRACKET
5496

Suspension Spring (Coil / Leaf): Service and Repair Coil Spring

Fig. 7 Coil Spring Replacement. 4x2 Models

4X2 MODELS

1. Raise and support front of vehicle. Support axle.

2. Remove lower retainer nut and lower retainer, Fig. 7. Lower axle until it hangs unsupported.

3. Insert pry bar between axles and force appropriate I-beam axle down far enough to allow spring to be lifted over bolt in lower spring seat. Rotate spring until retainer on upper spring seat is cleared. Remove spring. The axle must be supported when replacing spring and not be permitted to hang by the brake hose. If the length of the brake hose is not sufficient to permit spring replacement, it will be necessary to remove the disc brake caliper. Do not suspend caliper by brake hose, if removed.

4. Reverse procedure to install. Install bolt in axle arm and tighten nut all the way down. Install top of spring into upper spring seat and rotate into position. Raise axle until spring is seated in lower spring upper seat. Install lower retainer and nut.

Fig. 8 Coil Spring Replacement. 4x4 Models

4X4 MODELS

1. Raise and support front of vehicle. Support axle with a suitable jack so the spring is compressed.

2. Remove shock absorber to radius arm attaching bolt, then remove shock absorber from bracket.

3. Remove spring lower retainer attaching nut, then the retainer.

4. Lower axle until all spring tension is released, then remove spring by rotating upper coil out of tabs in upper spring seat, Fig. 8.

5. Remove spacer and seat from spring and the stud from axle assembly, if necessary. The axle must be supported when replacing spring and not be permitted to hang by the brake hose. If the length of the brake hose is not sufficient to permit spring replacement, it will be necessary to remove the disc brake caliper. Do not suspend caliper by brake hose, if removed.

6. Reverse procedure to install.

	Component	Torque/Ft. Lbs.
1987-88	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	11-19
	Radius Arm Front Bracket & Axle Stud	190-230
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	160-220
	Radius Arm To Rear Bracket	80-120
	Shock Absorber ToRadius Arm Nut	42-72
	Shock Absorber To Upper Seat	25-35
	Spring Retainer Nut	70-100
	Stabilizer Bar Bolts	77-110
	Stabilizer Bar U-Bolts	48-68
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100
1989-90	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	11-19
	Radius Arm Front Bracket & Axle Stud	160-220
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	160-220
	Radius Arm to Rear Bracket	80-120
	Shock Absorber to Radius Arm Nut	④
	Shock Absorber to Upper Seat	25-35
	Spring Retainer Nut	70-100
	Stabilizer Bar Bolts	35-50
	Stabilizer Bar Link Nuts	30-44
	Stabilizer Bar U-Bolts	48-68
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100
1991-93	Axle Pivot Bolt	120-150
	Jounce Bumper Bolt	18-26
	Radius Arm Front Bracket & Axle Stud	190-230
	Radius Arm Front Bracket Front Bolts	27-37
	Radius Arm Front Bracket Lower Bolts	190-230
	Radius Arm To Rear Brackets	80-120
	Shock Absorber to Radius Arm Nut	39-53
	Shock Absorber to Upper Seat	25-35
	Spring Retainer Nuts	70-100
	Stabilizer Bar Link Nut	30-44
	Stabilizer Bar Bolts	35-50
	Tie Rod Adjusting Sleeve	30-42
	Wheel Lug Nuts	100

① — On 1987-88, 1989 Bronco II & 1990, 104-146 ft. lbs., 1989 Ranger, 95-110 ft. lbs.
② — 1987-89, 42-72 ft. lbs., 1990, 40-63 ft. lbs.
③ — 1991, 40-63 ft. lbs., 1992, 39-53 ft. lbs.
④ — 1989, 48-68 ft. lbs., 1990, 41-63 ft. lbs.

Tightening Specifications

Component	Torque/Ft. Lbs.
Brake Backing Plate	20–40
Differential Bearing Cap Bolts	70–85
Differential Bearing Cap Bolts	95–115
Differential Pinion Shaft Lock Bolt	15–30
Filler Plug	15–30
Driveshaft To Companion Flange	70–95
Lower Shock Absorber Nut	39–53
Lug Nuts	100
Rear Leaf Spring U-Bolt To Plate Nut ①	88–108
Rear Leaf Spring U-Bolt To Plate Nut ②	66–75
Rear Shock Absorber To Lower Bracket Nut	40–60
Rear Shock Absorber To Upper Bracket Nut	41–63
Rear Shackle To Spring Nut	74–115
Rear Spring To Frame Nut	74–115
Rear Spring To Front Bracket Bolt ①	64–91
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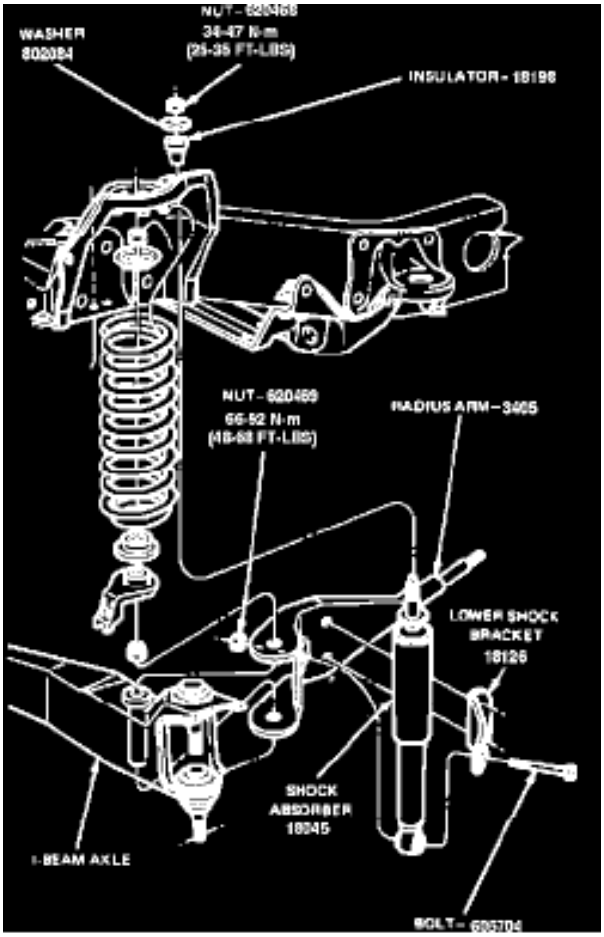
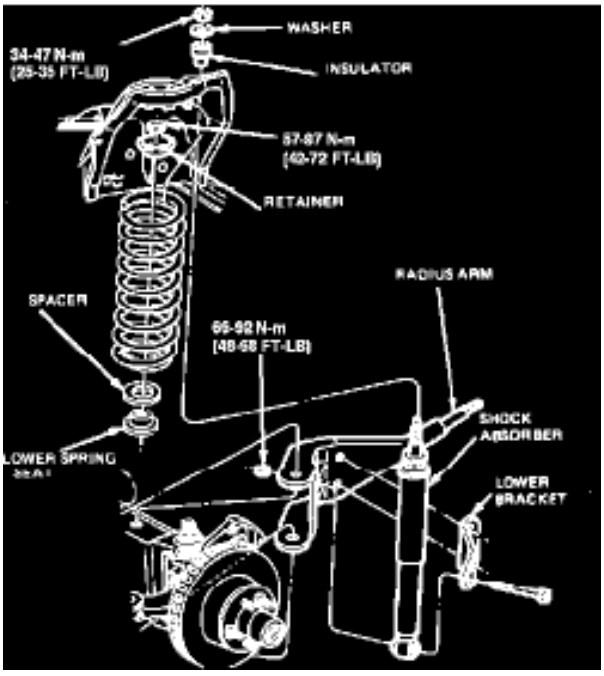
Stabilizer Link To Frame Nut ②	40–60
Upper Shock Absorber Nut	15–21
Wheel Lug Nuts	100

① ——Bronco II & Explorer
② ——Ranger

Tightening Specification

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Suspension Strut / Shock Absorber > Component Information > Service and Repair > Front Air Shock Absorber





Suspension Strut / Shock Absorber: Service and Repair Front Air Shock Absorber

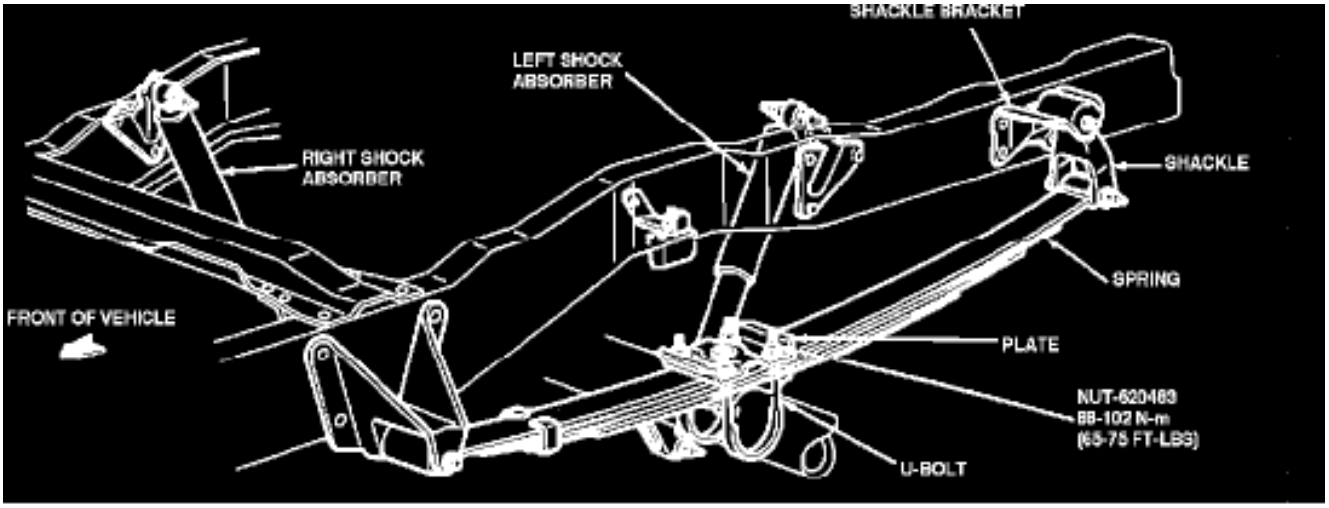
Fig. 4 Shock Absorber Replacement. 4x2 Models

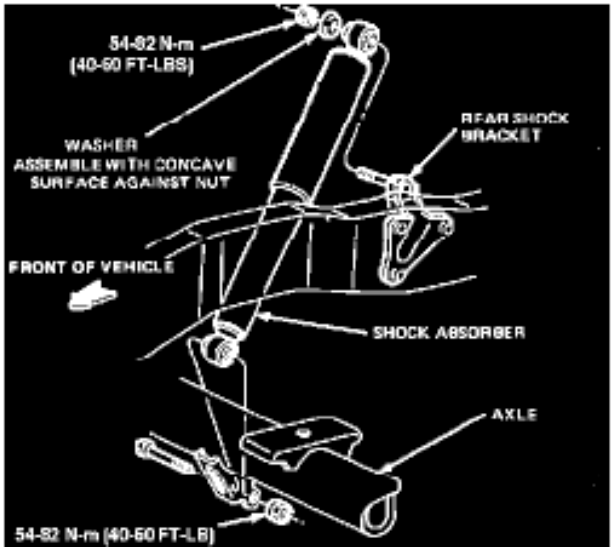
Fig. 5 Shock Absorber Replacement. 4x4 Models

1. Remove nut and washer from shock absorber at spring seat, Figs. 4 and 5.

2. Remove nut and bolt from shock absorber at radius arm and lower shock bracket. Slightly compress shock and remove.

3. Reverse procedure to install.





Suspension Strut / Shock Absorber: Service and Repair Rear

Fig. 3 Rear Suspension

Fig. 4 Shock Absorber Replacement

1. Raise vehicle and support rear axle.

2. Remove lower attaching bolt and nut from shock absorber, then swing lower end free from mounting bracket.

3. Disconnect shock absorber from upper mounting, then remove shock from vehicle, Figs. 3 and 4.

4. Reverse procedure to install.

Wheel Bearing: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

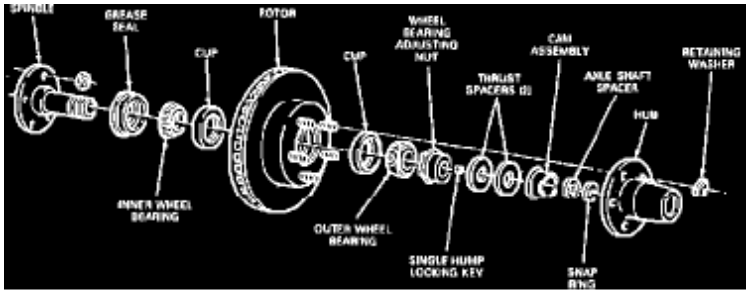
Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

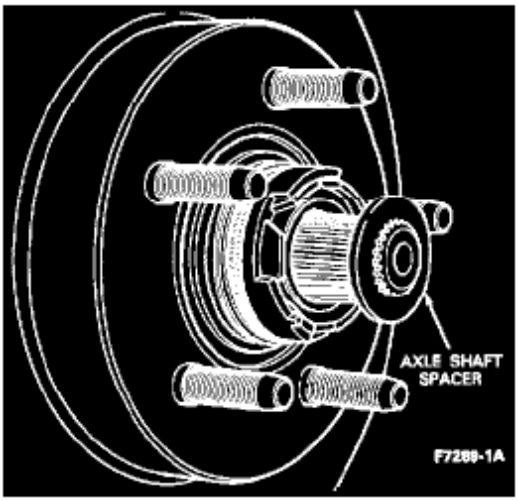
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

NOTES:

* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
RETAINING WASHER
HUB
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


AXLE SHAFT SPACER
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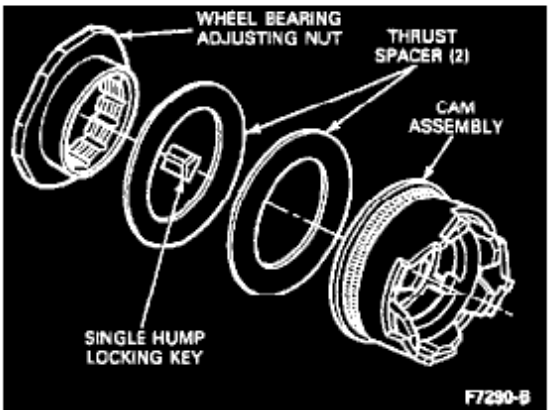

WHEEL BEARING ADJUSTING NUT
THRUST SPACER (2)
CAM ASSEMBLY
SINGLE HUMP LOCKING KEY
F7290-B

Wheel Bearing: Adjustments With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer. 6. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

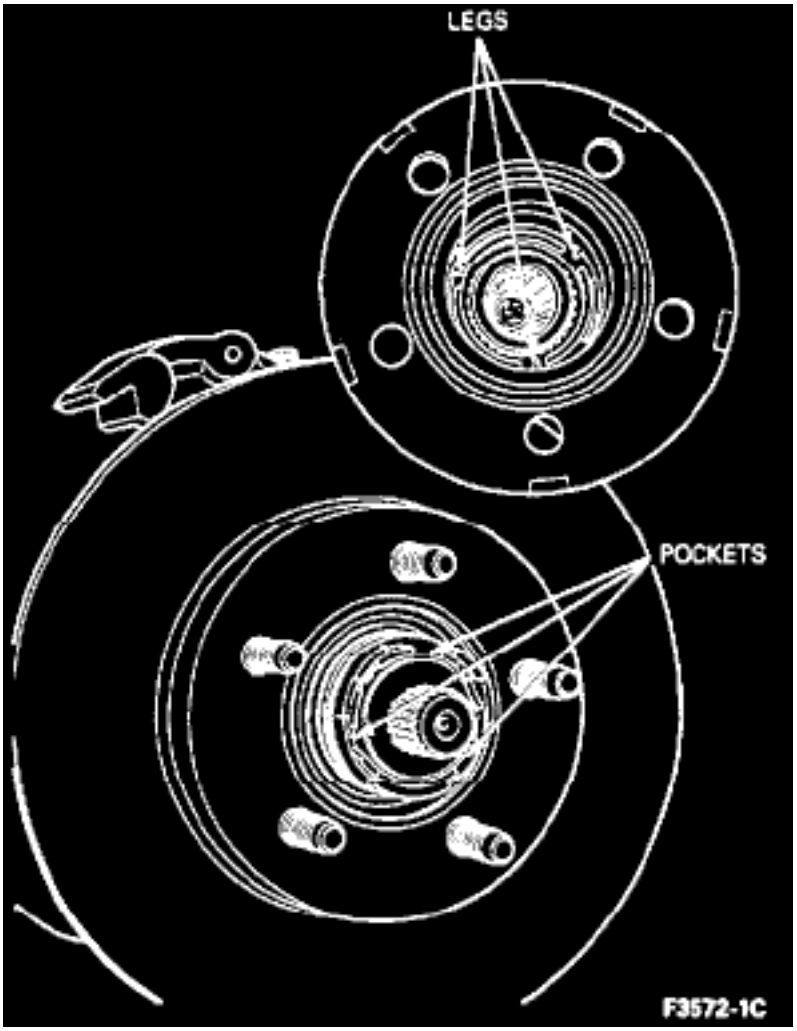
Cam Assembly And Locking Key

7. Using a magnet, remove the locking key.

NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

8. Loosen the wheel bearing adjusting nut from the spindle using a 2-3/8 inch hex locknut wrench.



9. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

10. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 11. Make sure the final end play of the wheel on the spindle is 0.00-0.08mm (0.000-0.003 inch). 12. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. the wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

13. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

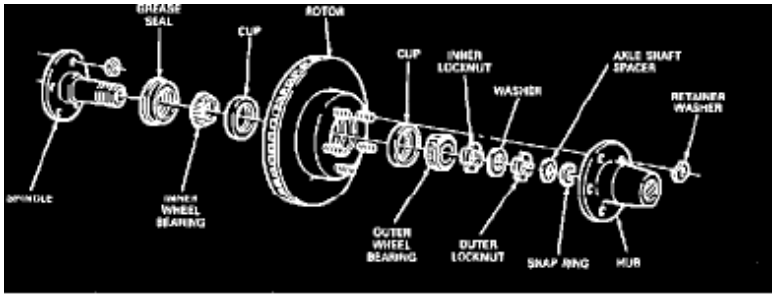
14. Install the axle shaft spacer. 15. Clip the snap ring onto the end of the spindle shaft.

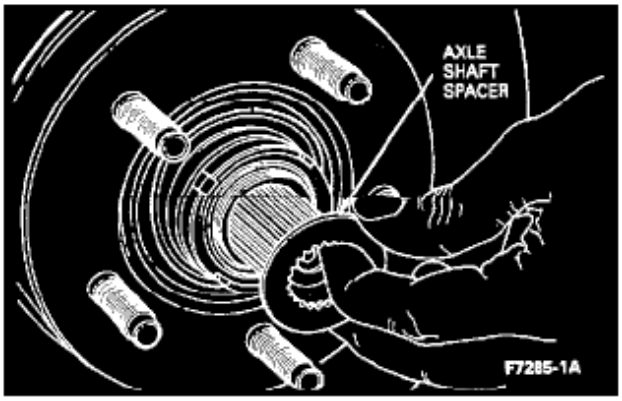
Automatic Locking Hub Installation

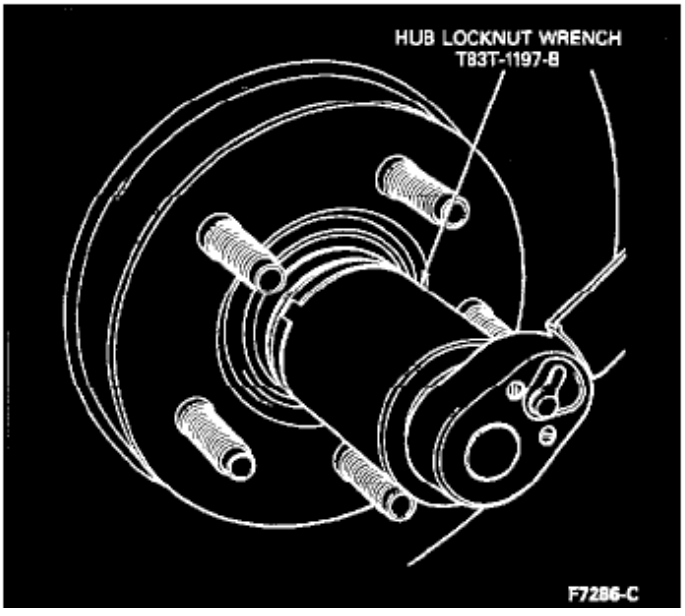
16. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

washers.

17. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB


AXLE SHAFT SPACER
F7285-1A


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

Wheel Bearing: Adjustments With Manual Locking Hubs

Fig. 5 Manual Locking Hub

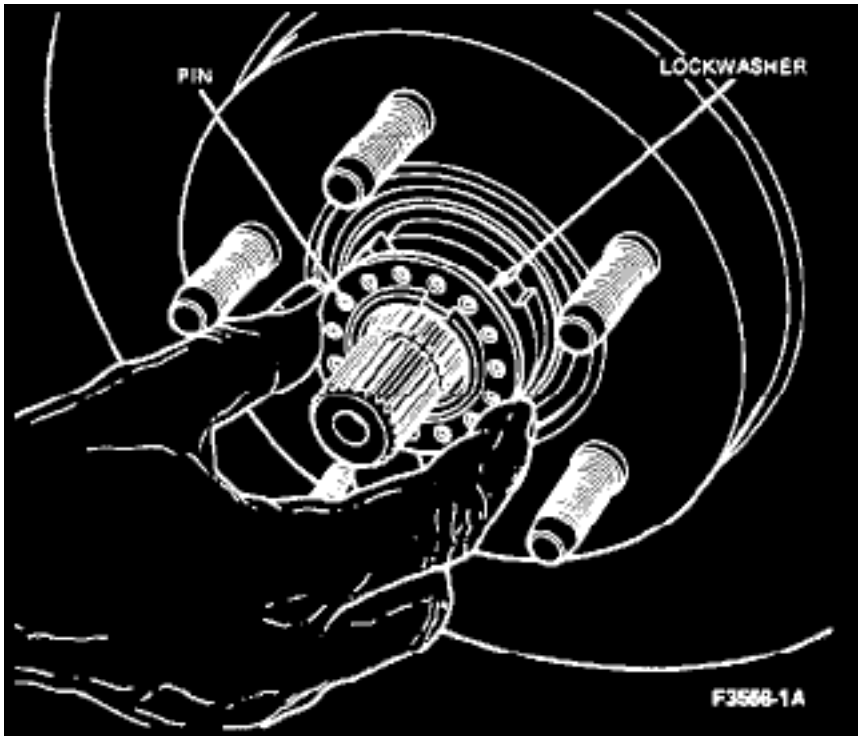
1. Raise the vehicle and install safety stands. 2. Remove the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.

Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.



Locknut Washer

7. Remove locknut washer from spindle. 8. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 9. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb).

10. Install the lockwasher on the spindle. 11. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 12. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.02-0.08 mm (0.001-0.003 inch). 13. Install the axle shaft spacer. 14. Clip the snap ring onto the end of the spindle shaft. 15. Install the manual hub assembly over the spindle. Install the retainer washers. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

Wheel Hub: Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Wheel Hub: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

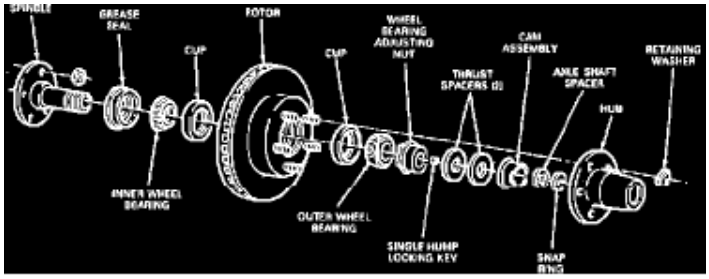
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

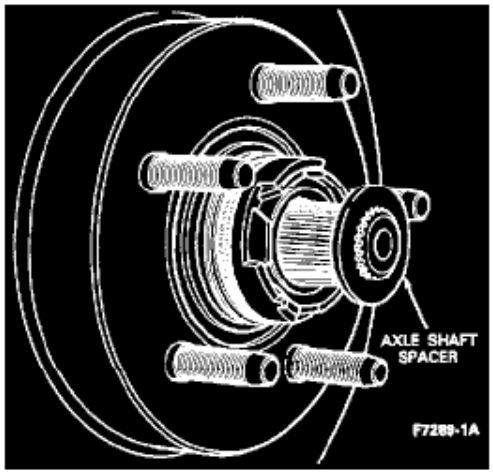
NOTES:

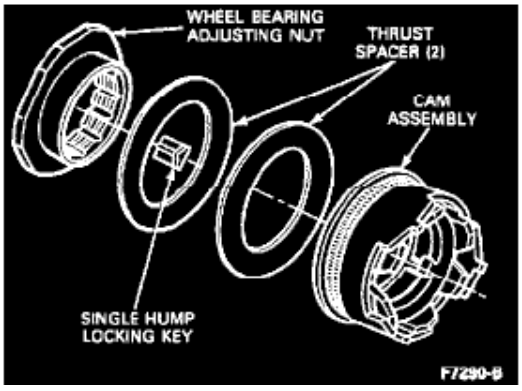
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Wheel Hub > Component Information > Service and Repair > Removal







Wheel Hub: Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

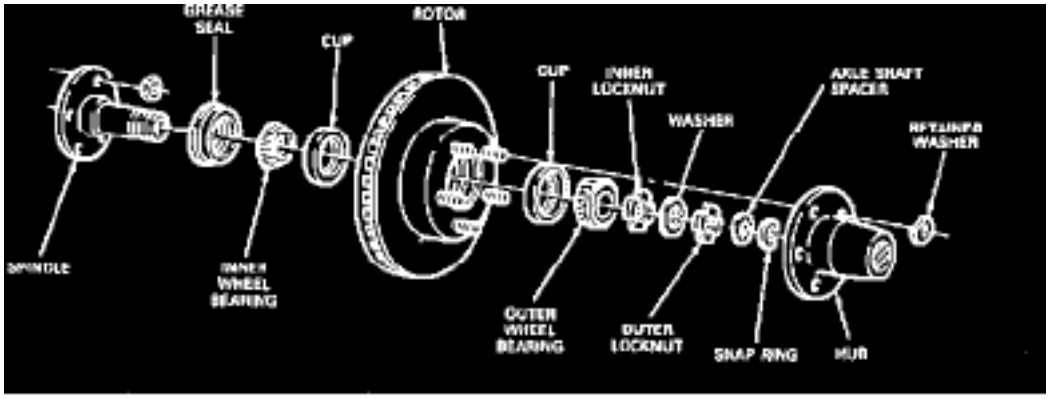
Axle Shaft Spacer

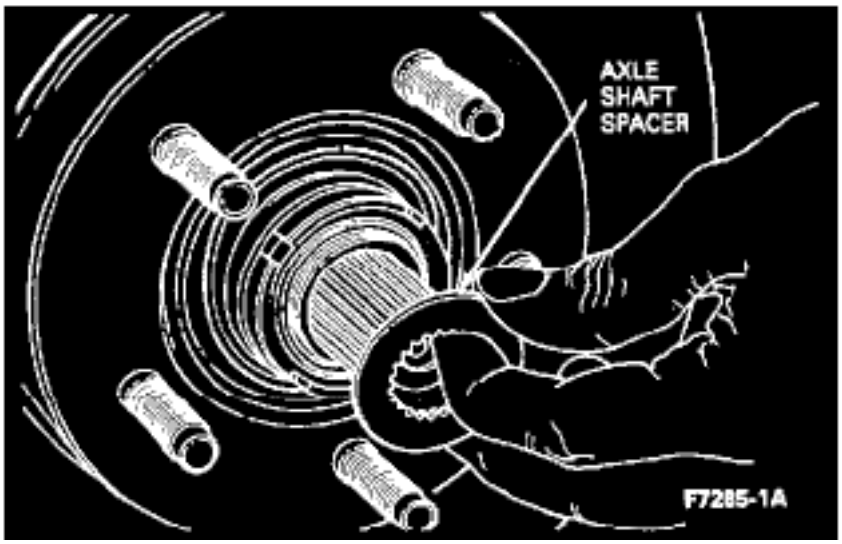
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

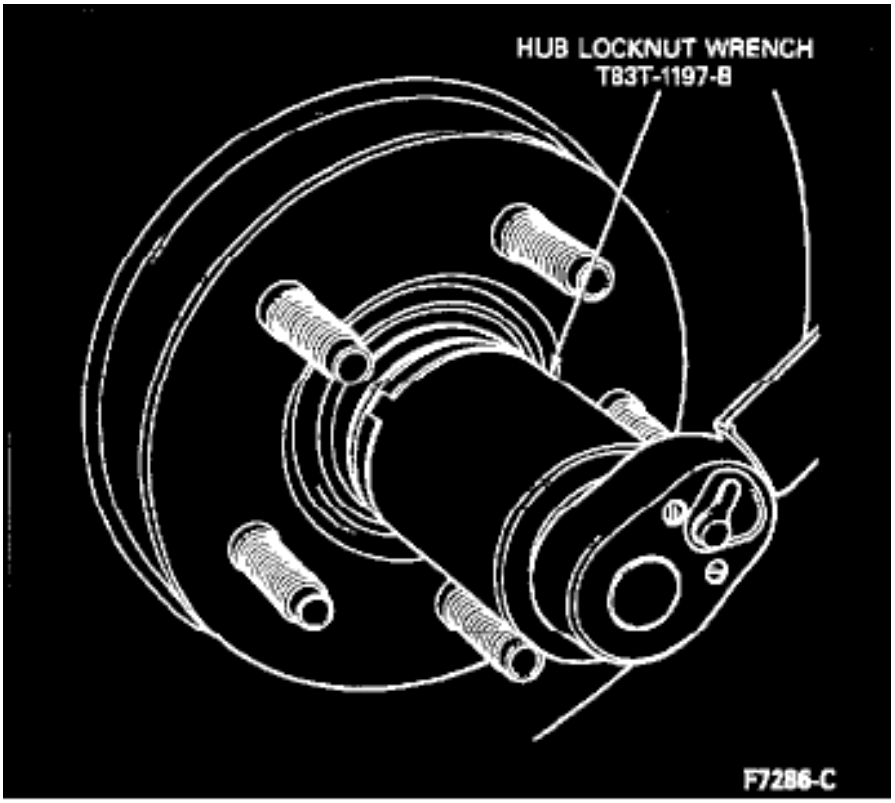
caliper.

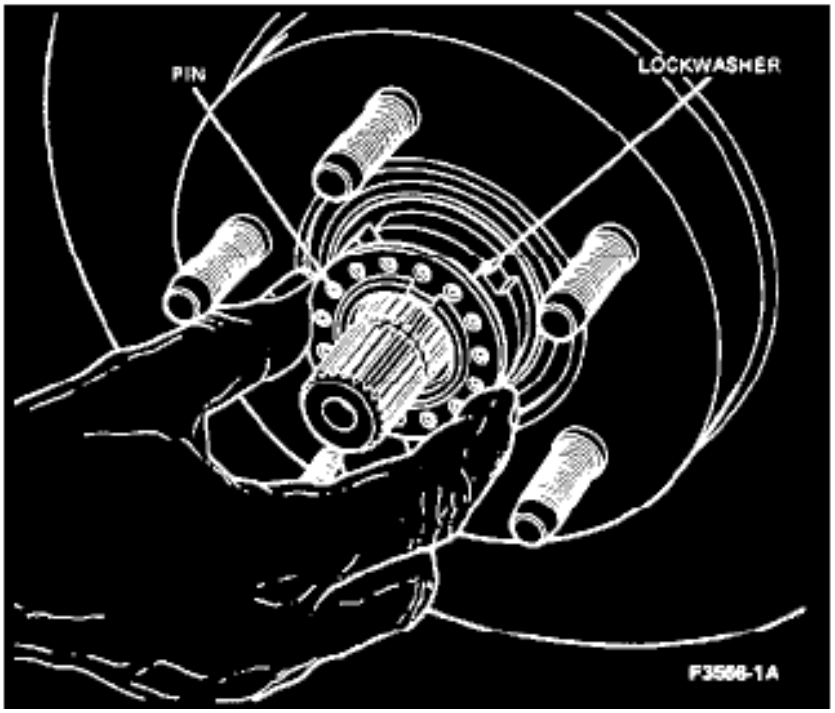
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

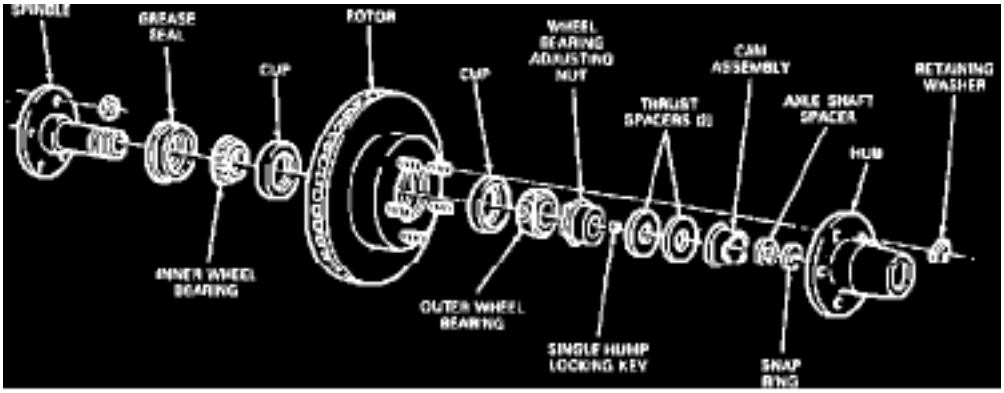

PIN
LOCKWASHER
F3566-1A

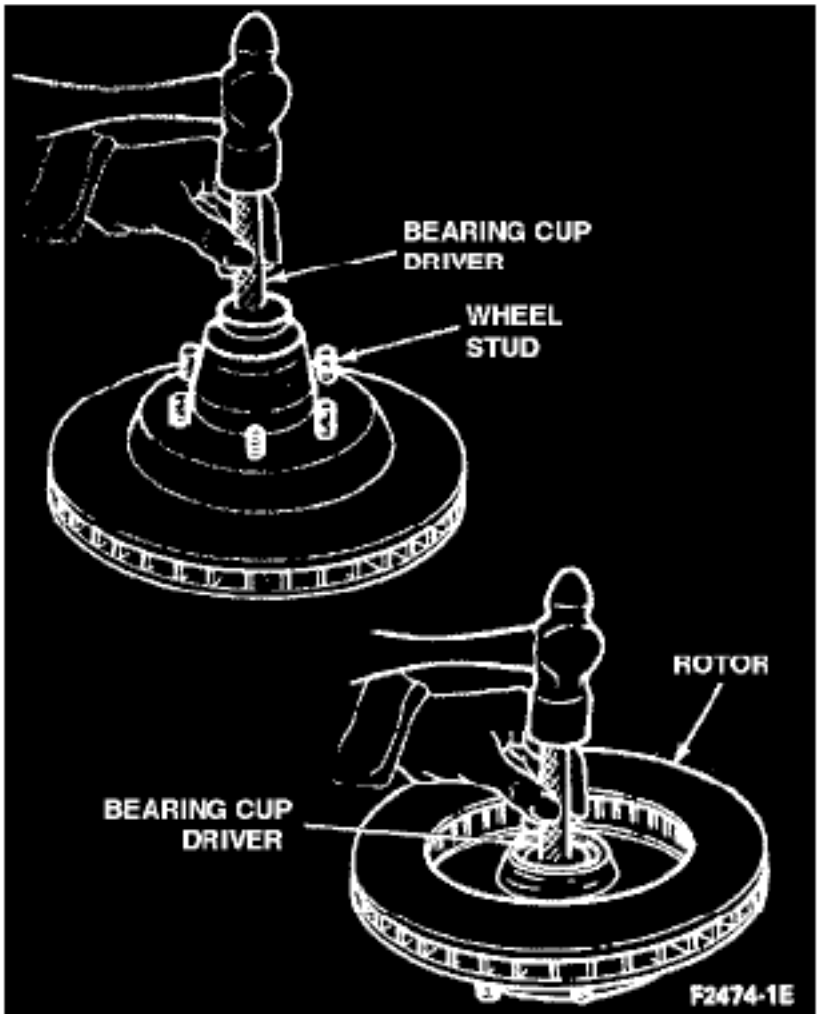
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
RETAINING WASHER
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub: Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

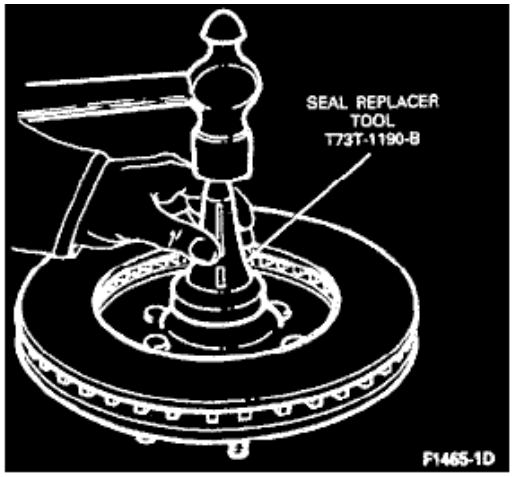
Installing Bearing Cups (Typical)

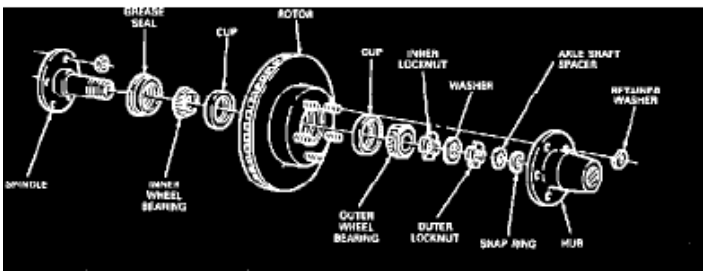
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

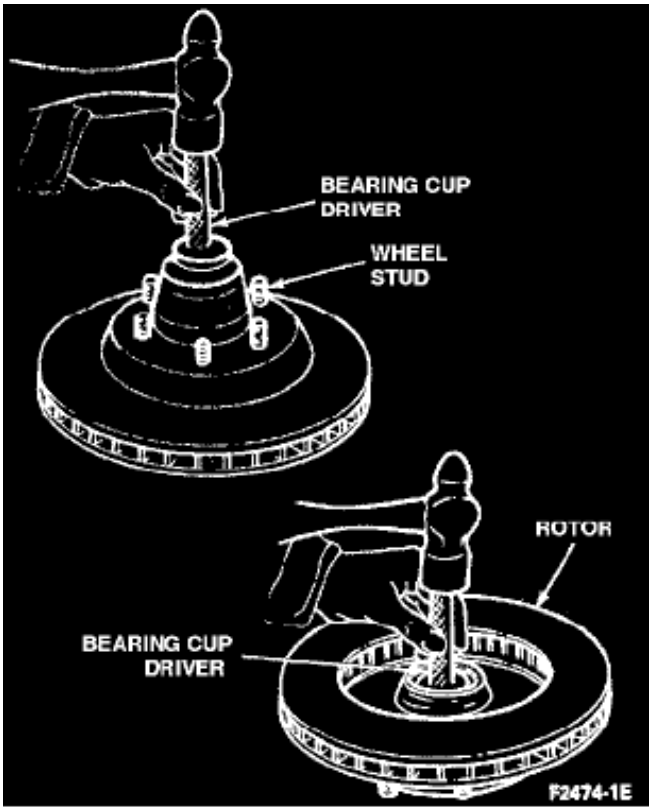
washers.

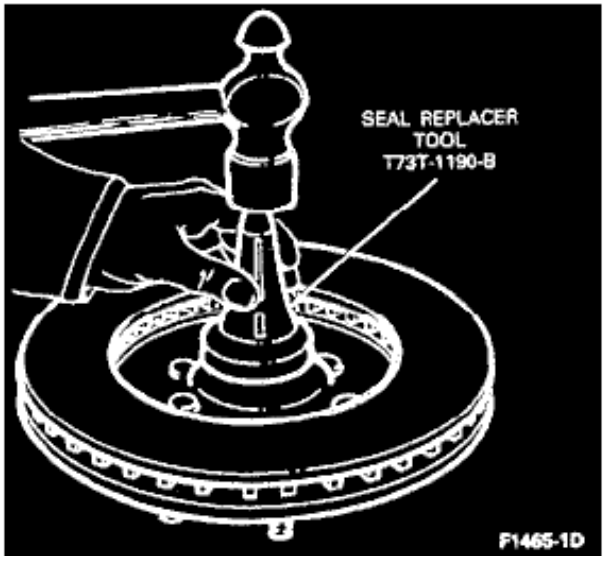
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP
DRIVER
WHEEL
STUD
ROTOR
BEARING CUP
DRIVER
F2474-1E


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Wheel Hub (Locking): Customer Interest Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

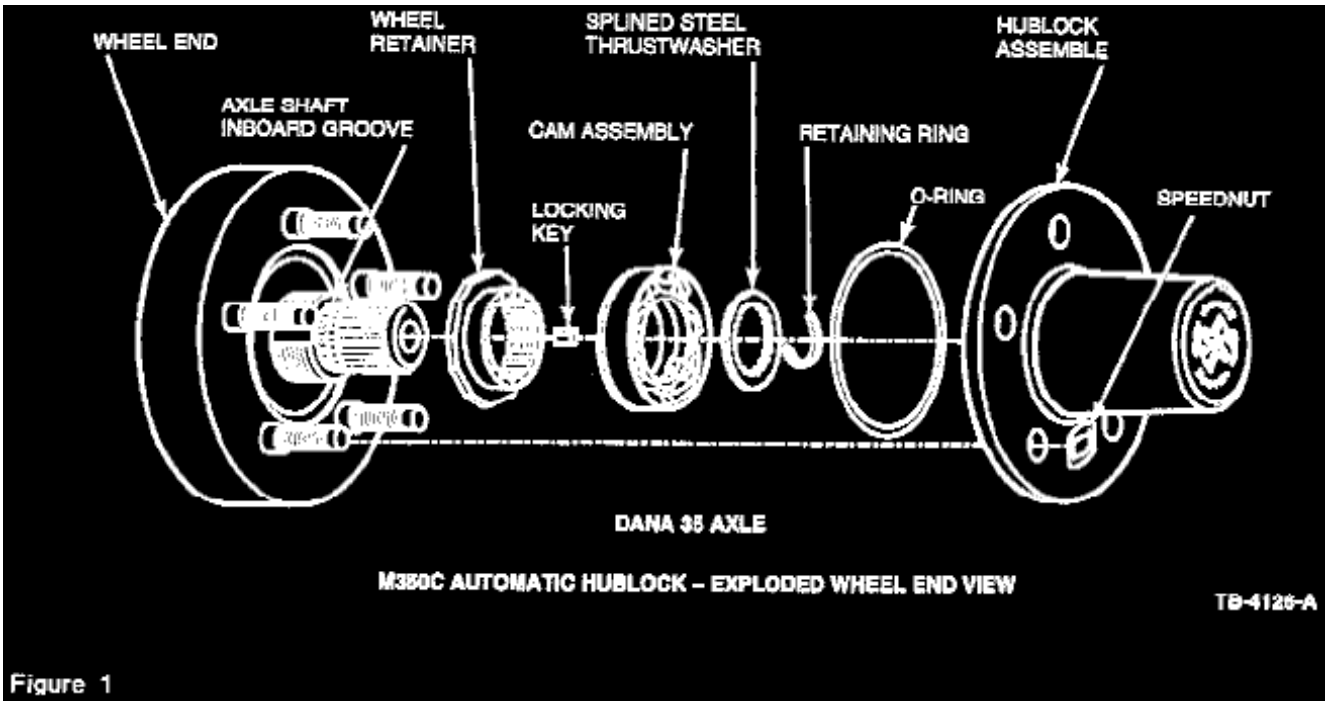


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

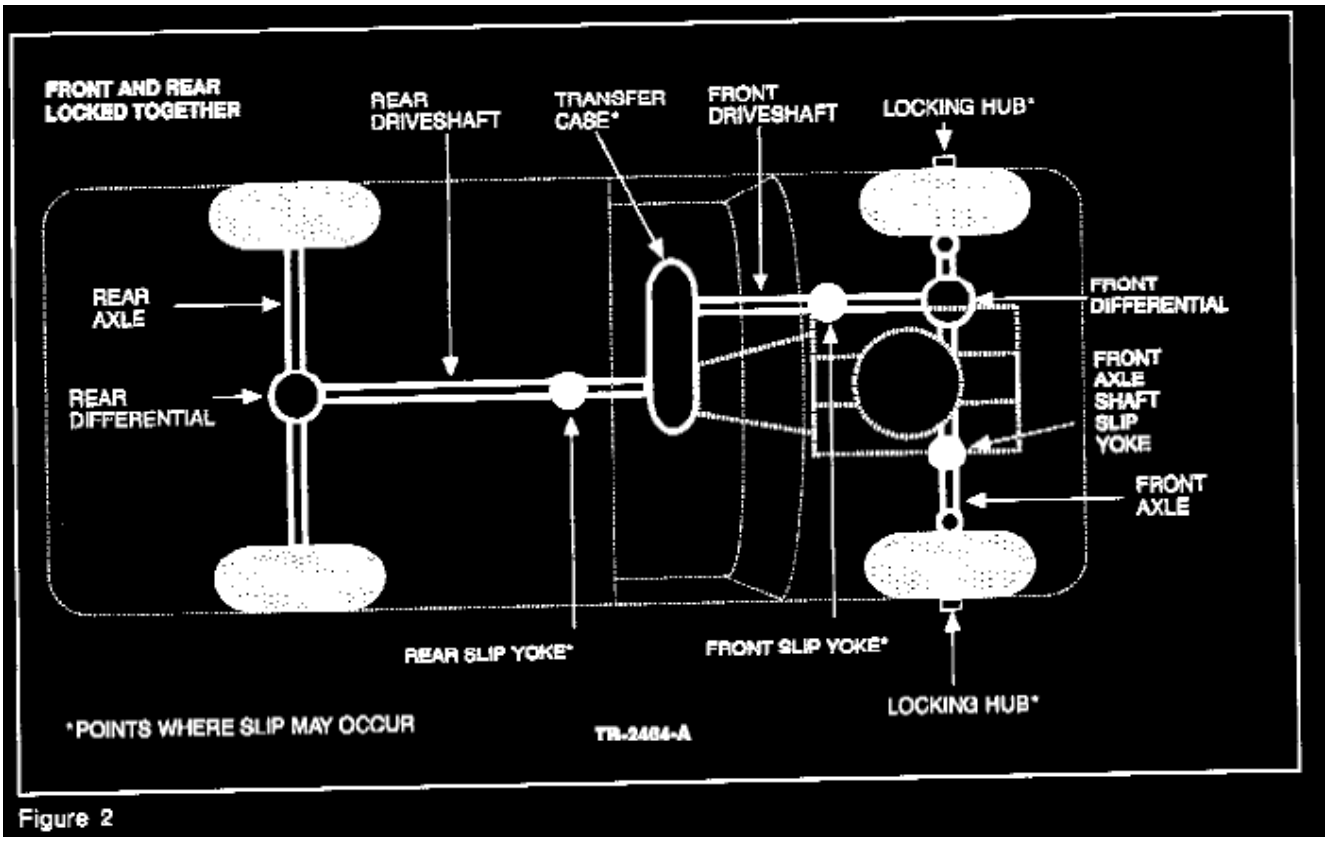


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART				
AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Wheel Hub (Locking) > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Wheel Hub (Locking): > 911812 > Sep > 91 > Front Hub - (4WD) Noise or Failure

Wheel Hub (Locking): All Technical Service Bulletins Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

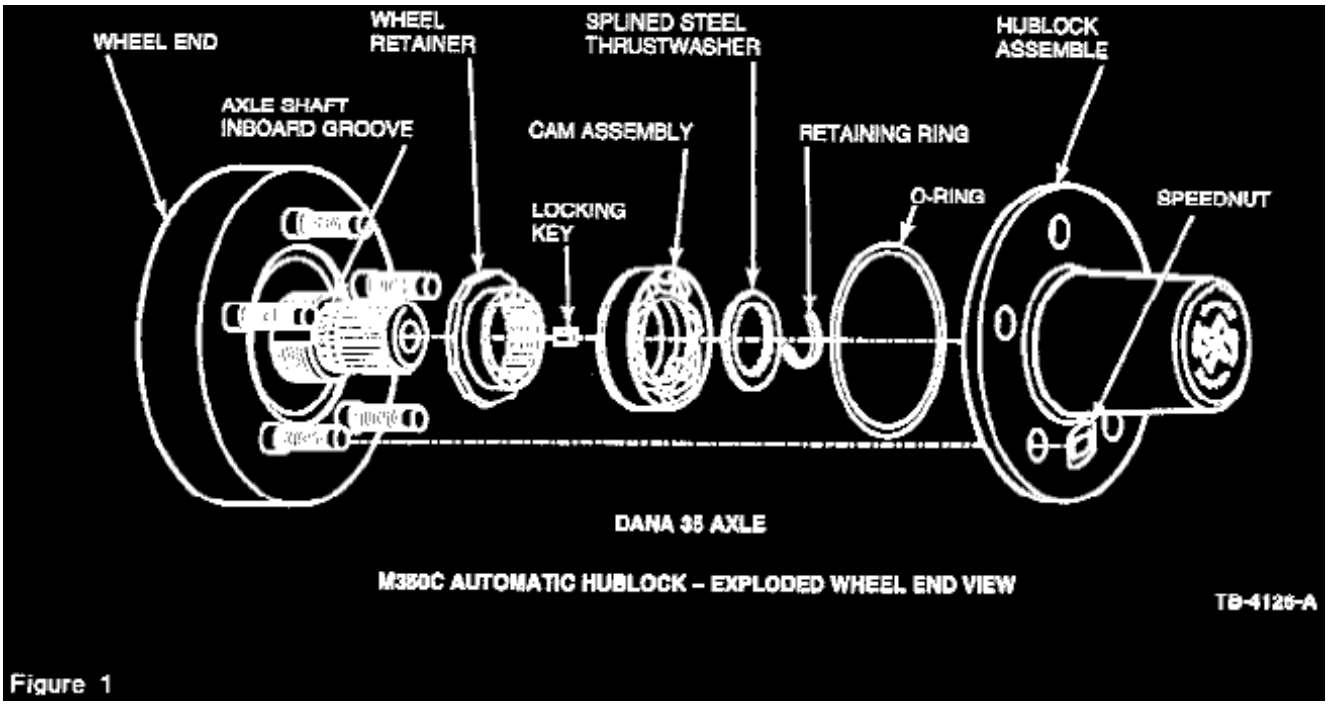


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

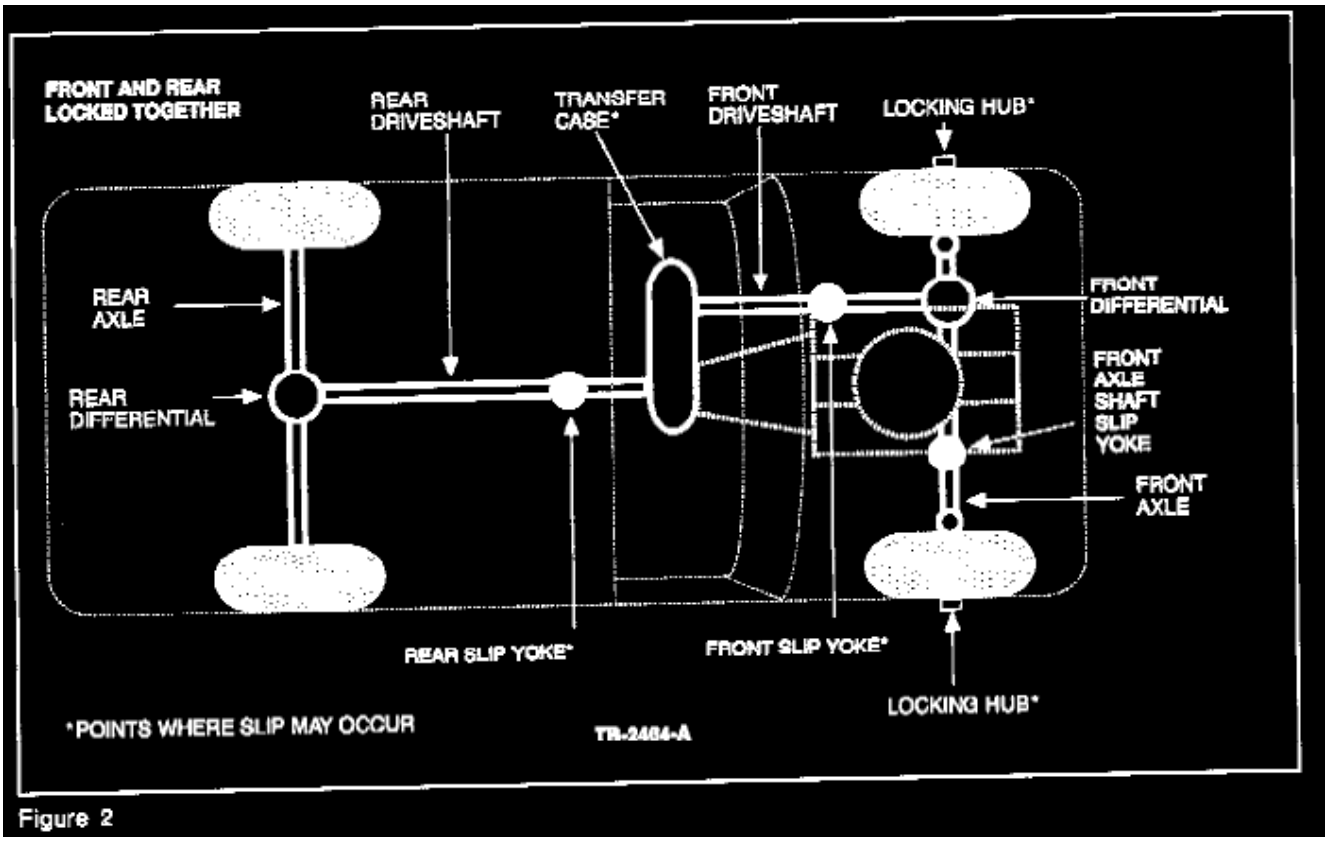


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART				
AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
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c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

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When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

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For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

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E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

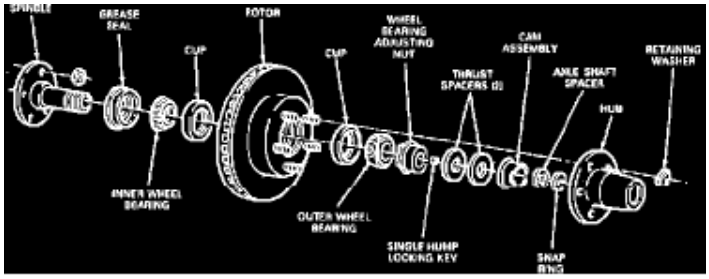
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

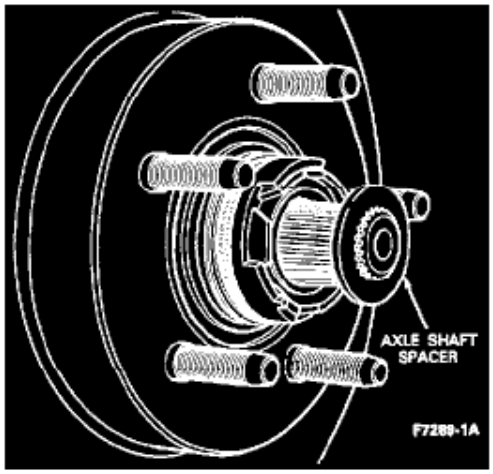
NOTES:

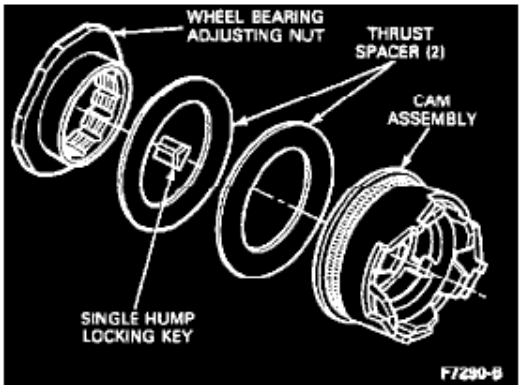
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Suspension > Wheel Hub (Locking) > Component Information > Service and Repair > Removal







Wheel Hub (Locking): Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

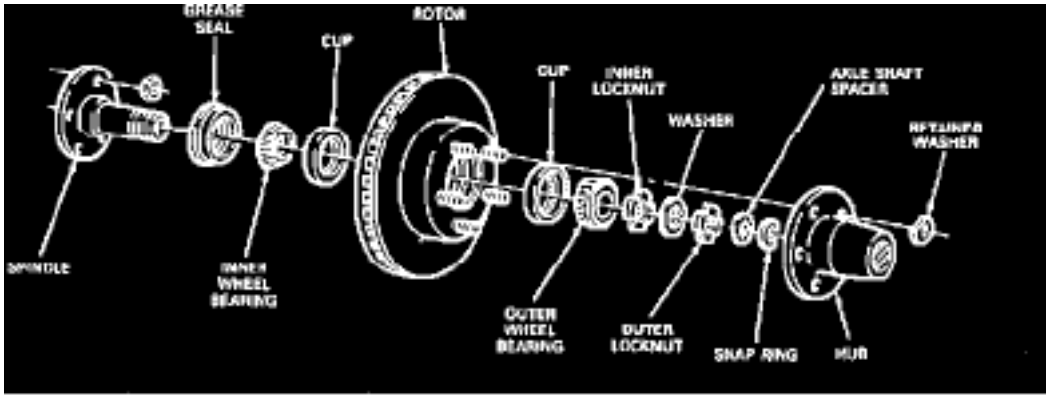
Axle Shaft Spacer

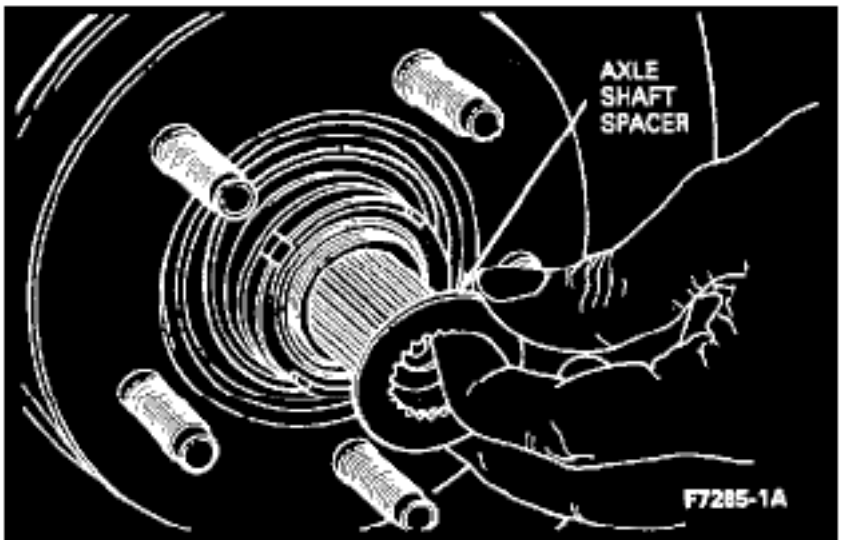
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

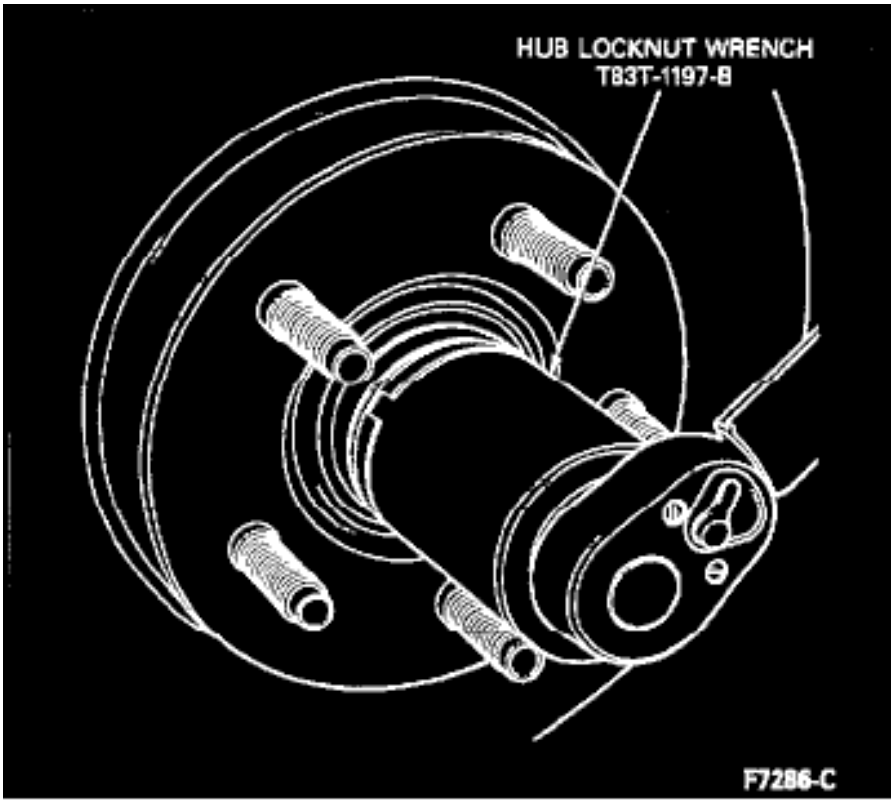
caliper.

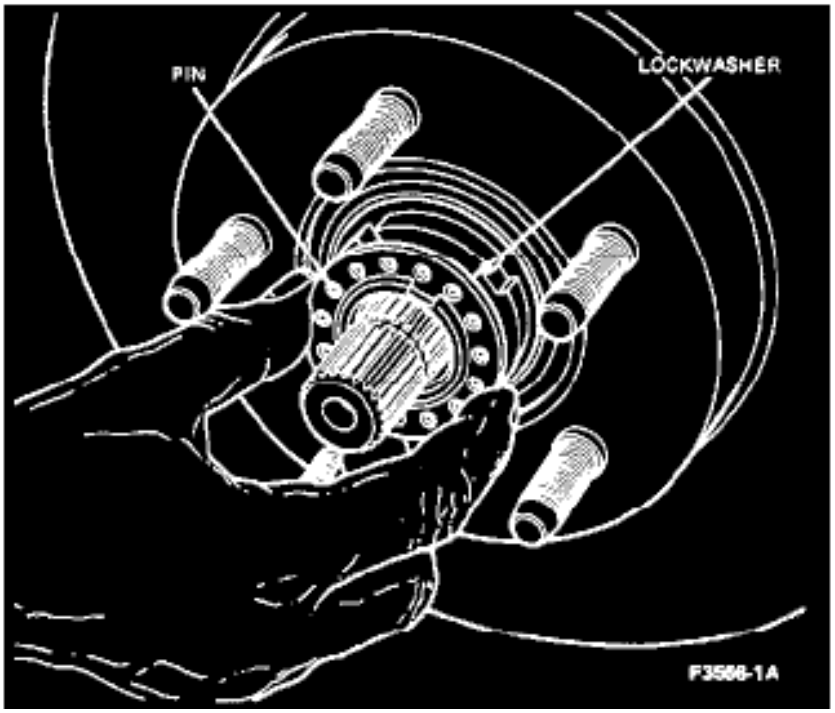
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

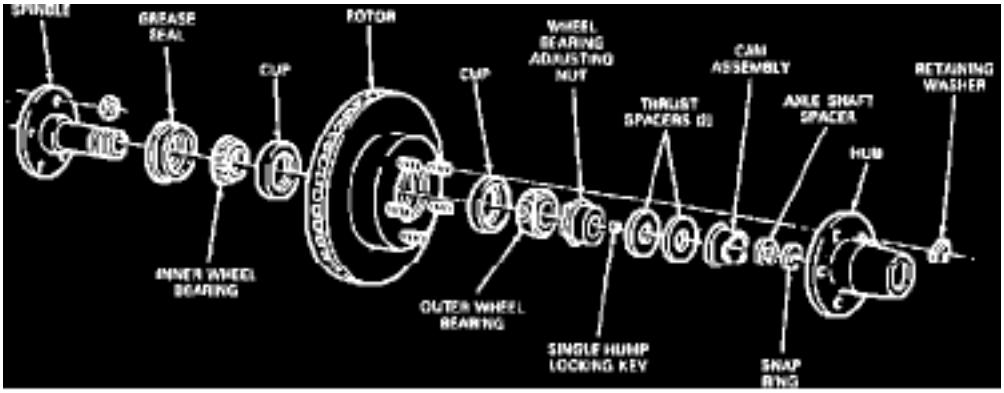

PIN
LOCKWASHER
F3566-1A

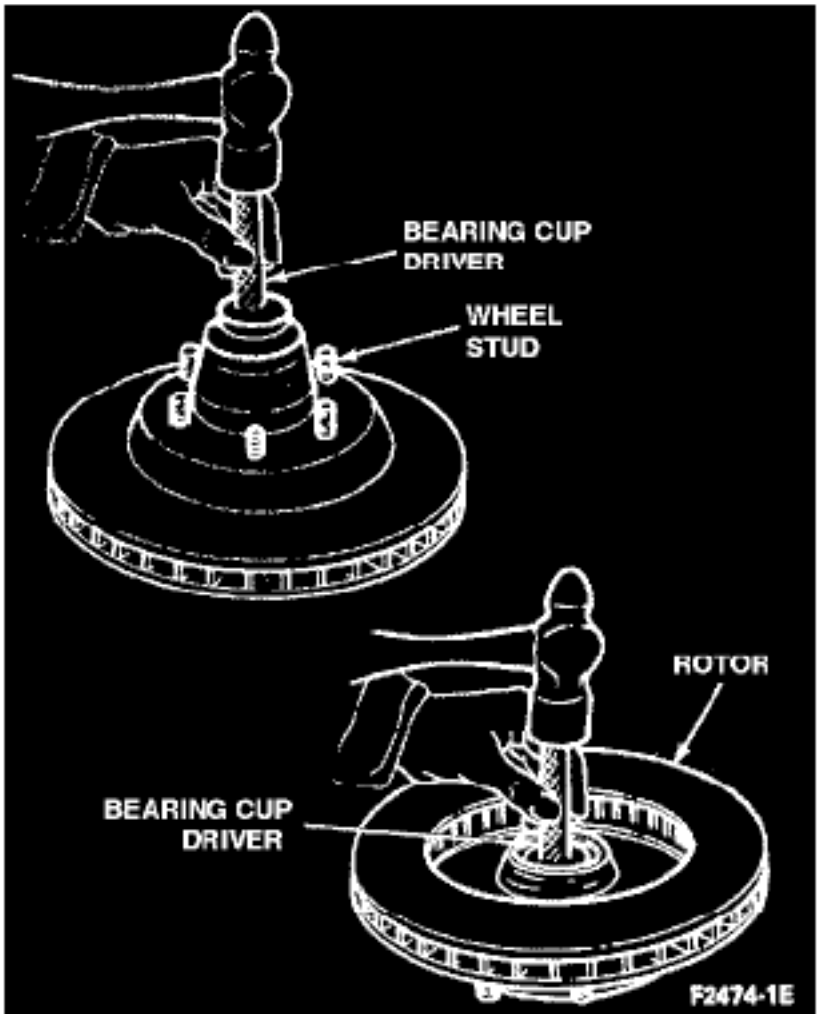
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub (Locking): Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

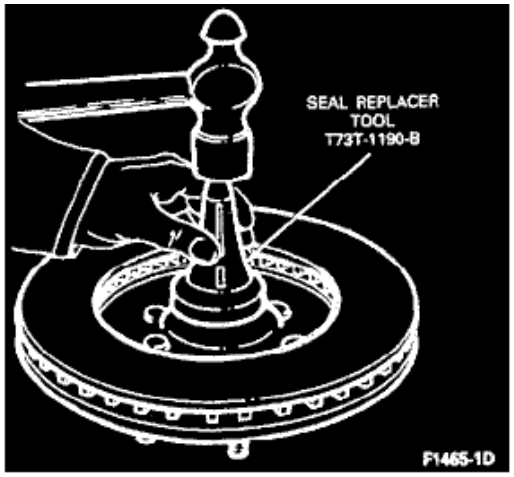
Installing Bearing Cups (Typical)

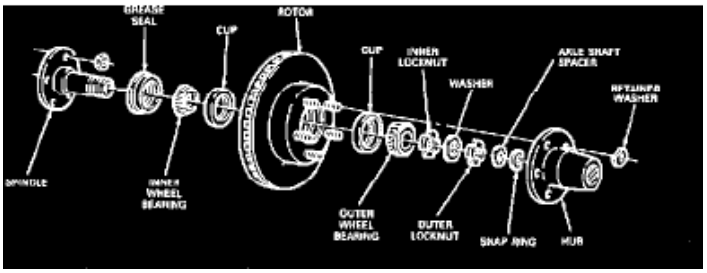
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

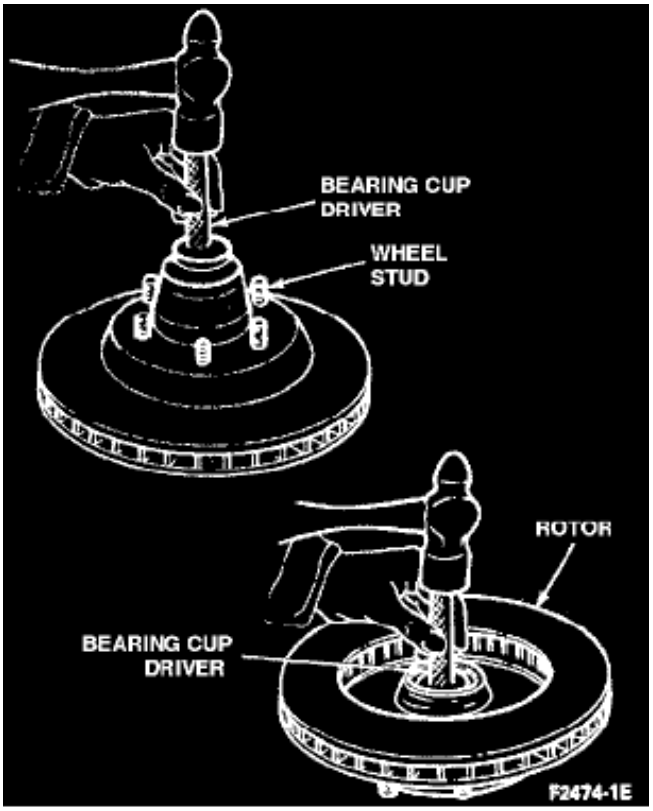
washers.

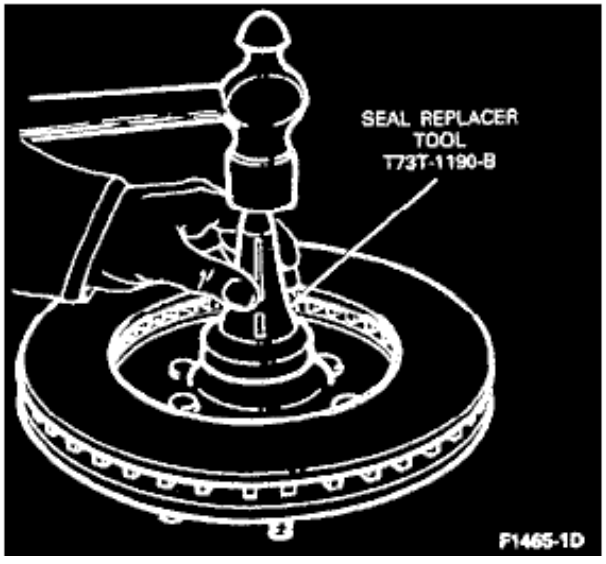
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP
DRIVER
WHEEL
STUD
ROTOR
BEARING CUP
DRIVER
F2474-1E


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Ford Motor Company

October 2001

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77 Supplement 7:** 10/12/01 Updated Information

REFERENCE: **Owner Notification Program 01B77 – Ford Wilderness AT Program:** Replacement of Wilderness AT tires

PROGRESS TO DATE

- To date we have replaced close to 7 million tires or 55% of the total tires needed
- Ford and Mercury dealers are currently handling over 70% of all Wilderness AT replacements
- All tire sizes are now readily available, though certain brands may not be available

The following information has been updated for ONP 01B77:

CHANGES MADE TO THE ALL DEALER LETTER

- ONP 01B77 – Ford Wilderness AT program will expire on March 31, 2002
- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- All customers who have not had their tires replaced will receive a follow-up letter by the end of October, 2001 announcing these program changes and encouraging them to visit a Ford Motor Company dealership for tire replacement
- 1995 and 1996 F-150 customers, which were added to the program on August 17, 2001, will receive their first notification letter by the end of October, 2001, which includes the following:
  - The customer must have their tires replaced at a Ford Motor Company dealer
  - They will only be eligible for refunds if they purchased their tires between August 1, 2000 through October 31, 2001

    NOTE: Refunded at actual cost and no DOT sections required, since these customers were never notified of the DOT requirements and maximum dollar limit.
- Effective immediately all tire refund requests are to be processed through the dealer (Online Refund Form should no longer be used)

CHANGES TO ATTACHMENT I

- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- The Online Refund Form used for refunds before May 22, 2001 is no longer posted on the web

CHANGES TO ATTACHMENT II

- Wait List Survey link added
- A procedure has been added to handle customers who purchase tires after November 15, 2001 and are seeking a refund

All revisions since Supplement 6 are in *red italics* and revised pages have been marked "*Revised10/12/01.*"

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Technical Service Bulletin # 01B77 Date: 011001

Ford Motor Company

May 2001
Revised 10/12/01

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77-S7 – Ford Firestone Wilderness AT Program:** Replacement of Firestone Wilderness AT tires.

OASIS: Yes
OWNER LIST: Yes
PARTS RETURN: No
PROGRAM TERMS: This program will expire *March 31, 2002* and has no mileage limit.

WHAT WE ARE DOING AND WHY

On August 9, 2000 Firestone initiated a voluntary recall of 6.5 million tires, including 3.8 million P235 75R15 Radial ATX tires manufactured since 1990 at all North American Firestone plants. Also, Firestone recalled about 2.7 million P235 75R15 Wilderness AT tires made at its Decatur, Illinois plant. The recall included both original equipment and replacement tires. As of January 22, 2001 more than 6.1 million tires have been replaced – the recall is more than 94% complete.

Under this new owner notification, Ford will replace 13 million Firestone Wilderness AT tires on Ford and Mercury SUVs and pickup trucks listed below under "affected tires and vehicles." This is a voluntary precautionary measure. Ford made the decision to take this action after extensive examination of field data as well as laboratory and track testing in close collaboration with NHTSA. The field data, along with our testing and statistical analysis, shows a directional trend toward elevated failure rates, that differs based upon where the tires were manufactured. Ford does not have sufficient confidence in the future performance of these tires, so we are acting in the interest of our customers to ensure their continued trust and confidence.

To date we have replaced close to 7 million tires or 55% of the total tires needed for this program. Ford and Mercury dealers are currently handling over 70% of the Wilderness AT tire replacements. Also, with the increased availability of all 15-, 16-, and 17-inch tires at the dealers, Ford is changing the expiration date of the program to March 31, 2002 to encourage customers to have their tires replaced as soon as possible.

NOTE: Certain brands of tires may have limited availability.

AFFECTED TIRES AND VEHICLES

This program affects 15-, 16-, and 17-inch Firestone Wilderness AT tires and Ford and Mercury vehicles with these tires on them. The vehicles listed below may have been originally equipped with Firestone Wilderness AT tires or may have had Wilderness AT tires installed during the Firestone recall launched in August, 2000.

- Certain 1991 through 2002 Ford Explorer
- Certain 2001 through 2002 Explorer Sport, and Sport Trac
- Certain 1997 through 2002 Mercury Mountaineer
- Certain 1991 through 2001 Ranger
- Certain 1999 through 2001 Expedition
- Certain 1991 through 1997 F-Series
- Certain 1991 through 1994 Bronco

NOTE: Both original equipment (OE) and replacement tires are affected.

IMPORTANT FACTS

- *Ford Wilderness AT tire program will expire on March 31, 2002.*
- *Tires purchased by customers after November 15, 2001 will no longer be eligible for a refund.*
- *A follow-up owner letter announcing program changes will be mailed beginning the week of October 17, 2001.*
- *1995 and 1996 F-150 owners, which were added to the program on August 17, 2001, will be notified by the end of October 2001.*
- All 15-, 16-, and 17-inch Firestone Wilderness AT tires (regardless of series number) that are mounted on Ford or Mercury vehicles are eligible for replacement.
- All other Firestone Wilderness AT tire sizes are not included in this program.
- AtW/Ford Tire Program dealers are to stop the sale of Firestone Wilderness AT tires in their parts inventory effective immediately.
- Ford Motor Company has notified customers of this owner notification program via first class mail.
- Customer refunds will be handled differently based on whether the tires were purchased before or after May 22, 2001.
- *Effective immediately all refunds will be processed through the dealer for customers who purchased their tires from August 1, 2000 through November 15, 2001, (Online Refund Form should no longer be used).*
- *1995 and 1996 F-150 owners will only be eligible for refunds for tires purchased between August 1, 2000 and October 31, 2001, (no DOT sections required).*
- A list of Ford-approved replacement tires is posted on QCDealer. Only these tires may be used as replacement tires for vehicles that were originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires under this program.
- There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.
- **Vehicles with branded titles** - although normally excluded from Owner Notification Programs are included as part of this program.
- Affected vehicles sold in Canada can be serviced by U.S. dealers, and affected vehicles sold in the U.S. can be serviced by Canadian dealers.

STOP SALE OF FIRESTONE WILDERNESS AT TIRES IN DEALER STOCK

Firestone Wilderness AT tires in stock at Ford and Lincoln Mercury dealers enrolled in the Around the Wheel or Ford Tire Program (Certified Tire Dealers) should not be sold. Dealers that purchased these tires through the Ford program and have them in stock should complete the *Unsold Wilderness AT Credit Form* located on QCDealer.com. If you have questions, call the Ford Tire Hotline at 1-888-353-3251 for disposal and credit information.

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

Non-Certified Tire (AtW or Ford Tire Program) Dealers who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program) or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "**SCHP**" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

SERVICE PROCEDURE

All 15-, 16-, and 17-inch Firestone Wilderness AT (regardless of series number) tires installed on Ford and Mercury vehicles must be replaced under this owner notification program. Original equipment (OE) and replacement tires are included.

Spare Tires

Firestone Wilderness AT (regardless of series number) spare tires are affected and should be replaced. The Firestone P235 75R15 ATX temporary spare tire used on Ranger vehicles is not included in this program.

Note: Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

Note: When processing refunds for customers, inspect the spare tire; if the spare tire is a Firestone Wilderness AT (with the Ranger exception noted previously) replace the spare tire using the information provided on Attachment II.

Does Current Tire Condition Affect Replacement Procedure?

All affected tires should be replaced regardless of the mileage or the remaining tread on the tire. If the customer caused damage to the tires, i.e. hit a curb, accident, under inflation, alignment issues, the tire should still be replaced. If the tire is worn out, it should still be replaced.

What if the Vehicle has a Mix of Affected and Non-Affected Tires?

- If the spare tire is the only Wilderness AT, then only the spare should be replaced (see exception on temporary spares above).
- In most cases an owner's vehicle will have all 15-, 16-, or 17–inch Firestone Wilderness AT tires installed and require replacement of all tires. In cases where a vehicle has a mix of tire brands/sizes installed, replace all Firestone Wilderness AT tires and the remaining tires to match the tire brand and size by axle.

For example, if a vehicle has a Wilderness AT on the left front, a Wilderness AT on the right rear, a Wilderness AT for a spare, and the other two tires are not Wilderness AT; the spare and the left front and right rear should be replaced and the new tires should be installed on the same axle. The customer should also be advised that all tires should be the same size especially on 4 X 4 models.

What replacement tires may be used for vehicles originally equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires?

Replacement tire(s) must be on the list of tires approved by Ford <link to approved tire list>. Any deviation from this approved list may change the vehicles handling, ride, vibration, and noise characteristics and cannot be claimed through Ford.

If customers are seeking reimbursement for tires purchased outside of a Ford Certified Tire Dealer, refer to Attachment I for reimbursement guidelines and claiming procedures. *Customers who purchase tires after November 15, 2001 are not eligible for a refund.*

Note: There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

Note: "Blemished" tires may not be used as replacement tires under this program.

FORD AND LINCOLN MERCURY DEALER TIRE DISPOSAL PROCESS

- Tires that are removed from vehicles must immediately be made unusable by either cutting the bead through the DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request. Marking the last 6 characters of the VIN on the removed tire(s) is no longer required.
- The tires will be disposed of by using the "National Tire Recovery and Recycle Program".

Regional FCSD and independent personnel will be randomly auditing dealers for proper tire scrapping and claiming procedures. Any infractions will result in prior approval for tire owner notification claims.

Note: Make removed tires unusable during tire replacement. Do not stack tires and disable them at a later time.

DEALERSHIPS ELIGIBLE TO REPLACE TIRES UNDER THIS PROGRAM

All Ford and Lincoln Mercury dealers enrolled on the Around the Wheel or Ford Tire Program (Certified Tire Dealers) are eligible to complete tire replacements under this program.

Ford dealers interested in joining the Ford Tire Program may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

APPROVED RETAILERS PARTICIPATION IN PROGRAM

We have developed a program to authorize Goodyear, Michelin, Continental, and General tire retailers to perform tire replacements at no cost to customers. These eligible retailers will use only tires from the Ford Approved Tire List when performing no cost replacements. This was done to reduce customer inconvenience by:

- Eliminating customer out of pocket expense
- Maximize the number of customers whose replacement tires are those on the Ford Approved tire list
- Expedite the completion of this program
- Reduce administrative burden on our Ford and Lincoln Mercury dealers
- Reduce dealer tire disposal responsibility
- Allow dealers to continue with their normal day to day service business

ATTACHMENTS

Attachment I:	Administrative Information
Attachment II:	Labor Allowances and Parts Ordering Information
Attachment III:	Technical Information

CONTACTS

Claims Information:	1-800-423-8851
For Around the Wheel/Ford Tire Program Questions:	1-888-353-3251
Ford Tire Inquiry Hotline (Customer):	1-866-300-1226
Other (Dealer Only) Program Questions:	1-800-325-5621
Tire Registration for Federal Regulations Questions:	1-330-794-9190

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Attachment I - Administrative Information

OASIS

OASIS must be used to determine vehicle eligibility.

IMPORTANT:

When an eligible vehicle is at the dealership for service, OASIS must be contacted to determine if Owner Notification Program 01B77 is open. If 01B77 is listed in OASIS as open, it is important that the vehicle is inspected for eligible tires. If the eligible vehicle is not equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires a claim must be submitted using labor operation 01B77A to close the program. If an affected vehicle does not have 01B77 open, this may indicate that a refund

or tire replacement has already been processed on this vehicle.

Some Ford and Lincoln Mercury vehicles not listed in the AFFECTED TIRES AND VEHICLES list may have 15-, 16-, or 17-inch Firestone Wilderness AT tires installed. These vehicles are covered under this program, but will not be active in OASIS. Contact the Special Service Support Center at 1-800-325-5621 to obtain prior approval before performing the repair or issuing a refund. This will insure that a previous repair/refund has not been performed on the vehicle.

CLAIMS PREPARATION AND SUBMISSION

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ Enter the full part number of the replacement tire with the quantity of tires replaced. Tires will be reimbursed at AtW Dealer cost + 25% (wheel weights and valve stems incl.).

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier. Dealers are encouraged to arrange for shipment of 4 or more tires at a time.

^ Dealers can no longer claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program". You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires on the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry.

RELATED DAMAGE

Vehicle damage caused by a tire related failure is not covered by this program. Refer to the Warranty and Policy Manual for proper claiming procedure for vehicles covered by the Ford Bumper-to-Bumper Tire Warranty (model years 2001 and 2002). All other pre-2001 model year vehicles with alleged tire related vehicle damage should be handled through the Firestone claims process, or by referring the customers to their insurance company.

Damage related to replacement of tires should be handled as described in the Warranty and Policy Manual.

OWNER REFUND

With the increased availability of replacement tires, it will no longer be necessary for customers to pay out-of-pocket expenses for tires. Therefore, refund requests for tires purchased after November 15, 2001 will no longer be granted. Owners will be notified of the refund expiration date and will be directed to a Ford or Mercury dealer They are directed to an authorized retailer only if the Ford or Mercury dealer cannot meet their scheduling needs or tires are not in stock. All Ford and Mercury dealers (AtW and non-AtW dealers) are required to process refunds for customers who purchase tires prior to November 15, 2001.

The following rules apply to refunds for tires purchased from August 1, 2001 through November 15, 2001:

Refunds will be processed for vehicles listed under "AFFECTED TIRES AND VEHICLES", and for other Ford and Lincoln Mercury vehicles that have 15-. 16-, or 17-inch Wilderness AT tires installed.

^ The customer must provide the original paid receipt (a copy of their paid receipt is acceptable on an exception basis in instances where the owner requires the original for another purpose (e.g. extended tire warranty or purchase rebate). The dealer will attach the receipt to the dealer file copy of the refund claim (see claim instructions below).

^ Dealers will be reimbursed to immediately disable tires returned for a refund (see claiming instructions for refunds and Attachment II for labor operations).

^ The tires must be purchased August 1, 2000 through November 15, 2001 to be eligible for a refund (through October 31, 2001 for 1995 and 1996 F-150 owners).

^ Customers requesting refunds for tire replacement May 22, 2001 through November 15, 2001 must provide either:

NOTE:

This does not apply to 1995 and 1996 F-150 customers.

^ The Firestone Wilderness AT tires that were replaced. Returned tire(s) are to be disabled by the dealership. Ford will reimburse the dealer to disable (see claim instructions below and use labor operation 01B77G). If tires are brought in for refund with the DOT codes missing dealers should not process the refund.

^ A section of the old tire(s) containing the DOT codes from each of the Firestone Wilderness AT tires that were replaced (To be cut from the Wilderness AT tires that were replaced by the outside repair facility) (use labor operation 01B77L). Dealers should deface (cut in pieces or make code unreadable) the DOT sections of the tire so they cannot be used to obtain another refund. If sections are brought in for refund with the DOT code defaced dealers should not process the refund.

NOTE:

The DOT Code Identification Guide has been developed to help dealers determine if the DOT sections returned to the dealership are from 15-, 16-,

Purchase Date Range	Refund Guidelines
August 1, 2000 through May 22, 2001	• The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
1995 and 1996 F-150 vehicles only *August 1, 2000 through October 31, 2001*	• *The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes (no DOT required)* • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
May 23, 2001 through November 15, 2001	• 15 inch tires - $110 (includes mounting, balancing, stems, disposal, and taxes) • 16 and 17 inch tires - $130 (includes mounting, balancing, stems, disposal, and taxes) • Dealers process refunds
After November 15, 2001	• *No refunds accepted for tires purchased after November 15, 2001*

Refund Questions	What is the owner qualified to receive?
Example: On December 21, 2000 the customer paid to have (4) Firestone Wilderness AT tires replaced on an affected vehicle.	o August 1, 2000 through May 22, 2001 (October 31, 2001 for 1995 and 1996 F-150) full refund with paid receipt o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
Example: On January 15, 2001 the customer paid to have (2) Wilderness AT tires replaced on a 1988 F-Series truck. The other tires are non-Firestone Wilderness AT.	o August 1, 2000 through May 22, 2001 – full refund with paid receipt o Dealer contacts Special Service Support Center at 1-800-325-5621 for approval code o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

or 17-inch Firestone Wilderness AT tires. Use the DOT Code Identification Guide in conjunction with the bulletin section "What if the Vehicle has a Mix of Affected and Non-Affected Tires" to determine how many tires are eligible for refund.

NOTE:

Ford will allow customers to file for a refund (with or without tires) for tires purchased after May 22 through June 30, 2001 because customers may not have tires to turn in. Customers must provide a paid receipt indicating tire replacement before July 1, 2001 in order to process a refund without tires or DOT sections. Customers who purchase tires after June 30, 2001 must provide tires or DOT sections.

Ford will reimburse customers the following amounts:

^ Tires purchased from August 1, 2000 through May 22, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes.

^ (1995 and 1996 F-150 vehicle only) Tires purchased from August 1, 2000 through October 31, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes. No DOT section required.

^ Tires purchased May 23, 2001 through November 15, 2001, the actual cost as stated on the receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes up to a maximum of $110 per tire for 15 inch, and $130 per tire for 16 and 17 inch tires.

^ Refunds will not be granted for tires purchased after November 15, 2001.

Note:

If an owner pays for the replacement of their tires after November 15, 2001, the dealer may handle on a case by case basis following the procedure in Attachment II.

Refund Questions	What is the owner qualified to receive?
Example: On May 27, 2001 the customer took their 1998 Explorer to an outside tire retailer and had (5) Firestone Wilderness AT 16 inch tires replaced.	o After May 22, 2001 refund tire replacement with paid receipt up to: o 15 inch = $110 (maximum per tire) o 16 and 17 inch = $130 (maximum per tire) o With a paid receipt this customer would be entitled to (5) tires x $130 (16 inch maximum per tire) = $650 refund (includes mounting, balancing, stems, disposal, and taxes) o Dealer will be eligible to claim for refund allowance using labor operation 01B77L o If the customer returns the old tires to the dealer o The dealer will disable the old tires and dispose of them using the *"National Tire Recovery and Recycle Program"* using labor operation 01B77G (disable) in conjunction with 01B77L (refund allowance) o Customer does not need old tire(s) *since tires purchased prior to July 1, 2001* (After June 30, 2001 customer will need old tires or removed DOT codes from replaced tires to qualify)
Example: On December 2, 2000 the owner replaced their (5) Firestone Wilderness AT tires with another set of Wilderness AT tires.	o The owner is not eligible for refund o The owner is eligible for tire replacement only o Use only tires from the "Ford Approved Tire List"
Example: *On November 16, 2001 the owner purchases tires from a tire retailer.*	o *No refund will be granted after November 15, 2001* o *Dealers may handle on a case-by-case (See Attachment II)*
Example: *On October 10, 2001 a 1995 F-150 owner purchases tires from a tire retailer.*	o *August 1, 2000 through October 31, 2001 – full refund with paid receipt* o *Customer does not need old tire(s) or DOT section(s)* o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

CLAIMS PREPARATION FOR REFUNDS (USE THIS PROCEDURE FOR ALL REFUND REQUESTS)

NOTE:

Tires must be purchased prior to November 15, 2001

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ When a customer brings in their old tires and is seeking a refund, use labor operation 01B77G (disable) and 01B77L (refund administration allowance) from Attachment II.

^ If a customer brings in the old DOT codes removed from the old tires - use labor operation 01B77L only.

^ The Miscellaneous Expense Code "ADMIN" will not be accepted under this program. A labor operation 01B77L has been provided to cover administrative costs.

^ Enter REFUND in the miscellaneous area of the claim.

^ Dealers will no longer be able to claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program" You may still claim any applicable local waste tax - enter OTHER

in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires in the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry. If the tires were replaced prior to May 23, 2001 (or November 1, 2001 for 1995 and 1996 F150 customers) the DOT may not be available, in this case record the brand, make and size of the tires in the technician comments area of the claim.

RENTAL CARS

TAP allowances have been increased specifically for this owner notification program. Refer to Don Brunner letter.

DOT REGISTRATION OF NEW TIRES

Dealers are required to register the DOT number of every tire sold to meet federal tire registration requirements. Ford has established a partnership with CIMS to assist dealers in registering these DOT codes. Information is available on QCDealer.com under CIMS Tire Registration or by contacting CIMS

Description	Labor Operation	Labor Time
Inspect for non-Wilderness AT tires (used to close 01B77 not for use when processing a refund)	01B77A	0.2 Hours
Replace & balance 1 tire (to be used for spare tire only)	01B77B	0.4 Hours
Replace & balance 2 tires (one axle)	01B77C	0.6 Hours
Replace & balance 3 tires (one axle plus spare)	01B77D	0.8 Hours
Replace & balance 4 tires (both axles)	01B77E	1.0 Hours
Replace & balance 5 tires	01B77F	1.2 Hours
Disable up to five tires (used only for refund claims)	01B77G	0.2 Hours
*Refund administration allowance (to be used when processing a customer refund without tire disposal, if tires are returned to dealership for disposal use in conjunction with operation 01B77G)	01B77L	0.2 Hours
Administrative Allowance for Non-Certified Tire Dealers (AtW or Ford Tire Program) to be used when sending a dealer stock unit, or customer vehicle (for tire replacement) to a Certified Tire Dealer, or tire retailer authorized to perform tire replacement under this program	Misc. Expense use code "SCHP"	$15.00

NOTE: Front-end alignment is not included in this program.

***NOTE:** When processing a refund for four (4) road tires, the non-temporary spare tire should be replaced as part of this program – file a related damage claim to cover the spare tire replacement.

at 330-794-9190.

NON-FORD OR LINCOLN MERCURY VEHICLES WITH FIRESTONE WILDERNESS AT

Non-Ford or Lincoln Mercury vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires installed by a Certified Tire Dealer (AtW or Ford Tire Program) are eligible for replacement. The repair should be submitted using a Warranty/ESP claim type form. The dealer must enter Program Code "P19", this will allow the repair to be submitted without a VIN. The causal part must be TIRE, with the actual part numbers for reimbursement at dealer cost plus 25%, and use actual time for labor reimbursement. These types of claims cannot be submitted as an Owner Notification Repair type.

Attachment II - Parts and Labor Information

LABOR ALLOWANCES

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

NOTE:

Non-Certified Tire Dealers (AtW or Ford Tire Program) who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program), or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "SCHP" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

PARTS REQUIREMENTS

Tire Ordering Information

^ Dealers are required to install only tires from the Approved Tire List for vehicles originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires. Dealers should immediately order replacement tires for inventory.

^ Certified Tire Dealers will order replacement tires through normal channels.

^ Dealers not authorized for the Around the Wheel Program will not participate in this recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

TIRE AVAILABILITY:

All dealers should check QCDealer.com daily for updates to the approved tires list. Distributors and tire retailers will allocate tires as best they can on a daily basis. Your dealership should do the following to ensure that you are able to secure your fair allotment of these limited volumes:

^ Contact your Ford authorized facing distributor(s) for each tire manufacturer.

^ Contact your Ford authorized facing tire retailers for each tire manufacturer.

^ Review with these supply points the volume of tires you need to ensure you have tires ready to fill orders with every supply point.

Questions not addressed by above sources should be directed to your market area team.

CUSTOMER WAIT LISTS:

Dealers should create a customer wait list and record: Customer name

^ Address and phone number

^ Vehicle make

^ Model year

^ Mileage

^ Tire size

NOTE:

Customers should be prioritized to replace oldest tires first.

WAIT LIST SURVEY

Please fill out the Firestone Tire Survey in the Management Report Section of QCDealer weekly. It is critical that you answer the questions as accurately as possible as the survey results will be used to help determine the level of production from the tire manufacturers.

DEALER PRICE

For latest prices on replacement tires, refer to the most recent Ford Motor Company Tire Price List.

PROCEDURE FOR CLAIMING REFUNDS FOR TIRES PURCHASED AFTER NOVEMBER 15, 2001

The following procedure applies to tires purchased after November 15, 2001:

1. Determine if the customer should receive special consideration based on owner loyalty, special circumstance cc, etc.

2. If the customer is eligible for special consideration the dealer will call the Special Service Support Center at 1800-325-5621 to request an authorization code.

3. The Special Service Support Center representative will ask for the following:

^ Customer Name

^ VIN

^ Date of repair

^ Original copy of invoice (be prepared to fax)

4. If the customer qualifies for a refund, the Special Service Support Center will provide your dealer with an authorization code.

5. Your dealer will input a claim with the authorization code (authorization code must be included to receive payment).

6. After the dealer receives payment for the claim, the dealer will then send the refund to the customer.

NOTE:

If the Special Service Support Center determines that the customer does not qualify for a refund, no authorization code will be given. Any appeals must be made by the dealer to the appropriate field representative

Attachment III - Technical Information

AFFECTED VEHICLES: REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES

OVERVIEW

This program details the replacement of 15-, 16-, and 17-inch Firestone Wilderness AT tires regardless of production plant. You will need to perform a DOT code inspection prior to replacing the 15, 16, or 17-inch Wilderness AT tires.

NOTE:

When lowering or raising an under-vehicle spare, DO NOT use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

NOTE:

Radial ATX "TEMPORARY USE" spare tires are not included under this program, and should not be replaced as part of this program.

NOTE:

Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

INSPECTION

1. Inspect the vehicle tires (including the spare tire) for the presence of Firestone Wilderness AT tires.

2. If Firestone Wilderness AT tires are present replace them with a suitable replacement from the "Approved Tire List".

Note:

There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

3. If only one Firestone Wilderness AT road tire is present on the vehicle, you will need to replace the opposing tire on the same axle. However, if one (1) front and one (1) rear tire are Wilderness AT you would not automatically replace all four (4) tires instead, you would replace the two (2) Wilderness AT tires and place them on the same axle.

4. Record the DOT code from each removed tire(s) on the repair order.

5. Tires that are removed from vehicles must immediately be made unusable by either cutting through the bead and DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall.

6. Adjust all tires to the proper inflation pressure, and release the vehicle. For specifications, refer to the vehicle Owner's Manual or the vehicle certification label located on the driver's door opening.

NOTE:

Tires that are removed from vehicles under this program, and those in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT

code will prevent the tire from being used for an additional refund request.

NOTE:

If the vehicle is a 4X4, and is equipped with non-Firestone Wilderness AT tires on one axle, and the replacement tires for the Firestone equipped axle causes a mismatch with the existing non-Firestone axle, the customer is responsible for the tire mismatch. If the customer refuses to purchase matching tires to correct the mismatch - the dealer should annotate the repair order to reflect the customer's decision.

Ford Motor Company

FIRESTONE TIRE RECALL

September 2000

TO: All Ford and Lincoln Mercury Dealers
SUBJECT: Firestone Tire Recall Supplement #4 9/1/00 - Updated Information
REFERENCE: Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires

Changes for this Supplement:

- The following has been added to Attachment I to clarify the claiming of freight: Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.
- Additional information is now required in the comments of each claim filed for tire replacement under both Program Codes P17 and P18. The comments must include the entire DOT code from the tire being replaced and under P17 only the part number of the replacement tire. Firestone requires this information for government reporting.

Claims under the Firestone recall for tire replacement filed by Ford and Lincoln Mercury dealers not enrolled in the AtW/Ford Tire Program will not be accepted for payment. Non-AtW/Ford Tire Program dealers will continue to be able to file claims for tire inspection. This is not new information; we have just added the edits to the ACES II system.

The revised letter and attachments have been marked "Revised 9/1/00", and a ( ) symbol appears at the beginning of any text that changed since the last Supplement and the text appears in green when viewed on line. To avoid confusion please discard all previous versions.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Technical Service Bulletin # FIRESTONE Date: 000901

Dealer Letter

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: DEMONSTRATION / DELIVERY HOLD - Firestone Tire Recall: Certain 1991 through 2000 Explorer, 1997 through 2000 Mountaineer, 2001 MY Explorer Sport Trac and Sport, 1991 through 2000 Ranger, 1991 through 1994 Bronco and 1991 through 1994 F-Series - Replacement of Firestone P235/75 R15 Radial ATX and Certain Wilderness AT Tires.

REFERENCE:

Model Year	Body Style	Tire/Wheel Size
1991 - 1994	ALL	15"
1995 - 1998	ALL (Excluding Eddie Bauer and 2-door Sport if equipped with 16 inch wheels)	15"
1999 - 2001	ALL (Excluding Eddie Bauer and Limited Editions if equipped with 16 inch wheels)	15"

Model Year	Body Style	Tire/Wheel Size
1995 - 1998	Eddie Bauer	16"
1996 - 2001	Sport and any 2-door Sport 4X4 w/Premium Sport Package	16"
1999 - 2001	Eddie Bauer and Limited	16"

Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires.

AFFECTED TIRES AND VEHICLES

Bridgestone Firestone Tire Company recently announced a Safety Recall on the following:

- All Firestone P235/75 R15 Radial ATX tires produced excluding tires marked "TEMPORARY" on the sidewall - and -

- P235/75 R15 wilderness AT tires produced only at the Decatur plant.

NOTE:

Decatur built tires have a DOT code of VDHL - see Attachment III for details. All other Wilderness AT tires are not affected.

Both original equipment (OE) and replacement tires are affected.

The following vehicles produced with Firestone P235/75 R15 Radial ATX original equipment tires are affected by this recall:

^ Certain 1991 through 1996 Ford Explorer (see chart)

^ Certain 1997 Mercury Mountaineer vehicles

^ Certain 1991 through 2000 Ranger vehicles

^ Certain 1991 through 1994 Bronco vehicles

^ Certain 1991 through 1994 F-Series vehicles

The following vehicles produced with P235/75 R15 Wilderness AT tires as original equipment are affected by this recall:

Certain 1997 through August 7, 2000 Mountaineer vehicles

^ Certain 1997 through August 7, 2000 Explorer vehicles (see chart)

^ Certain 1997 through June 1, 2000 Ranger vehicles

^ Certain 2001 Explorer Sport Trac and Sport vehicles produced through August 7, 2000

These Explorer vehicles produced with either P235/75 R15 Radial ATX or P235/75 R15 Wilderness AT tires as original equipment are affected as shown.

These Explorer vehicles are NOT affected:

IMPORTANT FACTS

^ This is a FIRESTONE recall.

^ FIRESTONE will notify customers of the recall via first class mail.

^ FIRESTONE will communicate recall information to authorized repair sites including Ford and Lincoln-Mercury Around the wheel/Ford Tire Program dealers.

FORD AND LINCOLN MERCURY DEALER INVOLVEMENT

As this field action will severely impact the availability of Firestone replacement tires, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers will be afforded the opportunity to address this recall utilizing Firestone and non-Firestone tires. This is being done to address immediate needs of our customers.

FORD AND LINCOLN MERCURY DEALERS ENROLLED IN AROUND THE WHEEL (AtW)

Dealerships enrolled in the AtW/Ford Tire Program are authorized Firestone outlets. If a customer with affected tires contacts an ATW Ford Tire Program dealer, as an authorized Firestone dealer regarding this safety recall, you will be able to replace that customer's tires with Firestone or "approved" non-Firestone tires. Tires that are approved for use as replacement tires under this recall will be posted in a matrix in the Firestone Tire Center in QCDealer.com. This matrix will be amended to add new tire manufactures and models of tires as they are approved. Claiming for reimbursement of tires is outlined on Attachment I.

If the customer requests a replacement Firestone tire, secure the tire through your normal distribution chain and process reimbursement as outlined in Attachment I.

FORD AND LINCOLN MERCURY DEALERS NOT ENROLLED IN AROUND THE WHEEL (AtW)

Dealers not enrolled in the ATW/Ford Tire Program can inspect customer vehicles (see Attachments I & II for claiming instructions & labor operations). These dealers should make individual arrangements with local Firestone outlets for tire replacement, or refer customers to their local Firestone outlet.

SERVICE PROCEDURE

All Firestone P235/75 R15 tires with Radial ATX on the sidewall (excludes Temporary spare tires identified by "Temporary" on the sidewall) must be replaced under this recall.

Firestone P235/75 R15 tires with Wilderness AT on the sidewall will need to be inspected for a DOT code of VDHL to determine if replacement is required. Refer to Attachment III for details.

This service action applies to original equipment and replacement tires that are installed on Ford and Mercury vehicles.

DEMONSTRATION / DELIVERY HOLD FOR VEHICLES AND TIRES IN DEALER INVENTORY

Do not demonstrate or deliver any of the affected vehicles prior to completing the Firestone recall. In addition, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers may have affected tires in inventory; these tires should not be sold.

Tires Removed from Vehicles

Tires that are removed from vehicles must immediately be made unusable by either cutting the bead with bolt cutters, drilling a one-inch diameter hole in the sidewall, or cutting the tire completely in half The DOT code should not be defaced or removed. The tire should then be disposed of according to local laws refer to the Tire Administration Guide for further information.

NOTE:

AtW/Ford Tire Program dealers will be independently audited for compliance with the above procedure.

New Inventory Tires

All new Radial ATX or Wilderness AT tires with DOT code VDHL tires (never mounted) in AtW/Ford Tire Program dealer inventory must be returned to Firestone. Dealers must call 1-800-668-0345 to obtain a "Returned Goods Authorization (RGA) number. The RGA is a 6-digit number required to return the tires. Only tires affected by the Firestone recall will be accepted. Firestone will pay all freight for the return of these tires.

ATTACHMENTS

^ Attachment I ^

Administrative Information

^ Attachment II ^

Labor Allowances

^ Parts Ordering Information

^ Attachment III ^

Technical Information

^ Attachment IV ^

Tire Inspection Aid

^ Attachment V ^

Tire Inflation Guide

CONTACTS

Claims Information: 1-800-423-8851

Other (Dealer Only) Recall Questions: 1-800-325-5621

For Around the Wheel/Ford Tire Program 1-888-353-3251

Questions:

Attachment I

OASIS Since this is a Firestone recall, OASIS will not be activated.

PLEASE NOTE

Correct all vehicles in stock before delivery. Federal law requires dealers to complete any outstanding safety recall service before a vehicle is delivered to the buyer or lessee. Violation of this requirement by a dealer could result in a civil penalty of up to $1,100 per vehicle.

CLAIMS PREPARATION AND SUBMISSION

NOTE:

Claims for Firestone tires (P18) may be entered for payment beginning with repairs dated August 28, 2000 and later.

Claims for non-Firestone tires

Enter claims in ACES II for non-Firestone tires using DWE with the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Program Code - P17. Enter P17TIRE as the causal part with condition code 82.

^ On the same line as PI7TIRE enter the total value of the tires from the "Suggested List Price" column of the latest Ford Motor Company Tire Selling Guide.

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.

^ Tire disposal and applicable local waste tax will be reimbursed - enter OTHER in the miscellaneous expense area of the claim with the actual cost.

^ Enter the entire DOT code and the part number of the replacement tire being used in the comments area of the claim.

Claims for Firestone tires

Enter claims in ACES II for Firestone tires using the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim type.

^ Program Code - P18.

^ Enter "P18TIRE" as the causal part, no material cost should be entered on this line.

Description	Labor Operation	Labor Time
Inspect 5 tires applies only to P235/75 R15 Wilderness AT tires) - VEHICLE NOT AFFECTED (Non VDHL DOT Code)	00V01G	0.2 Hours
Inspect 5 tires (applies only to P235/75 R15 Wilderness AT tires) - VEHICLE AFFECTED - Customer must return at a later date due to unavailability of replacement tires. This may be claimed only one time per vehicle per dealer.	00V01A	0.2 Hours
Replace & balance 1 tire (No longer includes inspect) May be used with labor op 00V01A only	00V01B	0.4 Hours
Replace & balance 2 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01C	0.6 Hours
Replace & balance 3 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01D	0.8 Hours
Replace & balance 4 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01E	1.0 Hours
Replace & balance 5 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01F	1.2 Hour

^ Condition code "82".

^ Use Customer Concern Code "A99".

^ Enter the full published tire part number with the quantity of tires replaced, the payment system will price the tire at Dealer Net multiplied by the quantity for the total value of the replaced tires.

^ Use Miscellaneous Expense Code "TIREMU" to claim the $20.00 difference per tire7 a maximum of $100.00.

^ The Firestone warranty claim form must be filled out and attached to the hard copy of the claim and retained in the service file. The entire DOT code from the replacement tire(s) must be recorded on this form.

^ The DOT code must also be entered in the comments area of the claim.

^ No labor operations will be allowed when claiming P18.

OWNER REFUND

Ford and Lincoln Mercury dealers, including AtW/Ford tire dealers; will not be involved in processing refunds for customers included in the Firestone recall. Customers inquiring about a refund should be provided copies of the Firestone refund request form. Refer to the Firestone website for the refund forms and for further details.

RENTAL CARS

TAP allowances have been increased specifically for the Firestone recall refer to M.J. Lombardi's Letter.

Attachment II

LABOR ALLOWANCES

NOTE:

Front-end alignment is not included in this recall.

NOTE:

These labor operations and revised times will begin paying with claims submitted on August 18, 2000; Claims in process at dealerships will need to use these new operations.

PARTS REQUIREMENTS

Tire Ordering Information

FIRESTONE TIRE INSPECTION

AFFECTED VEHICLES: **REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES**

OVERVIEW

This procedure outlines how to check the DOT code on the tires and determine if they must be replaced.

NOTE: All Firestone P235/75R15 tires that say "RADIAL ATX" on the sidewall are being recalled and no further inspection is necessary.

NOTE: All tires including the spare must be inspected if they are "WILDERNESS AT" P235/75R15.

NOTE: When lowering or raising an under-vehicle spare, **DO NOT** use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

INSPECTION

1. Raise vehicle on a hoist.
2. Locate the DOT code on the inboard sidewall of all tires including the spare. On F-Series and Bronco models, the spare tire must be lowered to view the DOT code. Clean the area if necessary in order to accurately read the code.
3. If the DOT code is **VDHL**, the tire must be replaced. See the matrix (part of the dealer bulletin) to determine the correct replacement tires. See Figure 1.

NOTE: Recall tires that are removed from vehicles and in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole in the sidewall.

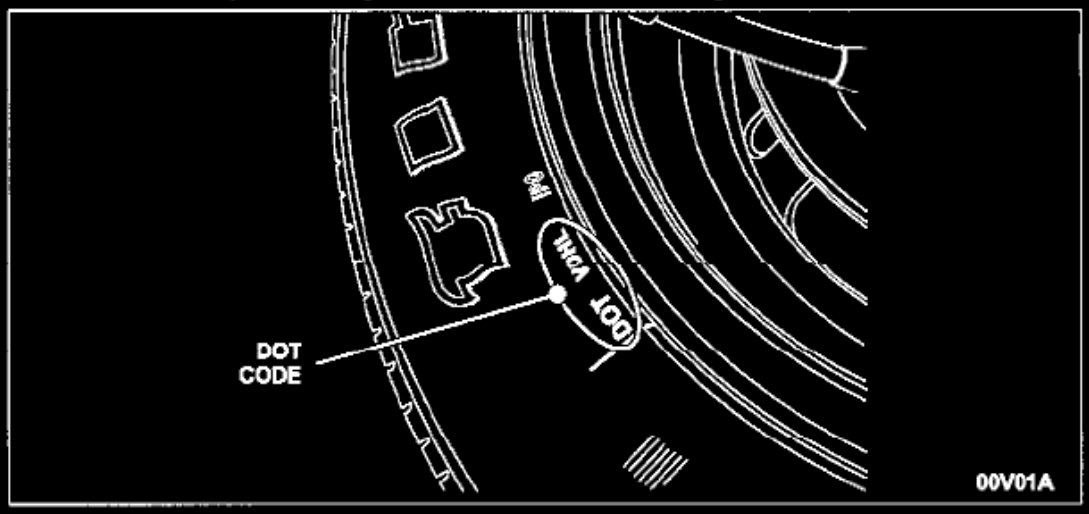

FIGURE 1

4. If the code is anything other than **VDHL**, release the vehicle to the owner.

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DEARBORN, MICHIGAN 48121
08/00

Authorized Around the Wheel (ATW)/Ford Tire Program dealers will order replacement tires through normal channels. Dealers not authorized for the Around the Wheel Program will not participate in the Firestone recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

DEALER PRICE

For latest prices on replacement tires refer to the most recent Ford Motor Company Tire Selling Guide.

ATTACHMENT IV
PAGE 1 OF 1
FIRESTONE TIRE RECALL SUPPLEMENT 1

TIRE INSPECTION

TIRES INVOLVED IN FIRESTONE RECALL

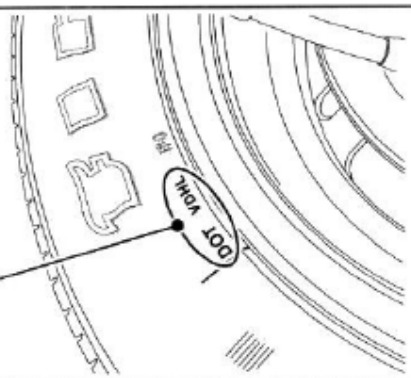
P235/75R15

ALL INCLUDED IN RECALL

P235/75R15

ONLY WITH DOT CODE VDHL

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL



DOT CODE

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL

TIRE DOT CODE CAN BE INSPECTED WITH VEHICLE ON GROUND

WARNING: IF RAISING THE VEHICLE TO INSPECT, DO NOT POSITION YOURSELF UNDER THE VEHICLE WITHOUT HAVING ADEQUATE SAFETY STANDS SUPPORTING THE WEIGHT OF THE VEHICLE. THE JACK PROVIDED FOR USE WHEN CHANGING A TIRE BY ITSELF IS NOT ADEQUATE FOR THE PURPOSE OF GETTING UNDER THE VEHICLE.

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08/00

Attachment V
Revised 8/16/00

Firestone Tire Recall

Replacement of Certain Firestone P235/75 R15 Tires

Tire Inflation Guide

AFFECTED BRAND	MODEL	FIRESTONE ATX	TIRE PRESSURE	FIRESTONE WILDERNESS	TIRE PRESSURE
		(MY)	(frt - rear) psi	(MY)	(frt - rear) psi
FORD	EXPLORER	91 - 96	26** - 26**	97 - 00*	26** - 26**
FORD	EXPLORER SPORT- 2DR.	91 - 96	26** - 26**	97 - 01*	26** - 26**
FORD	EXPLORER SPORTRAC	N/A	-	01*	28 - 35
FORD	RANGER	91 - 96	30 - 35	97 - 00*	30 - 35
FORD	F - 150	91 - 94	35 - 41	N/A	-
FORD	BRONCO	91 - 94	35 - 41	N/A	-
(I)MERCURY	MOUNTAINEER	N/A	26** - 26**	97 - 00*	26** - 26**
MAZDA	NAVAJO	91 - 94	26 - 26	N/A	-
MAZDA	B-SERIES PICKUP	94 - 96	30 - 35	97 - 00*	30 - 35

* Firestone Decatur, Illinois Plant only

** Ford approved range is 26 - 30 psi.

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Ford Customer Service Division

Tires: Customer Interest Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

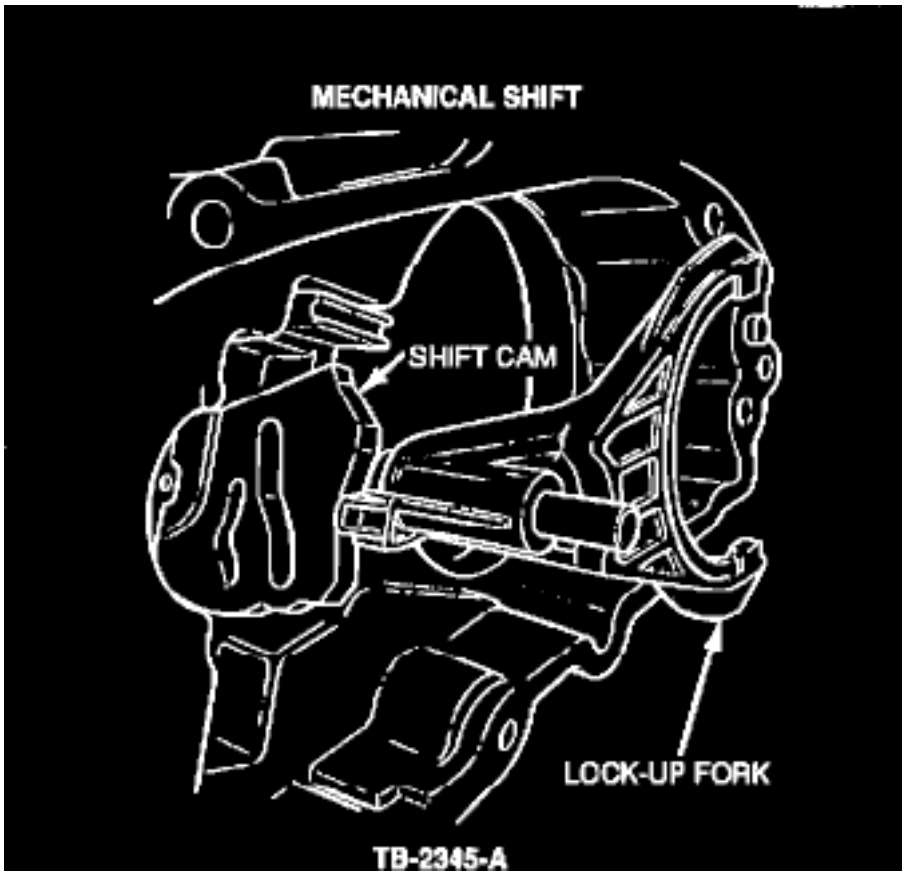
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

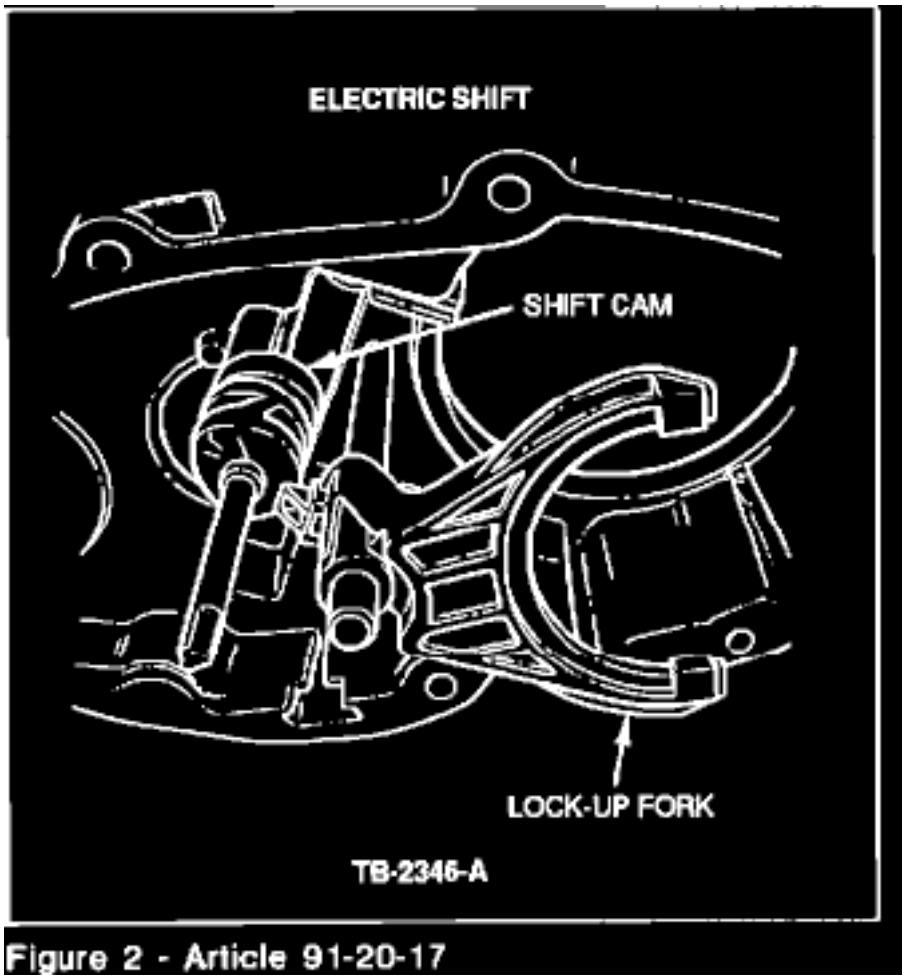


Figure 2 - Article 91-20-17

Figure 2

NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

EGTZ-7D126-A Sleeve Spring B

F1TZ-7289-D Lock-Up Fork B

OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

912017A Perform Initial Checks 0.5 Hr.

912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Ford Motor Company

October 2001

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77 Supplement 7:** 10/12/01 Updated Information

REFERENCE: **Owner Notification Program 01B77 – Ford Wilderness AT Program:** Replacement of Wilderness AT tires

PROGRESS TO DATE

- To date we have replaced close to 7 million tires or 55% of the total tires needed
- Ford and Mercury dealers are currently handling over 70% of all Wilderness AT replacements
- All tire sizes are now readily available, though certain brands may not be available

The following information has been updated for ONP 01B77:

CHANGES MADE TO THE ALL DEALER LETTER

- ONP 01B77 – Ford Wilderness AT program will expire on March 31, 2002
- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- All customers who have not had their tires replaced will receive a follow-up letter by the end of October, 2001 announcing these program changes and encouraging them to visit a Ford Motor Company dealership for tire replacement
- 1995 and 1996 F-150 customers, which were added to the program on August 17, 2001, will receive their first notification letter by the end of October, 2001, which includes the following:
  - The customer must have their tires replaced at a Ford Motor Company dealer
  - They will only be eligible for refunds if they purchased their tires between August 1, 2000 through October 31, 2001

    NOTE: Refunded at actual cost and no DOT sections required, since these customers were never notified of the DOT requirements and maximum dollar limit.
- Effective immediately all tire refund requests are to be processed through the dealer (Online Refund Form should no longer be used)

CHANGES TO ATTACHMENT I

- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- The Online Refund Form used for refunds before May 22, 2001 is no longer posted on the web

CHANGES TO ATTACHMENT II

- Wait List Survey link added
- A procedure has been added to handle customers who purchase tires after November 15, 2001 and are seeking a refund

All revisions since Supplement 6 are in *red italics* and revised pages have been marked "*Revised10/12/01.*"

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Technical Service Bulletin # 01B77 Date: 011001

Ford Motor Company

May 2001
Revised 10/12/01

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77-S7 – Ford Firestone Wilderness AT Program:** Replacement of Firestone Wilderness AT tires.

OASIS: Yes
OWNER LIST: Yes
PARTS RETURN: No
PROGRAM TERMS: This program will expire *March 31, 2002* and has no mileage limit.

WHAT WE ARE DOING AND WHY

On August 9, 2000 Firestone initiated a voluntary recall of 6.5 million tires, including 3.8 million P235 75R15 Radial ATX tires manufactured since 1990 at all North American Firestone plants. Also, Firestone recalled about 2.7 million P235 75R15 Wilderness AT tires made at its Decatur, Illinois plant. The recall included both original equipment and replacement tires. As of January 22, 2001 more than 6.1 million tires have been replaced – the recall is more than 94% complete.

Under this new owner notification, Ford will replace 13 million Firestone Wilderness AT tires on Ford and Mercury SUVs and pickup trucks listed below under "affected tires and vehicles." This is a voluntary precautionary measure. Ford made the decision to take this action after extensive examination of field data as well as laboratory and track testing in close collaboration with NHTSA. The field data, along with our testing and statistical analysis, shows a directional trend toward elevated failure rates, that differs based upon where the tires were manufactured. Ford does not have sufficient confidence in the future performance of these tires, so we are acting in the interest of our customers to ensure their continued trust and confidence.

To date we have replaced close to 7 million tires or 55% of the total tires needed for this program. Ford and Mercury dealers are currently handling over 70% of the Wilderness AT tire replacements. Also, with the increased availability of all 15-, 16-, and 17-inch tires at the dealers, Ford is changing the expiration date of the program to March 31, 2002 to encourage customers to have their tires replaced as soon as possible.

NOTE: Certain brands of tires may have limited availability.

AFFECTED TIRES AND VEHICLES

This program affects 15-, 16-, and 17-inch Firestone Wilderness AT tires and Ford and Mercury vehicles with these tires on them. The vehicles listed below may have been originally equipped with Firestone Wilderness AT tires or may have had Wilderness AT tires installed during the Firestone recall launched in August, 2000.

- Certain 1991 through 2002 Ford Explorer
- Certain 2001 through 2002 Explorer Sport, and Sport Trac
- Certain 1997 through 2002 Mercury Mountaineer
- Certain 1991 through 2001 Ranger
- Certain 1999 through 2001 Expedition
- Certain 1991 through 1997 F-Series
- Certain 1991 through 1994 Bronco

NOTE: Both original equipment (OE) and replacement tires are affected.

IMPORTANT FACTS

- *Ford Wilderness AT tire program will expire on March 31, 2002.*
- *Tires purchased by customers after November 15, 2001 will no longer be eligible for a refund.*
- *A follow-up owner letter announcing program changes will be mailed beginning the week of October 17, 2001.*
- *1995 and 1996 F-150 owners, which were added to the program on August 17, 2001, will be notified by the end of October 2001.*
- All 15-, 16-, and 17-inch Firestone Wilderness AT tires (regardless of series number) that are mounted on Ford or Mercury vehicles are eligible for replacement
- All other Firestone Wilderness AT tire sizes are not included in this program.
- AtW/Ford Tire Program dealers are to stop the sale of Firestone Wilderness AT tires in their parts inventory effective immediately.
- Ford Motor Company has notified customers of this owner notification program via first class mail.
- Customer refunds will be handled differently based on whether the tires were purchased before or after May 22, 2001.
- *Effective immediately all refunds will be processed through the dealer for customers who purchased their tires from August 1, 2000 through November 15, 2001, (Online Refund Form should no longer be used).*
- *1995 and 1996 F-150 owners will only be eligible for refunds for tires purchased between August 1, 2000 and October 31, 2001, (no DOT sections required).*
- A list of Ford-approved replacement tires is posted on QCDealer. Only these tires may be used as replacement tires for vehicles that were originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires under this program.
- There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.
- **Vehicles with branded titles** - although normally excluded from Owner Notification Programs are included as part of this program.
- Affected vehicles sold in Canada can be serviced by U.S. dealers, and affected vehicles sold in the U.S. can be serviced by Canadian dealers.

STOP SALE OF FIRESTONE WILDERNESS AT TIRES IN DEALER STOCK

Firestone Wilderness AT tires in stock at Ford and Lincoln Mercury dealers enrolled in the Around the Wheel or Ford Tire Program (Certified Tire Dealers) should not be sold. Dealers that purchased these tires through the Ford program and have them in stock should complete the *Unsold Wilderness AT Credit Form* located on QCDealer.com. If you have questions, call the Ford Tire Hotline at 1-888-353-3251 for disposal and credit information.

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

Non-Certified Tire (AtW or Ford Tire Program) Dealers who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program) or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "**SCHP**" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

SERVICE PROCEDURE

All 15-, 16-, and 17-inch Firestone Wilderness AT (regardless of series number) tires installed on Ford and Mercury vehicles must be replaced under this owner notification program. Original equipment (OE) and replacement tires are included.

Spare Tires

Firestone Wilderness AT (regardless of series number) spare tires are affected and should be replaced. The Firestone P235 75R15 ATX temporary spare tire used on Ranger vehicles is not included in this program.

Note: Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

Note: When processing refunds for customers, inspect the spare tire; if the spare tire is a Firestone Wilderness AT (with the Ranger exception noted previously) replace the spare tire using the information provided on Attachment II.

Does Current Tire Condition Affect Replacement Procedure?

All affected tires should be replaced regardless of the mileage or the remaining tread on the tire. If the customer caused damage to the tires, i.e. hit a curb, accident, under inflation, alignment issues, the tire should still be replaced. If the tire is worn out, it should still be replaced.

What if the Vehicle has a Mix of Affected and Non-Affected Tires?

- If the spare tire is the only Wilderness AT, then only the spare should be replaced (see exception on temporary spares above).
- In most cases an owner's vehicle will have all 15-, 16-, or 17–inch Firestone Wilderness AT tires installed and require replacement of all tires. In cases where a vehicle has a mix of tire brands/sizes installed, replace all Firestone Wilderness AT tires and the remaining tires to match the tire brand and size by axle.

For example, if a vehicle has a Wilderness AT on the left front, a Wilderness AT on the right rear, a Wilderness AT for a spare, and the other two tires are not Wilderness AT; the spare and the left front and right rear should be replaced and the new tires should be installed on the same axle. The customer should also be advised that all tires should be the same size especially on 4 X 4 models.

What replacement tires may be used for vehicles originally equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires?

Replacement tire(s) must be on the list of tires approved by Ford <link to approved tire list>. Any deviation from this approved list may change the vehicles handling, ride, vibration, and noise characteristics and cannot be claimed through Ford.

If customers are seeking reimbursement for tires purchased outside of a Ford Certified Tire Dealer, refer to Attachment I for reimbursement guidelines and claiming procedures. *Customers who purchase tires after November 15, 2001 are not eligible for a refund.*

Note: There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

Note: "Blemished" tires may not be used as replacement tires under this program.

FORD AND LINCOLN MERCURY DEALER TIRE DISPOSAL PROCESS

- Tires that are removed from vehicles must immediately be made unusable by either cutting the bead through the DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request. Marking the last 6 characters of the VIN on the removed tire(s) is no longer required.
- The tires will be disposed of by using the "National Tire Recovery and Recycle Program".

Regional FCSD and independent personnel will be randomly auditing dealers for proper tire scrapping and claiming procedures. Any infractions will result in prior approval for tire owner notification claims.

Note: Make removed tires unusable during tire replacement. Do not stack tires and disable them at a later time.

DEALERSHIPS ELIGIBLE TO REPLACE TIRES UNDER THIS PROGRAM

All Ford and Lincoln Mercury dealers enrolled on the Around the Wheel or Ford Tire Program (Certified Tire Dealers) are eligible to complete tire replacements under this program.

Ford dealers interested in joining the Ford Tire Program may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

APPROVED RETAILERS PARTICIPATION IN PROGRAM

We have developed a program to authorize Goodyear, Michelin, Continental, and General tire retailers to perform tire replacements at no cost to customers. These eligible retailers will use only tires from the Ford Approved Tire List when performing no cost replacements. This was done to reduce customer inconvenience by:

- Eliminating customer out of pocket expense
- Maximize the number of customers whose replacement tires are those on the Ford Approved tire list
- Expedite the completion of this program
- Reduce administrative burden on our Ford and Lincoln Mercury dealers
- Reduce dealer tire disposal responsibility
- Allow dealers to continue with their normal day to day service business

ATTACHMENTS

Attachment I:	Administrative Information
Attachment II:	Labor Allowances and Parts Ordering Information
Attachment III:	Technical Information

CONTACTS

Claims Information:	1-800-423-8851
For Around the Wheel/Ford Tire Program Questions:	1-888-353-3251
Ford Tire Inquiry Hotline (Customer):	1-866-300-1226
Other (Dealer Only) Program Questions:	1-800-325-5621
Tire Registration for Federal Regulations Questions:	1-330-794-9190

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Attachment I - Administrative Information

OASIS

OASIS must be used to determine vehicle eligibility.

IMPORTANT:

When an eligible vehicle is at the dealership for service, OASIS must be contacted to determine if Owner Notification Program 01B77 is open. If 01B77 is listed in OASIS as open, it is important that the vehicle is inspected for eligible tires. If the eligible vehicle is not equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires a claim must be submitted using labor operation 01B77A to close the program. If an affected vehicle does not have 01B77 open, this may indicate that a refund

or tire replacement has already been processed on this vehicle.

Some Ford and Lincoln Mercury vehicles not listed in the AFFECTED TIRES AND VEHICLES list may have 15-, 16-, or 17-inch Firestone Wilderness AT tires installed. These vehicles are covered under this program, but will not be active in OASIS. Contact the Special Service Support Center at 1-800-325-5621 to obtain prior approval before performing the repair or issuing a refund. This will insure that a previous repair/refund has not been performed on the vehicle.

CLAIMS PREPARATION AND SUBMISSION

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ Enter the full part number of the replacement tire with the quantity of tires replaced. Tires will be reimbursed at AtW Dealer cost + 25% (wheel weights and valve stems incl.).

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier. Dealers are encouraged to arrange for shipment of 4 or more tires at a time.

^ Dealers can no longer claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program". You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires on the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry.

RELATED DAMAGE

Vehicle damage caused by a tire related failure is not covered by this program. Refer to the Warranty and Policy Manual for proper claiming procedure for vehicles covered by the Ford Bumper-to-Bumper Tire Warranty (model years 2001 and 2002). All other pre-2001 model year vehicles with alleged tire related vehicle damage should be handled through the Firestone claims process, or by referring the customers to their insurance company.

Damage related to replacement of tires should be handled as described in the Warranty and Policy Manual.

OWNER REFUND

With the increased availability of replacement tires, it will no longer be necessary for customers to pay out-of-pocket expenses for tires. Therefore, refund requests for tires purchased after November 15, 2001 will no longer be granted. Owners will be notified of the refund expiration date and will be directed to a Ford or Mercury dealer They are directed to an authorized retailer only if the Ford or Mercury dealer cannot meet their scheduling needs or tires are not in stock. All Ford and Mercury dealers (AtW and non-AtW dealers) are required to process refunds for customers who purchase tires prior to November 15, 2001.

The following rules apply to refunds for tires purchased from August 1, 2001 through November 15, 2001:

Refunds will be processed for vehicles listed under "AFFECTED TIRES AND VEHICLES", and for other Ford and Lincoln Mercury vehicles that have 15-. 16-, or 17-inch Wilderness AT tires installed.

^ The customer must provide the original paid receipt (a copy of their paid receipt is acceptable on an exception basis in instances where the owner requires the original for another purpose (e.g. extended tire warranty or purchase rebate). The dealer will attach the receipt to the dealer file copy of the refund claim (see claim instructions below).

^ Dealers will be reimbursed to immediately disable tires returned for a refund (see claiming instructions for refunds and Attachment II for labor operations).

^ The tires must be purchased August 1, 2000 through November 15, 2001 to be eligible for a refund (through October 31, 2001 for 1995 and 1996 F-150 owners).

^ Customers requesting refunds for tire replacement May 22, 2001 through November 15, 2001 must provide either:

NOTE:

This does not apply to 1995 and 1996 F-150 customers.

^ The Firestone Wilderness AT tires that were replaced. Returned tire(s) are to be disabled by the dealership. Ford will reimburse the dealer to disable (see claim instructions below and use labor operation 01B77G). If tires are brought in for refund with the DOT codes missing dealers should not process the refund.

^ A section of the old tire(s) containing the DOT codes from each of the Firestone Wilderness AT tires that were replaced (To be cut from the Wilderness AT tires that were replaced by the outside repair facility) (use labor operation 01B77L). Dealers should deface (cut in pieces or make code unreadable) the DOT sections of the tire so they cannot be used to obtain another refund. If sections are brought in for refund with the DOT code defaced dealers should not process the refund.

NOTE:

The DOT Code Identification Guide has been developed to help dealers determine if the DOT sections returned to the dealership are from 15-, 16-,

Purchase Date Range	Refund Guidelines
August 1, 2000 through May 22, 2001	• The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
1995 and 1996 F-150 vehicles only *August 1, 2000 through October 31, 2001*	• *The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes (no DOT required)* • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
May 23, 2001 through November 15, 2001	• 15 inch tires - $110 (includes mounting, balancing, stems, disposal, and taxes) • 16 and 17 inch tires - $130 (includes mounting, balancing, stems, disposal, and taxes) • Dealers process refunds
After November 15, 2001	• *No refunds accepted for tires purchased after November 15, 2001*

Refund Questions	What is the owner qualified to receive?
Example: On December 21, 2000 the customer paid to have (4) Firestone Wilderness AT tires replaced on an affected vehicle.	o August 1, 2000 through May 22, 2001 (October 31, 2001 for 1995 and 1996 F 150) full refund with paid receipt o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
Example: On January 15, 2001 the customer paid to have (2) Wilderness AT tires replaced on a 1988 F-Series truck. The other tires are non-Firestone Wilderness AT.	o August 1, 2000 through May 22, 2001 – full refund with paid receipt o Dealer contacts Special Service Support Center at 1-800-325-5621 for approval code o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

or 17-inch Firestone Wilderness AT tires. Use the DOT Code Identification Guide in conjunction with the bulletin section "What if the Vehicle has a Mix of Affected and Non-Affected Tires" to determine how many tires are eligible for refund.

NOTE:

Ford will allow customers to file for a refund (with or without tires) for tires purchased after May 22 through June 30, 2001 because customers may not have tires to turn in. Customers must provide a paid receipt indicating tire replacement before July 1, 2001 in order to process a refund without tires or DOT sections. Customers who purchase tires after June 30, 2001 must provide tires or DOT sections.

Ford will reimburse customers the following amounts:

^ Tires purchased from August 1, 2000 through May 22, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes.

^ (1995 and 1996 F-150 vehicle only) Tires purchased from August 1, 2000 through October 31, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes. No DOT section required.

^ Tires purchased May 23, 2001 through November 15, 2001, the actual cost as stated on the receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes up to a maximum of $110 per tire for 15 inch, and $130 per tire for 16 and 17 inch tires.

^ Refunds will not be granted for tires purchased after November 15, 2001.

Note:

If an owner pays for the replacement of their tires after November 15, 2001, the dealer may handle on a case by case basis following the procedure in Attachment II.

Refund Questions	What is the owner qualified to receive?
Example: On May 27, 2001 the customer took their 1998 Explorer to an outside tire retailer and had (5) Firestone Wilderness AT 16 inch tires replaced.	o After May 22, 2001 refund tire replacement with paid receipt up to: o 15 inch = $110 (maximum per tire) o 16 and 17 inch = $130 (maximum per tire) o With a paid receipt this customer would be entitled to (5) tires x $130 (16 inch maximum per tire) = $650 refund (includes mounting, balancing, stems, disposal, and taxes) o Dealer will be eligible to claim for refund allowance using labor operation 01B77L o If the customer returns the old tires to the dealer o The dealer will disable the old tires and dispose of them using the *"National Tire Recovery and Recycle Program"* using labor operation 01B77G (disable) in conjunction with 01B77L (refund allowance) o Customer does not need old tire(s) *since tires purchased prior to July 1, 2001* (After June 30, 2001 customer will need old tires or removed DOT codes from replaced tires to qualify)
Example: On December 2, 2000 the owner replaced their (5) Firestone Wilderness AT tires with another set of Wilderness AT tires.	o The owner is not eligible for refund o The owner is eligible for tire replacement only o Use only tires from the "Ford Approved Tire List"
Example: *On November 16, 2001 the owner purchases tires from a tire retailer.*	o *No refund will be granted after November 15, 2001* o *Dealers may handle on a case-by-case (See Attachment II)*
Example: *On October 10, 2001 a 1995 F-150 owner purchases tires from a tire retailer.*	o *August 1, 2000 through October 31, 2001 – full refund with paid receipt* o *Customer does not need old tire(s) or DOT section(s)* o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

CLAIMS PREPARATION FOR REFUNDS (USE THIS PROCEDURE FOR ALL REFUND REQUESTS)

NOTE:

Tires must be purchased prior to November 15, 2001

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ When a customer brings in their old tires and is seeking a refund, use labor operation 01B77G (disable) and 01B77L (refund administration allowance) from Attachment II.

^ If a customer brings in the old DOT codes removed from the old tires - use labor operation 01B77L only.

^ The Miscellaneous Expense Code "ADMIN" will not be accepted under this program. A labor operation 01B77L has been provided to cover administrative costs.

^ Enter REFUND in the miscellaneous area of the claim.

^ Dealers will no longer be able to claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program" You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires in the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry. If the tires were replaced prior to May 23, 2001 (or November 1, 2001 for 1995 and 1996 F150 customers) the DOT may not be available, in this case record the brand, make and size of the tires in the technician comments area of the claim.

RENTAL CARS

TAP allowances have been increased specifically for this owner notification program. Refer to Don Brunner letter.

DOT REGISTRATION OF NEW TIRES

Dealers are required to register the DOT number of every tire sold to meet federal tire registration requirements. Ford has established a partnership with CIMS to assist dealers in registering these DOT codes. Information is available on QCDealer.com under CIMS Tire Registration or by contacting CIMS

Description	Labor Operation	Labor Time
Inspect for non-Wilderness AT tires (used to close 01B77 not for use when processing a refund)	01B77A	0.2 Hours
Replace & balance 1 tire (to be used for spare tire only)	01B77B	0.4 Hours
Replace & balance 2 tires (one axle)	01B77C	0.6 Hours
Replace & balance 3 tires (one axle plus spare)	01B77D	0.8 Hours
Replace & balance 4 tires (both axles)	01B77E	1.0 Hours
Replace & balance 5 tires	01B77F	1.2 Hours
Disable up to five tires (used only for refund claims)	01B77G	0.2 Hours
*Refund administration allowance (to be used when processing a customer refund without tire disposal, if tires are returned to dealership for disposal use in conjunction with operation 01B77G)	01B77L	0.2 Hours
Administrative Allowance for Non-Certified Tire Dealers (AtW or Ford Tire Program) to be used when sending a dealer stock unit, or customer vehicle (for tire replacement) to a Certified Tire Dealer, or tire retailer authorized to perform tire replacement under this program	Misc. Expense use code "SCHP"	$15.00

NOTE: Front-end alignment is not included in this program.

***NOTE:** When processing a refund for four (4) road tires, the non-temporary spare tire should be replaced as part of this program – file a related damage claim to cover the spare tire replacement.

at 330-794-9190.

NON-FORD OR LINCOLN MERCURY VEHICLES WITH FIRESTONE WILDERNESS AT

Non-Ford or Lincoln Mercury vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires installed by a Certified Tire Dealer (AtW or Ford Tire Program) are eligible for replacement. The repair should be submitted using a Warranty/ESP claim type form. The dealer must enter Program Code "P19", this will allow the repair to be submitted without a VIN. The causal part must be TIRE, with the actual part numbers for reimbursement at dealer cost plus 25%, and use actual time for labor reimbursement. These types of claims cannot be submitted as an Owner Notification Repair type.

Attachment II - Parts and Labor Information

LABOR ALLOWANCES

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

NOTE:

Non-Certified Tire Dealers (AtW or Ford Tire Program) who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program), or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "SCHP" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

PARTS REQUIREMENTS

Tire Ordering Information

^ Dealers are required to install only tires from the Approved Tire List for vehicles originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires. Dealers should immediately order replacement tires for inventory.

^ Certified Tire Dealers will order replacement tires through normal channels.

^ Dealers not authorized for the Around the Wheel Program will not participate in this recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

TIRE AVAILABILITY:

All dealers should check QCDealer.com daily for updates to the approved tires list. Distributors and tire retailers will allocate tires as best they can on a daily basis. Your dealership should do the following to ensure that you are able to secure your fair allotment of these limited volumes:

^ Contact your Ford authorized facing distributor(s) for each tire manufacturer.

^ Contact your Ford authorized facing tire retailers for each tire manufacturer.

^ Review with these supply points the volume of tires you need to ensure you have tires ready to fill orders with every supply point.

Questions not addressed by above sources should be directed to your market area team.

CUSTOMER WAIT LISTS:

Dealers should create a customer wait list and record: Customer name

^ Address and phone number

^ Vehicle make

^ Model year

^ Mileage

^ Tire size

NOTE:

Customers should be prioritized to replace oldest tires first.

WAIT LIST SURVEY

Please fill out the Firestone Tire Survey in the Management Report Section of QCDealer weekly. It is critical that you answer the questions as accurately as possible as the survey results will be used to help determine the level of production from the tire manufacturers.

DEALER PRICE

For latest prices on replacement tires, refer to the most recent Ford Motor Company Tire Price List.

PROCEDURE FOR CLAIMING REFUNDS FOR TIRES PURCHASED AFTER NOVEMBER 15, 2001

The following procedure applies to tires purchased after November 15, 2001:

1. Determine if the customer should receive special consideration based on owner loyalty, special circumstance cc, etc.

2. If the customer is eligible for special consideration the dealer will call the Special Service Support Center at 1800-325-5621 to request an authorization code.

3. The Special Service Support Center representative will ask for the following:

^ Customer Name

^ VIN

^ Date of repair

^ Original copy of invoice (be prepared to fax)

4. If the customer qualifies for a refund, the Special Service Support Center will provide your dealer with an authorization code.

5. Your dealer will input a claim with the authorization code (authorization code must be included to receive payment).

6. After the dealer receives payment for the claim, the dealer will then send the refund to the customer.

NOTE:

If the Special Service Support Center determines that the customer does not qualify for a refund, no authorization code will be given. Any appeals must be made by the dealer to the appropriate field representative

Attachment III - Technical Information

AFFECTED VEHICLES: REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES

OVERVIEW

This program details the replacement of 15-, 16-, and 17-inch Firestone Wilderness AT tires regardless of production plant. You will need to perform a DOT code inspection prior to replacing the 15, 16, or 17-inch Wilderness AT tires.

NOTE:

When lowering or raising an under-vehicle spare, DO NOT use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

NOTE:

Radial ATX "TEMPORARY USE" spare tires are not included under this program, and should not be replaced as part of this program.

NOTE:

Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

INSPECTION

1. Inspect the vehicle tires (including the spare tire) for the presence of Firestone Wilderness AT tires.

2. If Firestone Wilderness AT tires are present replace them with a suitable replacement from the "Approved Tire List".

Note:

There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

3. If only one Firestone Wilderness AT road tire is present on the vehicle, you will need to replace the opposing tire on the same axle. However, if one (1) front and one (1) rear tire are Wilderness AT you would not automatically replace all four (4) tires instead, you would replace the two (2) Wilderness AT tires and place them on the same axle.

4. Record the DOT code from each removed tire(s) on the repair order.

5. Tires that are removed from vehicles must immediately be made unusable by either cutting through the bead and DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall.

6. Adjust all tires to the proper inflation pressure, and release the vehicle. For specifications, refer to the vehicle Owner's Manual or the vehicle certification label located on the driver's door opening.

NOTE:

Tires that are removed from vehicles under this program, and those in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request.

NOTE:

If the vehicle is a 4X4, and is equipped with non-Firestone Wilderness AT tires on one axle, and the replacement tires for the Firestone equipped axle causes a mismatch with the existing non-Firestone axle, the customer is responsible for the tire mismatch. If the customer refuses to purchase matching tires to correct the mismatch - the dealer should annotate the repair order to reflect the customer's decision.

Ford Motor Company

FIRESTONE TIRE RECALL

September 2000

TO: All Ford and Lincoln Mercury Dealers
SUBJECT: Firestone Tire Recall Supplement #4 9/1/00 - Updated Information
REFERENCE: Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires

Changes for this Supplement:

- The following has been added to Attachment I to clarify the claiming of freight: Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.
- Additional information is now required in the comments of each claim filed for tire replacement under both Program Codes P17 and P18. The comments must include the entire DOT code from the tire being replaced and under P17 only the part number of the replacement tire. Firestone requires this information for government reporting.

Claims under the Firestone recall for tire replacement filed by Ford and Lincoln Mercury dealers not enrolled in the AtW/Ford Tire Program will not be accepted for payment. Non-AtW/Ford Tire Program dealers will continue to be able to file claims for tire inspection. This is not new information; we have just added the edits to the ACES II system.

The revised letter and attachments have been marked "Revised 9/1/00", and a ( ) symbol appears at the beginning of any text that changed since the last Supplement and the text appears in green when viewed on line. To avoid confusion please discard all previous versions.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Technical Service Bulletin # FIRESTONE Date: 000901

Dealer Letter

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: DEMONSTRATION / DELIVERY HOLD - Firestone Tire Recall: Certain 1991 through 2000 Explorer, 1997 through 2000 Mountaineer, 2001 MY Explorer Sport Trac and Sport, 1991 through 2000 Ranger, 1991 through 1994 Bronco and 1991 through 1994 F-Series - Replacement of Firestone P235/75 R15 Radial ATX and Certain Wilderness AT Tires.

REFERENCE:

Model Year	Body Style	Tire/Wheel Size
1991 - 1994	ALL	15"
1995 - 1998	ALL (Excluding Eddie Bauer and 2-door Sport if equipped with 16 inch wheels)	15"
1999 - 2001	ALL (Excluding Eddie Bauer and Limited Editions if equipped with 16 inch wheels)	15"

Model Year	Body Style	Tire/Wheel Size
1995 - 1998	Eddie Bauer	16"
1996 - 2001	Sport and any 2-door Sport 4X4 w/Premium Sport Package	16"
1999 - 2001	Eddie Bauer and Limited	16"

Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires.

AFFECTED TIRES AND VEHICLES

Bridgestone Firestone Tire Company recently announced a Safety Recall on the following:

- All Firestone P235/75 R15 Radial ATX tires produced excluding tires marked "TEMPORARY" on the sidewall - and -

- P235/75 R15 wilderness AT tires produced only at the Decatur plant.

NOTE:

Decatur built tires have a DOT code of VDHL - see Attachment III for details. All other Wilderness AT tires are not affected.

Both original equipment (OE) and replacement tires are affected.

The following vehicles produced with Firestone P235/75 R15 Radial ATX original equipment tires are affected by this recall:

^ Certain 1991 through 1996 Ford Explorer (see chart)

^ Certain 1997 Mercury Mountaineer vehicles

^ Certain 1991 through 2000 Ranger vehicles

^ Certain 1991 through 1994 Bronco vehicles

^ Certain 1991 through 1994 F-Series vehicles

The following vehicles produced with P235/75 R15 Wilderness AT tires as original equipment are affected by this recall:

Certain 1997 through August 7, 2000 Mountaineer vehicles

^ Certain 1997 through August 7, 2000 Explorer vehicles (see chart)

^ Certain 1997 through June 1, 2000 Ranger vehicles

^ Certain 2001 Explorer Sport Trac and Sport vehicles produced through August 7, 2000

These Explorer vehicles produced with either P235/75 R15 Radial ATX or P235/75 R15 Wilderness AT tires as original equipment are affected as shown.

These Explorer vehicles are NOT affected:

IMPORTANT FACTS

^ This is a FIRESTONE recall.

^ FIRESTONE will notify customers of the recall via first class mail.

^ FIRESTONE will communicate recall information to authorized repair sites including Ford and Lincoln-Mercury Around the wheel/Ford Tire Program dealers.

FORD AND LINCOLN MERCURY DEALER INVOLVEMENT

As this field action will severely impact the availability of Firestone replacement tires, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers will be afforded the opportunity to address this recall utilizing Firestone and non-Firestone tires. This is being done to address immediate needs of our customers.

FORD AND LINCOLN MERCURY DEALERS ENROLLED IN AROUND THE WHEEL (AtW)

Dealerships enrolled in the AtW/Ford Tire Program are authorized Firestone outlets. If a customer with affected tires contacts an ATW Ford Tire Program dealer, as an authorized Firestone dealer regarding this safety recall, you will be able to replace that customer's tires with Firestone or "approved" non-Firestone tires. Tires that are approved for use as replacement tires under this recall will be posted in a matrix in the Firestone Tire Center in QCDealer.com. This matrix will be amended to add new tire manufactures and models of tires as they are approved. Claiming for reimbursement of tires is outlined on Attachment I.

If the customer requests a replacement Firestone tire, secure the tire through your normal distribution chain and process reimbursement as outlined in Attachment I.

FORD AND LINCOLN MERCURY DEALERS NOT ENROLLED IN AROUND THE WHEEL (AtW)

Dealers not enrolled in the ATW/Ford Tire Program can inspect customer vehicles (see Attachments I & II for claiming instructions & labor operations). These dealers should make individual arrangements with local Firestone outlets for tire replacement, or refer customers to their local Firestone outlet.

SERVICE PROCEDURE

All Firestone P235/75 R15 tires with Radial ATX on the sidewall (excludes Temporary spare tires identified by "Temporary" on the sidewall) must be replaced under this recall.

Firestone P235/75 R15 tires with Wilderness AT on the sidewall will need to be inspected for a DOT code of VDHL to determine if replacement is required. Refer to Attachment III for details.

This service action applies to original equipment and replacement tires that are installed on Ford and Mercury vehicles.

DEMONSTRATION / DELIVERY HOLD FOR VEHICLES AND TIRES IN DEALER INVENTORY

Do not demonstrate or deliver any of the affected vehicles prior to completing the Firestone recall. In addition, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers may have affected tires in inventory; these tires should not be sold.

Tires Removed from Vehicles

Tires that are removed from vehicles must immediately be made unusable by either cutting the bead with bolt cutters, drilling a one-inch diameter hole in the sidewall, or cutting the tire completely in half The DOT code should not be defaced or removed. The tire should then be disposed of according to local laws refer to the Tire Administration Guide for further information.

NOTE:

AtW/Ford Tire Program dealers will be independently audited for compliance with the above procedure.

New Inventory Tires

All new Radial ATX or Wilderness AT tires with DOT code VDHL tires (never mounted) in AtW/Ford Tire Program dealer inventory must be returned to Firestone. Dealers must call 1-800-668-0345 to obtain a "Returned Goods Authorization (RGA) number. The RGA is a 6-digit number required to return the tires. Only tires affected by the Firestone recall will be accepted. Firestone will pay all freight for the return of these tires.

ATTACHMENTS

^ Attachment I ^

Administrative Information

^ Attachment II ^

Labor Allowances

^ Parts Ordering Information

^ Attachment III ^

Technical Information

^ Attachment IV ^

Tire Inspection Aid

^ Attachment V ^

Tire Inflation Guide

CONTACTS

Claims Information: 1-800-423-8851

Other (Dealer Only) Recall Questions: 1-800-325-5621

For Around the Wheel/Ford Tire Program 1-888-353-3251

Questions:

Attachment I

OASIS Since this is a Firestone recall, OASIS will not be activated.

PLEASE NOTE

Correct all vehicles in stock before delivery. Federal law requires dealers to complete any outstanding safety recall service before a vehicle is delivered to the buyer or lessee. Violation of this requirement by a dealer could result in a civil penalty of up to $1,100 per vehicle.

CLAIMS PREPARATION AND SUBMISSION

NOTE:

Claims for Firestone tires (P18) may be entered for payment beginning with repairs dated August 28, 2000 and later.

Claims for non-Firestone tires

Enter claims in ACES II for non-Firestone tires using DWE with the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Program Code - P17. Enter P17TIRE as the causal part with condition code 82.

^ On the same line as PI7TIRE enter the total value of the tires from the "Suggested List Price" column of the latest Ford Motor Company Tire Selling Guide.

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.

^ Tire disposal and applicable local waste tax will be reimbursed - enter OTHER in the miscellaneous expense area of the claim with the actual cost.

^ Enter the entire DOT code and the part number of the replacement tire being used in the comments area of the claim.

Claims for Firestone tires

Enter claims in ACES II for Firestone tires using the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim type.

^ Program Code - P18.

^ Enter "P18TIRE" as the causal part, no material cost should be entered on this line.

Description	Labor Operation	Labor Time
Inspect 5 tires applies only to P235/75 R15 Wilderness AT tires) - VEHICLE NOT AFFECTED (Non VDHL DOT Code)	00V01G	0.2 Hours
Inspect 5 tires (applies only to P235/75 R15 Wilderness AT tires) - VEHICLE AFFECTED - Customer must return at a later date due to unavailability of replacement tires. This may be claimed only one time per vehicle per dealer.	00V01A	0.2 Hours
Replace & balance 1 tire (No longer includes inspect) May be used with labor op 00V01A only	00V01B	0.4 Hours
Replace & balance 2 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01C	0.6 Hours
Replace & balance 3 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01D	0.8 Hours
Replace & balance 4 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01E	1.0 Hours
Replace & balance 5 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01F	1.2 Hour

^ Condition code "82".

^ Use Customer Concern Code "A99".

^ Enter the full published tire part number with the quantity of tires replaced, the payment system will price the tire at Dealer Net multiplied by the quantity for the total value of the replaced tires.

^ Use Miscellaneous Expense Code "TIREMU" to claim the $20.00 difference per tire7 a maximum of $100.00.

^ The Firestone warranty claim form must be filled out and attached to the hard copy of the claim and retained in the service file. The entire DOT code from the replacement tire(s) must be recorded on this form.

^ The DOT code must also be entered in the comments area of the claim.

^ No labor operations will be allowed when claiming P18.

OWNER REFUND

Ford and Lincoln Mercury dealers, including AtW/Ford tire dealers; will not be involved in processing refunds for customers included in the Firestone recall. Customers inquiring about a refund should be provided copies of the Firestone refund request form. Refer to the Firestone website for the refund forms and for further details.

RENTAL CARS

TAP allowances have been increased specifically for the Firestone recall refer to M.J. Lombardi's Letter.

Attachment II

LABOR ALLOWANCES

NOTE:

Front-end alignment is not included in this recall.

NOTE:

These labor operations and revised times will begin paying with claims submitted on August 18, 2000; Claims in process at dealerships will need to use these new operations.

PARTS REQUIREMENTS

Tire Ordering Information

FIRESTONE TIRE INSPECTION

AFFECTED VEHICLES: **REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES**

OVERVIEW

This procedure outlines how to check the DOT code on the tires and determine if they must be replaced.

NOTE: All Firestone P235/75R15 tires that say "RADIAL ATX" on the sidewall are being recalled and no further inspection is necessary.

NOTE: All tires including the spare must be inspected if they are "WILDERNESS AT" P235/75R15.

NOTE: When lowering or raising an under-vehicle spare, **DO NOT** use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

INSPECTION

1. Raise vehicle on a hoist.
2. Locate the DOT code on the inboard sidewall of all tires including the spare. On F-Series and Bronco models, the spare tire must be lowered to view the DOT code. Clean the area if necessary in order to accurately read the code.
3. If the DOT code is **VDHL**, the tire must be replaced. See the matrix (part of the dealer bulletin) to determine the correct replacement tires. See Figure 1.

NOTE: Recall tires that are removed from vehicles and in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole in the sidewall.

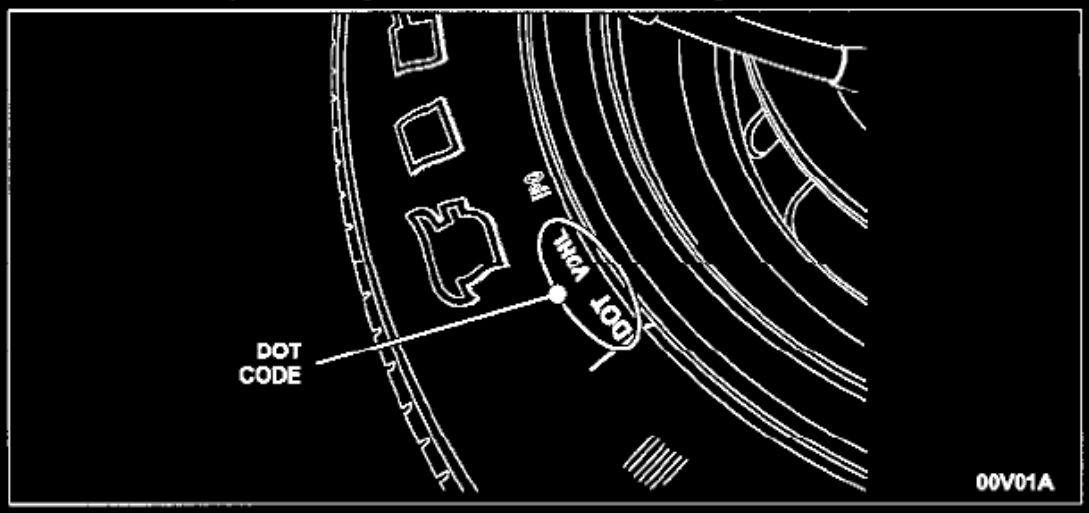

FIGURE 1

4. If the code is anything other than **VDHL**, release the vehicle to the owner.

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DEARBORN, MICHIGAN 48121
08/00

Authorized Around the Wheel (ATW)/Ford Tire Program dealers will order replacement tires through normal channels. Dealers not authorized for the Around the Wheel Program will not participate in the Firestone recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

DEALER PRICE

For latest prices on replacement tires refer to the most recent Ford Motor Company Tire Selling Guide.

TIRE INSPECTION

TIRES INVOLVED IN FIRESTONE RECALL

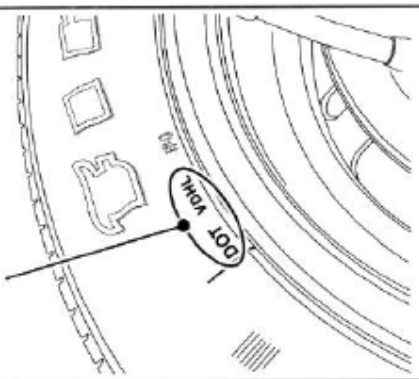
P235/75R15

ALL INCLUDED IN RECALL

P235/75R15

ONLY WITH DOT CODE VDHL

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL



DOT CODE

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL

TIRE DOT CODE CAN BE INSPECTED WITH VEHICLE ON GROUND

WARNING: IF RAISING THE VEHICLE TO INSPECT, DO NOT POSITION YOURSELF UNDER THE VEHICLE WITHOUT HAVING ADEQUATE SAFETY STANDS SUPPORTING THE WEIGHT OF THE VEHICLE. THE JACK PROVIDED FOR USE WHEN CHANGING A TIRE BY ITSELF IS NOT ADEQUATE FOR THE PURPOSE OF GETTING UNDER THE VEHICLE.

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Attachment V
Revised 8/16/00

Firestone Tire Recall

Replacement of Certain Firestone P235/75 R15 Tires

Tire Inflation Guide

AFFECTED BRAND	MODEL	FIRESTONE ATX	TIRE PRESSURE	FIRESTONE WILDERNESS	TIRE PRESSURE
		(MY)	(frt - rear) psi	(MY)	(frt - rear) psi
FORD	EXPLORER	91 - 96	26** - 26**	97 - 00*	26** - 26**
FORD	EXPLORER SPORT- 2DR.	91 - 96	26** - 26**	97 - 01*	26** - 26**
FORD	EXPLORER SPORTRAC	N/A	-	01*	28 - 35
FORD	RANGER	91 - 96	30 - 35	97 - 00*	30 - 35
FORD	F - 150	91 - 94	35 - 41	N/A	-
FORD	BRONCO	91 - 94	35 - 41	N/A	-
(I)MERCURY	MOUNTAINEER	N/A	26** - 26**	97 - 00*	26** - 26**
MAZDA	NAVAJO	91 - 94	26 - 26	N/A	-
MAZDA	B-SERIES PICKUP	94 - 96	30 - 35	97 - 00*	30 - 35

* Firestone Decatur, Illinois Plant only

** Ford approved range is 26 - 30 psi.

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Tires: All Technical Service Bulletins Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

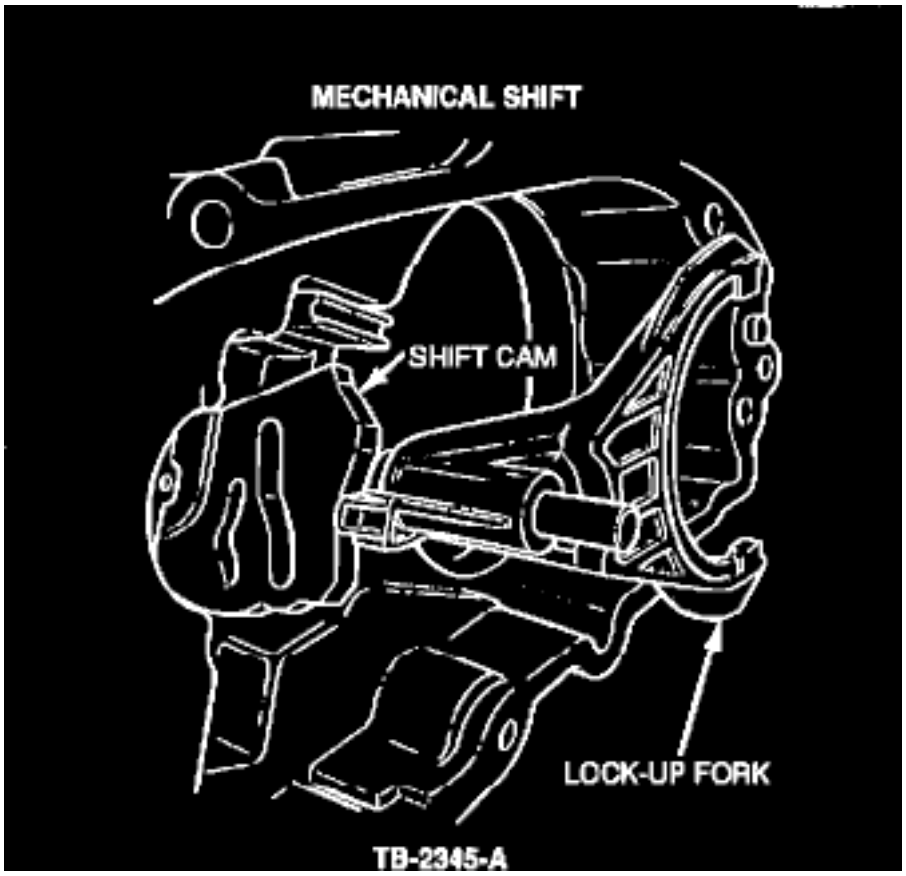
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

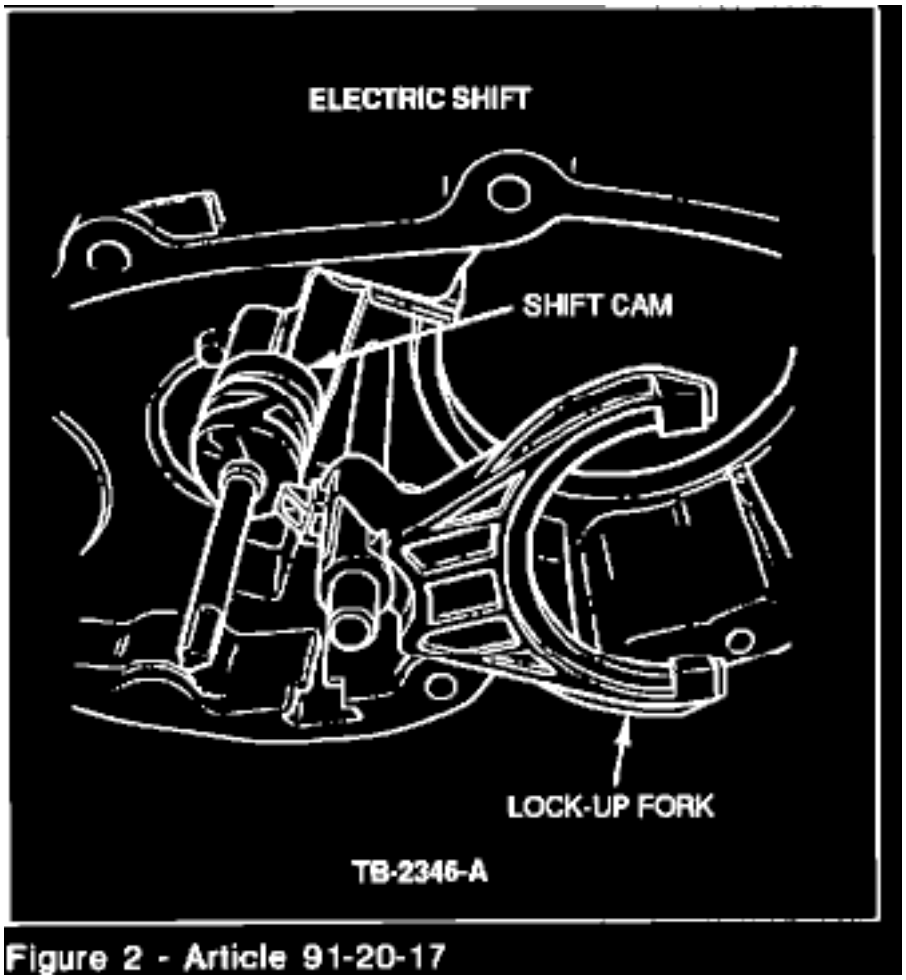


Figure 2 - Article 91-20-17

Figure 2

NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

F1TZ-7219-A Return Spring B

EGTZ-7D126-A Sleeve Spring B

F1TZ-7289-D Lock-Up Fork B

OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

912017A Perform Initial Checks 0.5 Hr.

912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Tires: All Technical Service Bulletins Transfer Case - Unable to Disengage 4WD Into 2WD

Article No. 91-20-17

10/02/91

TRANSFER CASE - 4X4 - UNABLE TO DISENGAGE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: The vehicle may remain in 4 Wheel Drive after the transfer case has been shifted back into 2WD. This may occur because of uneven tire wear, the front axle hubs not disengaging, or the return spring force not being sufficient to move the lock-up fork back to the 2WD position.

ACTION: Inspect the vehicle tires for wear and, if necessary, replace the return spring, sleeve spring and lock-up fork in the transfer case.

INITIAL CHECKS

1. Rotate the tires and check for evidence of an uneven wear band or spots.

2. Set the tire pressure as specified on the safety compliance certification label.

3. Confirm that the tires are matched in design, size and manufacture.

4. Confirm by hand rotation that the front axle automatic and manual locking hubs are disengaging correctly.

NOTE: IF THE VEHICLE WAS PREVIOUSLY REPAIRED PER TSB 91-15-10, THE TRANSFER CASE WAS UPDATED WITH THE PARTS

INCLUDED IN THIS TSB. IF THE UPDATED TRANSFER CASE STILL WILL NOT DISENGAGE AFTER FOLLOWING THE INITIAL CHECKS, THEN THE CAUSE COULD BE THAT THE DRIVER IS NOT ALLOWING SUFFICIENT TIME FOR THE 4WD SYSTEM TO DISENGAGE.

VERIFICATION

Drive the vehicle. If the transfer case still will not disengage after performing the initial checks, proceed as follows:

1. Shift the vehicle with lever operated or electric shift transfer case to 4WD high.

2. Hand rotate the front axle manual locking hubs to the lock position, if so equipped.

3. Drive the vehicle slowly in a tight turn on dry hard pavement until you feel the front wheel power hop/skip which indicates that the 4WD system is engaged.

4. Drive the vehicle on a frame hoist...

a. Shift the automatic or manual transmission to neutral.

b. Shift the transfer case to 2WD.

c. Turn the ignition key to the OFF position.

5. Raise the vehicle on the frame hoist, making sure all tires are free to rotate.

6. Using gloves, hand rotate the rear driveshaft while viewing the front driveshaft for rotation.

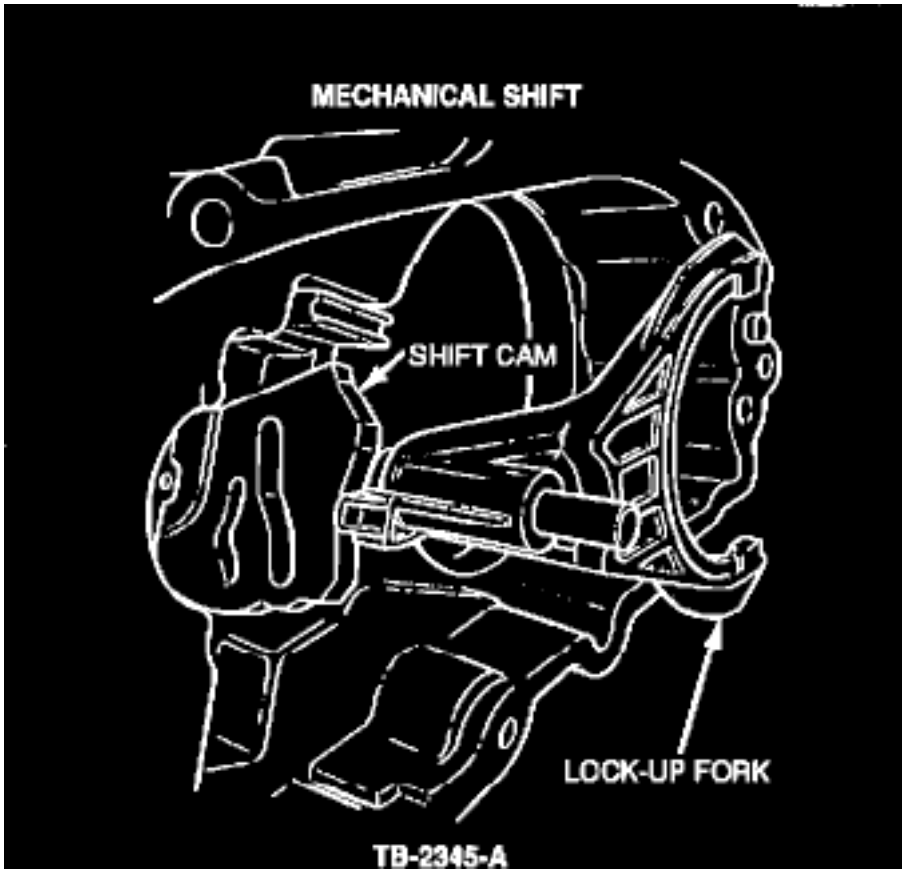
^ If the front driveshaft does not rotate, this indicates that the transfer case has disengaged and is functioning correctly.

^ If the front driveshaft rotates while turning the rear driveshaft, this indicates that the transfer case has not disengaged and must be repaired.

7. Before starting the repair, repeat the above procedure a second time to confirm that the transfer case will not disengage.

ELECTRIC SHIFT TRANSFER CASE

If the above procedure is not conclusive, for an electric shift transfer case system, proceed as follows:



1. Remove the 7K470 speed sensor/wiring harness bracket and 7F293 speed sensor assembly from the transfer case.

2. With the use of a light and looking into the speed sensor opening...

a. Locate the white or black 7289 lock-up fork.

b. Using a straight tool, push it forward toward the front of the vehicle.

^ If the lock-up fork does not move, this indicates that the lock-up assembly has moved back to the 2WD position and the transfer case is functioning correctly.

^ If the lock-up fork moves about 3/8" (9.525 mm), this indicates that the lock-up assembly remained in the 4WD position or did not disengage and must be repaired.

TRANSFER CASE REPAIR

Refer to the 1991 Ranger and Explorer Service Manual, Sections 07-07E and 07-07D, for procedures to remove and dissemble the transfer case. Install and reassemble the following components:

^ One (1) Return Spring (F1TZ-7219-A)

^ One (1) Sleeve Spring (E6TZ-7D126-A), with large end installed first into bore of 7106 lock-up collar.

^ One (1) Lock-Up Fork (F1TZ-7289-D, bone white color).

Figure 1

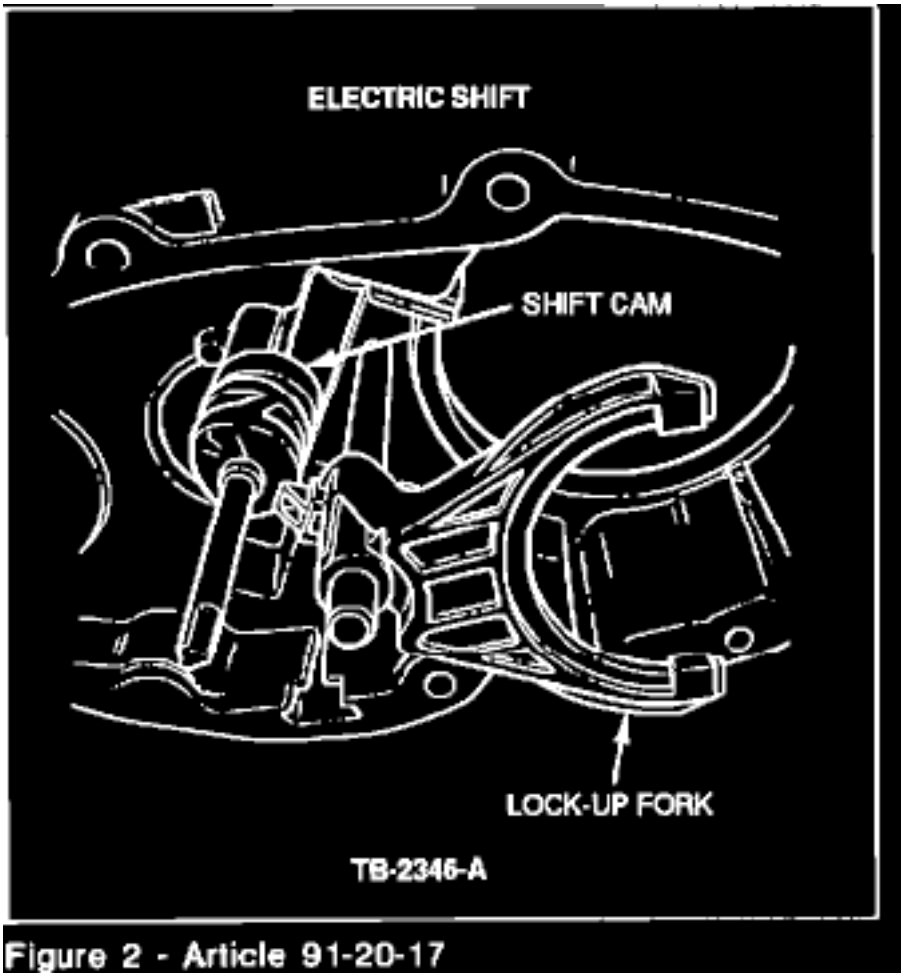


Figure 2 - Article 91-20-17

Figure 2

NOTE: WHEN INSTALLING THE 7289 LOCK-UP FORK, MAKE SURE THAT THE 7235 LOCK-UP FORK ROLLER BUSHING IS

POSITIONED ON THE TOP OR END SURFACE OF THE 7F063 SHIFT CAM AND NOT INTO AN INSIDE CAM TRACK, FIGURES 1 AND 2.

Reinstall the transfer case in the vehicle and check for shift function including engagement and disengagement.

PART NUMBER PART NAME CLASS

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OTHER APPLICABLE ARTICLES: 91-15-10 WARRANTY STATUS: Eligible Under Basic Warranty

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OPERATION DESCRIPTION TIME

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912017B Perform Concern 0.5 Hr.

Verification Checks

912017C Remove And Install Transfer 2.8 Hr.

Case, Separate Case Halves And Install Revised Components

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 41

OASIS CODES: 508000

Ford Motor Company

October 2001

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77 Supplement 7:** 10/12/01 Updated Information

REFERENCE: **Owner Notification Program 01B77 – Ford Wilderness AT Program:** Replacement of Wilderness AT tires

PROGRESS TO DATE

- To date we have replaced close to 7 million tires or 55% of the total tires needed
- Ford and Mercury dealers are currently handling over 70% of all Wilderness AT replacements
- All tire sizes are now readily available, though certain brands may not be available

The following information has been updated for ONP 01B77:

CHANGES MADE TO THE ALL DEALER LETTER

- ONP 01B77 – Ford Wilderness AT program will expire on March 31, 2002
- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- All customers who have not had their tires replaced will receive a follow-up letter by the end of October, 2001 announcing these program changes and encouraging them to visit a Ford Motor Company dealership for tire replacement
- 1995 and 1996 F-150 customers, which were added to the program on August 17, 2001, will receive their first notification letter by the end of October, 2001, which includes the following:
  - The customer must have their tires replaced at a Ford Motor Company dealer
  - They will only be eligible for refunds if they purchased their tires between August 1, 2000 through October 31, 2001

    NOTE: Refunded at actual cost and no DOT sections required, since these customers were never notified of the DOT requirements and maximum dollar limit.
- Effective immediately all tire refund requests are to be processed through the dealer (Online Refund Form should no longer be used)

CHANGES TO ATTACHMENT I

- Tires purchased by customers after November 15, 2001 will not be eligible for a refund
- The Online Refund Form used for refunds before May 22, 2001 is no longer posted on the web

CHANGES TO ATTACHMENT II

- Wait List Survey link added
- A procedure has been added to handle customers who purchase tires after November 15, 2001 and are seeking a refund

All revisions since Supplement 6 are in *red italics* and revised pages have been marked "*Revised10/12/01.*"

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Technical Service Bulletin # 01B77 Date: 011001

Ford Motor Company

May 2001
Revised 10/12/01

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: **Owner Notification Program 01B77-S7 – Ford Firestone Wilderness AT Program:** Replacement of Firestone Wilderness AT tires.

OASIS: Yes
OWNER LIST: Yes
PARTS RETURN: No
PROGRAM TERMS: This program will expire *March 31, 2002* and has no mileage limit.

WHAT WE ARE DOING AND WHY

On August 9, 2000 Firestone initiated a voluntary recall of 6.5 million tires, including 3.8 million P235 75R15 Radial ATX tires manufactured since 1990 at all North American Firestone plants. Also, Firestone recalled about 2.7 million P235 75R15 Wilderness AT tires made at its Decatur, Illinois plant. The recall included both original equipment and replacement tires. As of January 22, 2001 more than 6.1 million tires have been replaced – the recall is more than 94% complete.

Under this new owner notification, Ford will replace 13 million Firestone Wilderness AT tires on Ford and Mercury SUVs and pickup trucks listed below under "affected tires and vehicles." This is a voluntary precautionary measure. Ford made the decision to take this action after extensive examination of field data as well as laboratory and track testing in close collaboration with NHTSA. The field data, along with our testing and statistical analysis, shows a directional trend toward elevated failure rates, that differs based upon where the tires were manufactured. Ford does not have sufficient confidence in the future performance of these tires, so we are acting in the interest of our customers to ensure their continued trust and confidence.

To date we have replaced close to 7 million tires or 55% of the total tires needed for this program. Ford and Mercury dealers are currently handling over 70% of the Wilderness AT tire replacements. Also, with the increased availability of all 15-, 16-, and 17-inch tires at the dealers, Ford is changing the expiration date of the program to March 31, 2002 to encourage customers to have their tires replaced as soon as possible.

NOTE: Certain brands of tires may have limited availability.

AFFECTED TIRES AND VEHICLES

This program affects 15-, 16-, and 17-inch Firestone Wilderness AT tires and Ford and Mercury vehicles with these tires on them. The vehicles listed below may have been originally equipped with Firestone Wilderness AT tires or may have had Wilderness AT tires installed during the Firestone recall launched in August, 2000.

- Certain 1991 through 2002 Ford Explorer
- Certain 2001 through 2002 Explorer Sport, and Sport Trac
- Certain 1997 through 2002 Mercury Mountaineer
- Certain 1991 through 2001 Ranger
- Certain 1999 through 2001 Expedition
- Certain 1991 through 1997 F-Series
- Certain 1991 through 1994 Bronco

NOTE: Both original equipment (OE) and replacement tires are affected.

IMPORTANT FACTS

- *Ford Wilderness AT tire program will expire on March 31, 2002.*
- *Tires purchased by customers after November 15, 2001 will no longer be eligible for a refund.*
- *A follow-up owner letter announcing program changes will be mailed beginning the week of October 17, 2001.*
- *1995 and 1996 F-150 owners, which were added to the program on August 17, 2001, will be notified by the end of October 2001.*
- All 15-, 16-, and 17-inch Firestone Wilderness AT tires (regardless of series number) that are mounted on Ford or Mercury vehicles are eligible for replacement
- All other Firestone Wilderness AT tire sizes are not included in this program.
- AtW/Ford Tire Program dealers are to stop the sale of Firestone Wilderness AT tires in their parts inventory effective immediately.
- Ford Motor Company has notified customers of this owner notification program via first class mail.
- Customer refunds will be handled differently based on whether the tires were purchased before or after May 22, 2001.
- *Effective immediately all refunds will be processed through the dealer for customers who purchased their tires from August 1, 2000 through November 15, 2001, (Online Refund Form should no longer be used).*
- *1995 and 1996 F-150 owners will only be eligible for refunds for tires purchased between August 1, 2000 and October 31, 2001, (no DOT sections required).*
- A list of Ford-approved replacement tires is posted on QCDealer. Only these tires may be used as replacement tires for vehicles that were originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires under this program.
- There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.
- **Vehicles with branded titles** - although normally excluded from Owner Notification Programs are included as part of this program.
- Affected vehicles sold in Canada can be serviced by U.S. dealers, and affected vehicles sold in the U.S. can be serviced by Canadian dealers.

STOP SALE OF FIRESTONE WILDERNESS AT TIRES IN DEALER STOCK

Firestone Wilderness AT tires in stock at Ford and Lincoln Mercury dealers enrolled in the Around the Wheel or Ford Tire Program (Certified Tire Dealers) should not be sold. Dealers that purchased these tires through the Ford program and have them in stock should complete the *Unsold Wilderness AT Credit Form* located on QCDealer.com. If you have questions, call the Ford Tire Hotline at 1-888-353-3251 for disposal and credit information.

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

Non-Certified Tire (AtW or Ford Tire Program) Dealers who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program) or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "**SCHP**" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

SERVICE PROCEDURE

All 15-, 16-, and 17-inch Firestone Wilderness AT (regardless of series number) tires installed on Ford and Mercury vehicles must be replaced under this owner notification program. Original equipment (OE) and replacement tires are included.

Spare Tires

Firestone Wilderness AT (regardless of series number) spare tires are affected and should be replaced. The Firestone P235 75R15 ATX temporary spare tire used on Ranger vehicles is not included in this program.

Note: Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

Note: When processing refunds for customers, inspect the spare tire; if the spare tire is a Firestone Wilderness AT (with the Ranger exception noted previously) replace the spare tire using the information provided on Attachment II.

Does Current Tire Condition Affect Replacement Procedure?

All affected tires should be replaced regardless of the mileage or the remaining tread on the tire. If the customer caused damage to the tires, i.e. hit a curb, accident, under inflation, alignment issues, the tire should still be replaced. If the tire is worn out, it should still be replaced.

What if the Vehicle has a Mix of Affected and Non-Affected Tires?

- If the spare tire is the only Wilderness AT, then only the spare should be replaced (see exception on temporary spares above).
- In most cases an owner's vehicle will have all 15-, 16-, or 17–inch Firestone Wilderness AT tires installed and require replacement of all tires. In cases where a vehicle has a mix of tire brands/sizes installed, replace all Firestone Wilderness AT tires and the remaining tires to match the tire brand and size by axle.

For example, if a vehicle has a Wilderness AT on the left front, a Wilderness AT on the right rear, a Wilderness AT for a spare, and the other two tires are not Wilderness AT; the spare and the left front and right rear should be replaced and the new tires should be installed on the same axle. The customer should also be advised that all tires should be the same size especially on 4 X 4 models.

What replacement tires may be used for vehicles originally equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires?

Replacement tire(s) must be on the list of tires approved by Ford <link to approved tire list>. Any deviation from this approved list may change the vehicles handling, ride, vibration, and noise characteristics and cannot be claimed through Ford.

If customers are seeking reimbursement for tires purchased outside of a Ford Certified Tire Dealer, refer to Attachment I for reimbursement guidelines and claiming procedures. *Customers who purchase tires after November 15, 2001 are not eligible for a refund.*

Note: There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

Note: "Blemished" tires may not be used as replacement tires under this program.

FORD AND LINCOLN MERCURY DEALER TIRE DISPOSAL PROCESS

- Tires that are removed from vehicles must immediately be made unusable by either cutting the bead through the DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request. Marking the last 6 characters of the VIN on the removed tire(s) is no longer required.
- The tires will be disposed of by using the "National Tire Recovery and Recycle Program".

Regional FCSD and independent personnel will be randomly auditing dealers for proper tire scrapping and claiming procedures. Any infractions will result in prior approval for tire owner notification claims.

Note: Make removed tires unusable during tire replacement. Do not stack tires and disable them at a later time.

DEALERSHIPS ELIGIBLE TO REPLACE TIRES UNDER THIS PROGRAM

All Ford and Lincoln Mercury dealers enrolled on the Around the Wheel or Ford Tire Program (Certified Tire Dealers) are eligible to complete tire replacements under this program.

Ford dealers interested in joining the Ford Tire Program may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

APPROVED RETAILERS PARTICIPATION IN PROGRAM

We have developed a program to authorize Goodyear, Michelin, Continental, and General tire retailers to perform tire replacements at no cost to customers. These eligible retailers will use only tires from the Ford Approved Tire List when performing no cost replacements. This was done to reduce customer inconvenience by:

- Eliminating customer out of pocket expense
- Maximize the number of customers whose replacement tires are those on the Ford Approved tire list
- Expedite the completion of this program
- Reduce administrative burden on our Ford and Lincoln Mercury dealers
- Reduce dealer tire disposal responsibility
- Allow dealers to continue with their normal day to day service business

ATTACHMENTS

Attachment I:	Administrative Information
Attachment II:	Labor Allowances and Parts Ordering Information
Attachment III:	Technical Information

CONTACTS

Claims Information:	1-800-423-8851
For Around the Wheel/Ford Tire Program Questions:	1-888-353-3251
Ford Tire Inquiry Hotline (Customer):	1-866-300-1226
Other (Dealer Only) Program Questions:	1-800-325-5621
Tire Registration for Federal Regulations Questions:	1-330-794-9190

Sincerely,

Ann O'Neill
Director
Vehicle Service and Programs

Attachment I - Administrative Information

OASIS

OASIS must be used to determine vehicle eligibility.

IMPORTANT:

When an eligible vehicle is at the dealership for service, OASIS must be contacted to determine if Owner Notification Program 01B77 is open. If 01B77 is listed in OASIS as open, it is important that the vehicle is inspected for eligible tires. If the eligible vehicle is not equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tires a claim must be submitted using labor operation 01B77A to close the program. If an affected vehicle does not have 01B77 open, this may indicate that a refund

or tire replacement has already been processed on this vehicle.

Some Ford and Lincoln Mercury vehicles not listed in the AFFECTED TIRES AND VEHICLES list may have 15-, 16-, or 17-inch Firestone Wilderness AT tires installed. These vehicles are covered under this program, but will not be active in OASIS. Contact the Special Service Support Center at 1-800-325-5621 to obtain prior approval before performing the repair or issuing a refund. This will insure that a previous repair/refund has not been performed on the vehicle.

CLAIMS PREPARATION AND SUBMISSION

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ Enter the full part number of the replacement tire with the quantity of tires replaced. Tires will be reimbursed at AtW Dealer cost + 25% (wheel weights and valve stems incl.).

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier. Dealers are encouraged to arrange for shipment of 4 or more tires at a time.

^ Dealers can no longer claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program". You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires on the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry.

RELATED DAMAGE

Vehicle damage caused by a tire related failure is not covered by this program. Refer to the Warranty and Policy Manual for proper claiming procedure for vehicles covered by the Ford Bumper-to-Bumper Tire Warranty (model years 2001 and 2002). All other pre-2001 model year vehicles with alleged tire related vehicle damage should be handled through the Firestone claims process, or by referring the customers to their insurance company.

Damage related to replacement of tires should be handled as described in the Warranty and Policy Manual.

OWNER REFUND

With the increased availability of replacement tires, it will no longer be necessary for customers to pay out-of-pocket expenses for tires. Therefore, refund requests for tires purchased after November 15, 2001 will no longer be granted. Owners will be notified of the refund expiration date and will be directed to a Ford or Mercury dealer They are directed to an authorized retailer only if the Ford or Mercury dealer cannot meet their scheduling needs or tires are not in stock. All Ford and Mercury dealers (AtW and non-AtW dealers) are required to process refunds for customers who purchase tires prior to November 15, 2001.

The following rules apply to refunds for tires purchased from August 1, 2001 through November 15, 2001:

Refunds will be processed for vehicles listed under "AFFECTED TIRES AND VEHICLES", and for other Ford and Lincoln Mercury vehicles that have 15-. 16-, or 17-inch Wilderness AT tires installed.

^ The customer must provide the original paid receipt (a copy of their paid receipt is acceptable on an exception basis in instances where the owner requires the original for another purpose (e.g. extended tire warranty or purchase rebate). The dealer will attach the receipt to the dealer file copy of the refund claim (see claim instructions below).

^ Dealers will be reimbursed to immediately disable tires returned for a refund (see claiming instructions for refunds and Attachment II for labor operations).

^ The tires must be purchased August 1, 2000 through November 15, 2001 to be eligible for a refund (through October 31, 2001 for 1995 and 1996 F-150 owners).

^ Customers requesting refunds for tire replacement May 22, 2001 through November 15, 2001 must provide either:

NOTE:

This does not apply to 1995 and 1996 F-150 customers.

^ The Firestone Wilderness AT tires that were replaced. Returned tire(s) are to be disabled by the dealership. Ford will reimburse the dealer to disable (see claim instructions below and use labor operation 01B77G). If tires are brought in for refund with the DOT codes missing dealers should not process the refund.

^ A section of the old tire(s) containing the DOT codes from each of the Firestone Wilderness AT tires that were replaced (To be cut from the Wilderness AT tires that were replaced by the outside repair facility) (use labor operation 01B77L). Dealers should deface (cut in pieces or make code unreadable) the DOT sections of the tire so they cannot be used to obtain another refund. If sections are brought in for refund with the DOT code defaced dealers should not process the refund.

NOTE:

The DOT Code Identification Guide has been developed to help dealers determine if the DOT sections returned to the dealership are from 15-, 16-,

Purchase Date Range	Refund Guidelines
August 1, 2000 through May 22, 2001	• The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
1995 and 1996 F-150 vehicles only *August 1, 2000 through October 31, 2001*	• *The actual cost as stated on the paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes (no DOT required)* • *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
May 23, 2001 through November 15, 2001	• 15 inch tires - $110 (includes mounting, balancing, stems, disposal, and taxes) • 16 and 17 inch tires - $130 (includes mounting, balancing, stems, disposal, and taxes) • Dealers process refunds
After November 15, 2001	• *No refunds accepted for tires purchased after November 15, 2001*

Refund Questions	What is the owner qualified to receive?
Example: On December 21, 2000 the customer paid to have (4) Firestone Wilderness AT tires replaced on an affected vehicle.	o August 1, 2000 through May 22, 2001 (October 31, 2001 for 1995 and 1996 F 150) full refund with paid receipt o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*
Example: On January 15, 2001 the customer paid to have (2) Wilderness AT tires replaced on a 1988 F-Series truck. The other tires are non-Firestone Wilderness AT.	o August 1, 2000 through May 22, 2001 – full refund with paid receipt o Dealer contacts Special Service Support Center at 1-800-325-5621 for approval code o Customer does not need old tire(s) o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

or 17-inch Firestone Wilderness AT tires. Use the DOT Code Identification Guide in conjunction with the bulletin section "What if the Vehicle has a Mix of Affected and Non-Affected Tires" to determine how many tires are eligible for refund.

NOTE:

Ford will allow customers to file for a refund (with or without tires) for tires purchased after May 22 through June 30, 2001 because customers may not have tires to turn in. Customers must provide a paid receipt indicating tire replacement before July 1, 2001 in order to process a refund without tires or DOT sections. Customers who purchase tires after June 30, 2001 must provide tires or DOT sections.

Ford will reimburse customers the following amounts:

^ Tires purchased from August 1, 2000 through May 22, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes.

^ (1995 and 1996 F-150 vehicle only) Tires purchased from August 1, 2000 through October 31, 2001, the actual cost as stated on their paid receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes. No DOT section required.

^ Tires purchased May 23, 2001 through November 15, 2001, the actual cost as stated on the receipt for replacing tires, mounting, balancing, valve stems, disposal, and taxes up to a maximum of $110 per tire for 15 inch, and $130 per tire for 16 and 17 inch tires.

^ Refunds will not be granted for tires purchased after November 15, 2001.

Note:

If an owner pays for the replacement of their tires after November 15, 2001, the dealer may handle on a case by case basis following the procedure in Attachment II.

Refund Questions	What is the owner qualified to receive?
Example: On May 27, 2001 the customer took their 1998 Explorer to an outside tire retailer and had (5) Firestone Wilderness AT 16 inch tires replaced.	o After May 22, 2001 refund tire replacement with paid receipt up to: o 15 inch = $110 (maximum per tire) o 16 and 17 inch = $130 (maximum per tire) o With a paid receipt this customer would be entitled to (5) tires x $130 (16 inch maximum per tire) = $650 refund (includes mounting, balancing, stems, disposal, and taxes) o Dealer will be eligible to claim for refund allowance using labor operation 01B77L o If the customer returns the old tires to the dealer o The dealer will disable the old tires and dispose of them using the *"National Tire Recovery and Recycle Program"* using labor operation 01B77G (disable) in conjunction with 01B77L (refund allowance) o Customer does not need old tire(s) *since tires purchased prior to July 1, 2001* (After June 30, 2001 customer will need old tires or removed DOT codes from replaced tires to qualify)
Example: On December 2, 2000 the owner replaced their (5) Firestone Wilderness AT tires with another set of Wilderness AT tires.	o The owner is not eligible for refund o The owner is eligible for tire replacement only o Use only tires from the "Ford Approved Tire List"
Example: *On November 16, 2001 the owner purchases tires from a tire retailer.*	o *No refund will be granted after November 15, 2001* o *Dealers may handle on a case-by-case (See Attachment II)*
Example: *On October 10, 2001 a 1995 F-150 owner purchases tires from a tire retailer.*	o *August 1, 2000 through October 31, 2001 – full refund with paid receipt* o *Customer does not need old tire(s) or DOT section(s)* o *Effective immediately dealers process refunds (Online Refund Form should no longer be used)*

CLAIMS PREPARATION FOR REFUNDS (USE THIS PROCEDURE FOR ALL REFUND REQUESTS)

NOTE:

Tires must be purchased prior to November 15, 2001

^ Enter claims using DWE.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Enter information on a Recall/ONP claim type. DO NOT use a Warranty Claim type.

^ Program code 01B77.

^ When a customer brings in their old tires and is seeking a refund, use labor operation 01B77G (disable) and 01B77L (refund administration allowance) from Attachment II.

^ If a customer brings in the old DOT codes removed from the old tires - use labor operation 01B77L only.

^ The Miscellaneous Expense Code "ADMIN" will not be accepted under this program. A labor operation 01B77L has been provided to cover administrative costs.

^ Enter REFUND in the miscellaneous area of the claim.

^ Dealers will no longer be able to claim tire disposal for ONP 01B77. See the "National Tire Recovery and Recycle Program" You may still claim any applicable local waste tax - enter OTHER in the expense area of the claim with the actual cost.

^ Enter each unique (complete 10 or 11 digit) DOT codes of the replaced tires in the diagnostic code entry screen in the field marked "other". If the DOT codes cannot be completely entered in the space provided in the diagnostic code area, use the technician comment area to complete the data entry. If the tires were replaced prior to May 23, 2001 (or November 1, 2001 for 1995 and 1996 F150 customers) the DOT may not be available, in this case record the brand, make and size of the tires in the technician comments area of the claim.

RENTAL CARS

TAP allowances have been increased specifically for this owner notification program. Refer to Don Brunner letter.

DOT REGISTRATION OF NEW TIRES

Dealers are required to register the DOT number of every tire sold to meet federal tire registration requirements. Ford has established a partnership with CIMS to assist dealers in registering these DOT codes. Information is available on QCDealer.com under CIMS Tire Registration or by contacting CIMS

Description	Labor Operation	Labor Time
Inspect for non-Wilderness AT tires (used to close 01B77 not for use when processing a refund)	01B77A	0.2 Hours
Replace & balance 1 tire (to be used for spare tire only)	01B77B	0.4 Hours
Replace & balance 2 tires (one axle)	01B77C	0.6 Hours
Replace & balance 3 tires (one axle plus spare)	01B77D	0.8 Hours
Replace & balance 4 tires (both axles)	01B77E	1.0 Hours
Replace & balance 5 tires	01B77F	1.2 Hours
Disable up to five tires (used only for refund claims)	01B77G	0.2 Hours
*Refund administration allowance (to be used when processing a customer refund without tire disposal, if tires are returned to dealership for disposal use in conjunction with operation 01B77G)	01B77L	0.2 Hours
Administrative Allowance for Non-Certified Tire Dealers (AtW or Ford Tire Program) to be used when sending a dealer stock unit, or customer vehicle (for tire replacement) to a Certified Tire Dealer, or tire retailer authorized to perform tire replacement under this program	Misc. Expense use code "SCHP"	$15.00

NOTE: Front-end alignment is not included in this program.

***NOTE:** When processing a refund for four (4) road tires, the non-temporary spare tire should be replaced as part of this program – file a related damage claim to cover the spare tire replacement.

at 330-794-9190.

NON-FORD OR LINCOLN MERCURY VEHICLES WITH FIRESTONE WILDERNESS AT

Non-Ford or Lincoln Mercury vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires installed by a Certified Tire Dealer (AtW or Ford Tire Program) are eligible for replacement. The repair should be submitted using a Warranty/ESP claim type form. The dealer must enter Program Code "P19", this will allow the repair to be submitted without a VIN. The causal part must be TIRE, with the actual part numbers for reimbursement at dealer cost plus 25%, and use actual time for labor reimbursement. These types of claims cannot be submitted as an Owner Notification Repair type.

Attachment II - Parts and Labor Information

LABOR ALLOWANCES

NON-AtW DEALERS SERVICING IN-STOCK UNITS OR CUSTOMER VEHICLES

NOTE:

Non-Certified Tire Dealers (AtW or Ford Tire Program) who have vehicles in stock, or customer vehicles with 15-, 16-, or 17-inch Firestone Wilderness AT tires must send the vehicle to a Certified Tire Dealer (AtW or Ford Tire Program), or an approved tire retailer participating in the program to have the tire replacement performed. The non-Certified Tire Dealer (AtW or Ford Tire Program) will submit a 01B77 ONP claim using the miscellaneous expense code of "SCHP" (with a dollar value of $15.00 to cover administrative costs). Do not claim the "Admin" labor operation.

PARTS REQUIREMENTS

Tire Ordering Information

^ Dealers are required to install only tires from the Approved Tire List for vehicles originally equipped with 15-, 16-, and 17-inch Firestone Wilderness AT tires. Dealers should immediately order replacement tires for inventory.

^ Certified Tire Dealers will order replacement tires through normal channels.

^ Dealers not authorized for the Around the Wheel Program will not participate in this recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

TIRE AVAILABILITY:

All dealers should check QCDealer.com daily for updates to the approved tires list. Distributors and tire retailers will allocate tires as best they can on a daily basis. Your dealership should do the following to ensure that you are able to secure your fair allotment of these limited volumes:

^ Contact your Ford authorized facing distributor(s) for each tire manufacturer.

^ Contact your Ford authorized facing tire retailers for each tire manufacturer.

^ Review with these supply points the volume of tires you need to ensure you have tires ready to fill orders with every supply point.

Questions not addressed by above sources should be directed to your market area team.

CUSTOMER WAIT LISTS:

Dealers should create a customer wait list and record: Customer name

^ Address and phone number

^ Vehicle make

^ Model year

^ Mileage

^ Tire size

NOTE:

Customers should be prioritized to replace oldest tires first.

WAIT LIST SURVEY

Please fill out the Firestone Tire Survey in the Management Report Section of QCDealer weekly. It is critical that you answer the questions as accurately as possible as the survey results will be used to help determine the level of production from the tire manufacturers.

DEALER PRICE

For latest prices on replacement tires, refer to the most recent Ford Motor Company Tire Price List.

PROCEDURE FOR CLAIMING REFUNDS FOR TIRES PURCHASED AFTER NOVEMBER 15, 2001

The following procedure applies to tires purchased after November 15, 2001:

1. Determine if the customer should receive special consideration based on owner loyalty, special circumstance cc, etc.

2. If the customer is eligible for special consideration the dealer will call the Special Service Support Center at 1800-325-5621 to request an authorization code.

3. The Special Service Support Center representative will ask for the following:

^ Customer Name

^ VIN

^ Date of repair

^ Original copy of invoice (be prepared to fax)

4. If the customer qualifies for a refund, the Special Service Support Center will provide your dealer with an authorization code.

5. Your dealer will input a claim with the authorization code (authorization code must be included to receive payment).

6. After the dealer receives payment for the claim, the dealer will then send the refund to the customer.

NOTE:

If the Special Service Support Center determines that the customer does not qualify for a refund, no authorization code will be given. Any appeals must be made by the dealer to the appropriate field representative

Attachment III - Technical Information

AFFECTED VEHICLES: REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES

OVERVIEW

This program details the replacement of 15-, 16-, and 17-inch Firestone Wilderness AT tires regardless of production plant. You will need to perform a DOT code inspection prior to replacing the 15, 16, or 17-inch Wilderness AT tires.

NOTE:

When lowering or raising an under-vehicle spare, DO NOT use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

NOTE:

Radial ATX "TEMPORARY USE" spare tires are not included under this program, and should not be replaced as part of this program.

NOTE:

Spare tires should always be replaced with the exact same size tire; otherwise the spare tire may not store in the proper position on the vehicle.

INSPECTION

1. Inspect the vehicle tires (including the spare tire) for the presence of Firestone Wilderness AT tires.

2. If Firestone Wilderness AT tires are present replace them with a suitable replacement from the "Approved Tire List".

Note:

There may be cases where a vehicle is equipped with 15-, 16-, or 17-inch Firestone Wilderness AT tire sizes that are not included on the Ford-approved replacement list. These tires are not original equipment (OE) and, therefore, will not have an approved tire listed. In such cases, it is recommended that the customer install the proper OE tire, or have a tire of suitable quality installed. Reference the vehicle's "Safety Certification Label" and current "Ford Motor Company Tire Price Guide" for OE or suitable replacement recommendations.

3. If only one Firestone Wilderness AT road tire is present on the vehicle, you will need to replace the opposing tire on the same axle. However, if one (1) front and one (1) rear tire are Wilderness AT you would not automatically replace all four (4) tires instead, you would replace the two (2) Wilderness AT tires and place them on the same axle.

4. Record the DOT code from each removed tire(s) on the repair order.

5. Tires that are removed from vehicles must immediately be made unusable by either cutting through the bead and DOT code with bolt cutters, or drilling a one-inch diameter hole (directly on the DOT code to make the code unreadable) in the sidewall.

6. Adjust all tires to the proper inflation pressure, and release the vehicle. For specifications, refer to the vehicle Owner's Manual or the vehicle certification label located on the driver's door opening.

NOTE:

Tires that are removed from vehicles under this program, and those in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole (directly on the DOT code to make the code unreadable) in the sidewall. Defacing the DOT code will prevent the tire from being used for an additional refund request.

NOTE:

If the vehicle is a 4X4, and is equipped with non-Firestone Wilderness AT tires on one axle, and the replacement tires for the Firestone equipped axle causes a mismatch with the existing non-Firestone axle, the customer is responsible for the tire mismatch. If the customer refuses to purchase matching tires to correct the mismatch - the dealer should annotate the repair order to reflect the customer's decision.

Ford Motor Company

FIRESTONE TIRE RECALL

September 2000

TO: All Ford and Lincoln Mercury Dealers
SUBJECT: Firestone Tire Recall Supplement #4 9/1/00 - Updated Information
REFERENCE: Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires

Changes for this Supplement:

- The following has been added to Attachment I to clarify the claiming of freight: Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.
- Additional information is now required in the comments of each claim filed for tire replacement under both Program Codes P17 and P18. The comments must include the entire DOT code from the tire being replaced and under P17 only the part number of the replacement tire. Firestone requires this information for government reporting.

Claims under the Firestone recall for tire replacement filed by Ford and Lincoln Mercury dealers not enrolled in the AtW/Ford Tire Program will not be accepted for payment. Non-AtW/Ford Tire Program dealers will continue to be able to file claims for tire inspection. This is not new information; we have just added the edits to the ACES II system.

The revised letter and attachments have been marked "Revised 9/1/00", and a ( ) symbol appears at the beginning of any text that changed since the last Supplement and the text appears in green when viewed on line. To avoid confusion please discard all previous versions.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Technical Service Bulletin # FIRESTONE Date: 000901

Dealer Letter

TO: All Ford and Lincoln Mercury Dealers

SUBJECT: DEMONSTRATION / DELIVERY HOLD - Firestone Tire Recall: Certain 1991 through 2000 Explorer, 1997 through 2000 Mountaineer, 2001 MY Explorer Sport Trac and Sport, 1991 through 2000 Ranger, 1991 through 1994 Bronco and 1991 through 1994 F-Series - Replacement of Firestone P235/75 R15 Radial ATX and Certain Wilderness AT Tires.

REFERENCE:

Model Year	Body Style	Tire/Wheel Size
1991 - 1994	ALL	15"
1995 - 1998	ALL (Excluding Eddie Bauer and 2-door Sport if equipped with 16 inch wheels)	15"
1999 - 2001	ALL (Excluding Eddie Bauer and Limited Editions if equipped with 16 inch wheels)	15"

Model Year	Body Style	Tire/Wheel Size
1995 - 1998	Eddie Bauer	16"
1996 - 2001	Sport and any 2-door Sport 4X4 w/Premium Sport Package	16"
1999 - 2001	Eddie Bauer and Limited	16"

Firestone Recall - Firestone P235/75 R15 Radial ATX and Certain Wilderness AT tires.

AFFECTED TIRES AND VEHICLES

Bridgestone Firestone Tire Company recently announced a Safety Recall on the following:

- All Firestone P235/75 R15 Radial ATX tires produced excluding tires marked "TEMPORARY" on the sidewall - and -

- P235/75 R15 wilderness AT tires produced only at the Decatur plant.

NOTE:

Decatur built tires have a DOT code of VDHL - see Attachment III for details. All other Wilderness AT tires are not affected.

Both original equipment (OE) and replacement tires are affected.

The following vehicles produced with Firestone P235/75 R15 Radial ATX original equipment tires are affected by this recall:

^ Certain 1991 through 1996 Ford Explorer (see chart)

^ Certain 1997 Mercury Mountaineer vehicles

^ Certain 1991 through 2000 Ranger vehicles

^ Certain 1991 through 1994 Bronco vehicles

^ Certain 1991 through 1994 F-Series vehicles

The following vehicles produced with P235/75 R15 Wilderness AT tires as original equipment are affected by this recall:

Certain 1997 through August 7, 2000 Mountaineer vehicles

^ Certain 1997 through August 7, 2000 Explorer vehicles (see chart)

^ Certain 1997 through June 1, 2000 Ranger vehicles

^ Certain 2001 Explorer Sport Trac and Sport vehicles produced through August 7, 2000

These Explorer vehicles produced with either P235/75 R15 Radial ATX or P235/75 R15 Wilderness AT tires as original equipment are affected as shown.

These Explorer vehicles are NOT affected:

IMPORTANT FACTS

^ This is a FIRESTONE recall.

^ FIRESTONE will notify customers of the recall via first class mail.

^ FIRESTONE will communicate recall information to authorized repair sites including Ford and Lincoln-Mercury Around the wheel/Ford Tire Program dealers.

FORD AND LINCOLN MERCURY DEALER INVOLVEMENT

As this field action will severely impact the availability of Firestone replacement tires, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers will be afforded the opportunity to address this recall utilizing Firestone and non-Firestone tires. This is being done to address immediate needs of our customers.

FORD AND LINCOLN MERCURY DEALERS ENROLLED IN AROUND THE WHEEL (AtW)

Dealerships enrolled in the AtW/Ford Tire Program are authorized Firestone outlets. If a customer with affected tires contacts an ATW Ford Tire Program dealer, as an authorized Firestone dealer regarding this safety recall, you will be able to replace that customer's tires with Firestone or "approved" non-Firestone tires. Tires that are approved for use as replacement tires under this recall will be posted in a matrix in the Firestone Tire Center in QCDealer.com. This matrix will be amended to add new tire manufactures and models of tires as they are approved. Claiming for reimbursement of tires is outlined on Attachment I.

If the customer requests a replacement Firestone tire, secure the tire through your normal distribution chain and process reimbursement as outlined in Attachment I.

FORD AND LINCOLN MERCURY DEALERS NOT ENROLLED IN AROUND THE WHEEL (AtW)

Dealers not enrolled in the ATW/Ford Tire Program can inspect customer vehicles (see Attachments I & II for claiming instructions & labor operations). These dealers should make individual arrangements with local Firestone outlets for tire replacement, or refer customers to their local Firestone outlet.

SERVICE PROCEDURE

All Firestone P235/75 R15 tires with Radial ATX on the sidewall (excludes Temporary spare tires identified by "Temporary" on the sidewall) must be replaced under this recall.

Firestone P235/75 R15 tires with Wilderness AT on the sidewall will need to be inspected for a DOT code of VDHL to determine if replacement is required. Refer to Attachment III for details.

This service action applies to original equipment and replacement tires that are installed on Ford and Mercury vehicles.

DEMONSTRATION / DELIVERY HOLD FOR VEHICLES AND TIRES IN DEALER INVENTORY

Do not demonstrate or deliver any of the affected vehicles prior to completing the Firestone recall. In addition, Ford and Lincoln Mercury Around the Wheel (AtW)/Ford Tire Program dealers may have affected tires in inventory; these tires should not be sold.

Tires Removed from Vehicles

Tires that are removed from vehicles must immediately be made unusable by either cutting the bead with bolt cutters, drilling a one-inch diameter hole in the sidewall, or cutting the tire completely in half The DOT code should not be defaced or removed. The tire should then be disposed of according to local laws refer to the Tire Administration Guide for further information.

NOTE:

AtW/Ford Tire Program dealers will be independently audited for compliance with the above procedure.

New Inventory Tires

All new Radial ATX or Wilderness AT tires with DOT code VDHL tires (never mounted) in AtW/Ford Tire Program dealer inventory must be returned to Firestone. Dealers must call 1-800-668-0345 to obtain a "Returned Goods Authorization (RGA) number. The RGA is a 6-digit number required to return the tires. Only tires affected by the Firestone recall will be accepted. Firestone will pay all freight for the return of these tires.

ATTACHMENTS

^ Attachment I ^

Administrative Information

^ Attachment II ^

Labor Allowances

^ Parts Ordering Information

^ Attachment III ^

Technical Information

^ Attachment IV ^

Tire Inspection Aid

^ Attachment V ^

Tire Inflation Guide

CONTACTS

Claims Information: 1-800-423-8851

Other (Dealer Only) Recall Questions: 1-800-325-5621

For Around the Wheel/Ford Tire Program 1-888-353-3251

Questions:

Attachment I

OASIS Since this is a Firestone recall, OASIS will not be activated.

PLEASE NOTE

Correct all vehicles in stock before delivery. Federal law requires dealers to complete any outstanding safety recall service before a vehicle is delivered to the buyer or lessee. Violation of this requirement by a dealer could result in a civil penalty of up to $1,100 per vehicle.

CLAIMS PREPARATION AND SUBMISSION

NOTE:

Claims for Firestone tires (P18) may be entered for payment beginning with repairs dated August 28, 2000 and later.

Claims for non-Firestone tires

Enter claims in ACES II for non-Firestone tires using DWE with the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim.

^ Refer to ACESII User Manual for claims preparation and submission information.

^ Program Code - P17. Enter P17TIRE as the causal part with condition code 82.

^ On the same line as PI7TIRE enter the total value of the tires from the "Suggested List Price" column of the latest Ford Motor Company Tire Selling Guide.

^ Use the appropriate labor operation(s) from Attachment II.

^ Freight is reimbursable at actual cost in the miscellaneous expense area of the claim.

NOTE:

Freight is only reimbursable for rural dealers whose only means of acquiring tires is by having them shipped in via common carrier.

^ Tire disposal and applicable local waste tax will be reimbursed - enter OTHER in the miscellaneous expense area of the claim with the actual cost.

^ Enter the entire DOT code and the part number of the replacement tire being used in the comments area of the claim.

Claims for Firestone tires

Enter claims in ACES II for Firestone tires using the following information:

^ Enter information on a warranty claim. DO NOT use a recall claim type.

^ Program Code - P18.

^ Enter "P18TIRE" as the causal part, no material cost should be entered on this line.

Description	Labor Operation	Labor Time
Inspect 5 tires applies only to P235/75 R15 Wilderness AT tires) - VEHICLE NOT AFFECTED (Non VDHL DOT Code)	00V01G	0.2 Hours
Inspect 5 tires (applies only to P235/75 R15 Wilderness AT tires) - VEHICLE AFFECTED - Customer must return at a later date due to unavailability of replacement tires. This may be claimed only one time per vehicle per dealer.	00V01A	0.2 Hours
Replace & balance 1 tire (No longer includes inspect) May be used with labor op 00V01A only	00V01B	0.4 Hours
Replace & balance 2 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01C	0.6 Hours
Replace & balance 3 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01D	0.8 Hours
Replace & balance 4 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01E	1.0 Hours
Replace & balance 5 tires (No longer includes inspect) May be used with labor op 00V01A only	00V01F	1.2 Hour

^ Condition code "82".

^ Use Customer Concern Code "A99".

^ Enter the full published tire part number with the quantity of tires replaced, the payment system will price the tire at Dealer Net multiplied by the quantity for the total value of the replaced tires.

^ Use Miscellaneous Expense Code "TIREMU" to claim the $20.00 difference per tire7 a maximum of $100.00.

^ The Firestone warranty claim form must be filled out and attached to the hard copy of the claim and retained in the service file. The entire DOT code from the replacement tire(s) must be recorded on this form.

^ The DOT code must also be entered in the comments area of the claim.

^ No labor operations will be allowed when claiming P18.

OWNER REFUND

Ford and Lincoln Mercury dealers, including AtW/Ford tire dealers; will not be involved in processing refunds for customers included in the Firestone recall. Customers inquiring about a refund should be provided copies of the Firestone refund request form. Refer to the Firestone website for the refund forms and for further details.

RENTAL CARS

TAP allowances have been increased specifically for the Firestone recall refer to M.J. Lombardi's Letter.

Attachment II

LABOR ALLOWANCES

NOTE:

Front-end alignment is not included in this recall.

NOTE:

These labor operations and revised times will begin paying with claims submitted on August 18, 2000; Claims in process at dealerships will need to use these new operations.

PARTS REQUIREMENTS

Tire Ordering Information

FIRESTONE TIRE INSPECTION

AFFECTED VEHICLES: **REFER TO DEALER LETTER FOR AFFECTED TIRES AND VEHICLES**

OVERVIEW

This procedure outlines how to check the DOT code on the tires and determine if they must be replaced.

NOTE: All Firestone P235/75R15 tires that say "RADIAL ATX" on the sidewall are being recalled and no further inspection is necessary.

NOTE: All tires including the spare must be inspected if they are "WILDERNESS AT" P235/75R15.

NOTE: When lowering or raising an under-vehicle spare, **DO NOT** use power tools. Also make sure that the spare is secure under the vehicle, and not swinging loose. The spare tire winch will ratchet when the tire is completely stowed.

INSPECTION

1. Raise vehicle on a hoist.
2. Locate the DOT code on the inboard sidewall of all tires including the spare. On F-Series and Bronco models, the spare tire must be lowered to view the DOT code. Clean the area if necessary in order to accurately read the code.
3. If the DOT code is **VDHL**, the tire must be replaced. See the matrix (part of the dealer bulletin) to determine the correct replacement tires. See Figure 1.

NOTE: Recall tires that are removed from vehicles and in dealer inventory must immediately be made unusable by either cutting the bead with bolt cutters or drilling a 1" diameter hole in the sidewall.

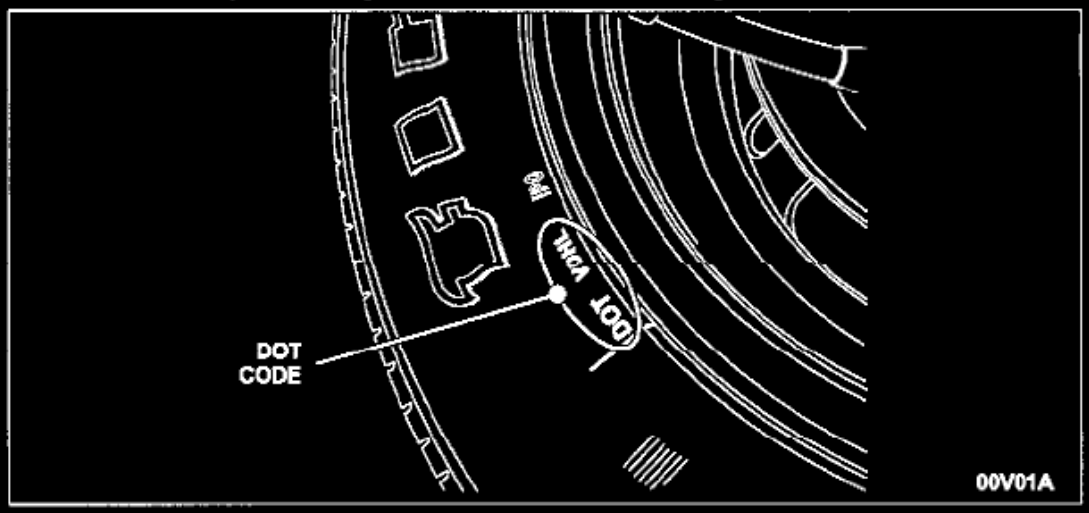

FIGURE 1

4. If the code is anything other than **VDHL**, release the vehicle to the owner.

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DEARBORN, MICHIGAN 48121
08/00

Authorized Around the Wheel (ATW)/Ford Tire Program dealers will order replacement tires through normal channels. Dealers not authorized for the Around the Wheel Program will not participate in the Firestone recall. Dealers may call the Ford Tire Hotline 1-888-353-3251 for enrollment and program details.

DEALER PRICE

For latest prices on replacement tires refer to the most recent Ford Motor Company Tire Selling Guide.

TIRE INSPECTION

TIRES INVOLVED IN FIRESTONE RECALL

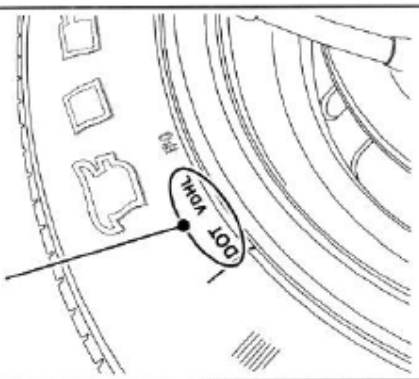
P235/75R15

ALL INCLUDED IN RECALL

P235/75R15

ONLY WITH DOT CODE VDHL

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL



DOT CODE

THE DOT CODE IS LOCATED ON THE INBOARD SIDEWALL

TIRE DOT CODE CAN BE INSPECTED WITH VEHICLE ON GROUND

WARNING: IF RAISING THE VEHICLE TO INSPECT, DO NOT POSITION YOURSELF UNDER THE VEHICLE WITHOUT HAVING ADEQUATE SAFETY STANDS SUPPORTING THE WEIGHT OF THE VEHICLE. THE JACK PROVIDED FOR USE WHEN CHANGING A TIRE BY ITSELF IS NOT ADEQUATE FOR THE PURPOSE OF GETTING UNDER THE VEHICLE.

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08/00

Attachment V
Revised 8/16/00

Firestone Tire Recall

Replacement of Certain Firestone P235/75 R15 Tires

Tire Inflation Guide

AFFECTED BRAND	MODEL	FIRESTONE ATX	TIRE PRESSURE	FIRESTONE WILDERNESS	TIRE PRESSURE
		(MY)	(frt - rear) psi	(MY)	(frt - rear) psi
FORD	EXPLORER	91 - 96	26** - 26**	97 - 00*	26** - 26**
FORD	EXPLORER SPORT- 2DR.	91 - 96	26** - 26**	97 - 01*	26** - 26**
FORD	EXPLORER SPORTRAC	N/A	-	01*	28 - 35
FORD	RANGER	91 - 96	30 - 35	97 - 00*	30 - 35
FORD	F - 150	91 - 94	35 - 41	N/A	-
FORD	BRONCO	91 - 94	35 - 41	N/A	-
(I)MERCURY	MOUNTAINEER	N/A	26** - 26**	97 - 00*	26** - 26**
MAZDA	NAVAJO	91 - 94	26 - 26	N/A	-
MAZDA	B-SERIES PICKUP	94 - 96	30 - 35	97 - 00*	30 - 35

* Firestone Decatur, Illinois Plant only

** Ford approved range is 26 - 30 psi.

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Published By: Recall/Service Programs Department
Ford Customer Service Division

Wheels: Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Wheels: Specifications

Lugnut torque ..... 135 Nm (100 ft lb)

NOTE: Torque specifications are for clean, dirt and paint free dry bolt and nut threads. Never use oil or grease on studs and nuts.

Wheel Bearing: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

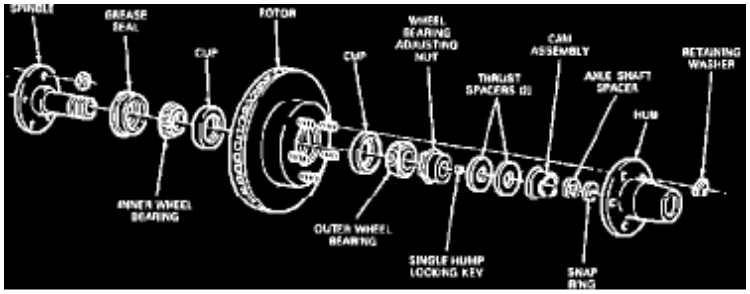
Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

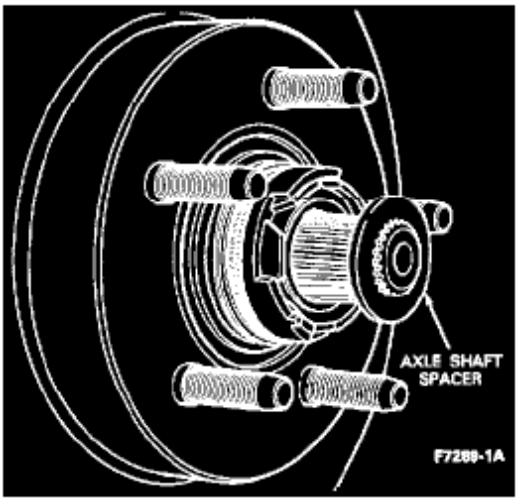
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

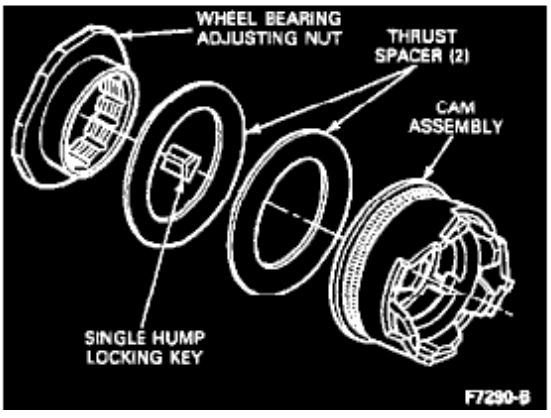
NOTES:

* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
THRUST SPACERS (2)
CAM ASSEMBLY
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


AXLE SHAFT SPACER
F7288-1A


WHEEL BEARING ADJUSTING NUT
THRUST SPACER (2)
CAM ASSEMBLY
SINGLE HUMP LOCKING KEY
F7290-B

Wheel Bearing: Adjustments With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer. 6. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

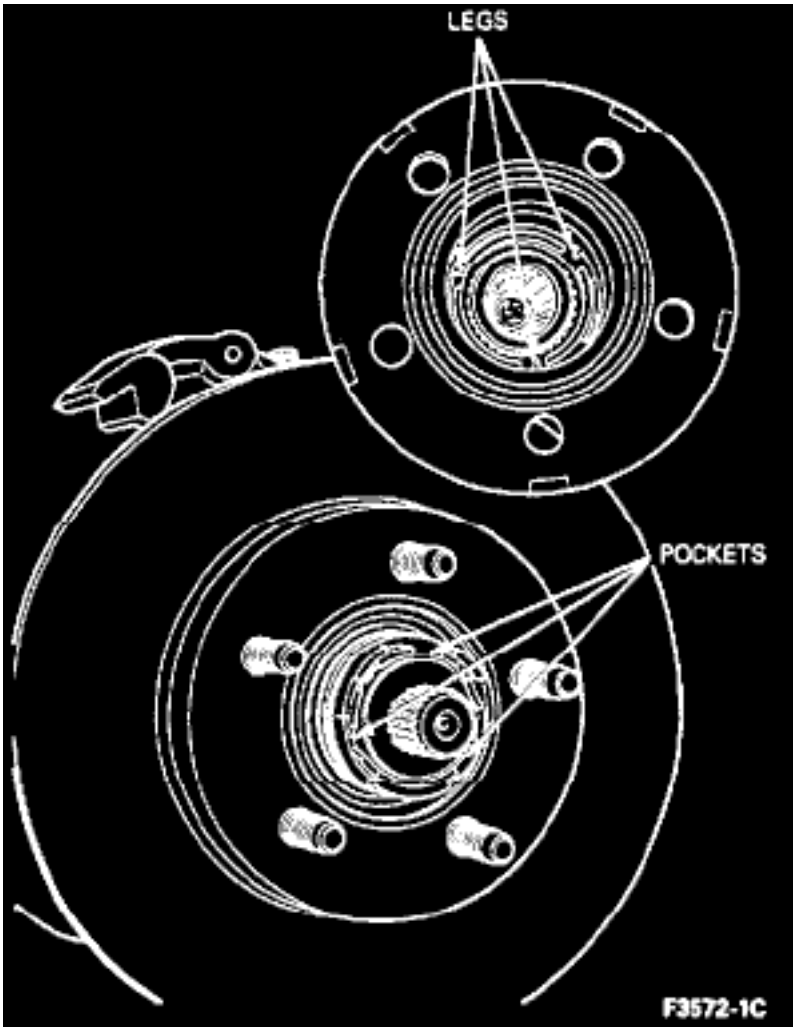
Cam Assembly And Locking Key

7. Using a magnet, remove the locking key.

NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

8. Loosen the wheel bearing adjusting nut from the spindle using a 2-3/8 inch hex locknut wrench.



9. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

10. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 11. Make sure the final end play of the wheel on the spindle is 0.00-0.08mm (0.000-0.003 inch). 12. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. the wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

13. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

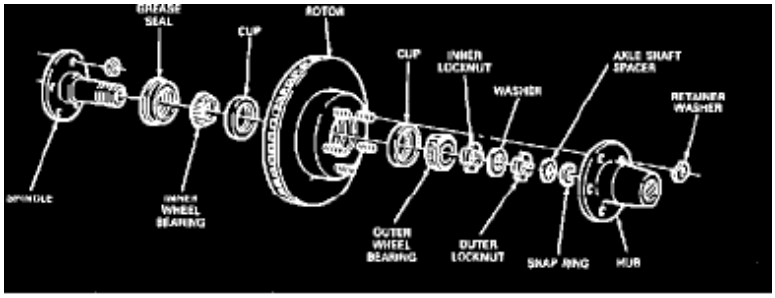
14. Install the axle shaft spacer. 15. Clip the snap ring onto the end of the spindle shaft.

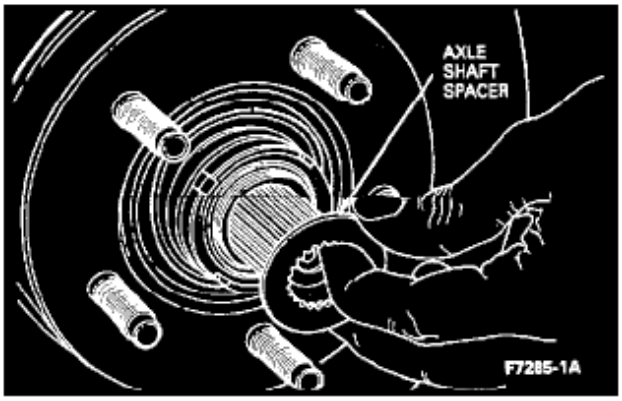
Automatic Locking Hub Installation

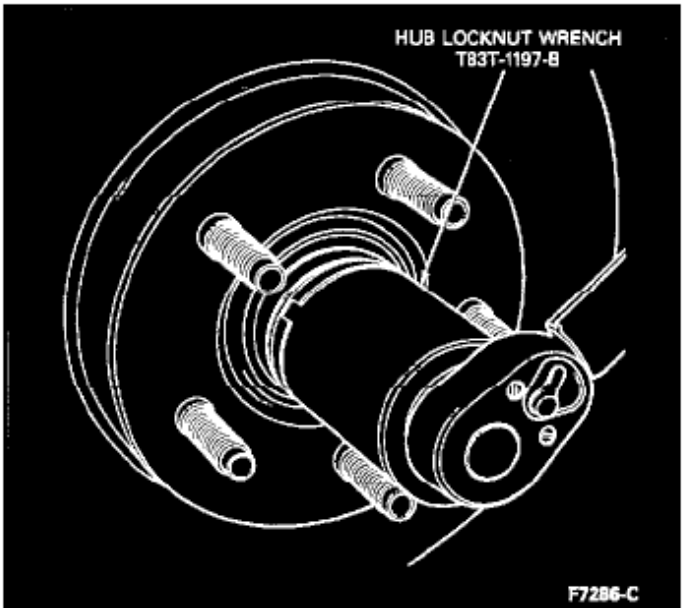
16. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

washers.

17. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB


AXLE SHAFT SPACER
F7285-1A


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

Wheel Bearing: Adjustments With Manual Locking Hubs

Fig. 5 Manual Locking Hub

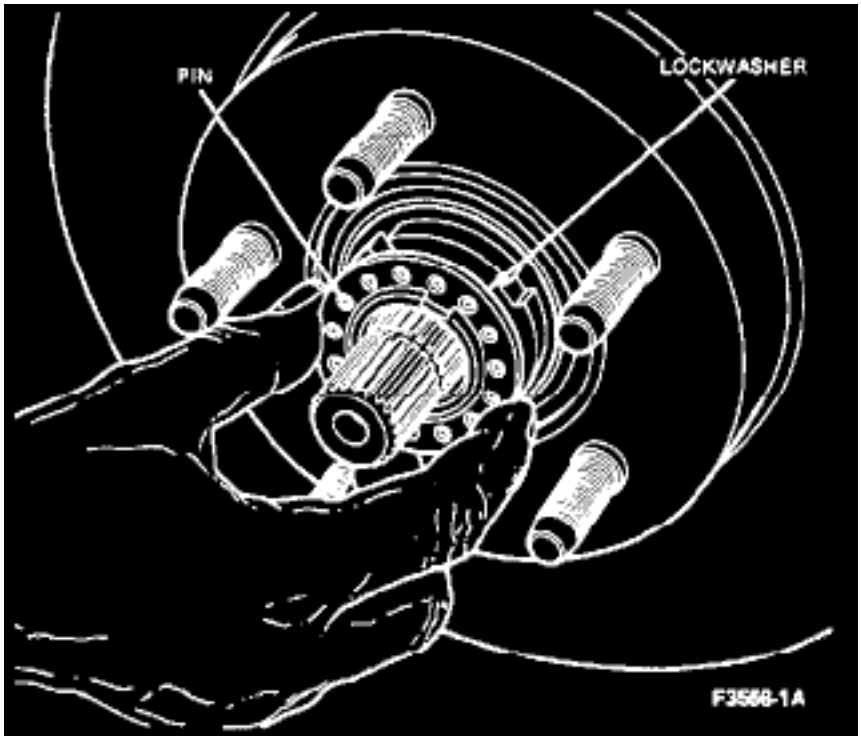
1. Raise the vehicle and install safety stands. 2. Remove the wheel and tire assembly. 3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.

Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.



Locknut Washer

7. Remove locknut washer from spindle. 8. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 9. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb).

10. Install the lockwasher on the spindle. 11. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 12. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.02-0.08 mm (0.001-0.003 inch). 13. Install the axle shaft spacer. 14. Clip the snap ring onto the end of the spindle shaft. 15. Install the manual hub assembly over the spindle. Install the retainer washers. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

Wheel Hub: Technical Service Bulletins Lug Nuts - Proper Torqueing Procedure

^ BRAKE SHUDDER - ROTOR DISTORTED - OVERTIGHTENED LUG NUTS

^ WHEEL - NUT INSTALLATION - SERVICE TIP

Article No. 90-19-9

FORD: 1986-91 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1986 CAPRI 1986-87 LYNX 1986-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOPAZ, TOWN CAR 1987-89 TRACER 1991 CAPRI, TRACER

MERKUR: 1985-88 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1986-90 BRONCO II 1986-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-91 F SUPER DUTY 1991 EXPLORER

ISSUE: The use of a power impact wrench to install wheel nuts provides minimal torque control. Undertightening may allow the lug nuts to loosen, and can result in the wheel separating from the vehicle. Overtightening of wheel nuts may cause brake rotor distortion that could result in a brake shudder. Overtightening may cause distortion of the wheel. This can result in a change in the diameter of the center (axle) hole and make it difficult to remove from the axle it is mounted on or difficult or impossible to install on another axle with a smaller center hole diameter.

ACTION: Use a manual torque wrench to tighten wheel nuts. Refer to the approriate Shop Manual for specific torque values.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

306000, 301000

Wheel Hub: Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

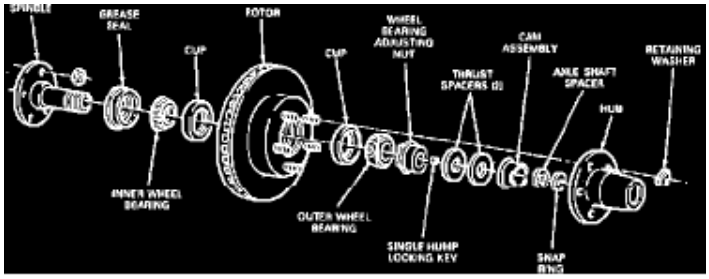
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

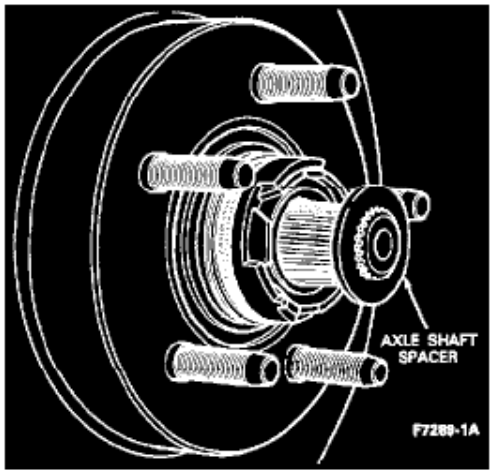
NOTES:

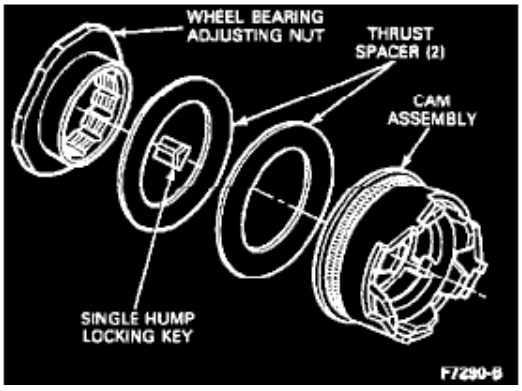
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Wheels and Tires > Wheel Hub > Component Information > Service and Repair > Removal







Wheel Hub: Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

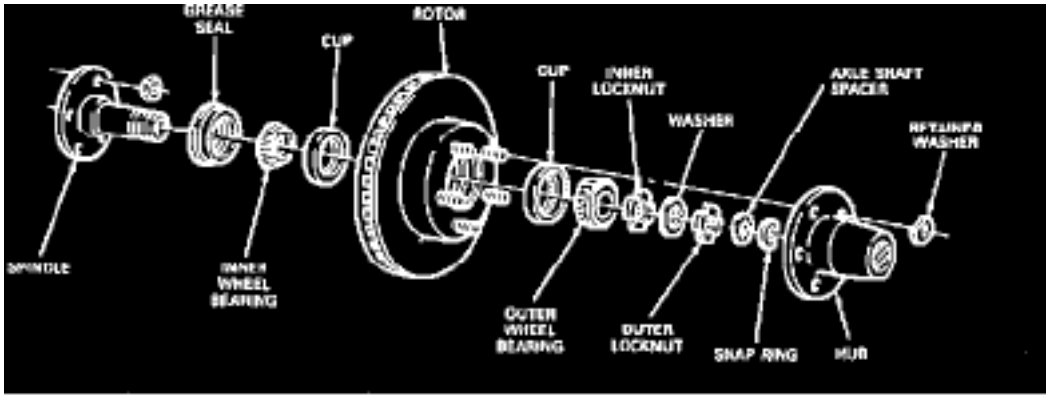
Axle Shaft Spacer

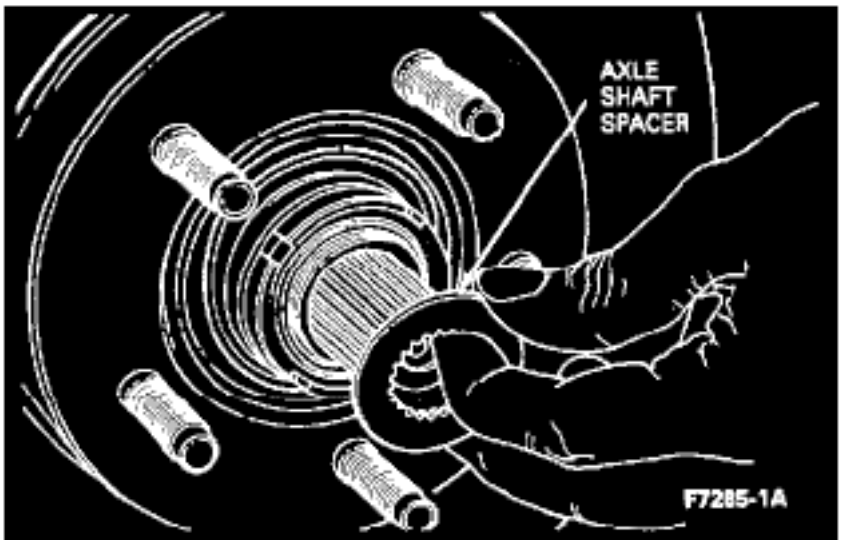
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

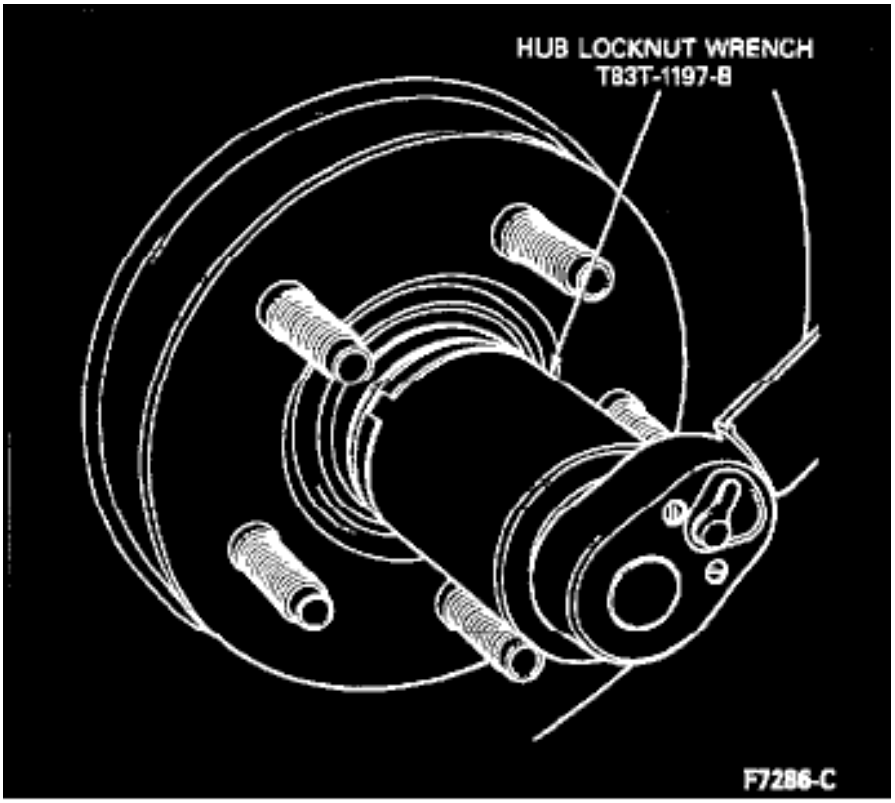
caliper.

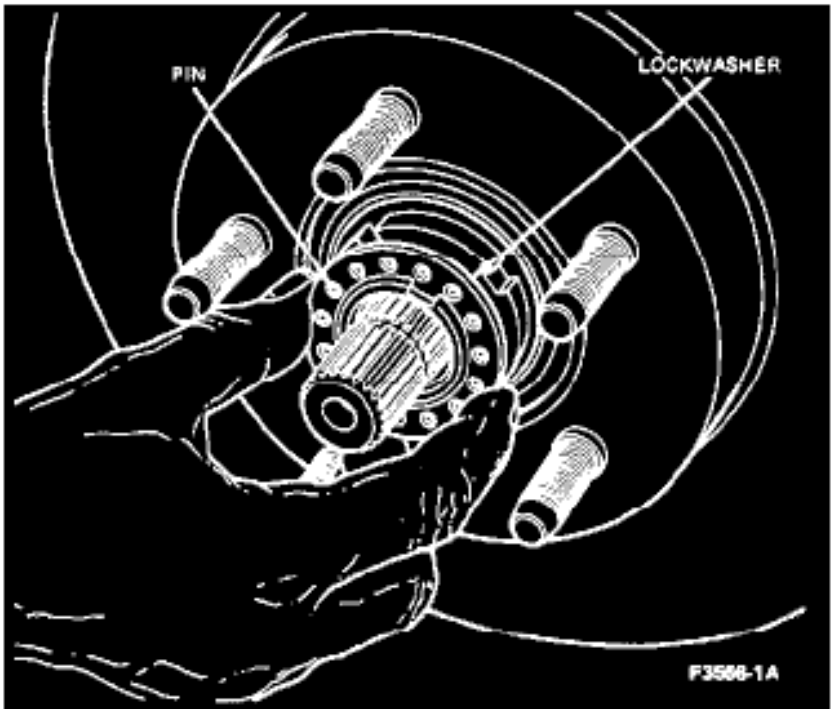
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

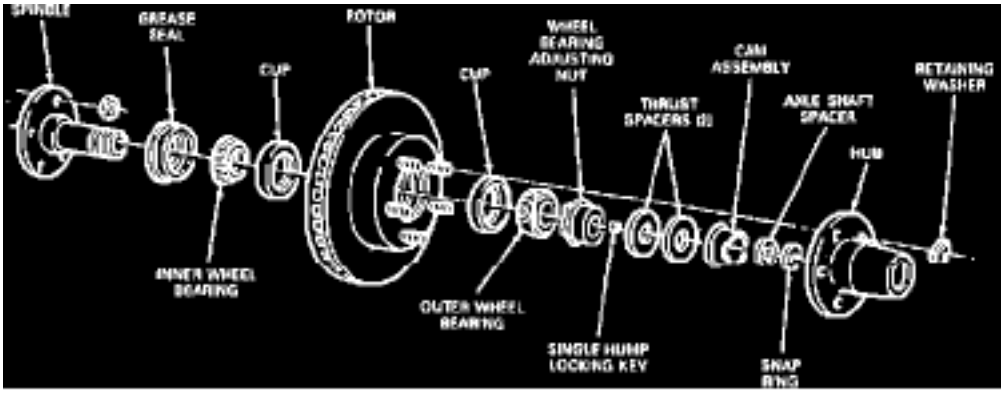

PIN
LOCKWASHER
F3566-1A

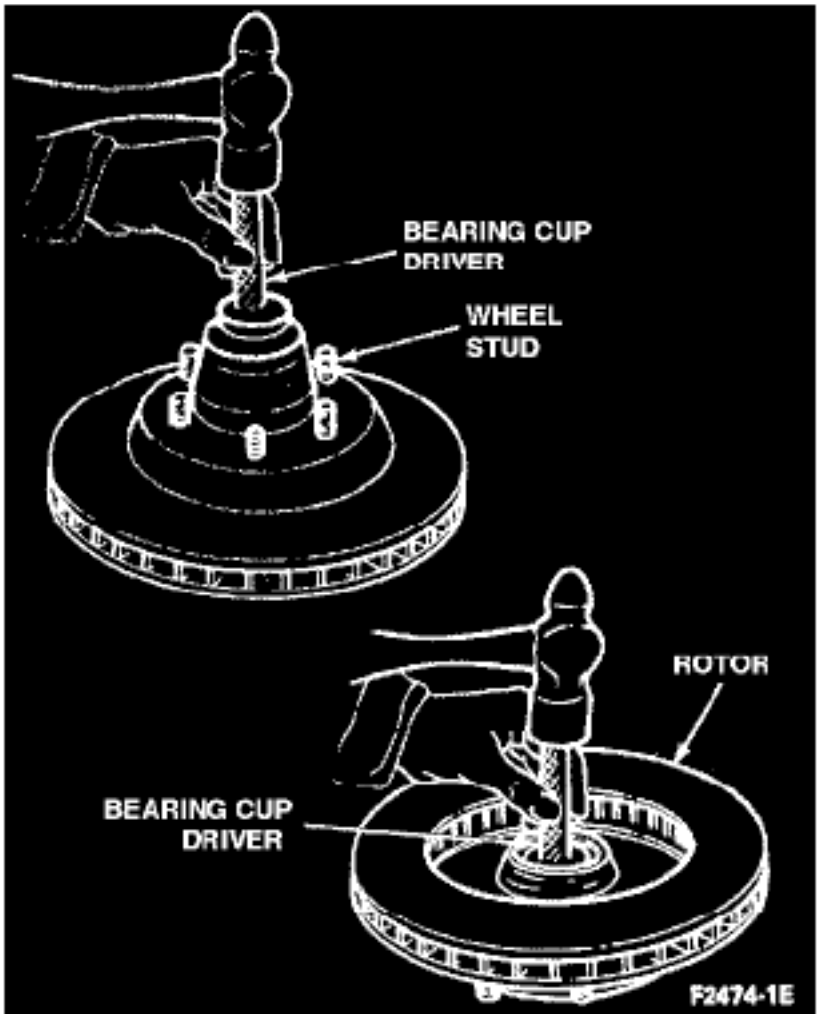
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub: Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

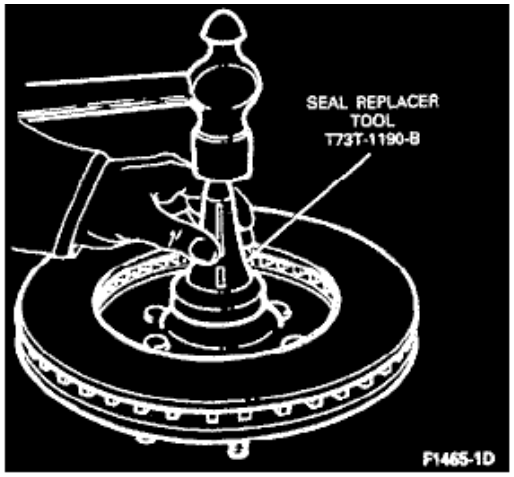
Installing Bearing Cups (Typical)

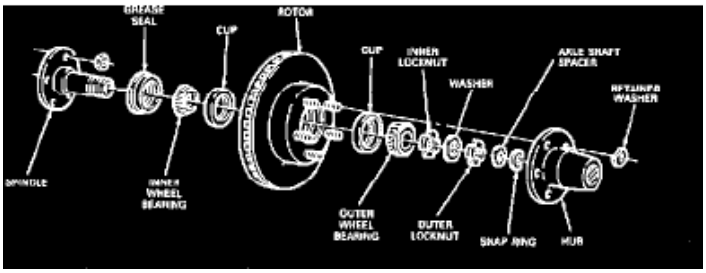
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

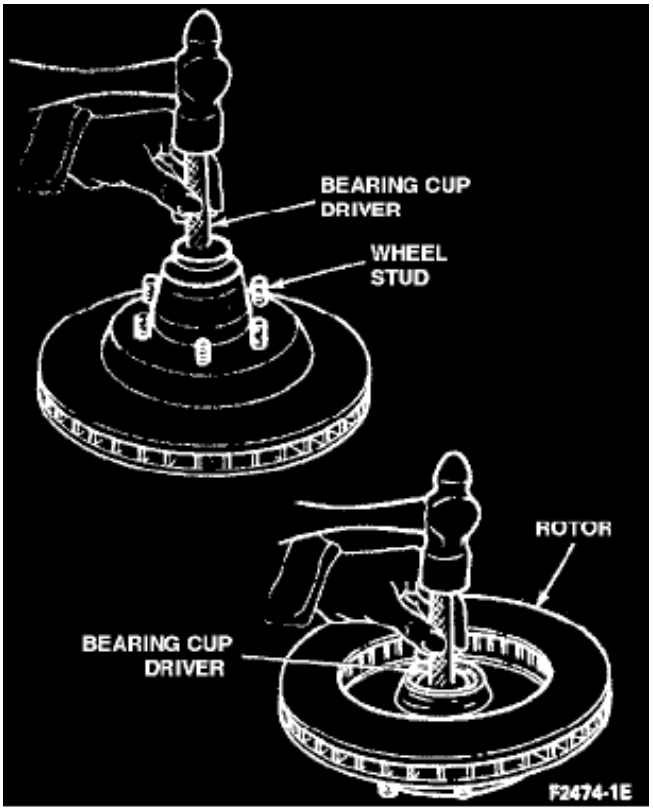
washers.

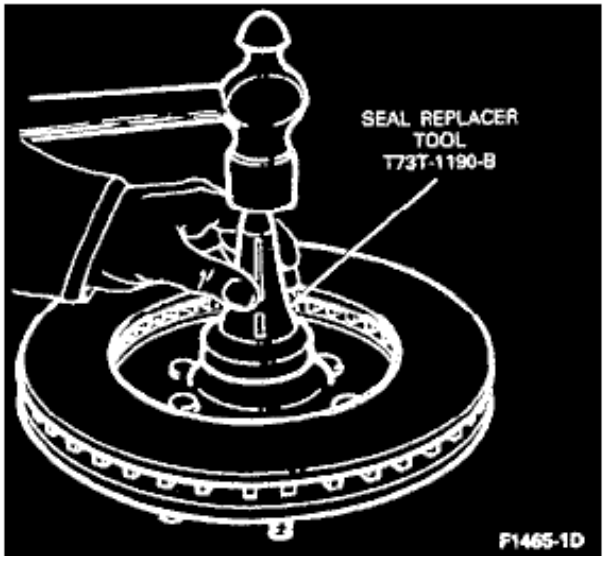
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E


SEAL REPLACER TOOL T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Wheel Hub (Locking): Customer Interest Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

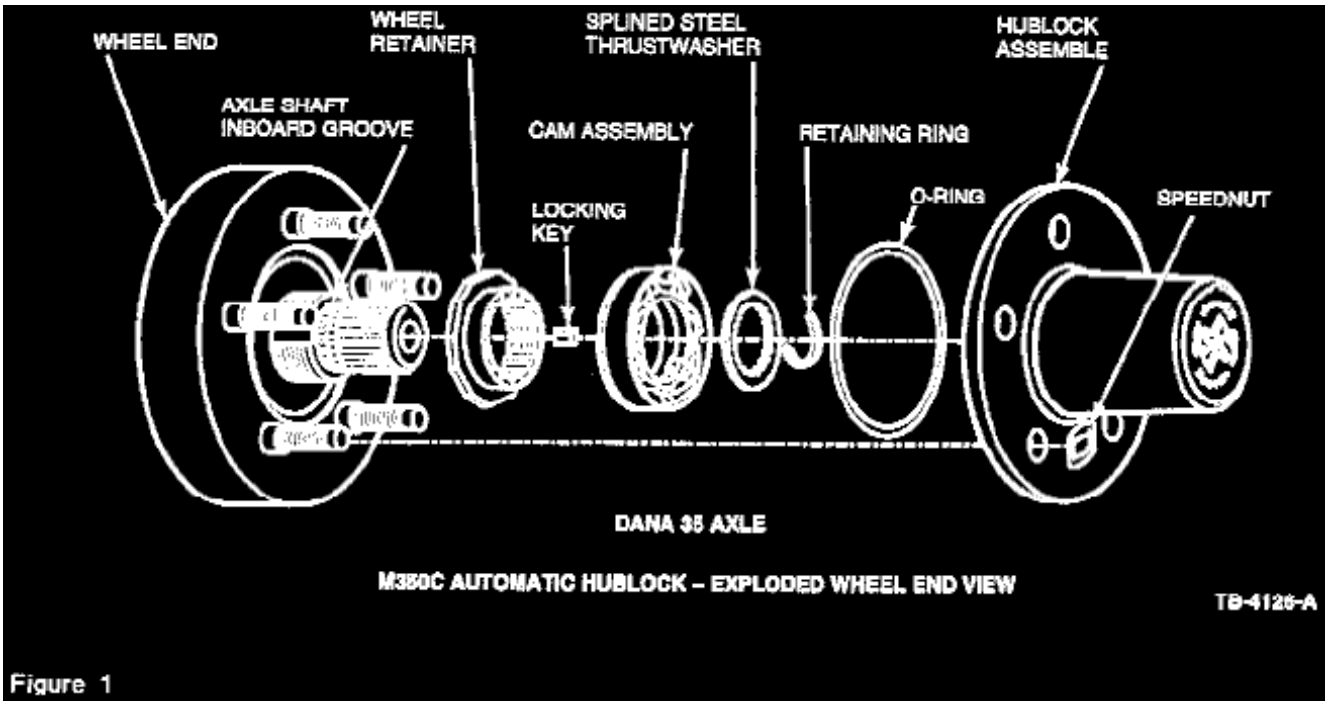


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

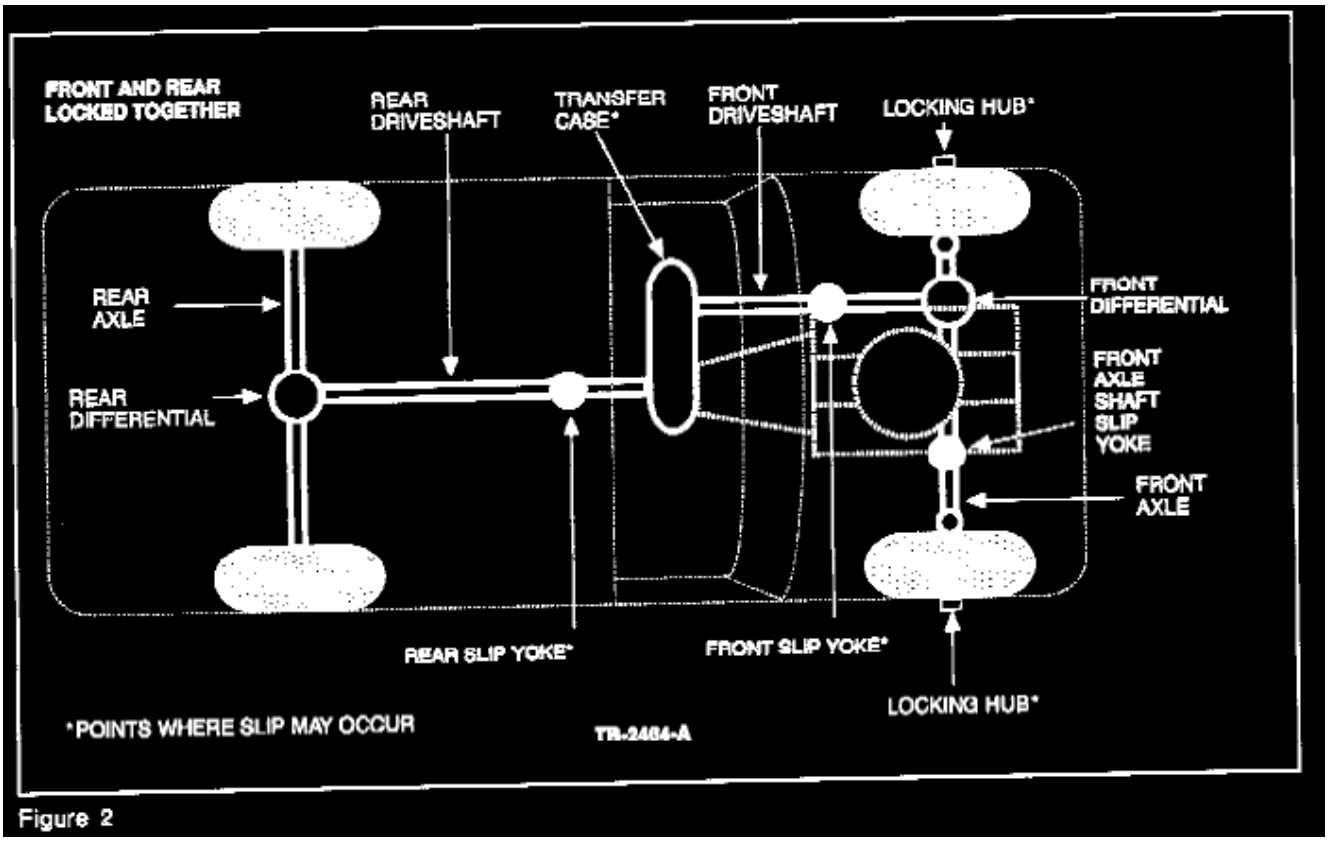


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART				
AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): All Technical Service Bulletins Front Hub - (4WD) Noise or Failure

Article No. 91-18-12 09/05/91

^ NOISE-"RATCHETING" SOUND FROM HUBLOCKBRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

^ AXLE-FRONT-AUTOMATIC LOCKING HUBS-ENGAGEMENT OF FRONT DRIVELINE DELAYED OR NO COUPLING OF FRONT WHEELS-BRONCO II BUILT AFTER 10/1/89, RANGER BUILT BETWEEN 10/1/89 AND 3/31/91, EXPLORER BUILT UNTIL 3/31/91

LIGHT TRUCK: 1990 BRONCO II 1990-91 RANGER 1991 EXPLORER

This TSB article is being republished in its entirety to note that the wheel bearing retaining nut is included with the front automatic locking hub assembly.

ISSUE: Engagement of the front driveline on 4x4 models of the subject vehicles with Shift-On-The-Fly and Dana 35 axles may exhibit delayed or no coupling of the front wheels. Both of these conditions may result in a hublock ratcheting noise and sometimes may result in structural damage to the hublock. These concerns are caused by the failure of the transfer case to provide synchronization of the drivetrain during cold weather.

ACTION: Test drive the vehicle to determine if the driveline exhibits delayed or no coupling of the front wheels. If so, use the following procedure to service the vehicle.

NOTE: THESE ACTIONS SHOULD PROVIDE SHIFT-ON-FLY CAPABILITY TO 55 MPH (89 KM/H) AT TEMPERATURES ABOVE 32~F (0~C) AND 45 MPH (72 KM/H) WITH TEMPERATURES FROM 32~F (0~C) TO AS LOW AS -20~F (-29~C).

FRONT AUTOMATIC LOCKING HUB

1. Remove the left and right front automatic locking hubs and camming assemblies and replace with new assemblies (FOTZ-3B396-B). Refer to the appropriate Light Truck Shop Manual, Section 04-01D, for service details.

2. Inspect the wheel bearing retaining nut for damage and presence of foreign material which would diminish wheel bearing life.

3. Replace the wheel bearing retaining nut if damaged. This nut is included with the front automatic locking hub assembly.

FRONT AXLE LUBRICANT

1. Determine if the vehicle was built prior to 12/15/90.

2. If the vehicle was built prior to 12/15/90, replace the front axle lubricant with new lubricant (F1TZ-19580-A).

a. Extract the old lubricant using a suction gun.

NOTE: BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

b. Refill the front axle with 56 ounces of lubricant (F1TZ-19580-A) using a suction gun.

TRANSFER CASE

1. Remove the following old transfer case parts and replace them with the following new parts. Refer to the appropriate Light Truck Shop Manual, Section 07-07E, for service details.

^ Clutch Coil Assembly (F1TZ-7G361-B)

^ Clutch Housing (F1TZ-7G362-A)

^ Lock-Up Collar (F1TZ-7106-B)

^ Lock-Up Fork (FOTZ-7289-A) - (Green paint mark by part number)

^ Return Spring (F1TZ-7219-A)

^ Sleeve Spring (E6TZ-7D126-A)

2. Install the sleeve spring (E6TZ-7D126-A) into the bore of the 7106 lock-up collar large end first.

PART NUMBER PART NAME CLASS

F1TZ-7G361-B Clutch Coil Assy. B

F1TZ-7G362-A Clutch Housing B

F1TZ-7106-B Lock-Up Collar B

FOTZ-7289-A Lock-Up Fork B

F1TZ-7219-A Return Spring B

E6TZ-7D126-A Sleeve Spring B

FOTZ-3B396-B Front Automatic Locking Hub B

Assy.

F1TZ-19580-A Lubricant (Pkg. of 12) V

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

91-15-10

WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911812A Replace Locking Hubs, 3.9 Hr.

Front Axle Lube And Transfer Case Components - Vehicles Built Before 12/15/90.

911812B Replace Locking Hubs And 3.7 Hr.

Transfer Case Components - Vehicles Built After 12/15/90.

DEALER CODING

BASIC PART NO. CONDITION CODE

T7A195 63

OASIS CODES: 508000, 509000, 597997, 702000, 702100

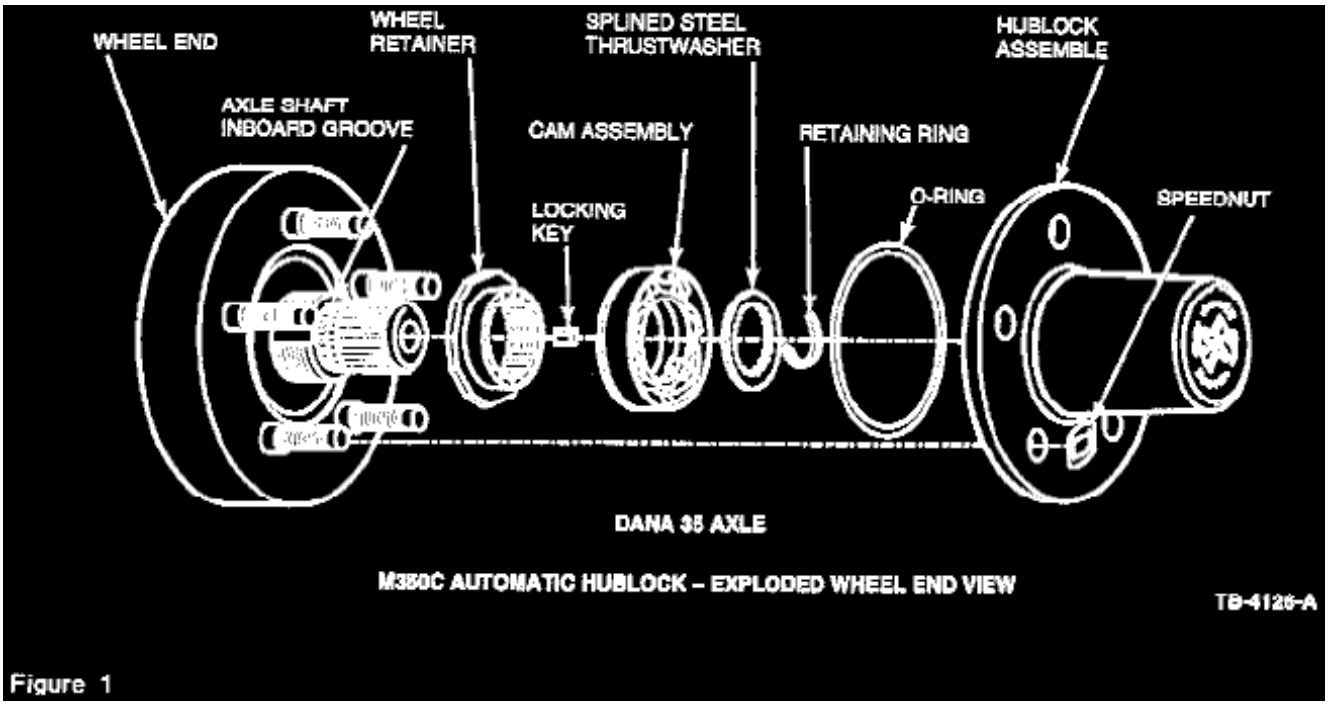


Figure 1

Wheel Hub (Locking): All Technical Service Bulletins Automatic Hublock - Diagnosis/Service Tips

Article No. 95-5-18

03/13/95

^ LOCK HUBS - 4WD - AUTOMATIC HUBLOCK INFORMATION - SERVICE TIPS

^ FOUR-WHEEL DRIVE (4WD) - AUTOMATIC LOCK HUB DIAGNOSIS

LIGHT TRUCK: 1983-90 BRONCO II 1983-95 RANGER 1991-94 EXPLORER

ISSUE: 4X4 system diagnosis can be difficult at times due to system complexities.

ACTION:

For general system operation and diagnosis: Refer to TSB Article No. 92-1-8.

For specific automatic lock hub diagnosis and service: Refer to this article.

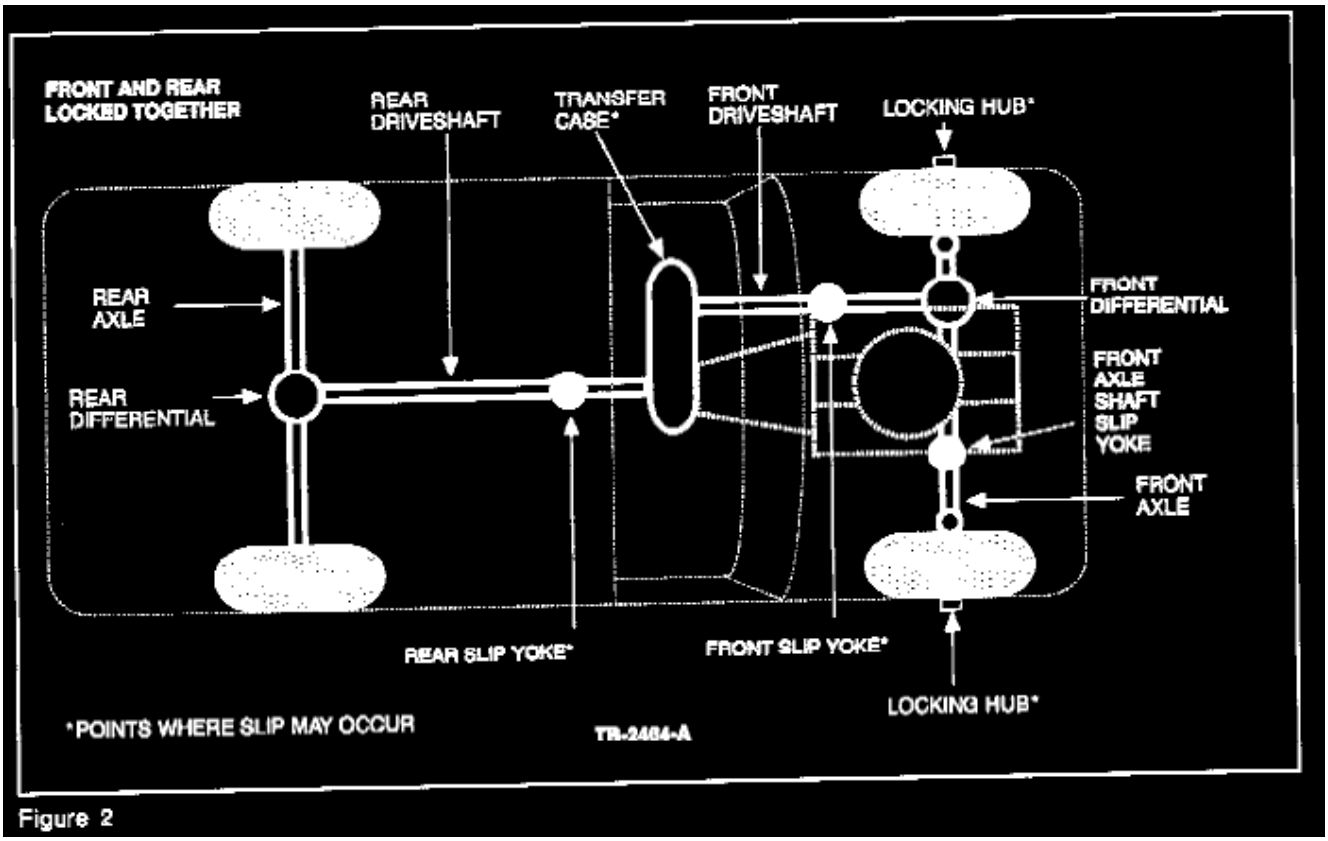


Figure 2

HUBLOCK DIAGNOSTICS

WHEEL END CONTAMINATION:

^ All compact vehicle hublocks have an O-ring seal between the hublock and wheel hub to prevent contamination. Whenever the hublock is removed, the 0-ring seal should be checked for damage.

^ If contamination is found in the wheel end, the path must be determined and corrected. Path possibilities are through the hublock seal, the wheel

bearing seals or the axle spindle seals.

WHEEL END NOISE (BUZZING) IN 4X2, AFTER UNLOCKING HUBS, SHORTLY AFTER FOUR-WHEEL DRIVE USAGE:

^ Noise concerns in two-wheel drive shortly after shifting from four-wheel drive and unlocking hubs, can occur if one of the hublocks fails to disengage. As the vehicle moves forward, the one (1) hublock that has failed to disengage will rotate its axle shaft through the differential and attempt to rotate the other axle shaft in the opposite direction. This is called differential motoring torque. As this torque attempts to turn the other axle shaft through the differential gears, that shaft's hublock will attempt to engage which will result in a ratcheting or buzzing noise.

^ This type of noise concern is usually found on axles that have incorrect front axle differential lubricant or very few 4X4 miles on them.

^ Verify that the front axle differential lubricant is F1TZ-19580-A. If incorrect lubricant is detected, extract the old lubricant using a suction gun.

NOTE:

BREAKING THE CARRIER SEAL IS NOT A RECOMMENDED METHOD OF EXTRACTING THE LUBRICANT.

1. Refill the front axle with 56 oz (1.66 L) of lubricant F1TZ-19580-A using a suction gun.

2. As the front axle accumulates 100-200 miles (161-322 km) of locked hublock operation, the axle will break-in, thus reducing the amount of differential motoring torque significantly.

3. If a front axle requires breaking in, refer to the Front Axle Break-In Procedure in this article.

4. If the front axle has been broken-in and the differential lubricant is F1TZ-19580-A, however, a wheel end noise (buzzing) in 4X2 is still experienced shortly after four-wheel drive usage. It is advised that the hublock which is not ratcheting be replaced as it is not disengaging correctly. When this condition occurs on any 4X4 Ranger, Explorer, or Bronco II, built from 10/89 through model year 1993, it is advised that both hublocks be replaced as the ratcheting hub is likely to become damaged.

FRONT AXLE BREAK-IN PROCEDURE:

^ To break-in the front axle, engage four-wheel drive and then shift out of it without disengaging the hublocks.

^ Thereafter, continue to drive the vehicle with locked hublocks until 100-200 miles (161-322 km) are accumulated. This will break-in the axle. Should the vehicle be backed up during this time

period, the hublocks will disengage and will have to be locked again by repeating the engagement procedure.

WHEEL END NOISE (RATCHETING) IN 4X2 AND HUBS UNLOCKED:

^ This condition could occur during turns or when the suspension is stroked. It is more prevalent in cold weather, with new front axles. It is usually caused by high motoring torque at the axle shafts or by incorrect axle lubrication.

^ Verify that axle lubrication is F1TZ-19580-A. If the front axle is not broken-in, 100-200 4X4 miles (161-322 km), proceed to do so following the outlined front axle break-in procedure in the Hublock Diagnostics section of this TSB article.

WHEEL END NOISE (BUZZING) WHILE ENGAGING 4X4 (TOUCH DRIVE) WHILE MOVING:

^ Refer to TSB Article No. 91-15-10.

POPPING/BANGING SOUND WHILE IN 4X4:

^ If the system slips under load, find what has broken or is slipping. To locate where slip is taking place, put marks at various possible slip points (Figure 1). Test drive the vehicle, then check to see if marks at different points are still in the same relationship to each other. This will help you determine where the slippage is taking place or where to look for broken parts, if any.

^ On vehicles with automatic hubs, find a place where you can do your test, mark the components, then drive without backing up. Stop and check the marks to see if they are in the same relationship to each other. If you back up before checking your marks, the hubs may reindex and not reveal the problem.

^ Reindex component should be serviced.

INSTALLATION PROCEDURE

1. Remove old hublock; remove key from bearing retainer nut and then remove nut.

2. If replacing a manual hublock with an automatic hublock, also remove the three-piece wheel bearing nut assembly.

3. Remove the new wheel bearing retaining nut from the cam assembly and install on the threaded spindle.

4. Using Hex Locknut Wrench (T70T-4252-B), torque the wheel bearing retainer nut to 47 N-m (35 lb.ft.) while rotating the wheel assembly. Back nut off 1/4 turn and retighten to 1.8 N-m (16 lb.in.) of torque.

5. Align scallop of the wheel bearing retaining nut with the center of the spindle keyway by advancing the nut clockwise.

6. Install the retaining key into the spindle keyway. With the garter spring inboard, align the key on the cam assembly with the keyway on the spindle.

7. Firmly press the cam assembly on the wheel bearing retaining nut.

CAUTION:

DO NOT PACK THE HUBLOCK WITH GREASE. TOO MUCH GREASE WILL CAUSE IMPROPER HUBLOCK OPERATION AND MAY DAMAGE THE HUBLOCK.

8. For Ranger and Bronco II, model years 1983-90 (through build date 10/4/89), using the DANA 28 Axle, install the thrust washer set onto the axle:

a. First, the plain steel washer.

b. Second, the needle bearing.

c. Last, the spline washer.

9. For model years 1990-94 (begin build date 10/5/89), DANA 35 Axle, install the one-piece spline washer. Install the "C" clip into the axle groove. It may be necessary to push the axle outboard from the inboard side of the knuckle.

10. For 1995 Ranger, install the thrust washer onto the axle:

a. First, the plain steel thrust washer.

b. Second, the plastic unsplined thrust washer.

AUTOMATIC HUBLOCK IDENTIFICATION CHART				
AUTOMATIC HUBLOCK MODEL TYPE	DATE CODE DESCRIPTION	EXAMPLE	PRODUCTION DATE	HUBLOCK BODY COLOR
M350A	Three (3) alphanumeric characters, or in some cases, no code	AB2 or no code	10/89	Argent
M350B	Six (6) numbers	920621	6/92	Argent
M350C	Backward letter "C" or the letter "C" followed by six (6) numbers	" " 931020 or C931021	8/93	Argent

c. Last, the steel spline thrust washer.

CAUTION:

ENSURE THE RETAINING RING OR "C" CLIP IS SEATED PROPERLY IN THE AXLE GROOVE FOR STEPS 8, 9, OR 10.

11. Check to ensure 0-ring seal on the flange face of the hublock body is not damaged and is properly positioned in its groove.

12. Install the hublock body assembly into the vehicle hub and rotor assembly. The hub may have to be rotated to line up the three (3) prongs of the cam follower (found internally to the hublock) with the cam assembly.

13. Install retainer flat nuts on wheel studs.

NOTE:

DO NOT FORCE THE HUBLOCK ASSEMBLY. IF THE BODY ASSEMBLY WILL NOT FIT, RECHECK THE ALIGNMENT OF ALL COMPONENTS. INSTALL SPEEDNUTS ON WHEEL LUGS TO RETAIN HUBLOCK. THEREAFTER, INSTALL THE WHEEL AND TORQUE THE LUG NUTS TO 136 N-m (100 LB.FT.) (FIGURE 2).

HISTORY AND TIMING

The Warn Automatic Hublock (Model M350) was used on the DANA 28 Axle (Bronco II and Ranger) from model years 1983-90 (through build date 10/4/89). The Warn Automatic Hublocks (Models M350A and M350B) were used on the DANA 35 Axle (Bronco II, Explorer and Ranger) for model years 1990-93 (begin build date 10/5/89). Starting with model year 1994 the Warn Automatic Hublock (Model M350C) used on the DANA 35 Axle (Explorer and Ranger) was introduced.

The Model M350 is black and Model M350A, M350B and M350C are argent (white silver) in color. The Model M350 can only be replaced by Model M350 service parts. The M350C service kits should be used as replacements for the following:

^ M350A hublocks released 10/89 as model year 1990 running change.

^ M350B hublocks released 4/92 as model year 1992 late running change.

^ M350C hublocks released 8/93 as model year 1994 Job 1 change.

When automatic hublock servicing is required for any Ranger, Explorer, or Bronco II built from 10/89 through model year 1993, it is advised that both hublocks be replaced.

NOTE:

IF AN M350A OR M350B HUBLOCK REQUIRES SERVICING, ALL THE HUBLOCK COMPONENTS MUST BE REMOVED AND REPLACED WITH SERVICE KIT F3TZ-3B396-B, WHICH ESSENTIALLY IS THE SERVICE KIT FOR THE M350C AUTOMATIC HUBLOCK. THE CAM ASSEMBLY OF THE M350A OR M35OB SHOULD NOT BE USED WITH AN M350C AUTOMATIC HUBLOCK BODY NOR SHOULD AN M350A OR M350B AUTOMATIC HUBLOCK BODY BE USED WITH AN M350C CAM ASSEMBLY.

For model year 1994 (and beyond) 4X4 Rangers or Explorers, replace automatic hublocks in accordance with the automatic hublock Service Manual procedure and additional diagnostics procedure outlined in this TSB.

IDENTIFYING AUTOMATIC HUBLOCK MODELS

A stamped code found on the rear of the automatic hublock flange face can be used to identify the automatic hublock type, in addition to the model year summary described above. Examples of the three (3) different codes which correlate to the automatic hublock model type are outlined in the chart:

PART NUMBER	PART NAME
E3TZ-1K105-B	Hublock Assembly
E3TZ-3N105-A	Nut And Bearing
E3TZ-1K106-B	Seal Kit
E5TZ-3B459-A	Key
E6TZ-3B477-A	Cam

PART NUMBER	PART NAME
F3TZ-3B396-B	Hublock - Automatic (Hublock Assembly, Wheel Retainer, Cam Assembly Key)
F3TZ-3N105-A	Hublock Nut/Key
F3TZ-1K106-A	Hublock Seal/Decal

THE ABOVE PART APPLICATION CHART IS FOR 1983-90 (THROUGH BUILD DATE 10/4/89) BRONCO II, RANGER, DANA 28 AXLE, HUBLOCK MODEL M350:

THE ABOVE PART APPLICATION CHART IS FOR:

^ 1990-95 Ranger (begin build date 10/5/89)

^ 1990 Bronco (begin build date 10/5/89 through end of production)

^ 1991-94 Explorer (through build date 11/18/94, DANA 35 Axle, Hublock Model M350C)

OTHER APPLICABLE ARTICLES: 92-1-8 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 508000, 509000, 590000

Wheel Hub (Locking): Specifications

TORQUE SPECIFICATIONS

Bearing Inner Locknut - Manual Locking Hub* Torque Limits - ..... 47 Nm (35 ft lb)

Bearing Outer Locknut - Manual Locking Hub Torque Limits - ..... 203 Nm (150 ft lb)

Bearing Nut - Automatic Locknut Hub* Torque Limits - ..... 47 Nm (35 ft lb)

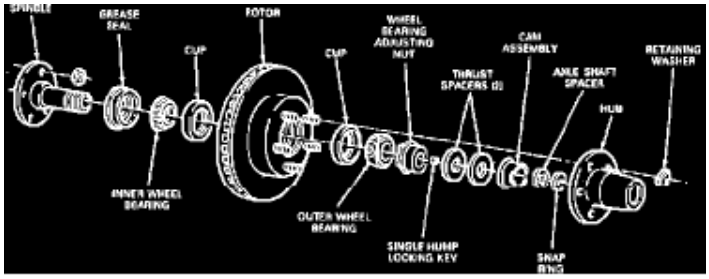
Wheel Lug Nuts** Torque Limits - ..... 135 Nm (100 ft lb)

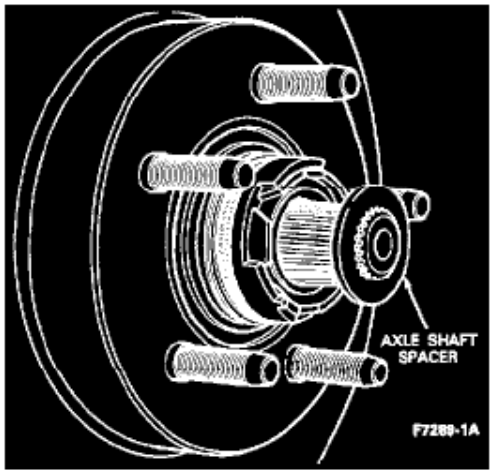
NOTES:

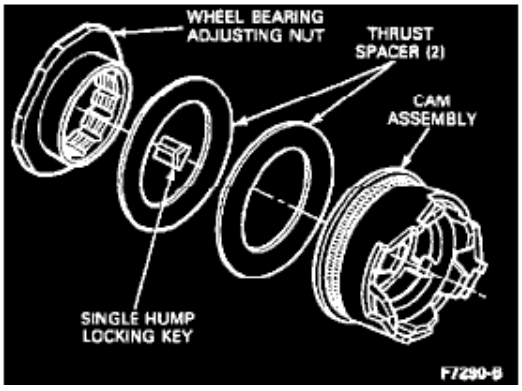
* After tightening to specified torque, back off the nut 1/4 turn (90°). After backing off the nut, retighten to 1.8 Nm (16 in lb)

** Torque specifications are for clean, dry bolt and nut threads. Never use oil or grease on studs or nuts.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Steering and Suspension > Wheels and Tires > Wheel Hub (Locking) > Component Information > Service and Repair > Removal







Wheel Hub (Locking): Service and Repair Removal

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

1. Raise the vehicle and install safety stands. 2. Remove the wheel lugnuts and the wheel and tire assembly. 3. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

caliper. Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

4. Remove the retainer washers from the lugnut studs. Remove the automatic locking hub assembly from the spindle. 5. Remove the snap ring from the end of the spindle shaft.

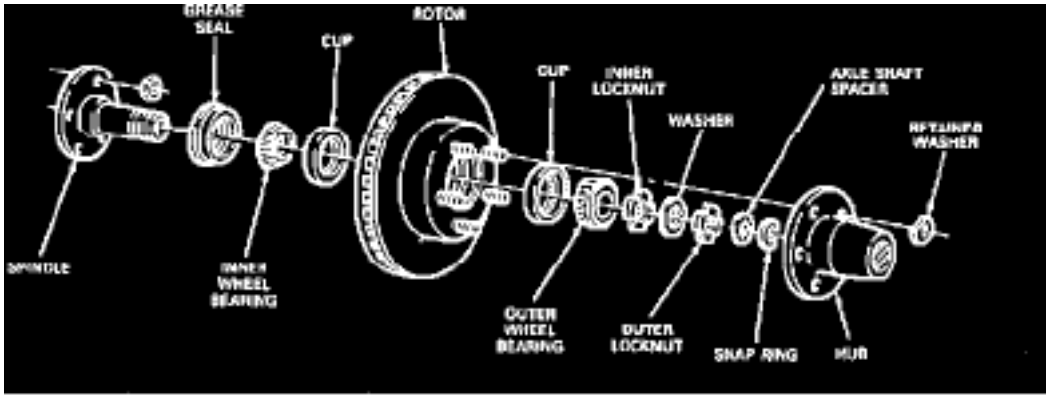
Axle Shaft Spacer

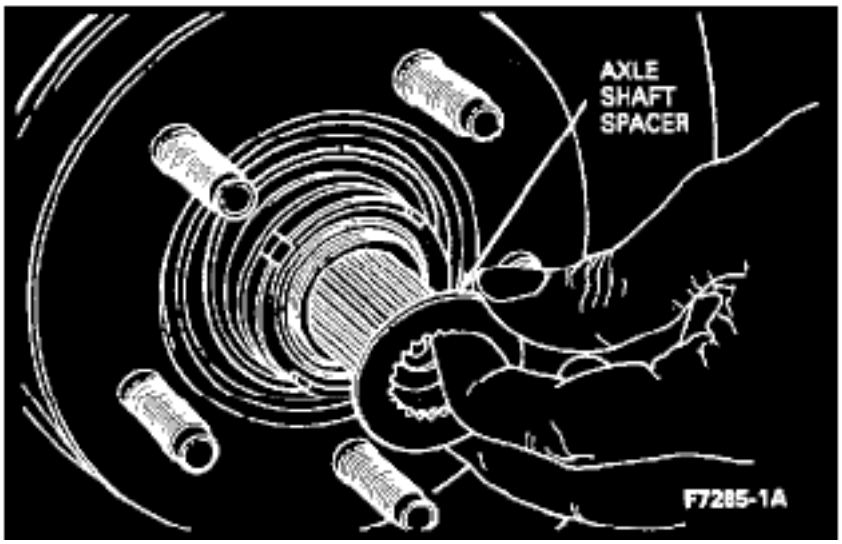
6. Remove the axle shaft spacer. 7. Pull cam assembly off the wheel bearing adjusting nut and remove the two plastic thrust spacers from the adjusting nut.

CAUTION: Do not pry on the plastic cam or thrust spacers during removal. Prying may damage the cam or spacers.

Cam Assembly And Locking Key

8. Using a magnet, remove the locking key.





NOTICE: If required, rotate the adjusting nut slightly to relieve pressure against the locking key, before the key can be removed.

CAUTION: To prevent damage to the spindle threads, look into the spindle keyway under the adjusting nut and remove the separate locking key before removing the adjusting nut.

9. Remove the wheel bearing adjusting nut from the spindle using a 2-3/8 inch Hex Locknut Wrench.

10. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

1. Raise the vehicle until the tire clears the floor and remove the wheel and tire assembly. 2. Remove the brake caliper and secure to the underbody to prevent damage to the brake hose. It is not necessary to disconnect the hose from the

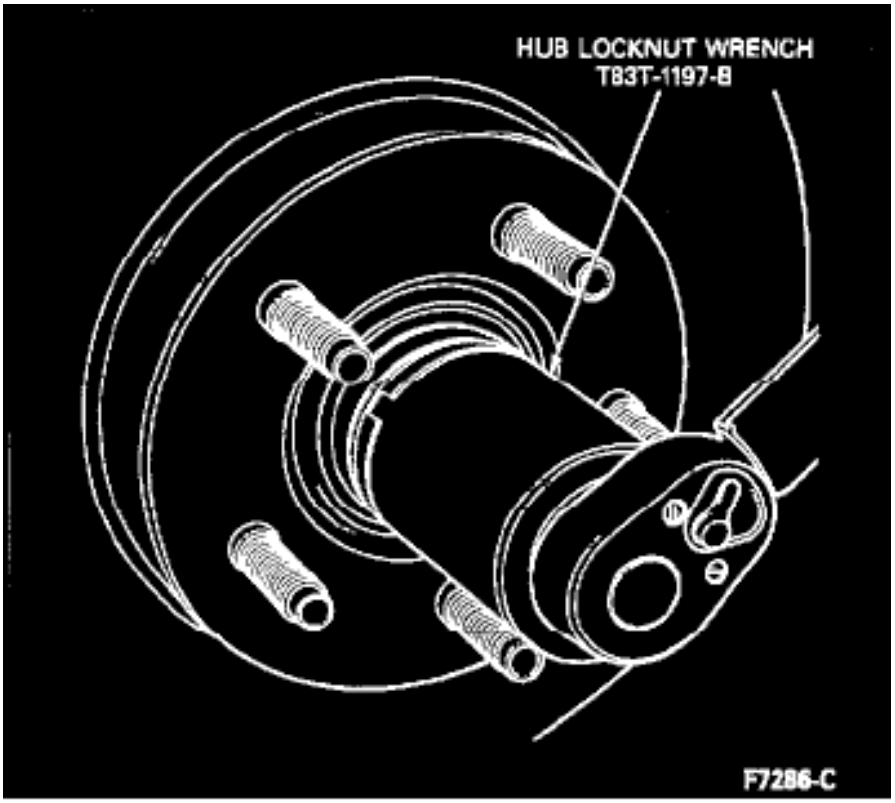
caliper.

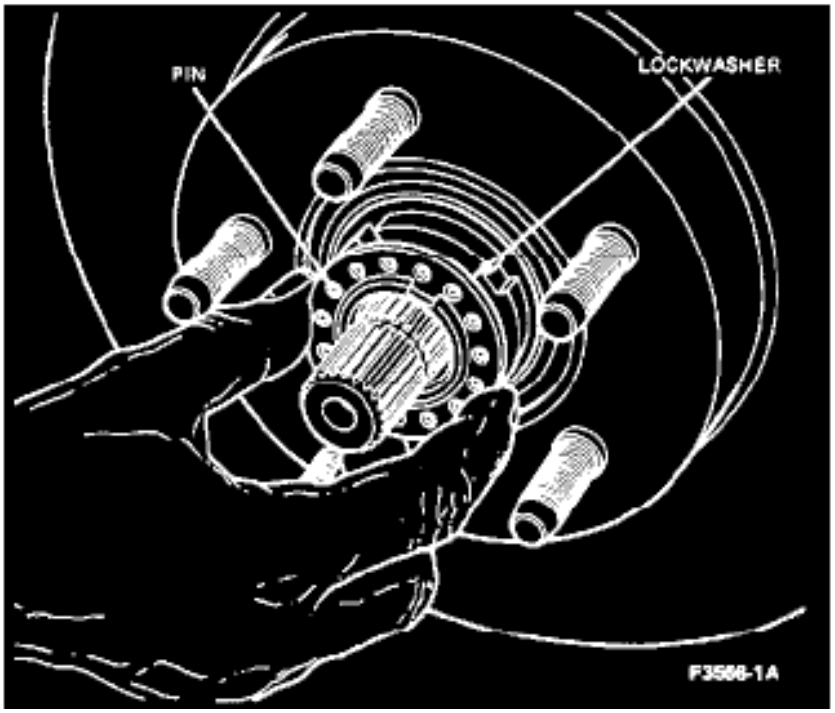
CAUTION: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched, twisted or ruptured.

3. Remove the retainer washers from the lugnut studs and the manual locking hub assembly from the spindle. 4. Remove the snap ring from the end of the spindle shaft.

Axle Shaft Spacer

5. Remove the axle shaft spacer.


HUB LOCKNUT WRENCH
T83T-1197-B
F7286-C

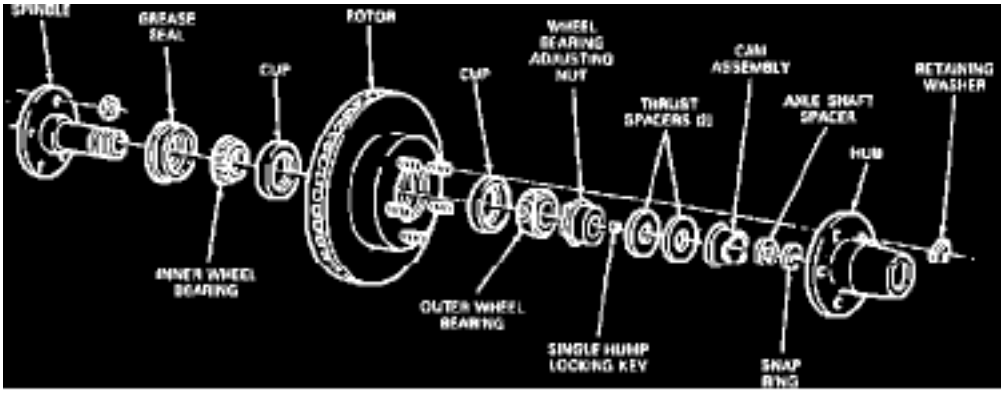

PIN
LOCKWASHER
F3566-1A

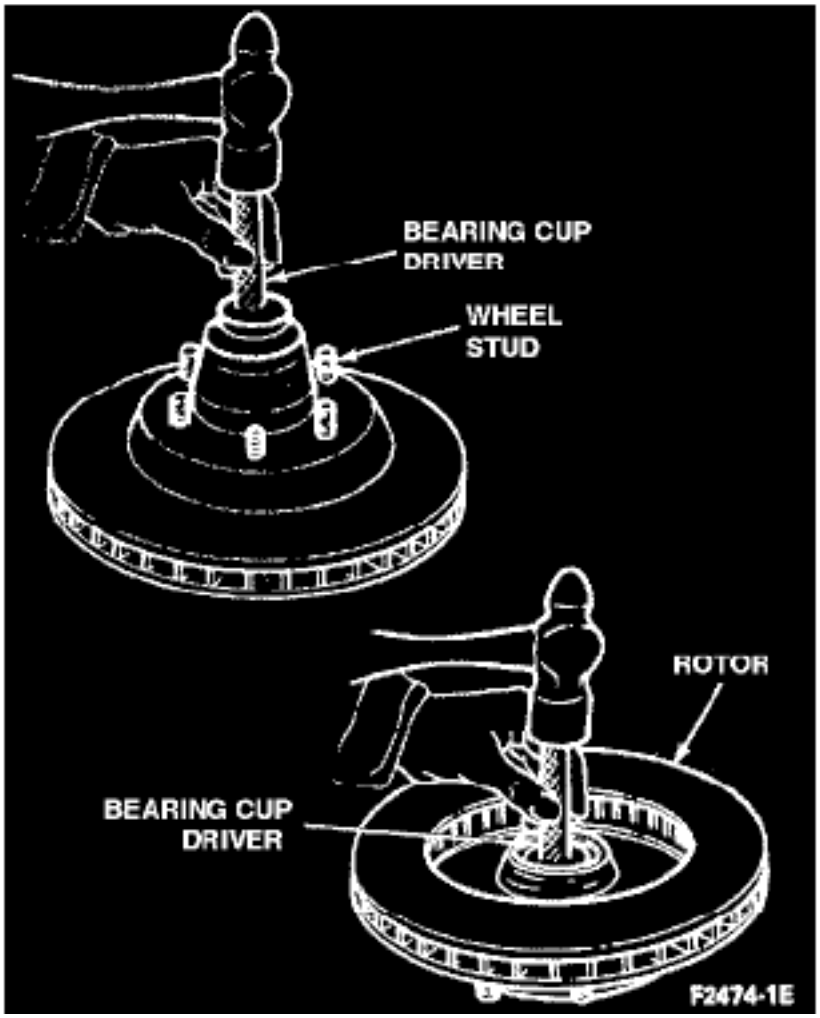
Locknut Wrench

6. Remove the outer wheel bearing locknut from the spindle using a hub locknut wrench. Engage tool tabs into locknut slots.

Locknut Washer

7. Remove locknut washer from spindle. 8. Remove the inner locknut and slide hub/rotor off spindle being careful to catch the outer wheel bearing.


SPINDLE
GREASE SEAL
CUP
ROTOR
CUP
WHEEL BEARING ADJUSTING NUT
CAM ASSEMBLY
THRUST SPACERS (2)
AXLE SHAFT SPACER
HUB
RETAINING WASHER
INNER WHEEL BEARING
OUTER WHEEL BEARING
SINGLE HUMP LOCKING KEY
SNAP RING


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E

Wheel Hub (Locking): Service and Repair Installation

With Automatic Locking Hubs

Fig. 6 Automatic Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.

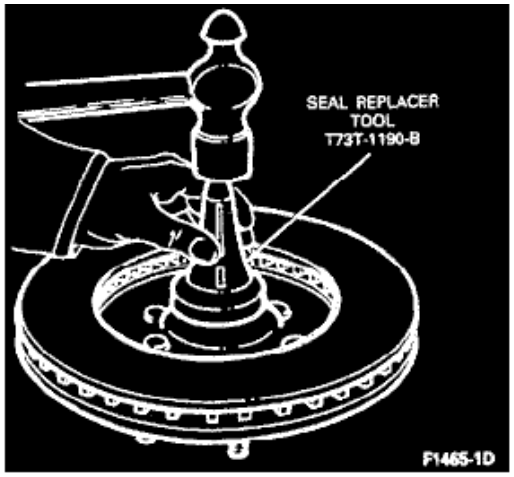
Installing Bearing Cups (Typical)

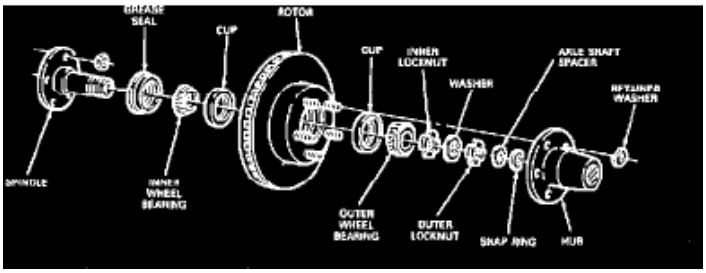
1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Replace grease retainers. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.


SEAL REPLACER
TOOL
T73T-1190-B
F1465-1D


GREASE SEAL
CUP
ROTOR
CUP
INNER LOCKNUT
WASHER
AXLE SHAFT SPACER
RETAINER WASHER
SPINDLE
INNER WHEEL BEARING
OUTER WHEEL BEARING
OUTER LOCKNUT
SNAP RING
HUB

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the wheel bearing adjustment nut. 7. While rotating the hub and rotor assembly, tighten the wheel bearing adjusting nut to 47 Nm (35 ft lb) to seat the bearings. Spin the rotor and back

off the nut one-quarter turn (90 degrees).

8. Retighten the adjusting nut to 1.8 Nm (16 in lb) using a torque wrench. 9. Make sure the final end play of the wheel on the spindle is 0.00-0.08 mm (0.000-0.003 in). the maximum torque to rotate the hub is 2.8 Nm (25 in

lb).

10. Align the closest lug in the wheel bearing adjusting nut with the center of the spindle keyway slot. Advance the nut to the next lug if required.

Install the separate locking key in the spindle keyway under the adjusting nut.

WARNING: Extreme care must be taken when aligning the spindle nut adjustment lug with the center of the spindle keyway slot to prevent damage to the separate locking key. The wheel and tire assembly may come off while the vehicle is in motion if the key is damaged.

11. Install the two thrust spacers and push or press the cam assembly onto the locknut by lining up the key in the fixed cam with the spindle keyway.

CAUTION: Extreme care must be taken when aligning the fixed cam key with the spindle keyway to prevent damage to the fixed cam.

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft. 14. Install the automatic locking hub assembly over the spindle. Align three hub assembly legs with three pockets in cam assembly. Install the retainer

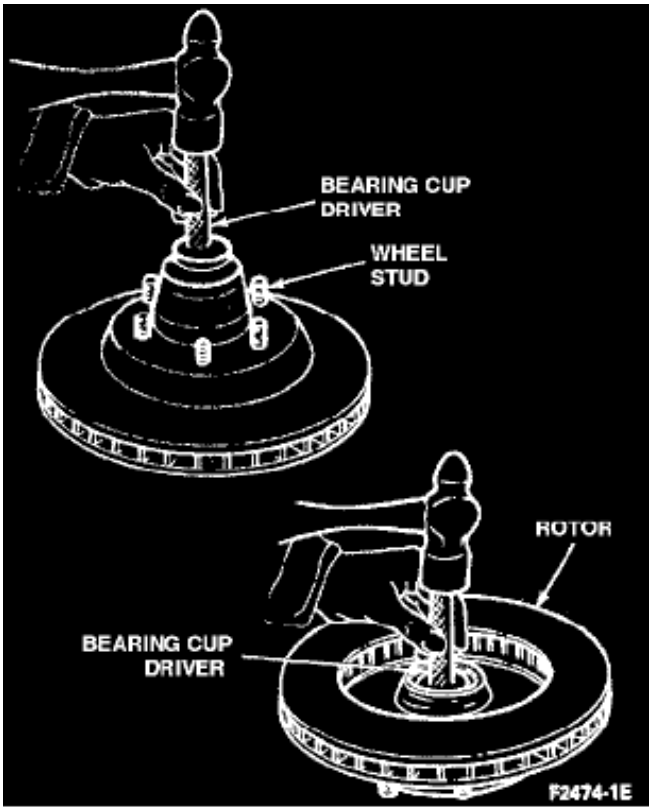
washers.

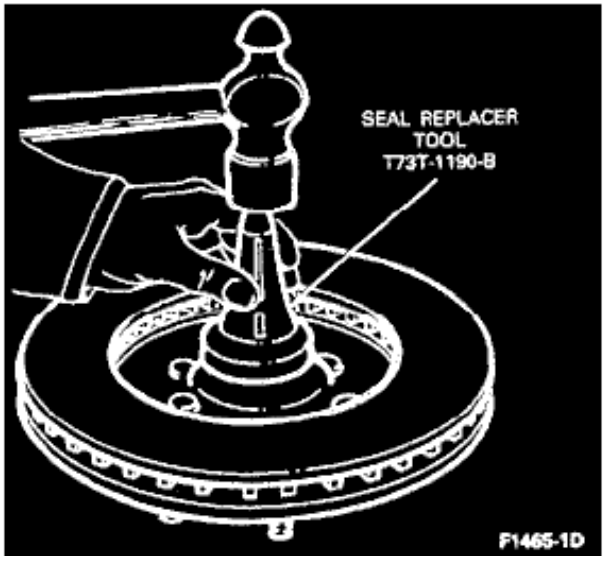
15. Install the caliper. 16. Install the wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb).

With Manual Locking Hubs

Fig. 5 Manual Locking Hub

CAUTION: Wheel bearing lubricant is a lithium-base grease. Sodium-base grease is not compatible with lithium-base grease and should not be intermixed. Therefore, do not lubricate front wheel bearings without first identifying the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants may result in premature lubricant breakdown.


BEARING CUP DRIVER
WHEEL STUD
ROTOR
BEARING CUP DRIVER
F2474-1E


SEAL REPLACER TOOL T73T-1190-B
F1465-1D

Installing Bearing Cups (Typical)

1. If inner or outer bearing cups were removed, install replacement inner and outer bearing cups in the hub with the appropriate bearing cup replacer

tool. Be sure to seat the cups properly in the hub. The cups will be properly seated when they are fully bottomed. Polish grease retainer journal on spindle with 400 grit sandpaper. Clean with clean cloth. Replace grease retainers.

2. Pack the inside of the hub with lithium-base grease or equivalent. Fill the hub until the grease is flush with the inside diameters of both bearing

cups. Pack the bearing cones and rollers with wheel bearing grease. Use a bearing packer for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

Installing Grease Seal (Typical)

3. Place the inner bearing in the inner cup and install the new grease seal. Be sure that the seal is fully seated. 4. Install the hub/rotor on the wheel spindle. Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads. 5. Place the outer bearing in the outer cup. 6. Install the inner locknut. 7. Tighten the inner locknut to 47 Nm (35 ft lb) while turning the rotor in the opposite direction to seat bearings. 8. Spin the rotor and back off the inner locknut one-quarter turn. Retighten the inner locknut to 1.8 Nm (16 in lb). 9. Install the lockwasher on the spindle.

NOTICE: If necessary, tighten inner locknut slightly to align the locknut pin with lockwasher hole.

10. Install the outer wheel bearing locknut using locknut wrench. Tighten locknut to 203 Nm (150 ft lb). 11. Check the end play of the wheel and tire assembly on the spindle. Final end play should be 0.00-0.08 mm (0.000-0.003 in). The maximum torque

to rotate the hub is 2.8 Nm (25 in lb).

12. Install the axle shaft spacer. 13. Clip the snap ring onto the end of the spindle shaft.

14. Install the manual hub assembly over the spindle. Install the retainer washers. 15. Install caliper. 16. Install wheel and tire assembly. Install and tighten lugnuts to 135 Nm (100 ft lb). 17. Lower vehicle. 18. Check brakes for proper operation.

WARNING: Before moving vehicle, pump brake pedal several times to be sure it is firm. Do not move vehicle until a firm pedal is obtained.

Wheel Fastener: Technical Service Bulletins Lug Nuts - Proper Installation/Torqueing Procedure

Article No. 98-5A-4

^ BRAKES - PREVENTING BRAKE VIBRATION - SERVICE TIP

^ WHEELS - PROPER LUG TORQUE PROCEDURES - SERVICE TIP

FORD: 1972-97 THUNDERBIRD 1976-86 LTD 1976-97 MUSTANG 1981-97 CROWN VICTORIA 1982-88 EXP 1982-98 ESCORT 1984-94 TEMPO 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1979-83 MONARCH, ZEPHYR 1979-97 COUGAR 1980-83 MARK VI 1980-98 CONTINENTAL, TOWN CAR 1981-86 LYNX 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-97 SABLE 1987-89 TRACER 1987-97 GRAND MARQUIS 1991-94 CAPRI 1991-97 TRACER 1993-98 MARK VIII 1995-98 MYSTIQUE

LIGHT TRUCK: 1979-96 BRONCO 1979-97 ECONOLINE, F-150-350 SERIES 1984-90 BRONCO II 1984-97 RANGER 1986-97 AEROSTAR 1988-97 F SUPER DUTY 1991-97 EXPLORER 1993-97 VILLAGER 1995-98 WINDSTAR 1997 EXPEDITION 1998 NAVIGATOR

ISSUE: The use of air impact tools to tighten wheel lug nuts can lead to overtightened and/or unevenly tightened wheel lug nuts. Air impact tools typically used for wheel lug nut removal and installation can generate up to 475 N.m (350 lb-ft) of torque. Overtightened and/or unevenly torqued wheel lug nuts may cause:

^ Brake vibration

^ Distortion of the wheel hub

^ Distortion of the brake rotor

ACCUTORQ SOCKETS

VEHICLE	YEAR	SIZE	LB-FT TORQUE	TOOL COLOR
FORD				
Aspire	1994-97	21mm	80	Light Brown
Contour	1995-96	19mm-3/4"	100	Grey
Crown Victoria	1981-97	13/16"	100	Dark Brown
Escort ZX2	1998	21mm	80	Light Brown
Escort	1991-98	21mm	80	Light Brown
Escort	1982-90	19mm-3/4"	100	Grey
EXP	1982-88	19mm-3/4"	100	Grey
Festiva	1988-93	21mm	80	Light Brown
Granada	1975-82	13/16"	100	Dark Brown
LTD	1975-86	13/16"	100	Dark Brown
Mustang	1979-97	13/16"	100	Dark Brown
Probe	1989-97	21mm	80	Light Brown
Taurus	1986-97	19mm-3/4"	100	Grey
Tempo	1984-94	19mm-3/4"	100	Grey
Thunderbird	1987-97	19mm-3/4"	100	Grey
Thunderbird	1972-86	13/16"	100	Dark Brown
LINCOLN				
All Models	1980-98	13/16"	100	Dark Brown
MERCURY				
Capri	1991-94	21mm	80	Light Brown
Capri	1979-86	13/16"	100	Dark Brown
Cougar	1987-97	19mm-3/4"	100	Grey
Cougar	1979-86	13/16"	100	Dark Brown
Lynx	1981-86	19mm-3/4"	100	Grey
Marquis	1983-86	13/16"	100	Dark Brown
Mystique	1996-98	19mm-3/4"	100	Grey
Monarch, Zephyr	1979-83	13/16"	100	Dark Brown
Sable	1986-97	19mm-3/4"	100	Grey
Topaz	1984-94	19mm-3/4"	100	Grey
Tracer	1991-97	21mm	80	Light Brown
Tracer	1987-89	21mm	80	Light Brown
Grand Marquis	1987-97	19mm-3/4"	100	Grey
LIGHT TRUCK				
E-150/F-150	1975-97	13/16"	100	Dark Brown
E/F-250/350	1989-97	7/8"	140	Turquoise
E/F-250/350 (Dual Rears)	1994-97	7/8"	140	Turquoise
F-Super Duty	1998 97		140	N/A
Aerostar	1986-97	19mm-3/4"	100	Grey
Bronco	1975-96	13/16"	100	Dark Brown
Bronco II	1984-90	19mm-3/4"	100	Grey
Courier	1979-83	21mm	65	Black
Explorer	1991-97	13/16"	100	Dark Brown
Ranger	1984-97	19mm-3/4"	100	Grey
Windstar	1995-98	13/16"	100	Dark Brown
Villager	1993-97	21mm	80	Light Brown
Expedition	1997	19mm-3/4"	100	Grey
Navigator	1998	19mm-3/4"	100	Grey

TD-4106-B

Figure 1

^ Brake rotor runout

^ Damage to the wheel

^ Damage to the wheel nuts and studs

ACTION: All wheel lug nuts should only be tightened to specification using a torque wrench or by using the Rotunda ACCUTORO 164-R0314 or equivalent on a 1/2" drive air impact tool. The "ACCUTORO" lug nut sockets limit the torque of the air impact tool, preventing overtightening or uneven tightening of the wheel lug nuts. The torque limiting devices (regulators) on air impact tools will not reduce the output torque enough to prevent overtightening of the wheel lug nuts.

NOTE:

REFER TO THE APPROPRIATE SERVICE MANUAL OR THE CHART IN FIGURE 1 FOR THE CORRECT WHEEL LUG NUT TORQUE SPECIFICATION. THE CHART IN FIGURE 1 ALSO PROVIDES THE CORRECT "ACCUTORO" LUG NUT SOCKET TO USE.

The "ACCUTORO" socket is intended for lug nut installation, not removal. When using the "ACCUTORO" socket, the output torque of the air impact tool must be set to 217-339 N.m (160-250 lb-ft), usually this will be the lowest setting on the air impact tool.

The "ACCUTORO" lug nut sockets are available through Rotunda Equipment. The four-piece set (164-R0314) fits most Ford Motor Company cars and light trucks. The tool set consists of four (4) lug nut sockets and a storage case. The set can be ordered by calling Rotunda Equipment at 1-800-ROT-UNDA (768-8632).

CAUTION:

AIR IMPACT TOOLS SHOULD NOT BE USED TO TIGHTEN WHEEL LUG NUTS UNLESS THE "ACCUTORO" LUG NUT SOCKET OF THE CORRECT SPECIFICATION IS USED.

NOTE:

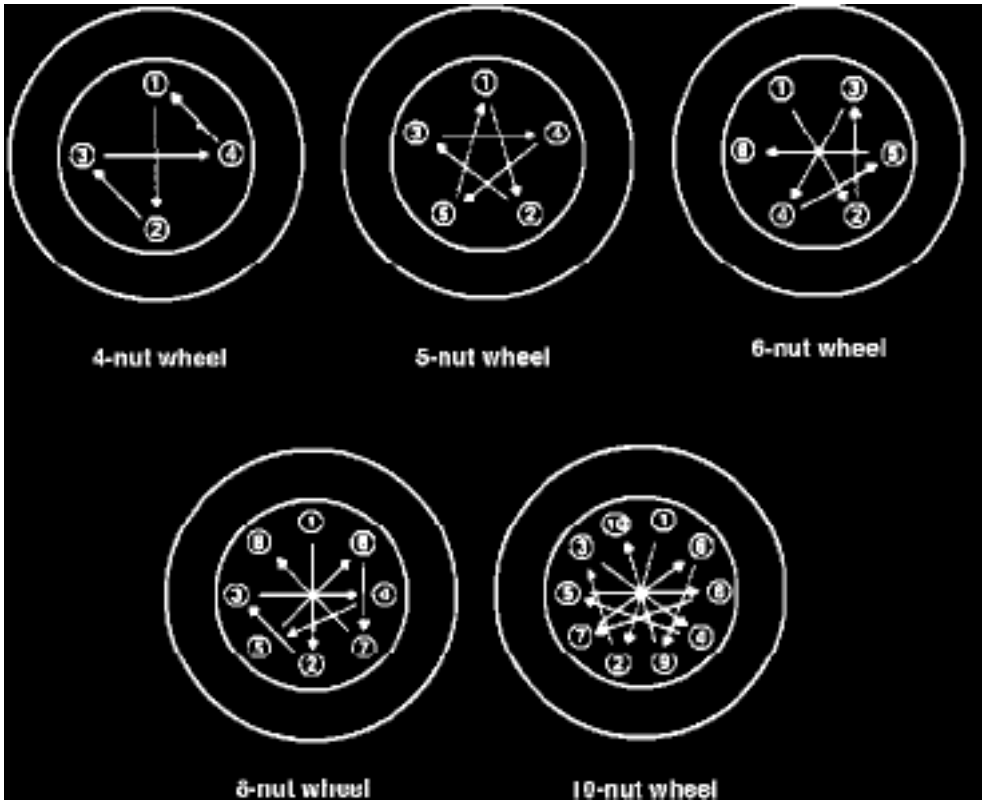
DO NOT USE AIR IMPACT TOOLS ON LOCKING WHEEL LUG NUTS. THEY ARE TO BE HAND-TORQUED ONLY.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 97-17-6

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 301000, 303000, 306000



Wheel Fastener: Service and Repair

NOTE: For additional information see Tightening Notes.

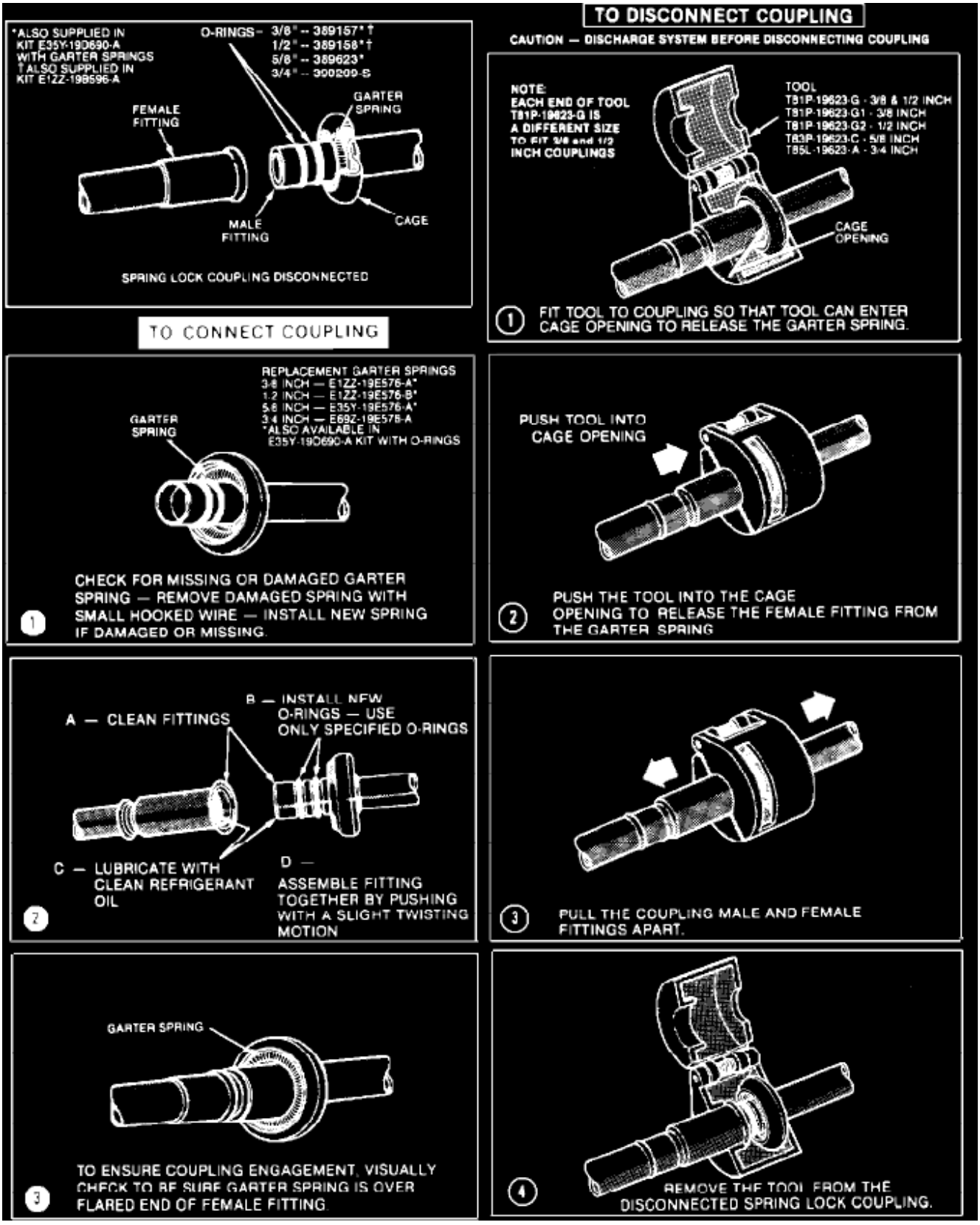
Lug Nut Torque Patterns

IMPORTANT

Check all parts, including rims, lug studs, lug nuts, and mating surfaces of hubs and tire rims for rust, damage, or dirt. Clean mating surfaces with a wire brush to remove any foreign material. Replace any damaged parts as needed. Careless installation of tire/rim assemblies in a vehicle is a major cause of tire installation problems. Proper installation, including fastener torque, is essential to economical, safe and trouble free service. Use only the proper sizes and types of fasteners for safe and proper service.

Tighten the fasteners a quarter turn at a time using the tightening sequence diagram as a guide. This is very important to prevent misalignment of the wheel. Continue tightening the fasteners in sequence until the fasteners are tightened to the proper torque. See Specifications See: Wheels/Specifications

CAUTION: Improper torque or tightening sequence can cause distortion, fatigue cracks, or alignment problems. After driving the vehicle for a short distance, recheck the wheel fastener torque. Parts will usually seat naturally, reducing the torque on the fasteners. Retorque all fasteners to the proper torque.


*ALSO SUPPLIED IN KIT E35Y-19D690-A WITH GARTER SPRINGS
†ALSO SUPPLIED IN KIT E1ZZ-19B596-A
O-RINGS - 3/8" -- 389157"†
1/2" -- 389158"†
5/8" -- 389623"
3/4" -- 390209-S
FEMALE FITTING
GARTER SPRING
MALE FITTING
CAGE
SPRING LOCK COUPLING DISCONNECTED
TO CONNECT COUPLING
REPLACEMENT GARTER SPRINGS
3/8 INCH — E1ZZ-19E576-A*
1/2 INCH — E1ZZ-19E576-B*
5/8 INCH — E35Y-19E576-A*
3/4 INCH — E69Z-19E576-A
*ALSO AVAILABLE IN E35Y-19D690-A KIT WITH O-RINGS
GARTER SPRING
1 CHECK FOR MISSING OR DAMAGED GARTER SPRING — REMOVE DAMAGED SPRING WITH SMALL HOOKED WIRE — INSTALL NEW SPRING IF DAMAGED OR MISSING.
A — CLEAN FITTINGS
B — INSTALL NEW O-RINGS — USE ONLY SPECIFIED O-RINGS
C — LUBRICATE WITH CLEAN REFRIGERANT OIL
D — ASSEMBLE FITTING TOGETHER BY PUSHING WITH A SLIGHT TWISTING MOTION
2
GARTER SPRING
3 TO ENSURE COUPLING ENGAGEMENT, VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING.
TO DISCONNECT COUPLING
CAUTION — DISCHARGE SYSTEM BEFORE DISCONNECTING COUPLING
NOTE: EACH END OF TOOL T81P-19623-G IS A DIFFERENT SIZE TO FIT 3/8 and 1/2 INCH COUPLINGS
TOOL
T81P-19623-G - 3/8 & 1/2 INCH
T81P-19623-G1 - 3/8 INCH
T81P-19623-G2 - 1/2 INCH
T83P-19623-C - 5/8 INCH
T85L-19623-A - 3/4 INCH
CAGE OPENING
1 FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.
PUSH TOOL INTO CAGE OPENING
2 PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING
3 PULL THE COUPLING MALE AND FEMALE FITTINGS APART.
4 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING.

Accumulator HVAC: Service and Repair

The accumulator/dryer must be replaced any time the system has been left open for more than 24 hours with the system completely discharged, there is evidence of moisture in the system, the system is badly contaminated, there is more than five ounces of compressor oil in it, or the accumulator/dryer is restricted, plugged or perforated. Replacement of a refrigerant line or a major component (condenser, evaporator or seized compressor) requires replacement of the accumulator/drier. The receiver/dryer does not necessarily need to be replaced every time there is a loss of refrigerant charge, a component is replaced or the outer shell of the unit is dented.

Fig. 2 Spring lock coupling disconnect & connect

1. Disconnect battery ground cable.

2. Discharge refrigerant from system.

3. Disconnect electrical connector from pressure switch and remove switch from accumulator.

4. Disconnect and cap suction line from accumulator/dryer, Fig. 2.

5. Loosen fitting connecting accumulator to evaporator core.

6. Remove lower forward screw holding flanges of case and bracket together, and remove screw holding evaporator inlet tube to the accumulator bracket. Disconnect accumulator from evaporator core, then remove bracket from accumulator/dryer.

7. Reverse procedure to install. Use new O-rings lubricated with refrigerant oil.

8. Leak test, evacuate and charge system. Check system for proper operation.

Air Door Actuator / Motor: Customer Interest Climate Control - Vibration Type Sound

Article No. 94-8-15

^ CLIMATE CONTROL - LOOSE SPRING IN RECIRC DOOR VACUUM MOTOR MAKES VIBRATION NOISE - VEHICLES BUILT BEFORE 1/16/94

^ NOISE - "VIBRATION TYPE" SOUND FROM LOOSE SPRING IN RECIRC DOOR VACUUM MOTOR - VEHICLES BUILT BEFORE 1/16/94

LIGHT TRUCK: 1991-94 EXPLORER, RANGER

ISSUE: A vibration noise from under the dash may be heard while driving. This occurs because of a loose spring in the recirc door vacuum motor.

ACTION: Install a revised recirc door vacuum motor which retains the spring. Refer to the appropriate model year Service Manual, Section 12, for the removal and installation details.

PART NUMBER PART NAME CLASS

F4TZ-18A318-A Recirc Door Vacuum Motor A

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper Warranty Coverage For 1992-94 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940815A Replace Recirculation Door 0.3 Hr.

Vacuum Motor

DEALER CODING

BASIC PART NO. CONDITION CODE

18A318 56

OASIS CODES: 208000, 208300, 208999, 702000

Article No. 94-8-15

^ CLIMATE CONTROL - LOOSE SPRING IN RECIRC DOOR VACUUM MOTOR MAKES VIBRATION NOISE - VEHICLES BUILT BEFORE 1/16/94

^ NOISE - "VIBRATION TYPE" SOUND FROM LOOSE SPRING IN RECIRC DOOR VACUUM MOTOR - VEHICLES BUILT BEFORE 1/16/94

LIGHT TRUCK: 1991-94 EXPLORER, RANGER

ISSUE: A vibration noise from under the dash may be heard while driving. This occurs because of a loose spring in the recirc door vacuum motor.

ACTION: Install a revised recirc door vacuum motor which retains the spring. Refer to the appropriate model year Service Manual, Section 12, for the removal and installation details.

PART NUMBER PART NAME CLASS

F4TZ-18A318-A Recirc Door Vacuum Motor A

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper Warranty Coverage For 1992-94 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940815A Replace Recirculation Door 0.3 Hr.

Vacuum Motor

DEALER CODING

BASIC PART NO. CONDITION CODE

18A318 56

OASIS CODES: 208000, 208300, 208999, 702000

Air Duct: Customer Interest Heater - Poor Heat Distribution On the Driver's Side

Article No. 92-15-11

07/15/92

HEATER - FLOOR DUCTS - POOR HEAT DISTRIBUTION ON DRIVER'S SIDE - VEHICLES BUILT BEFORE 2/1/92

LIGHT TRUCK: 1991-92 EXPLORER, RANGER

ISSUE: Poor heat distribution on the driver's side may result in cold feet or legs. This condition is caused by the floor duct outlets directing air away from the driver's feet.

ACTION: Install a new floor duct that provides better directional air flow to the feet and leg area. Refer to the following procedure for service details.

SERVICE PROCEDURE - RANGER

REMOVAL:

1. Remove the one screw which attaches the rear of the front floor duct to the plenum.

2. Disengage the front floor duct from the tab on the left side of the plenum and remove the front floor duct.

INSTALLATION:

1. Position the new front floor duct (F2TZ-18C433-A) so the tab on the left side of the plenum protrudes through the oval hole in the duct.

2. Install the front floor duct attaching screw.

SERVICE PROCEDURE - EXPLORER

REMOVAL:

1. Remove the console and bracket (if applicable).

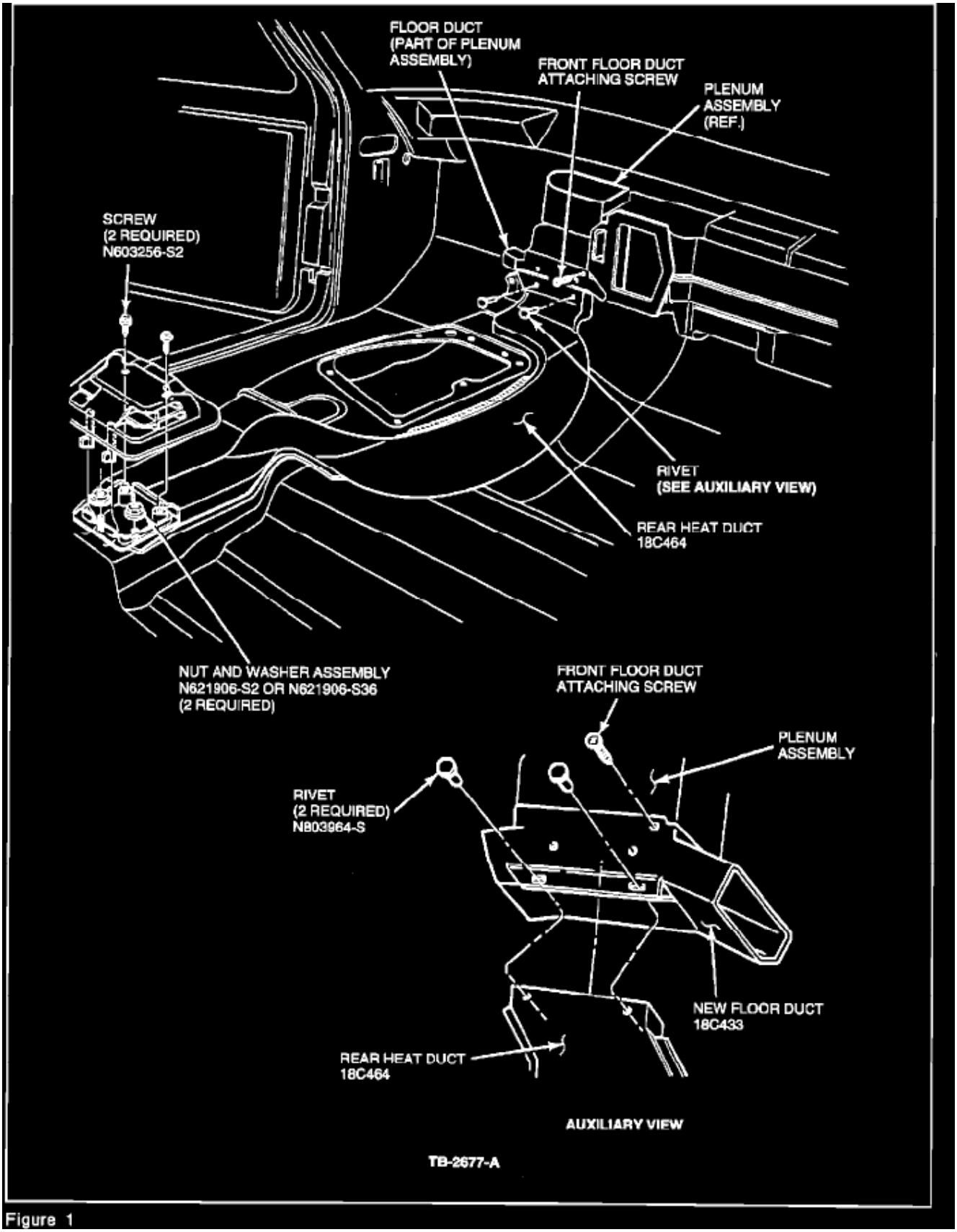

FLOOR DUCT
(PART OF PLENUM
ASSEMBLY)
FRONT FLOOR DUCT
ATTACHING SCREW
PLENUM
ASSEMBLY
(REF.)
SCREW
(2 REQUIRED)
N603256-S2
RIVET
(SEE AUXILIARY VIEW)
REAR HEAT DUCT
18C464
NUT AND WASHER ASSEMBLY
N621906-S2 OR N621906-S36
(2 REQUIRED)
FRONT FLOOR DUCT
ATTACHING SCREW
PLENUM
ASSEMBLY
RIVET
(2 REQUIRED)
N803964-S
NEW FLOOR DUCT
18C433
REAR HEAT DUCT
18C464
AUXILIARY VIEW
TB-2677-A

Figure 1

2. Remove the one screw which attaches the rear of the front floor duct to the plenum. Refer to Figure 1.

3. Remove two rivets attaching the rear register to the rear heat duct and unhook the rear register from the rear heat duct. Refer to Figure 1.

4. Disengage the front floor duct from the tab on the left side of the plenum and remove the front floor duct.

INSTALLATION:

1. Position the new floor duct (F2TZ-18C433-A) so the tab on the left side of the plenum protrudes through the oval hole in the duct. Engage the hooks on the rear register with the rear heat duct.

2. Install the front floor duct attaching screw, then install the two rear register attaching rivets.

3. Install the console and bracket (if applicable).

PART NUMBER PART NAME CLASS

F2TZ-18C433-A Duct Assembly Heater Outlet C

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty For 1991 Models And Bumper To Bumper For 1992 Models OPERATION DESCRIPTION

TIME

921511A Replace - Floor Duct Outlet 0.6 Hr.

(Ranger)

921511B Replace - Floor Duct Outlet 0.7 Hr.

(Explorer)

DEALER CODING

BASIC PART NO. CONDITION CODE

18C433 36

OASIS CODES: 208100, 208300

Air Duct: All Technical Service Bulletins Heater - Poor Heat Distribution On the Driver's Side

Article No. 92-15-11

07/15/92

HEATER - FLOOR DUCTS - POOR HEAT DISTRIBUTION ON DRIVER'S SIDE - VEHICLES BUILT BEFORE 2/1/92

LIGHT TRUCK: 1991-92 EXPLORER, RANGER

ISSUE: Poor heat distribution on the driver's side may result in cold feet or legs. This condition is caused by the floor duct outlets directing air away from the driver's feet.

ACTION: Install a new floor duct that provides better directional air flow to the feet and leg area. Refer to the following procedure for service details.

SERVICE PROCEDURE - RANGER

REMOVAL:

1. Remove the one screw which attaches the rear of the front floor duct to the plenum.

2. Disengage the front floor duct from the tab on the left side of the plenum and remove the front floor duct.

INSTALLATION:

1. Position the new front floor duct (F2TZ-18C433-A) so the tab on the left side of the plenum protrudes through the oval hole in the duct.

2. Install the front floor duct attaching screw.

SERVICE PROCEDURE - EXPLORER

REMOVAL:

1. Remove the console and bracket (if applicable).

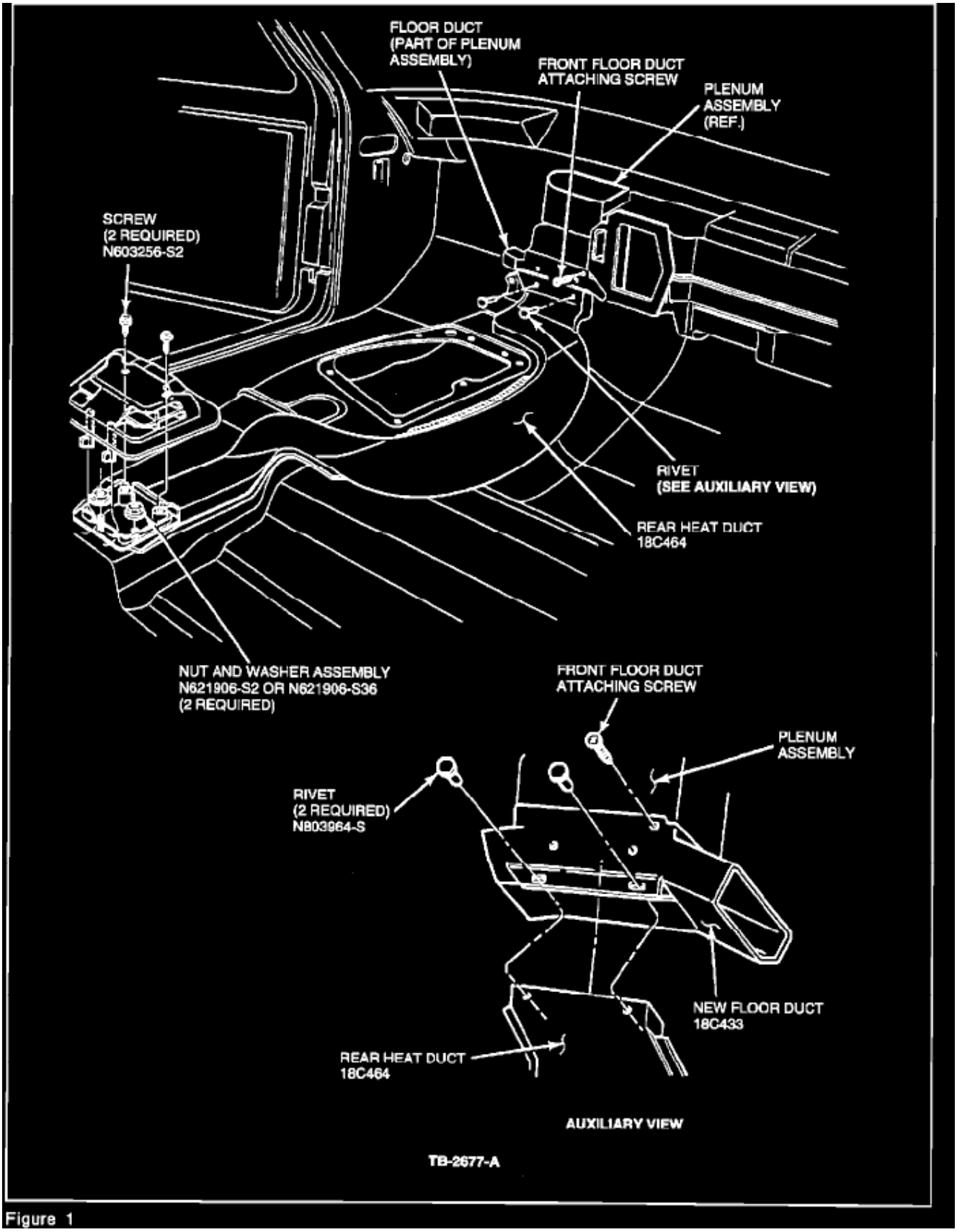


Figure 1

2. Remove the one screw which attaches the rear of the front floor duct to the plenum. Refer to Figure 1.

3. Remove two rivets attaching the rear register to the rear heat duct and unhook the rear register from the rear heat duct. Refer to Figure 1.

4. Disengage the front floor duct from the tab on the left side of the plenum and remove the front floor duct.

INSTALLATION:

1. Position the new floor duct (F2TZ-18C433-A) so the tab on the left side of the plenum protrudes through the oval hole in the duct. Engage the hooks on the rear register with the rear heat duct.

2. Install the front floor duct attaching screw, then install the two rear register attaching rivets.

3. Install the console and bracket (if applicable).

PART NUMBER PART NAME CLASS

F2TZ-18C433-A Duct Assembly Heater Outlet C

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty For 1991 Models And Bumper To Bumper For 1992 Models OPERATION DESCRIPTION

TIME

921511A Replace - Floor Duct Outlet 0.6 Hr.

(Ranger)

921511B Replace - Floor Duct Outlet 0.7 Hr.

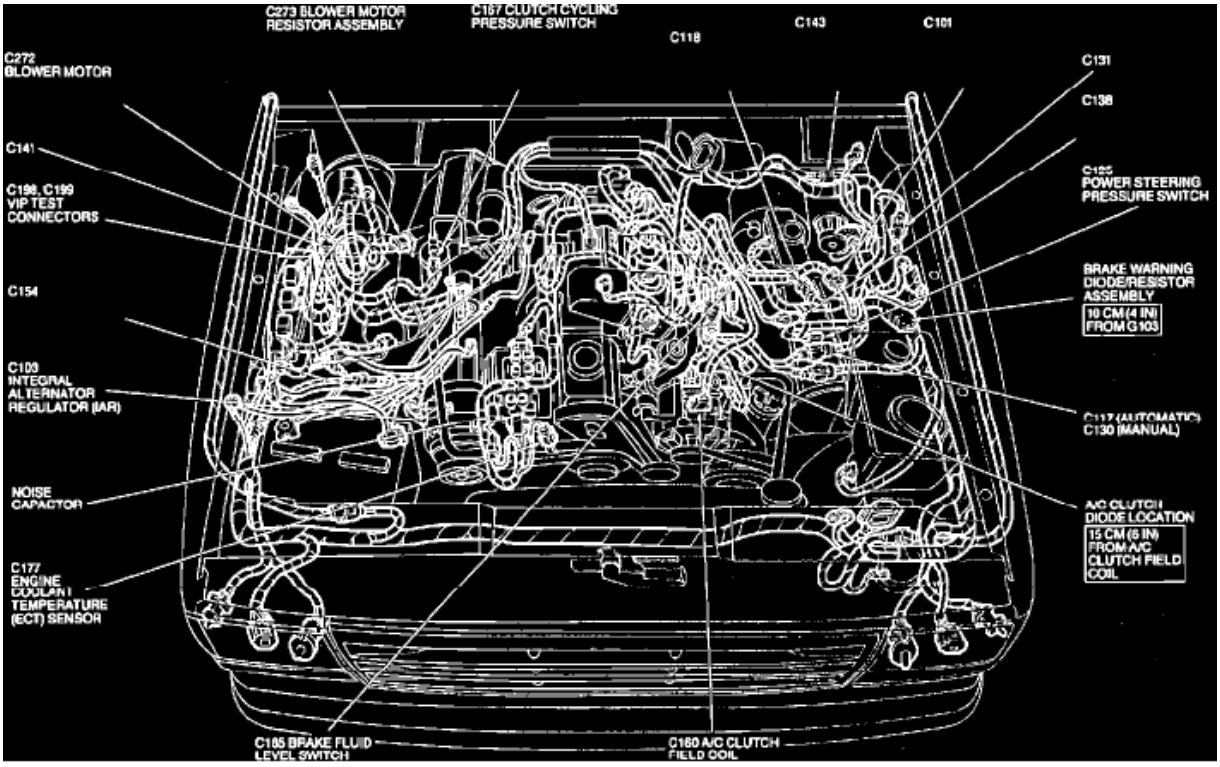
(Explorer)

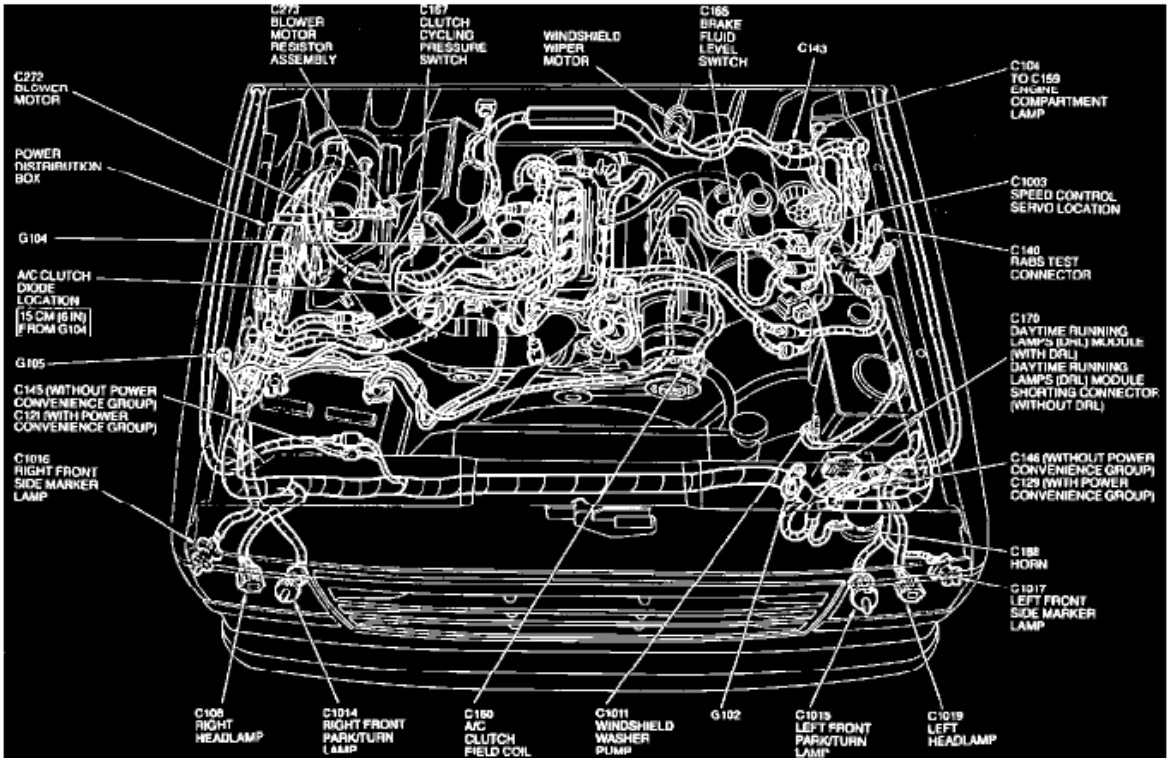
DEALER CODING

BASIC PART NO. CONDITION CODE

18C433 36

OASIS CODES: 208100, 208300


C273 BLOWER MOTOR RESISTOR ASSEMBLY
C167 CLUTCH CYCLING PRESSURE SWITCH
C118
C143
C101
C272 BLOWER MOTOR
C131
C138
C141
C125 POWER STEERING PRESSURE SWITCH
C198, C199 VIP TEST CONNECTORS
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
10 CM (4 IN) FROM G103
C154
C109 INTEGRAL ALTERNATOR REGULATOR (IAR)
C117 (AUTOMATIC) C130 (MANUAL)
NOISE CAPACITOR
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C177 ENGINE COOLANT TEMPERATURE (ECT) SENSOR
C185 BRAKE FLUID LEVEL SWITCH
C160 A/C CLUTCH FIELD COIL


C273 BLOWER MOTOR RESISTOR ASSEMBLY
C167 CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C185 BRAKE FLUID LEVEL SWITCH
C143
C272 BLOWER MOTOR
C104 TO C159 ENGINE COMPARTMENT LAMP
POWER DISTRIBUTION BOX
C1003 SPEED CONTROL SERVO LOCATION
G104
C140 RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM G104
C170 DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL) DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
G105
C145 (WITHOUT POWER CONVENIENCE GROUP) C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP) C129 (WITH POWER CONVENIENCE GROUP)
C1016 RIGHT FRONT SIDE MARKER LAMP
C158 HORN
C1017 LEFT FRONT SIDE MARKER LAMP
C108 RIGHT HEADLAMP
C1014 RIGHT FRONT PARK/TURN LAMP
C160 A/C CLUTCH FIELD COIL
C1011 WINDSHIELD WASHER PUMP
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP

Blower Motor: Locations

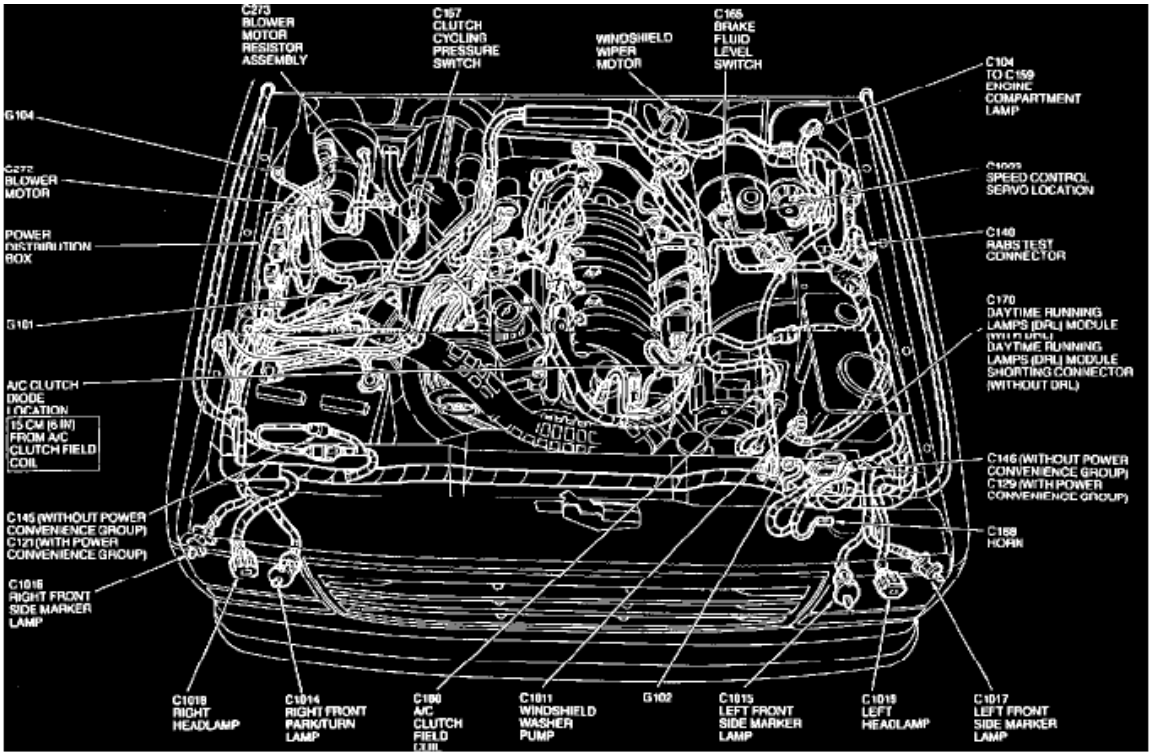
Engine Compartment Components.

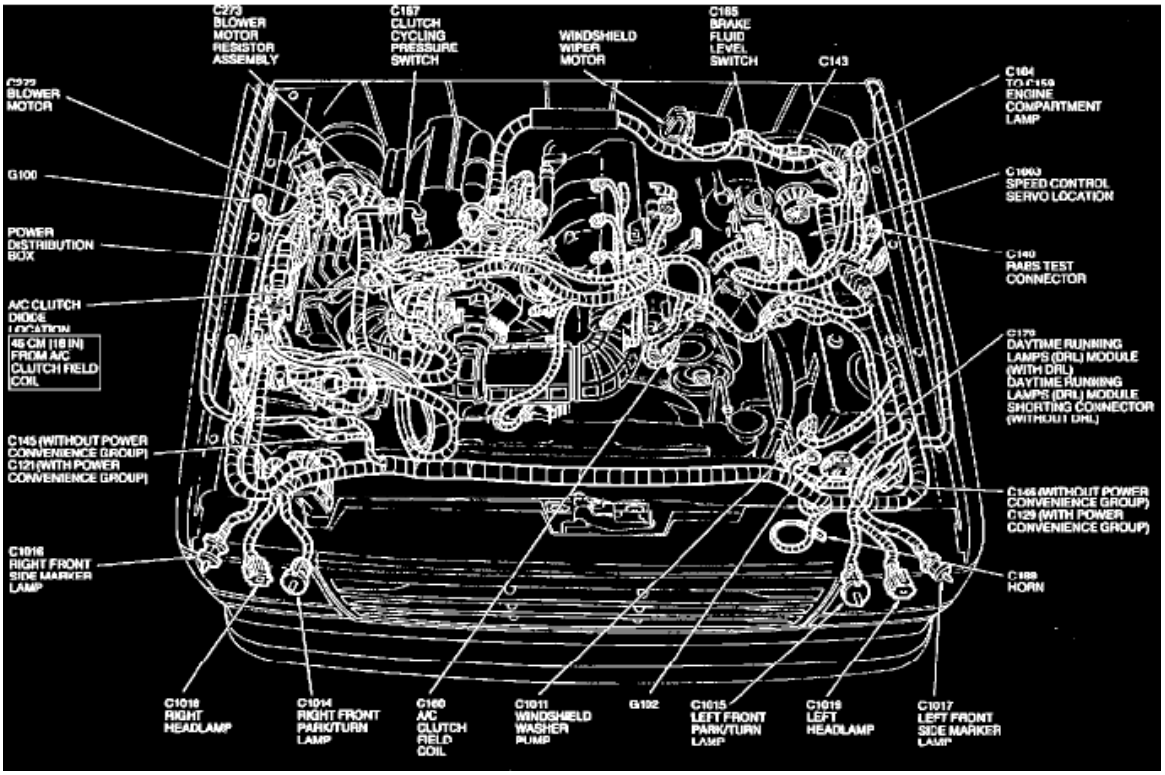
Rear RH Side Of Engine Compartment, On Safety Wall

Applicable to: 2.3L/4-140

Engine Compartment Components.

Rear RH Side Of Engine Compartment, On Safety Wall


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C272
BLOWER MOTOR
C104
TO C159
ENGINE COMPARTMENT LAMP
G100
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
45 CM (18 IN) FROM A/C CLUTCH FIELD COIL
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Rear RH Side Of Engine Compartment, On Safety Wall

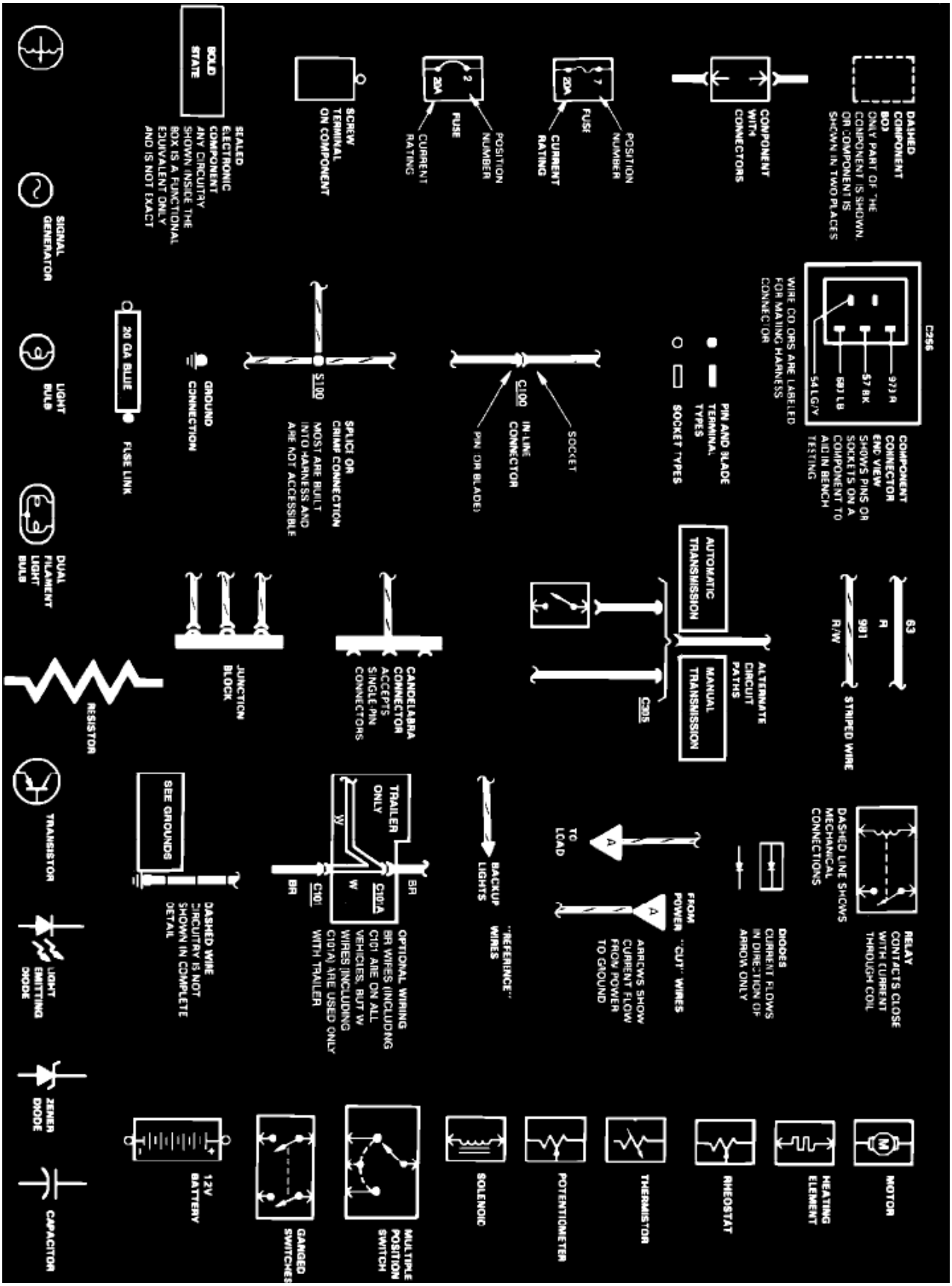
Applicable to: 3.0L/V6-181

Engine Compartment Components.

Rear RH Side Of Engine Compartment, On Safety Wall

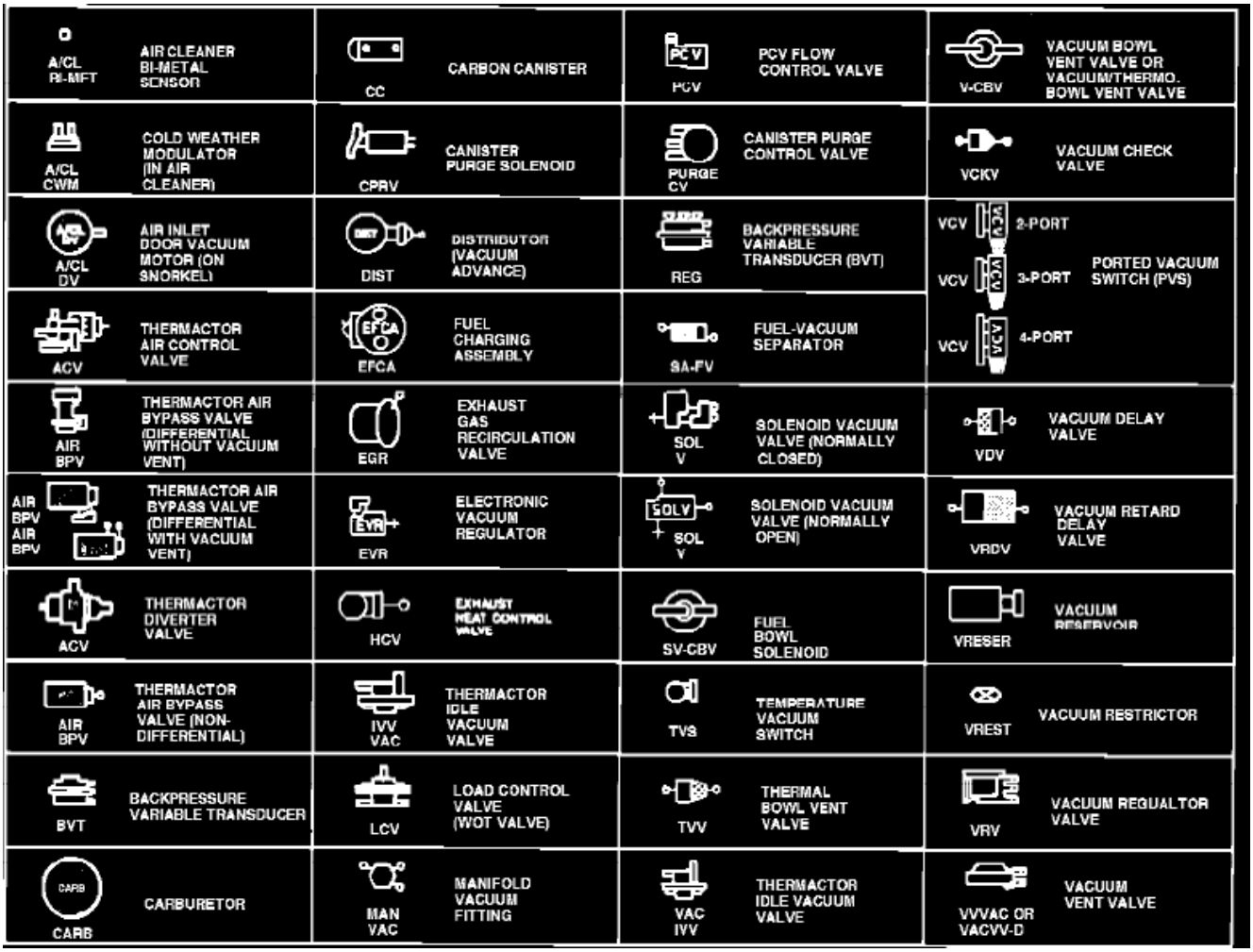
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Heating and Air Conditioning > Blower Motor > Component Information > Diagrams > Diagram Information and Instructions

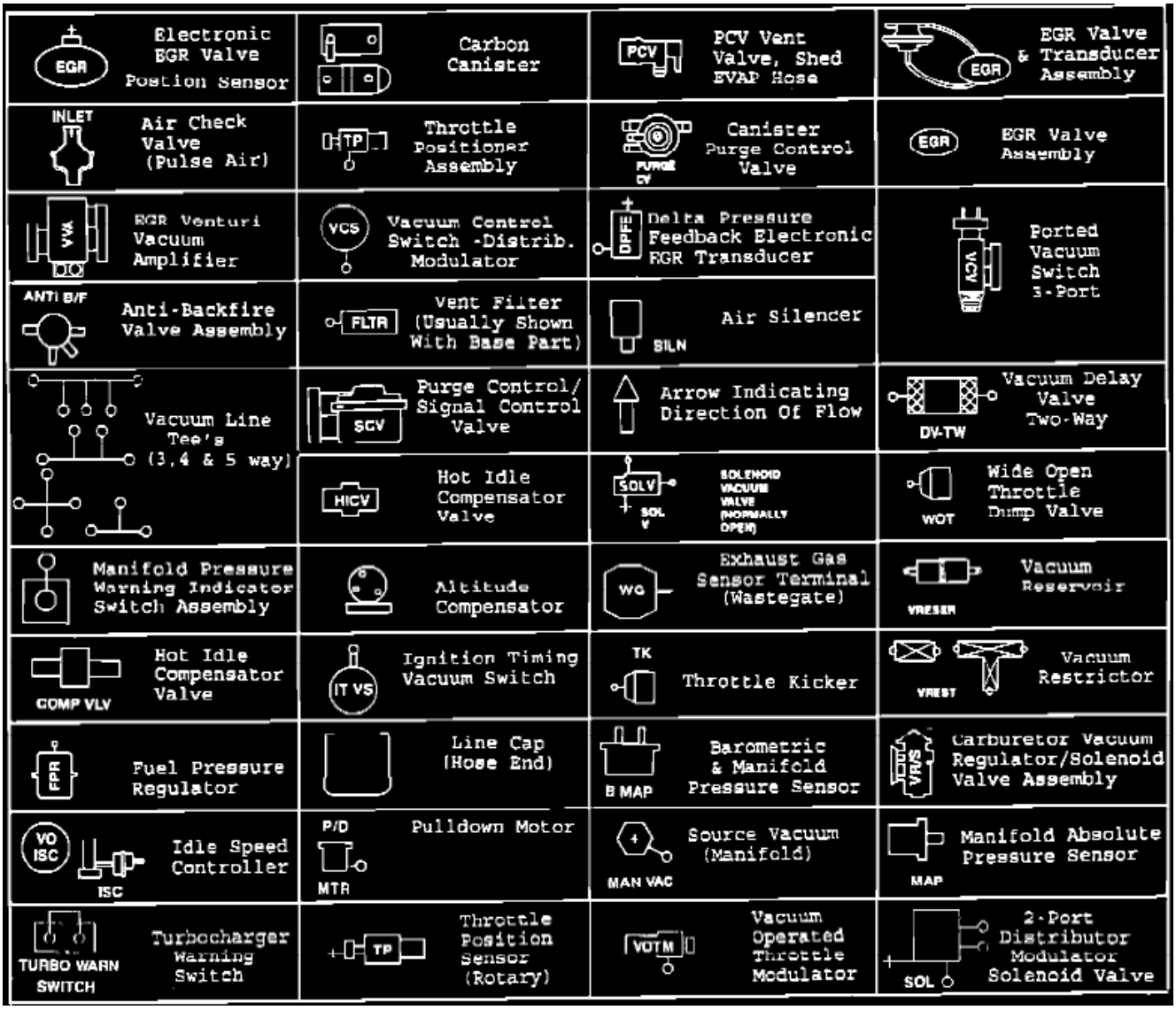


Blower Motor: Diagram Information and Instructions

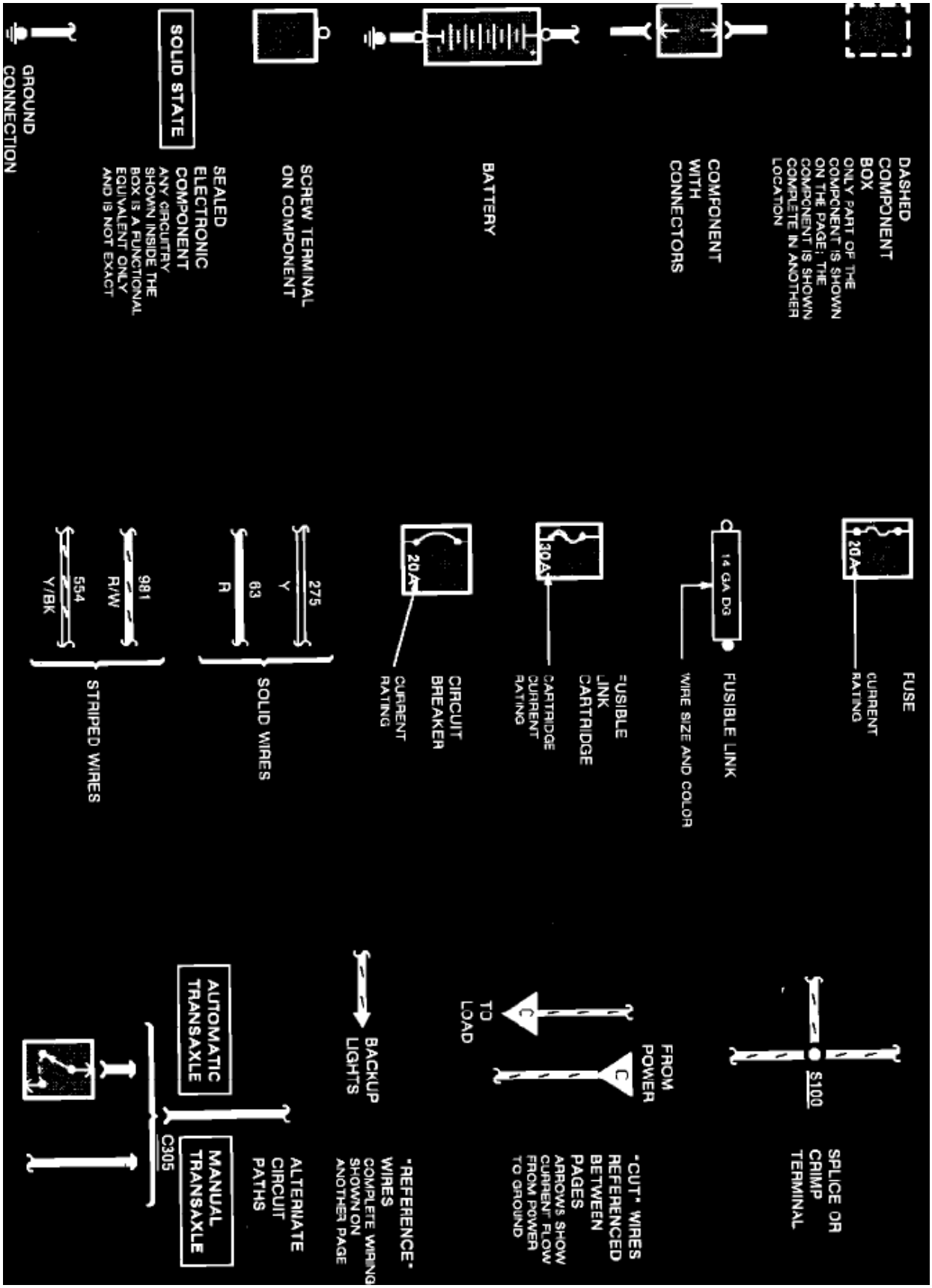
Symbol Identification



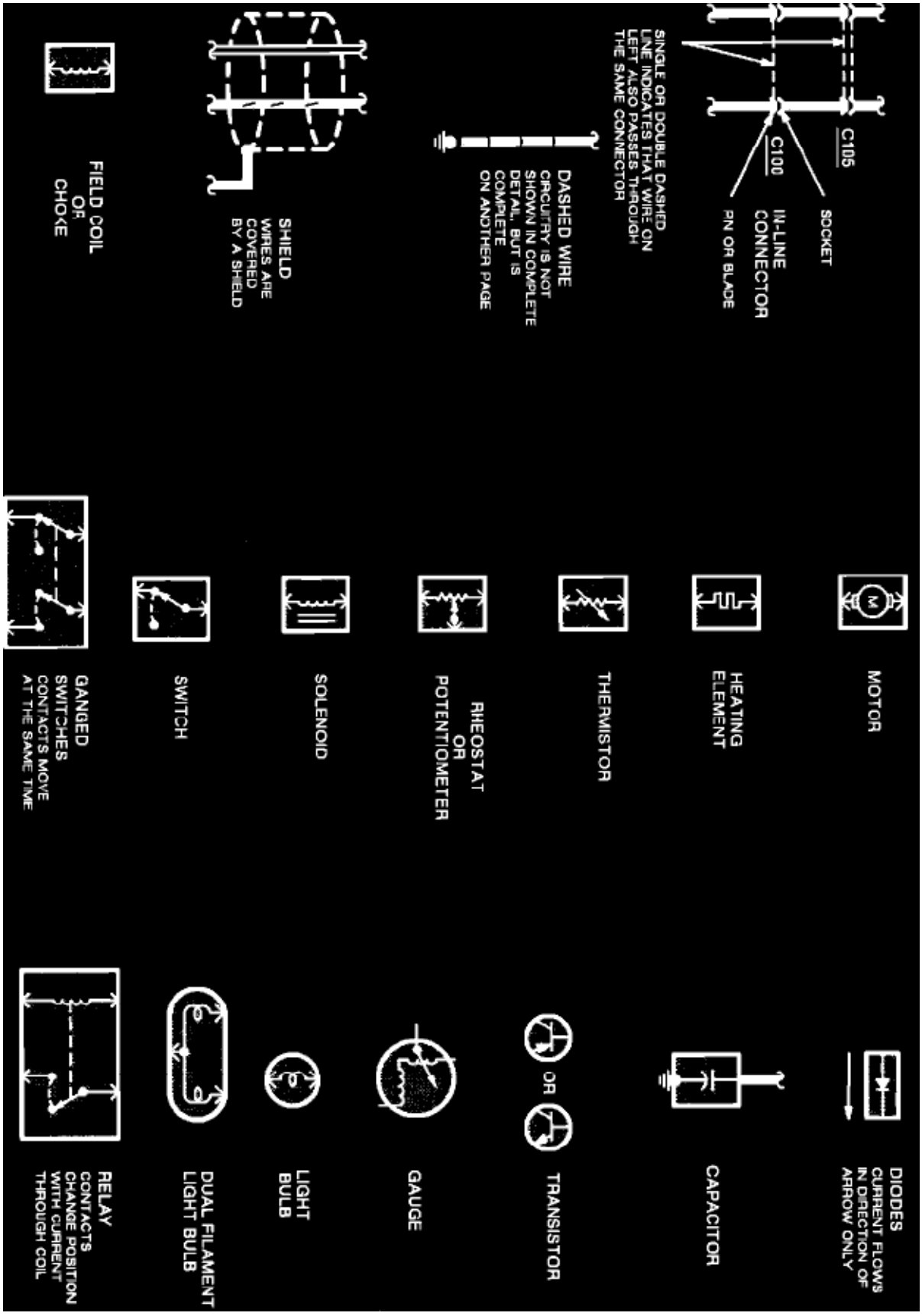
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
TRANSISTOR
OR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

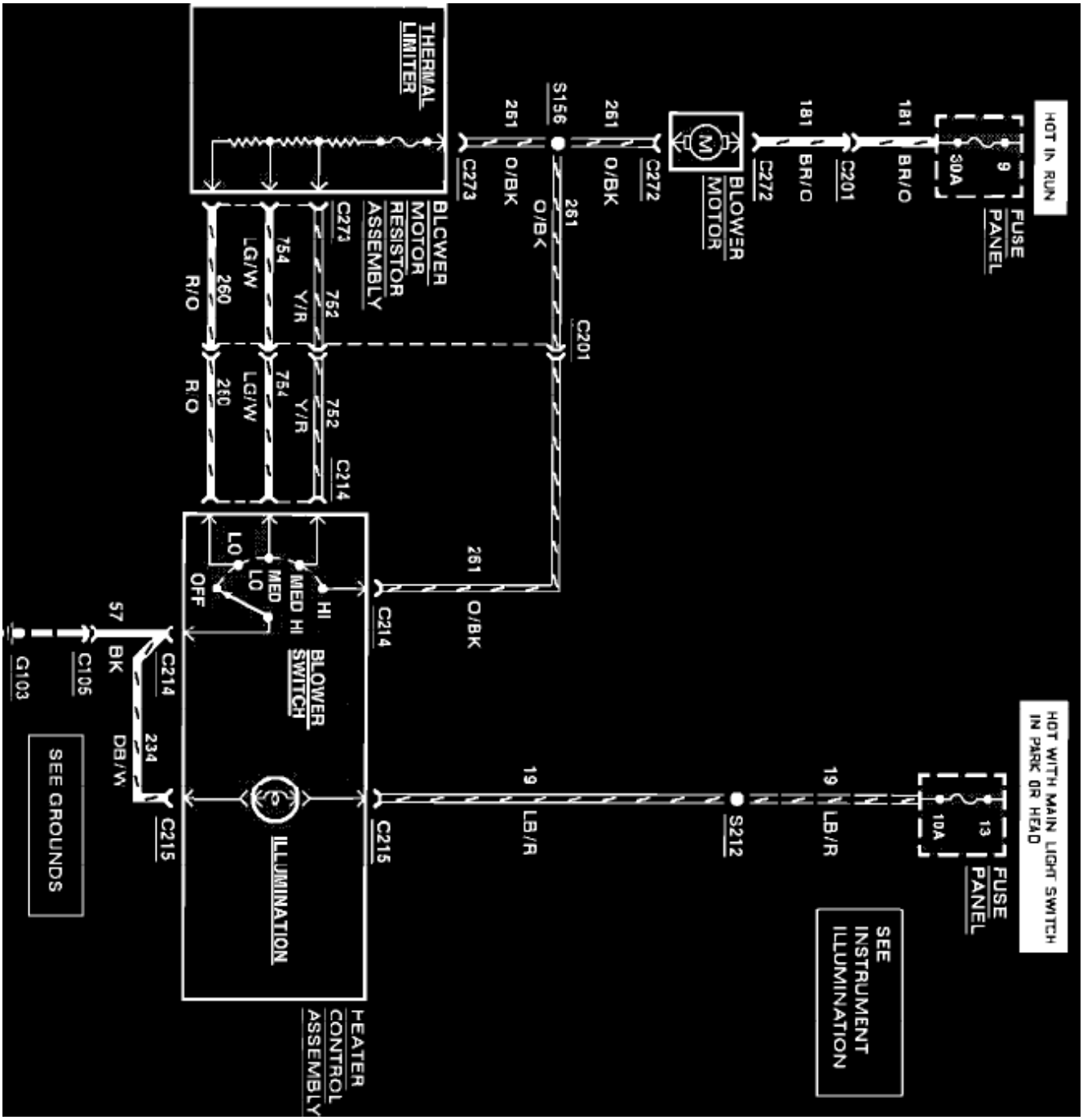
P: Purple

T: Tan

V: Violet

W: White

Y: Yellow



Heater Wiring Circuit

Blower Motor Current Draw		
Switch Setting	Amps	Volts
Off	0	0
Low	3.5-5.5	5
Med. Low	5-7.5	8
Med. High	7-9.5	10
High	9.5-11.5	12

Blower Motor: Testing and Inspection Blower Motor Current Draw, HEATER

Fig. 40 Blower motor current draw & voltage test chart.

1. Disconnect blower motor electrical connector.

2. Connect ammeter between positive terminal on motor and corresponding terminal of wire harness electrical connector.

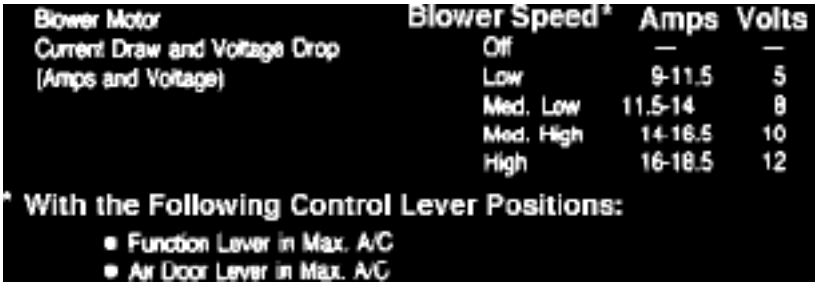
3. Connect jumper wire between two negative terminals.

4. Place system temperature control lever in mid-range position (halfway between COOL and WARM). Place function selector lever in HEAT or VENT position on models less A/C. A/C on models with A/C. Ensure blower is on.

5. With engine running, operate blower in all speeds. Note current draw for each blower speed. Ensure battery voltage is approximately 14.2 volts when performing this test.

6. Current draw for each blower speed should be as shown in Fig. 40.

7. Disconnect ammeter and jumper wire, then connect electrical connector to blower motor.



Blower Motor Current Draw and Voltage Drop (Amps and Voltage)	Blower Speed*	Amps	Volts
	Off	—	—
	Low	9-11.5	5
	Med. Low	11.5-14	8
	Med. High	14-16.5	10
	High	16-18.5	12

* With the Following Control Lever Positions:
- Function Lever in Max. A/C
- Air Door Lever in Max. A/C

Blower Motor: Testing and Inspection W/ MTC

Fig. 41 Blower motor current draw & voltage test chart.

1. Disconnect blower motor electrical connector.

2. Connect ammeter between positive terminal on motor and corresponding terminal of wire harness electrical connector.

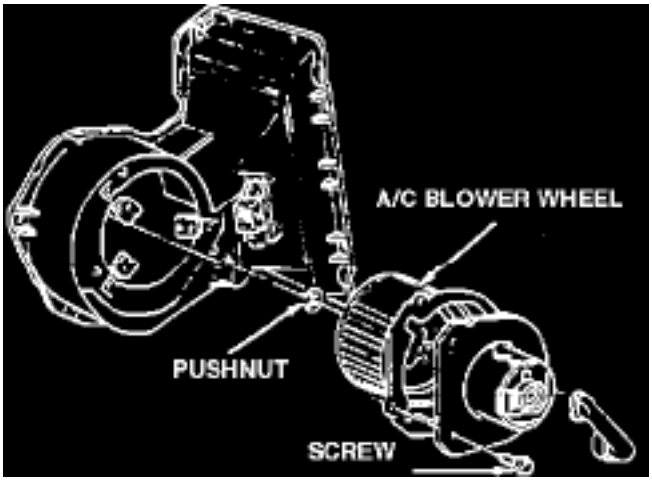
3. Connect jumper wire between two negative terminals.

4. Place system temperature control lever in mid-range position (halfway between COOL and WARM). Place function selector lever in HEAT or VENT position on models less A/C. A/C on models with A/C. Ensure blower is on.

5. With engine running, operate blower in all speeds. Note current draw for each blower speed. Ensure battery voltage is approximately 14.2 volts when performing this test.

6. Current draw for each blower speed should be as shown in Fig. 41

7. Disconnect ammeter and jumper wire, then connect electrical connector to blower motor.



Blower Motor: Service and Repair

Fig. 26 Disconnecting blower motor wire connectors

1. Disconnect battery ground cable.

2. Disconnect wire connector from blower motor.

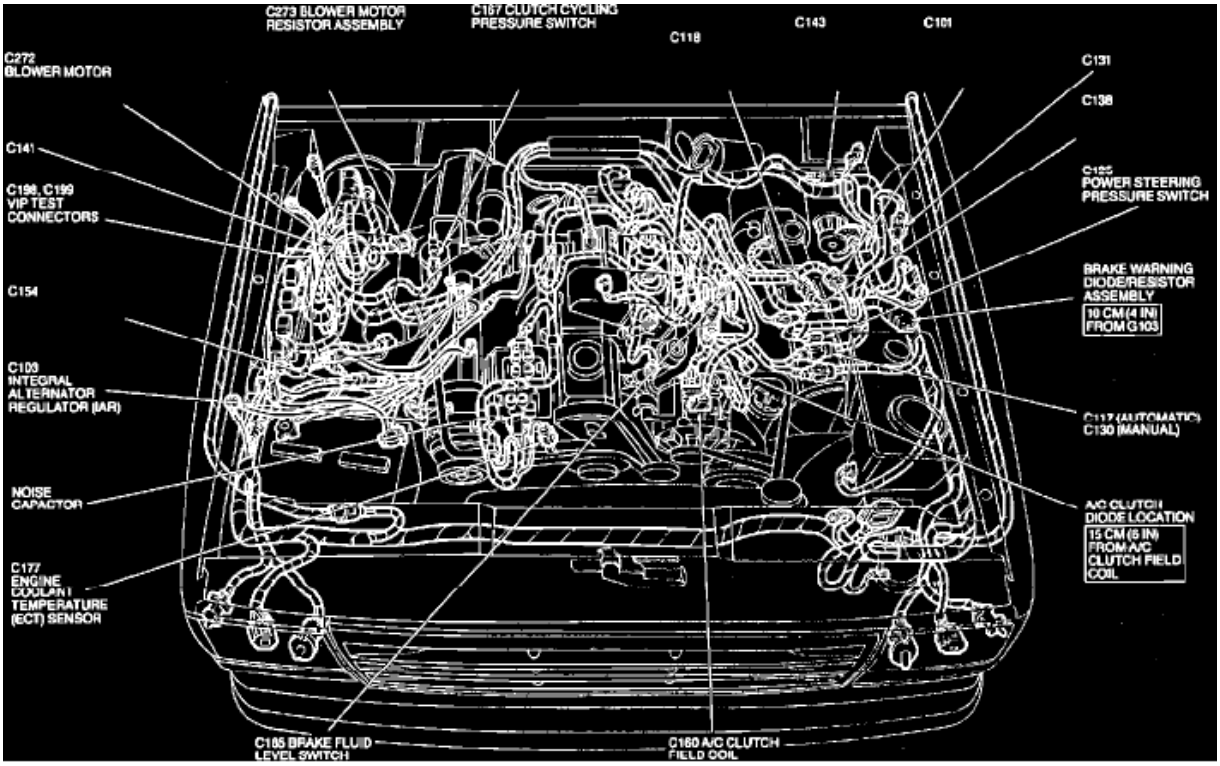
3. Remove air cleaner.

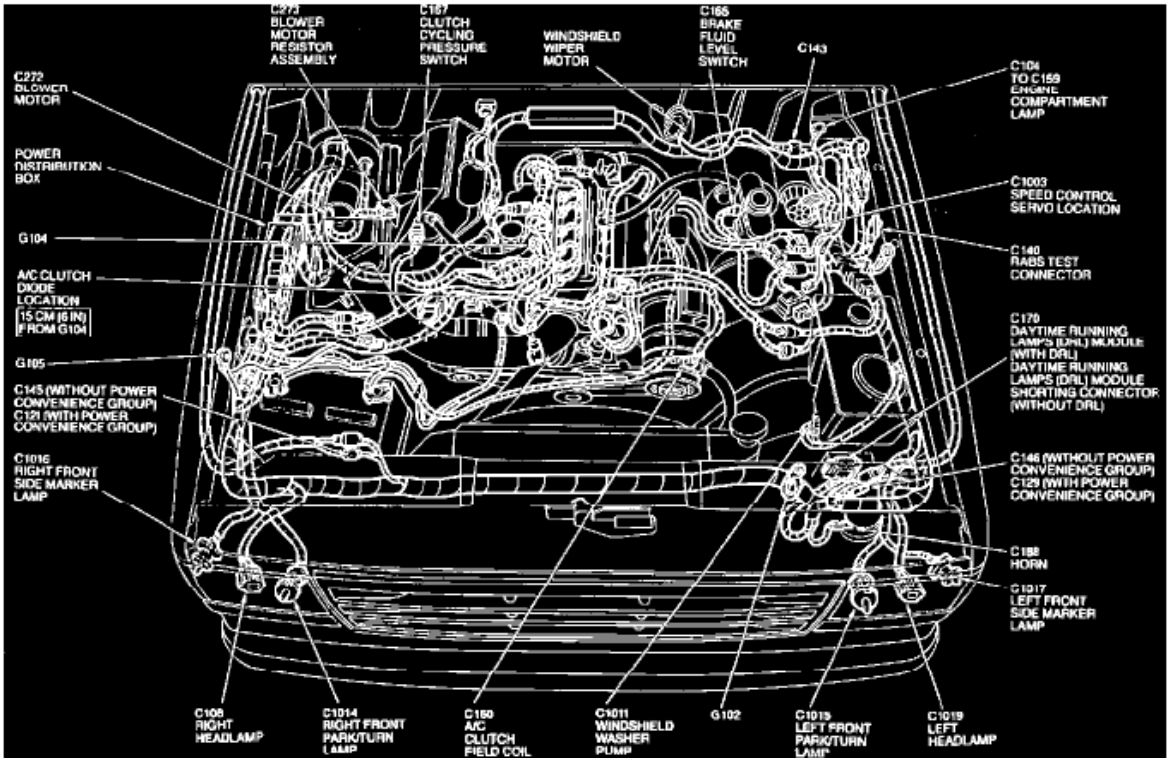
4. Remove three solenoid box cover bolts, Fig. 26.

5. Disconnect blower motor cooling tube at blower motor.

6. Remove three blower motor to housing attaching screws and remove motor and wheel assembly.

7. Reverse procedure to install.


C273 BLOWER MOTOR RESISTOR ASSEMBLY
C167 CLUTCH CYCLING PRESSURE SWITCH
C118
C143
C101
C272 BLOWER MOTOR
C131
C138
C141
C125 POWER STEERING PRESSURE SWITCH
C199, C199 VIP TEST CONNECTORS
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
10 CM (4 IN) FROM G103
C154
C109 INTEGRAL ALTERNATOR REGULATOR (IAR)
C117 (AUTOMATIC) C130 (MANUAL)
NOISE CAPACITOR
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C177 ENGINE COOLANT TEMPERATURE (ECT) SENSOR
C185 BRAKE FLUID LEVEL SWITCH
C160 A/C CLUTCH FIELD COIL


C273 BLOWER MOTOR RESISTOR ASSEMBLY
C167 CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165 BRAKE FLUID LEVEL SWITCH
C143
C272 BLOWER MOTOR
C104 TO C159 ENGINE COMPARTMENT LAMP
POWER DISTRIBUTION BOX
C1003 SPEED CONTROL SERVO LOCATION
G104
C140 RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM G104
C170 DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL) DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
G105
C145 (WITHOUT POWER CONVENIENCE GROUP) C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP) C129 (WITH POWER CONVENIENCE GROUP)
C1016 RIGHT FRONT SIDE MARKER LAMP
C158 HORN
C1017 LEFT FRONT SIDE MARKER LAMP
C108 RIGHT HEADLAMP
C1014 RIGHT FRONT PARK/TURN LAMP
C150 A/C CLUTCH FIELD COIL
C1011 WINDSHIELD WASHER PUMP
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP

Blower Motor Resistor: Locations

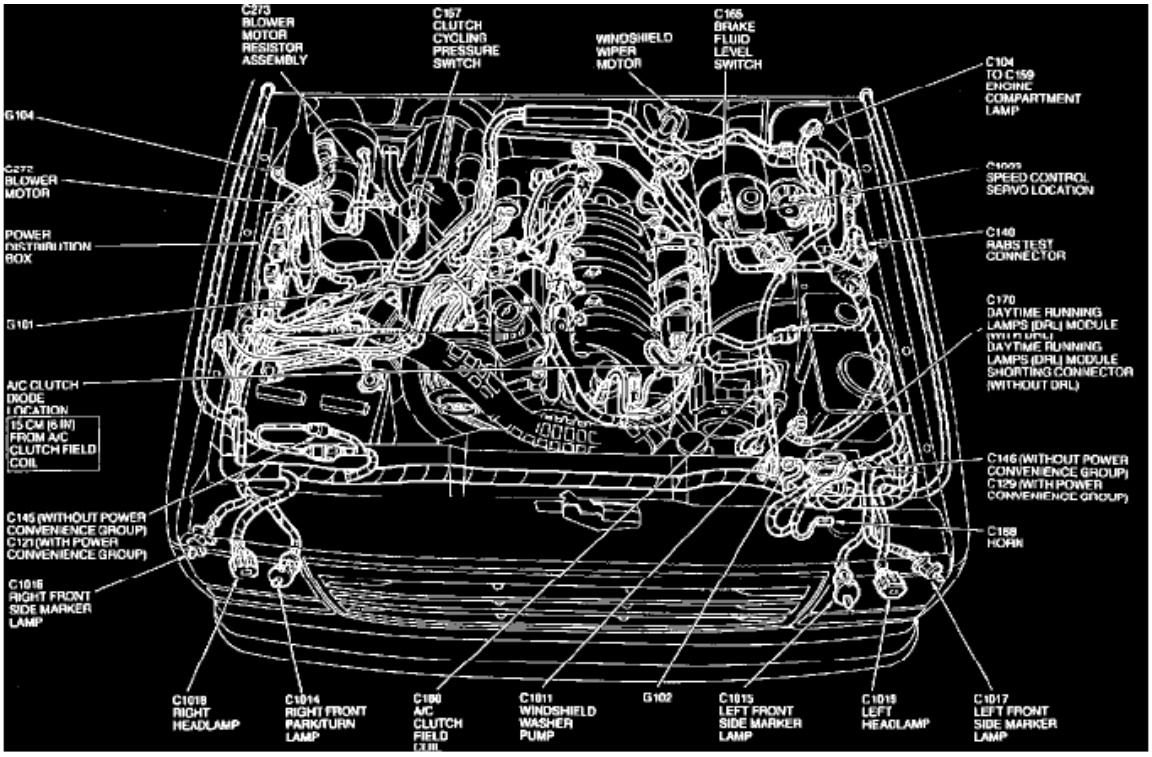
Engine Compartment Components.

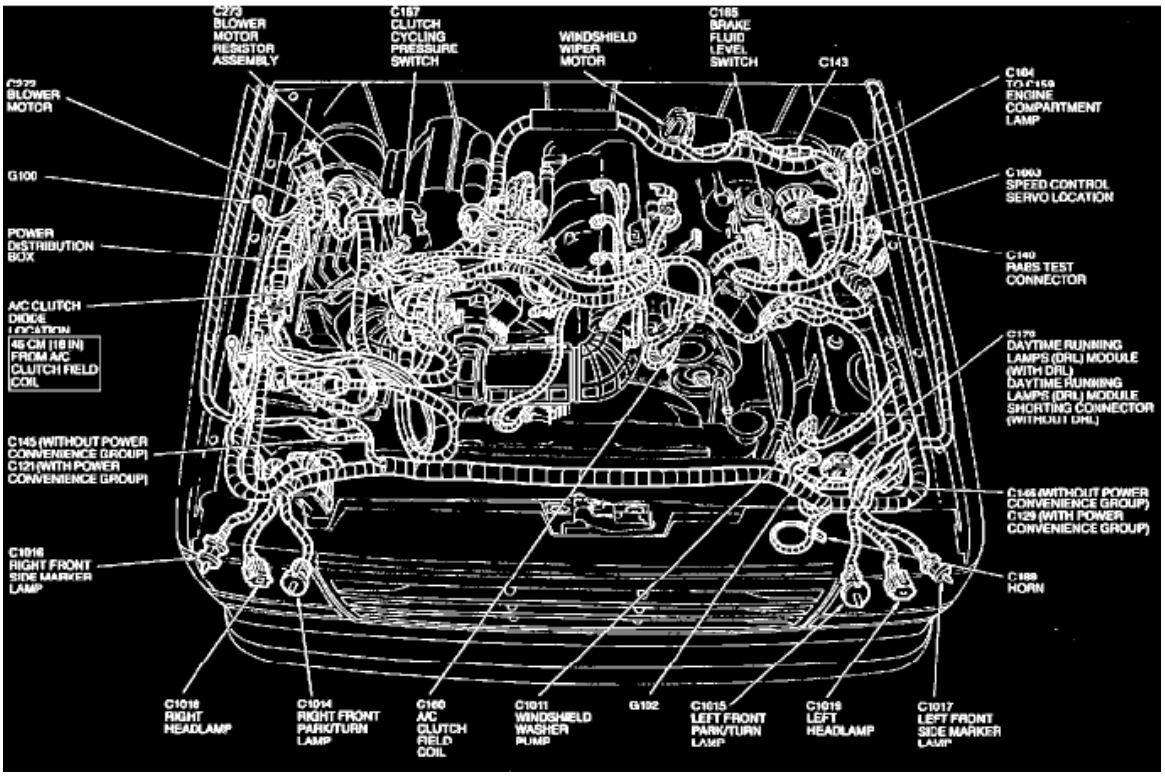
Rear RH Side Of Engine Compartment, Near Blower Motor

Applicable to: 2.3L/4-140

Engine Compartment Components.

Rear RH Side Of Engine Compartment, Near Blower Motor


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C104
TO C159
ENGINE COMPARTMENT LAMP
C272
BLOWER MOTOR
G100
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
45 CM (18 IN) FROM A/C CLUTCH FIELD COIL
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

Rear RH Side Of Engine Compartment, Near Blower Motor

Applicable to: 3.0L/V6-181

Engine Compartment Components.

Rear RH Side Of Engine Compartment, Near Blower Motor

Applicable to: 4.0L/V6-244

PART NUMBER	PART NAME	CLASS
F1VY-2D884-A	Spacer Kit	B

Compressor Clutch: Technical Service Bulletins A/C Clutch - Slips At High Ambient Temperature

Article No. 92-20-5

09/23/92

AIR CONDITIONING - FX-15 - COMPRESSOR AIR GAP SPECIFICATION - REVISION

FORD: 1988-93 TAURUS 1989-93 THUNDERBIRD 1991-93 CROWN VICTORIA 1992-93 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-93 SABLE 1989-93 COUGAR 1991-93 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992-93 TOPAZ, TRACER

LIGHT TRUCK: 1989 ECONOLINE 1989-90 BRONCO II 1989-93 BRONCO, F-150-350 SERIES, F-47, RANGER 1990-93 AEROSTAR, EXPLORER

ISSUE: The air conditioner clutch may "slip" during high ambient temperature conditions. This is normally caused by improper air gap adjustment between the clutch plate and hub assembly.

ACTION: The air gap specifications between the clutch plate, hub assembly and the clutch pulley has been revised. When service is required the air gap must be set between 0.35 and 0.85 mm instead of the current Service Manual specification of 0.45 and 0.85 mm.

NOTE: WHEN ADJUSTMENT IS REQUIRED, USE THE SPACERS INCLUDED IN THE SPACER KIT LISTED IN THE PARTS BLOCK. OPTIMUM ADJUSTMENT IS TOWARD THE LOWER LIMIT OF THE SPECIFICATION RANGE IN THE INTEREST OF DURABILITY.

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208200

Model	Refrigerant Capacity, Lbs.	Refrigerant Oil			Compressor Clutch Air Gap, inch
		Viscosity	Total System Capacity, Ounces	Compressor Oil Level Check, Inches	
F150–350	3.25	500	10	③	.021–.036
Aerostar	3.5–3.75	500	④	③	.021–.042
Bronco	2.7–2.8	500	⑤	③	.018–.033
Bronco II & Ranger	2.25–2.50	500	④	③	.021–.036
E150–350①	3.50–3.75	500	7	③	.021–.036
E150–350②	4.25–4.50	500	7	③	.021–.036
F150–350	2.7–2.8	500	⑤	③	.018–.033

①—Models less rear A/C unit.
②—Models with rear A/C unit.
③—Compressor Oil Level Inches cannot be checked. Refer to "Maintenance Procedures" section for oil check & charging procedure.
④—R-4 compressor, 11 oz.; V-5 compressor, 8 oz.
⑤—Less auxiliary air, 7 oz.; w/auxiliary air, 10 oz.

Air Conditioning Specifications

• Compressor Clutch doesn't operate.	• No voltage at Clutch Cycling Pressure Switch.	• Fuse 7 blown. • Remove Connector from Cluich Cycling Pressure Switch. With the A/C-Heater Control Assembly Switch in the ON position, check for battery voltage at the 348 (P) wire.
	• Inoperative Clutch Cycling Pressure Switch.	• Check the Clutch Cycling Pressure Switch for continuity. No continuity indicates low refrigerant, or an inoperative Clutch Cycling Pressure Switch. Check refrigerant system.
	• No voltage at A/C Clutch Field Coil.	• Remove connector from the A/C Clutch Field Coil. Check the wire connector for battery voltage. Check the EEC Module (including Throttle Position Sensor and Coolant Temperature Sensor) and the WOT Cutout Relay for correct operation.
	• Inoperative A/C Clutch Field Coil.	• Repair A/C Clutch Field Coil or terminals as required.
• Compressor Clutch won't shut off.	• A/C Switch or Defrost Switch in A/C-Heater Control Assembly is stuck closed.	• Remove connector from the A/C Clutch Field Coil. Ensure correct voltage for each switch position.
• No cooling or not enough cooling (compressor operates).	• Clutch plates have no air gap. • Loose A/C Compressor drive belt. • Temperature Blend door out of adjustment. • Too much or too little Refrigerant in system.	• If compressor continues to run with connector disconnected, repair clutch air gap • Check drive belt tension. • Check operation of temperature control cable • Perform refrigerant system diagnosis and problem evaluation

Troubleshooting Hints - Compressor

Compressor Clutch Coil: Technical Service Bulletins A/C - FX15 Clutch Application Chart

Article No. 92-25-5

Dec. 2, 1992

AIR CONDITIONING - COMPRESSOR - FX-15 CLUTCH, COIL AND PULLEY APPLICATIONS CHART

FORD: 1991-93 TAURUS, THUNDERBIRD 1992-93 CROWN VICTORIA, ESCORT, TEMPO

LINCOLN-MERCURY: 1991-93 CONTINENTAL, COUGAR, SABLE 1992-93 GRAND MARQUIS, TOPAZ, TOWN CAR, TRACER 1993 MARK VIII

LIGHT TRUCK: 1991-93 AEROSTAR, BRONCO, EXPLORER, F-150-350 SERIES, F-47, RANGER 1992-93 ECONOLINE 1993 VILLAGER

ISSUE: An application chart is available for the FX-15 A/C compressor for cars and light trucks. This application chart shows coil and pulley usage, by size and vehicle line. The information will help in determining service requirements.

ACTION:

FX-15 A/C COMPRESSOR MAGNETIC CLUTCH COIL APPLICATIONS

SMALL COIL USAGE
COIL PART NO.: E9SZ-2987-A

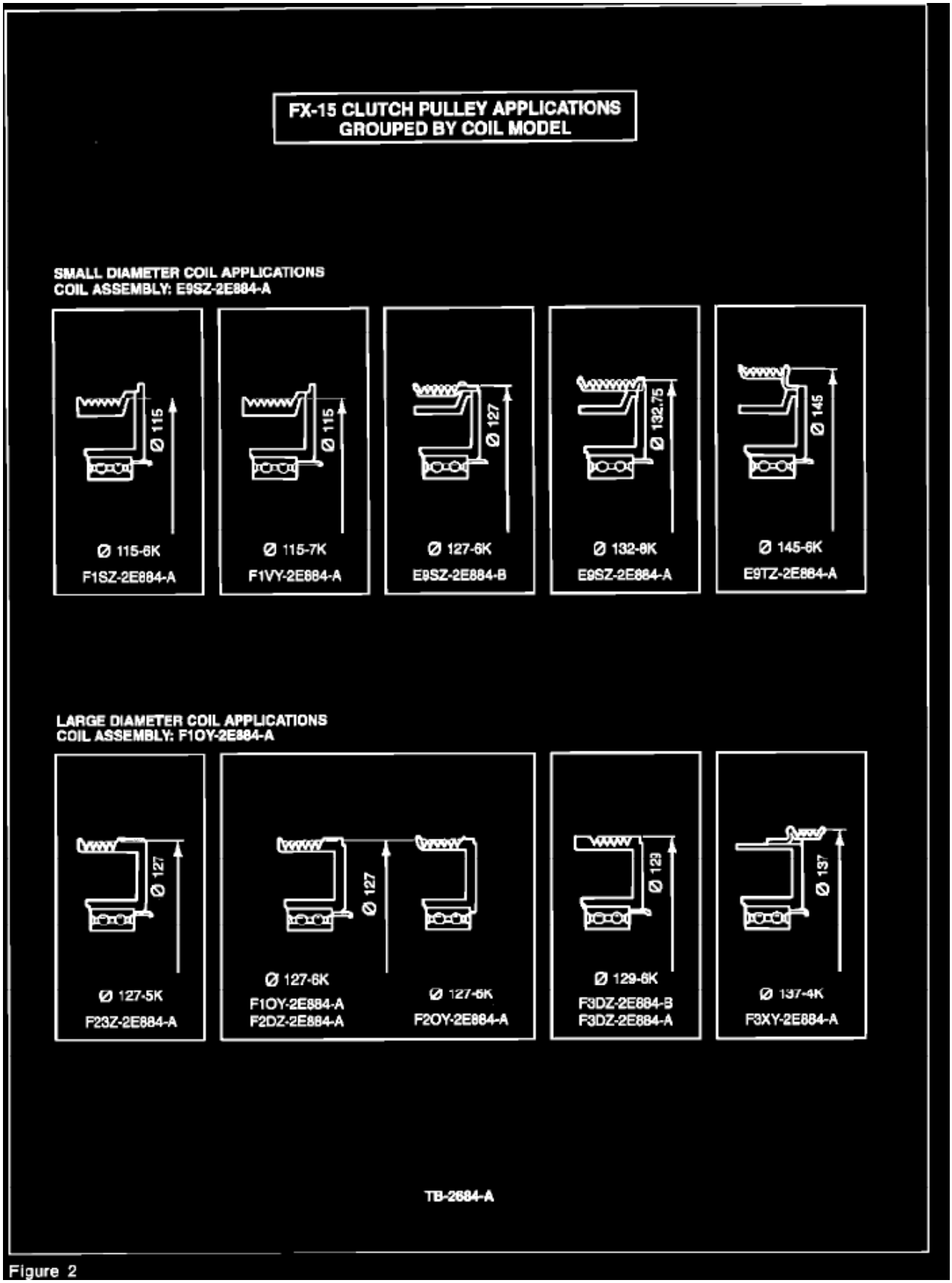
Pulley Size	Part No. -2E884-	MY1991		MY1992		MY1993	
		Application	Engine(s)	Application	Engine(s)	Application	Engine(s)
115-6K	F1SZ-A	T-Bird/Cougar Aerostar	5.0L 3.0/4.0L	T-Bird/Cougar Aerostar Escort/Tracer	5.0L 3.0/4.0L 1.9L	T-Bird/Cougar Aerostar Escort/Tracer Mark VIII Crwn. Vic/Grd Mq. Town Car	5.0L 3.0/4.0L 1.9L 4.6L 4V 4.6L 4.6L
115-7K	F1VY-A			Crwn. Vic/Grd Mq. Town Car	4.6L 4.6L		
127-6K	E9SZ-B	Ranger Explorer Taurus/Sable Continental T-Bird/Cougar Aerostar F-Series/Bronco	2.3/3.0/4.0L 4.0L 3.0/3.8L 3.8L 3.8L 3.0L 5.0/5.8L				
132-8K	E9SZ-A	T-Bird/Cougar	3.8L S.C.	T-Bird	3.8L S.C.	T-Bird	3.8L S.C.
145-6K	E9TZ-A	F-Series/Bronco	4.9/7.5L	F-Series/Bronco Ranger	4.9/7.5L 2.3L	F-Series/Bronco Ranger	4.9/7.5L 2.3L

LARGE COIL USAGE
COIL PART NO.: F1OY-2987-A

Pulley Size	Part No. -2E884-	MY1991		MY1992		MY1993	
		Application	Engine(s)	Application	Engine(s)	Application	Engine(s)
127-5K	F23Z-A ↓ Starting in late model year 1992			Tempo/Topaz	2.3L	Tempo/Topaz	2.3L
127-6K	F1OY-A ↓ Starting in late model year 1992	Ranger Explorer Taurus/Sable	2.3/3.0/4.0L 4.0L 3.0/3.8L	Ranger Explorer Taurus/Sable	3.0/4.0L 4.0L 3.0/3.8L	Ranger Explorer Taurus/Sable	3.0/4.0L 4.0L 3.8L
	F2OY-A (Late MY92)	Continental T-Bird/Cougar Aerostar F-Series/Bronco	3.8L 3.8L 3.0L 5.0/5.8L	Continental T-Bird/Cougar F-Series/Bronco F-Series Econoline	3.8L 3.8L 5.0/5.8L 7.3L D 7.3L D	Continental T-Bird/Cougar F-Series/Bronco F-Series Econoline	3.8L 3.8L 5.0/5.8L 7.3L D 7.3L D/7.5L
	F2DZ-A (Gold)			Taurus Prepilot (R134a)	3.0L		
129-6K	F3DZ-B					Taurus/Sable	3.0L
	F3DZ-A (Gold)					Taurus Prepilot (R134a)	3.0L
137-4K	F3XY-B					Villager	3.0L

TB-2563-A

Figure 1


FX-15 CLUTCH PULLEY APPLICATIONS
GROUPED BY COIL MODEL
SMALL DIAMETER COIL APPLICATIONS
COIL ASSEMBLY: E9SZ-2E884-A
Ø 115
Ø 115-6K
F1SZ-2E884-A
Ø 115
Ø 115-7K
F1VY-2E884-A
Ø 127
Ø 127-6K
E9SZ-2E884-B
Ø 132.75
Ø 132-8K
E9SZ-2E884-A
Ø 145
Ø 145-6K
E9TZ-2E884-A
LARGE DIAMETER COIL APPLICATIONS
COIL ASSEMBLY: F1OY-2E884-A
Ø 127
Ø 127-5K
F23Z-2E884-A
Ø 127
Ø 127-6K
F1OY-2E884-A
F2DZ-2E884-A
Ø 127-6K
F2OY-2E884-A
Ø 129
Ø 129-6K
F3DZ-2E884-B
F3DZ-2E884-A
Ø 137
Ø 137-4K
F3XY-2E884-A
TB-2684-A
Figure 2

Refer to the application chart to determine vehicle requirements. The chart in Figure 1 shows both small and large coil usage and pulley size, by vehicle line, for model years 1991, 1992 and 1993. Figure 2 shows the pulley configuration for the coil.

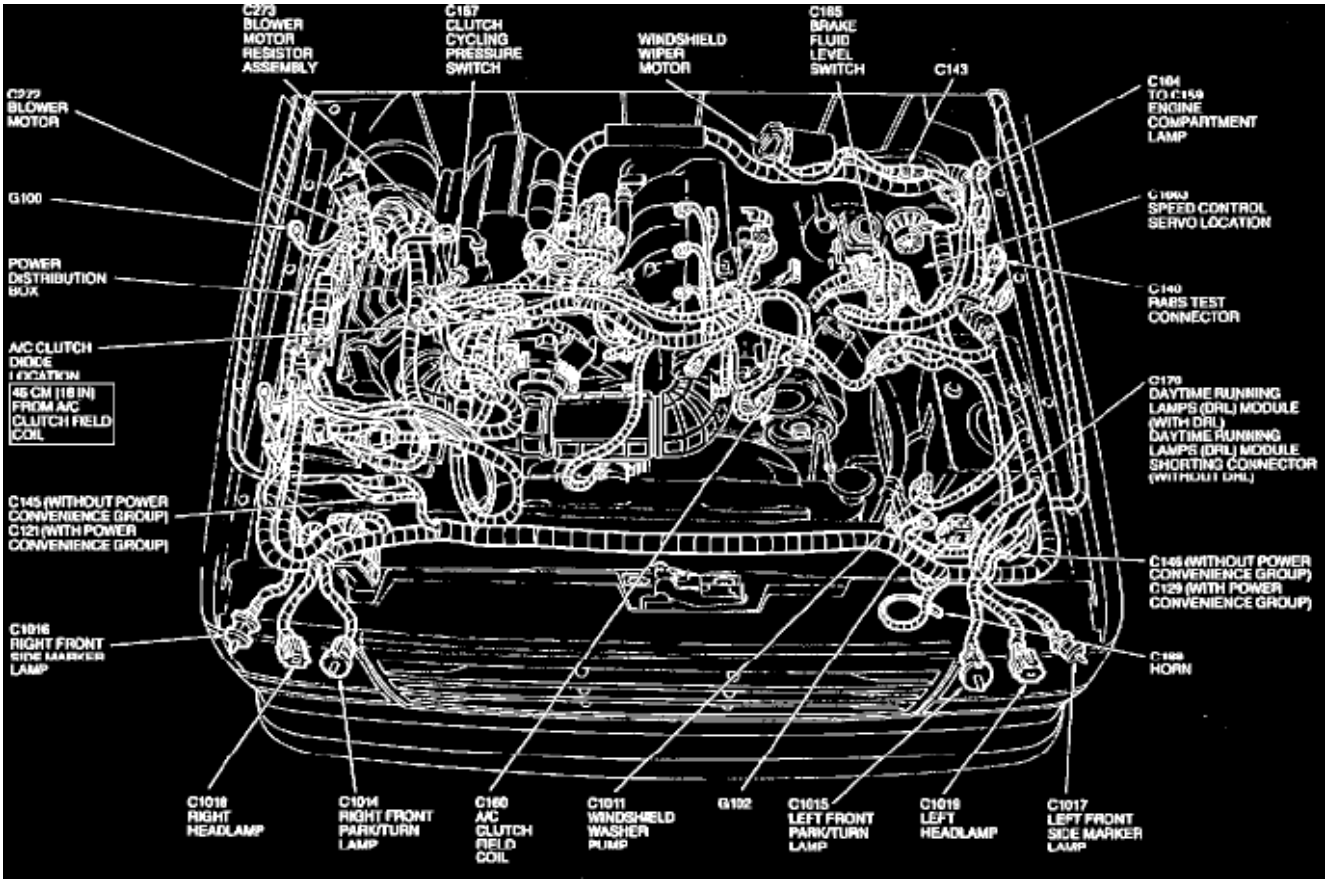
PART NUMBER	PART NAME	CLASS
E9SZ-2987-A	Coil	B
F1OY-2987-A	Coil	B
F1SZ-2E884-A	Pulley	C
F1VY-2E884-A	Pulley	B
E9SZ-2E884-B	Pulley	B
E9SZ-2E884-A	Pulley	B
E9TZ-2E884-A	Pulley	B
F23Z-2E884-A	Pulley	C
F1OY-2E884-A	Pulley	B
F2OY-2E884-A	Pulley	C
F2DZ-2E884-A	Pulley	C
F3DZ-2E884-B	Pulley	C
F3DZ-2E884-A	Pulley	C
F3XY-2E884-B	Pulley	C

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208999, 290000



Compressor Clutch Coil: Locations

Engine Compartment Components.

Top LH Front Of Engine, Part Of A/C Compressor Assembly

Applicable to: 4.0L/V6-244

Compressor Clutch Coil: Testing and Inspection

1. Disconnect wire connector at clutch.

2. Connect negative terminal of an ammeter to one of the field coil terminals, then connect a jumper wire from a suitable ground to other terminal.

3. Connect a jumper wire to positive terminal of ammeter and connect other end of jumper wire to battery positive terminal.

4. With engine running and at operating temperature, current draw should be approximately 3.44 amperes. An audible click should be heard, indicating clutch engagement. If intermittent coil operation is suspected, maintain current draw test for 5 minutes or longer if necessary.

5. If current draw is not within specifications, replace magnetic clutch field coil.

Compressor Clutch Coil: Service and Repair Except FX-15 Compressor

Removal

1. Remove clutch hub and pulley.

2. Disconnect ground wire if equipped.

3. Remove snap ring retaining clutch field coil on front of compressor.

4. Remove field coil.

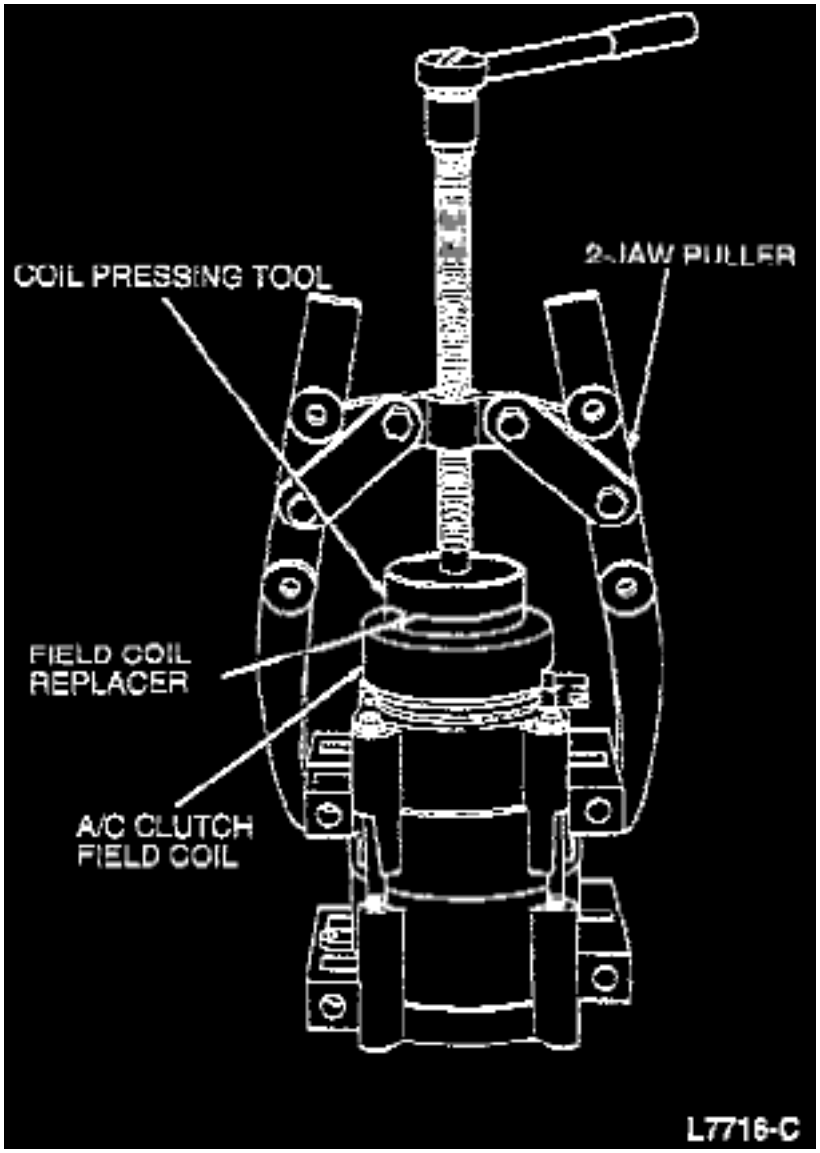
Installation

1. Position clutch field coil to compressor, engaging locator pin on compressor head with hole in clutch field coil.

2. Connect ground wire if equipped.

3. Install snap ring to retain clutch field coil on compressor with bevel side out.

4. Install pulley and hub on compressor.



Compressor Clutch Coil: Service and Repair With FX-15 Compressor

A/C Coil Pressing Tool - Installation

Removal

1. Remove clutch hub and pulley.

2. Install shaft protector tool T89P-19623-RH or equivalent on nose of compressor, and 2-jaw puller on coil Fig. 7.

3. Tighten puller, forcing screw to pull coil from compressor head.

Installation

1. Place coil on compressor head and ensure electrical connector is in correct position.

2. Install using tool T89P-19623-EH or equivalent and 2-jaw puller.

3. Install clutch hub and pulley on compressor.

Compressor Clutch Hub: Technical Service Bulletins A/C - FX15 Clutch Application Chart

Article No. 92-25-5

Dec. 2, 1992

AIR CONDITIONING - COMPRESSOR - FX-15 CLUTCH, COIL AND PULLEY APPLICATIONS CHART

FORD: 1991-93 TAURUS, THUNDERBIRD 1992-93 CROWN VICTORIA, ESCORT, TEMPO

LINCOLN-MERCURY: 1991-93 CONTINENTAL, COUGAR, SABLE 1992-93 GRAND MARQUIS, TOPAZ, TOWN CAR, TRACER 1993 MARK VIII

LIGHT TRUCK: 1991-93 AEROSTAR, BRONCO, EXPLORER, F-150-350 SERIES, F-47, RANGER 1992-93 ECONOLINE 1993 VILLAGER

ISSUE: An application chart is available for the FX-15 A/C compressor for cars and light trucks. This application chart shows coil and pulley usage, by size and vehicle line. The information will help in determining service requirements.

ACTION:

FX-15 A/C COMPRESSOR MAGNETIC CLUTCH COIL APPLICATIONS

SMALL COIL USAGE
COIL PART NO.: E9SZ-2987-A

Pulley Size	Part No. -2E884-	MY1991		MY1992		MY1993	
		Application	Engine(s)	Application	Engine(s)	Application	Engine(s)
115-6K	F1SZ-A	T-Bird/Cougar Aerostar	5.0L 3.0/4.0L	T-Bird/Cougar Aerostar Escort/Tracer	5.0L 3.0/4.0L 1.9L	T-Bird/Cougar Aerostar Escort/Tracer Mark VIII Crwn. Vic/Grd Mq. Town Car	5.0L 3.0/4.0L 1.9L 4.6L 4V 4.6L 4.6L
115-7K	F1VY-A			Crwn. Vic/Grd Mq. Town Car	4.6L 4.6L		
127-6K	E9SZ-B	Ranger Explorer Taurus/Sable Continental T-Bird/Cougar Aerostar F-Series/Bronco	2.3/3.0/4.0L 4.0L 3.0/3.8L 3.8L 3.8L 3.0L 5.0/5.8L				
132-8K	E9SZ-A	T-Bird/Cougar	3.8L S.C.	T-Bird	3.8L S.C.	T-Bird	3.8L S.C.
145-6K	E9TZ-A	F-Series/Bronco	4.9/7.5L	F-Series/Bronco Ranger	4.9/7.5L 2.3L	F-Series/Bronco Ranger	4.9/7.5L 2.3L

LARGE COIL USAGE
COIL PART NO.: F1OY-2987-A

Pulley Size	Part No. -2E884-	MY1991		MY1992		MY1993	
		Application	Engine(s)	Application	Engine(s)	Application	Engine(s)
127-5K	F23Z-A ↓ Starting in late model year 1992			Tempo/Topaz	2.3L	Tempo/Topaz	2.3L
127-6K	F1OY-A ↓ Starting in late model year 1992	Ranger Explorer Taurus/Sable	2.3/3.0/4.0L 4.0L 3.0/3.8L	Ranger Explorer Taurus/Sable	3.0/4.0L 4.0L 3.0/3.8L	Ranger Explorer Taurus/Sable	3.0/4.0L 4.0L 3.8L
	F2OY-A (Late MY92)	Continental T-Bird/Cougar Aerostar F-Series/Bronco	3.8L 3.8L 3.0L 5.0/5.8L	Continental T-Bird/Cougar F-Series/Bronco F-Series Econoline	3.8L 3.8L 5.0/5.8L 7.3L D 7.3L D	Continental T-Bird/Cougar F-Series/Bronco F-Series Econoline	3.8L 3.8L 5.0/5.8L 7.3L D 7.3L D/7.5L
	F2DZ-A (Gold)			Taurus Prepilot (R134a)	3.0L		
129-6K	F3DZ-B					Taurus/Sable	3.0L
	F3DZ-A (Gold)					Taurus Prepilot (R134a)	3.0L
137-4K	F3XY-B					Villager	3.0L

TB-2563-A

Figure 1

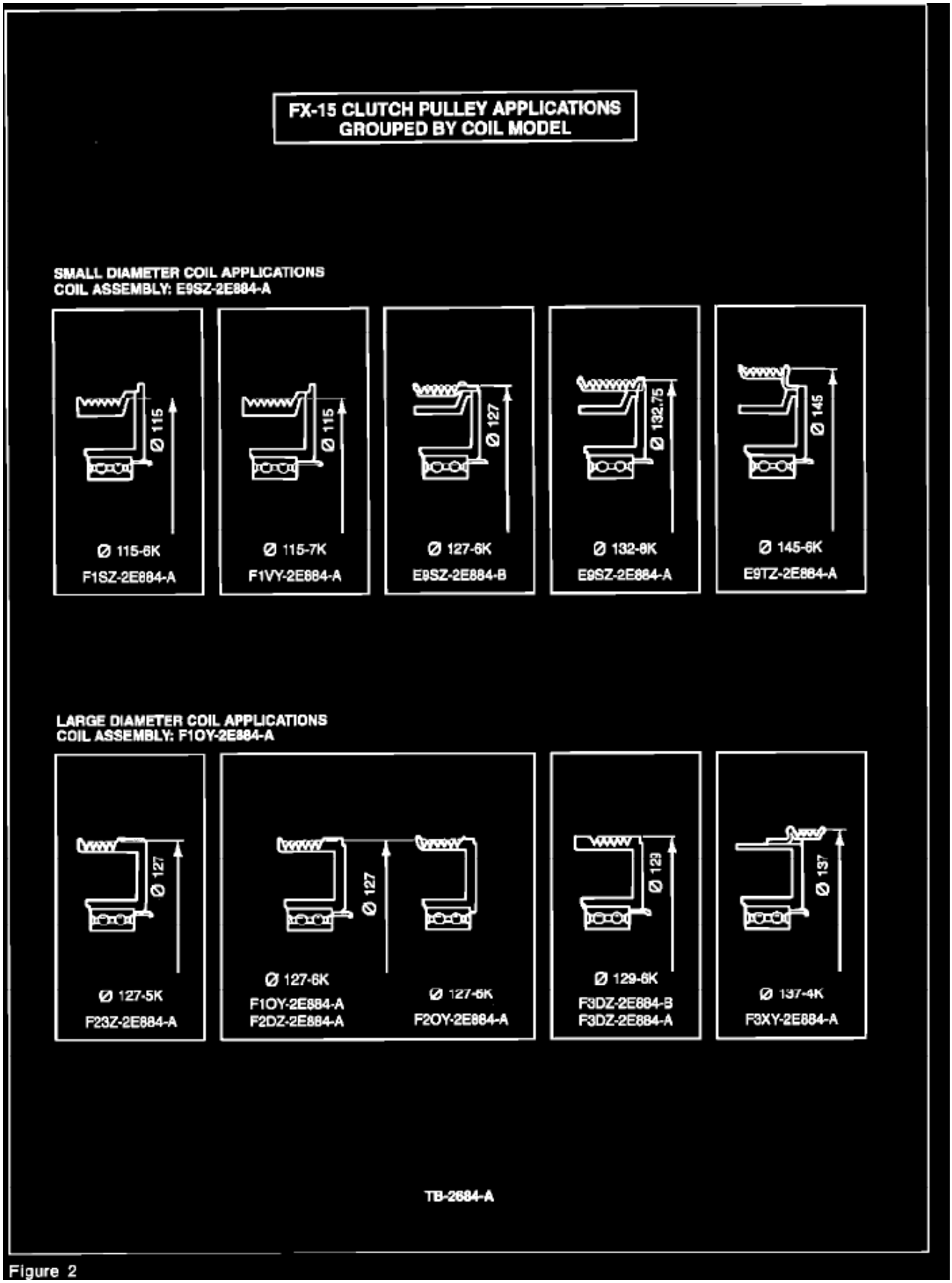

FX-15 CLUTCH PULLEY APPLICATIONS
GROUPED BY COIL MODEL
SMALL DIAMETER COIL APPLICATIONS
COIL ASSEMBLY: E9SZ-2E884-A
Ø 115
Ø 115-6K
F1SZ-2E884-A
Ø 115
Ø 115-7K
F1VY-2E884-A
Ø 127
Ø 127-6K
E9SZ-2E884-B
Ø 132.75
Ø 132-8K
E9SZ-2E884-A
Ø 145
Ø 145-6K
E9TZ-2E884-A
LARGE DIAMETER COIL APPLICATIONS
COIL ASSEMBLY: F1OY-2E884-A
Ø 127
Ø 127-5K
F23Z-2E884-A
Ø 127
Ø 127-6K
F1OY-2E884-A
F2DZ-2E884-A
Ø 127-6K
F2OY-2E884-A
Ø 129
Ø 129-6K
F3DZ-2E884-B
F3DZ-2E884-A
Ø 137
Ø 137-4K
F3XY-2E884-A
TB-2684-A

Figure 2

Refer to the application chart to determine vehicle requirements. The chart in Figure 1 shows both small and large coil usage and pulley size, by vehicle line, for model years 1991, 1992 and 1993. Figure 2 shows the pulley configuration for the coil.

PART NUMBER	PART NAME	CLASS
E9SZ-2987-A	Coil	B
F1OY-2987-A	Coil	B
F1SZ-2E884-A	Pulley	C
F1VY-2E884-A	Pulley	B
E9SZ-2E884-B	Pulley	B
E9SZ-2E884-A	Pulley	B
E9TZ-2E884-A	Pulley	B
F23Z-2E884-A	Pulley	C
F1OY-2E884-A	Pulley	B
F2OY-2E884-A	Pulley	C
F2DZ-2E884-A	Pulley	C
F3DZ-2E884-B	Pulley	C
F3DZ-2E884-A	Pulley	C
F3XY-2E884-B	Pulley	C

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208999, 290000

Compressor Clutch Hub: Technical Service Bulletins A/C - FX 15 Compressor Clutch Shaft and Hub Assembly

Article No. 92-5-8

February 26, 1992

AIR CONDITIONING - FX-15 COMPRESSOR - CLUTCH SHAFT AND HUB ASSEMBLY - DESIGN CHANGE INFORMATION

FORD: 1988-92 TAURUS 1989-92 THUNDERBIRD 1991-92 CROWN VICTORIA 1992 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-92 SABLE

1989-92 COUGAR 1991-92 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992 TOPAZ

LIGHT TRUCK: 1989 ECONOLINE 1989-92 BRONCO, F-150-350 SERIES, F-47, RANGER 1990-92 AEROSTAR 1991-92 EXPLORER

ISSUE: Effective with Job # 1, 1992, the FX-15 compressor shaft and hub assemblies have 21 splines instead of 16, as in prior years. This design change was made to increase shaft strength. The 16 tooth spline compressor is no longer in production.

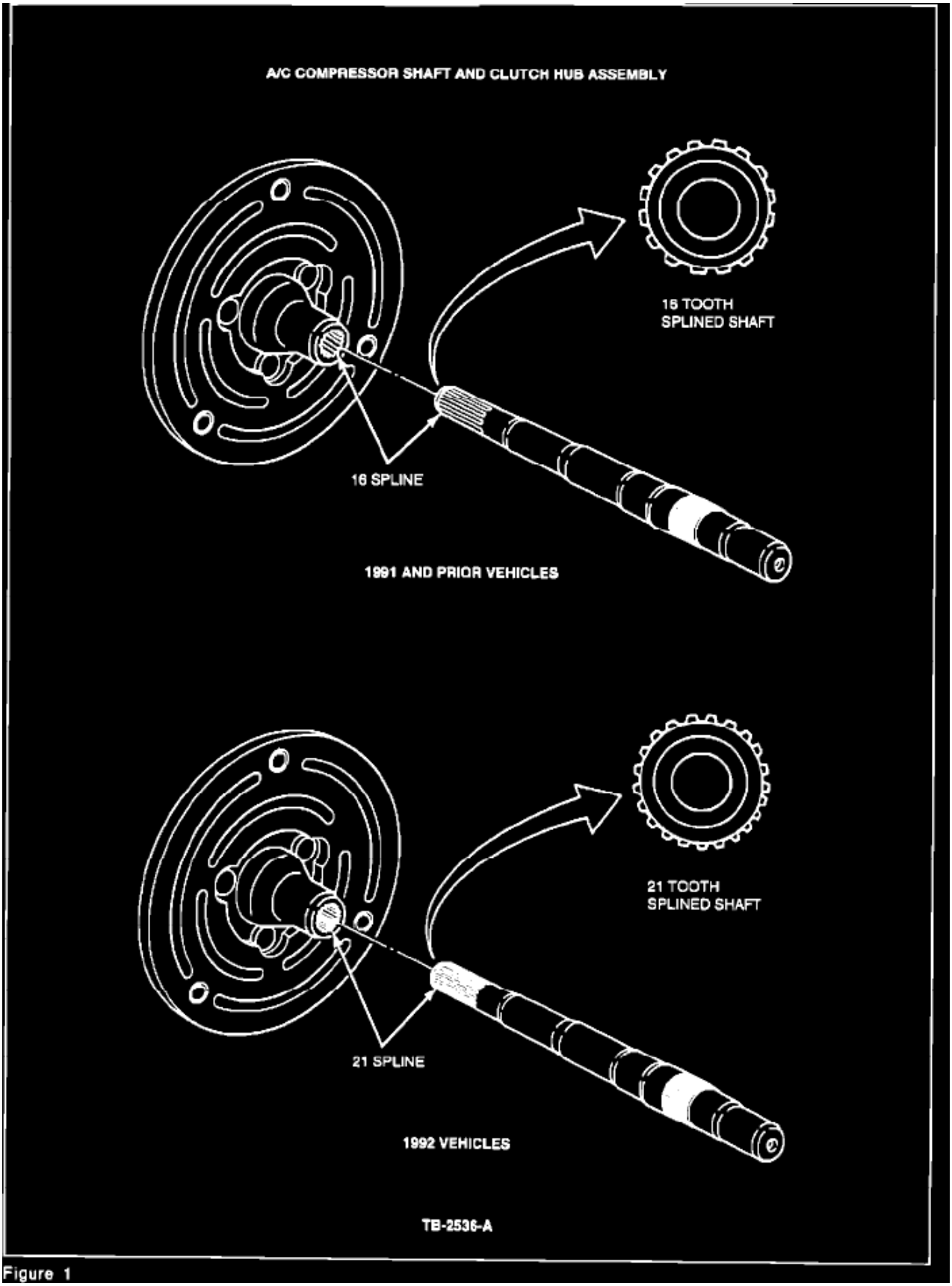

A/C COMPRESSOR SHAFT AND CLUTCH HUB ASSEMBLY
15 TOOTH
SPLINED SHAFT
16 SPLINE
1991 AND PRIOR VEHICLES
21 TOOTH
SPLINED SHAFT
21 SPLINE
1992 VEHICLES
TB-2536-A

Figure 1

ACTION: If it becomes necessary to replace an FX-15 Compressor, use the following guidelines for replacement. Refer to Figure 1.

16 TOOTH SPLINE COMPRESSOR AND CLUTCH ASSEMBLY

If a 16 tooth spline compressor and clutch assembly are not available, replace both assemblies with 21 tooth spline compressor and clutch hub assembly.

16 TOOTH SPLINE CLUTCH HUB ASSEMBLY

Use a 16 tooth spline clutch hub assembly.

16 TOOTH SPLINE COMPRESSOR

If a 16 tooth spline compressor is not available, replace it with a 21 tooth spline compressor. It will also be necessary to replace the clutch hub assembly with a 21 tooth spline clutch hub. If the clutch pulley has grooves worn into the friction surface, it should be replaced.

21 TOOTH SPLINE COMPRESSOR AND/OR CLUTCH HUB ASSEMBLY

Job # 1, 1992 and beyond ... Replace with 21 tooth spline components. Clutch hub assembly and compressor are ordered separately.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

208000

PART NUMBER	PART NAME	CLASS
F1VY-2D884-A	Spacer Kit	B

Compressor Clutch Hub: Technical Service Bulletins A/C Clutch - Slips At High Ambient Temperature

Article No. 92-20-5

09/23/92

AIR CONDITIONING - FX-15 - COMPRESSOR AIR GAP SPECIFICATION - REVISION

FORD: 1988-93 TAURUS 1989-93 THUNDERBIRD 1991-93 CROWN VICTORIA 1992-93 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-93 SABLE 1989-93 COUGAR 1991-93 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992-93 TOPAZ, TRACER

LIGHT TRUCK: 1989 ECONOLINE 1989-90 BRONCO II 1989-93 BRONCO, F-150-350 SERIES, F-47, RANGER 1990-93 AEROSTAR, EXPLORER

ISSUE: The air conditioner clutch may "slip" during high ambient temperature conditions. This is normally caused by improper air gap adjustment between the clutch plate and hub assembly.

ACTION: The air gap specifications between the clutch plate, hub assembly and the clutch pulley has been revised. When service is required the air gap must be set between 0.35 and 0.85 mm instead of the current Service Manual specification of 0.45 and 0.85 mm.

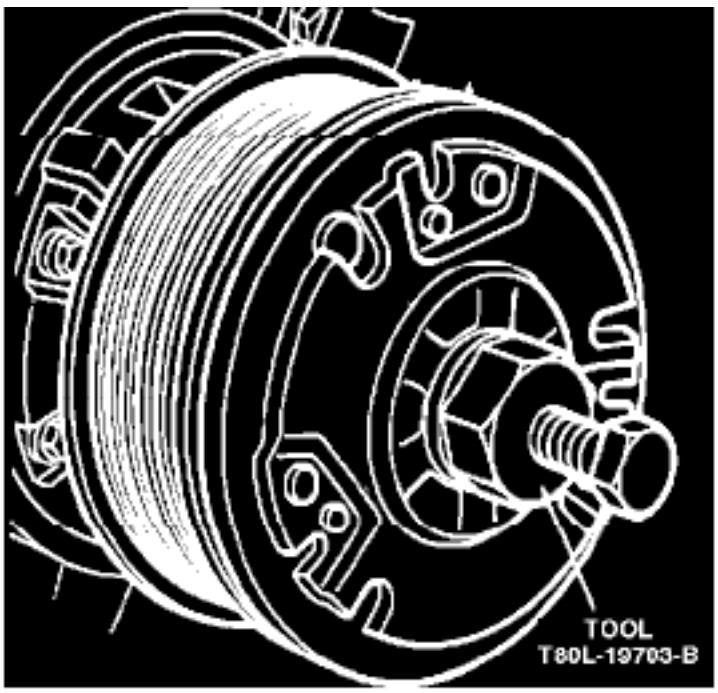
NOTE: WHEN ADJUSTMENT IS REQUIRED, USE THE SPACERS INCLUDED IN THE SPACER KIT LISTED IN THE PARTS BLOCK. OPTIMUM ADJUSTMENT IS TOWARD THE LOWER LIMIT OF THE SPECIFICATION RANGE IN THE INTEREST OF DURABILITY.

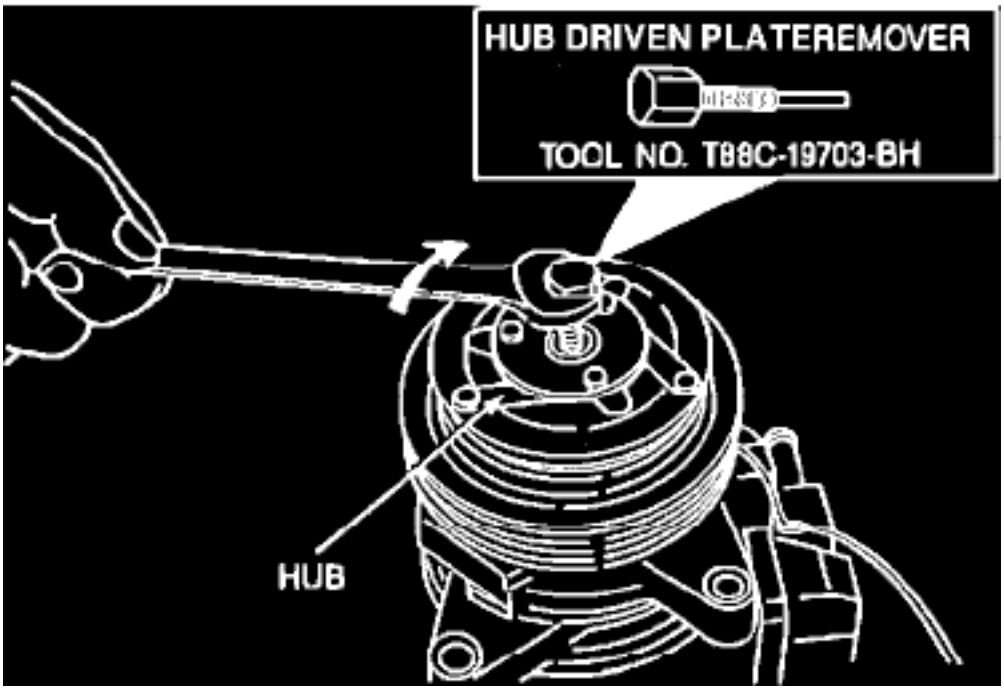
Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208200





Compressor Clutch Hub: Service and Repair Removal

1. Remove clutch hub retaining nut using spanner wrench T81P-19623-MH or equivalent. On 10P15A compressors, use strap wrench D85L-6000-A or equivalent. It is necessary to connect field coil to a 12V source to energize the coil engaging the clutch.

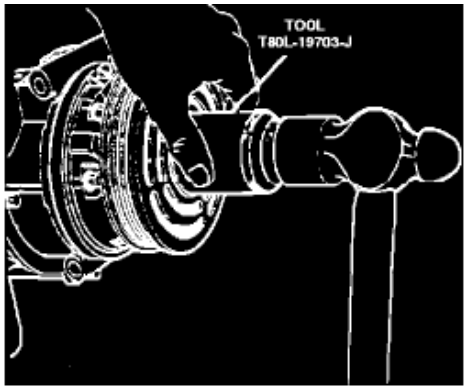
Fig. 2 Clutch hub removal

Fig. 1a Hub Driven Plate Remover Tool. FX-15

2. Remove clutch hub and shims from compressor shaft with tool T80L-19703-B or equivalent, Fig. 2. Holding tool with 1 inch wrench, tighten bolt with 1/2 inch wrench. Use tool T88C-19703-BH or equivalent, Fig. 1a, to remove hub plate of 10P15A compressors.

3. Remove clutch pulley retaining snap ring.

4. Remove pulley and bearing assembly from compressor. If pulley and bearing assembly cannot be removed by hand, use a suitable puller.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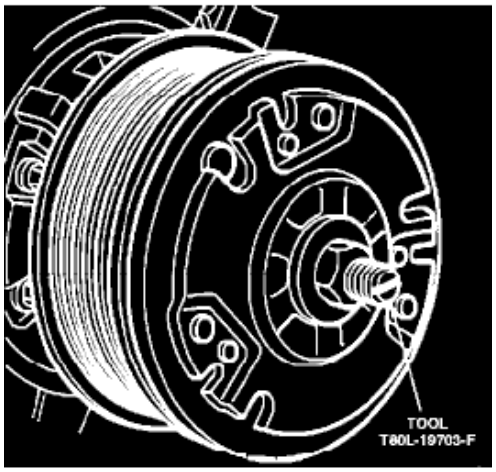
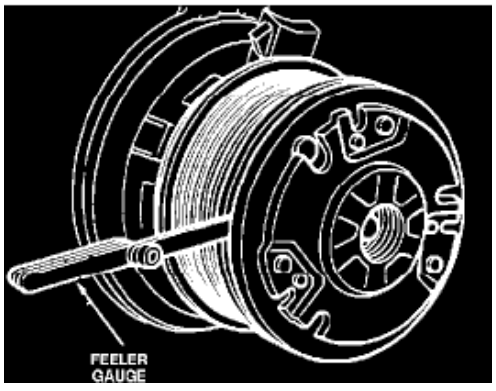
T80L-19703-J


TOOL
T80L-19703-F


FEELER
GAUGE

Compressor Clutch Hub: Service and Repair Installation

Fig. 4 Clutch pulley installation

1. Clean pulley bearing surface of compressor.

2. Install pulley and bearing on compressor. Bearing should be a slip fit onto compressor head. If difficulty is encountered installing pulley, gently tap pulley on compressor using tool T80L-19703-J or equivalent, Fig. 4. Ensure pulley bearing is aligned with compressor head.

3. Install pulley retaining snap ring with bevel side out.

Fig. 5 Clutch hub installation

4. Install clutch hub on compressor shaft using new shims between clutch hub and end of shaft. Ensure shaft key is aligned with keyway in clutch hub. Do not attempt to drive hub on compressor shaft as damage to compressor will result. Use tool T80L-19703-F or equivalent if hub will not easily slide on compressor shaft, Fig. 5.

5. Install hub retaining nut on compressor shaft and torque to 10-14 ft. lbs.

Fig. 6 Clutch air gap

6. Check clutch air gap between hub and pulley mating surface in three locations equally spaced, Fig. 6. Rotate pulley one-half turn and check again. The smallest air gap must be within specification, refer to ``Air Conditioning Specifications'' section. Add or remove shims until desired limit is attained.

Compressor Pulley: Technical Service Bulletins A/C - FX15 Clutch Application Chart

Article No. 92-25-5

Dec. 2, 1992

AIR CONDITIONING - COMPRESSOR - FX-15 CLUTCH, COIL AND PULLEY APPLICATIONS CHART

FORD: 1991-93 TAURUS, THUNDERBIRD 1992-93 CROWN VICTORIA, ESCORT, TEMPO

LINCOLN-MERCURY: 1991-93 CONTINENTAL, COUGAR, SABLE 1992-93 GRAND MARQUIS, TOPAZ, TOWN CAR, TRACER 1993 MARK VIII

LIGHT TRUCK: 1991-93 AEROSTAR, BRONCO, EXPLORER, F-150-350 SERIES, F-47, RANGER 1992-93 ECONOLINE 1993 VILLAGER

ISSUE: An application chart is available for the FX-15 A/C compressor for cars and light trucks. This application chart shows coil and pulley usage, by size and vehicle line. The information will help in determining service requirements.

ACTION:

FX-15 A/C COMPRESSOR MAGNETIC CLUTCH COIL APPLICATIONS

SMALL COIL USAGE
COIL PART NO.: E9SZ-2987-A

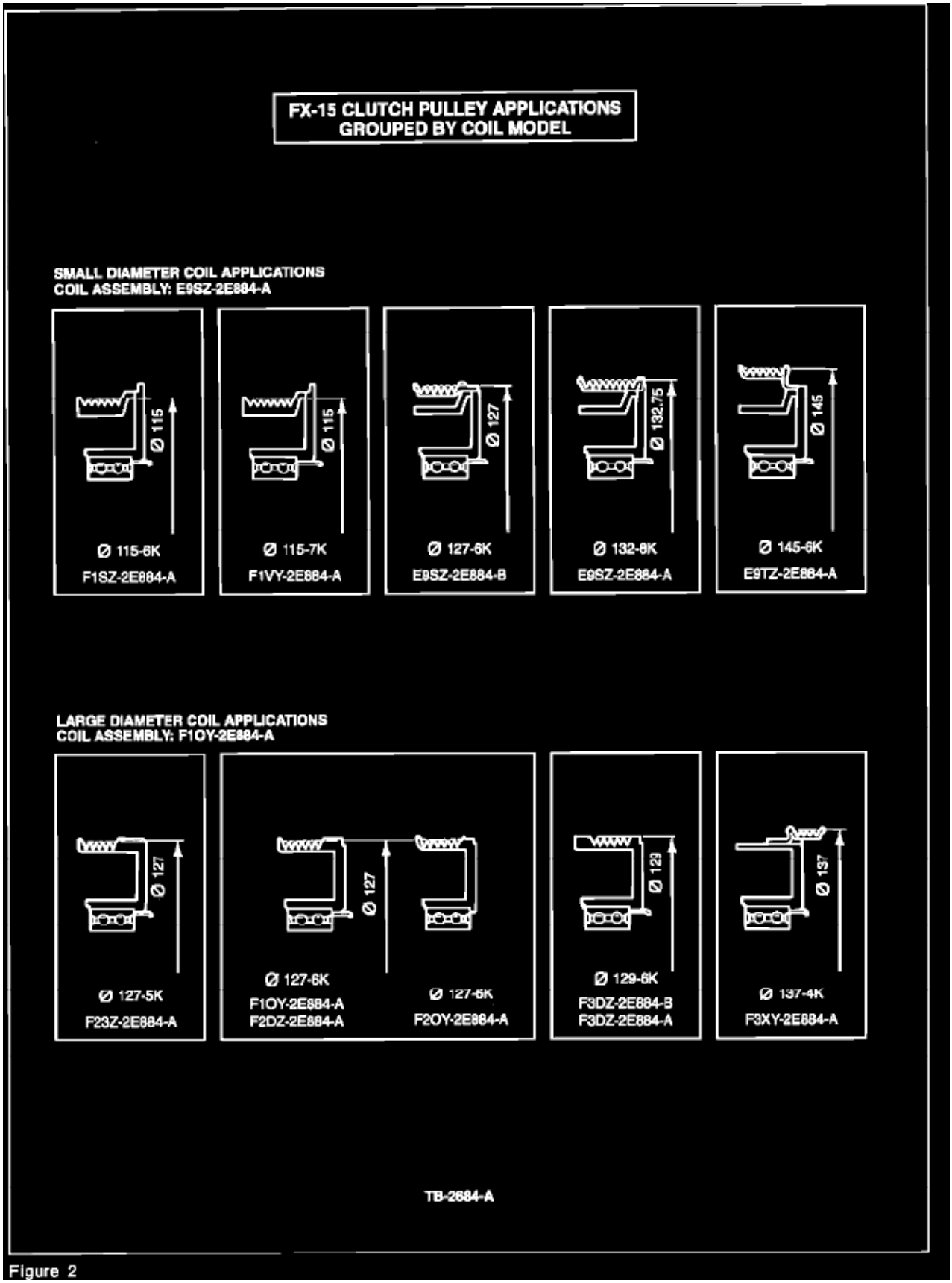
Pulley Size	Part No. -2E884-	MY1991		MY1992		MY1993	
		Application	Engine(s)	Application	Engine(s)	Application	Engine(s)
115-6K	F1SZ-A	T-Bird/Cougar Aerostar	5.0L 3.0/4.0L	T-Bird/Cougar Aerostar Escort/Tracer	5.0L 3.0/4.0L 1.9L	T-Bird/Cougar Aerostar Escort/Tracer Mark VIII Crwn. Vic/Grd Mq. Town Car	5.0L 3.0/4.0L 1.9L 4.6L 4V 4.6L 4.6L
115-7K	F1VY-A			Crwn. Vic/Grd Mq. Town Car	4.6L 4.6L		
127-6K	E9SZ-B	Ranger Explorer Taurus/Sable Continental T-Bird/Cougar Aerostar F-Series/Bronco	2.3/3.0/4.0L 4.0L 3.0/3.8L 3.8L 3.8L 3.0L 5.0/5.8L				
132-8K	E9SZ-A	T-Bird/Cougar	3.8L S.C.	T-Bird	3.8L S.C.	T-Bird	3.8L S.C.
145-6K	E9TZ-A	F-Series/Bronco	4.9/7.5L	F-Series/Bronco Ranger	4.9/7.5L 2.3L	F-Series/Bronco Ranger	4.9/7.5L 2.3L

LARGE COIL USAGE
COIL PART NO.: F1OY-2987-A

Pulley Size	Part No. -2E884-	MY1991		MY1992		MY1993	
		Application	Engine(s)	Application	Engine(s)	Application	Engine(s)
127-5K	F23Z-A ↓ Starting in late model year 1992			Tempo/Topaz	2.3L	Tempo/Topaz	2.3L
127-6K	F1OY-A ↓ Starting in late model year 1992	Ranger Explorer Taurus/Sable	2.3/3.0/4.0L 4.0L 3.0/3.8L	Ranger Explorer Taurus/Sable	3.0/4.0L 4.0L 3.0/3.8L	Ranger Explorer Taurus/Sable	3.0/4.0L 4.0L 3.8L
	F2OY-A (Late MY92)	Continental T-Bird/Cougar Aerostar F-Series/Bronco	3.8L 3.8L 3.0L 5.0/5.8L	Continental T-Bird/Cougar F-Series/Bronco F-Series Econoline	3.8L 3.8L 5.0/5.8L 7.3L D 7.3L D	Continental T-Bird/Cougar F-Series/Bronco F-Series Econoline	3.8L 3.8L 5.0/5.8L 7.3L D 7.3L D/7.5L
	F2DZ-A (Gold)			Taurus Prepilot (R134a)	3.0L		
129-6K	F3DZ-B					Taurus/Sable	3.0L
	F3DZ-A (Gold)					Taurus Prepilot (R134a)	3.0L
137-4K	F3XY-B					Villager	3.0L

TB-2563-A

Figure 1


FX-15 CLUTCH PULLEY APPLICATIONS
GROUPED BY COIL MODEL
SMALL DIAMETER COIL APPLICATIONS
COIL ASSEMBLY: E9SZ-2E884-A
Ø 115
Ø 115-6K
F1SZ-2E884-A
Ø 115
Ø 115-7K
F1VY-2E884-A
Ø 127
Ø 127-6K
E9SZ-2E884-B
Ø 132.75
Ø 132-8K
E9SZ-2E884-A
Ø 145
Ø 145-6K
E9TZ-2E884-A
LARGE DIAMETER COIL APPLICATIONS
COIL ASSEMBLY: F1OY-2E884-A
Ø 127
Ø 127-5K
F23Z-2E884-A
Ø 127
Ø 127-6K
F1OY-2E884-A
F2DZ-2E884-A
Ø 127-6K
F2OY-2E884-A
Ø 129
Ø 129-6K
F3DZ-2E884-B
F3DZ-2E884-A
Ø 137
Ø 137-4K
F3XY-2E884-A
TB-2684-A
Figure 2

Refer to the application chart to determine vehicle requirements. The chart in Figure 1 shows both small and large coil usage and pulley size, by vehicle line, for model years 1991, 1992 and 1993. Figure 2 shows the pulley configuration for the coil.

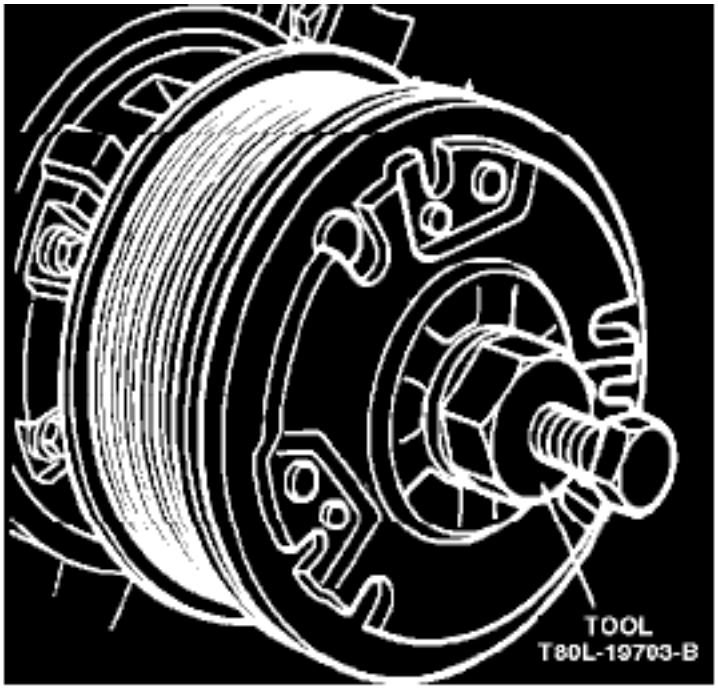
PART NUMBER	PART NAME	CLASS
E9SZ-2987-A	Coil	B
F1OY-2987-A	Coil	B
F1SZ-2E884-A	Pulley	C
F1VY-2E884-A	Pulley	B
E9SZ-2E884-B	Pulley	B
E9SZ-2E884-A	Pulley	B
E9TZ-2E884-A	Pulley	B
F23Z-2E884-A	Pulley	C
F1OY-2E884-A	Pulley	B
F2OY-2E884-A	Pulley	C
F2DZ-2E884-A	Pulley	C
F3DZ-2E884-B	Pulley	C
F3DZ-2E884-A	Pulley	C
F3XY-2E884-B	Pulley	C

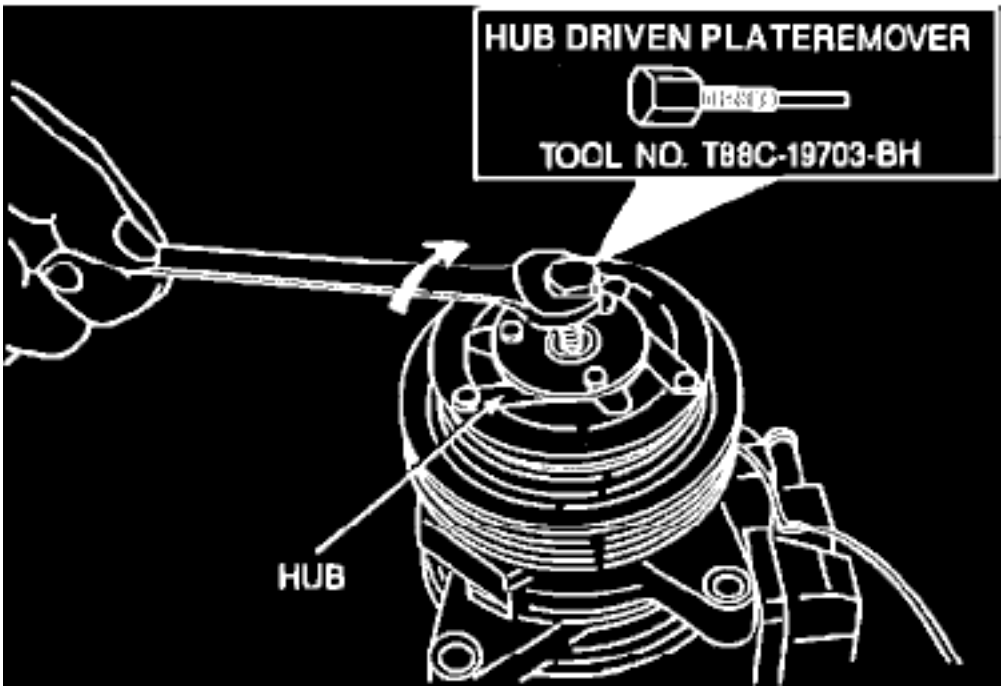
Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208999, 290000





Compressor Pulley: Service and Repair Removal

1. Remove clutch hub retaining nut using spanner wrench T81P-19623-MH or equivalent. On 10P15A compressors, use strap wrench D85L-6000-A or equivalent. It is necessary to connect field coil to a 12V source to energize the coil engaging the clutch.

Fig. 2 Clutch hub removal

Fig. 1a Hub Driven Plate Remover Tool. FX-15

2. Remove clutch hub and shims from compressor shaft with tool T80L-19703-B or equivalent, Fig. 2. Holding tool with 1 inch wrench, tighten bolt with 1/2 inch wrench. Use tool T88C-19703-BH or equivalent, Fig. 1a, to remove hub plate of 10P15A compressors.

3. Remove clutch pulley retaining snap ring.

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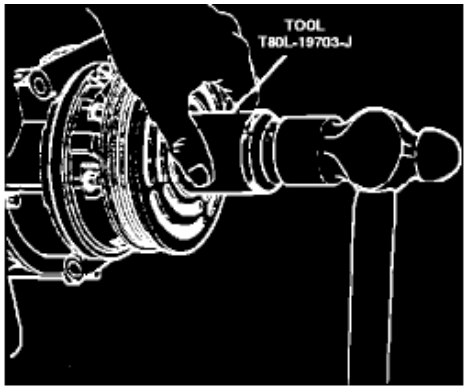
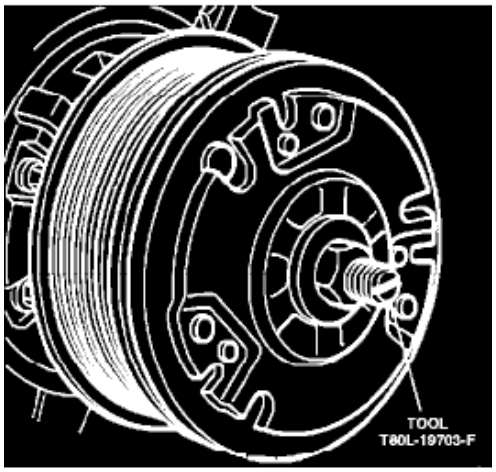
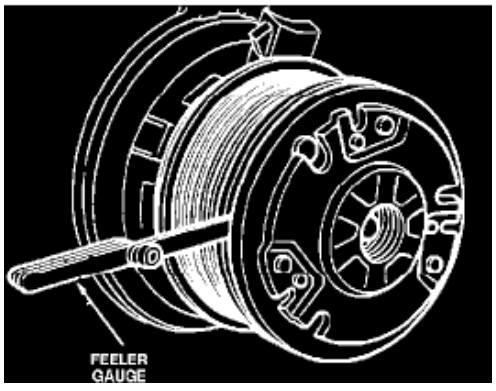

TOOL
T80L-19703-J


TOOL
T80L-19703-F


FEELER
GAUGE

Compressor Pulley: Service and Repair Installation

Fig. 4 Clutch pulley installation

1. Clean pulley bearing surface of compressor.

2. Install pulley and bearing on compressor. Bearing should be a slip fit onto compressor head. If difficulty is encountered installing pulley, gently tap pulley on compressor using tool T80L-19703-J or equivalent, Fig. 4. Ensure pulley bearing is aligned with compressor head.

3. Install pulley retaining snap ring with bevel side out.

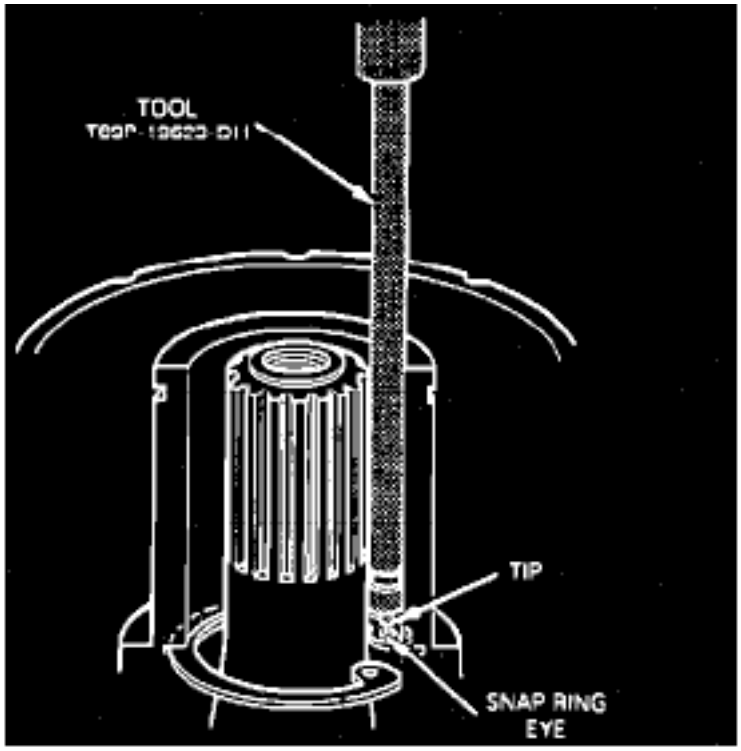
Fig. 5 Clutch hub installation

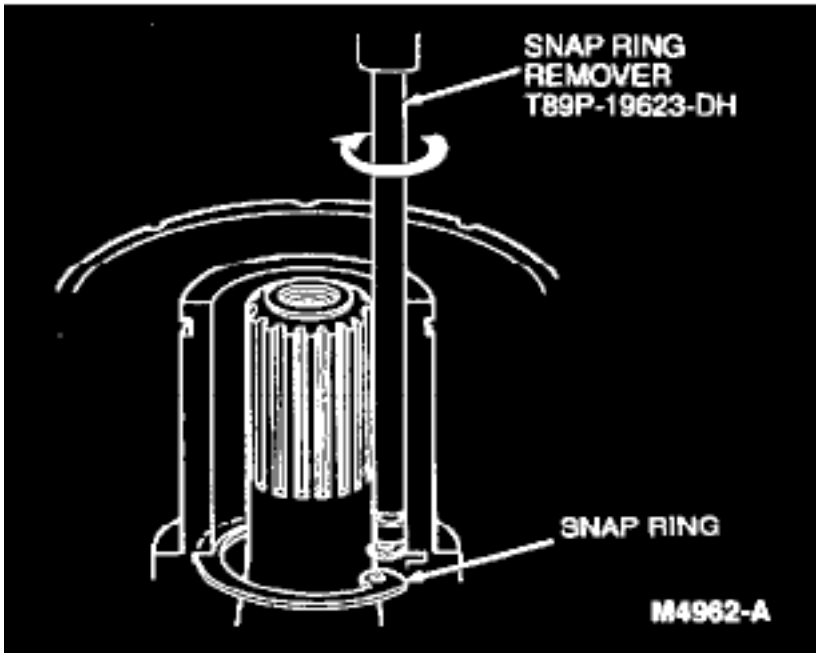
4. Install clutch hub on compressor shaft using new shims between clutch hub and end of shaft. Ensure shaft key is aligned with keyway in clutch hub. Do not attempt to drive hub on compressor shaft as damage to compressor will result. Use tool T80L-19703-F or equivalent if hub will not easily slide on compressor shaft, Fig. 5.

5. Install hub retaining nut on compressor shaft and torque to 10-14 ft. lbs.

Fig. 6 Clutch air gap

6. Check clutch air gap between hub and pulley mating surface in three locations equally spaced, Fig. 6. Rotate pulley one-half turn and check again. The smallest air gap must be within specification, refer to ``Air Conditioning Specifications'' section. Add or remove shims until desired limit is attained.





Compressor Shaft Seal: Service and Repair

Except for manifold hose O-rings and front shaft seal this compressor is not serviceable and must be replaced as an assembly.

Removal

1. Drain oil from compressor through manifold openings.

2. Clamp compressor in suitable vise, then remove clutch hub.

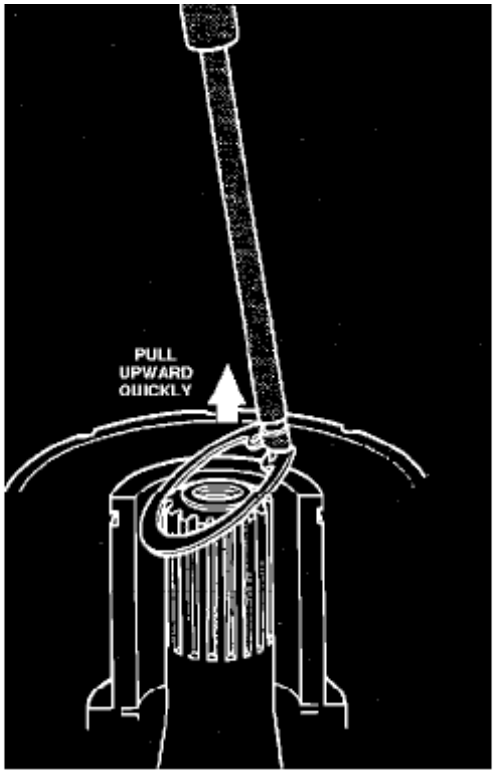
3. Remove shaft seal felt from nose of compressor.

4. Remove retaining snap ring as follows:

Fig. 25 Snap ring tool placement. FX-15

a. Insert tip of snap ring remover T89P-19623-DH or equivalent into one of snap ring eyes. Fig. 25.

b. Rotate tool to position tip and snap ring eye closest to compressor shaft. Fig. 26.


PULL
UPWARD
QUICKLY

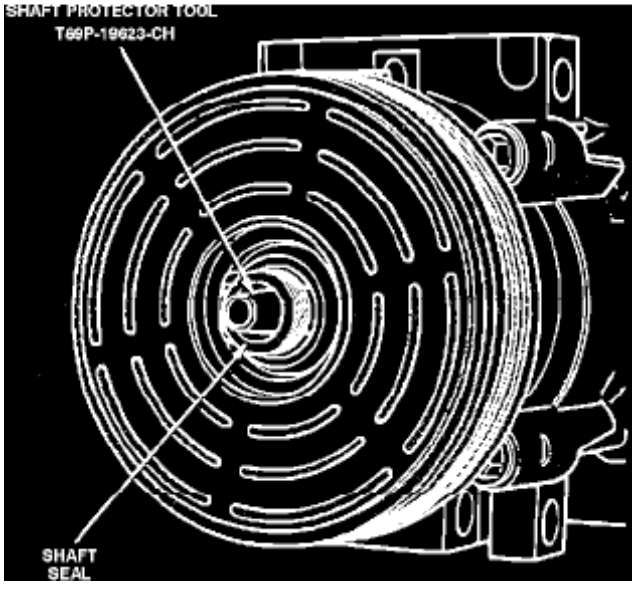

SHAFT PROTECTOR TOOL
T69P-19623-CH
SHAFT
SEAL

Fig. 27 Snap ring removal. FX-15

c. Pull tool up quickly while keeping tool shaft against side of nose opening and remove snap ring. Fig. 27.

5. Place shaft seal remover tool T89P-19623-BH or equivalent over compressor shaft and push tool into nose of compressor and down against shaft seal. Engage end of tool with internal diameter of shaft seal and turn handle clockwise to expand tool tip inside seal inner radius, then remove seal.

Installation

1. Ensure new shaft protector is free of burrs, then lubricate tool with clean refrigerant oil.

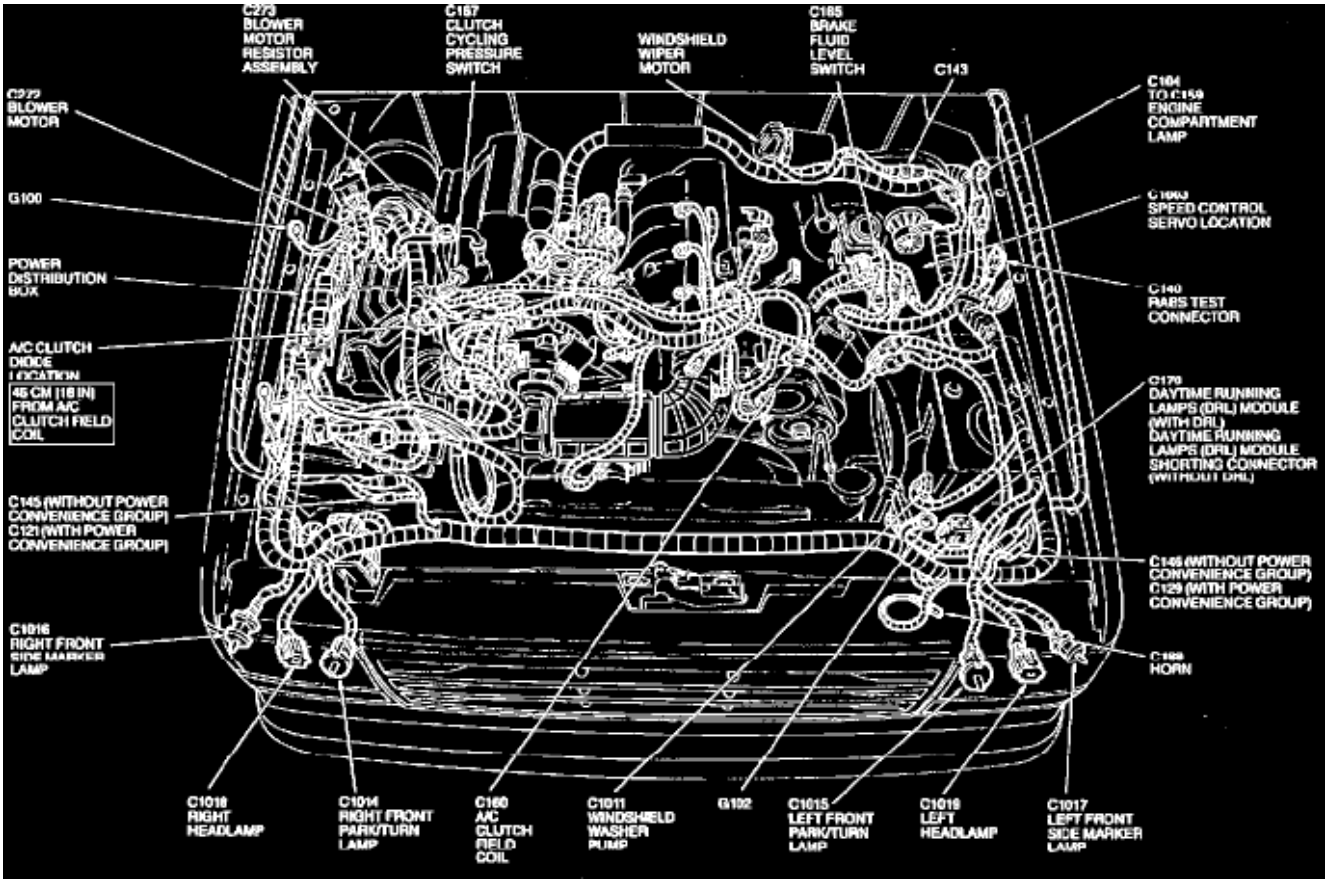
2. Lubricate shaft seal in clean refrigerant oil and place seal over shaft protector. Ensure lip portion of seal is pointed toward large end of protector.

Fig. 24 Shaft seal removal. FX-15

3. Place protector and seal over end of compressor shaft. Fig. 28.

4. Using shaft seal installer tool T89P-19623-AH or equivalent, slowly push seal down shaft protector until seated.

5. Remove replacer tool and shaft protector tool, then install snap ring. After ensuring no external leaks are present, install felt in nose and replace hub on compressor.

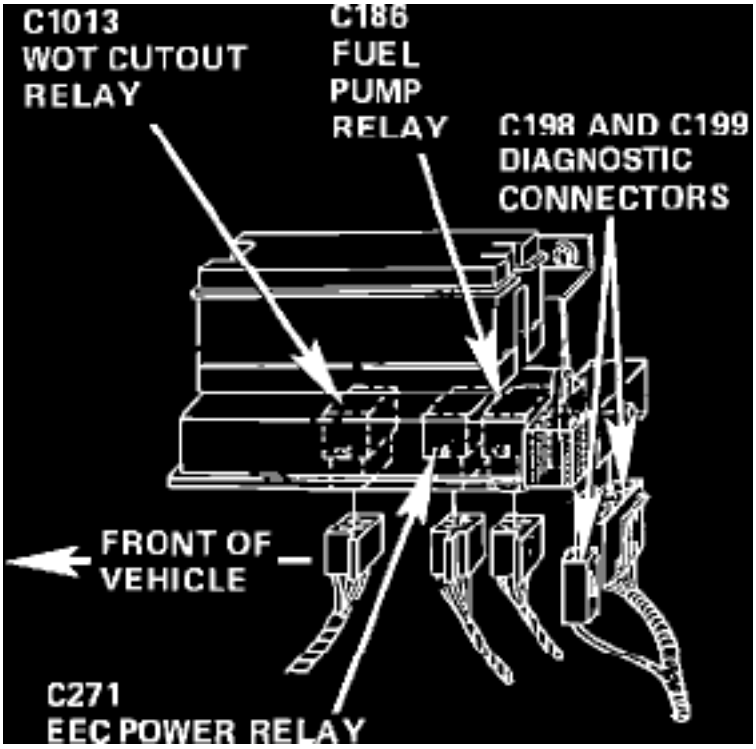


Compressor Clutch Diode HVAC: Locations

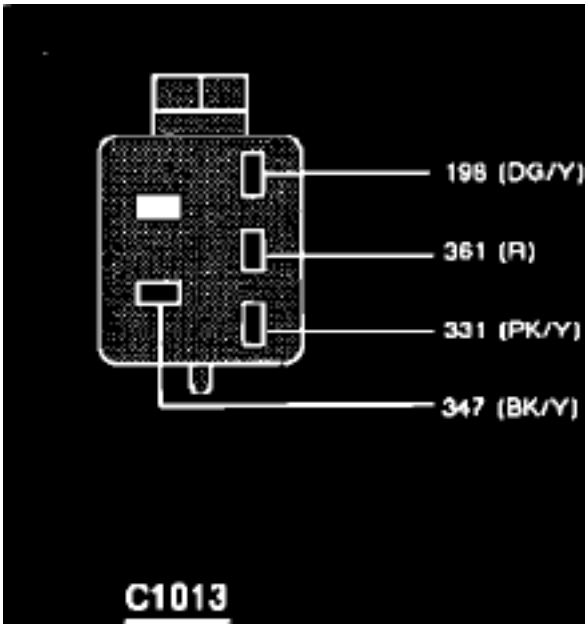
Engine Compartment Components.

Top Front Of Engine, Taped In Harness

Applicable to: 4.0L/V6-244



Relay And Diagnostic Connectors



Wide Open Throttle (WOT) Cutout Relay Connector

Compressor Clutch Relay: Description and Operation

When the vehicle operator goes to Wide Open Throttle (WOT), the Wide open throttle A/C (WAC) relay opens, suspending A/C operation until normal vehicle operation resumes. This is done to allow maximum power to the drive wheels under heavy acceleration or load.

• Compressor Clutch doesn't operate.	• No voltage at Clutch Cycling Pressure Switch. • Inoperative Clutch Cycling Pressure Switch. • No voltage at A/C Clutch Field Coil. • Inoperative A/C Clutch Field Coil.	• Fuse 7 blown. • Remove Connector from Clutch Cycling Pressure Switch. With the A/C-Heater Control Assembly Switch in the ON position, check for battery voltage at the 348 (P) wire. • Check the Clutch Cycling Pressure Switch for continuity. No continuity indicates low refrigerant, or an inoperative Clutch Cycling Pressure Switch. Check refrigerant system. • Remove connector from the A/C Clutch Field Coil. Check the wire connector for battery voltage. Check the EEC Module (including Throttle Position Sensor and Coolant Temperature Sensor) and the WOT Cutout Relay for correct operation. • Repair A/C Clutch Field Coil or terminals as required.
• Compressor Clutch won't shut off. • No cooling or not enough cooling (compressor operates).	• A/C Switch or Defrost Switch in A/C-Heater Control Assembly is stuck closed. • Clutch plates have no air gap. • Loose A/C Compressor drive belt. • Temperature Blend door out of adjustment. • Too much or too little Refrigerant in system.	• Remove connector from the A/C Clutch Field Coil. Ensure correct voltage for each switch position. • If compressor continues to run with connector disconnected, repair clutch air gap • Check drive belt tension. • Check operation of temperature control cable • Perform refrigerant system diagnosis and problem evaluation

Troubleshooting Hints - Compressor

Condenser HVAC: Technical Service Bulletins Air Conditioning - Approved Flushing Procedures

Article No. 95-18-4

09/11/95

AIR CONDITIONING - FORD APPROVED FLUSHING PROCEDURES - SERVICE TIP

FORD: 1985-86 LTD 1985-88 EXP 1985-94 TEMPO 1985-95 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-96 TAURUS 1989-93 FESTIVA 1989-95 PROBE 1994-95 ASPIRE 1995-96 CONTOUR

LINCOLN-MERCURY: 1984-92 MARK VII 1985-86 MARQUIS 1985-87 LYNX 1985-94 TOPAZ 1985-95 COUGAR, GRAND MARQUIS, TOWN CAR 1985-96 CONTINENTAL 1986-96 SABLE 1987-89 TRACER 1991-93 CAPRI 1991-95 TRACER 1993-95 MARK VIII 1995-96 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-95 BRONCO, ECONOLINE, F-150-350 SERIES 1985-96 RANGER 1986-95 AEROSTAR 1991-96 EXPLORER 1993-95 VILLAGER 1995-96 WINDSTAR

This TSB is being republished in its entirety to include Labor Operations for system flushing.

ISSUE: Ford Motor Company has approved a procedure to provide technicians with a non-CFC method of flushing contaminated A/C system heat exchangers (evaporators and condensers). This procedure allows the A/C components to be cleaned and flushed while installed in the vehicle. The types of contamination flushed include particle matter which results from compressor or desiccant failure and the gummy residue which may form when refrigerant oil is overheated. Some Ford authorized HFC-134a retrofit kit procedures will also require A/C system flushing to remove mineral oil for capacity reasons.

ACTION: Refer to the following text for proper flushing procedures.

The flushing procedure is a two-step process which involves the use of an A/C Flusher. The Flusher is used to do the following:

1. Circulate the flushing solvent through the A/C system heat exchangers in the reverse direction of normal refrigerant flow (back flushing). Particle matter is filtered from the returning solvent and the solvent is returned to the reservoir for continued circulation.

2. Remove the flushing solvent from the A/C system. In this step, pressurized air (90-125 psi/620-862 kPa) is used to push and evaporate any remaining flush solvent from the heat exchangers.

Only Rotunda Item No. 014-00990 A/C Flushing kit which includes 014-00991 A/C Flusher, 014-00992 A/C Flusher Filling Kit. and F4AZ-19579-A A/C Flushing Solvent (case of 4 gallons/15 L), is approved for use on Ford vehicles. No other flushing device or solvent is approved by Ford Motor Company for flushing A/C systems. The use of other equipment or solvent may cause damage to the A/C system and the flushing unit.

Minimum time for flushing is 15 minutes and minimum time for air flushing is 30 minutes. Failure to continue air purge for the entire 30 minutes as specified may result in residual amounts of flush solvent contaminating the A/C system. Residual flush solvent in a functioning A/C system may lead to A/C system failure.

Do not flush through orifice tubes. TXVs, accumulator/driers, receiver/driers, mufflers or hoses. Internal plumbing and material make-up of these components make it impossible to properly remove the debris and/or residual flushing solvent.

One (1) gallon (3.8 L) of Ford A/C System Flushing Solvent is used in this device and is intended for one (1) vehicle only. It may be used to flush both heat exchangers on an individual vehicle, but under no circumstances should it be used on more than one (1) vehicle. The filter used when flushing is also intended for use on one (1) vehicle only.

NOTE:

DURING THE FLUSHING PROCESS, THIS MATERIAL MAY COLLECT RESIDUE FROM THE A/C SYSTEM, WHICH MAY INCLUDE CFC-12. DISPOSE OF THE SOLVENT AND FILTER IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

Use of A/C system filter kits as prescribed in TSB 94-15-5 is optional if the A/C system is flushed. Filter kit use is recommended after flushing if the system is highly contaminated. If the hoses are clogged with debris, hose replacement is required.

Always remember to match oil properly, replace the accumulator/drier and orifice tube, or TXV and receiver/drier when servicing an A/C system with a compressor or desiccant failure.

The following vehicles require A/C system flushing with retrofit kits to remove mineral oil for capacity reasons.

^ 1993 Probe 2.0L and 2.5L

^ 1988-90 Escort 1.9L EFI

^ 1989-93 Thunderbird Super Coupe

^ 1986-92 Mark VII

^ 1991-93 Capri 1.6L and 1.6T

^ 1988-93 Festiva 1 .3L

^ 1987-90 Tracer 1.6L

^ 1985-89 XR4Ti

^ 1988-89 Scorpio

OTHER APPLICABLE ARTICLES: 94-15-5 SUPERSEDES: 95-8-1 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1991-95 Lincolns And All

Other 1992-95 Models

OPERATION DESCRIPTION TIME

951804A Flush Evaporator 1.0 Hr.

951804B Flush Condenser 1.0 Hr.

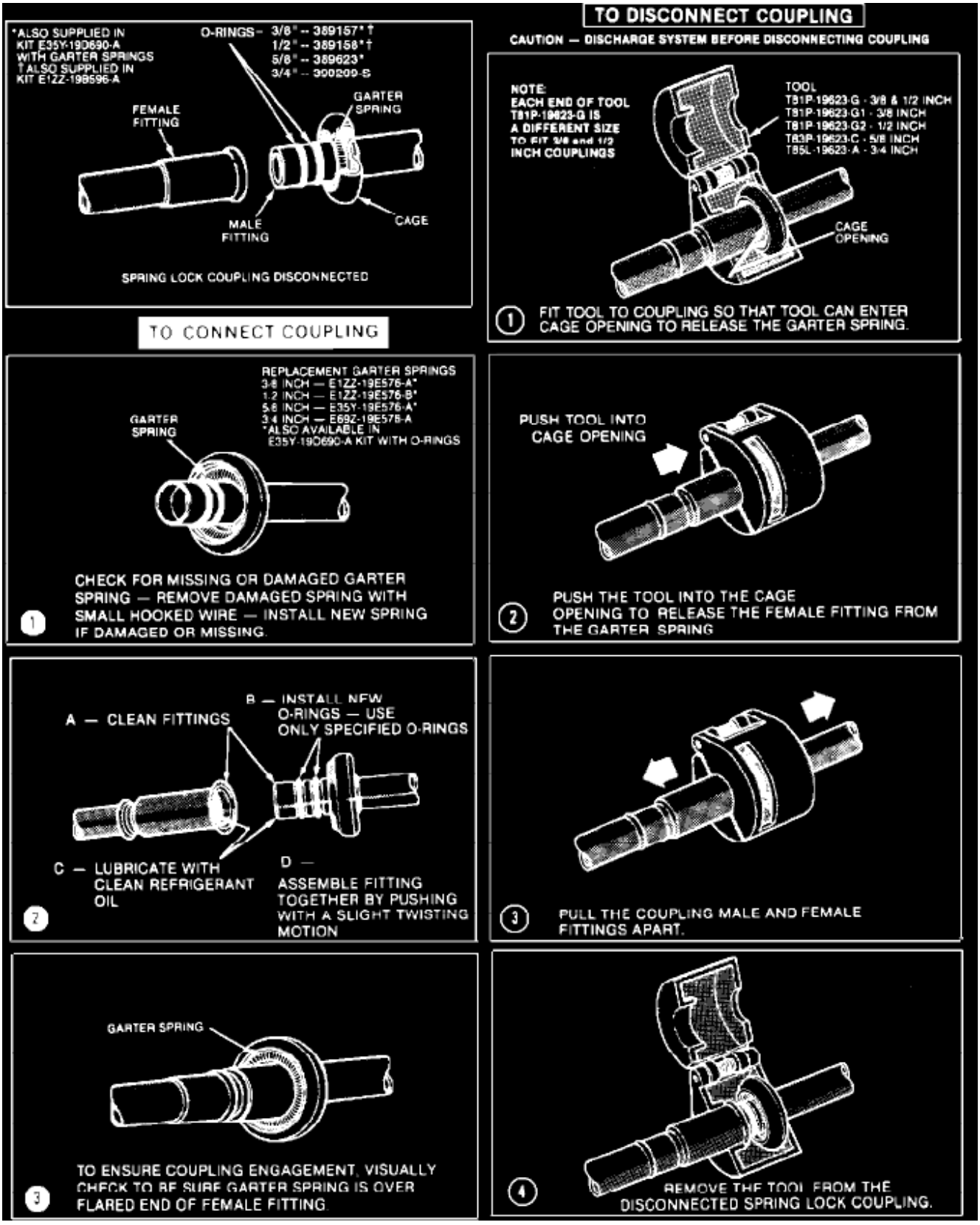
DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208200, 208999


*ALSO SUPPLIED IN KIT E35Y-19D690-A WITH GARTER SPRINGS
†ALSO SUPPLIED IN KIT E1ZZ-19B596-A
O-RINGS - 3/8" -- 389157"†
1/2" -- 389158"†
5/8" -- 389623"
3/4" -- 390209-S
FEMALE FITTING
GARTER SPRING
MALE FITTING
CAGE
SPRING LOCK COUPLING DISCONNECTED
TO DISCONNECT COUPLING
CAUTION — DISCHARGE SYSTEM BEFORE DISCONNECTING COUPLING
NOTE: EACH END OF TOOL T81P-19623-G IS A DIFFERENT SIZE TO FIT 3/8 and 1/2 INCH COUPLINGS
TOOL
T81P-19623-G - 3/8 & 1/2 INCH
T81P-19623-G1 - 3/8 INCH
T81P-19623-G2 - 1/2 INCH
T83P-19623-C - 5/8 INCH
T85L-19623-A - 3/4 INCH
CAGE OPENING
1 FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.
TO CONNECT COUPLING
REPLACEMENT GARTER SPRINGS
3/8 INCH — E1ZZ-19E576-A*
1/2 INCH — E1ZZ-19E576-B*
5/8 INCH — E35Y-19E576-A*
3/4 INCH — E69Z-19E576-A
*ALSO AVAILABLE IN E35Y-19D690-A KIT WITH O-RINGS
GARTER SPRING
1 CHECK FOR MISSING OR DAMAGED GARTER SPRING — REMOVE DAMAGED SPRING WITH SMALL HOOKED WIRE — INSTALL NEW SPRING IF DAMAGED OR MISSING.
PUSH TOOL INTO CAGE OPENING
2 PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING
A — CLEAN FITTINGS
B — INSTALL NEW O-RINGS — USE ONLY SPECIFIED O-RINGS
C — LUBRICATE WITH CLEAN REFRIGERANT OIL
D — ASSEMBLE FITTING TOGETHER BY PUSHING WITH A SLIGHT TWISTING MOTION
2
3 PULL THE COUPLING MALE AND FEMALE FITTINGS APART.
GARTER SPRING
3 TO ENSURE COUPLING ENGAGEMENT, VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING.
4 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING.

Condenser HVAC: Service and Repair

Fig. 2 Spring lock coupling disconnect & connect

1. Discharge refrigerant from system.

2. Disconnect and cap compressor discharge line and liquid line from condenser, Fig. 2.

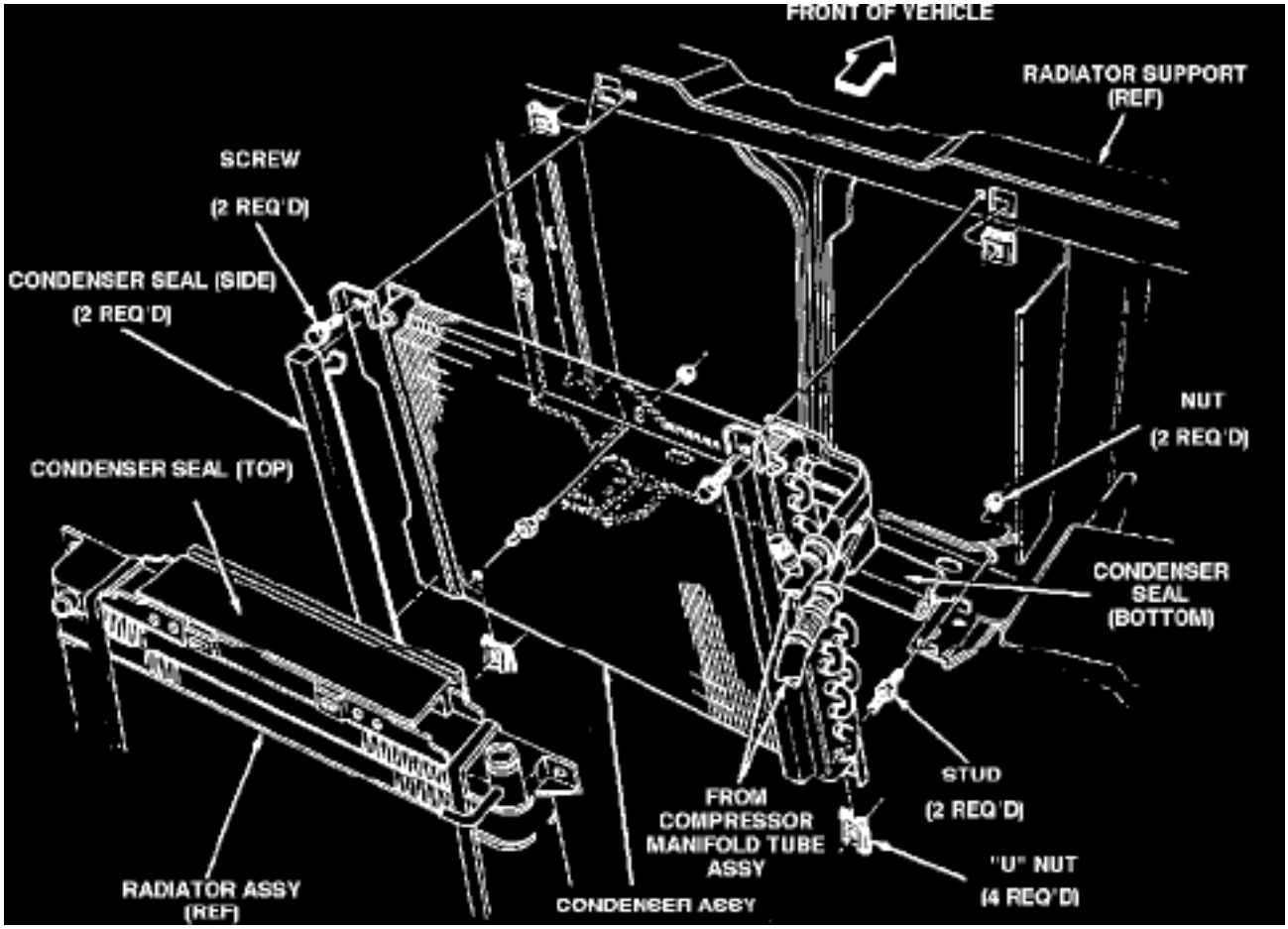


Fig. 4 Condenser removal

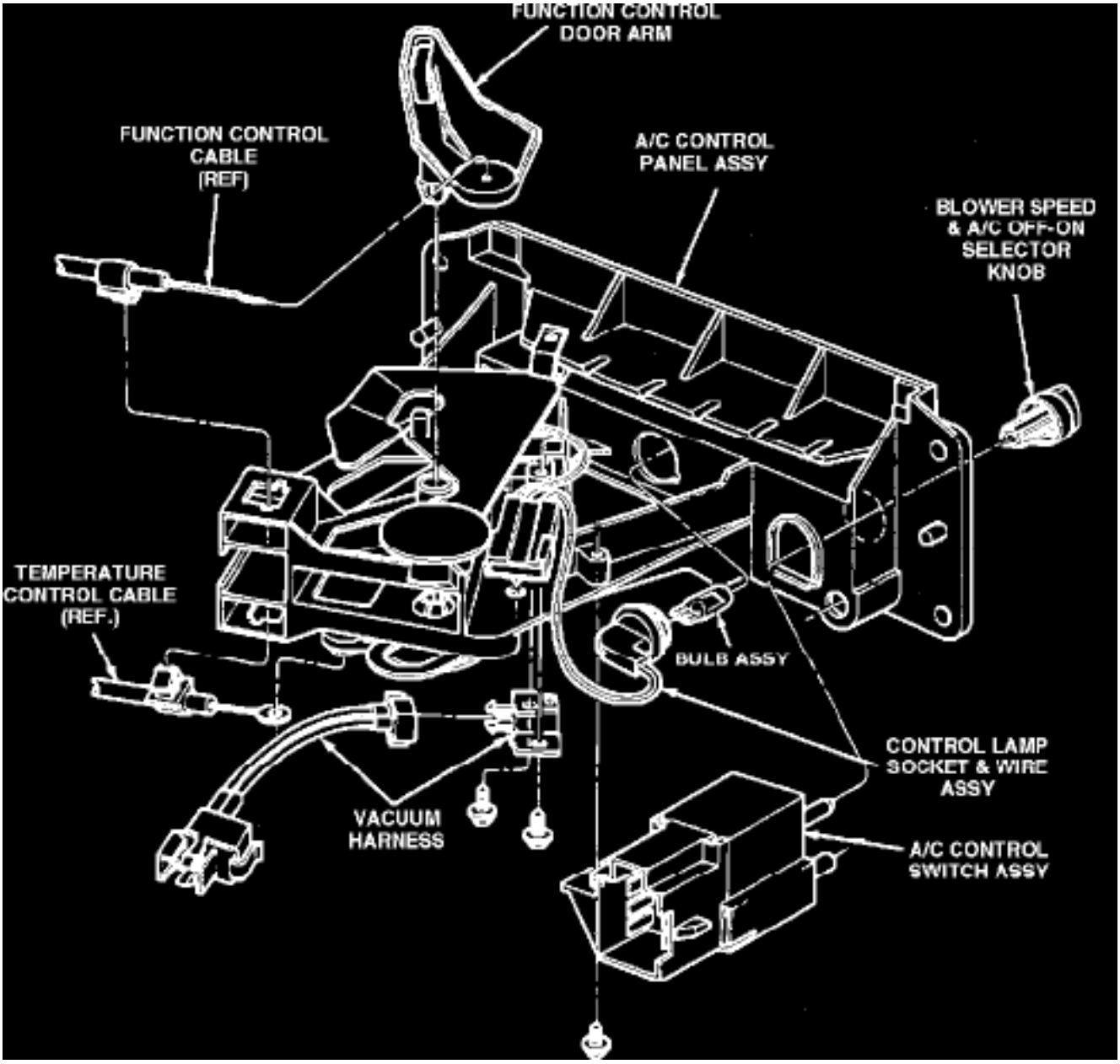
3. Working under vehicle, remove two nuts attaching two lower mounting studs, Fig. 4.

4. Remove upper radiator brackets and tilt top of radiator rearward. Then remove two bolts attaching two condenser upper mounting brackets to rear side of radiator support.

5. Remove condenser from vehicle.

6. Reverse procedure to install. Use new O-ring lubricated with suitable oil.

7. Leak test, evacuate and charge system.



Control Assembly: Service and Repair Control Assembly, HVAC

1. Disconnect battery ground cable.

2. Remove ashtray and disconnect cigar lighter electrical connector, then remove ashtray retaining screws and the ashtray retainer from instrument panel.

Fig. 9 Control assembly & electrical connectors

3. Pull center finish panel away from instrument panel to expose heater control attaching screws, Fig. 9. On 4WD Vehicles equipped with electronic shift-on-the-fly module, disconnect wire from the rear of the 4x4/transfer switch before trying to remove finish panel.

4. Remove four screws attaching control assembly to the instrument panel.

5. Pull control assembly through opening far enough to allow removal of electrical connectors from blower switch and control lamp.

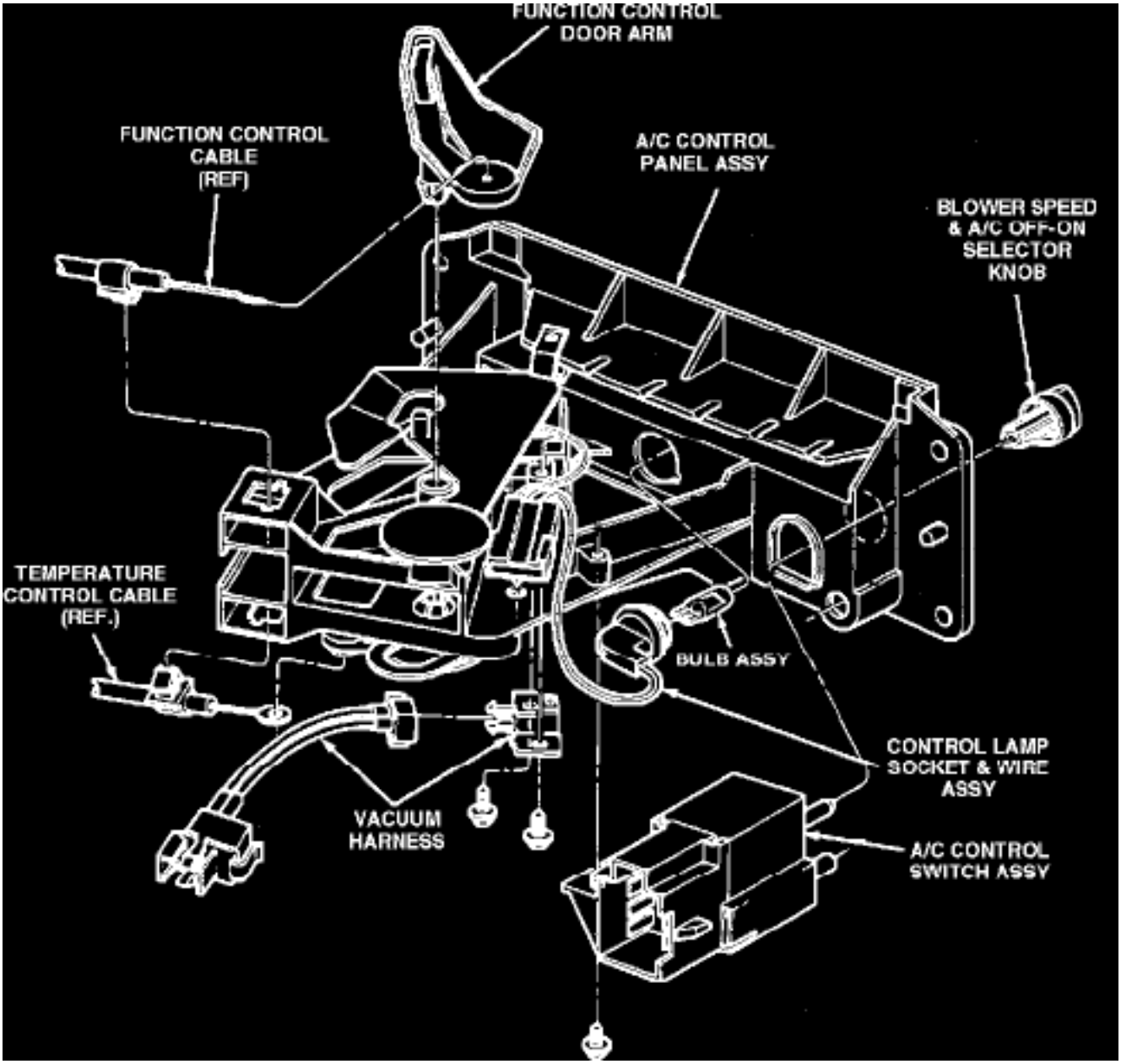
6. Disconnect vacuum harness from outside air control.

7. Using a screwdriver or needle nose pliers, release temperature and function cable snap-on flags from control bracket.

8. Spin temperature cable until it is released from T-pin.

9. Pull enough white cable through instrument panel opening until function cable can be held vertical to control. Remove control cable from function lever.

10. Reverse procedure to install.



Control Assembly: Service and Repair Control Panel Assembly Replace

1. Disconnect battery ground cable.

2. Remove ashtray and disconnect cigar lighter electrical connector, then remove ashtray retaining screws and the ashtray retainer from instrument panel.

Fig. 9 Control assembly & electrical connectors

3. Pull center finish panel away from instrument panel to expose heater control attaching screws, Fig. 9. On 4WD Vehicles equipped with electronic shift-on-the-fly module, disconnect wire from the rear of the 4x4/transfer switch before trying to remove finish panel.

4. Remove four screws attaching control assembly to the instrument panel.

5. Pull control assembly through opening far enough to allow removal of electrical connectors from blower switch and control lamp.

6. Disconnect vacuum harness from outside air control.

7. Using a screwdriver or needle nose pliers, release temperature and function cable snap-on flags from control bracket.

8. Spin temperature cable until it is released from T-pin.

9. Pull enough white cable through instrument panel opening until function cable can be held vertical to control. Remove control cable from function lever.

10. Reverse procedure to install.

A/C Coupler O-ring: Technical Service Bulletins A/C - New Refrigerant O-Rings

Article No. 91-22-5 10/30/91

AIR CONDITIONING - NEW REFRIGERANT FITTING "O" RINGS (GREEN COLOR) AVAILABLE TO PROVIDE IMPROVED SEALING AND DURABILITY

FORD: 1985-86 LTD 1985-92 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-92 TAURUS

LINCOLN-MERCURY: 1985-86 CAPRI, MARQUIS 1985-87 LYNX 1985-92 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-92 SABLE 1991-92 TRACER

LIGHT TRUCK: 1985-90 BRONCO II 1985-92 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-92 AEROSTAR 1988-92 F SUPER DUTY 1989-92 F-47 1991-92 EXPLORER

ISSUE: New refrigerant 0-rings (GREEN COLOR) are available for use in the Ford Spring Lock Coupling (SLC) and threaded (Tube-0) connections. The new GREEN COLORED 0-ring material provides improved sealing and longer seal life. Use of any other 0-ring for Ford refrigerant fittings is not recommended and may result in premature leakage at the fitting.

ACTION: If a refrigerant system repair is made which requires an A/C fitting to be disconnected, replace the existing 0-rings with the new GREEN COLORED type. Refer to the following 0-ring Usage Chart for identifying the correct 0-ring.

O-RING USAGE CHART

(SLC) (SLC) (TUBE-0) (TUBE-0)

MOTORCRAFT SERVICE MOTORCRAFT SERVICE

SIZE PART NO. PART NO. PART NO. PART NO.

3/8" YF-1753 391302-S100 YF-1753 391302-S100

1/2" YF-1754 391303-S100 YF-1754 391303-S100

5/8" YF-1755 391304-S100 YF-1756 391306-S100

3/4" YF-1752 3913O5-S100 YF-1757 391307-S100

PART NUMBER PART NAME CLASS

391302-S100 3/8" 0-ring (SLC & TUBE-0, S

Pkg./6)

391303-S100 1/2" 0-ring (SLC & TUBE-0, S

Pkg./6)

391304-S100 5/8" 0-ring (SLC, Pkg./6) S

391306-S100 5/8" 0-ring (TUBE-0, Pkg./6) S

391305-S100 3/4" 0-ring (SLC, Pkg./6) S

391307-S100 3/4" 0-ring (TUBE-0, Pkg./4) S

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES:

90-14-8

WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

208000, 208999

A/C Coupler O-ring: Technical Service Bulletins Air Conditioning - O Ring Removal Service Tip

Article No. 95-2-2

01/30/95

AIR CONDITIONING - O-RING REMOVAL FROM SPRING LOCK COUPLER - SERVICE TIP

FORD: 1981-95 MUSTANG 1982-83 FAIRMONT 1982-88 EXP 1982-95 CROWN VICTORIA, ESCORT, THUNDERBIRD 1983-86 LTD 1984-94 TEMPO 1986-95 TAURUS 1989-95 PROBE 1995 CONTOUR

LINCOLN-MERCURY: 1982-83 LN7, ZEPHYR 1982-87 LYNX 1982-95 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-95 SABLE 1991-95 TRACER 1993-94 CAPRI 1993-95 MARK VIII 1995 MYSTIQUE

LIGHT TRUCK: 1982-95 BRONCO, F SUPER DUTY, F-150-350 SERIES, RANGER 1983-90 BRONCO II 1986-95 AEROSTAR 1988-95 ECONOLINE 1991-95 EXPLORER 1995 WINDSTAR

This TSB is being republished in its entirety to include the latest level tools and procedures available.

ISSUE: Some technicians may use small screwdrivers to remove 0-rings from spring lock coupling fittings. This practice can and has resulted in scratches across the 0-ring grooves in the fittings. Loss of refrigerant charge in the system may result.

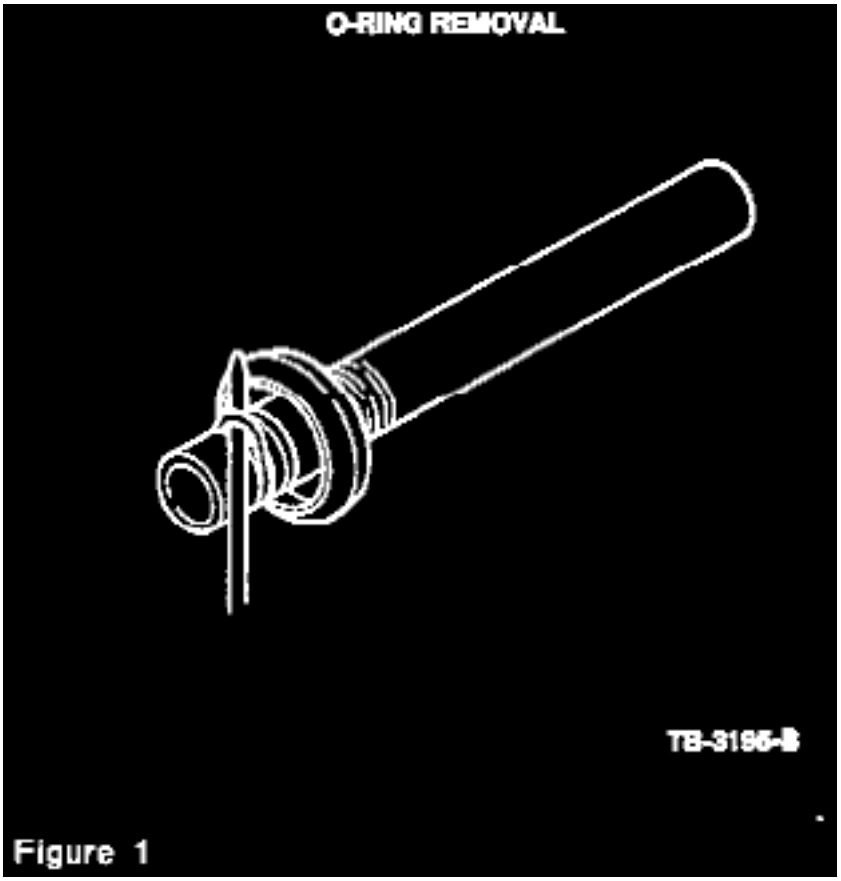


Figure 1

ACTION: It is recommended that a plastic toothpick, or equivalent tool, be used to remove 0-rings. Refer to Figure 1. Do not use the metal O-Ring Tool (T71P-19703-C). Only plastic O-Ring Tool (F5VH-17B017-AA) is approved for O-ring removal.

OTHER APPLICABLE ARTICLES: 91-22-5, 93-6-5 SUPERSEDES: 93-15-5 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208000, 208999

PART NUMBER	PART NAME	CLASS
391396-S100	O-ring, 3/8"	BS
391397-S100	O-ring, 1/2"	BS
391304-S100	O-ring, 5/8"	BS
391305-S100	O-ring, 3/4"	BS
F2AZ-19D690-B	O-ring Service Kit (Contains 8 pieces each of above O-ring sizes)	B
F73Z-19577-A	YN-9 Compressor Oil	B

A/C Coupler O-ring: Technical Service Bulletins A/C Coupling - Cleaning Procedures

Article No. 93-6-5

03/17/93

^ AIR CONDITIONING - AVAILABILITY OF NEW GREEN O-RING SERVICE KIT TO PROVIDE IMPROVED SEALING AND DURABILITY

^ AIR CONDITIONING - SPRING LOCK COUPLING REFRIGERANT FITTINGS - CLEANING PROCEDURE

FORD: 1981-91 MUSTANG 1982-88 EXP 1982-91 CROWN VICTORIA, ESCORT, THUNDERBIRD

1983-86 LTD 1984-91 TEMPO 1986-91 TAURUS

LINCOLN-MERCURY: 1981-86 CAPRI 1982-83 MARK VI 1982-87 LYNX 1982-91 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1983-86 MARQUIS 1984-91 MARK VII, TOPAZ 1986-91 SABLE 1991 TRACER

LIGHT TRUCK: 1982-91 BRONCO, F-150-350 SERIES 1983-90 BRONCO II 1983-91 RANGER 1986-91 AEROSTAR 1988-91 ECONOLINE 1991 EXPLORER

ISSUE: A procedure has been developed for cleaning Spring Lock Coupling (SLC) refrigerant fittings during air conditioning system repairs. This procedure and replacement of black O-rings with the improved green O-rings will reduce the potential of refrigerant leaks.

ACTION:

When servicing the air conditioning system on the subject vehicles, or if a refrigerant leak is suspected at any of the SLC connections, disconnect all SLC connections and replace all black O-rings with new green O-rings which are made of an improved material. Use the following service procedure to clean the coupling before installing new green O-rings. Refer to the Parts Block in this article for correct parts usage.

CLEANING PROCEDURE

1. Remove all refrigerant from the vehicle A/C system using an U.L. approved Refrigerant/Recovery device prior to disconnecting the refrigerant couplings. Refer to the appropriate model year Service Manual for a detailed A/C discharging procedure.

2. Disconnect the SLC coupling.

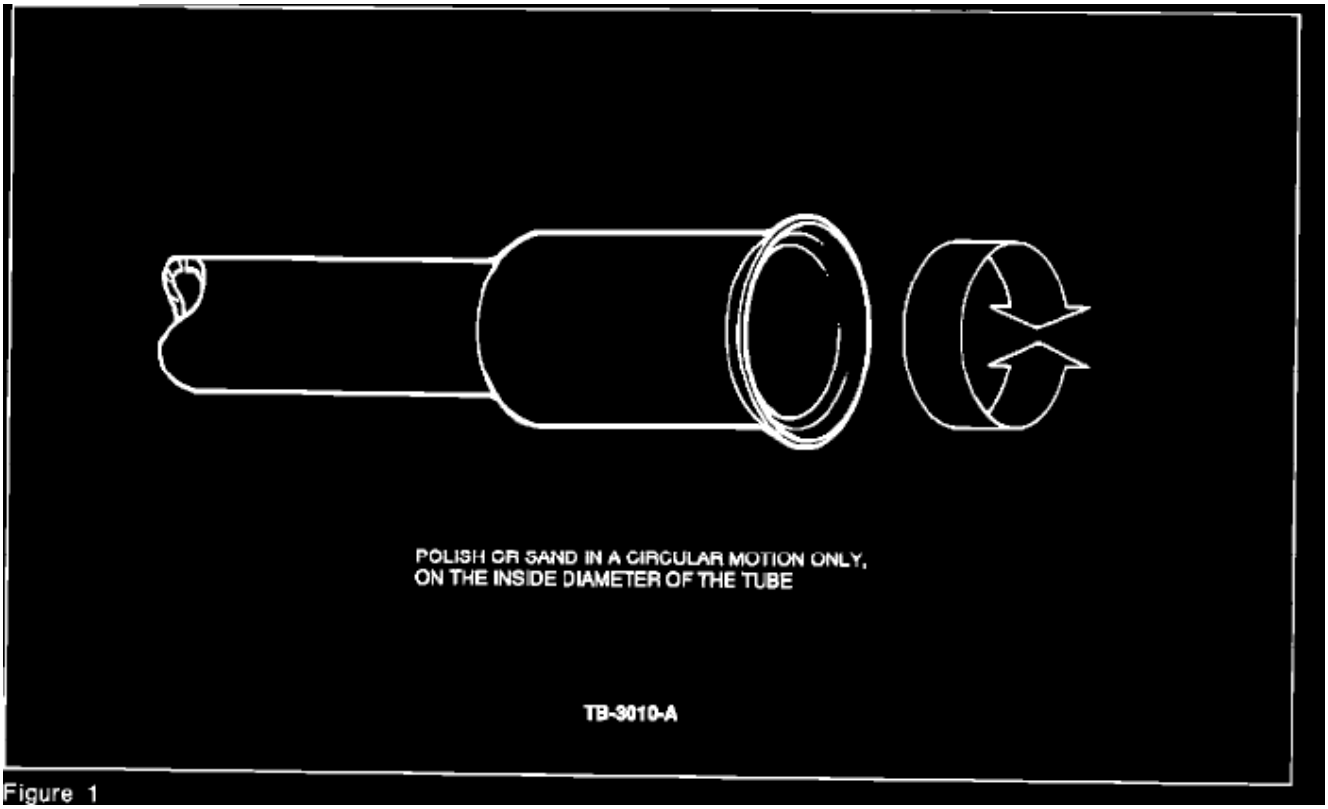


Figure 1

3. Remove the black O-rings. Be careful not to scratch the O-ring grooves.

CAUTION: A SCRATCH CAN CAUSE FUTURE REFRIGERANT LEAKS.

4. Remove any surface residue from the inside of the female SLC and the grooves of the male SLC by polishing with 400 grit emery cloth or equivalent. Polish the female surface by using a twisting motion, Figure 1, so that any scratches made will not cross the O-ring sealing surface.

5. Perform additional polishing of the surface using 600 grit emery cloth or equivalent.

6. Remove all residue from polishing operations from both fittings by wiping with a lint-free rag.

7. Install new green O-rings. If the O-rings are not prelubricated, lube with YN-9 A/C compressor oil (F73Z-19577-A) before installing them.

8. Lubricate the inside of the female portion of the SLC with YN-9 compressor oil (F73Z-19577-A) and apply additional oil to the O-rings.

9. Reconnect the fitting.

10. Recharge the A/C system. Refer to the appropriate model year Service Manual for specific detailed instructions.

OTHER APPLICABLE ARTICLES: 91-22-5

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999

PART NUMBER	PART NAME	CLASS
391396-S100	O-ring, 3/8"	BS
391397-S100	O-ring, 1/2"	BS
391304-S100	O-ring, 5/8"	BS
391305-S100	O-ring, 3/4"	BS
F2AZ-19D690-B	O-ring Service Kit (Contains 8 pieces each of above O-ring sizes)	B
F73Z-19577-A	YN-9 Compressor Oil	B

A/C Coupler Spring: Technical Service Bulletins A/C Coupling - Cleaning Procedures

Article No. 93-6-5

03/17/93

^ AIR CONDITIONING - AVAILABILITY OF NEW GREEN O-RING SERVICE KIT TO PROVIDE IMPROVED SEALING AND DURABILITY

^ AIR CONDITIONING - SPRING LOCK COUPLING REFRIGERANT FITTINGS - CLEANING PROCEDURE

FORD: 1981-91 MUSTANG 1982-88 EXP 1982-91 CROWN VICTORIA, ESCORT, THUNDERBIRD

1983-86 LTD 1984-91 TEMPO 1986-91 TAURUS

LINCOLN-MERCURY: 1981-86 CAPRI 1982-83 MARK VI 1982-87 LYNX 1982-91 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1983-86 MARQUIS 1984-91 MARK VII, TOPAZ 1986-91 SABLE 1991 TRACER

LIGHT TRUCK: 1982-91 BRONCO, F-150-350 SERIES 1983-90 BRONCO II 1983-91 RANGER 1986-91 AEROSTAR 1988-91 ECONOLINE 1991 EXPLORER

ISSUE: A procedure has been developed for cleaning Spring Lock Coupling (SLC) refrigerant fittings during air conditioning system repairs. This procedure and replacement of black O-rings with the improved green O-rings will reduce the potential of refrigerant leaks.

ACTION:

When servicing the air conditioning system on the subject vehicles, or if a refrigerant leak is suspected at any of the SLC connections, disconnect all SLC connections and replace all black O-rings with new green O-rings which are made of an improved material. Use the following service procedure to clean the coupling before installing new green O-rings. Refer to the Parts Block in this article for correct parts usage.

CLEANING PROCEDURE

1. Remove all refrigerant from the vehicle A/C system using an U.L. approved Refrigerant/Recovery device prior to disconnecting the refrigerant couplings. Refer to the appropriate model year Service Manual for a detailed A/C discharging procedure.

2. Disconnect the SLC coupling.

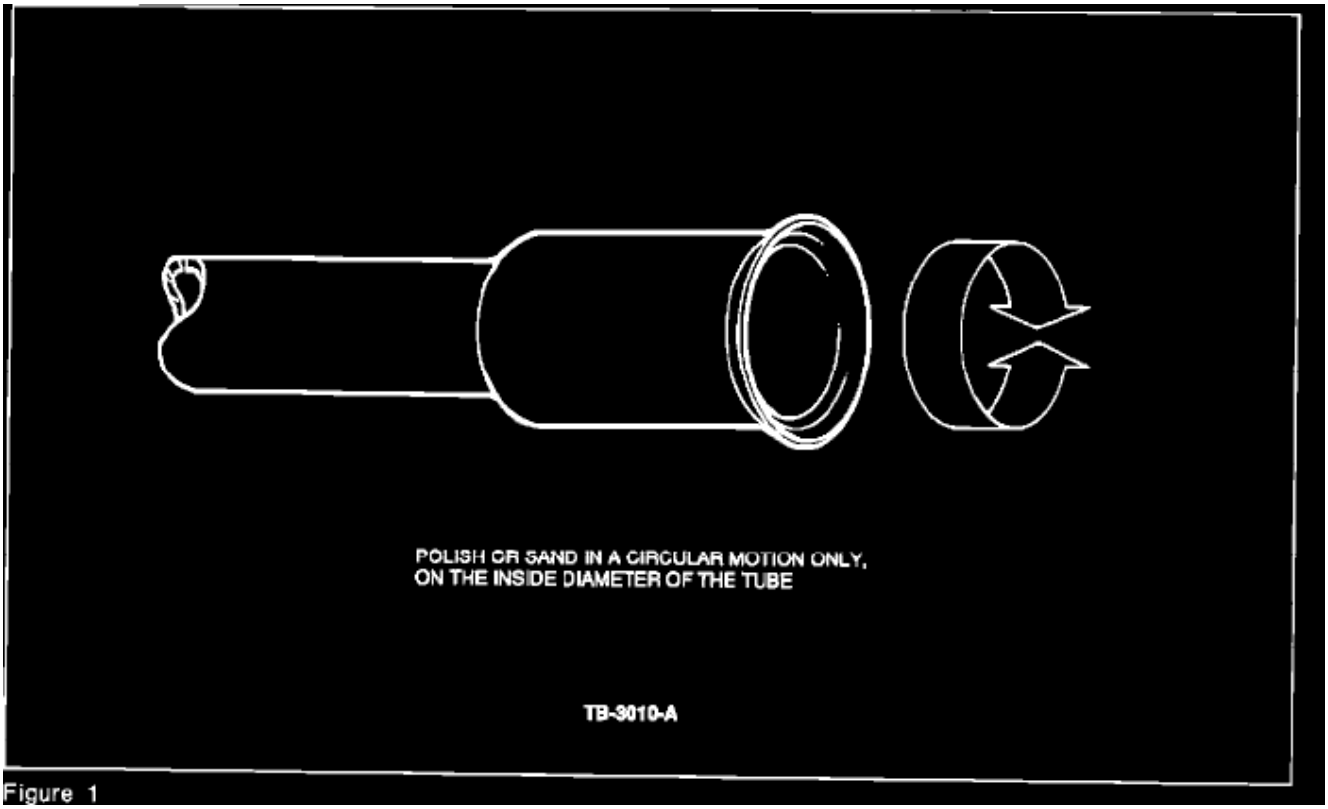


Figure 1

3. Remove the black O-rings. Be careful not to scratch the O-ring grooves.

CAUTION: A SCRATCH CAN CAUSE FUTURE REFRIGERANT LEAKS.

4. Remove any surface residue from the inside of the female SLC and the grooves of the male SLC by polishing with 400 grit emery cloth or equivalent. Polish the female surface by using a twisting motion, Figure 1, so that any scratches made will not cross the O-ring sealing surface.

5. Perform additional polishing of the surface using 600 grit emery cloth or equivalent.

6. Remove all residue from polishing operations from both fittings by wiping with a lint-free rag.

7. Install new green O-rings. If the O-rings are not prelubricated, lube with YN-9 A/C compressor oil (F73Z-19577-A) before installing them.

8. Lubricate the inside of the female portion of the SLC with YN-9 compressor oil (F73Z-19577-A) and apply additional oil to the O-rings.

9. Reconnect the fitting.

10. Recharge the A/C system. Refer to the appropriate model year Service Manual for specific detailed instructions.

OTHER APPLICABLE ARTICLES: 91-22-5

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999

Evaporator Core: Technical Service Bulletins Air Conditioning - Approved Flushing Procedures

Article No. 95-18-4

09/11/95

AIR CONDITIONING - FORD APPROVED FLUSHING PROCEDURES - SERVICE TIP

FORD: 1985-86 LTD 1985-88 EXP 1985-94 TEMPO 1985-95 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-96 TAURUS 1989-93 FESTIVA 1989-95 PROBE 1994-95 ASPIRE 1995-96 CONTOUR

LINCOLN-MERCURY: 1984-92 MARK VII 1985-86 MARQUIS 1985-87 LYNX 1985-94 TOPAZ 1985-95 COUGAR, GRAND MARQUIS, TOWN CAR 1985-96 CONTINENTAL 1986-96 SABLE 1987-89 TRACER 1991-93 CAPRI 1991-95 TRACER 1993-95 MARK VIII 1995-96 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-95 BRONCO, ECONOLINE, F-150-350 SERIES 1985-96 RANGER 1986-95 AEROSTAR 1991-96 EXPLORER 1993-95 VILLAGER 1995-96 WINDSTAR

This TSB is being republished in its entirety to include Labor Operations for system flushing.

ISSUE: Ford Motor Company has approved a procedure to provide technicians with a non-CFC method of flushing contaminated A/C system heat exchangers (evaporators and condensers). This procedure allows the A/C components to be cleaned and flushed while installed in the vehicle. The types of contamination flushed include particle matter which results from compressor or desiccant failure and the gummy residue which may form when refrigerant oil is overheated. Some Ford authorized HFC-134a retrofit kit procedures will also require A/C system flushing to remove mineral oil for capacity reasons.

ACTION: Refer to the following text for proper flushing procedures.

The flushing procedure is a two-step process which involves the use of an A/C Flusher. The Flusher is used to do the following:

1. Circulate the flushing solvent through the A/C system heat exchangers in the reverse direction of normal refrigerant flow (back flushing). Particle matter is filtered from the returning solvent and the solvent is returned to the reservoir for continued circulation.

2. Remove the flushing solvent from the A/C system. In this step, pressurized air (90-125 psi/620-862 kPa) is used to push and evaporate any remaining flush solvent from the heat exchangers.

Only Rotunda Item No. 014-00990 A/C Flushing kit which includes 014-00991 A/C Flusher, 014-00992 A/C Flusher Filling Kit. and F4AZ-19579-A A/C Flushing Solvent (case of 4 gallons/15 L), is approved for use on Ford vehicles. No other flushing device or solvent is approved by Ford Motor Company for flushing A/C systems. The use of other equipment or solvent may cause damage to the A/C system and the flushing unit.

Minimum time for flushing is 15 minutes and minimum time for air flushing is 30 minutes. Failure to continue air purge for the entire 30 minutes as specified may result in residual amounts of flush solvent contaminating the A/C system. Residual flush solvent in a functioning A/C system may lead to A/C system failure.

Do not flush through orifice tubes. TXVs, accumulator/driers, receiver/driers, mufflers or hoses. Internal plumbing and material make-up of these components make it impossible to properly remove the debris and/or residual flushing solvent.

One (1) gallon (3.8 L) of Ford A/C System Flushing Solvent is used in this device and is intended for one (1) vehicle only. It may be used to flush both heat exchangers on an individual vehicle, but under no circumstances should it be used on more than one (1) vehicle. The filter used when flushing is also intended for use on one (1) vehicle only.

NOTE:

DURING THE FLUSHING PROCESS, THIS MATERIAL MAY COLLECT RESIDUE FROM THE A/C SYSTEM, WHICH MAY INCLUDE CFC-12. DISPOSE OF THE SOLVENT AND FILTER IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

Use of A/C system filter kits as prescribed in TSB 94-15-5 is optional if the A/C system is flushed. Filter kit use is recommended after flushing if the system is highly contaminated. If the hoses are clogged with debris, hose replacement is required.

Always remember to match oil properly, replace the accumulator/drier and orifice tube, or TXV and receiver/drier when servicing an A/C system with a compressor or desiccant failure.

The following vehicles require A/C system flushing with retrofit kits to remove mineral oil for capacity reasons.

^ 1993 Probe 2.0L and 2.5L

^ 1988-90 Escort 1.9L EFI

^ 1989-93 Thunderbird Super Coupe

^ 1986-92 Mark VII

^ 1991-93 Capri 1.6L and 1.6T

^ 1988-93 Festiva 1 .3L

^ 1987-90 Tracer 1.6L

^ 1985-89 XR4Ti

^ 1988-89 Scorpio

OTHER APPLICABLE ARTICLES: 94-15-5 SUPERSEDES: 95-8-1 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1991-95 Lincolns And All

Other 1992-95 Models

OPERATION DESCRIPTION TIME

951804A Flush Evaporator 1.0 Hr.

951804B Flush Condenser 1.0 Hr.

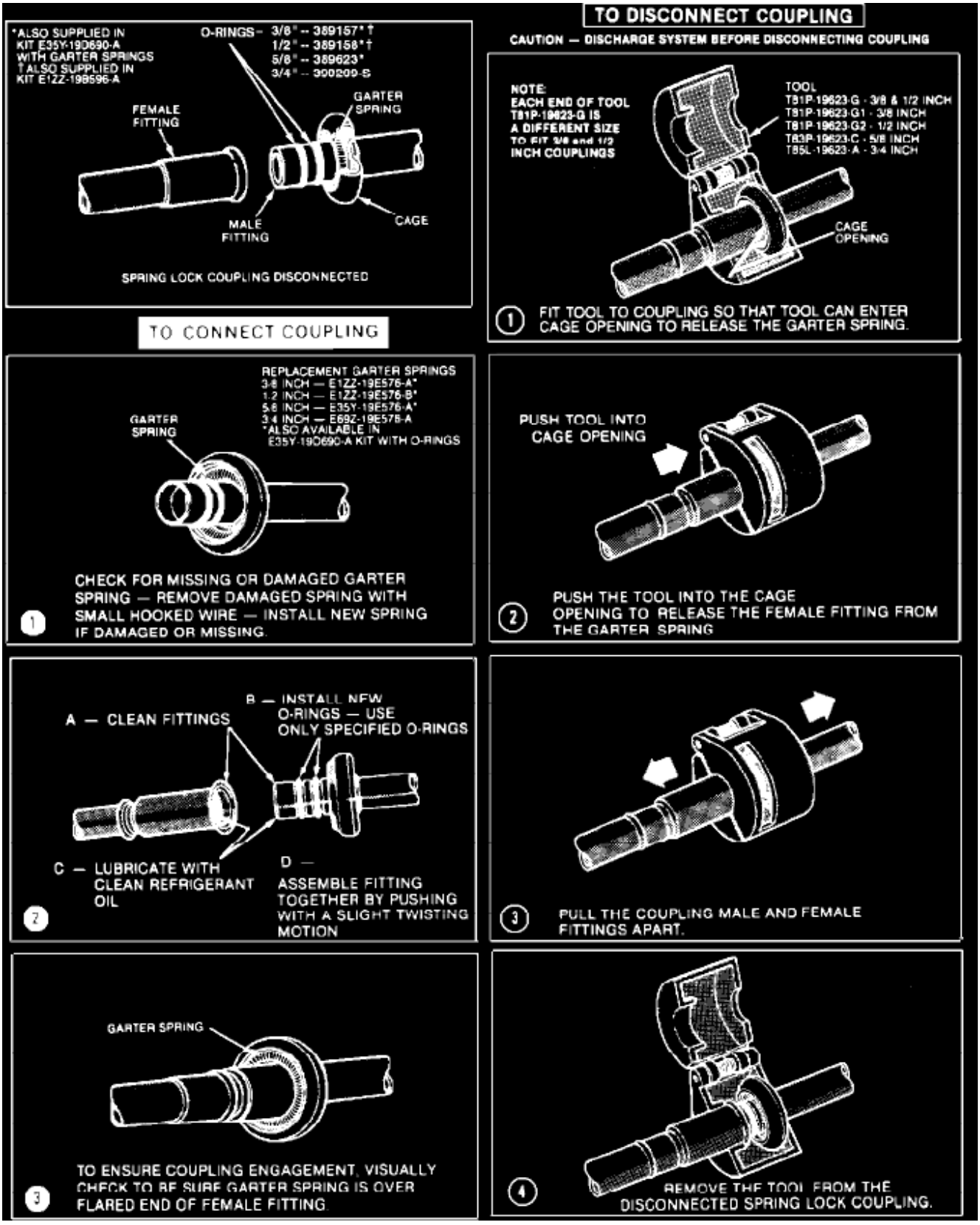
DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208200, 208999


*ALSO SUPPLIED IN KIT E35Y-19D690-A WITH GARTER SPRINGS
†ALSO SUPPLIED IN KIT E1ZZ-19B596-A
O-RINGS - 3/8" -- 389157"†
1/2" -- 389158"†
5/8" -- 389623"
3/4" -- 390209-S
FEMALE FITTING
GARTER SPRING
MALE FITTING
CAGE
SPRING LOCK COUPLING DISCONNECTED
TO DISCONNECT COUPLING
CAUTION — DISCHARGE SYSTEM BEFORE DISCONNECTING COUPLING
NOTE: EACH END OF TOOL T81P-19623-G IS A DIFFERENT SIZE TO FIT 3/8 and 1/2 INCH COUPLINGS
TOOL
T81P-19623-G - 3/8 & 1/2 INCH
T81P-19623-G1 - 3/8 INCH
T81P-19623-G2 - 1/2 INCH
T83P-19623-C - 5/8 INCH
T85L-19623-A - 3/4 INCH
CAGE OPENING
1 FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.
TO CONNECT COUPLING
REPLACEMENT GARTER SPRINGS
3/8 INCH — E1ZZ-19E576-A*
1/2 INCH — E1ZZ-19E576-B*
5/8 INCH — E35Y-19E576-A*
3/4 INCH — E69Z-19E576-A
*ALSO AVAILABLE IN E35Y-19D690-A KIT WITH O-RINGS
GARTER SPRING
1 CHECK FOR MISSING OR DAMAGED GARTER SPRING — REMOVE DAMAGED SPRING WITH SMALL HOOKED WIRE — INSTALL NEW SPRING IF DAMAGED OR MISSING.
PUSH TOOL INTO CAGE OPENING
2 PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING
A — CLEAN FITTINGS
B — INSTALL NEW O-RINGS — USE ONLY SPECIFIED O-RINGS
C — LUBRICATE WITH CLEAN REFRIGERANT OIL
D — ASSEMBLE FITTING TOGETHER BY PUSHING WITH A SLIGHT TWISTING MOTION
2
3 PULL THE COUPLING MALE AND FEMALE FITTINGS APART.
GARTER SPRING
3 TO ENSURE COUPLING ENGAGEMENT, VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING.
4 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING.

Evaporator Core: Service and Repair

Fig. 2 Spring lock coupling disconnect & connect

1. Disconnect battery ground cable. Discharge refrigerant from system.

2. Disconnect pressure switch electrical connector and remove switch from accumulator.

3. Disconnect and cap refrigerant lines from accumulator and evaporator, Fig. 2.

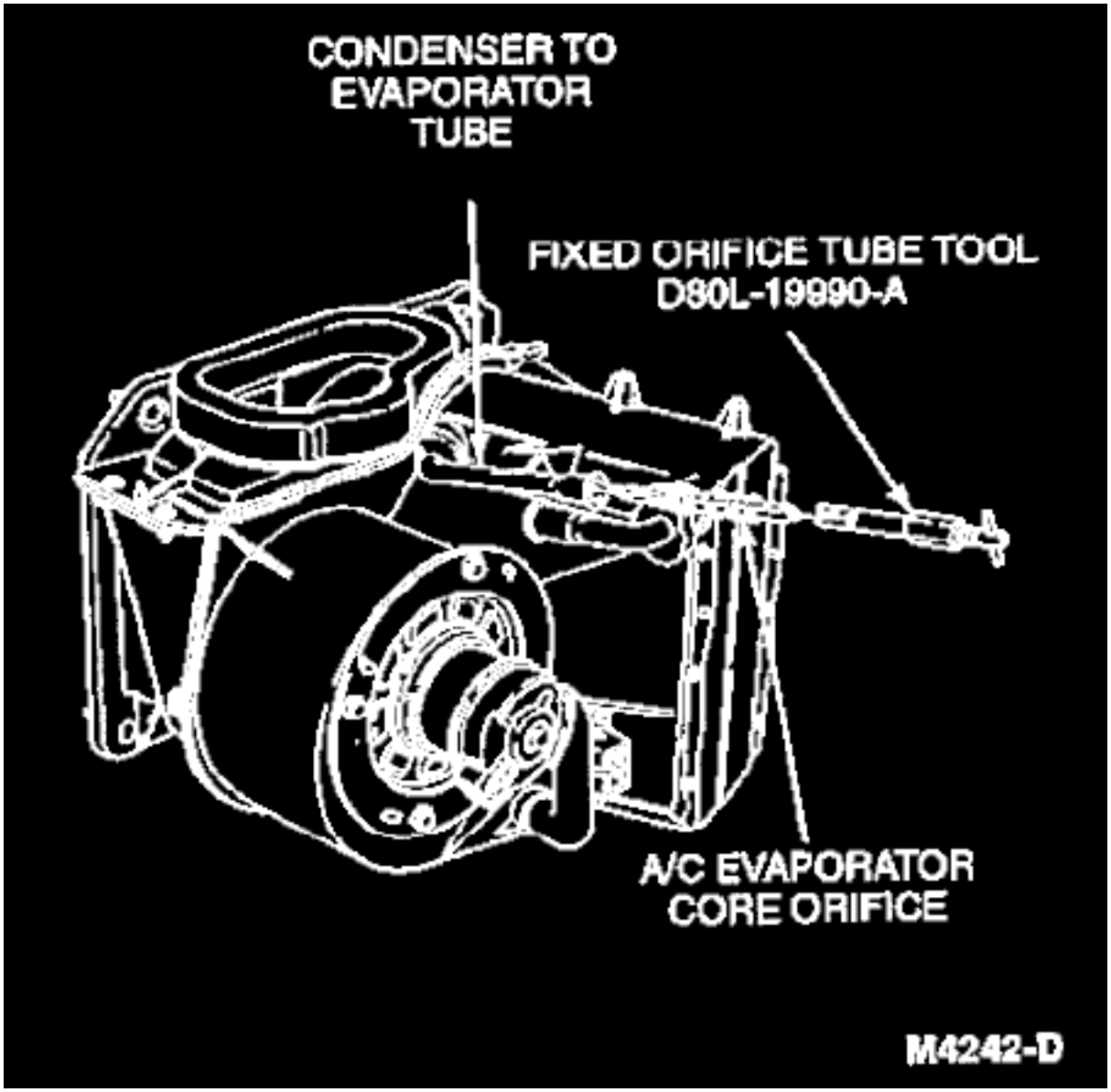
4. Remove screws attaching service cover and vacuum reservoir to evaporator case assembly. Remove service cover

5. Store vacuum reservoir in a secure position and remove two dash panel mounting nuts.

6. Remove evaporator core and accumulator/dryer from vehicle as an assembly.

7. Reverse procedure to install. Use new O-ring lubricated with refrigerant oil.

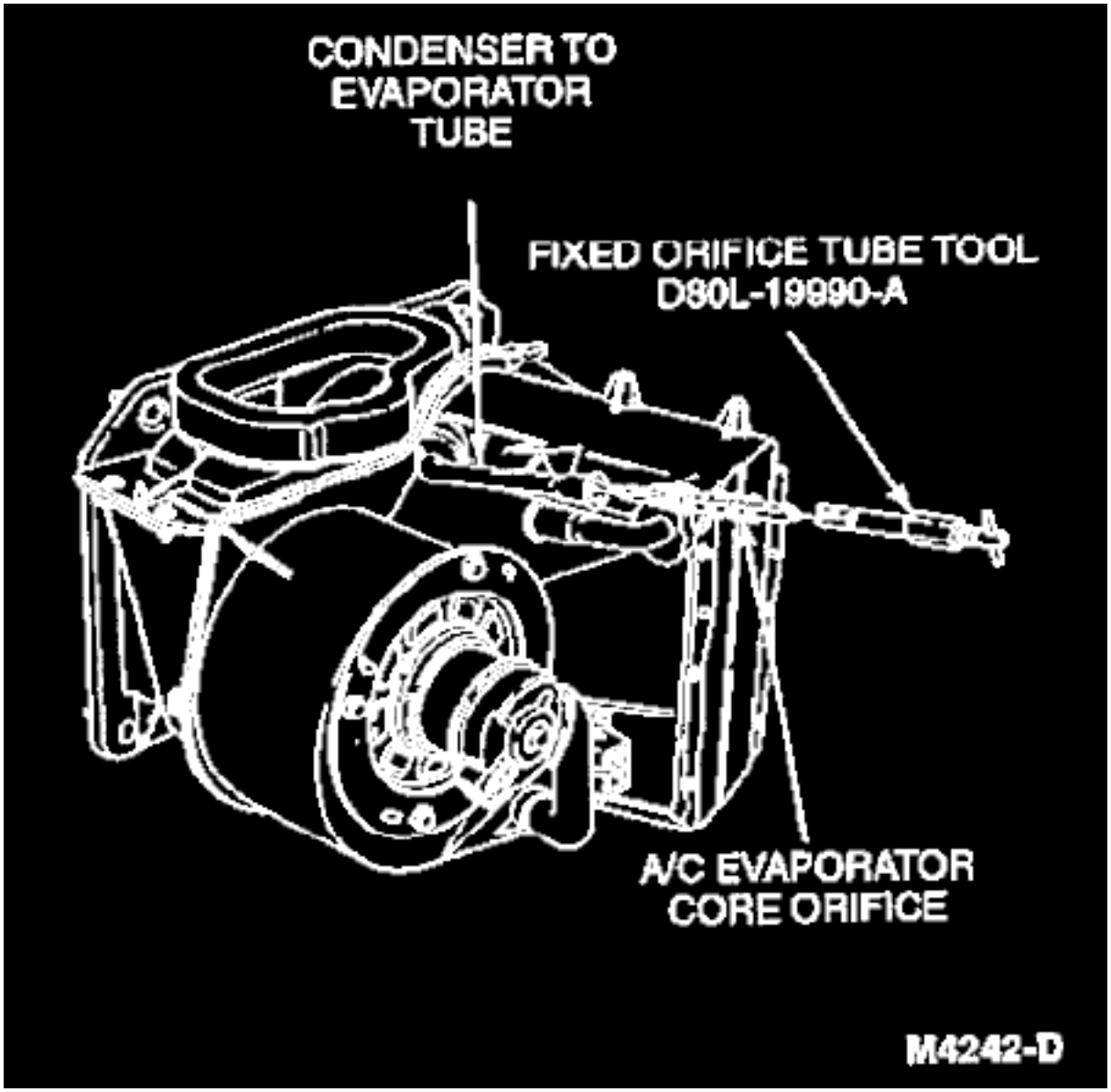
8. Leak test, evacuate and charge system.



Expansion Block/Orifice Tube: Locations

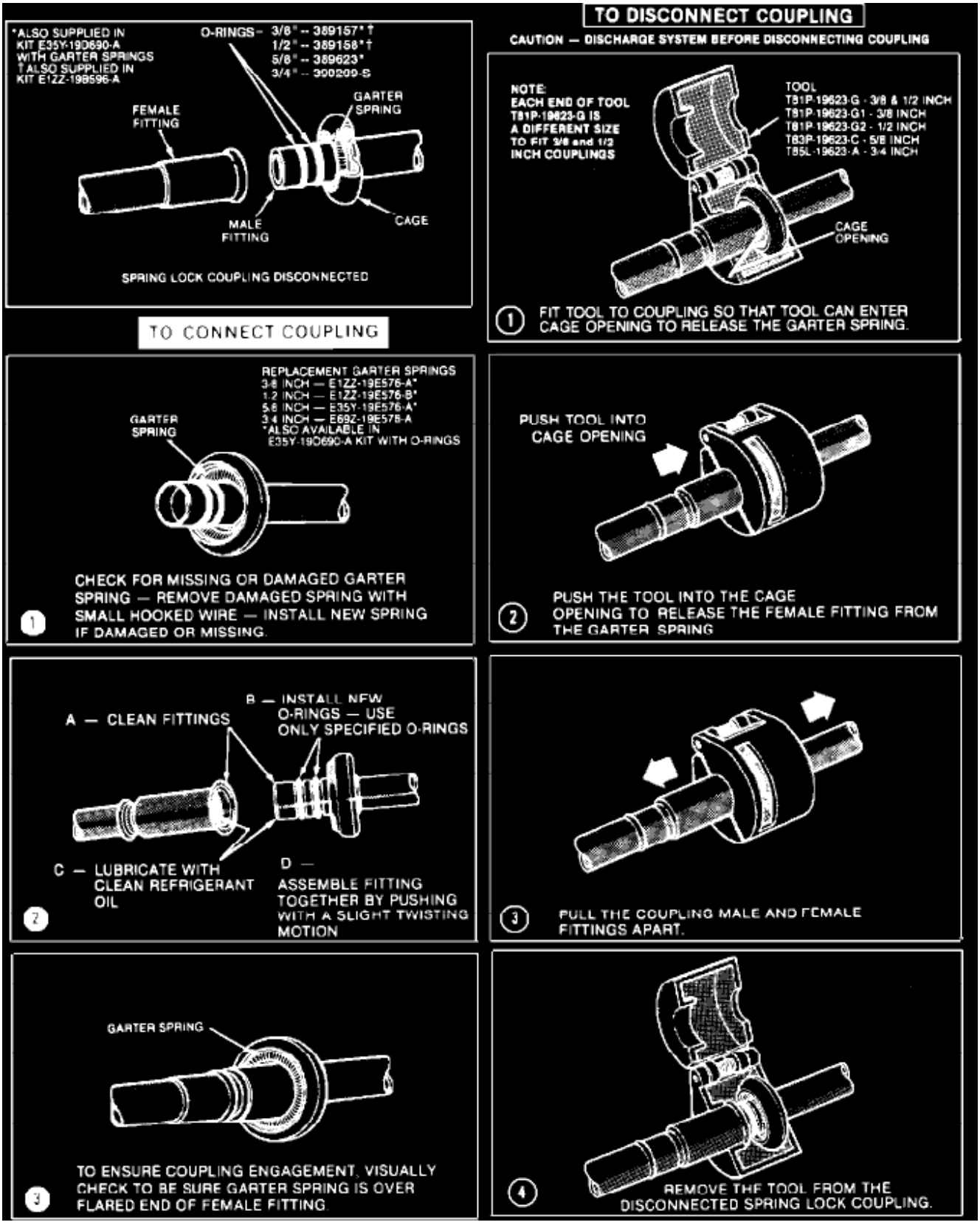
A/C Orifice Tube

The A/C evaporator core orifice is located in the A/C evaporator core inlet tube.



Expansion Block/Orifice Tube: Service and Repair

A/C Orifice Tube


*ALSO SUPPLIED IN KIT E35Y-19D690-A WITH GARTER SPRINGS
†ALSO SUPPLIED IN KIT E1ZZ-19B596-A
O-RINGS - 3/8" -- 389157"†
1/2" -- 389158"†
5/8" -- 389623"
3/4" -- 390209-S
FEMALE FITTING
GARTER SPRING
MALE FITTING
CAGE
SPRING LOCK COUPLING DISCONNECTED
TO DISCONNECT COUPLING
CAUTION — DISCHARGE SYSTEM BEFORE DISCONNECTING COUPLING
NOTE: EACH END OF TOOL T81P-19623-G IS A DIFFERENT SIZE TO FIT 3/8 and 1/2 INCH COUPLINGS
TOOL
T81P-19623-G - 3/8 & 1/2 INCH
T81P-19623-G1 - 3/8 INCH
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T83P-19623-C - 5/8 INCH
T85L-19623-A - 3/4 INCH
CAGE OPENING
1 FIT TOOL TO COUPLING SO THAT TOOL CAN ENTER CAGE OPENING TO RELEASE THE GARTER SPRING.
TO CONNECT COUPLING
REPLACEMENT GARTER SPRINGS
3/8 INCH — E1ZZ-19E576-A*
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*ALSO AVAILABLE IN E35Y-19D690-A KIT WITH O-RINGS
GARTER SPRING
1 CHECK FOR MISSING OR DAMAGED GARTER SPRING — REMOVE DAMAGED SPRING WITH SMALL HOOKED WIRE — INSTALL NEW SPRING IF DAMAGED OR MISSING.
PUSH TOOL INTO CAGE OPENING
2 PUSH THE TOOL INTO THE CAGE OPENING TO RELEASE THE FEMALE FITTING FROM THE GARTER SPRING
A — CLEAN FITTINGS
B — INSTALL NEW O-RINGS — USE ONLY SPECIFIED O-RINGS
C — LUBRICATE WITH CLEAN REFRIGERANT OIL
D — ASSEMBLE FITTING TOGETHER BY PUSHING WITH A SLIGHT TWISTING MOTION
2
3 PULL THE COUPLING MALE AND FEMALE FITTINGS APART.
GARTER SPRING
3 TO ENSURE COUPLING ENGAGEMENT, VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING.
4 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING.

Fig. 2 Spring lock coupling disconnect & connect

Removal

1. Discharge refrigerant from system. 2. Disconnect and cap liquid line from evaporator core inlet tube. 3. Pour a small amount of refrigerant oil into inlet tube to lubricate orifice tube O-rings and inlet tube. 4. Using tool D80L-19990-A or equivalent, engage with the two tangs on the orifice tube.

CAUTION: Do not twist or rotate the fixed orifice tube in the evaporator core inlet tube, as it may break off.

5. Hold T-handle of removal tool to prevent it from turning, and run nut down against evaporator core tube until orifice tube is pulled from inlet tube. 6. If the A/C Evaporator Core Orifice breaks in tube, it must be removed from the tube with Broken Orifice Tube Extractor D80L-19990-B. 7. To remove a broken Orifice Tube, insert the screw end of the Extractor Tool into the tube and thread the screw end of the tool into the brass tube

in the center of the orifice body. Then pull the orifice from the tube.

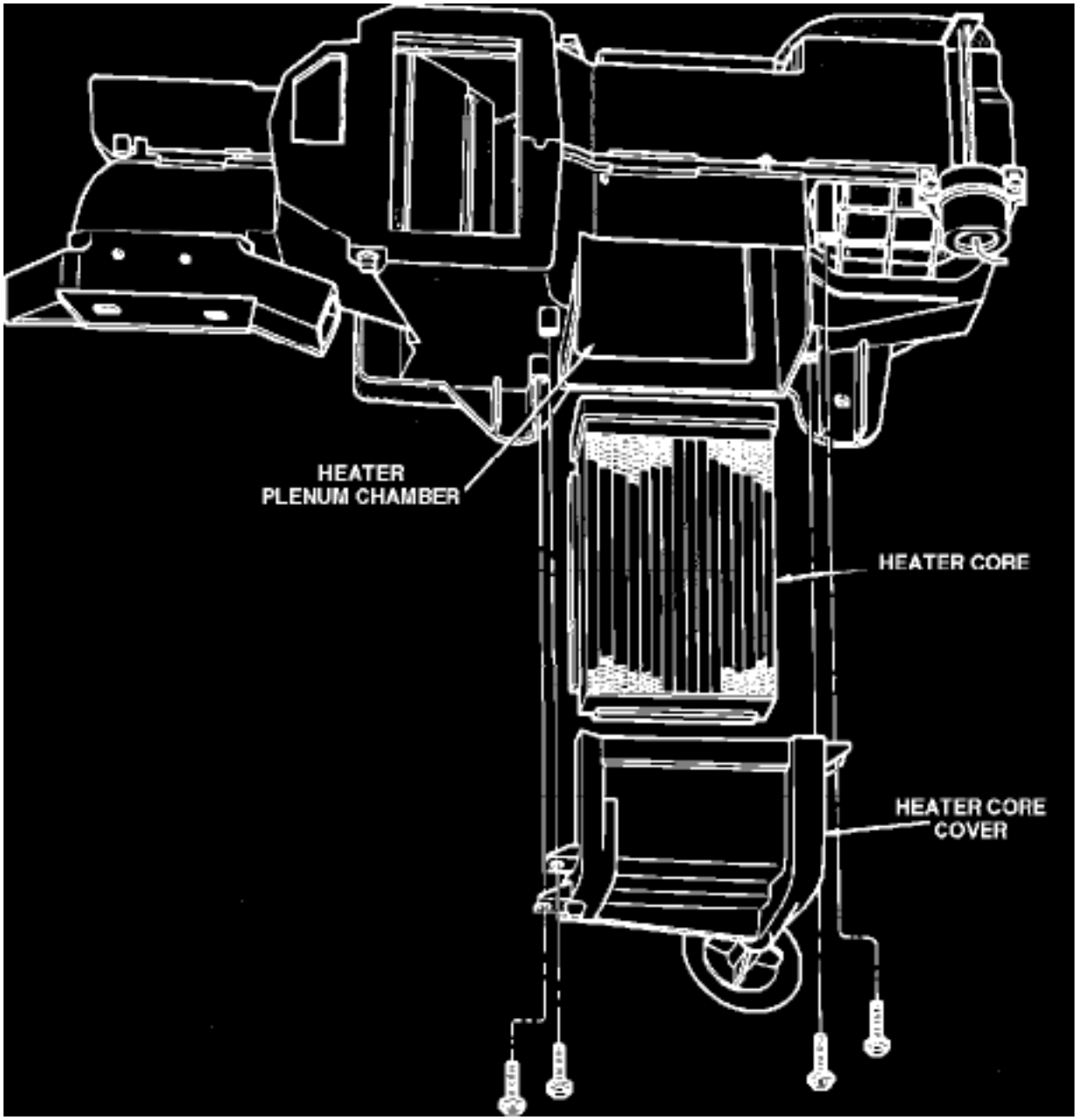
8. If only the brass tube is removed in step 7, insert the screw end of the extractor tool into the orifice body. Then pull the body from the tube.

Installation

1. Lubricate the O-rings on the A/C Evaporator cor orifice liberally with clean refrigerant oil. 2. Place the orifice in the remover/replacer tool and insert into the evaporator tube until the orifice is seated at the stop. 3. Remove the tool from the orifice. 4. After checking the condenser to evaporator tube coupling end for a missing or damaged spring, install two new O-rings lubricated with clean

refrigerant oil onto the male fitting. Insert the male fitting into the inlet tube until the spring lock coupling is fully engaged.

5. Leak test, evacuate and charge system. 6. Check system for proper operation.



Heater Core: Service and Repair

Heater Core

REMOVAL

1. Drain cooling system. See: Engine, Cooling and Exhaust/Cooling System/Service and Repair 2. Disconnect hoses from heater core. Plug hoses and core openings to prevent leakage of residual coolant. 3. Working inside the passenger compartment, remove screws attaching heater core access cover and remove the cover. 4. Pull the heater core rearward and down to remove from the plenum.

INSTALLATION

1. Position heater core and seal in the plenum opening. 2. Install heater core access cover. 3. Attach heater hoses to core tubes. Do not overtighten clamps. 4. Refill cooling system. 5. Check system for proper operation.

Housing Assembly HVAC: Customer Interest Heater - Lack of Heat to the Floor Area

Article No. 91-8-20

04/17/91

HEATER - EXCESSIVE AIR BLEED TO DEFROST

LIGHT TRUCK: 1990-91 EXPLORER, RANGER

ISSUE: Lack of heat to the floor area while in the floor heat mode may be caused by excessive air bleed to the defroster. This may be caused by the floor/defroster door. This is most noticeable after the vehicle has reached normal operating temperatures.

ACTION: Install a new foam covered floor/defrost door. Refer to the following procedure for service details.

SERVICE PROCEDURE:

1. Remove the plenum assembly from the vehicle. Refer to the Shop Manual Section 12-02B for service details.

2. Disconnect the floor/defrost door linkage from the black arm of the function cam located on the top of the plenum assembly.

3. Using a flat blade screwdriver, disengage the door pivot pins from the side of the plenum air duct and lift the door out of the plenum.

4. Position the new foam covered floor/defrost door in the plenum air duct.

5. Snap the pivot pins into the slots provided.

6. Be sure the notched section of the foamed door is above the lower case opening to the floor duct. This will assure that the door will open and close

properly.

7. Connect the floor/defrost door linkage to the function cam.

8. Use Ford Silicone Spray or equivalent, to lubricate both door pivots, both ends of the door linkage, plenum air duct walls and the foam edges of the

door.

9. Install the plenum assembly in the vehicle. Refer to the Shop Manual Section 12-02B for service details.

PART NUMBER PART NAME CLASS

F1TZ-18A478-A Door Assembly C

D7AZ-19553-AA Silicone Spray Lubricant B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

910820A Replace Door Assembly 2.4 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

18A478 09

OASIS CODES: 208300

Article No. 91-8-20

04/17/91

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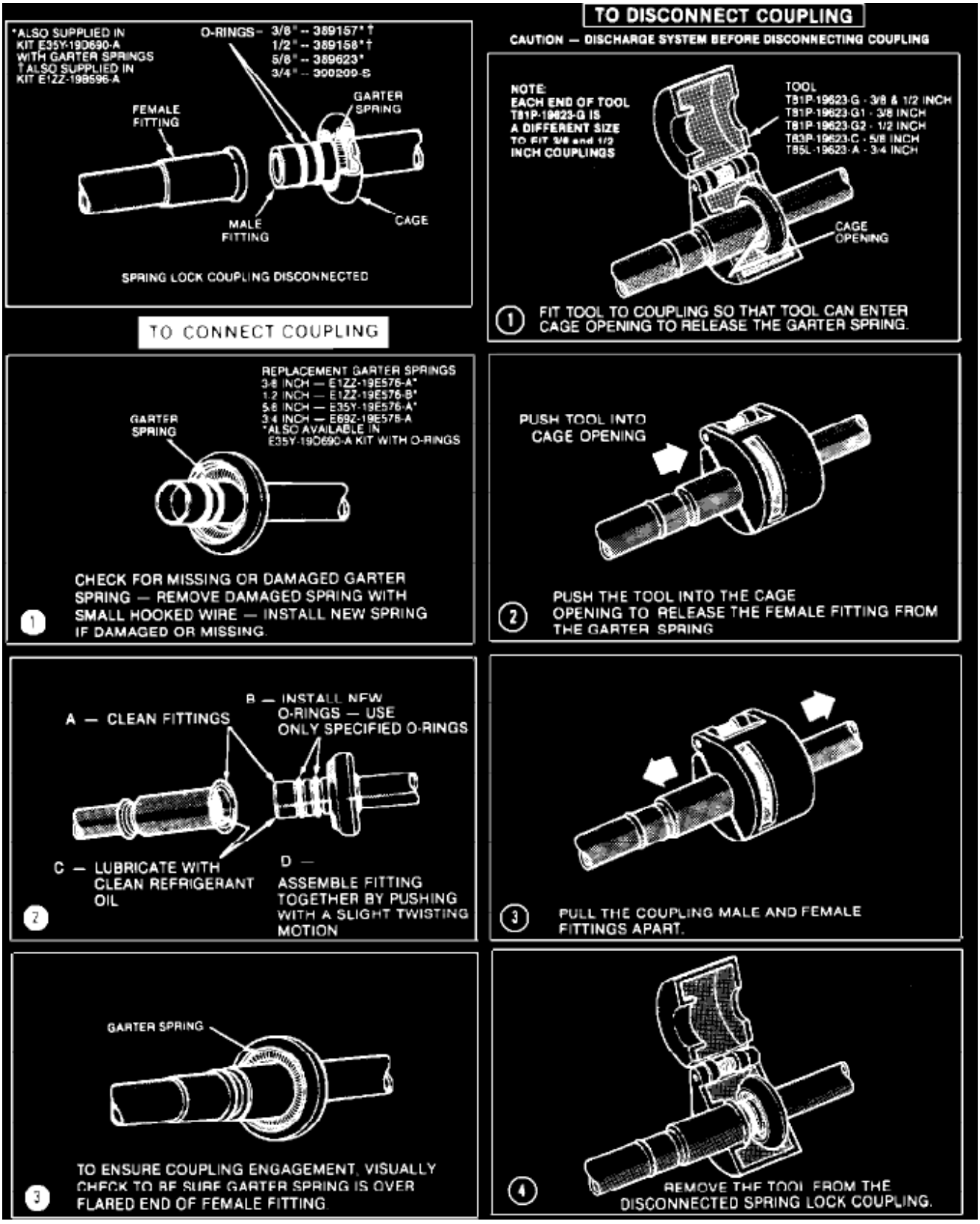
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GARTER SPRING
3 TO ENSURE COUPLING ENGAGEMENT, VISUALLY CHECK TO BE SURE GARTER SPRING IS OVER FLARED END OF FEMALE FITTING.
4 REMOVE THE TOOL FROM THE DISCONNECTED SPRING LOCK COUPLING.

Receiver Dryer: Service and Repair

The accumulator/dryer must be replaced any time the system has been left open for more than 24 hours with the system completely discharged, there is evidence of moisture in the system, the system is badly contaminated, there is more than five ounces of compressor oil in it, or the accumulator/dryer is restricted, plugged or perforated. Replacement of a refrigerant line or a major component (condenser, evaporator or seized compressor) requires replacement of the accumulator/drier. The receiver/dryer does not necessarily need to be replaced every time there is a loss of refrigerant charge, a component is replaced or the outer shell of the unit is dented.

Fig. 2 Spring lock coupling disconnect & connect

1. Disconnect battery ground cable.

2. Discharge refrigerant from system.

3. Disconnect electrical connector from pressure switch and remove switch from accumulator.

4. Disconnect and cap suction line from accumulator/dryer, Fig. 2.

5. Loosen fitting connecting accumulator to evaporator core.

6. Remove lower forward screw holding flanges of case and bracket together, and remove screw holding evaporator inlet tube to the accumulator bracket. Disconnect accumulator from evaporator core, then remove bracket from accumulator/dryer.

7. Reverse procedure to install. Use new O-rings lubricated with refrigerant oil.

8. Leak test, evacuate and charge system. Check system for proper operation.

Technical Service Bulletin # 99-19-6 Date: 990920

A/C - Identification of Non Approved Refrigerants

Article No. 99-19-6

09/20/99

^ AIR CONDITIONING - IDENTIFICATION OF NON-FORD APPROVED REFRIGERANTS

^ AIR CONDITIONING - PURGING AIR FROM SYSTEM

FORD: 1985-1986 LTD 1985-1988 EXP 1985-1994 TEMPO 1985-1997 THUNDERBIRD 1985-2000 CROWN VICTORIA, ESCORT, MUSTANG 1986-2000 TAURUS 1988-1993 FESTIVA 1989-1997 PROBE 1994-1997 ASPIRE 1995-2000 CONTOUR 2000 FOCUS 1985-1990 BRONCO II 1985-1996 BRONCO 1985-1997 F-250 HD, F-350 1985-2000 ECONOLINE, F-150, F-250 LD, RANGER 1986-1997 AEROSTAR 1988-1997 F SUPER DUTY 1991-2000 EXPLORER 1995-2000 WINDSTAR 1997-2000 EXPEDITION 1999-2000 SUPER DUTY F SERIES 1985-1991 CL-CLT-9000 SERIES 1985-1999 L SERIES 1985-2000 F & B SERIES 1986-1998 CARGO SERIES 1997-1998 AEROMAX, LOUISVILLE

LINCOLN: 1985-1992 MARK VII 1985-2000 CONTINENTAL, TOWN CAR 1993-1998 MARK VIII 2000 LS 1998-2000 NAVIGATOR

MERCURY: 1985-1986 MARQUIS 1985-1987 LYNX 1985-1994 TOPAZ 1985-1997 COUGAR 1985-2000 GRAND MARQUIS 1986-2000 SABLE 1987-1989 TRACER 1991-1994 CAPRI 1991-2000 TRACER 1995-2000 MYSTIQUE 1999-2000 COUGAR 1993-2000 VILLAGER 1997-2000 MOUNTAINEER

MERKUR: 1985-1989 XR4TI 1988-1989 SCORPIO

This TSB article is being republished in its entirety to add model year vehicles

ISSUE A number of non-approved/alternate refrigerants have entered the marketplace and are being advertised as "drop-in replacements" for R-12 and R-134a. The use of non-approved refrigerants such as R-22, hydrocarbons, and other refrigerant blends could cause safety, durability, and performance concerns if they are installed in Ford A/C systems. Identification of the type of refrigerant contained in vehicle A/C systems, before servicing, is necessary to prevent dealer service equipment and refrigerant supplies from being contaminated with non-approved refrigerants.

ACTION Refrigerant identification must be performed prior to recovering the refrigerant into a recovery machine to prevent cross-contamination of the recovery machine and other A/C systems being serviced with that recovery machine. Refer to the following text.

OTHER APPLICABLE ARTICLES: 94-14-3, 95-18-4

SUPERSEDES: 98-12-8

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1993-2000 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

991906A Test A/C System For 0.3 Hr.

Contaminated Refrigerant

DEALER CODING

CONDITION

BASIC PART NO. CODE

R-12 49

OASIS CODES: 208000, 208999

A/C Refrigerant Analyzer Function

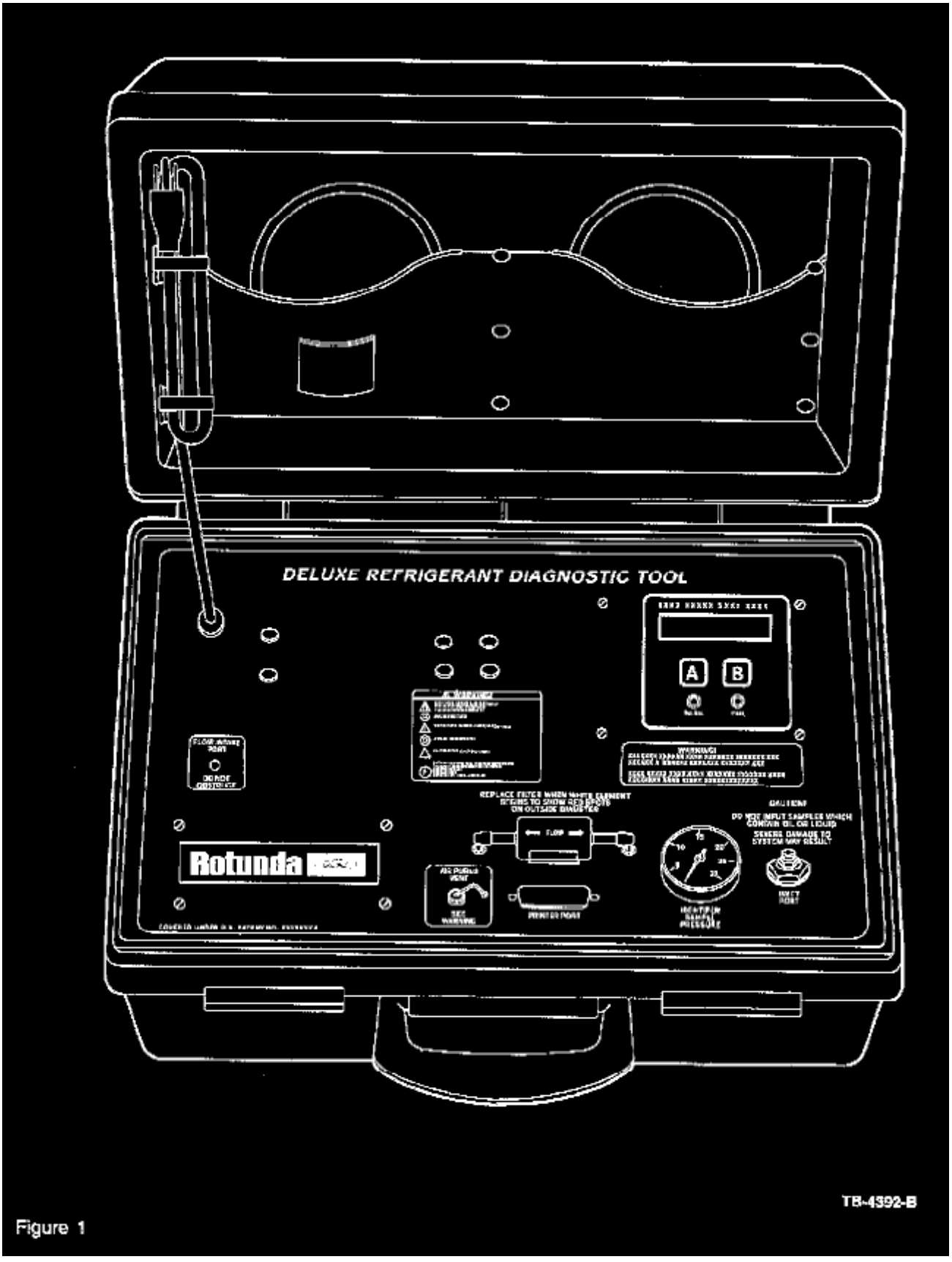

Figure 1

Ford Motor Company has approved the Rotunda Deluxe A/C Refrigerant Analyzer (198-00003) for use on Ford and Lincoln-Mercury vehicles (Figure 1). The analyzer provides the technician with a quick and easy way to identify the type and percentage of refrigerant (R-134a, R-12, R-22, or flammable hydrocarbon). The analyzer can also provide the percentage of air in the A/C system and automatically purge air from the system.

The A/C Refrigerant Analyzer is designed to identify vapor gas samples taken directly from automotive air conditioning systems or refrigerant storage cylinders. Refrigerant vapor passes through the multiple sensor Non-Dispersive Infra-Red (NDIR) sensing unit. The microprocessor calculates each refrigerant type and purity percentage which is displayed on the analyzer's Liquid Crystal Display (LCD).

The analyzer identifies the purity percentage of R-134a, R-12, R-22, hydrocarbon; and air in the sample. If the purity percentage of the R-134a or R-12 is 98% or greater by weight, a green "PASS" Light Emitting Diode (LED) will light. If refrigerants R-134a or R-12 do not meet 98% purity levels, the red "FAIL" LED will light. Levels of R-22 and flammable hydrocarbons above 2% will light the red "FAIL" light. If a hydrocarbon is detected above 5%, both the "FAIL" light and "HYDROCARBON" light will illuminate and a horn will sound alerting the user of potential hazards.

The percent of air contained in the sample will be displayed if the R-134a or R-12 content is 98% or above. The analyzer eliminates the effect of air

when determining the refrigerant sample content because air is not considered a contaminant although air can affect A/C system performance. Air will automatically be purged until a pure refrigerant with a less than 2% by weight air measurement is reached.

Recovery of Contaminated Refrigerant

If contaminated refrigerant is detected, DO NOT recover the refrigerant into your R-134a or R-12 recovery/recycling equipment. Take the following actions:

1. Repeat the test to verify contaminated refrigerant is present.

2. Advise the customer of the contaminated A/C system and any additional cost to repair the system. The customer may wish to return to the service facility which performed the last A/C service.

3. Recover the contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant. This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles. As an alternative, contact an A/C service facility in your area which has the proper equipment for refrigerant recovery.

Repairing A Contaminated A/C System

Once the contaminated refrigerant is removed from the system it will be necessary to repair the system. Ford recommends that you do the following to be sure a quality repair is made:

1. Determine the cause of the failure.

2. Determine which parts will need to be replaced.

3. Flush the heat exchangers to remove any oil that may be degraded due to the contaminated refrigerant.

4. Install a new suction/accumulator.

5. Properly oil match the system to verify that the correct amount of clean refrigerant oil is present in the system.

6. Evacuate the system for 45 minutes.

7. Recharge the system, verify proper operation, and leak test.

Disposal of Contaminated Refrigerant

Disposal of contaminated refrigerant is a new process to the automotive industry Listed below are companies that will assist with disposal of contaminated refrigerant. Ford Motor Company has not evaluated the processes of the listed refrigerant disposal companies and is not endorsing or promoting their companies Business transactions are between the dealership and disposal companies. Disposal costs will vary between $3.00 and $5.00 per pound, plus the cost of round trip cylinder shipping.

^ Omega Refrigerant Reclamation

^ 5263 North Fourth St.

^ Irwindale, CA 91706

^ (310) 698-0991 FAX: (310) 696-7908

^ Full Cycle Global

^ 2966 Wireton

^ Blue Island, IL 60406

^ (708) 388-8551 FAX: (708) 399-6550

^ U.S. Refrigerant Reclaim, Inc.

^ 12420 North Green River Road

^ Evansville, IN 47711

^ (800) 207-5931 FAX: (812) 867-1463

^ Full Cycle Global

^ 343 South Airline Highway

^ Gonzales, LA 70737

^ (504) 644-5333 FAX: (504) 644-1609

^ CFC Reclamation

^ 1321 Swift North

^ Kansas City, MO 64116

^ (816) 471-2511

^ Full Cycle Global

^ 550 James St.

^ Lakewood, NJ 08701

^ (908) 370-3400 FAX: (908) 370-3088

^ National Refrigerants, Inc.

^ 11401 Roosevelt Blvd.

^ Philadelphia, PA 19154

^ (215) 698-6620 FAX: (215) 602-8205

^ Gartech Refrigerant Reclamation

^ 2002 Platinum

^ Garland, TX 75042

^ (214) 272-4070 FAX: (214) 272-6548

^ Refrigerant Reclaim Services

^ 121 S. Norwood Dr.

^ Hurst, TX 76053-7807

^ (817) 282-0022 FAX: (800) 831-6182

^ Full Cycle Global

^ 2055 Silber, Suite 109

^ Houston, TX 77055

^ (713) 681-7370 FAX: (713) 681-9947

^ Refrigerant Reclaim, Inc.

^ 122 Old Stage Coach Road

^ Dumfries, VA 22026

^ (800) 238-5902 FAX: (703) 441-0393

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Article No. 99-19-6

09/20/99

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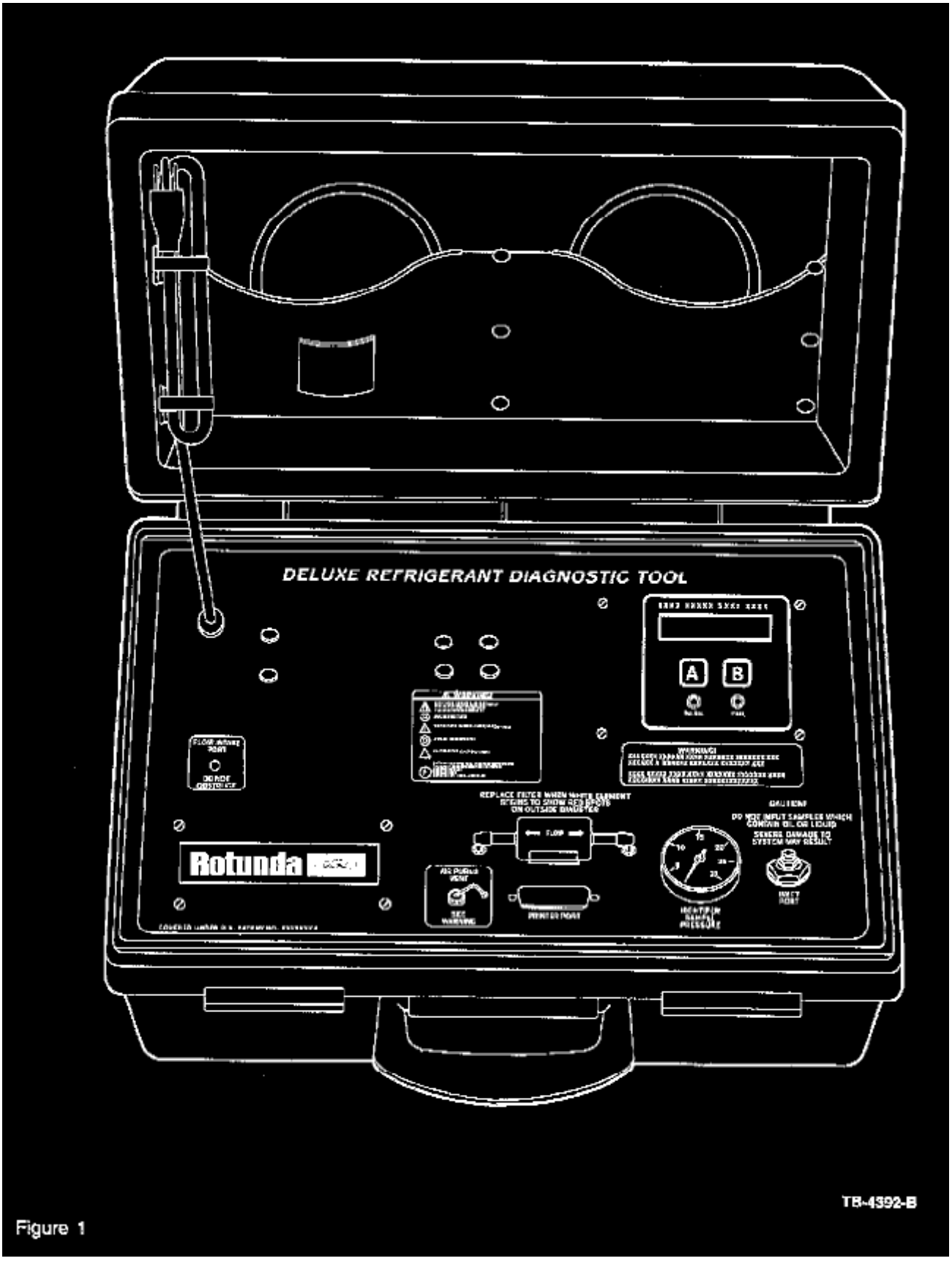

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1. Determine the cause of the failure.

2. Determine which parts will need to be replaced.

3. Flush the heat exchangers to remove any oil that may be degraded due to the contaminated refrigerant.

4. Install a new suction/accumulator.

5. Properly oil match the system to verify that the correct amount of clean refrigerant oil is present in the system.

6. Evacuate the system for 45 minutes.

7. Recharge the system, verify proper operation, and leak test.

Disposal of Contaminated Refrigerant

Disposal of contaminated refrigerant is a new process to the automotive industry Listed below are companies that will assist with disposal of contaminated refrigerant. Ford Motor Company has not evaluated the processes of the listed refrigerant disposal companies and is not endorsing or promoting their companies Business transactions are between the dealership and disposal companies. Disposal costs will vary between $3.00 and $5.00 per pound, plus the cost of round trip cylinder shipping.

^ Omega Refrigerant Reclamation

^ 5263 North Fourth St.

^ Irwindale, CA 91706

^ (310) 698-0991 FAX: (310) 696-7908

^ Full Cycle Global

^ 2966 Wireton

^ Blue Island, IL 60406

^ (708) 388-8551 FAX: (708) 399-6550

^ U.S. Refrigerant Reclaim, Inc.

^ 12420 North Green River Road

^ Evansville, IN 47711

^ (800) 207-5931 FAX: (812) 867-1463

^ Full Cycle Global

^ 343 South Airline Highway

^ Gonzales, LA 70737

^ (504) 644-5333 FAX: (504) 644-1609

^ CFC Reclamation

^ 1321 Swift North

^ Kansas City, MO 64116

^ (816) 471-2511

^ Full Cycle Global

^ 550 James St.

^ Lakewood, NJ 08701

^ (908) 370-3400 FAX: (908) 370-3088

^ National Refrigerants, Inc.

^ 11401 Roosevelt Blvd.

^ Philadelphia, PA 19154

^ (215) 698-6620 FAX: (215) 602-8205

^ Gartech Refrigerant Reclamation

^ 2002 Platinum

^ Garland, TX 75042

^ (214) 272-4070 FAX: (214) 272-6548

^ Refrigerant Reclaim Services

^ 121 S. Norwood Dr.

^ Hurst, TX 76053-7807

^ (817) 282-0022 FAX: (800) 831-6182

^ Full Cycle Global

^ 2055 Silber, Suite 109

^ Houston, TX 77055

^ (713) 681-7370 FAX: (713) 681-9947

^ Refrigerant Reclaim, Inc.

^ 122 Old Stage Coach Road

^ Dumfries, VA 22026

^ (800) 238-5902 FAX: (703) 441-0393

A/C - Filtering Refrigerant After Compressor Replacement

Article No. 98-12-5

06/22/98

AIR CONDITIONING - FILTERING REFRIGERANT

AFTER A/C COMPRESSOR REPLACEMENT - SERVICE TIPS

FORD: 1980-98 CROWN VICTORIA 1981-98 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-97 THUNDERBIRD 1982-98 MUSTANG 1983-86 LTD 1984-94 TEMPO 1986-98 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-98 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1980-98 GRAND MARQUIS, TOWN CAR 1982-83 ZEPHYR 1982-86 CAPRI 1982-87 LN7 1982-97 COUGAR 1982-98 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-98 SABLE 1991-94 CAPRI 1991-98 TRACER 1993-98 MARK VIII 1995-98-MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1980-96 BRONCO 1980-97 F SUPER DUTY 1980-98 ECONOLINE, F-150, F-150, F-350 1983-98 RANGER 1984-90 BRONCO II 1986-97 AEROSTAR 1988-97 F-47 1991-98 EXPLORER 1993-98 VILLAGER 1995-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to revise the Service Procedure and to update the model years.

ISSUE Vehicles that have and inoperative A/C compressor, due to internal causes, MUST have the refrigerant system cleaned to remove any debris or contaminants that may be present to prevent damage to the replacement compressor.

ACTION

Install a Service Filter Kit in the refrigerant system prior to installing the replacement compressor. Refer to the following Service Procedure for details.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 96-15-5

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-99 Models And 1991 Lincolns, Basic Warranty Coverage For All Other Models And Major Component Warranty Coverage For All Other Lincoins

OPERATION DESCRIPTION TIME

981205A Kit Installation 1.2 Hrs.

981205B Extra Time For Refrigerant 0.4 Hr.

(R-12) Recovery

DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208999

Service Procedure

THIS PROCEDURE IS OPTIONAL IF THE SYSTEM IS FLUSHED USING THE ROTUNDA A/C FLUSHER.

CAUTION

THIS FILTERING PROCEDURE MAY BE USED FOR EITHER R-12 OR R-134a REFRIGERANT SYSTEMS. BECAUSE THE TWO (2) SYSTEMS USE DIFFERENT REFRIGERANT OILS AND BECAUSE THE COMPRESSOR COULD BE DAMAGED IF THE WRONG OIL IS USED, SYSTEM IDENTIFICATION IS VERY IMPORTANT. BE SURE SYSTEM IS CORRECTLY IDENTIFIED BEFORE STARTING THE FILTERING PROCEDURE.

Each Service Filter Kit includes the following items:

^ One (1) Pancake Filter (to be installed in the liquid line between the condenser and the orifice tube)

^ One (1) Instruction Sheet

NOTE

ON 1993-94 RANGER/EXPLORER VEHICLES, TECHNICIANS MAY EXPERIENCE DIFFICULTY WHEN CONNECTING THE PANCAKE FILTER HOSE FITTINGS TO THE EVAPORATOR INLET WITH THE ORIFICE TUBE INSTALLED. REMOVE THE OFFICE TUBE AND RUN THE SYSTEM FOR 1 HOUR AS DESCRIBED IN THE FILTERING PROCEDURE. REINSTALL THE ORIFICE TUBE AFTER FILTERING IS COMPLETE.

CAUTION

FOLLOW ALL REFRIGERANT SYSTEM SAFETY AND SERVICE PRECAUTIONS OUTLINED IN THE APPROPRIATE SERVICE OR WORKSHOP MANUAL.

1. Before removing any refrigerant system components, recover the refrigerant from the system following the recycling methods outlined In the appropriate Service/Workshop Manual.

2. Remove the suction accumulator/drier assembly and drain the oil into a calibrated container.

3. Install a new suction accumulator/drier and add new refrigerant oil to replace the old oil. The quantity of the new oil to be added is the amount to match that drained from the old accumulator plus 60 mL (2 oz). Refer to the Dealer Master Parts Catalog for the correct suction accumulator/drier part number.

CAUTION

REMEMBER TO USE MOTORCRAFT YN-9-A REFRIGERANT COMPRESSOR OIL WITH R-12 SYSTEMS AND MOTORCRAFT YN-12-C REFRIGERANT COMPRESSOR OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

4. Install a new orifice tube. Refer to the Dealer Master Parts Catalog for the correct orifice tube part number. If the orifice tube in the vehicle is located in the liquid line between the condenser and the evaporator, replace the liquid line assembly.

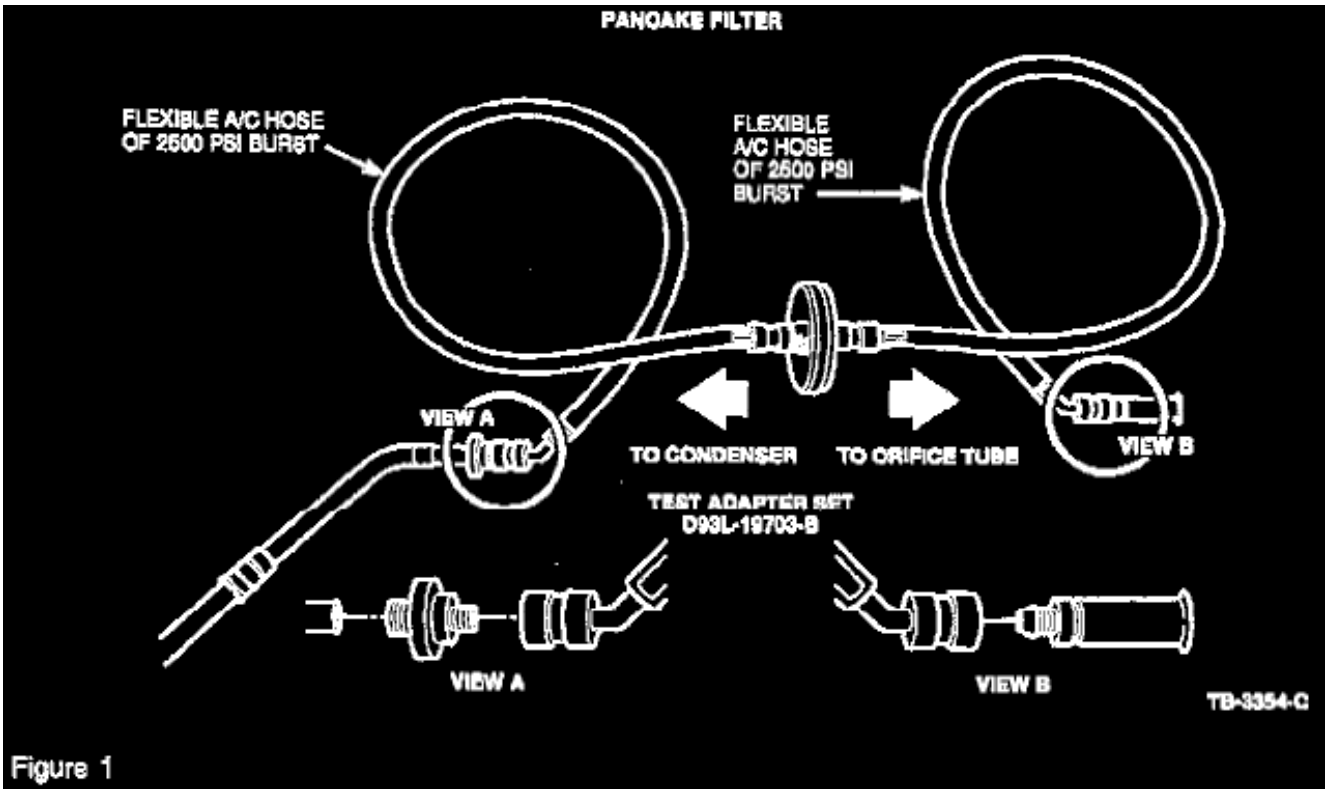


Figure 1

5. Install pancake filter in the liquid line between the condenser and the orifice tube, Figure 1.

a. Be sure orifice inlet is toward the condenser.

b. Connections can be made using Test Adapter Set D93L-19703-B, or equivalent, and flexible refrigerant hose of 2500 psi burst rating. Individual fittings are also available.

6. Remove the old compressor following Service/Workshop Manual procedures. Drain the oil into a calibrated container.

7. Drain the oil from the replacement compressor into a clean calibrated container.

NOTE:

IT WILL BE NECESSARY TO TRANSFER THE MAGNET CLUTCH FROM THE OLD COMPRESSOR TO THE REPLACEMENT COMPRESSOR. FOLLOW SERVICE/WORKSHOP MANUAL PROCEDURES.

8. A new FX-15 service compressor contains 207 mL (7 oz.) of R-12 refrigerant oil. A new FS-10 service compressor does not contain any oil and can be used with an R-12 or an R-134a system.

CAUTION

REMEMBER TO USE YN-9-A (MINERAL) OIL WITH R-12 SYSTEMS AND YN-12-C (PAG) OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

^ If the amount of oil drained from the removed compressor is between 90 and 148 mL (3-5 oz), pour the same amount of clean refrigerant oil into the new compressor.

^ If the amount of oil drained from the old compressor is greater than 90 mL (3 oz), pour 90 mL (3 oz) of clean refrigerant oil into the new compressor.

9. Install the new compressor following Service/Workshop Manual procedures. Make sure all mounting bolts are tightened properly. Check the tension of the compressor drive belt. Adjust if necessary.

10. Evacuate, charge and leak test the system, following Service/Workshop Manual procedures.

11. Check all refrigerant system hoses, lines and the position of the newly-installed filters to make sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

12. Set the A/C control on Max A/C, high blower and temperature control at full cold.

a. Start engine and let idle briefly.

b. Be sure A/C system is operating properly.

13. Gradually bring the engine up to 1200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1000 rpm). Set the engine at 1200 rpm and run it for an hour with the A/C system

operating.

14. Stop the engine.

NOTE:

IT WILL BE NECESSARY TO RECOVER THE SYSTEM REFRIGERANT CHARGE BEFORE PROCEEDING.

15. Allow the engine to cool sufficiently to remove the fittings, flexible hoses and pancake filter from the liquid line.

16. Discard the filter. It can be used one (1) tie only.

17. Reconnect the liquid line back into the system.

18. Evacuate, charge and leak test the system. Make any necessary adjustments.

19. Check the operation of the system in all models.

PART NUMBER PART NAME

F8VZ-19E773-AA Filter Kit

F73Z-19577-AA Refrigerant Oil - Motorcraft YN-9-A (For R-12 Refrigerant Systems Only)

F7AZ-19589-DA Refrigerant Oil - Motorcraft YN-12-C (PAG-Type Oil For R-134a Refrigerant Systems Only)

NOTE

THE TOTAL REPAIR TIME IS FOR INSTALLING SERVICE FILTER KIT PER INSTRUCTIONS THIS INCLUDES INSTALLATION OF AND DISCARD OF FILTER. REFER TO SERVICE LABOR TIME STANDARDS MANUALS IF ADDITIONAL LABOR OPERATIONS ARE REQUIRED.

Refrigerant: Technical Service Bulletins A/C - R12 Refrigerant Substitutes Service Tip

Article No. 96-17-10

08/12/96

AIR CONDITIONING - USE OF R-12 REFRIGERANT SUBSTITUTES - SERVICE TIP

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-94 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 COUGAR 1982-94 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1993 VILLAGER

MEDIUM/HEAVY TRUCK: 1985-94 CARGO SERIES, F & B SERIES, L SERIES

This TSB article is being republished in its entirety to list Environmental Protection Agency (EPA) reviewed NC substitutes for R-12 refrigerant.

ISSUE: A number of manufacturers are producing refrigerant products which are described as being direct replacements for refrigerant R-12.

ACTION: If service is required, use only new or of known quality recycled refrigerant R-12. Ford Motor Company has approved R-134a as the only refrigerant substitute for R-12.

CAUTION:

USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C SYSTEM COMPONENTS.

INFORMATION FROM THE EPA

				Components Percentage							
Brand Name (1)	Ford Approved	Status (2)	Date	HCFC 22	HCFC 124	HCFC 142b	HFC 134a	HFC 152a	Propane (R-290)	Butane (R-600)	Iso-butane (R-600a)
HFC-134a	Yes	ASU	3/18/94				100%				
R-401C	No	ASU	3/18/94	33%	52%			15%			
FRIGC FR-12	No	ASU	6/13/95		39%		59%			2%	
Freezone (3)	No	ASU	5/22/96			19%	70%				
R-406A / GHG / McCool (4)	No	P	5/22/96	55%		41%					4%
GHG-X4 / Autofrost / Chill-It (4)	No	P	5/22/96	51%	28.5%	16.5%					4%
Hot Shot / Kar Kool (4)	No	P	5/22/96	50%	39%	9.5%					1.5%
GHG-HP (4)	No	P	5/22/96	65%		31%					4%
FREEZ-12	No	Under Review				20%	80%				

(1) R-401A (made by DuPont), R-401B (DuPont), R-409A (Elf Atochem), Care 30 (Calor Gas), Adak-29/Adak-12 (TACIP International) and ES-12R (Interveet) have not been submitted for review in motor vehicle air conditioning, and it is therefore illegal to use them in such systems.

(2) See article for details on legality of use according to Status:
- ASU = acceptable subject to fittings, labeling, and no drop-in use conditions
- P = proposed acceptable subject to use conditions; open to public comment so decision is not final
- UNA = unacceptable; illegal for use as CFC-12 substitutes in motor vehicle air conditioners

(3) Freezone contains 2% of a lubricant

(4) Additional use condition: MUST BE USED WITH BARRIER HOSES

This information has been taken from EPA documents to address Ford specific applications and recommendations. Further EPA information on ozone-depleting substances and regulations regarding its handling can be found on the Internet at World Wide Web site: http://www.epa.gov/ozone/

In 1994, EPA established the Significant New Alternatives Policy (SNAP) program to review alternatives to ozone-depleting substances like R-12. EPA examines new substitutes for their ozone depleting, global warming, flammability, and toxicity characteristics. The SNAP process does not test these substitutes for A/C system compatibility, reliability, durability, or performance.

Under the SNAP rule, each new refrigerant must be used in accordance with the following conditions:

1. Unique Fittings - Each new refrigerant must be used with a unique set of fittings to prevent the accidental mixing of different refrigerants.

2. Unique Equipment - Each refrigerant must have dedicated recovery/recycling equipment for that refrigerant.

3. Labels - Whether a vehicle is originally designed to use a new refrigerant or is retrofitted, the technician must apply a detailed label giving specific information about the alternative. This label covers up information about the old refrigerant and provides valuable details on the alternative and how it was used. The technician is required to fill in their name, company performing the retrofit, address and the date retrofitted.

4. Remove Original Refrigerant - The original R-12 must be removed from the system prior to charging with the new refrigerant. This will guarantee that the largest amount of clean R-12 is available for use in vehicles that still need it.

				Reason Unacceptable
Brand Name (1)	Ford Approved	Status (2)	Date	HCFC 22, HCFC 124, HCFC 142b, HFC 134a, HFC 152a, Propane (R-290), Butane (R-600), Iso-butane (R-600a)
Ikon-12	No	ASU	5/22/96	Composition claimed as confidential business information
OZ-12	No	UNA	3/18/94	Flammable blend of hydrocarbons; insufficient data to demonstrate safety
R-176	No	UNA	3/18/94	Contains CFC-12, which is inappropriate in a CFC-12 substitute
HC-12a	No	UNA	6/13/95	Flammable blend of hydrocarbons; insufficient data to demonstrate safety
R-405A	No	UNA	6/13/95	Contains a perfluorocarbon, which has extremely high global warming potential and lifetime

(1) R-401A (made by DuPont), R-401B (DuPont), R-409A (Elf Atochem), Care 30 (Calor Gas), Adak-29/Adak-12 (TACIP International) and ES-12H (Intervest) have not been submitted for review in motor vehicle air conditioning, and it is therefore illegal to use them in such systems.

(2) See article for details on legality of use according to Status:

- ASU = acceptable subject to fittings, labeling, and no drop-in use conditions
- P = proposed acceptable subject to use conditions; open to public comment so decision is not final
- UNA = unacceptable; illegal for use as CFC-12 substitutes in motor vehicle air conditioners

(3) Freezone contains 2% of a lubricant

(4) Additional use condition; MUST BE USED WITH BARRIER HOSES

A summary of the refrigerants reviewed under EPA's SNAP program for use in motor vehicle air conditioning systems is in the table.

OTHER APPLICABLE ARTICLES: 91-9-7, 96-15-7

SUPERSEDES: 93-23-11

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999, 290000

Refrigerant: Technical Service Bulletins R-12 Refrigerant - Substitutes

Article No. 94-14-3

07/13/94

Air Conditioning - Use Of R-12 Refrigerant Substitutes - Service Tip

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

MERKUR: 1986-89 SCORPIO, XR4TI

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1992-94 F-53 1993 VILLAGER

MEDIUM/HEAVY TRUCK: 1954-90 C SERIES 1970-94 L SERIES 1979-90 CL-9000, CL-CLT-9000 SERIES 1980-94 F SERIES 1986-94 CARGO SERIES

This TSB is being republished in its entirety to include Heavy Truck models.

ISSUE:

A number of manufacturers are producing refrigerant products which are described as being direct replacements for refrigerant R-12. The use of any unauthorized substitute refrigerant may severely damage the A/C system components.

ACTION:

If service is required, use only NEW or RECYCLED refrigerant R-12.

Ford Motor Company has not tested or approved any R-12 refrigerant substitute at this time. R-134a is approved only for systems which specify R-134a,

and is not compatible with R-12 systems.

R-22 likewise, is not compatible with R-12 systems.

CAUTION:

USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C SYSTEM COMPONENTS.

OTHER APPLICABLE ARTICLES: 91-9-7

SUPERSEDES: 93-23-11

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999, 290000

Article No. 93-20-6

09/29/93

AIR CONDITIONING - USE OF CORRECT FLUORESCENT TRACER DYE - SERVICE TIP

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1993 VILLAGER

ISSUE: Use of untested, unapproved fluorescent tracer dyes for A/C system leak checking may damage the air conditioning system. Some of these materials may not be compatible with Ford A/C systems.

ACTION: When leak-checking an R-12 A/C system with a "black light", use only Rotunda-supplied Part No. 112-R0027, Fluoro-Lite brand dye. No other dyes have been approved by Ford Motor Company.

NOTE: 112-R0027 DYE IS NOT COMPATIBLE WITH R-134a REFRIGERANT.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208999

Refrigerant: Technical Service Bulletins A/C - R12 Refrigerant Service Tips

Article No. 91-9-7

05/01/91

AIR CONDITIONING - REFRIGERANT R-12 - SERVICE TIPS

FORD: 1985-86 LTD 1985-88 EXP 1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-91 TAURUS 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1985-87 LYNX 1985-91 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER 1991 CAPRI

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-91 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1988-91 F SUPER DUTY 1991 EXPLORER

MEDIUM/HEAVY TRUCK: 1985-90 C SERIES 1985-91 CL-CLT-9000 SERIES, F & B SERIES, L SERIES 1986-91 CARGO SERIES

ISSUE: A number of manufacturers are producing refrigerant products which are described as being direct replacements for Refrigerant R-12. The use of any unauthorized substitute refrigerant may severely damage the A/C components.

ACTION: If service is required, use only NEW or RECYCLED Refrigerant R-12.

CAUTION: USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C

SYSTEM COMPONENTS.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

208000, 208200

Technical Service Bulletin # 98-12-5 Date: 980622

A/C - Filtering Refrigerant After Compressor Replacement

Article No. 98-12-5

06/22/98

AIR CONDITIONING - FILTERING REFRIGERANT

AFTER A/C COMPRESSOR REPLACEMENT - SERVICE TIPS

FORD: 1980-98 CROWN VICTORIA 1981-98 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-97 THUNDERBIRD 1982-98 MUSTANG 1983-86 LTD 1984-94 TEMPO 1986-98 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-98 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1980-98 GRAND MARQUIS, TOWN CAR 1982-83 ZEPHYR 1982-86 CAPRI 1982-87 LN7 1982-97 COUGAR 1982-98 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-98 SABLE 1991-94 CAPRI 1991-98 TRACER 1993-98 MARK VIII 1995-98-MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1980-96 BRONCO 1980-97 F SUPER DUTY 1980-98 ECONOLINE, F-150, F-150, F-350 1983-98 RANGER 1984-90 BRONCO II 1986-97 AEROSTAR 1988-97 F-47 1991-98 EXPLORER 1993-98 VILLAGER 1995-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to revise the Service Procedure and to update the model years.

ISSUE Vehicles that have and inoperative A/C compressor, due to internal causes, MUST have the refrigerant system cleaned to remove any debris or contaminants that may be present to prevent damage to the replacement compressor.

ACTION

Install a Service Filter Kit in the refrigerant system prior to installing the replacement compressor. Refer to the following Service Procedure for details.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 96-15-5

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-99 Models And 1991 Lincolns, Basic Warranty Coverage For All Other Models And Major Component Warranty Coverage For All Other Lincoins

OPERATION DESCRIPTION TIME

981205A Kit Installation 1.2 Hrs.

981205B Extra Time For Refrigerant 0.4 Hr.

(R-12) Recovery

DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208999

Service Procedure

THIS PROCEDURE IS OPTIONAL IF THE SYSTEM IS FLUSHED USING THE ROTUNDA A/C FLUSHER.

CAUTION

THIS FILTERING PROCEDURE MAY BE USED FOR EITHER R-12 OR R-134a REFRIGERANT SYSTEMS. BECAUSE THE TWO (2) SYSTEMS USE DIFFERENT REFRIGERANT OILS AND BECAUSE THE COMPRESSOR COULD BE DAMAGED IF THE WRONG OIL IS USED, SYSTEM IDENTIFICATION IS VERY IMPORTANT. BE SURE SYSTEM IS CORRECTLY IDENTIFIED BEFORE STARTING THE FILTERING PROCEDURE.

Each Service Filter Kit includes the following items:

^ One (1) Pancake Filter (to be installed in the liquid line between the condenser and the orifice tube)

^ One (1) Instruction Sheet

NOTE

ON 1993-94 RANGER/EXPLORER VEHICLES, TECHNICIANS MAY EXPERIENCE DIFFICULTY WHEN CONNECTING THE PANCAKE FILTER HOSE FITTINGS TO THE EVAPORATOR INLET WITH THE ORIFICE TUBE INSTALLED. REMOVE THE OFFICE TUBE AND RUN THE SYSTEM FOR 1 HOUR AS DESCRIBED IN THE FILTERING PROCEDURE. REINSTALL THE ORIFICE TUBE AFTER FILTERING IS COMPLETE.

CAUTION

FOLLOW ALL REFRIGERANT SYSTEM SAFETY AND SERVICE PRECAUTIONS OUTLINED IN THE APPROPRIATE SERVICE OR WORKSHOP MANUAL.

1. Before removing any refrigerant system components, recover the refrigerant from the system following the recycling methods outlined In the appropriate Service/Workshop Manual.

2. Remove the suction accumulator/drier assembly and drain the oil into a calibrated container.

3. Install a new suction accumulator/drier and add new refrigerant oil to replace the old oil. The quantity of the new oil to be added is the amount to match that drained from the old accumulator plus 60 mL (2 oz). Refer to the Dealer Master Parts Catalog for the correct suction accumulator/drier part number.

CAUTION

REMEMBER TO USE MOTORCRAFT YN-9-A REFRIGERANT COMPRESSOR OIL WITH R-12 SYSTEMS AND MOTORCRAFT YN-12-C REFRIGERANT COMPRESSOR OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

4. Install a new orifice tube. Refer to the Dealer Master Parts Catalog for the correct orifice tube part number. If the orifice tube in the vehicle is located in the liquid line between the condenser and the evaporator, replace the liquid line assembly.

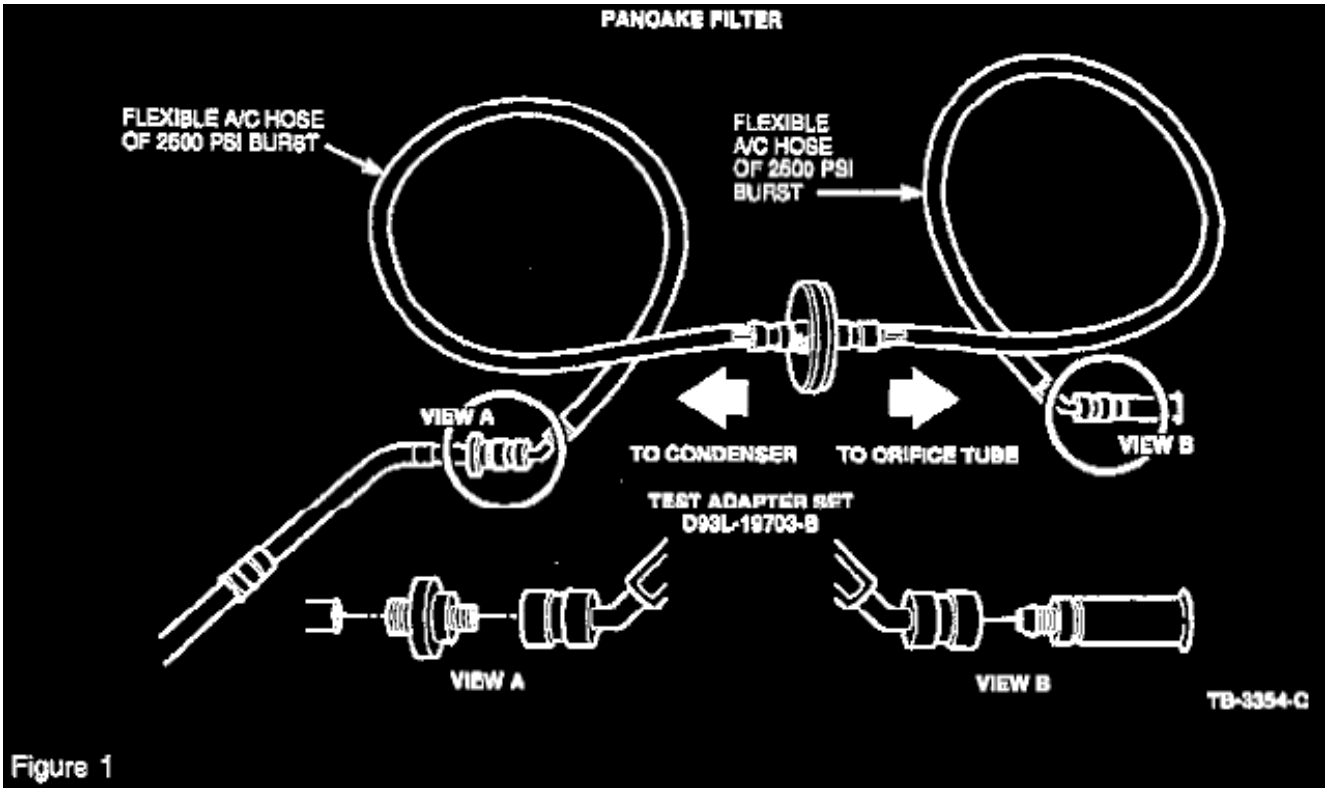


Figure 1

5. Install pancake filter in the liquid line between the condenser and the orifice tube, Figure 1.

a. Be sure orifice inlet is toward the condenser.

b. Connections can be made using Test Adapter Set D93L-19703-B, or equivalent, and flexible refrigerant hose of 2500 psi burst rating. Individual fittings are also available.

6. Remove the old compressor following Service/Workshop Manual procedures. Drain the oil into a calibrated container.

7. Drain the oil from the replacement compressor into a clean calibrated container.

NOTE:

IT WILL BE NECESSARY TO TRANSFER THE MAGNET CLUTCH FROM THE OLD COMPRESSOR TO THE REPLACEMENT COMPRESSOR. FOLLOW SERVICE/WORKSHOP MANUAL PROCEDURES.

8. A new FX-15 service compressor contains 207 mL (7 oz.) of R-12 refrigerant oil. A new FS-10 service compressor does not contain any oil and can be used with an R-12 or an R-134a system.

CAUTION

REMEMBER TO USE YN-9-A (MINERAL) OIL WITH R-12 SYSTEMS AND YN-12-C (PAG) OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

^ If the amount of oil drained from the removed compressor is between 90 and 148 mL (3-5 oz), pour the same amount of clean refrigerant oil into the new compressor.

^ If the amount of oil drained from the old compressor is greater than 90 mL (3 oz), pour 90 mL (3 oz) of clean refrigerant oil into the new compressor.

9. Install the new compressor following Service/Workshop Manual procedures. Make sure all mounting bolts are tightened properly. Check the tension of the compressor drive belt. Adjust if necessary.

10. Evacuate, charge and leak test the system, following Service/Workshop Manual procedures.

11. Check all refrigerant system hoses, lines and the position of the newly-installed filters to make sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

12. Set the A/C control on Max A/C, high blower and temperature control at full cold.

a. Start engine and let idle briefly.

b. Be sure A/C system is operating properly.

13. Gradually bring the engine up to 1200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1000 rpm). Set the engine at 1200 rpm and run it for an hour with the A/C system operating.

14. Stop the engine.

NOTE:

IT WILL BE NECESSARY TO RECOVER THE SYSTEM REFRIGERANT CHARGE BEFORE PROCEEDING.

15. Allow the engine to cool sufficiently to remove the fittings, flexible hoses and pancake filter from the liquid line.

16. Discard the filter. It can be used one (1) tie only.

17. Reconnect the liquid line back into the system.

18. Evacuate, charge and leak test the system. Make any necessary adjustments.

19. Check the operation of the system in all models.

PART NUMBER PART NAME

F8VZ-19E773-AA Filter Kit

F73Z-19577-AA Refrigerant Oil - Motorcraft YN-9-A (For R-12 Refrigerant Systems Only)

F7AZ-19589-DA Refrigerant Oil - Motorcraft YN-12-C (PAG-Type Oil For R-134a Refrigerant Systems Only)

NOTE

THE TOTAL REPAIR TIME IS FOR INSTALLING SERVICE FILTER KIT PER INSTRUCTIONS THIS INCLUDES INSTALLATION OF AND DISCARD OF FILTER. REFER TO SERVICE LABOR TIME STANDARDS MANUALS IF ADDITIONAL LABOR OPERATIONS ARE REQUIRED.

Refrigerant: Technical Service Bulletins Air Conditioning - Use of Correct Fluorescent Tracer Dye

Article No. 93-20-6

09/29/93

AIR CONDITIONING - USE OF CORRECT FLUORESCENT TRACER DYE - SERVICE TIP

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1993 VILLAGER

ISSUE: Use of untested, unapproved fluorescent tracer dyes for A/C system leak checking may damage the air conditioning system. Some of these materials may not be compatible with Ford A/C systems.

ACTION: When leak-checking an R-12 A/C system with a "black light", use only Rotunda-supplied Part No. 112-R0027, Fluoro-Lite brand dye. No other dyes have been approved by Ford Motor Company.

NOTE: 112-R0027 DYE IS NOT COMPATIBLE WITH R-134a REFRIGERANT.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208999

Refrigerant: Technical Service Bulletins R-12 Refrigerant - Substitutes

Article No. 94-14-3

07/13/94

Air Conditioning - Use Of R-12 Refrigerant Substitutes - Service Tip

FORD: 1980-93 CROWN VICTORIA 1981-93 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-93 MUSTANG, THUNDERBIRD 1983-86 LTD 1984-93 TEMPO 1986-93 TAURUS 1988-93 FESTIVA 1989-93 PROBE

LINCOLN-MERCURY: 1980-93 GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1982-83 LN7, ZEPHYR 1982-86 CAPRI 1982-93 CONTINENTAL, COUGAR 1983-86 MARQUIS 1984-92 MARK VII 1984-93 TOPAZ 1986-93 SABLE 1991-93 CAPRI, TRACER

MERKUR: 1986-89 SCORPIO, XR4TI

LIGHT TRUCK: 1980-93 BRONCO, ECONOLINE, F-150-350 SERIES 1983-93 RANGER 1984-90 BRONCO II 1986-93 AEROSTAR 1988-93 F-47 1991-93 EXPLORER 1992-94 F-53 1993 VILLAGER

MEDIUM/HEAVY TRUCK: 1954-90 C SERIES 1970-94 L SERIES 1979-90 CL-9000, CL-CLT-9000 SERIES 1980-94 F SERIES 1986-94 CARGO SERIES

This TSB is being republished in its entirety to include Heavy Truck models.

ISSUE:

A number of manufacturers are producing refrigerant products which are described as being direct replacements for refrigerant R-12. The use of any unauthorized substitute refrigerant may severely damage the A/C system components.

ACTION:

If service is required, use only NEW or RECYCLED refrigerant R-12.

Ford Motor Company has not tested or approved any R-12 refrigerant substitute at this time. R-134a is approved only for systems which specify R-134a,

and is not compatible with R-12 systems.

R-22 likewise, is not compatible with R-12 systems.

CAUTION:

USING ANY UNAUTHORIZED SUBSTITUTE REFRIGERANT FOR R-12 MAY RESULT IN SEVERE DAMAGE TO THE A/C SYSTEM COMPONENTS.

OTHER APPLICABLE ARTICLES: 91-9-7

SUPERSEDES: 93-23-11

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999, 290000

Refrigerant: Capacity Specifications

A/C Refrigerant Capacity ..... 32 oz

Refrigerant: Fluid Type Specifications

A/C Refrigerant Type R-12

Technical Service Bulletin # 98-12-5 Date: 980622

A/C - Filtering Refrigerant After Compressor Replacement

Article No. 98-12-5

06/22/98

AIR CONDITIONING - FILTERING REFRIGERANT

AFTER A/C COMPRESSOR REPLACEMENT - SERVICE TIPS

FORD: 1980-98 CROWN VICTORIA 1981-98 ESCORT 1982-83 FAIRMONT 1982-88 EXP 1982-97 THUNDERBIRD 1982-98 MUSTANG 1983-86 LTD 1984-94 TEMPO 1986-98 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-98 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1980-98 GRAND MARQUIS, TOWN CAR 1982-83 ZEPHYR 1982-86 CAPRI 1982-87 LN7 1982-97 COUGAR 1982-98 CONTINENTAL 1983-86 MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-98 SABLE 1991-94 CAPRI 1991-98 TRACER 1993-98 MARK VIII 1995-98-MYSTIQUE 1999 COUGAR

LIGHT TRUCK: 1980-96 BRONCO 1980-97 F SUPER DUTY 1980-98 ECONOLINE, F-150, F-150, F-350 1983-98 RANGER 1984-90 BRONCO II 1986-97 AEROSTAR 1988-97 F-47 1991-98 EXPLORER 1993-98 VILLAGER 1995-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to revise the Service Procedure and to update the model years.

ISSUE Vehicles that have and inoperative A/C compressor, due to internal causes, MUST have the refrigerant system cleaned to remove any debris or contaminants that may be present to prevent damage to the replacement compressor.

ACTION

Install a Service Filter Kit in the refrigerant system prior to installing the replacement compressor. Refer to the following Service Procedure for details.

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 96-15-5

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-99 Models And 1991 Lincolns, Basic Warranty Coverage For All Other Models And Major Component Warranty Coverage For All Other Lincoins

OPERATION DESCRIPTION TIME

981205A Kit Installation 1.2 Hrs.

981205B Extra Time For Refrigerant 0.4 Hr.

(R-12) Recovery

DEALER CODING

CONDITION

BASIC PART NO. CODE

19703 49

OASIS CODES: 208000, 208999

Service Procedure

THIS PROCEDURE IS OPTIONAL IF THE SYSTEM IS FLUSHED USING THE ROTUNDA A/C FLUSHER.

CAUTION

THIS FILTERING PROCEDURE MAY BE USED FOR EITHER R-12 OR R-134a REFRIGERANT SYSTEMS. BECAUSE THE TWO (2) SYSTEMS USE DIFFERENT REFRIGERANT OILS AND BECAUSE THE COMPRESSOR COULD BE DAMAGED IF THE WRONG OIL IS USED, SYSTEM IDENTIFICATION IS VERY IMPORTANT. BE SURE SYSTEM IS CORRECTLY IDENTIFIED BEFORE STARTING THE FILTERING PROCEDURE.

Each Service Filter Kit includes the following items:

^ One (1) Pancake Filter (to be installed in the liquid line between the condenser and the orifice tube)

^ One (1) Instruction Sheet

NOTE

ON 1993-94 RANGER/EXPLORER VEHICLES, TECHNICIANS MAY EXPERIENCE DIFFICULTY WHEN CONNECTING THE PANCAKE FILTER HOSE FITTINGS TO THE EVAPORATOR INLET WITH THE ORIFICE TUBE INSTALLED. REMOVE THE OFFICE TUBE AND RUN THE SYSTEM FOR 1 HOUR AS DESCRIBED IN THE FILTERING PROCEDURE. REINSTALL THE ORIFICE TUBE AFTER FILTERING IS COMPLETE.

CAUTION

FOLLOW ALL REFRIGERANT SYSTEM SAFETY AND SERVICE PRECAUTIONS OUTLINED IN THE APPROPRIATE SERVICE OR WORKSHOP MANUAL.

1. Before removing any refrigerant system components, recover the refrigerant from the system following the recycling methods outlined In the appropriate Service/Workshop Manual.

2. Remove the suction accumulator/drier assembly and drain the oil into a calibrated container.

3. Install a new suction accumulator/drier and add new refrigerant oil to replace the old oil. The quantity of the new oil to be added is the amount to match that drained from the old accumulator plus 60 mL (2 oz). Refer to the Dealer Master Parts Catalog for the correct suction accumulator/drier part number.

CAUTION

REMEMBER TO USE MOTORCRAFT YN-9-A REFRIGERANT COMPRESSOR OIL WITH R-12 SYSTEMS AND MOTORCRAFT YN-12-C REFRIGERANT COMPRESSOR OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

4. Install a new orifice tube. Refer to the Dealer Master Parts Catalog for the correct orifice tube part number. If the orifice tube in the vehicle is located in the liquid line between the condenser and the evaporator, replace the liquid line assembly.

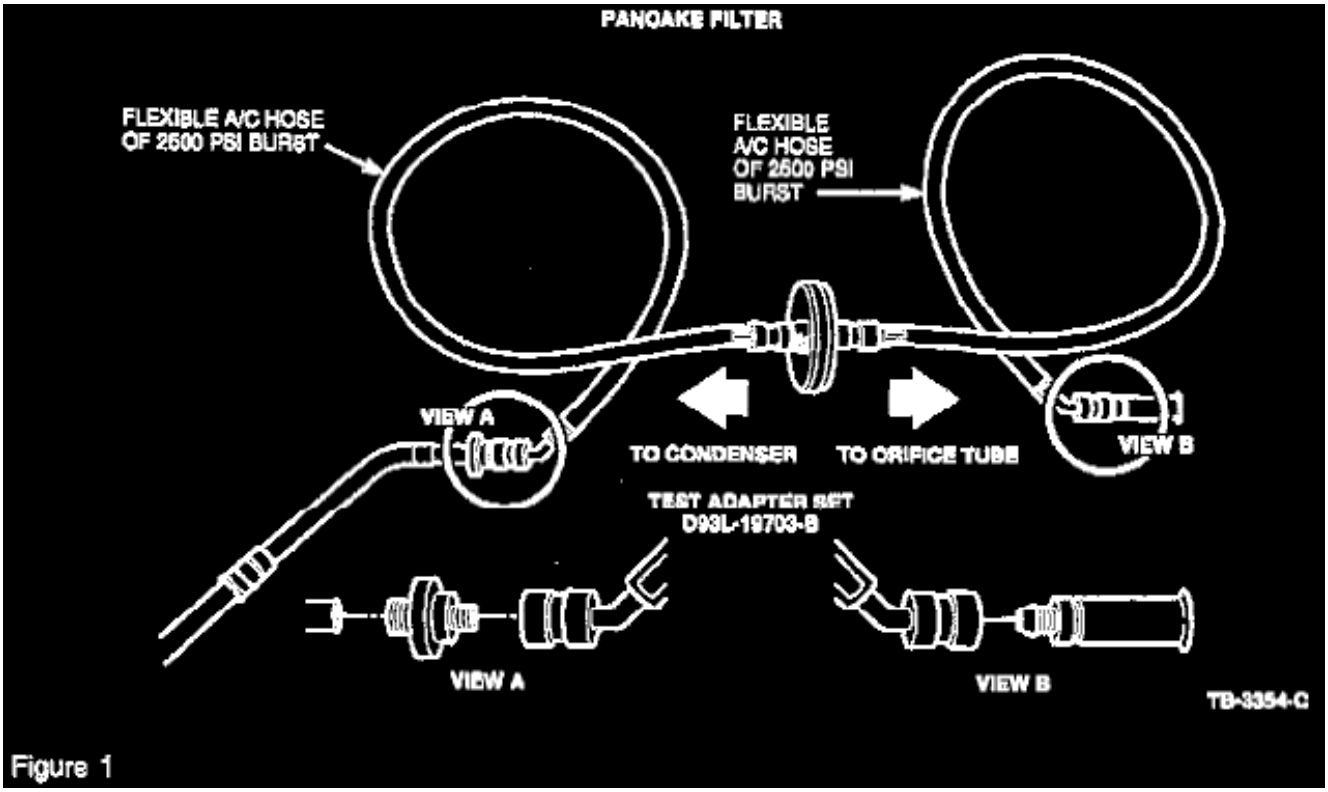


Figure 1

5. Install pancake filter in the liquid line between the condenser and the orifice tube, Figure 1.

a. Be sure orifice inlet is toward the condenser.

b. Connections can be made using Test Adapter Set D93L-19703-B, or equivalent, and flexible refrigerant hose of 2500 psi burst rating. Individual fittings are also available.

6. Remove the old compressor following Service/Workshop Manual procedures. Drain the oil into a calibrated container.

7. Drain the oil from the replacement compressor into a clean calibrated container.

NOTE:

IT WILL BE NECESSARY TO TRANSFER THE MAGNET CLUTCH FROM THE OLD COMPRESSOR TO THE REPLACEMENT COMPRESSOR. FOLLOW SERVICE/WORKSHOP MANUAL PROCEDURES.

8. A new FX-15 service compressor contains 207 mL (7 oz.) of R-12 refrigerant oil. A new FS-10 service compressor does not contain any oil and can be used with an R-12 or an R-134a system.

CAUTION

REMEMBER TO USE YN-9-A (MINERAL) OIL WITH R-12 SYSTEMS AND YN-12-C (PAG) OIL WITH R-134a SYSTEMS. FAILURE TO USE THE CORRECT REFRIGERANT OIL MAY RESULT IN DAMAGE TO SYSTEM COMPONENTS.

^ If the amount of oil drained from the removed compressor is between 90 and 148 mL (3-5 oz), pour the same amount of clean refrigerant oil into the new compressor.

^ If the amount of oil drained from the old compressor is greater than 90 mL (3 oz), pour 90 mL (3 oz) of clean refrigerant oil into the new compressor.

9. Install the new compressor following Service/Workshop Manual procedures. Make sure all mounting bolts are tightened properly. Check the tension of the compressor drive belt. Adjust if necessary.

10. Evacuate, charge and leak test the system, following Service/Workshop Manual procedures.

11. Check all refrigerant system hoses, lines and the position of the newly-installed filters to make sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.

12. Set the A/C control on Max A/C, high blower and temperature control at full cold.

a. Start engine and let idle briefly.

b. Be sure A/C system is operating properly.

13. Gradually bring the engine up to 1200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1000 rpm). Set the engine at 1200 rpm and run it for an hour with the A/C system operating.

14. Stop the engine.

NOTE:

IT WILL BE NECESSARY TO RECOVER THE SYSTEM REFRIGERANT CHARGE BEFORE PROCEEDING.

15. Allow the engine to cool sufficiently to remove the fittings, flexible hoses and pancake filter from the liquid line.

16. Discard the filter. It can be used one (1) tie only.

17. Reconnect the liquid line back into the system.

18. Evacuate, charge and leak test the system. Make any necessary adjustments.

19. Check the operation of the system in all models.

PART NUMBER PART NAME

F8VZ-19E773-AA Filter Kit

F73Z-19577-AA Refrigerant Oil - Motorcraft YN-9-A (For R-12 Refrigerant Systems Only)

F7AZ-19589-DA Refrigerant Oil - Motorcraft YN-12-C (PAG-Type Oil For R-134a Refrigerant Systems Only)

NOTE

THE TOTAL REPAIR TIME IS FOR INSTALLING SERVICE FILTER KIT PER INSTRUCTIONS THIS INCLUDES INSTALLATION OF AND DISCARD OF FILTER. REFER TO SERVICE LABOR TIME STANDARDS MANUALS IF ADDITIONAL LABOR OPERATIONS ARE REQUIRED.

FS-10 Compressors	
Tag Part Number	Oil Type/System
F1DH-19497-BA	Mineral/R-12
F3CH-19497-BB	Mineral/R-12
F3DH-19497-BB	PAG/R-134a
F3LH-19497-BB	PAG/R-134a
F3SH-19497-BB	Mineral/R-12
F3VH-19497-BB	Mineral/R-12
F3ZH-19497-BB	Mineral/R-12
93EW-19497-BB	PAG/R-134a
94EW-19497-BB	PAG/R-134a

Refrigerant Oil: Technical Service Bulletins A/C Compressor - Service Tips

Article No. 94-15-6

07/27/94

AIR CONDITIONING - FS-10 AND FX-15 COMPRESSORS - SERVICE TIPS

FORD: 1988-94 CROWN VICTORIA, ESCORT, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1988-92 MARK VII 1988-94 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOPAZ, TOWN CAR 1991-94 TRACER 1993-94 MARK VIII

LIGHT TRUCK: 1988-90 BRONCO II 1988-94 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1991-94 EXPLORER 1993-94 VILLAGER

ISSUE: FS-10 service compressors built between 1/1/93 and 9/30/93 were built with 7 oz. of oil. These compressors have a white label and are labeled to be compatible with either R-12 or R-134a. These compressors contain either PAG oil or Mineral oil and should be used only in the proper systems.

ACTION: Refer to the chart to determine the type of oil that is in each service compressor.

NOTE:

BE SURE TO CHOOSE THE COMPRESSOR THAT HAS THE CORRECT OIL FOR THE SYSTEM BEING SERVICED.

NOTE:

FS-10 COMPRESSORS BUILT AFTER 9/30/93 ARE NOT FILLED WITH OIL AND HAVE A YELLOW LABEL. THESE COMPRESSORS REQUIRE THE CORRECT AMOUNT OF EITHER MINERAL OIL OR PAG OIL DEPENDING ON THE SYSTEM BEING SERVICED.

NOTE:

FX-15 SERVICE COMPRESSORS BUILT BEFORE 1/1/93 ARE FILLED WITH MINERAL OIL AND ARE ONLY COMPATIBLE WITH R-12 SYSTEMS.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 208000, 208999

Refrigerant Oil: Technical Service Bulletins A/C Compressor - Oil Recovery & Measuring Procedure

Article No. 92-24-6

11/18/92

AIR CONDITIONING - FX-15 AIR COMPRESSOR - OIL RECOVERY AND MEASURING PROCEDURE

FORD: 1988-93 TAURUS 1989-93 CROWN VICTORIA, THUNDERBIRD 1992-93 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-93 SABLE 1989-93 COUGAR 1991-93 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992-93 TOPAZ, TRACER

LIGHT TRUCK: 1989-90 BRONCO II 1989-93 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-93 EXPLORER

This article is being republished in its entirety to clarify the information about removing oil from both the "old" and "new" compressors.

ISSUE: When replacing the FX-15 Compressor it is very important to accurately match the amount of oil being replaced. Some dealerships have indicated that they are unable to properly match the amounts of oil being replaced.

ACTION: Replace the amount of oil being drained from the FX-15 compressor with an equal amount of new oil to assure proper compressor operation. Refer to the following service procedure for service details.

SERVICE - PROCEDURE

1. With both "OLD" and "NEW" compressors, remove as much oil as possible. On both compressors, the shaft should be rotated about six to eight revolutions while pouring the oil from the ports. This effectively empties the compressor of oil.

a. Obtain a clean container that can also be used as a measuring device.

b. Place the disc and hub assembly on the compressor shaft so the shaft can be rotated.

c. Rotate the shaft by hand (6) six to (8) eight revolutions, collecting the oil in a clean measuring device.

NOTE: SERVICE COMPRESSORS COME PRE-CHARGED WITH 7 OUNCES OF OIL

2. If the amount of oil drained from the old compressor is between (3) three and (5) five fluid ounces (85 and 142 cc), pour the same amount of clean Motorcraft YN-9 refrigerant oil into the new compressor.

3. If the amount of oil that was removed from the old compressor is greater than (5) fluid ounces (142 cc), pour five ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

4. If the amount of refrigerant oil that was removed from the old compressor is less than (3) three fluid ounces (85 cc), pour three fluid ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

NOTE: THE SUCTION/ACCUMULATOR-DRYER AND ORIFICE TUBE MUST BE REPLACED WHENEVER THE COMPRESSOR IS REPLACED.

PART NUMBER	PART NAME	CLASS
E73Z-19577-A	Refrigerant Oil (Motorcraft YN-9)	B

Part Number/Name Chart

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 92-18-4

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208200, 208999, 290000

PART NUMBER	PART NAME	CLASS
E73Z-19577-A	Refrigerant Oil (Motorcraft YN-9)	B

Refrigerant Oil: Technical Service Bulletins A/C Compressor - Oil Recovery/Measuring Procedures

Article No. 92-18-4

08/26/92

AIR CONDITIONING - FX-15 AIR COMPRESSOR - OIL RECOVERY AND MEASURING PROCEDURE

FORD: 1988-93 TAURUS 1989-93 CROWN VICTORIA, THUNDERBIRD 1992-93 ESCORT, TEMPO

LINCOLN-MERCURY: 1988-93 SABLE 1989-93 COUGAR 1991-93 CONTINENTAL, GRAND MARQUIS, TOWN CAR 1992-93 TOPAZ, TRACER

LIGHT TRUCK: 1989-90 BRONCO II 1989-93 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1990-93 EXPLORER

ISSUE: When replacing the FX-15 compressor it is very important to accurately match the amount of oil being replaced. Some dealerships have indicated that they are unable to properly match the amounts of oil being replaced.

ACTION: Replace the amount of oil being drained from the FX-15 compressor with an equal amount of new oil, to assure proper compressor operation. Refer to the following service procedure for service details.

SERVICE - PROCEDURE

1. Remove as much oil as possible from the compressor. The compressor shaft should be rotated about six to eight revolutions allowing the oil to drain from the compressor ports.

a. Obtain a clean container that can be also used as a measuring device.

b. Place the disc and hub assembly on the compressor shaft so the shaft can be rotated.

c. Rotate the shaft by hand (6) six to (8) eight revolutions allowing the oil to drain from the ports, while collecting the oil in the clean measuring device.

NOTE: SERVICE COMPRESSORS COME PRE-CHARGED WITH 7 OUNCES OF OIL

2. If the amount of oil drained from the old compressor is between (3) three and (5) five fluid ounces, pour the same amount of clean Motorcraft YN-9 refrigerant oil into the new compressor.

3. If the amount of oil that was removed from the old compressor is greater than (5) fluid ounces, pour five ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

4. If the amount of refrigerant oil that was removed from the old compressor is less than (3) three fluid ounces, pour three fluid ounces of clean Motorcraft YN-9 refrigerant oil into the new compressor.

NOTE: THE SUCTION/ACCUMULATOR-DRYER AND ORIFICE TUBE MUST BE REPLACED WHENEVER THE COMPRESSOR IS REPLACED.

Part Number

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208200

Refrigerant Oil: Technical Service Bulletins A/C - Adding Refrigerant Oil Service Tip

Article No. 95-5-12

03/13/95

AIR CONDITIONING - ADDING REFRIGERANT OIL - SERVICE TIP

FORD: 1990-93 FESTIVA 1990-94 TEMPO 1990-95 CROWN VICTORIA, ESCORT, MUSTANG, PROBE, TAURUS, THUNDERBIRD 1994-95 ASPIRE

LINCOLN-MERCURY: 1990-92 MARK VII 1990-94 TOPAZ 1990-95 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1991-94 CAPRI 1993-95 MARK VIII MERKUR: 1990 SCORPIO

LIGHT TRUCK: 1990 BRONCO II 1990-95 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, RANGER 1991-95 EXPLORER 1993-95 VILLAGER 1995 WINDSTAR

MEDIUM/HEAVY TRUCK: 1990-91 C SERIES, CL-CLT-9000 SERIES 1990-95 CARGO SERIES, F & B SERIES, L SERIES

ISSUE: Current repair procedures do not advise on the addition of refrigerant oil to the A/C system when a minor repair is made.

ACTION: Add 0.06 L (2 oz) of the proper type new refrigerant oil to the system,. before recharging, when servicing concerns that do not require major component replacement. Repairs considered minor are: O-ring leaks, charge port leaks, Pressure Relief Valve (PRV) leaks, compressor shaft seal leaks, hose leaks, etc. Remember to use polyalkylene glycol (PAG) oil with R-134a systems and mineral oil with R-12 systems.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 208000, 208999

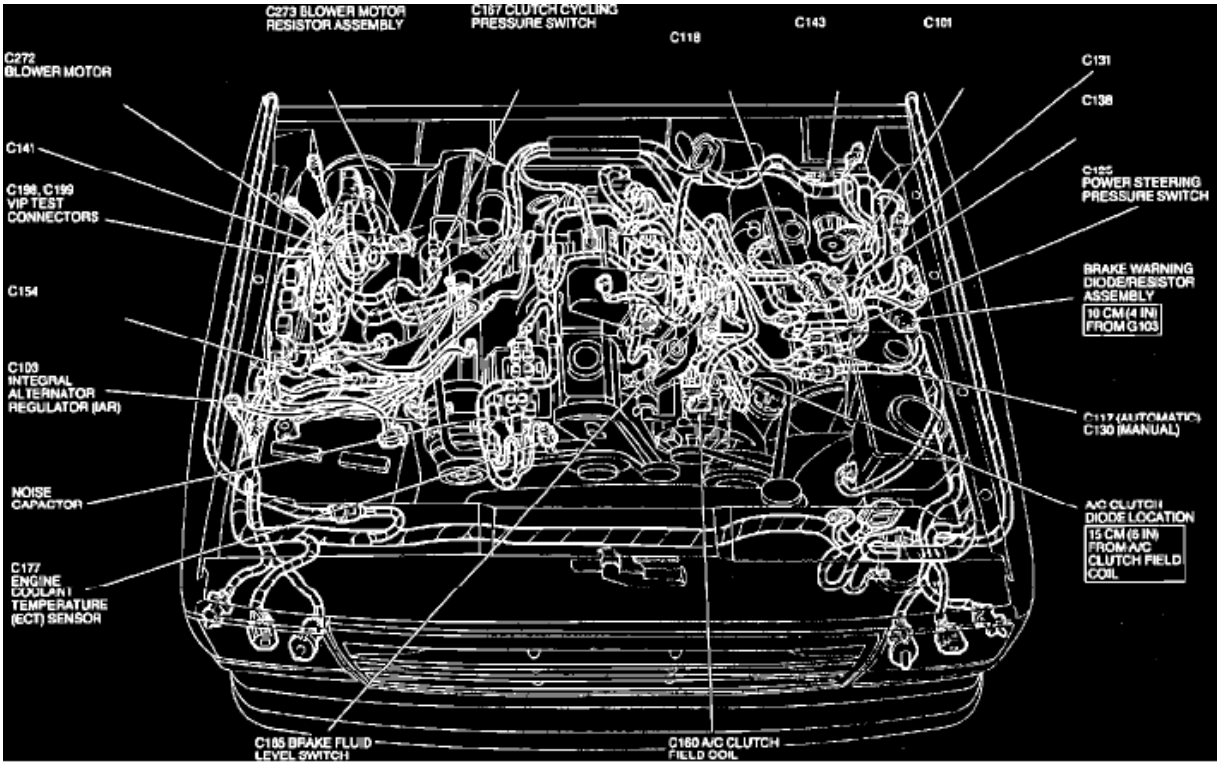
Refrigerant Oil: Capacity Specifications

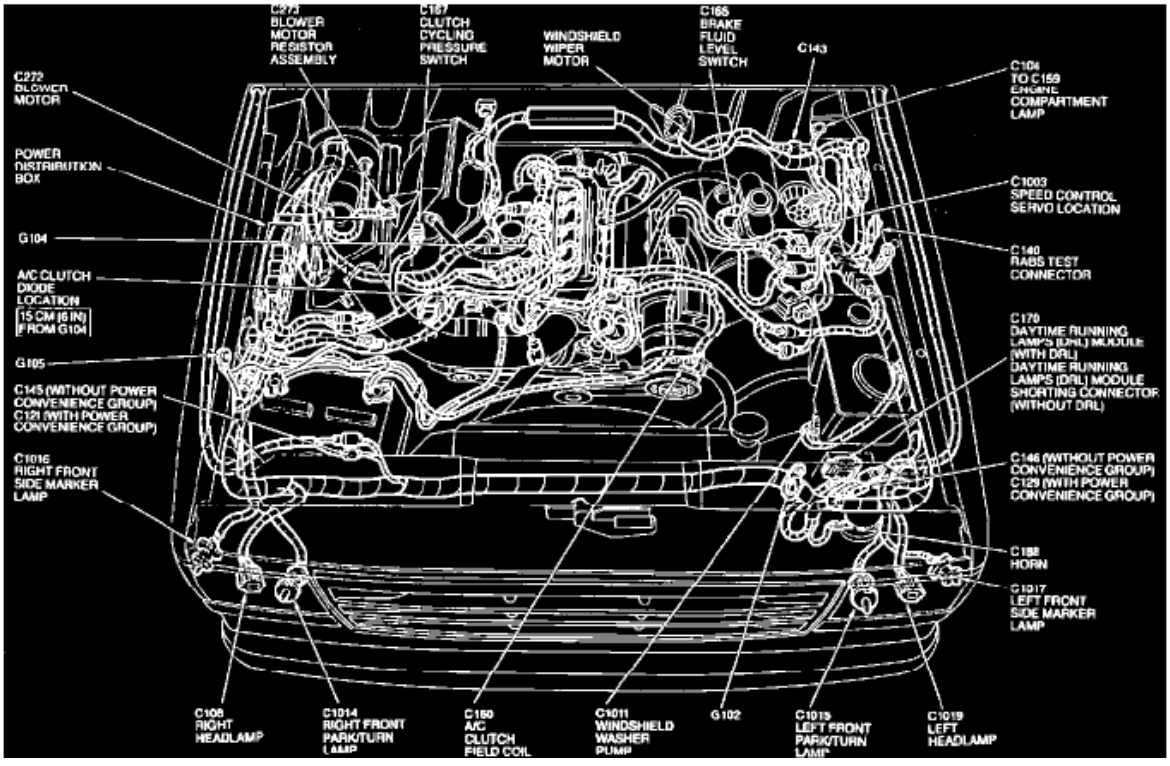
Refrigerant Oil System Capacity ..... 7.0 oz

Refrigerant Oil: Fluid Type Specifications

Paraffin base viscosity refrigerant oil, part no. Motorcraft YN-9

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Heating and Air Conditioning > Refrigerant Pressure Sensor / Switch, HVAC > Component Information > Locations





Refrigerant Pressure Sensor / Switch: Locations

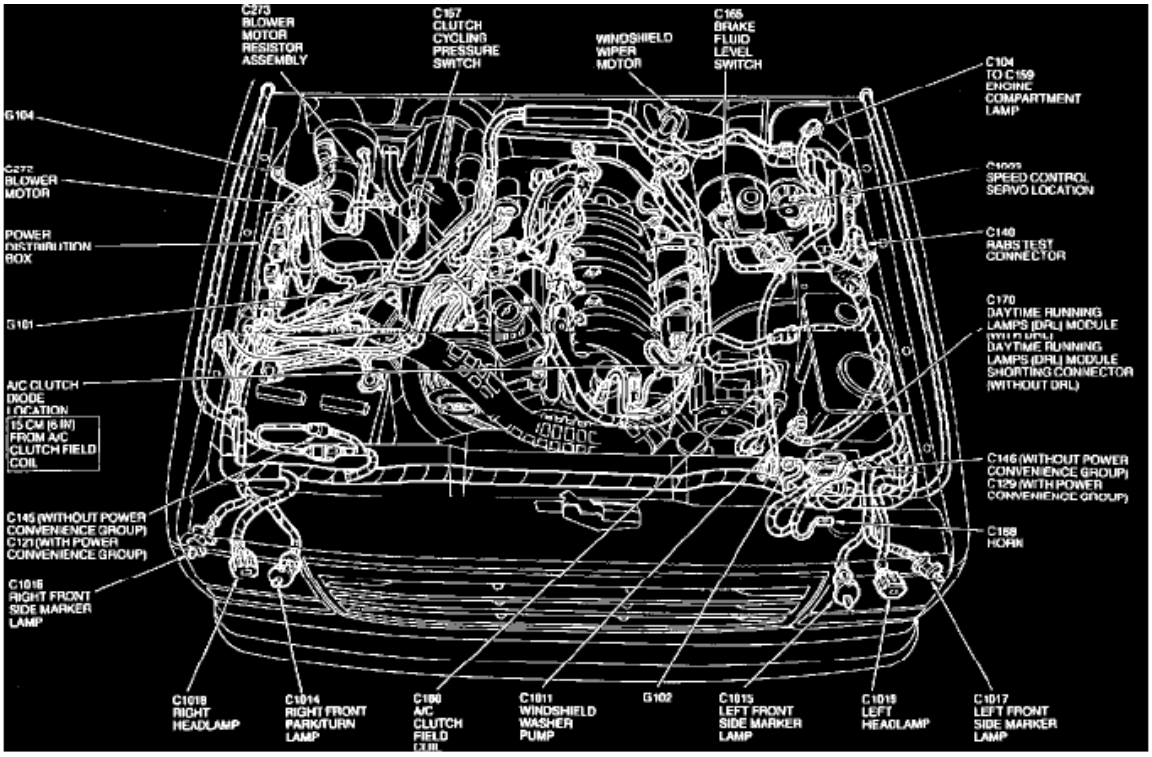
Engine Compartment Components.

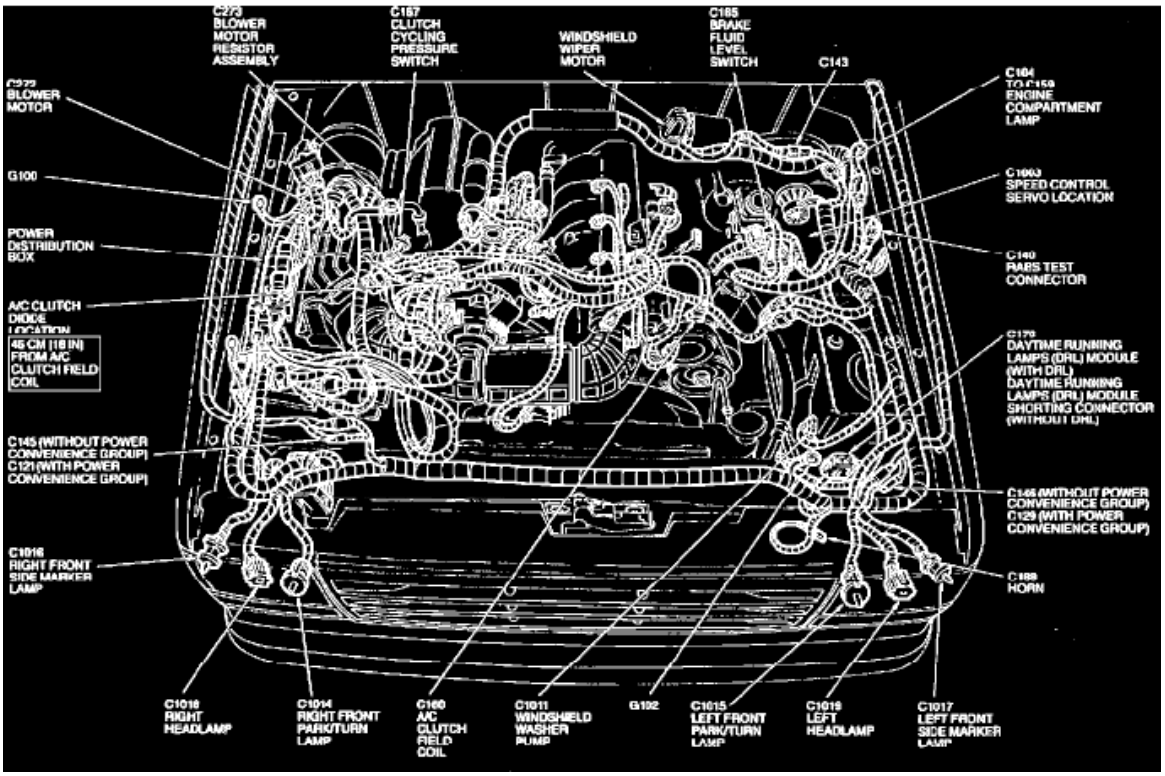
RH Side Of Engine Compartment, On A/C Accumulator

Applicable to: 2.3L/4-140

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C104
ENGINE COMPARTMENT LAMP
G100
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
46 CM (18 IN) FROM A/C CLUTCH FIELD COIL
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C188
HORN
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Applicable to: 2.9L/V6-179

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator

Applicable to: 3.0L/V6-181

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator

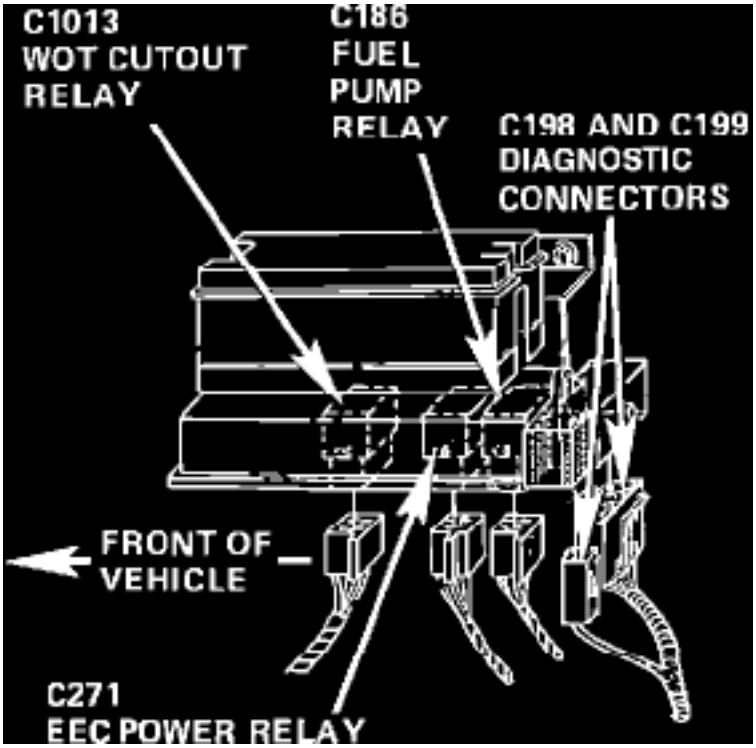
Applicable to: 4.0L/V6-244

• Compressor Clutch doesn't operate.	• No voltage at Clutch Cycling Pressure Switch. • Inoperative Clutch Cycling Pressure Switch. • No voltage at A/C Clutch Field Coil. • Inoperative A/C Clutch Field Coil.	• Fuse 7 blown. • Remove Connector from Cluich Cycling Pressure Switch. With the A/C-Heater Control Assembly Switch in the ON position, check for battery voltage at the 348 (P) wire. • Check the Clutch Cycling Pressure Switch for continuity. No continuity indicates low refrigerant, or an inoperative Clutch Cycling Pressure Switch. Check refrigerant system. • Remove connector from the A/C Clutch Field Coil. Check the wire connector for battery voltage. Check the EEC Module (including Throttle Position Sensor and Coolant Temperature Sensor) and the WOT Cutout Relay for correct operation. • Repair A/C Clutch Field Coil or terminals as required.
• Compressor Clutch won't shut off. • No cooling or not enough cooling (compressor operates).	• A/C Switch or Defrost Switch in A/C-Heater Control Assembly is stuck closed. • Clutch plates have no air gap. • Loose A/C Compressor drive belt. • Temperature Blend door out of adjustment. • Too much or too little Refrigerant in system.	• Remove connector from the A/C Clutch Field Coil. Ensure correct voltage for each switch position. • If compressor continues to run with connector disconnected, repair clutch air gap • Check drive belt tension. • Check operation of temperature control cable • Perform refrigerant system diagnosis and problem evaluation

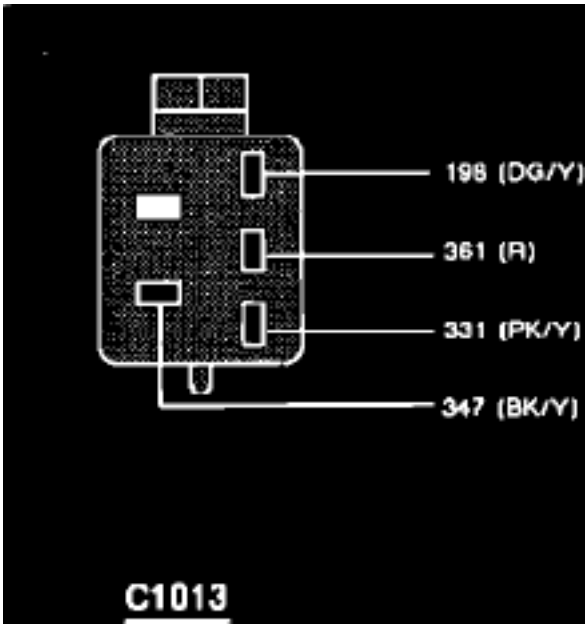
Troubleshooting Hints - Compressor

Refrigerant Pressure Sensor / Switch: Service and Repair

The clutch cycling pressure switch is mounted on a schrader type fitting on the accumulator. Replacement of switch does not require discharge of refrigerant from system.



Relay And Diagnostic Connectors



Wide Open Throttle (WOT) Cutout Relay Connector

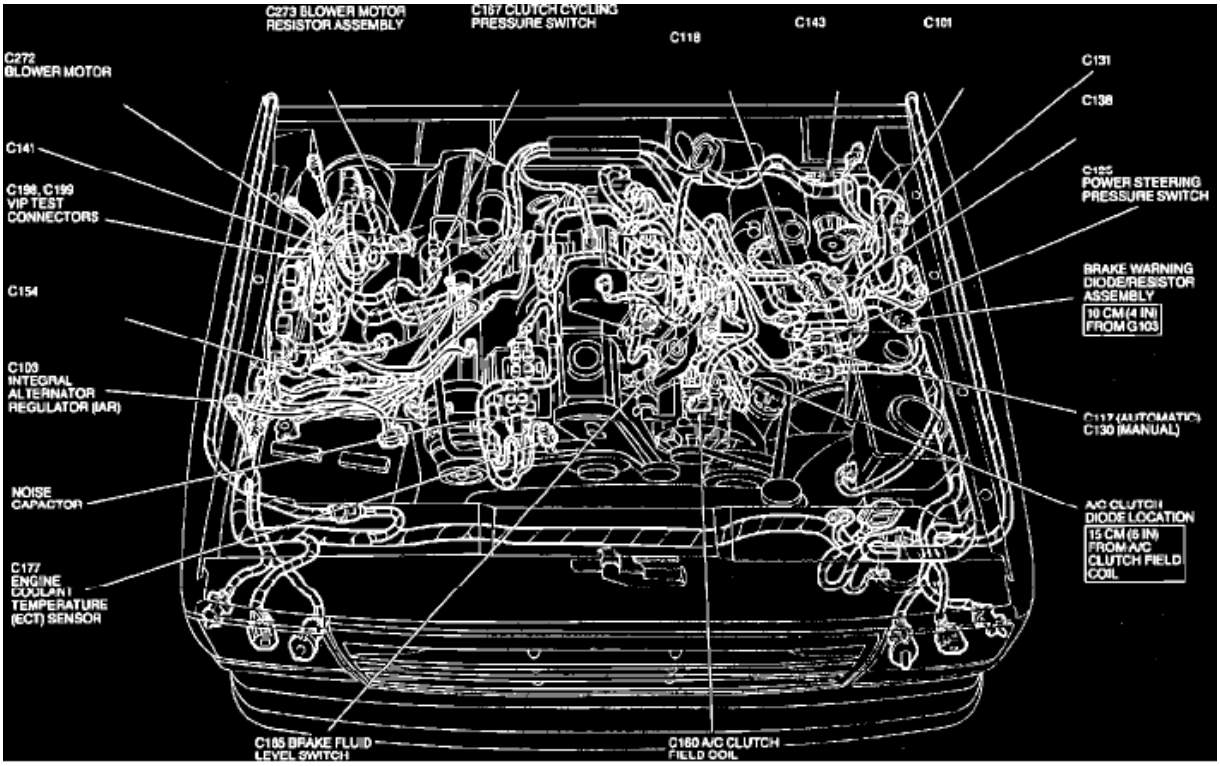
Compressor Clutch Relay: Description and Operation

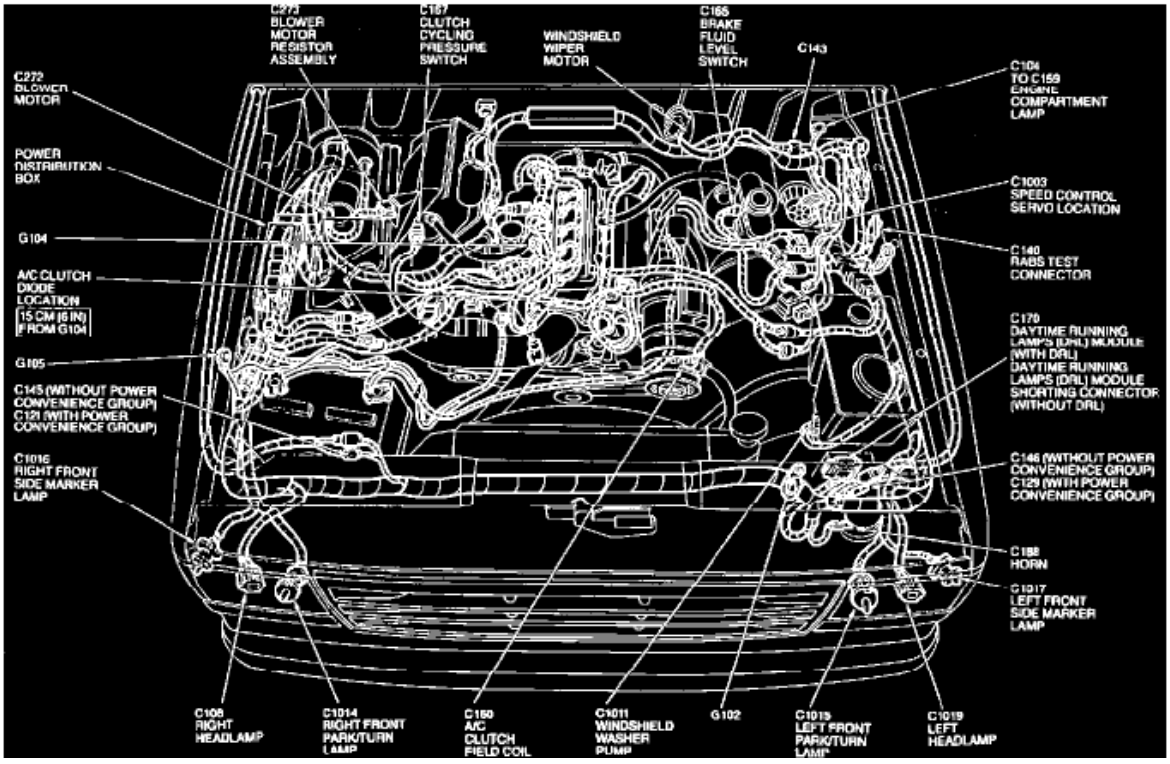
When the vehicle operator goes to Wide Open Throttle (WOT), the Wide open throttle A/C (WAC) relay opens, suspending A/C operation until normal vehicle operation resumes. This is done to allow maximum power to the drive wheels under heavy acceleration or load.

• Compressor Clutch doesn't operate.	• No voltage at Clutch Cycling Pressure Switch.	• Fuse 7 blown. • Remove Connector from Cluich Cycling Pressure Switch. With the A/C-Heater Control Assembly Switch in the ON position, check for battery voltage at the 348 (P) wire.
	• Inoperative Clutch Cycling Pressure Switch.	• Check the Clutch Cycling Pressure Switch for continuity. No continuity indicates low refrigerant, or an inoperative Clutch Cycling Pressure Switch. Check refrigerant system.
	• No voltage at A/C Clutch Field Coil.	• Remove connector from the A/C Clutch Field Coil. Check the wire connector for battery voltage. Check the EEC Module (including Throttle Position Sensor and Coolant Temperature Sensor) and the WOT Cutout Relay for correct operation.
	• Inoperative A/C Clutch Field Coil.	• Repair A/C Clutch Field Coil or terminals as required.
• Compressor Clutch won't shut off.	• A/C Switch or Defrost Switch in A/C-Heater Control Assembly is stuck closed.	• Remove connector from the A/C Clutch Field Coil. Ensure correct voltage for each switch position.
• No cooling or not enough cooling (compressor operates).	• Clutch plates have no air gap. • Loose A/C Compressor drive belt. • Temperature Blend door out of adjustment. • Too much or too little Refrigerant in system.	• If compressor continues to run with connector disconnected, repair clutch air gap • Check drive belt tension. • Check operation of temperature control cable • Perform refrigerant system diagnosis and problem evaluation

Troubleshooting Hints - Compressor

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Heating and Air Conditioning > Sensors and Switches - HVAC > Refrigerant Pressure Sensor / Switch, HVAC > Component Information > Locations





Refrigerant Pressure Sensor / Switch: Locations

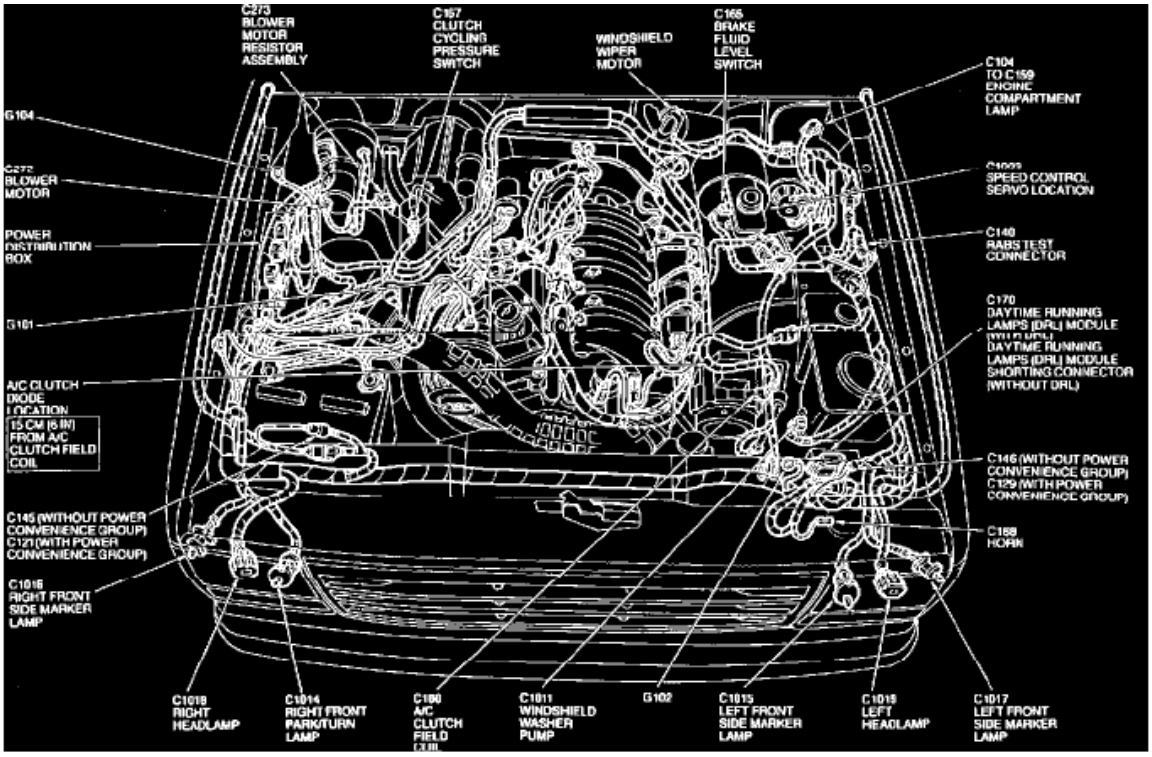
Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator

Applicable to: 2.3L/4-140

Engine Compartment Components.

RH Side Of Engine Compartment, On A/C Accumulator


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C157
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C188
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
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C160
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C1011
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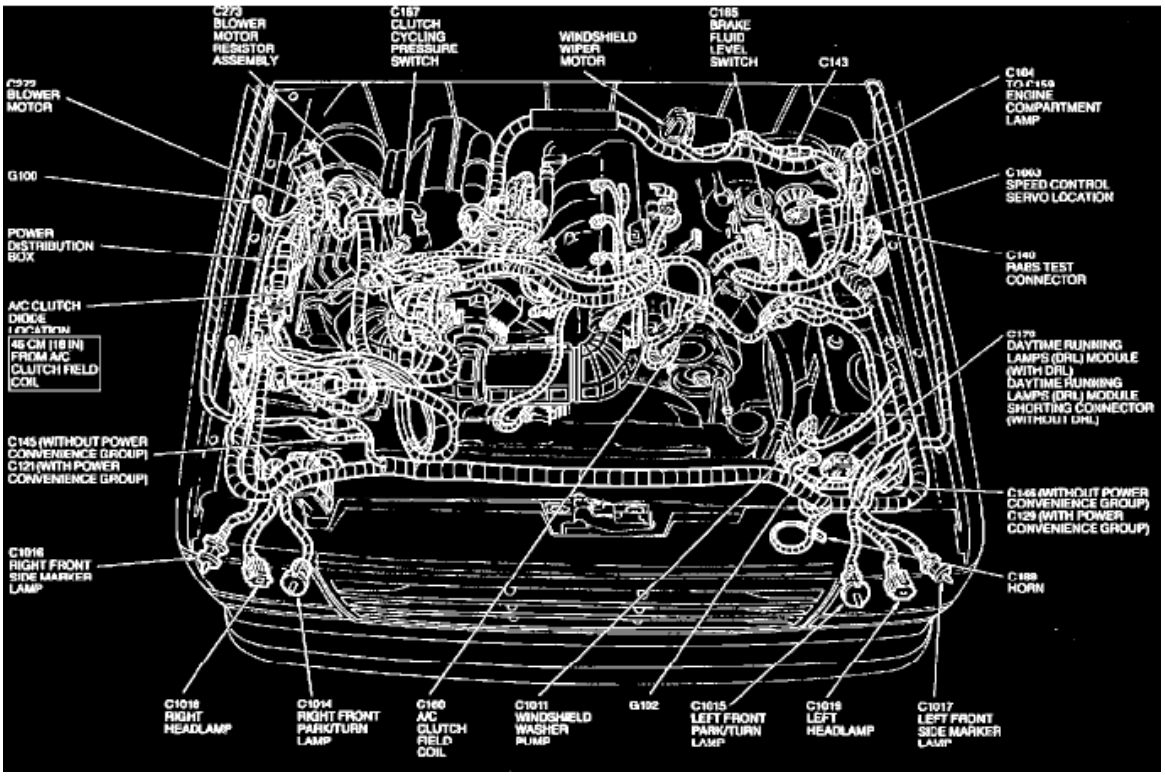
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
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CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C104
TO C159
ENGINE COMPARTMENT LAMP
C272
BLOWER MOTOR
G100
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
45 CM (18 IN) FROM A/C CLUTCH FIELD COIL
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
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C188
HORN
C1018
RIGHT HEADLAMP
C1014
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C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP
C1017
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Applicable to: 2.9L/V6-179

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RH Side Of Engine Compartment, On A/C Accumulator

Applicable to: 3.0L/V6-181

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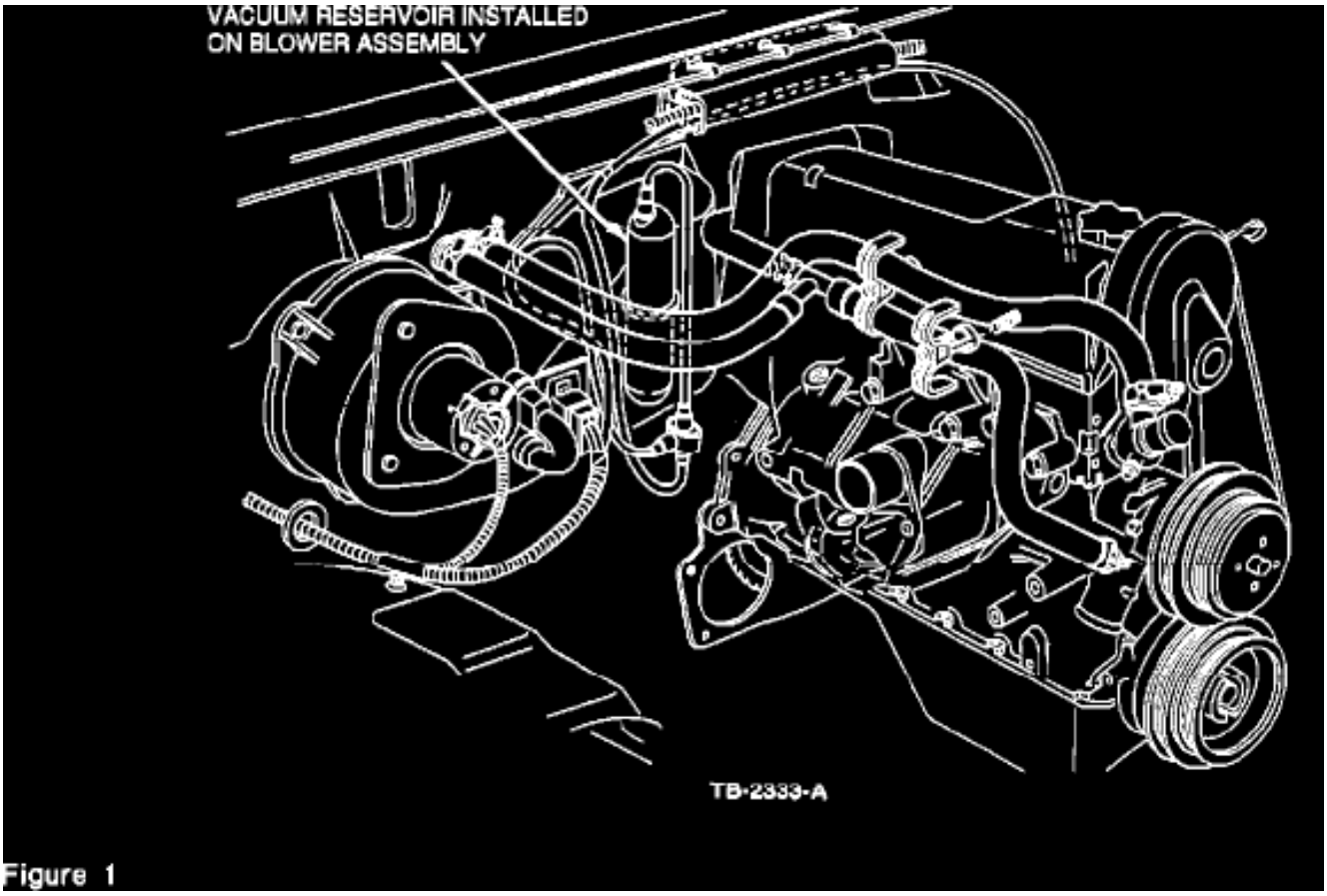

Figure 1

Vacuum Check Valve HVAC: Customer Interest Heater - Air Flow From Panel During Heavy Acceleration

Article No. 94-4-11

02/23/94

HEATER - OBJECTIONABLE AIRFLOW FROM PANEL REGISTERS DURING HEAVY ACCELERATION - NON A/C VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

This TSB article is being republished in its entirety to include 1992 Model vehicles.

ISSUE: Objectionable airflow from the heater system panel registers may occur when the system is in the OFF mode and the vehicle is under heavy acceleration. This condition is caused by movement of the fresh air door when the vacuum to the door actuator is lost during heavy acceleration.

ACTION: Installation of a vacuum hose/reservoir/check valve assembly will provide sufficient vacuum level to maintain proper operation of the heater system in the OFF mode. Refer to the following procedure for service details.

SERVICE PROCEDURE

1. Remove the blower assembly from the vehicle.

2. Drill two holes in the blower assembly, in a vertical position, to allow for installation of the vacuum reservoir. Refer to Figure 1.

3. Using two screws, mount the vacuum reservoir as shown in Figure 1.

4. Disconnect the existing vacuum check valve.

5. Remove the vacuum line which sourced the heater system check valve and attached to an engine vacuum port. Refer to Figure 1.

6. Discard the check valve and vacuum line.

7. Reinstall the blower assembly in the vehicle.

8. Route the new vacuum line and check valve (attached to the reservoir) as the original vacuum line was routed and attach to the original vacuum port.

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300

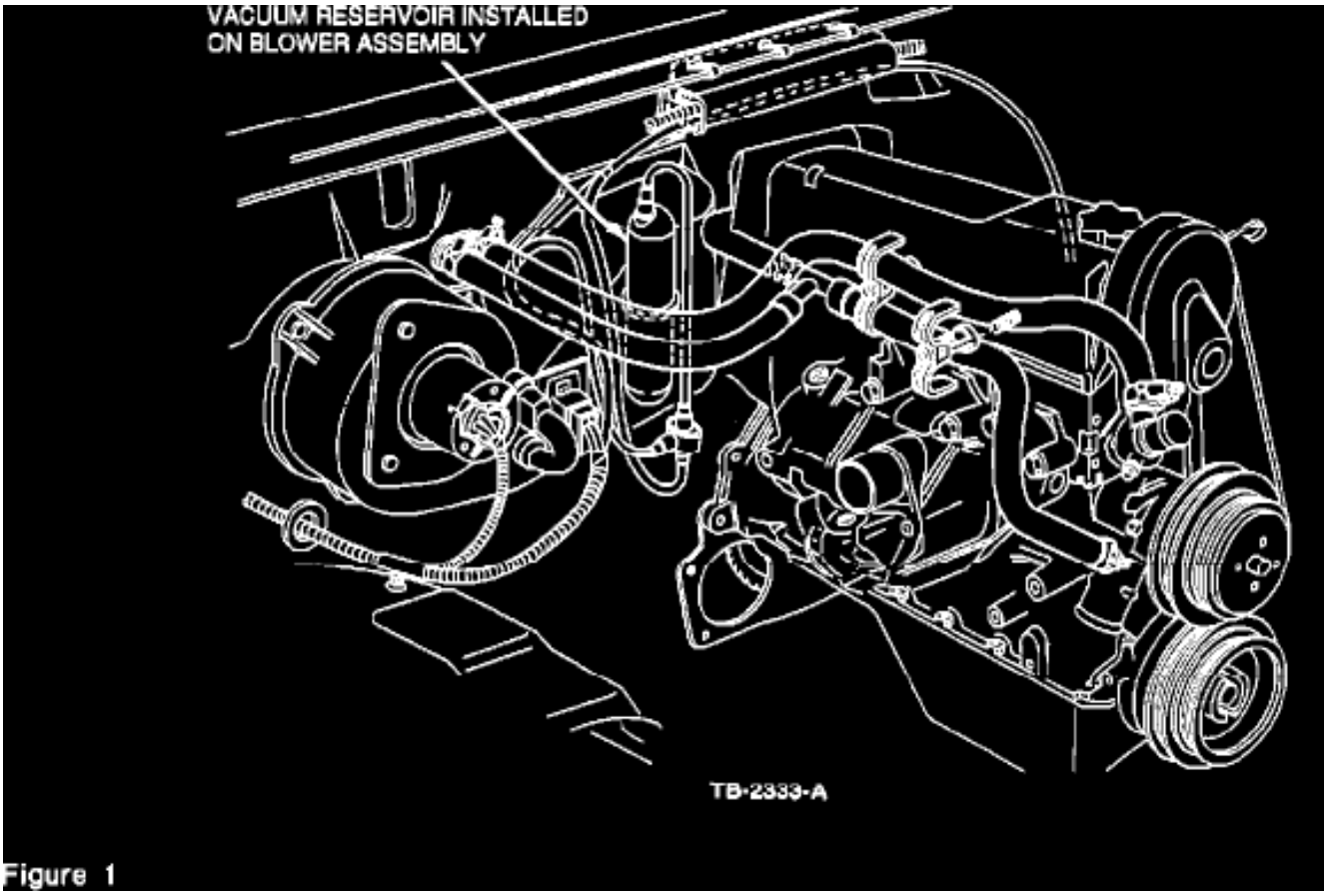

Figure 1

Vacuum Check Valve HVAC: All Technical Service Bulletins Heater - Air Flow From Panel During Heavy Acceleration

Article No. 94-4-11

02/23/94

HEATER - OBJECTIONABLE AIRFLOW FROM PANEL REGISTERS DURING HEAVY ACCELERATION - NON A/C VEHICLES

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389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE			
Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

voltage at idle.

NOTE

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^ Spark Knock/Detonation

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^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

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^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

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3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

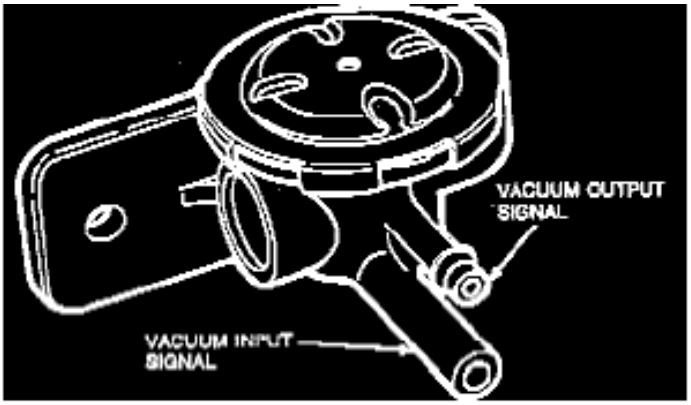
4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

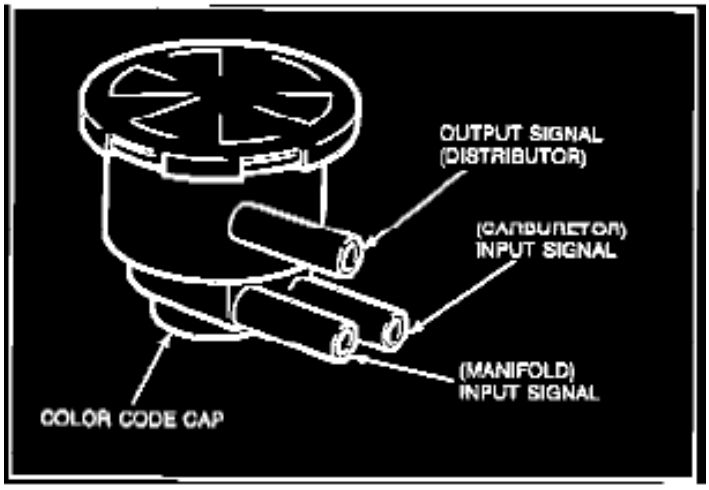
NOTE

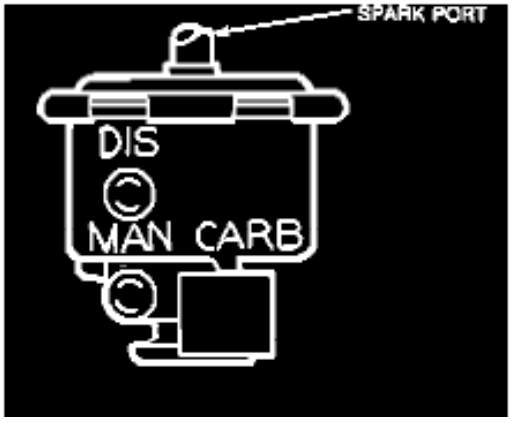
DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298


VACUUM OUTPUT SIGNAL
VACUUM INPUT SIGNAL


OUTPUT SIGNAL (DISTRIBUTOR)
(CARBURETOR) INPUT SIGNAL
(MANIFOLD) INPUT SIGNAL
COLOR CODE CAP


SPARK PORT
DIS
MAN CARB

Vacuum Controller: Description and Operation

VACUUM REGULATOR VALVES

LOCATION

The Vacuum Regulator Valve (VRV) is located within the vacuum hose routing or harness assembly.

PURPOSE

The VRV is designed to provide a constant vacuum output.

TYPES

2-Port Vacuum Regulator

The 2-Port Vacuum Regulator Valve - maintains a constant vacuum output signal, while source vacuum is greater than the pre-set calibration of the valve.

If the input source vacuum falls below the pre-set calibration, the 2-port VRV output vacuum signal will be equal to the input source vacuum.

3-Port Vacuum Regulator

Vacuum Regulator (3 & 4 Port)

The 3-Port and 4-Port Regulators - are used to control the vacuum signal to the vacuum advance unit of the distributor. During engine idle, the manifold vacuum input signal is limited to a constant output signal.

Once the engine is off-idle, the output signal will equal the spark port.

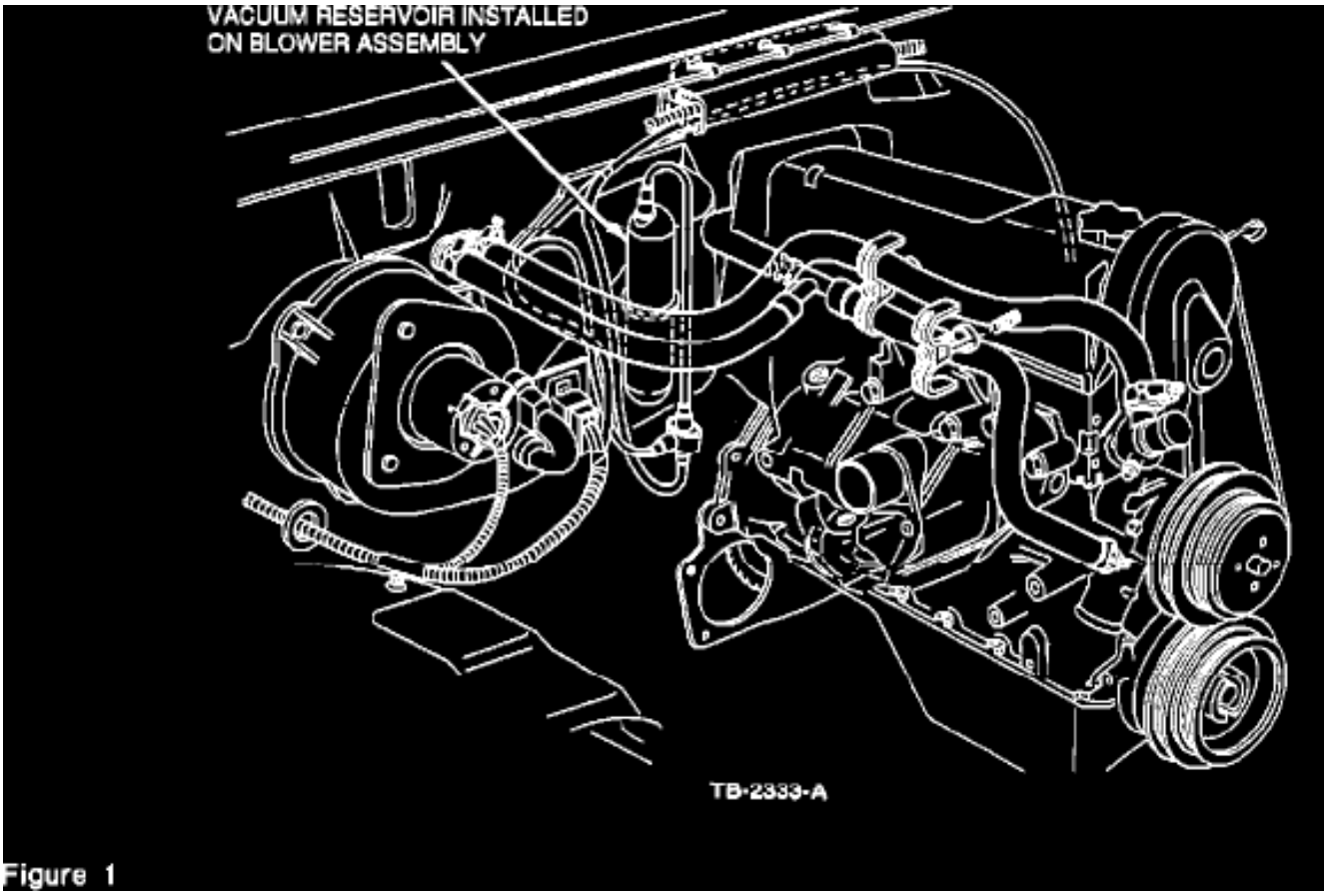


Figure 1

Vacuum Tank: Customer Interest Heater - Air Flow From Panel During Heavy Acceleration

Article No. 94-4-11

02/23/94

HEATER - OBJECTIONABLE AIRFLOW FROM PANEL REGISTERS DURING HEAVY ACCELERATION - NON A/C VEHICLES

LIGHT TRUCK: 1990-92 RANGER 1991-92 EXPLORER

This TSB article is being republished in its entirety to include 1992 Model vehicles.

ISSUE: Objectionable airflow from the heater system panel registers may occur when the system is in the OFF mode and the vehicle is under heavy acceleration. This condition is caused by movement of the fresh air door when the vacuum to the door actuator is lost during heavy acceleration.

ACTION: Installation of a vacuum hose/reservoir/check valve assembly will provide sufficient vacuum level to maintain proper operation of the heater system in the OFF mode. Refer to the following procedure for service details.

SERVICE PROCEDURE

1. Remove the blower assembly from the vehicle.

2. Drill two holes in the blower assembly, in a vertical position, to allow for installation of the vacuum reservoir. Refer to Figure 1.

3. Using two screws, mount the vacuum reservoir as shown in Figure 1.

4. Disconnect the existing vacuum check valve.

5. Remove the vacuum line which sourced the heater system check valve and attached to an engine vacuum port. Refer to Figure 1.

6. Discard the check valve and vacuum line.

7. Reinstall the blower assembly in the vehicle.

8. Route the new vacuum line and check valve (attached to the reservoir) as the original vacuum line was routed and attach to the original vacuum port.

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300

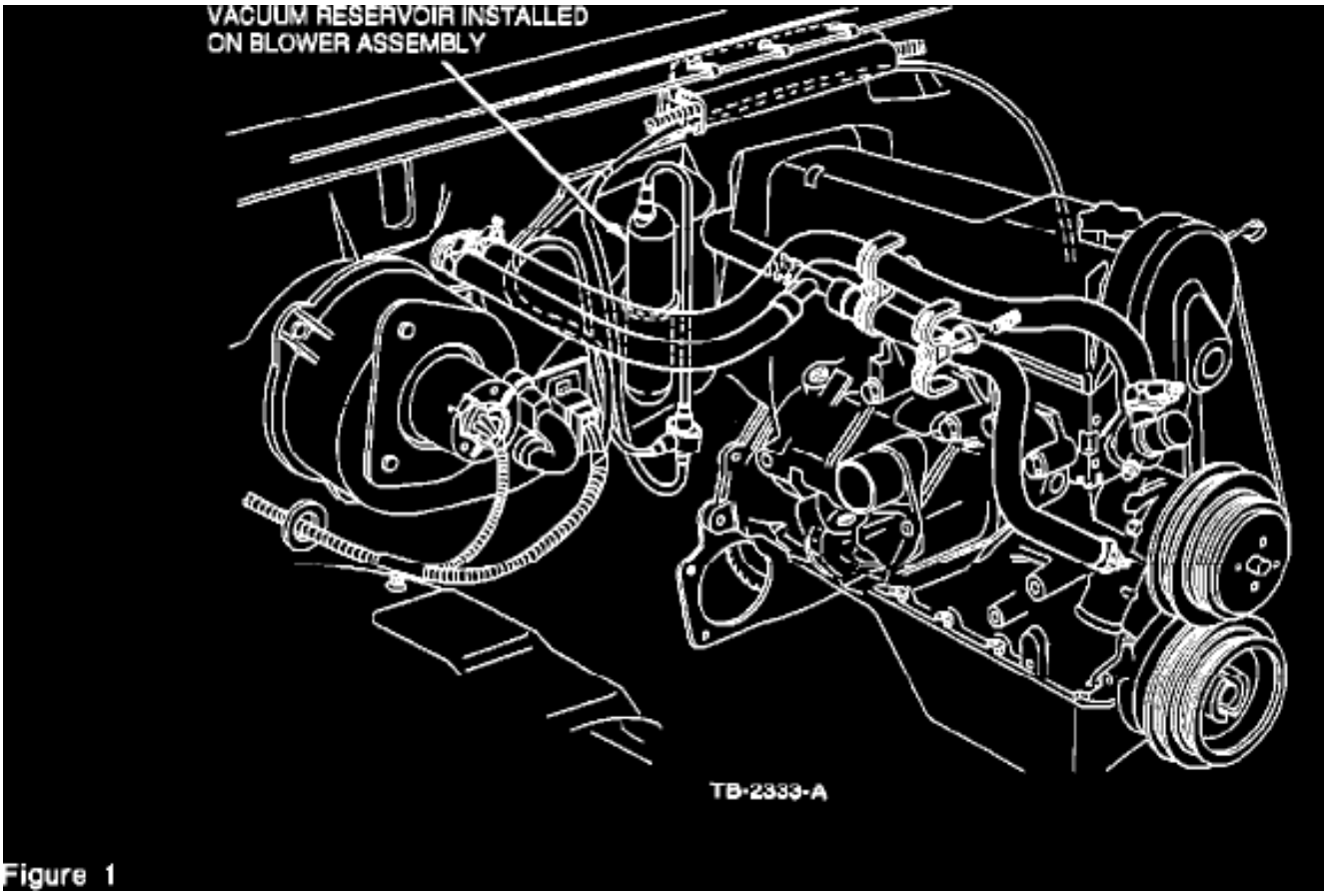


Figure 1

Vacuum Tank: All Technical Service Bulletins Heater - Air Flow From Panel During Heavy Acceleration

Article No. 94-4-11

02/23/94

HEATER - OBJECTIONABLE AIRFLOW FROM PANEL REGISTERS DURING HEAVY ACCELERATION - NON A/C VEHICLES

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8. Route the new vacuum line and check valve (attached to the reservoir) as the original vacuum line was routed and attach to the original vacuum port.

9. Attach the vacuum line from the heater plenum chamber to the open port on the vacuum check valve.

10. Start the engine and verify proper operation of the Fresh Air/Off door.

PART NUMBER PART NAME CLASS

F1TZ-19A566-A Vacuum Reservoir Assembly C

389915-S2 Screws S

SUPERSEDES: 91-20-13 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

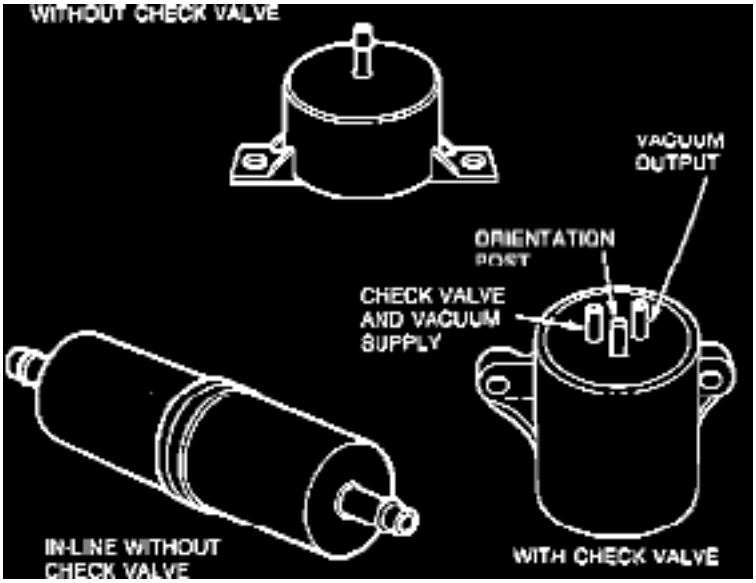
940411A Install - Vacuum Reservoir 0.6 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

19A566 08

OASIS CODES: 208000, 208300



Vacuum Tank: Description and Operation

Vacuum Reservoirs

PURPOSE

The Vacuum Reservoir temporarily stores vacuum until it is needed. This temporary vacuum storage helps to prevent rapid fluctuations and/or sudden drops in a vacuum signal line, as when an engine is under load or during acceleration.

Vacuum Tank: Testing and Inspection

1. Disconnect vacuum hose at servo, then connect hose to suitable vacuum gauge.

2. Start engine and observe vacuum gauge. Vacuum should be approximately 23 inches Hg. If vacuum is not as specified, check for leaking vacuum hose or defective vacuum pump.

3. Turn engine off after vacuum has stabilized above 20 inches Hg. Vacuum should remain steady. After 24 hours, vacuum should still be a minimum of 15 inches Hg.

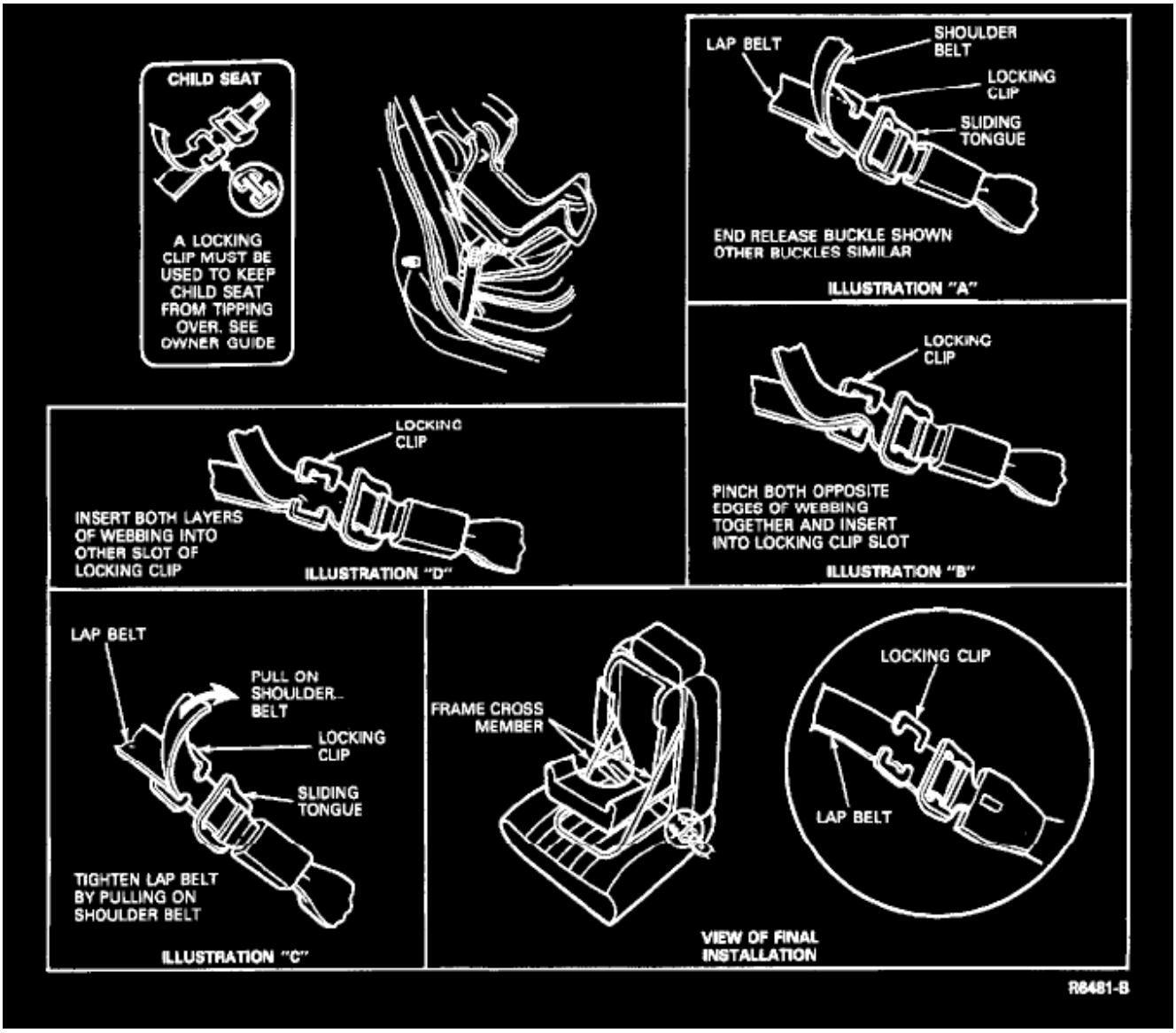
4. If vacuum does not hold, check for leak in vacuum harness and repair or replace as required. If vacuum still does not hold after checking vacuum harness for leaks, replace vacuum reservoir.

Vacuum Tank: Service and Repair

1. Disconnect the two vacuum lines connected to the reservoir ports.

2. Remove reservoir retaining nuts from the underside of the lefthand apron, then the reservoir.

3. Reverse procedure to install.



Child Restraint: Service and Repair

Child Seat Locking Clip

The locking clip must be used to secure a child seat when your vehicle has a shoulder and lap belt with a sliding tongue. The locking clip is not needed it the seat belt has only a lap belt. It you do not use a locking clip, injuries could result from the child seat tipping over during normal braking or turning. 1. Thread the belt webbing through the child seat according to the child seat manufacturers instructions. 2. Buckle seat belt. Pull on shoulder portion of the belt to make the lap portion fit snugly. 3. Slide either corner of locking clip slot closest to the tongue, over both layers of webbing as shown in Illustration "A" 4. Pinch both opposite edges of webbing together and insert them into locking clip slot as shown in Illustration "B". 5. Tighten the lap belt by pulling on the shoulder belt as shown in Illustration "C". 6. Insert both layers of webbing into the other slot of the locking clip in the same manner as step 4. See Illustration "D". 7. Forcibly tilt the child seat from side to side and also tug it forward to see if it is held securely in place. If excessive movement occurs, repeat steps

3 through 7 or properly install the child seat in a different seating position in the vehicle.

Seat Belt: Customer Interest Safety Belts - Front/Rear Twisted at `D' Ring

Article No. 92-5-1

February 26, 1992

SAFETY BELTS - FRONT/REAR - SHOULDER BELTS TWISTED AT "D" RING OR SAFETY BELT TONGUE

ROTATED ON WEBBING

FORD: 1990-92 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1990-92 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOWN CAR

1991-92 TRACER

LIGHT TRUCK: 1990 BRONCO II 1990-92 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, F-47, RANGER 1991-92 EXPLORER

ISSUE: The front and/or rear seat shoulder safety belts may become twisted at the "D" ring or the safety belt tongue may be rotated on the belt webbing. A procedure has been developed for correcting these concerns.

ACTION: If the safety belt becomes twisted at the "D" ring or the safety belt tongue is rotated on the belt webbing, use the following procedure to

remove the twists.

NOTE: THESE PROCEDURES AFFECT BOTH WIRE FORMED AND STAMPED "D" RING DESIGNS.

SAFETY BELT TWISTED AT THE "D" RING

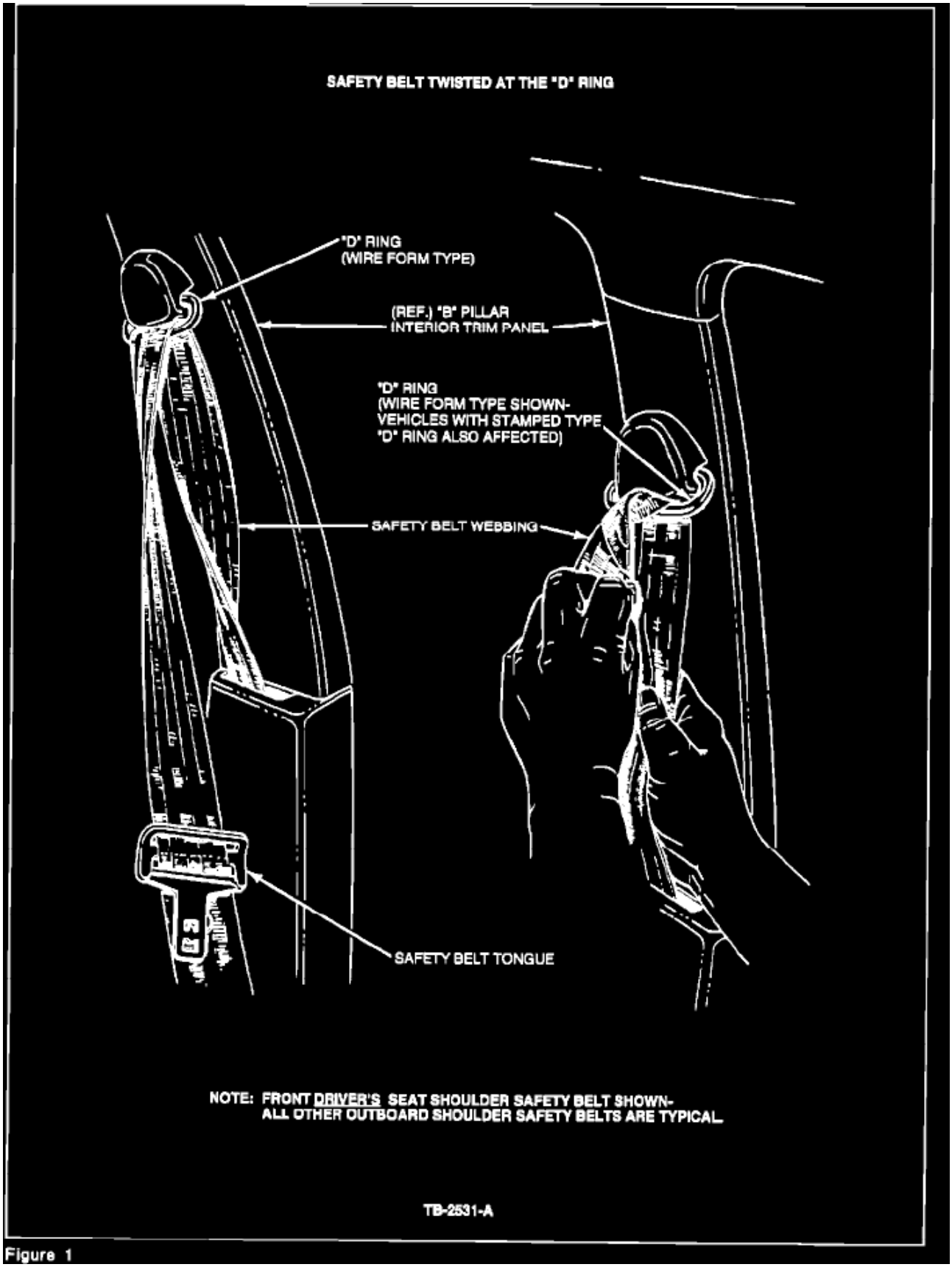


Figure 1

1. Grasp the belt webbing at the "D" ring as shown on the right side of Figure 1.

2. Rotate and fold the belt webbing over itself as required to remove the twist.

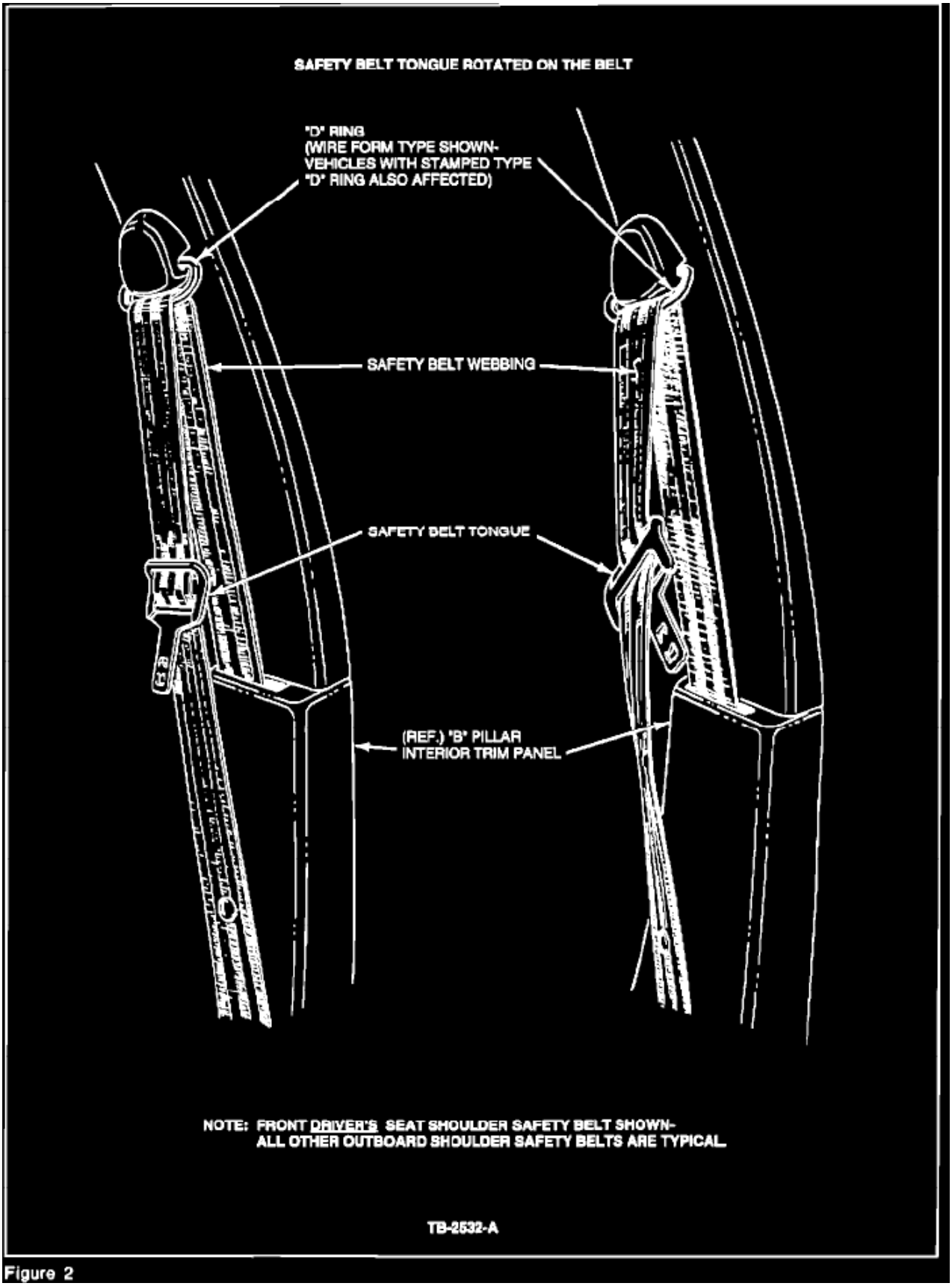


Figure 2

3. When completed, the safety belt should look like the belt shown on the left side of Figure 2.

SAFETY BELT TONGUE ROTATED ON BELT

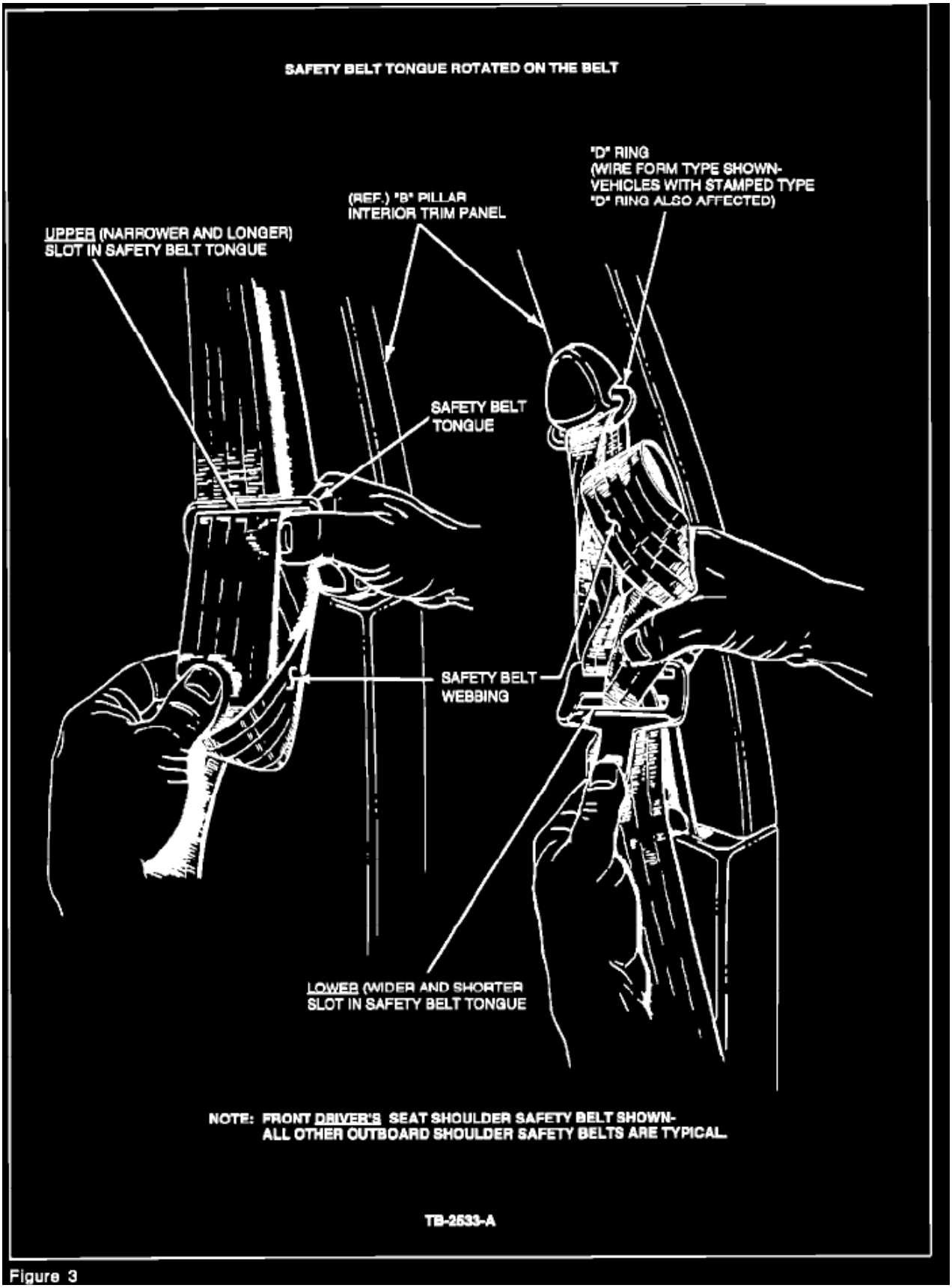


Figure 3

1. Grasp the belt tongue and pull down on the belt webbing closest to you to form a loop through the upper (narrow and longer) slot in the tongue. See the left side of Figure 3.

2. Working within the upper slot, rotate and fold the belt webbing over itself as required to remove the twist.

3. Pull the excess belt webbing back through the upper slot in the tongue.

4. Repeat the above steps to complete the removal of the twist at the lower (wider and larger) slot in the tongue. See the right side of Figure 3.

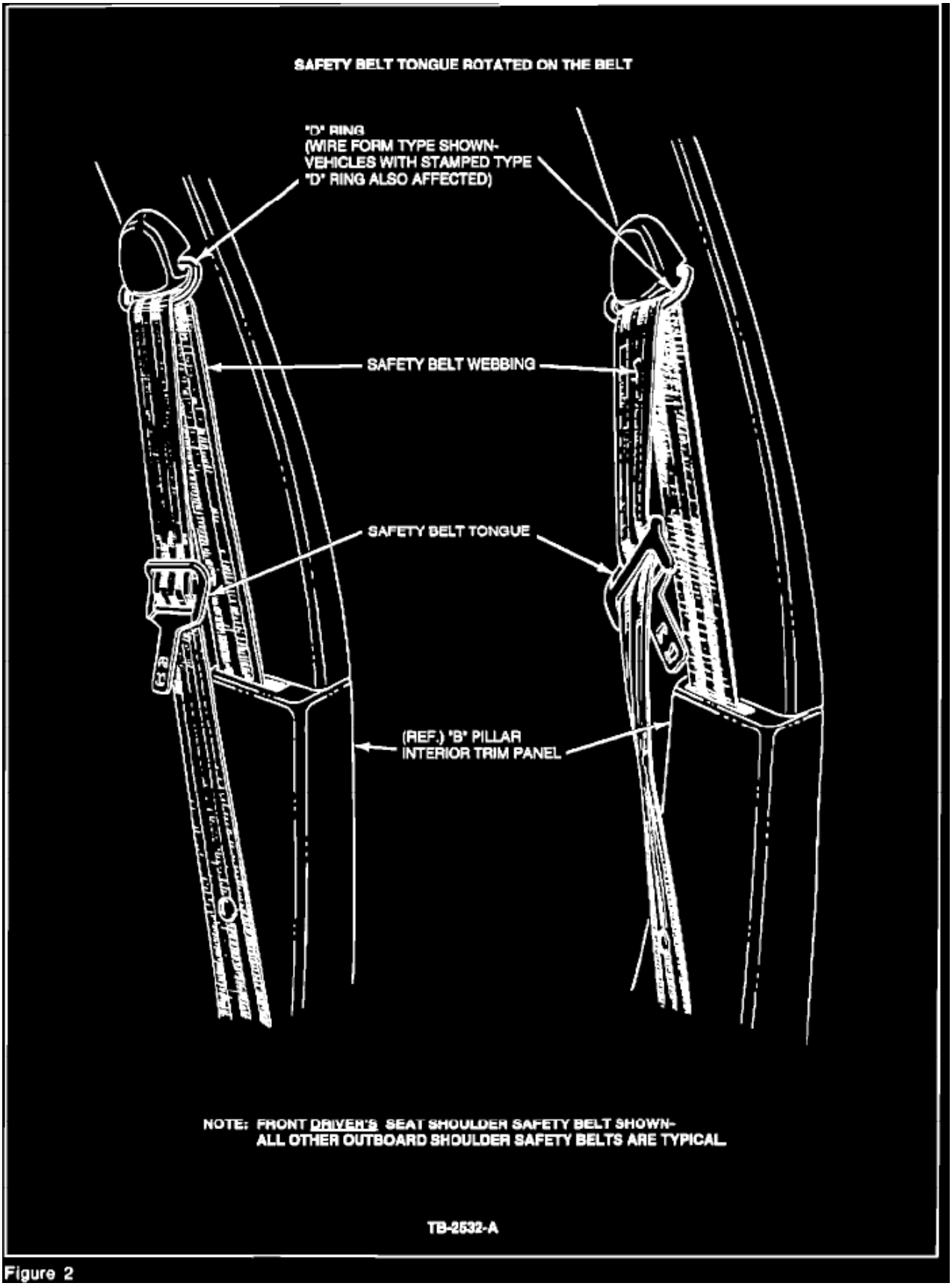


Figure 2

5. When completed, the safety belt should look like the belt shown on the left side of Figure 2.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

101000, 104000

Seat Belt: All Technical Service Bulletins Safety Belts - Front/Rear Twisted at `D' Ring

Article No. 92-5-1

February 26, 1992

SAFETY BELTS - FRONT/REAR - SHOULDER BELTS TWISTED AT "D" RING OR SAFETY BELT TONGUE

ROTATED ON WEBBING

FORD: 1990-92 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1990-92 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOWN CAR

1991-92 TRACER

LIGHT TRUCK: 1990 BRONCO II 1990-92 AEROSTAR, BRONCO, ECONOLINE, F SUPER DUTY, F-150-350 SERIES, F-47, RANGER 1991-92 EXPLORER

ISSUE: The front and/or rear seat shoulder safety belts may become twisted at the "D" ring or the safety belt tongue may be rotated on the belt webbing. A procedure has been developed for correcting these concerns.

ACTION: If the safety belt becomes twisted at the "D" ring or the safety belt tongue is rotated on the belt webbing, use the following procedure to

remove the twists.

NOTE: THESE PROCEDURES AFFECT BOTH WIRE FORMED AND STAMPED "D" RING DESIGNS.

SAFETY BELT TWISTED AT THE "D" RING

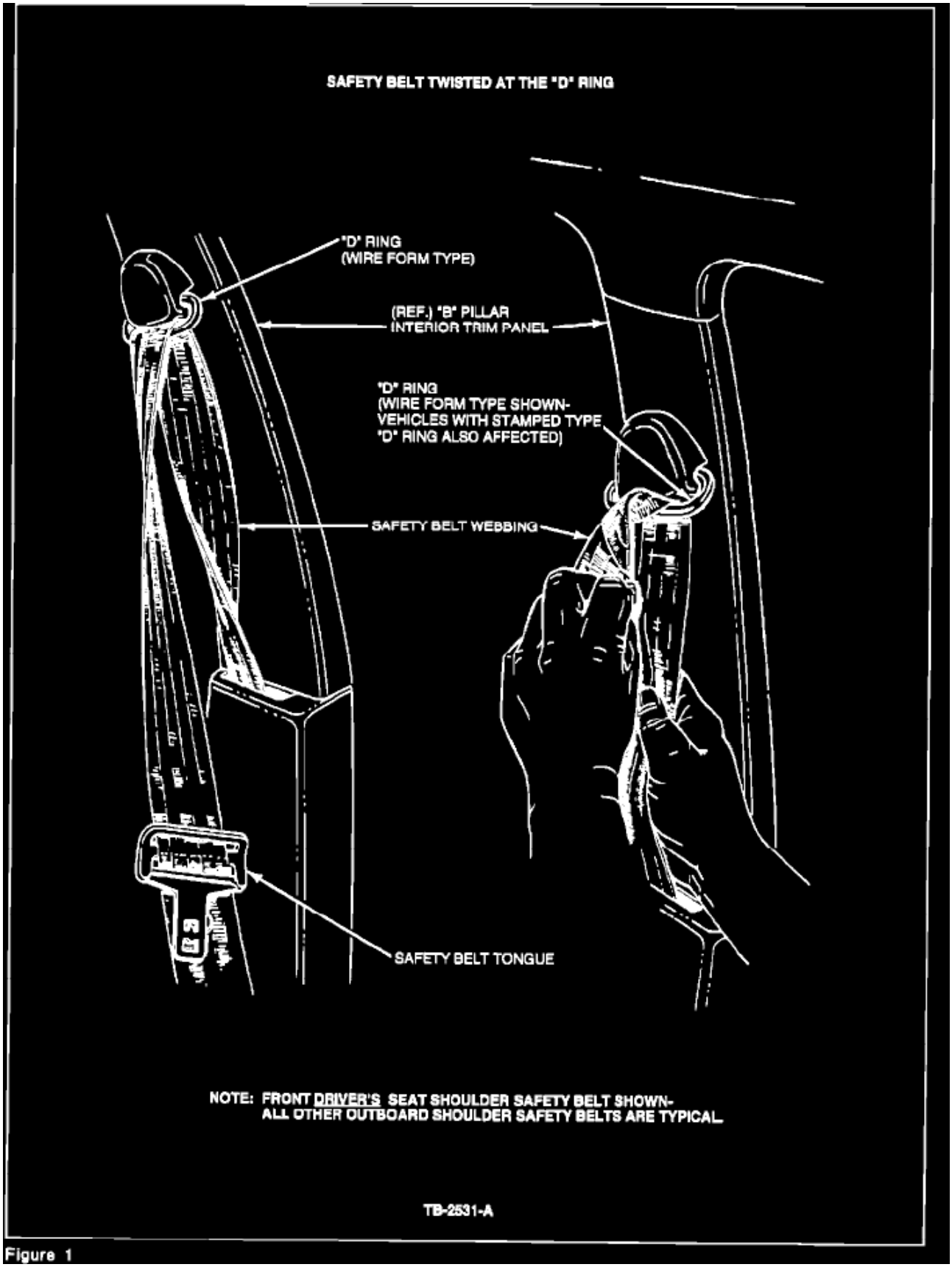


Figure 1

1. Grasp the belt webbing at the "D" ring as shown on the right side of Figure 1.

2. Rotate and fold the belt webbing over itself as required to remove the twist.

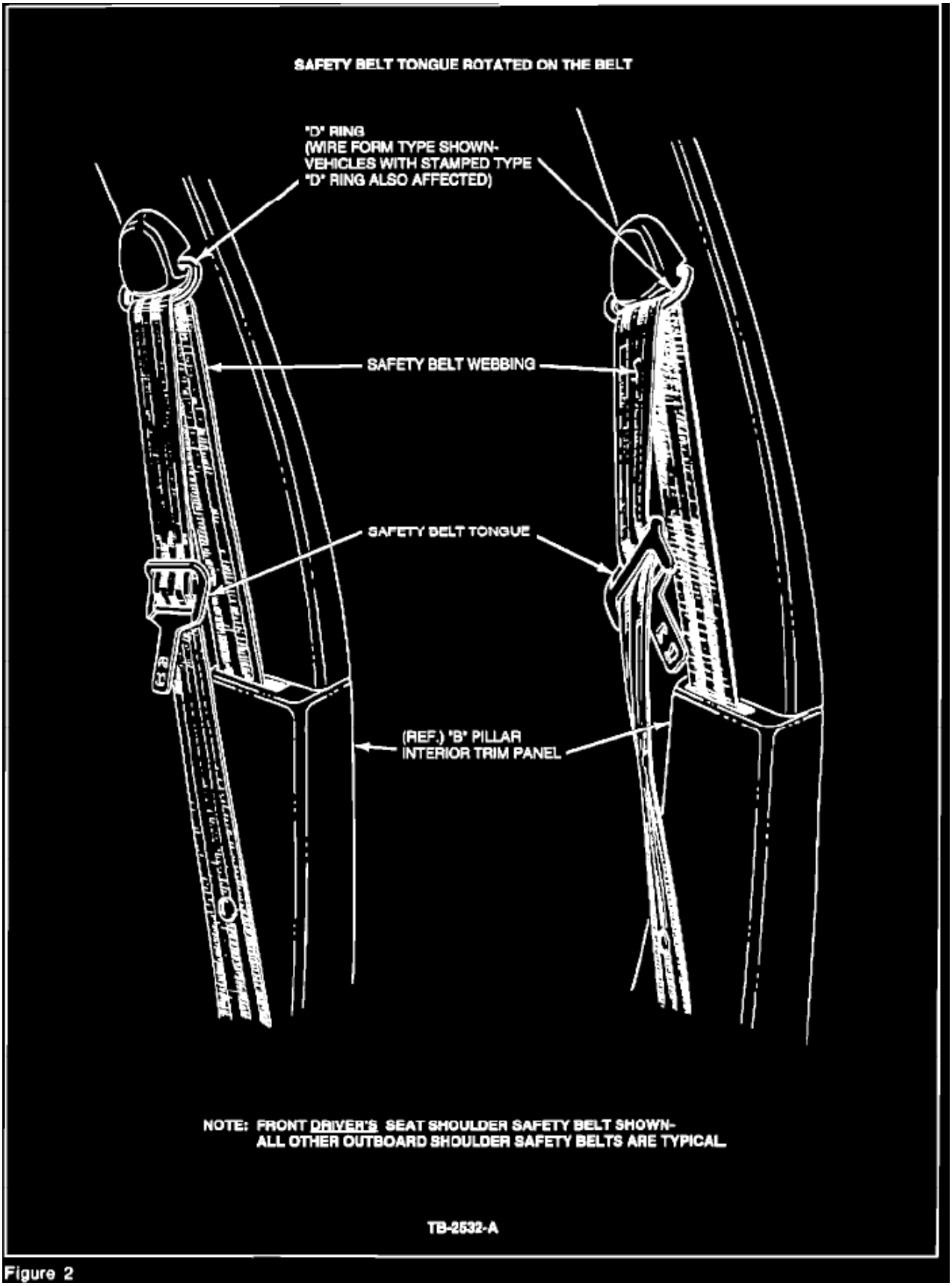


Figure 2

3. When completed, the safety belt should look like the belt shown on the left side of Figure 2.

SAFETY BELT TONGUE ROTATED ON BELT

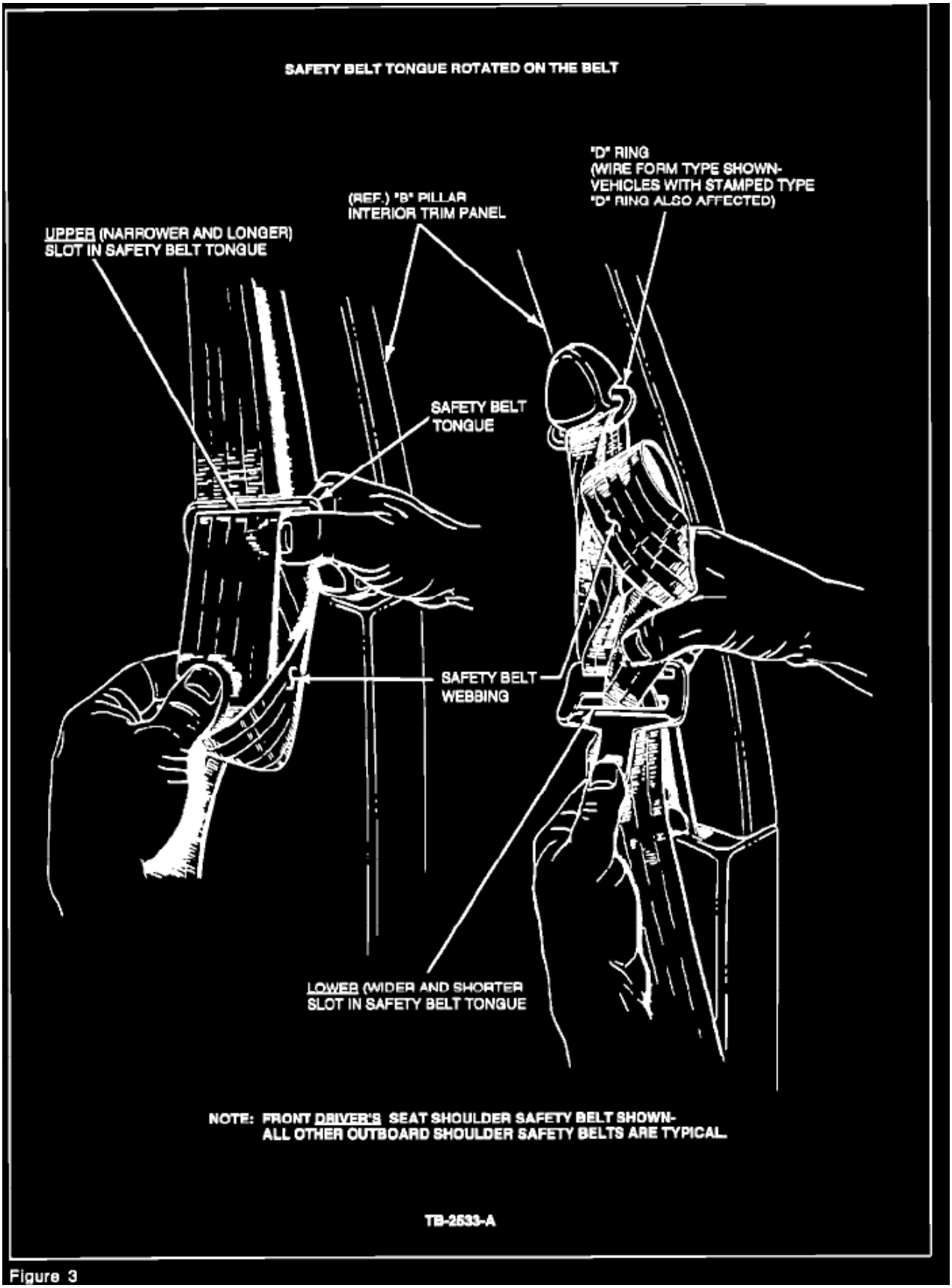


Figure 3

1. Grasp the belt tongue and pull down on the belt webbing closest to you to form a loop through the upper (narrow and longer) slot in the tongue. See the left side of Figure 3.

2. Working within the upper slot, rotate and fold the belt webbing over itself as required to remove the twist.

3. Pull the excess belt webbing back through the upper slot in the tongue.

4. Repeat the above steps to complete the removal of the twist at the lower (wider and larger) slot in the tongue. See the right side of Figure 3.

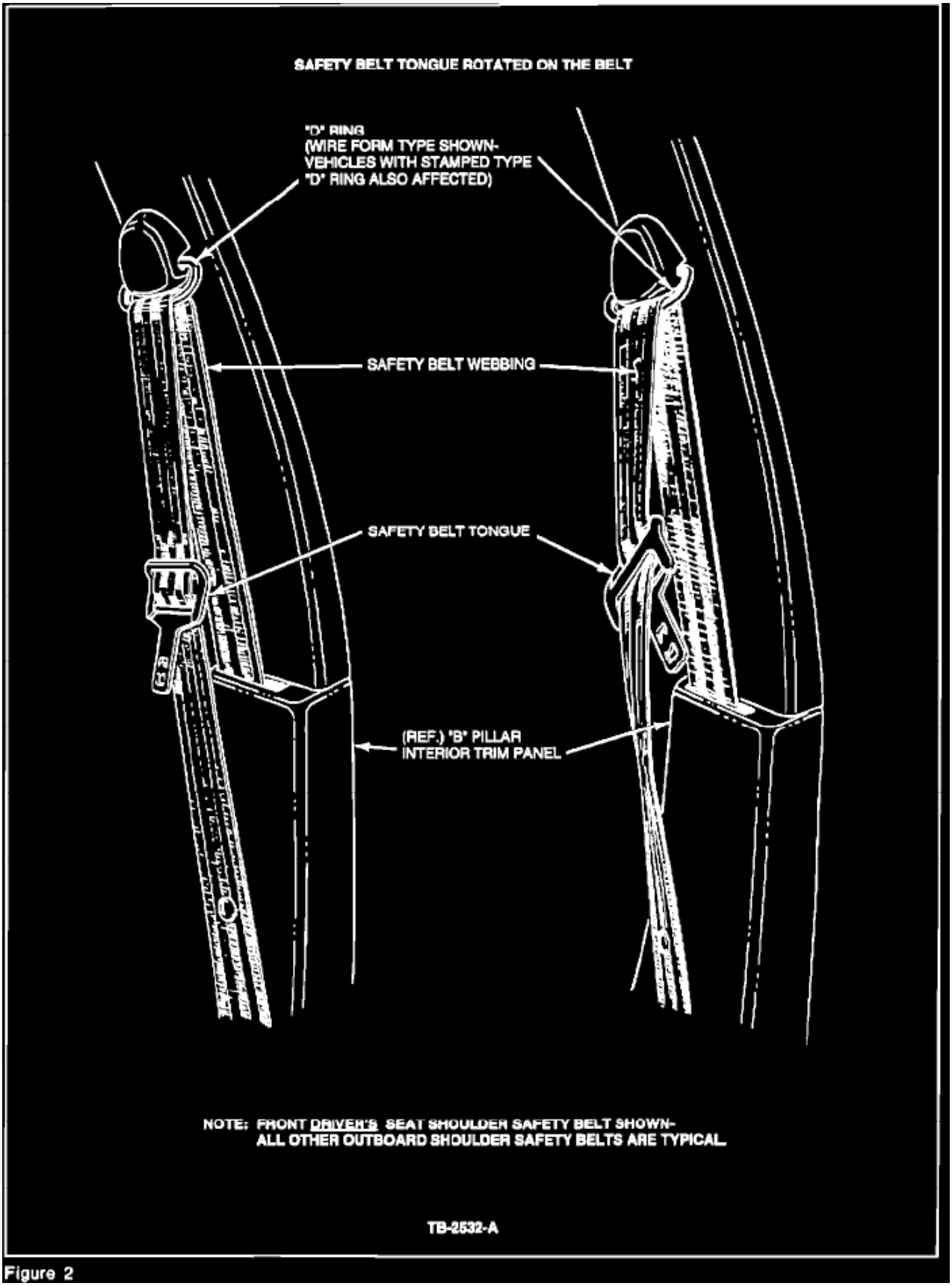


Figure 2

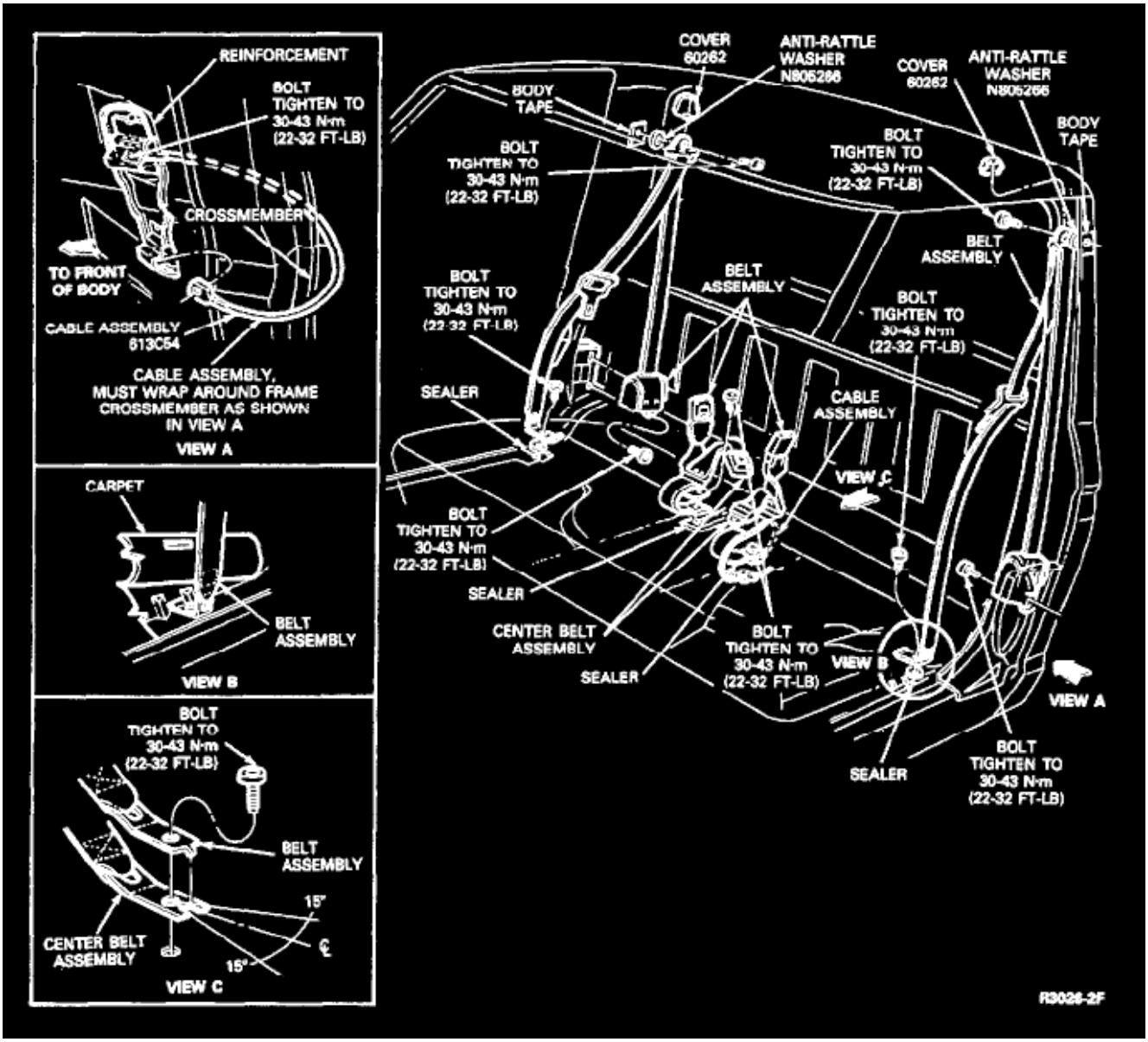
5. When completed, the safety belt should look like the belt shown on the left side of Figure 2.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

101000, 104000

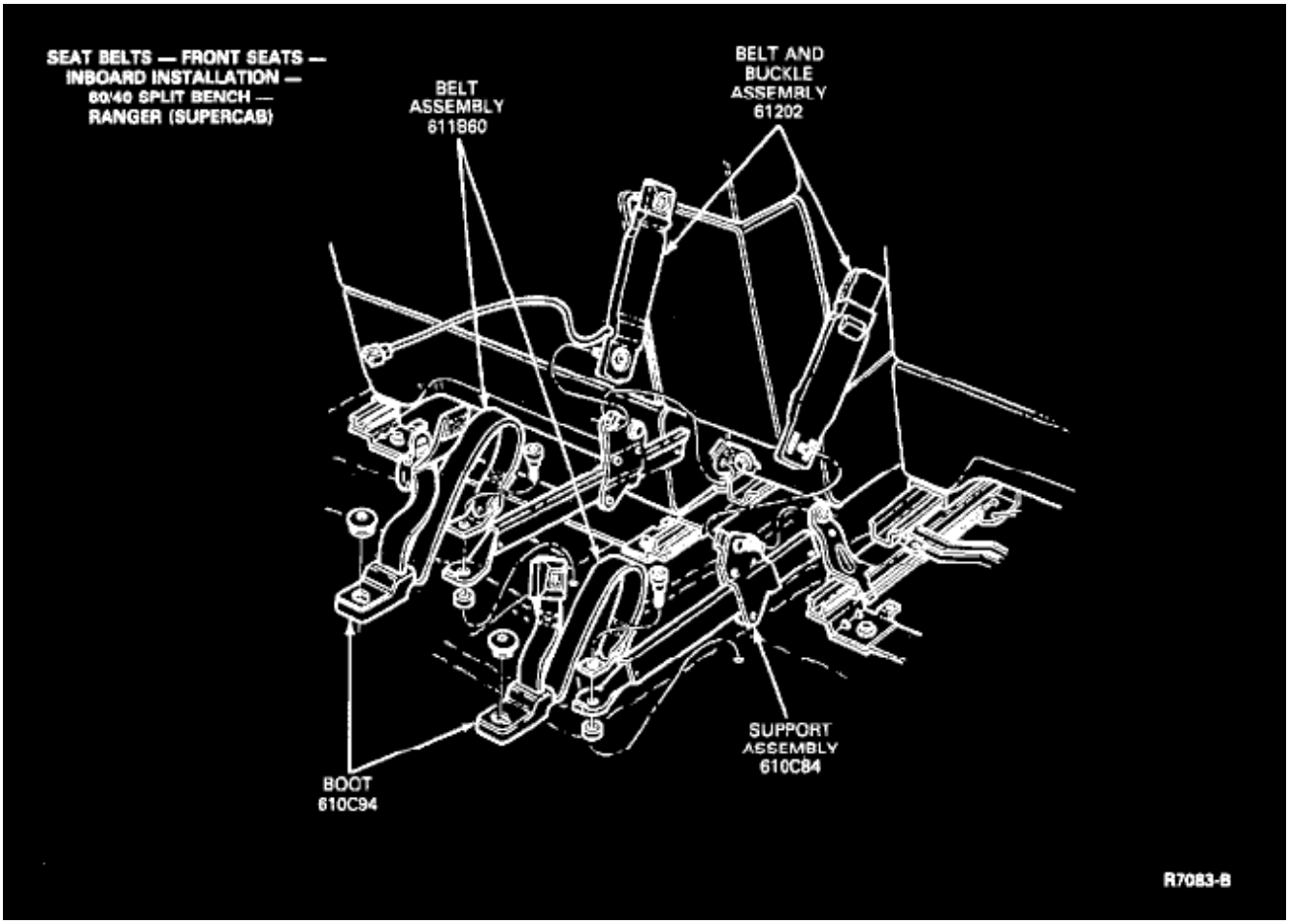
Seat Belt: Service and Repair Cleaning and Inspection

Clean the belt webbing with any mild soap solution recommended for cleaning upholstery or carpets; follow instructions provided with soap. Avoid bleaching or redyeing the webbing as this could hinder belt strength and performance.



Seat Belt: Service and Repair Removal and Installation

Center Belt/Buckle - Bench Seat

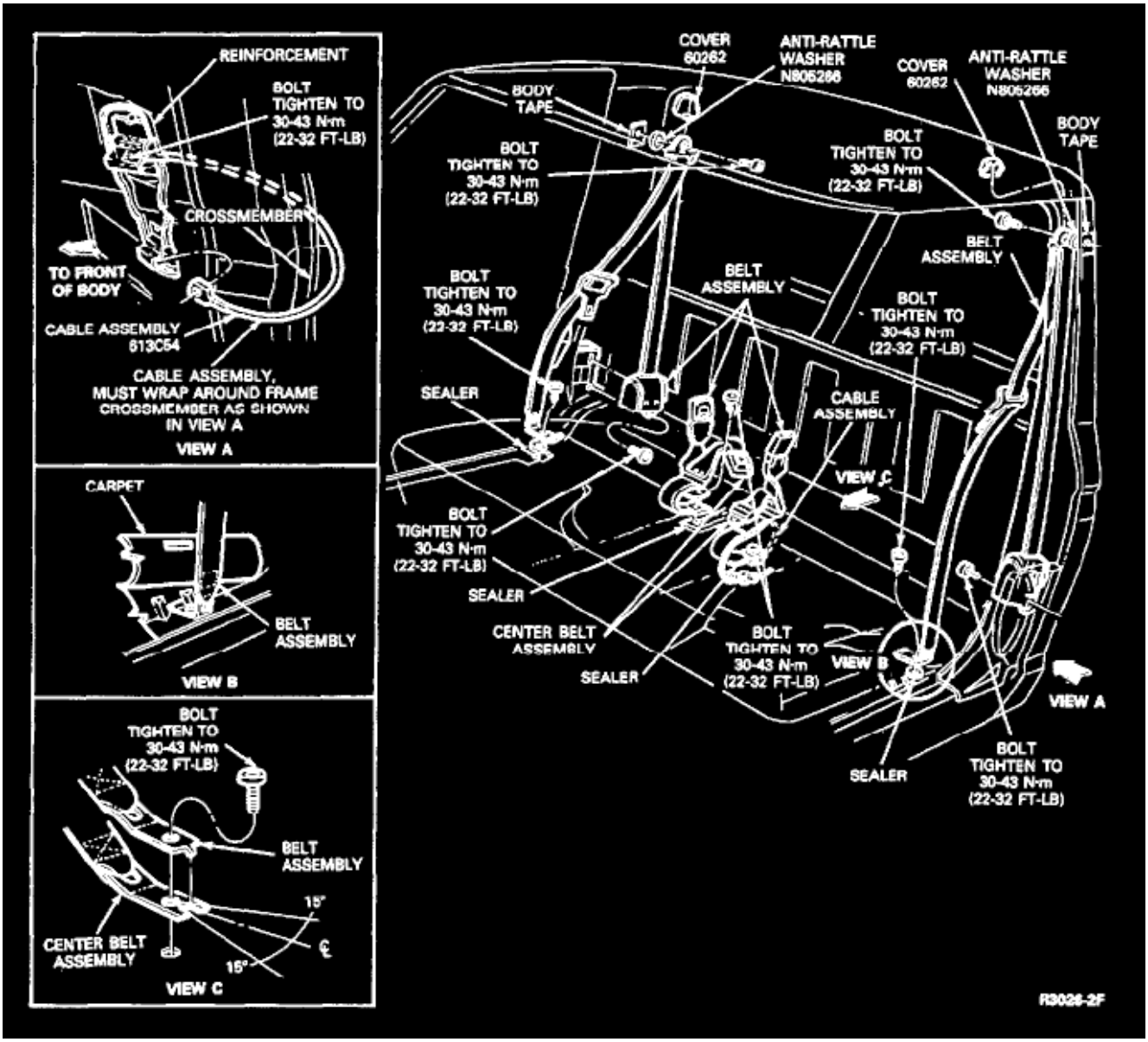


Removal

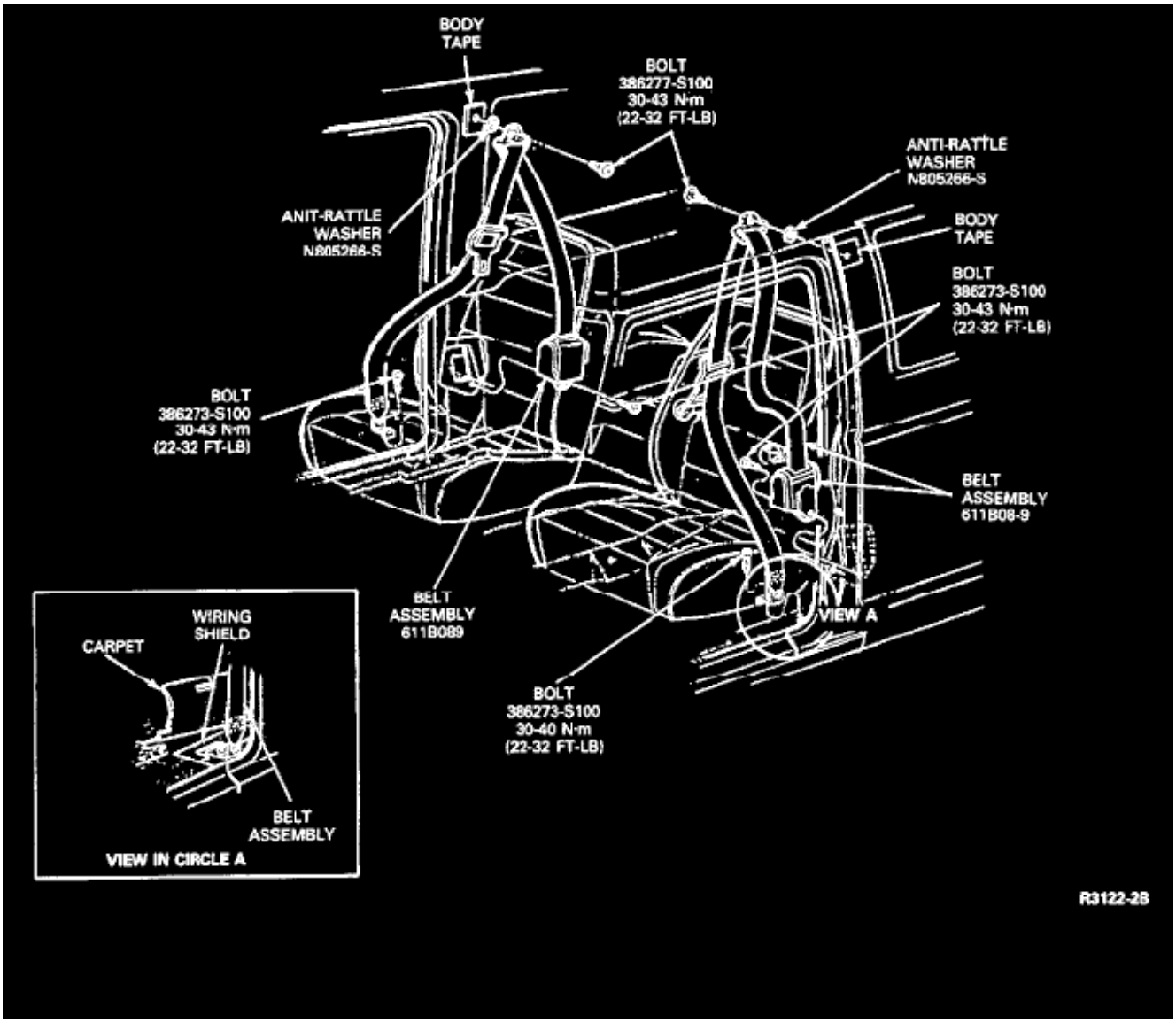
1. Remove the bolts securing the belt and buckle assemblies to floorpan (one each side). Remove belt and buckle assemblies from vehicle.

Installation

1. Position belt and buckle assemblies to floorpan and secure with bolt. Tighten to 30-43 N.m (22-32 ft-lb).



Front Outboard



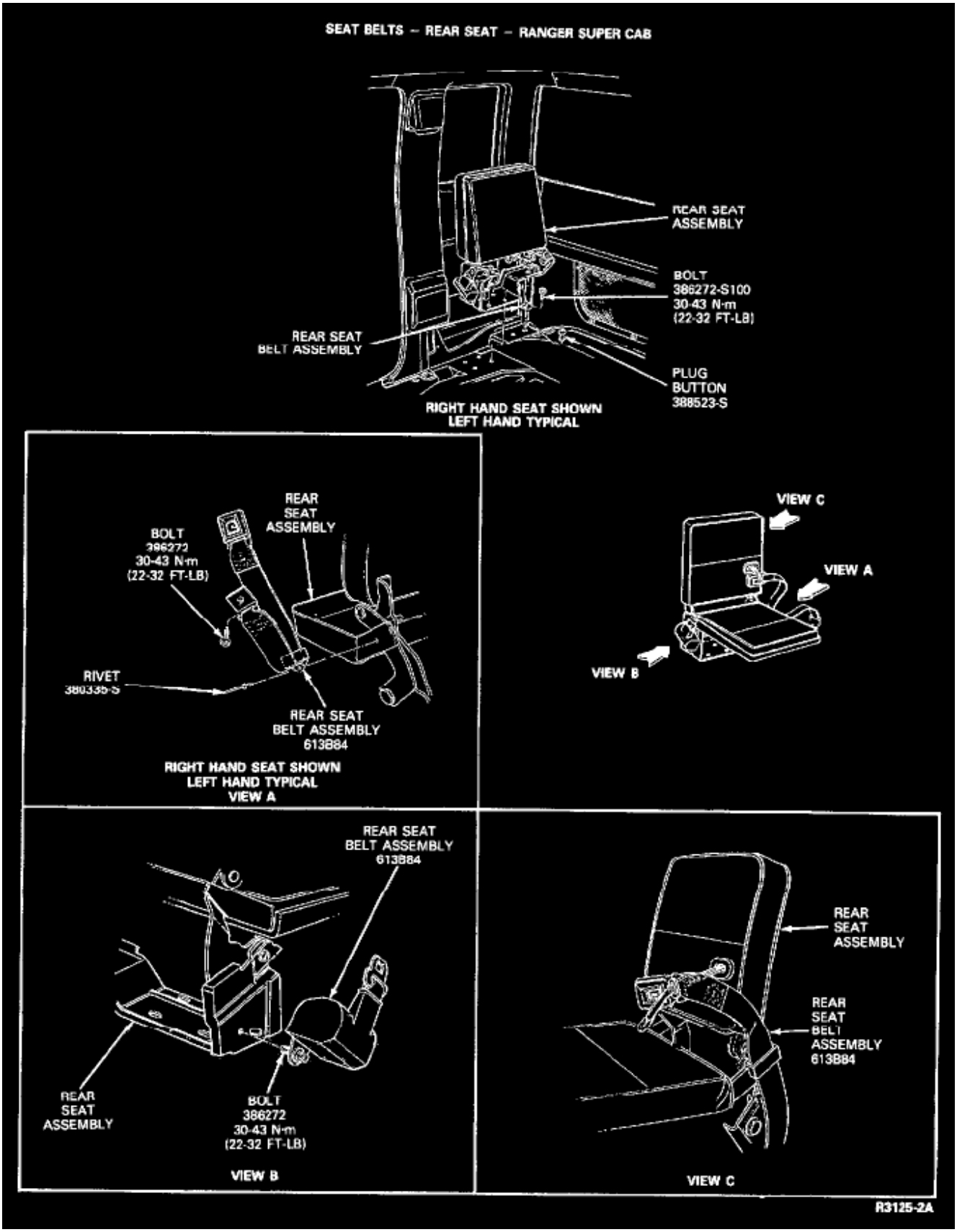
Removal

1. Remove the D-ring cover. 2. Remove bolt from the retractor assembly. 3. Remove bolt from floor anchorage by lifting up on carpet. 4. Remove bolt from strap guide and remove belt from vehicle.

Installation

1. Position belt to vehicle and install bolt into guide strap. Tighten to 30-43 N.m (22-32 ft-lb). 2. Install bolt into retractor assembly. Tighten to 30-43 N.m (22-32 ft-lb). 3. Install bolt into floor anchorage. Tighten to 30-43 N.m (22-32 ft-lb). 4. Install D-ring cover.

Rear Seat Belt - Supercab


SEAT BELTS – REAR SEAT – RANGER SUPER CAB
REAR SEAT ASSEMBLY
BOLT 386272-S100 30-43 N·m (22-32 FT-LB)
REAR SEAT BELT ASSEMBLY
PLUG BUTTON 388523-S
RIGHT HAND SEAT SHOWN LEFT HAND TYPICAL
REAR SEAT ASSEMBLY
BOLT 386272 30-43 N·m (22-32 FT-LB)
RIVET
REAR SEAT BELT ASSEMBLY 613B84
RIGHT HAND SEAT SHOWN LEFT HAND TYPICAL VIEW A
VIEW C
VIEW A
VIEW B
REAR SEAT BELT ASSEMBLY 613B84
REAR SEAT ASSEMBLY
BOLT 386272 30-43 N·m (22-32 FT-LB)
VIEW B
REAR SEAT ASSEMBLY
REAR SEAT BELT ASSEMBLY 613B84
VIEW C
R3125-2A

Removal

1. Fold back of seat down. Remove bolt securing belt and tongue to side panel. Remove washer belt and tongue assembly. 2. Remove bolt securing latch and belt to floorpan. Remove belt and latch assembly.

Installation

1. Position belt and latch assembly. Install retaining bolt. Tighten to 30-43 N.m (22-32 ft-lb). 2. Position washer, belt and tongue assembly. Install retaining bolt. Tighten to 30-43 N.m (22-32 ft-lb).

Seat Belt: Service and Repair Safety Belt Maintenance and Inspection

Safety belt assemblies are maintenance-free, however, they should be periodically inspected to ensure they have not become damaged and that they are in proper operating condition.

Original Parts — Seat Belt		Replacement Parts — Seat Belt	
①Code Letter	Part Name	①Code Letter	Part Name
IR	Bolt 7/16-20 x 1.54 Pan Head Shoulder Tapping — .75 Shldr.	S	Bolt 1/2 — 13 x 1.54 Pan Head Shoulder Locking — .75 Shldr.
IA	Bolt 7/16-20 x 1.38 Pan Head Tapping	X	Bolt — 1/2-13 x 1.38 Pan Head Locking
IB	Bolt — 7/16-20 x 1.75 Pan Head Tapping (.50 Shoulder)	Y	Bolt 1/2-13 x 1.75 Pan Head Locking (.50 Shoulder)
	7/16 Flat Washer		1/2 Flat Washer
	Washer — .463/.443 I.D. Plate (1.80 Dia. .190 Thick)		Washer — 1/2 Flat (1.30 Dia. .190 Thick)
	Washer — 1/2 Serrated (.18 Thick)		Washer — 9/16 Flat (.25 Thick)
IF	Bolt — 7/16-20 x .88 Pan Head Tapping	W	Bolt — 1/2 x 13 Pan Head Locking
IL	Bolt 7/16-20 x 1.75 Pan Shldr. Tapping — .75 Shldr.	Z	Bolt — 1/2 13 x 2.25 Pan Head Locking (.88 Shoulder)
IK	Bolt 7/16-20 x 1.38 Pan Shldr. Tapping — .50 Shldr.	T	Bolt — 1/2 13 x 1.38 Pan Head Shoulder Locking
IG	Bolt — 7/16 20 x 2.15 Pan Head Tapping	Z	Bolt — 1/2 13 x 2.25 Pan Head Shoulder Locking
IV	Bolt — 7/16 20 x 1.75 Pan Head Tapping	X	Bolt — 1/2 13 x 1.38 Pan Head Locking
IM	Bolt 7/16-20 x 1.15 Pan Head Tapping	U	Bolt 1/2 — 13 x 1.15 Pan Head Locking

①Identification letter on top of bolt head or face of spacer.
NOTE: Bolt Torque Must be Maintained at 30-43 N-m (22-32 ft-lbs). CR3105-2B

Seat Belt: Service and Repair Service Procedures

Post Collision Inspection

All safety belt assemblies must be replaced after a collision, provided:

1. The safety belt was in use at the time of the accident or, 2. The safety belt was damaged by the accident (bent retractor, torn webbing, etc.) or, 3. The safety belt attaching area(s) was damaged by the accident.

Before installing the new safety belt assembly, the safety belt attaching areas must be inspected for damage and distortion. If the attaching points are damaged and distorted, the sheet metal must be reworked back to its original shape and structural integrity.

Install the new safety belt(s) using the appropriate instructions, then functionally test.

Repair Notes

The seat and shoulder safety belts are factory installed in their proper locations. If the belts are removed for any reason, they should be re-installed Ford Caulking Cord D6AZ-19560-A or equivalent sealer should be placed around all seat belt anchor bolt holes in the floorpan. Tighten the anchor bolts to 30-43 N.m (22-32 ft-lb).

Seat Belt With Anchor Plate Thread Damage

Parts Replacement Chart

1. Remove the broken or stripped bolt and discard. 2. Drill out the internal threads in the safety belt anchor plate with a 27/64-inch drill. 3. Re-thread the anchor plate with a 1/2-13 tap (seat belt). 4. Blow out the chips. 5. Install the attachment parts in the order shown, whichever is applicable. Tighten the replacement bolt to 30-43 N.m (22-32 ft-lb). Original parts

are to be replaced with the repair parts indicated in the Parts Replacement Chart. Unless specified in the chart, use original parts.

6. When repairing a multiple belt and attachment, install nut to the bolt in the tunnel area from the underside of the floorpan. Tighten to specification

30-43 N.m (22-32 ft-lb).

Seat Belt Without Anchor Plate Thread Damage

Original Parts — Seat Belt		Replacement Parts — Seat Belt	
①Code Letter	Part Name	①Code Letter	Part Name
IR	Bolt 7/16-20 x 1.54 Pan Head Shoulder Tapping — .75 Shldr.	S	Bolt 1/2 — 13 x 1.54 Pan Head Shoulder Locking — .75 Shldr.
IA	Bolt 7/16-20 x 1.38 Pan Head Tapping	X	Bolt — 1/2-13 x 1.38 Pan Head Locking
IB	Bolt — 7/16-20 x 1.75 Pan Head Tapping (.50 Shoulder)	Y	Bolt 1/2-13 x 1.75 Pan Head Locking (.50 Shoulder)
	7/16 Flat Washer		1/2 Flat Washer
	Washer — .463/.443 I.D. Plate (1.80 Dia. .190 Thick)		Washer — 1/2 Flat (1.30 Dia. .190 Thick)
	Washer — 1/2 Serrated (.18 Thick)		Washer — 9/16 Flat (.25 Thick)
IF	Bolt — 7/16-20 x .88 Pan Head Tapping	W	Bolt — 1/2 x 13 Pan Head Locking
IL	Bolt 7/16-20 x 1.75 Pan Shldr. Tapping — .75 Shldr.	Z	Bolt — 1/2 13 x 2.25 Pan Head Locking (.88 Shoulder)
IK	Bolt 7/16-20 x 1.38 Pan Shldr. Tapping — .50 Shldr.	T	Bolt — 1/2 13 x 1.38 Pan Head Shoulder Locking
IG	Bolt — 7/16 20 x 2.15 Pan Head Tapping	Z	Bolt — 1/2 13 x 2.25 Pan Head Shoulder Locking
IV	Bolt — 7/16 20 x 1.75 Pan Head Tapping	X	Bolt — 1/2 13 x 1.38 Pan Head Locking
IM	Bolt 7/16-20 x 1.15 Pan Head Tapping	U	Bolt 1/2 — 13 x 1.15 Pan Head Locking

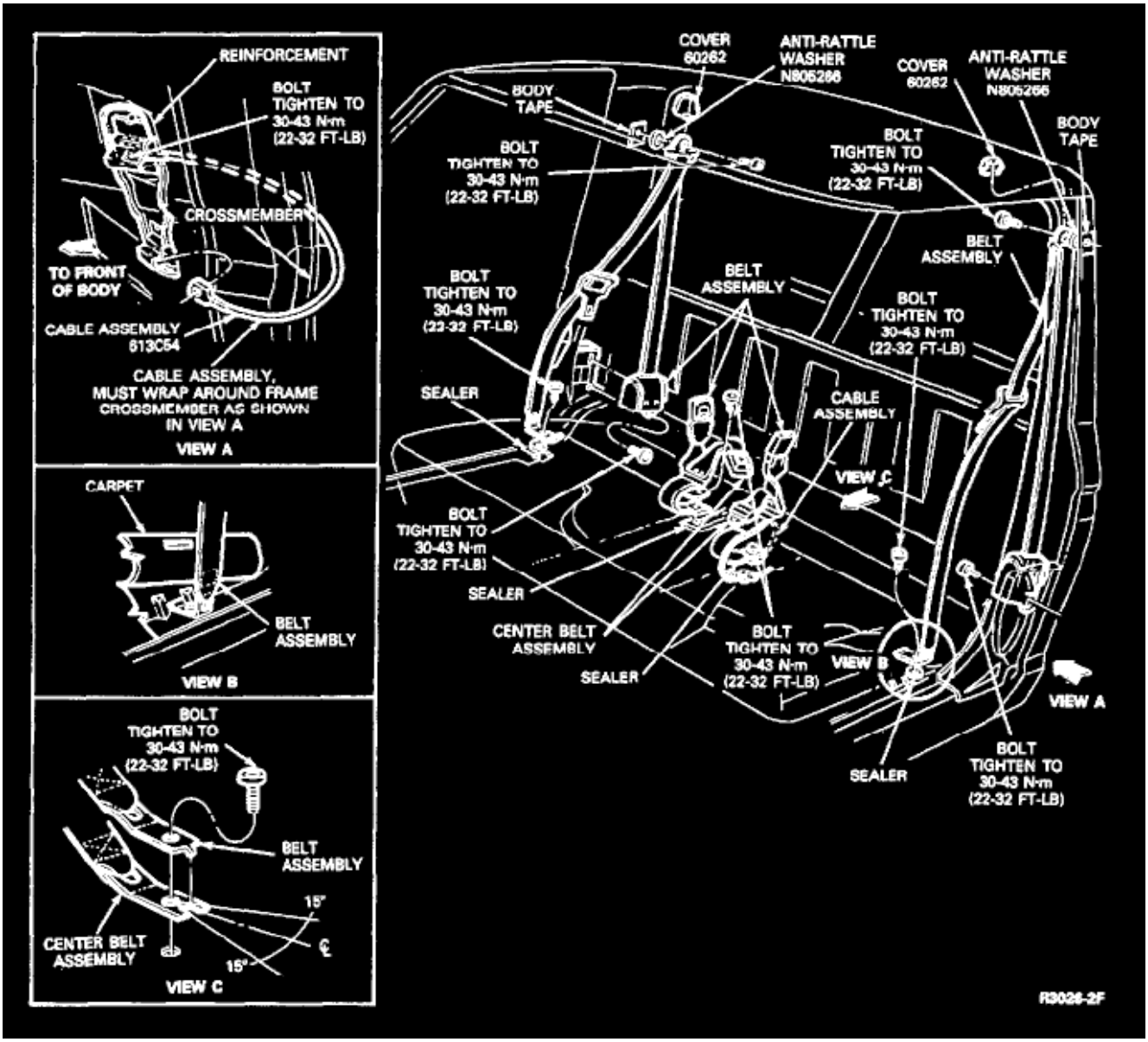
①Identification letter on top of bolt head or face of spacer.
NOTE: Bolt Torque Must be Maintained at 30-43 N-m (22-32 ft-lbs). CR3105-2B

Parts Replacement Chart

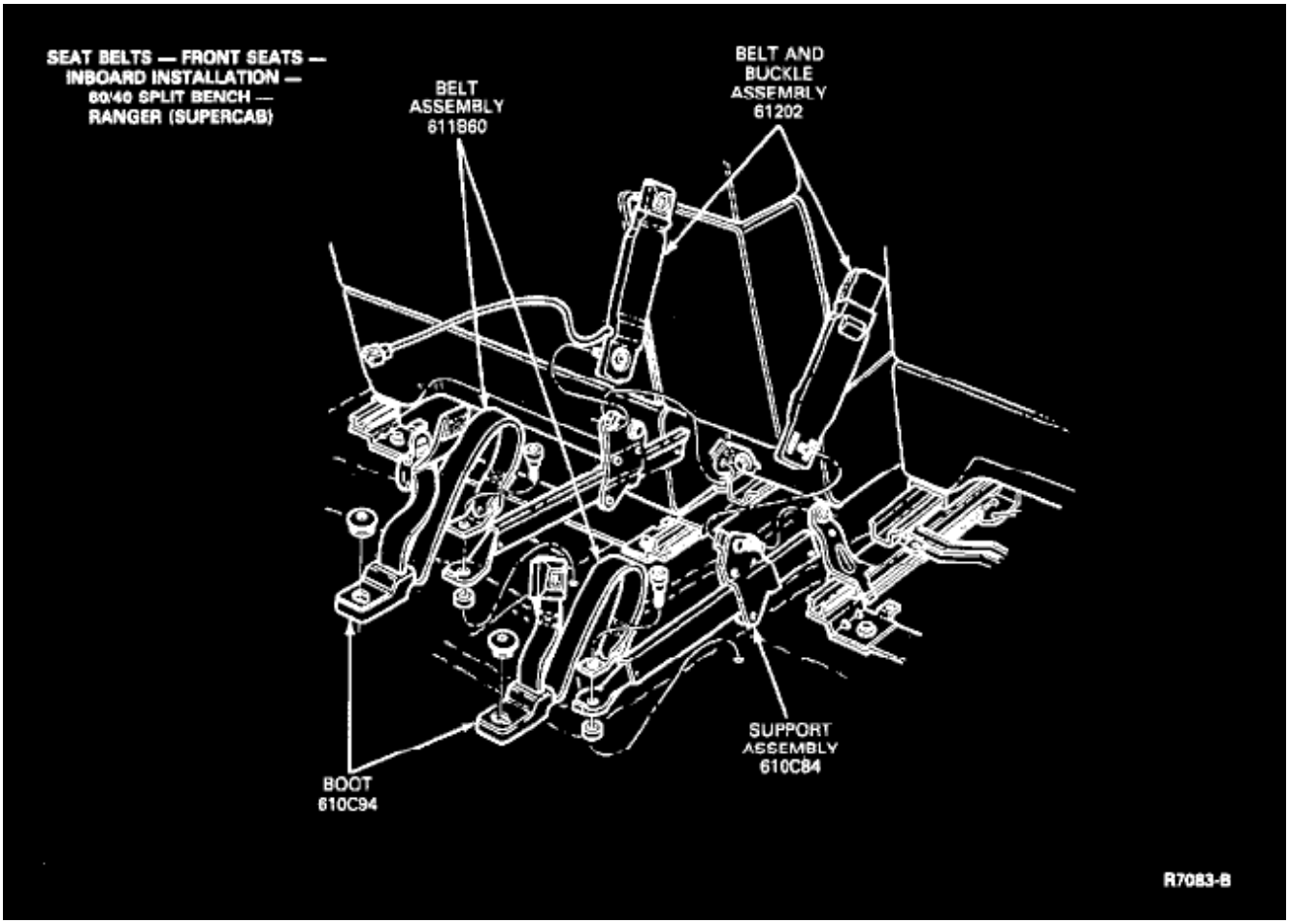
1. Remove the damaged bolt for the anchor reinforcement and discard. 2. Install a new bolt with the same part number as indicated on Parts Replacement Chart. Tighten to 30-43 N.m (22-32 ft-lb).

Seat Belt: Tools and Equipment

Seat Belt Bolt Bit Tool T77L-2100-A



Seat Belt Buckle: Service and Repair Center Belt/Buckle - Bench Seat

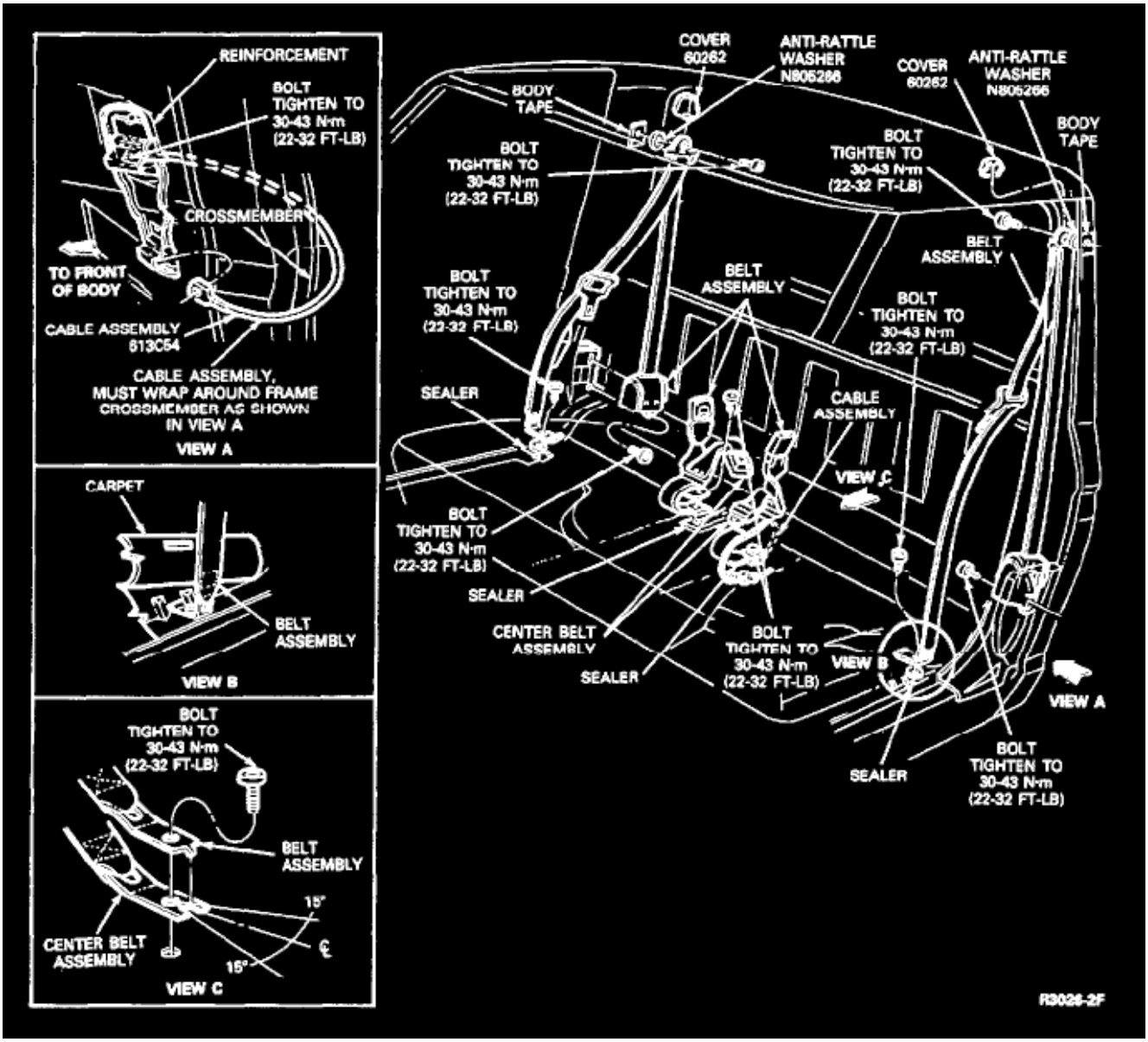


Removal

1. Remove the bolts securing the belt and buckle assemblies to floorpan (one each side). Remove belt and buckle assemblies from vehicle.

Installation

1. Position belt and buckle assemblies to floorpan and secure with bolt. Tighten to 30-43 N.m (22-32 ft-lb).


REINFORCEMENT
BOLT TIGHTEN TO 30-43 N·m (22-32 FT-LB)
CROSSMEMBER
TO FRONT OF BODY
CABLE ASSEMBLY 613C54
CABLE ASSEMBLY, MUST WRAP AROUND FRAME CROSSMEMBER AS SHOWN IN VIEW A
VIEW A
CARPET
BELT ASSEMBLY
VIEW B
BOLT TIGHTEN TO 30-43 N·m (22-32 FT-LB)
BELT ASSEMBLY
15°
CENTER BELT ASSEMBLY
15°
VIEW C
COVER 60262
ANTI-RATTLE WASHER N805266
BODY TAPE
BOLT TIGHTEN TO 30-43 N·m (22-32 FT-LB)
BELT ASSEMBLY
SEALER
CABLE ASSEMBLY
CENTER BELT ASSEMBLY
R3036-2F

Seat Belt Extension: Description and Operation

Safety Belt Extension Assembly

A safety belt assembly that is too short when fully extended over the lap of a stocky vehicle occupant can be lengthened approximately 203 mm (8 inches) with a safety belt extension assembly, which can be procured through local Ford dealers. The safety belt extension assembly is only available with black webbing and standard buckle and must be of the same manufacture as the belt system to which it is attached.

Seat Belt Guide Track: Customer Interest Split Bench - Difficult or No Fore/Aft Adjustment

Article No. 94-17-7

08/24/94

FRONT SEAT - DRIVER'S 60/40 SPLIT BENCH - POOR OR NO FORE/AFT ADJUSTMENT - SUPERCAB MODELS BUILT THROUGH 7/93

LIGHT TRUCK: 1991-93 RANGER

ISSUE: Some vehicles may exhibit the front seat being difficult to adjust and may eventually lead to no seat adjustment at all. This could be caused by the sliding collar of the front seat belt buckle support assembly (slide bar) rotating and not allowing the seat to glide freely on the seat tracks.

ACTION: Replace the front seat belt support bracket or the slide bar. Refer to the following, for proper service procedures.

SERVICE PROCEDURE

1. Remove the front seat from the vehicle as follows:

a. Remove the plastic seat track covers from the seat tracks.

b. Remove the four (4) seat track-to-floor retaining bolts.

c. Remove the Torx bolt behind the cover retaining the rear part of the slide bar assembly to the floor.

d. Disconnect the electrical connector for the seat belt buckle switch.

e. Lift the complete seat assembly from the vehicle and place upside down on a clean and protected surface.

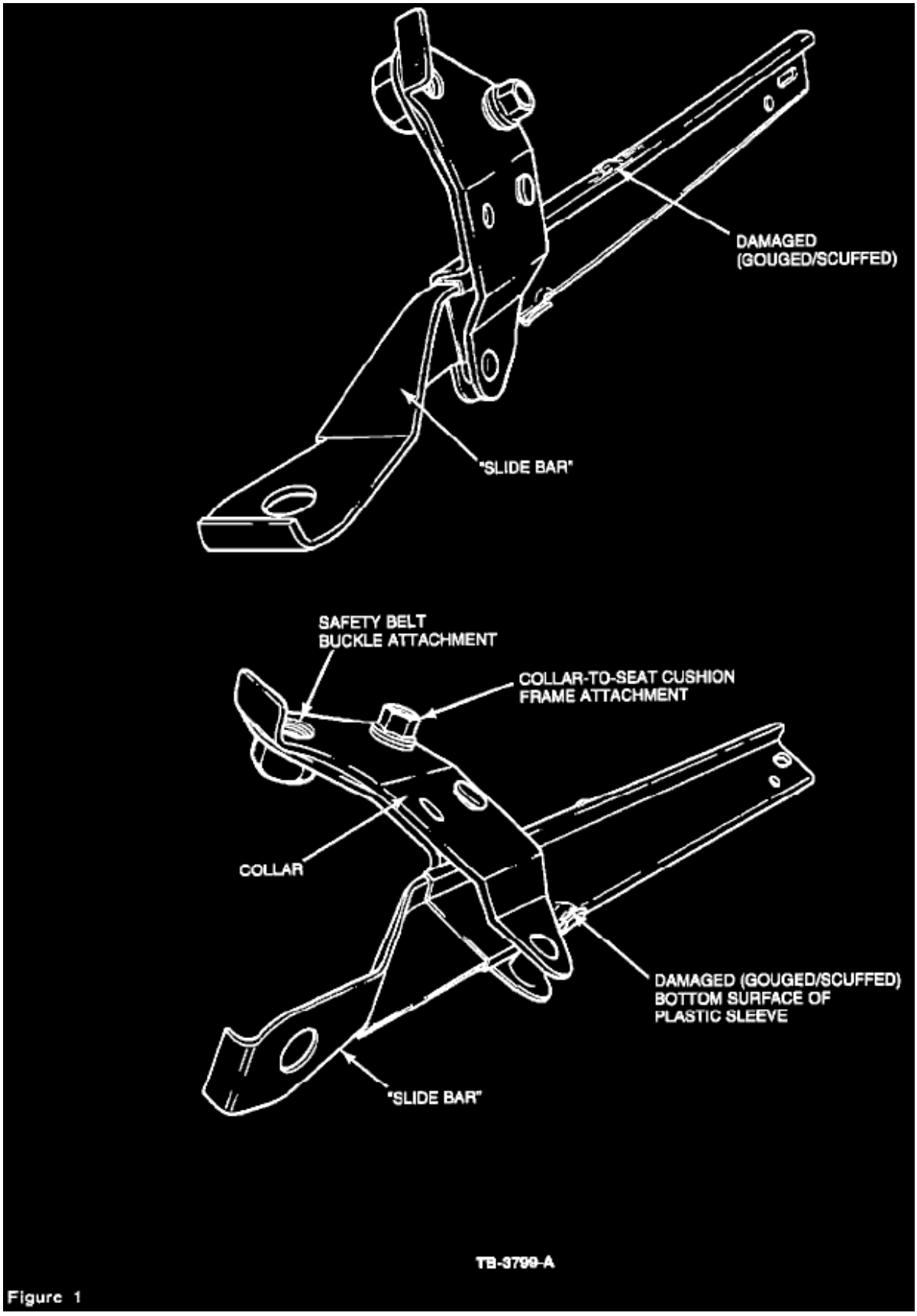


Figure 1

2. Inspect the top and/or bottom plastic surfaces of the front seat belt buckle support assembly slide bar for damaged, scuffed or gouged top and/or bottom surfaces. Refer to Figure 1.

NOTE:

IF THE SLIDE BAR SLEEVE DOES NOT SHOW ANY DAMAGE AS DESCRIBED ABOVE, DO NOT REPLACE THE SLIDE BAR. REPLACE THE FRONT SEAT BELT SUPPORT BRACKET ASSEMBLY (F37Z-13610D11-A). PROCEED TO STEP 3 FOR DETAILS.

NOTE:

IF THE SLIDE BAR DOES SHOW DAMAGE AS DESCRIBED ABOVE, OBTAIN A NEW SLIDE BAR ASSEMBLY (F3TZ-13610C85-A) AND FRONT SEAT BELT BUCKLE BRACKET ASSEMBLY (F37Z-13610D11-A) AND PROCEED TO STEP 3.

3. Remove the seat belt buckle assembly from the slide bar assembly.

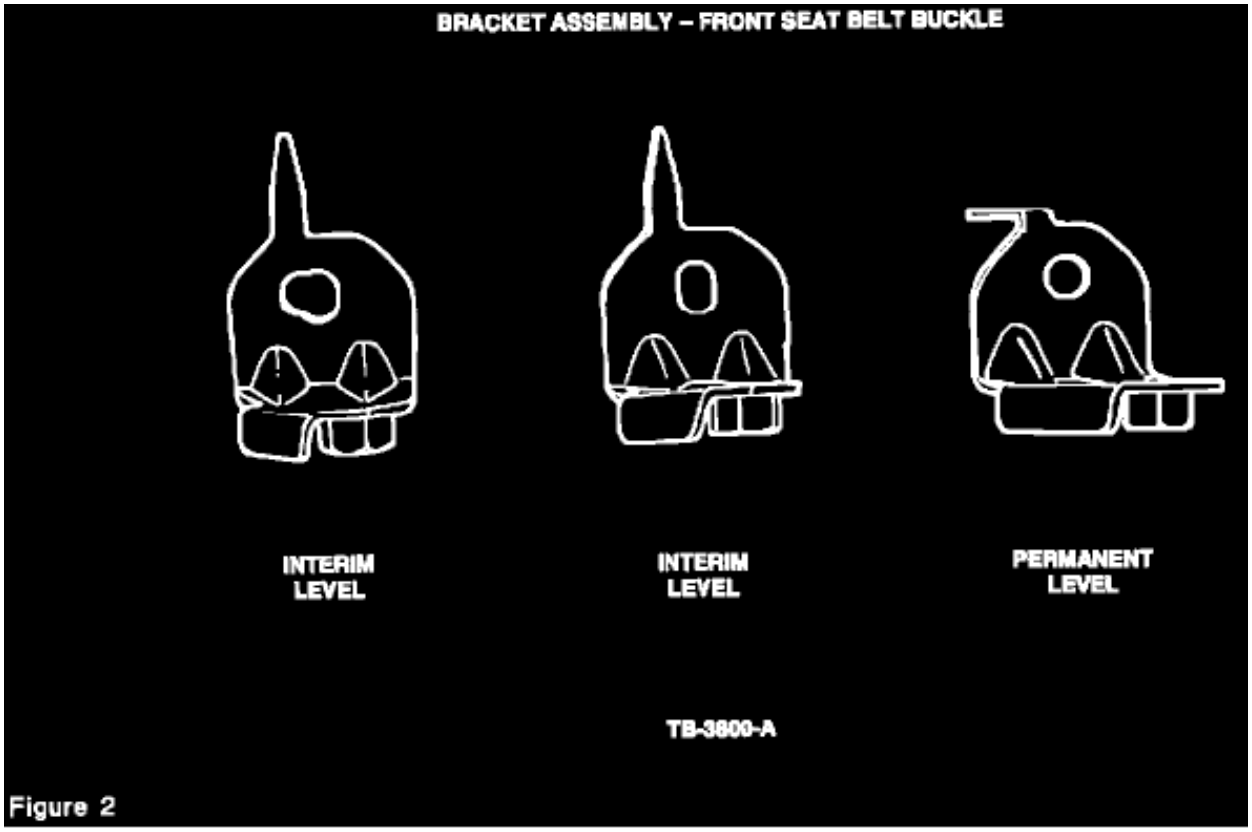


Figure 2

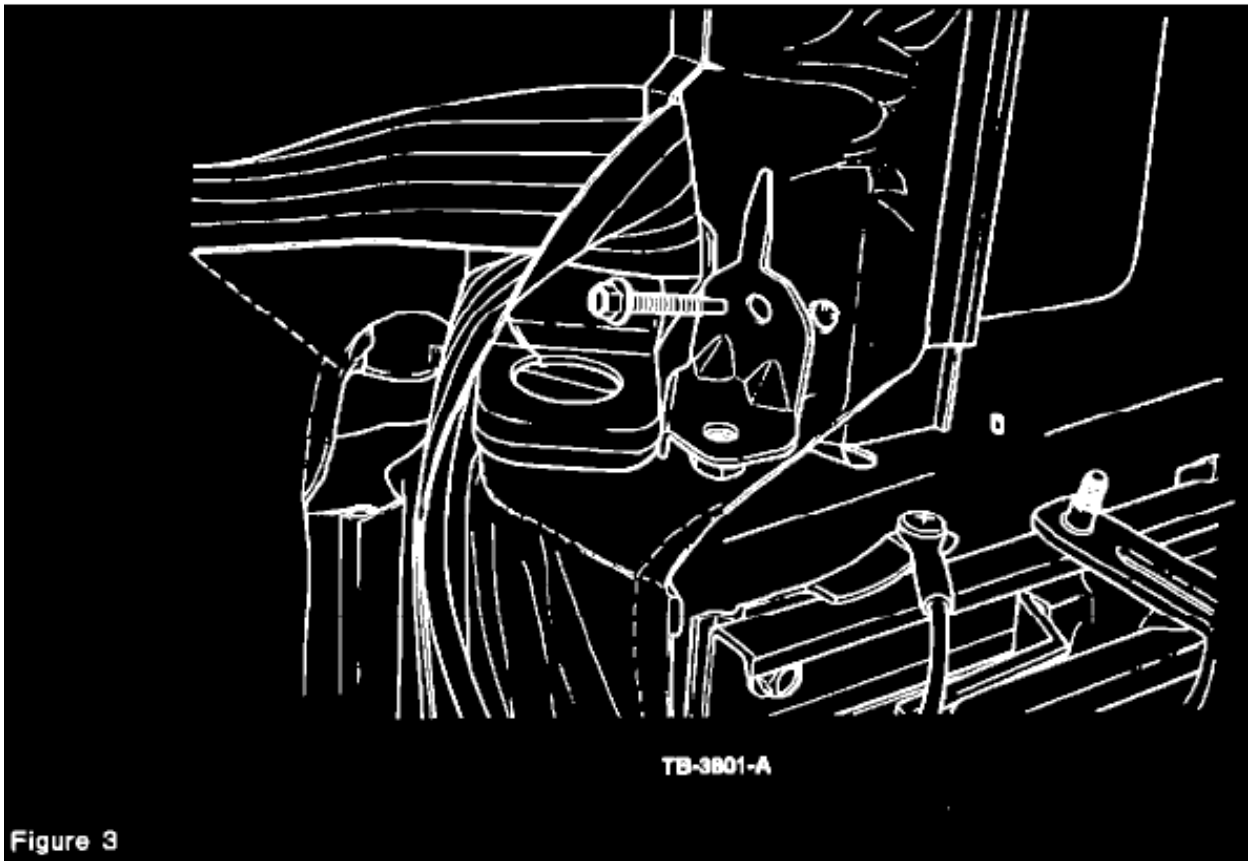


Figure 3

4. Remove the slide bar assembly from the seat as follows:

a. Remove the bolt retaining the collar of the slide bar assembly to the seat belt buckle support bracket on the inboard side of the seat cushion.

b. Remove the nut retaining the slide bar assembly to the mounting bracket attached to the front of the seat track assembly.

c. Remove the slide bar assembly from the seat assembly.

5. Locate and remove the M6 Torx head bolt retaining the seat belt buckle support bracket to the seat cushion frame. Discard the bracket and save the bolt for installation.

INSTALLATION PROCEDURE

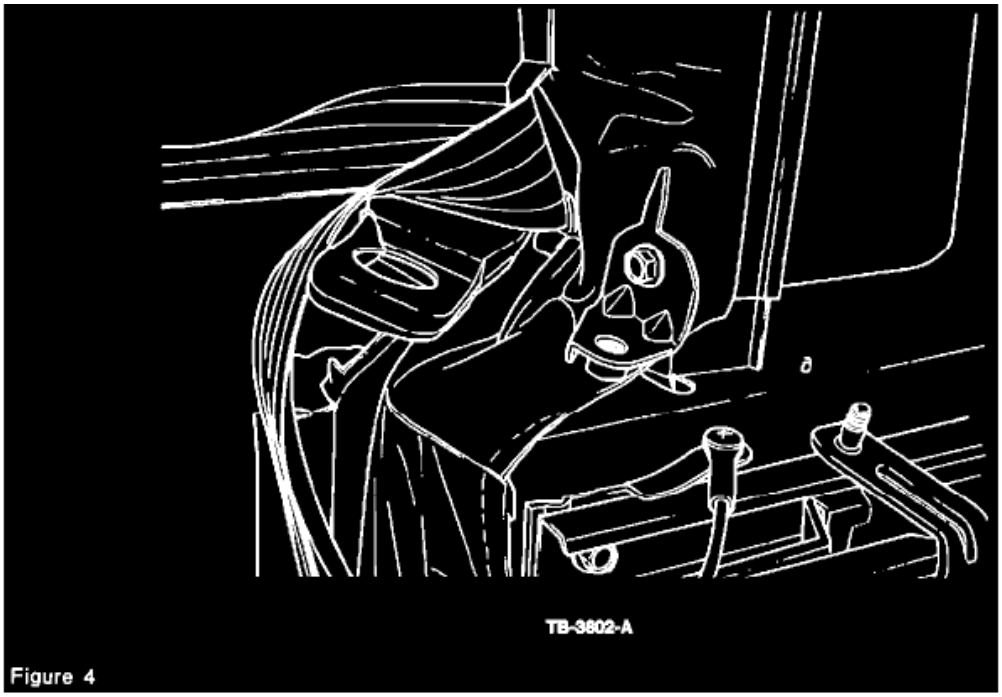


Figure 4

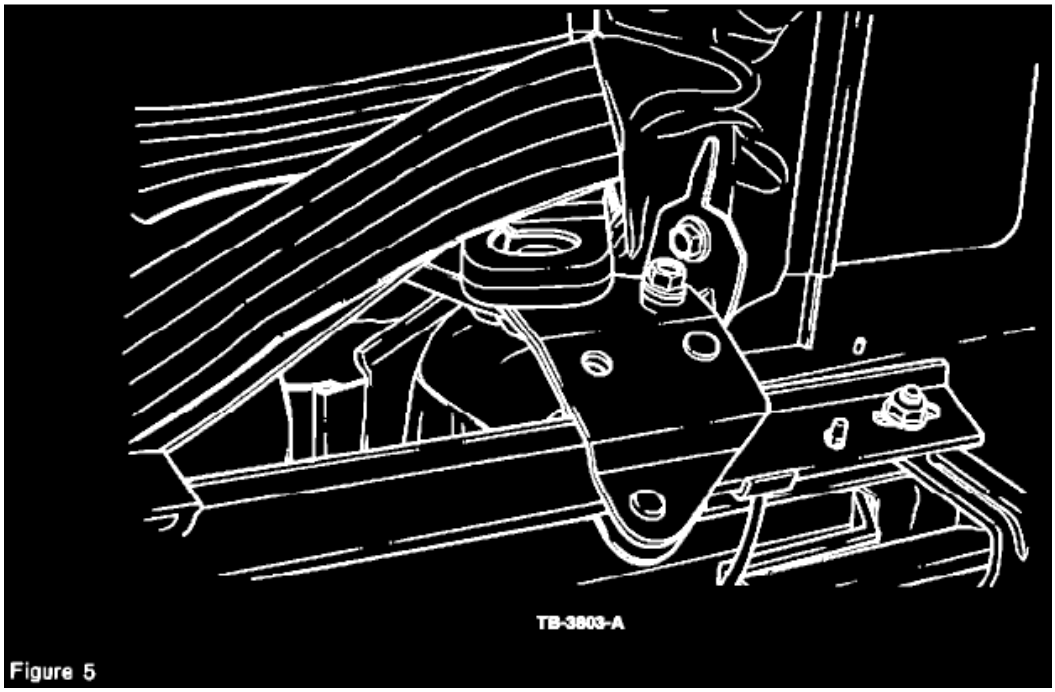


Figure 5

1. Install the new seat belt buckle support bracket (F37Z-13610D11-A) Figure 2, to the seat cushion frame using the M6 Torx head bolt and torque to 8-11 N-m (6-8 lb.ft.). Refer to Figures 3

and 4.

2. Lubricate the seat track assembly assembly with Multi-Purpose Grease Spray (D7AZ-19584-AA, or equivalent).

3. Position the slide bar assembly onto the seat track assembly. Refer to Figure 3.

NOTE:

THE SLIDE BAR MUST BE POSITIONED OVER THE STUD OF THE MOUNTING BRACKET ATTACHED TO THE SEAT TRACK ASSEMBLY.

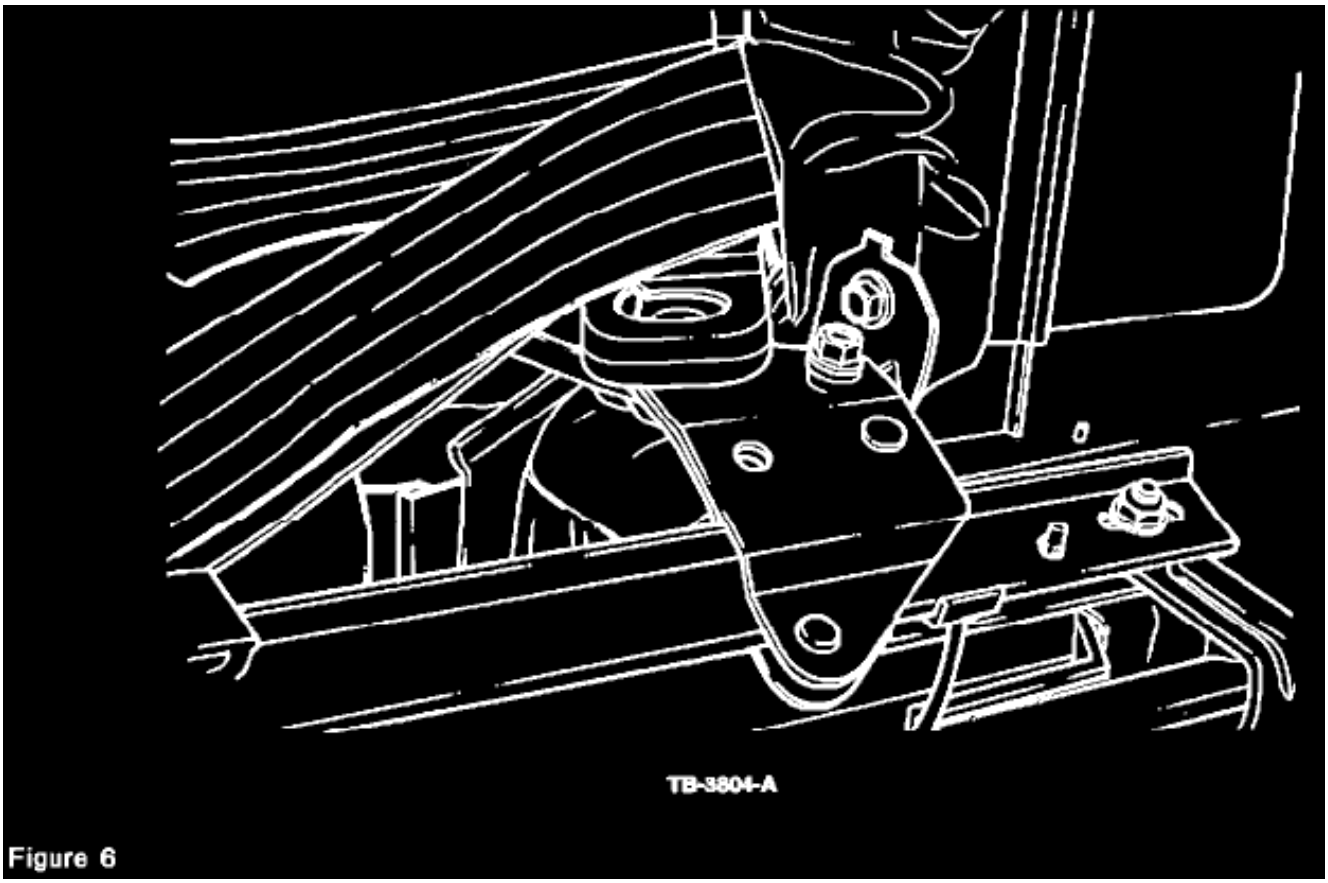


Figure 6

4. Secure the bolt required to retain the collar of the slide bar to the seat cushion seat belt buckle bracket as shown in Figures 5 and 6; torque to 8-11 N-m (6-8 lb.ft.).

5. Loosely install the nut required to retain the front end of the slide bar to the seat belt buckle support bracket located on the front of the seat track assembly.

NOTE:

THE SLIDE BAR MUST ABLE TO MOVE EASILY FORWARD AND REARWARD PRIOR TO INSTALLATION OF THE SEAT INTO THE VEHICLE.

6. Position the seat assembly into the vehicle.

7. Install the bolts needed to retain the seat track to the floor and torque the front retaining bolts to 12-23 N-m (9-17 lb.ft.).

a. Torque the rear seat track attaching bolts to 19-26 N-m (14-19 lb.ft.).

8. Position the anchor of the center seat belt assembly on the end of the slide bar.

9. Position the slide bar boot over both the anchor of the seat belt and the end of the slide bar.

10. Align the rear attaching hole in slide bar assembly with the attaching hole in the floor.

NOTE:

BE SURE THE RUBBER SPACER IS IN PLACE BETWEEN THE SLIDE BAR AND THE FLOOR ATTACHMENT.

11. Position the Torx head bolt through the boot, seat belt anchor, end of slide bar, rubber spacer and into the weld nut in the floor.

12. Pull the slide bar against the head of the shoulder bolt.

NOTE:

IF THE SLIDE BAR IS NOT HELD AGAINST THE BOLT HEAD, IT MAY BE POSSIBLE FOR THE SHOULDER OF THE BOLT TO BOTTOM OUT ON THE SLIDE BAR RESULTING THE SLIDE BAR NOT BEING IN REQUIRED ALIGNMENT.

13. Torque the bolt to 30-40 N-m (22-29 lb.ft.).

14. Install the boot plug.

15. Install the electrical connector for the lumbar support, if so equipped.

16. Connect the connector for the seat belt buckle switch.

17. Install the seat track covers on the seat tracks.

18. Move the seat rearward and forward at least ten (10) times to verify concern has been resolved.

PART NUMBER PART NAME CLASS

F37Z-13610D11-A Bracket Assembly C

F3TZ-1361OC85-A Slide Bar C

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage And Basic Warranty Coverage For 1991 Model

OPERATION DESCRIPTION TIME

941707A Replace Bracket Assembly 0.5 Hr.

(includes Time To Replace Slide Bar When Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

721546 41

OASIS CODES: 101000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Restraint Systems > Seat Belt Systems > Seat Belt Guide Track > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Seat Belt Guide Track: > 94177 > Aug > 94 > Split Bench - Difficult or No Fore/Aft Adjustment

Seat Belt Guide Track: All Technical Service Bulletins Split Bench - Difficult or No Fore/Aft Adjustment

Article No. 94-17-7

08/24/94

FRONT SEAT - DRIVER'S 60/40 SPLIT BENCH - POOR OR NO FORE/AFT ADJUSTMENT - SUPERCAB MODELS BUILT THROUGH 7/93

LIGHT TRUCK: 1991-93 RANGER

ISSUE: Some vehicles may exhibit the front seat being difficult to adjust and may eventually lead to no seat adjustment at all. This could be caused by the sliding collar of the front seat belt buckle support assembly (slide bar) rotating and not allowing the seat to glide freely on the seat tracks.

ACTION: Replace the front seat belt support bracket or the slide bar. Refer to the following, for proper service procedures.

SERVICE PROCEDURE

1. Remove the front seat from the vehicle as follows:

a. Remove the plastic seat track covers from the seat tracks.

b. Remove the four (4) seat track-to-floor retaining bolts.

c. Remove the Torx bolt behind the cover retaining the rear part of the slide bar assembly to the floor.

d. Disconnect the electrical connector for the seat belt buckle switch.

e. Lift the complete seat assembly from the vehicle and place upside down on a clean and protected surface.

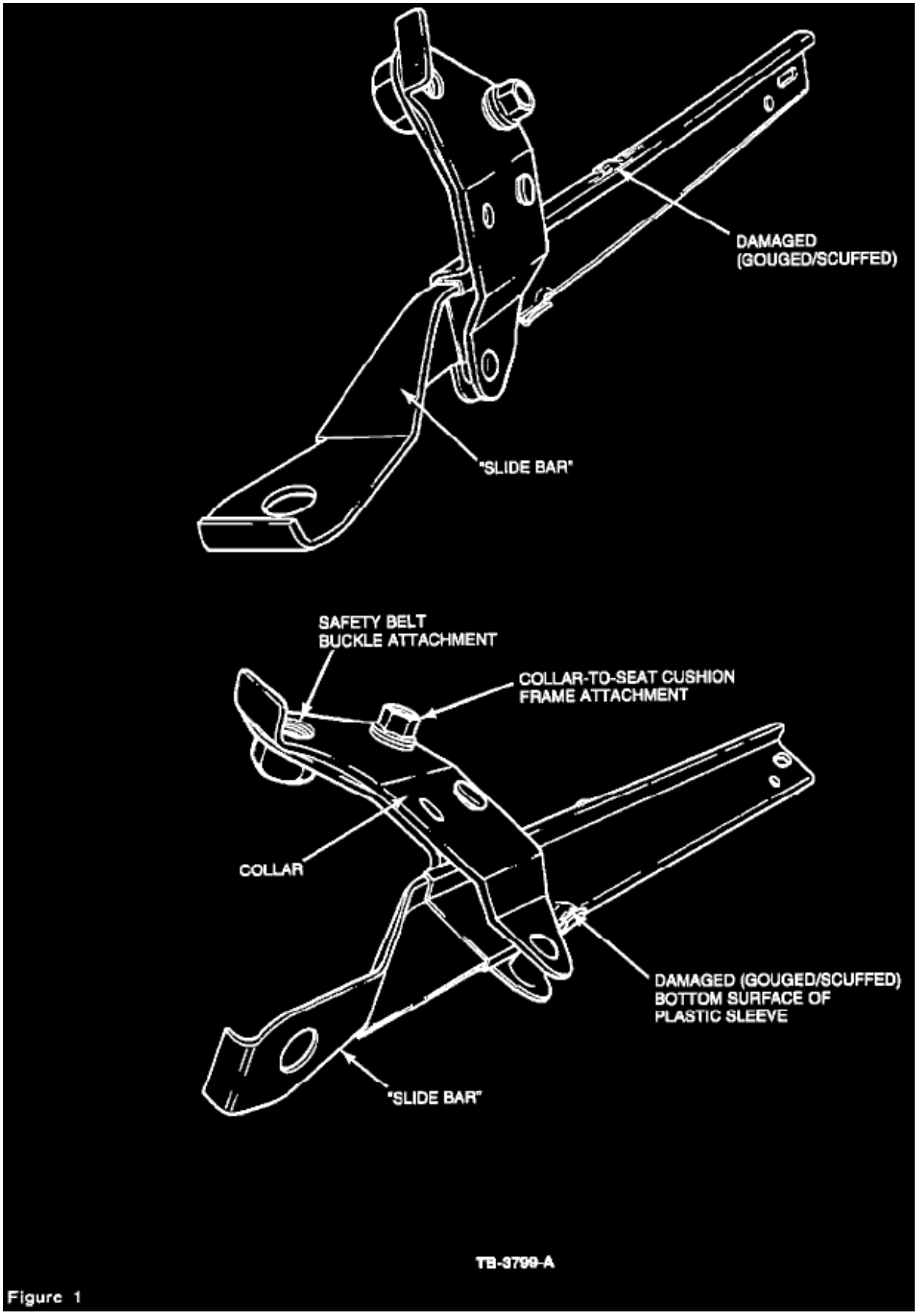


Figure 1

2. Inspect the top and/or bottom plastic surfaces of the front seat belt buckle support assembly slide bar for damaged, scuffed or gouged top and/or bottom surfaces. Refer to Figure 1.

NOTE:

IF THE SLIDE BAR SLEEVE DOES NOT SHOW ANY DAMAGE AS DESCRIBED ABOVE, DO NOT REPLACE THE SLIDE BAR. REPLACE THE FRONT SEAT BELT SUPPORT BRACKET ASSEMBLY (F37Z-13610D11-A). PROCEED TO STEP 3 FOR DETAILS.

NOTE:

IF THE SLIDE BAR DOES SHOW DAMAGE AS DESCRIBED ABOVE, OBTAIN A NEW SLIDE BAR ASSEMBLY (F3TZ-13610C85-A) AND FRONT SEAT BELT BUCKLE BRACKET ASSEMBLY (F37Z-13610D11-A) AND PROCEED TO STEP 3.

3. Remove the seat belt buckle assembly from the slide bar assembly.

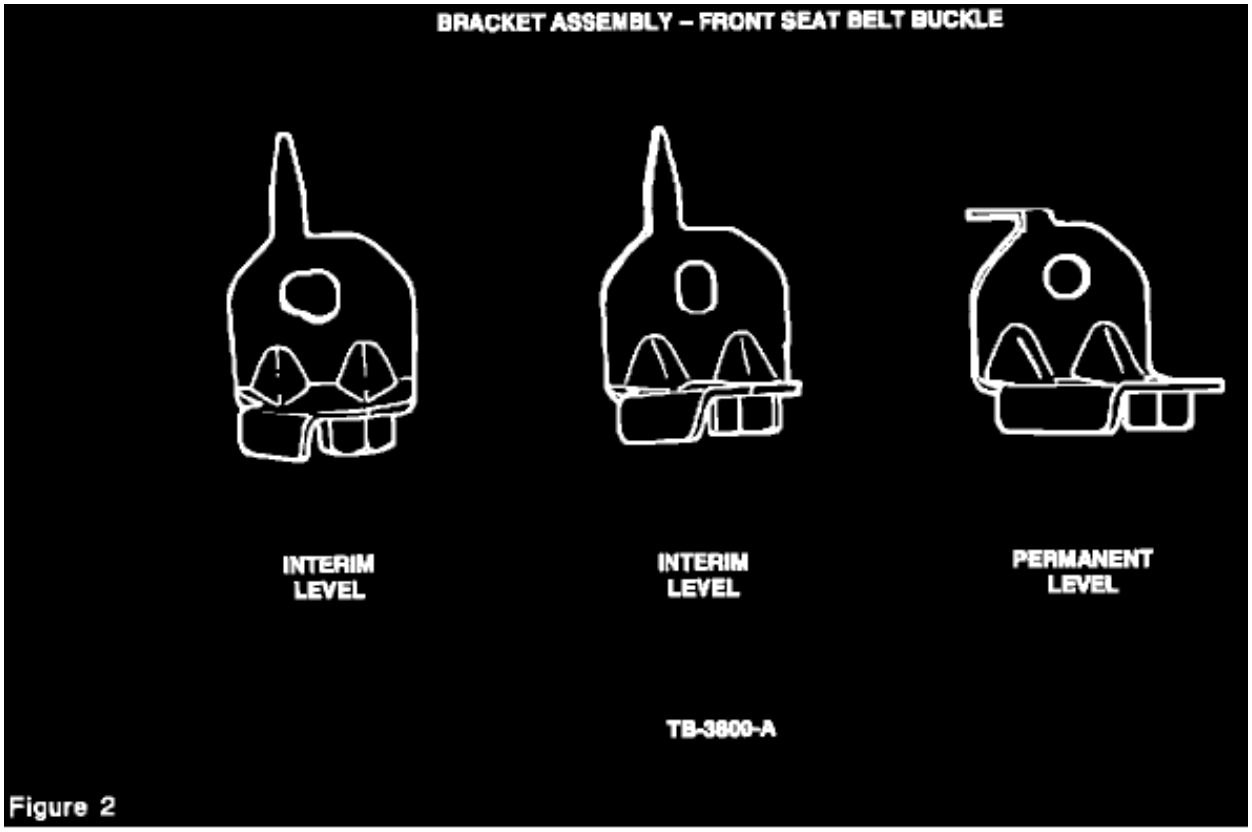


Figure 2

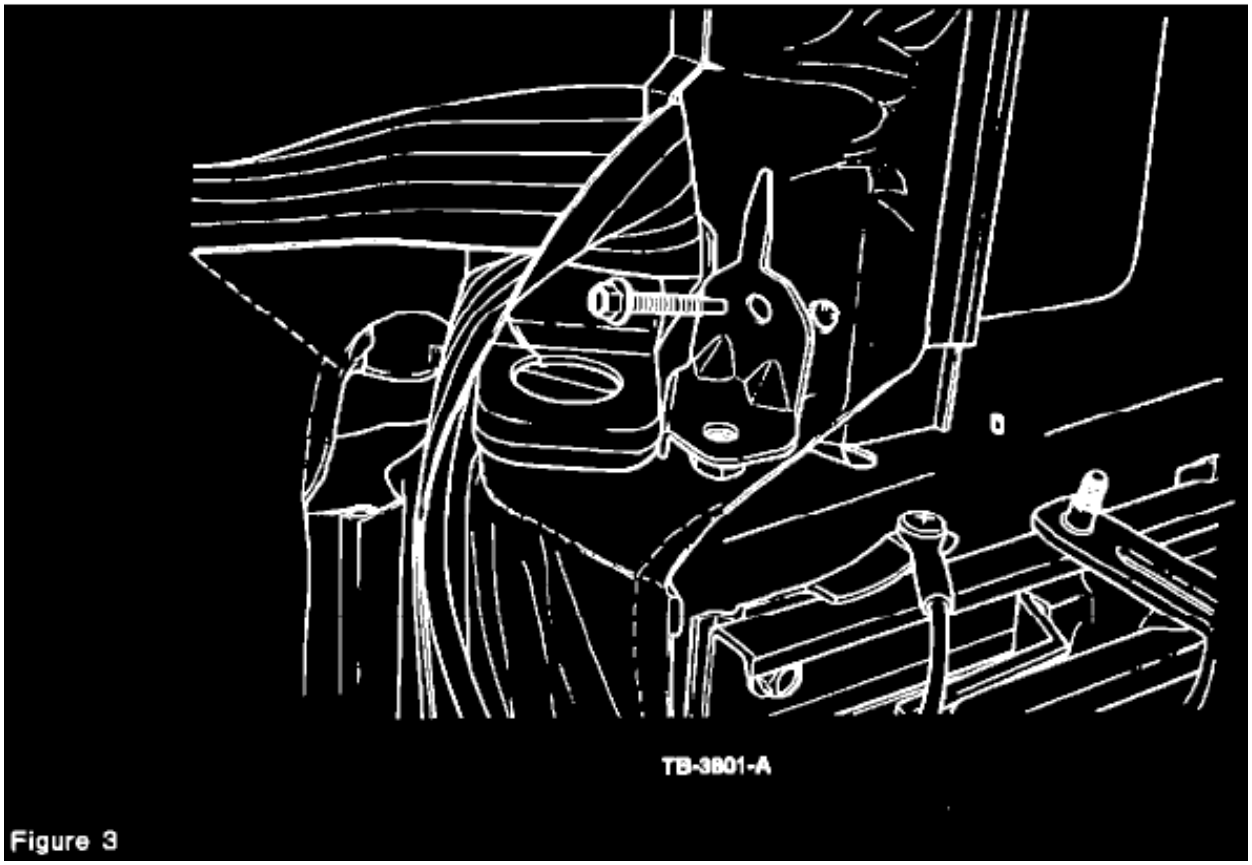


Figure 3

4. Remove the slide bar assembly from the seat as follows:

a. Remove the bolt retaining the collar of the slide bar assembly to the seat belt buckle support bracket on the inboard side of the seat cushion.

b. Remove the nut retaining the slide bar assembly to the mounting bracket attached to the front of the seat track assembly.

c. Remove the slide bar assembly from the seat assembly.

5. Locate and remove the M6 Torx head bolt retaining the seat belt buckle support bracket to the seat cushion frame. Discard the bracket and save the bolt for installation.

INSTALLATION PROCEDURE

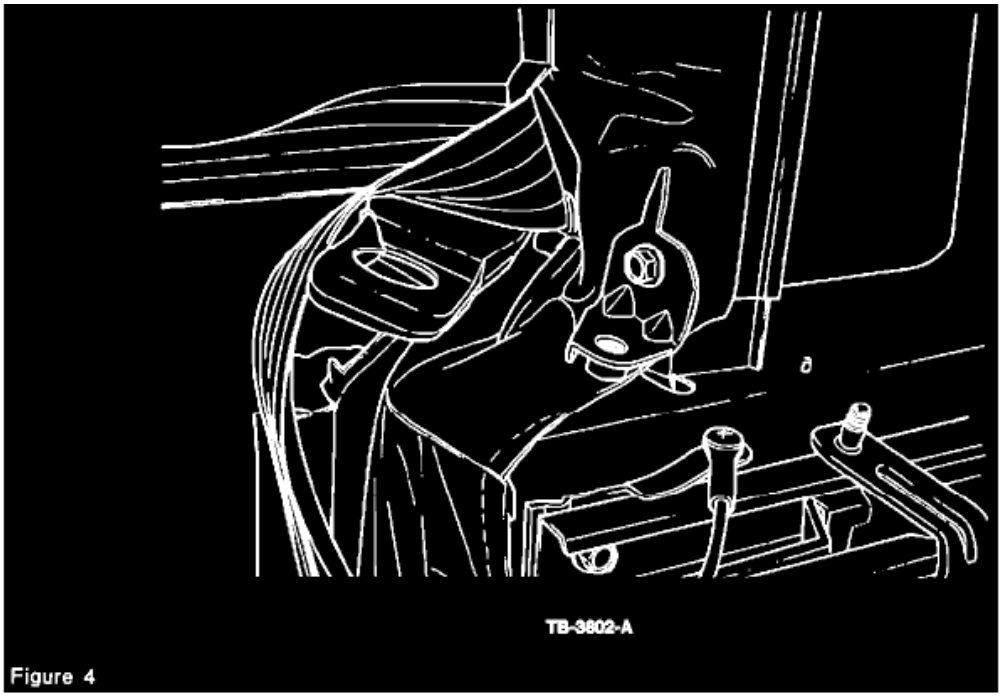


Figure 4

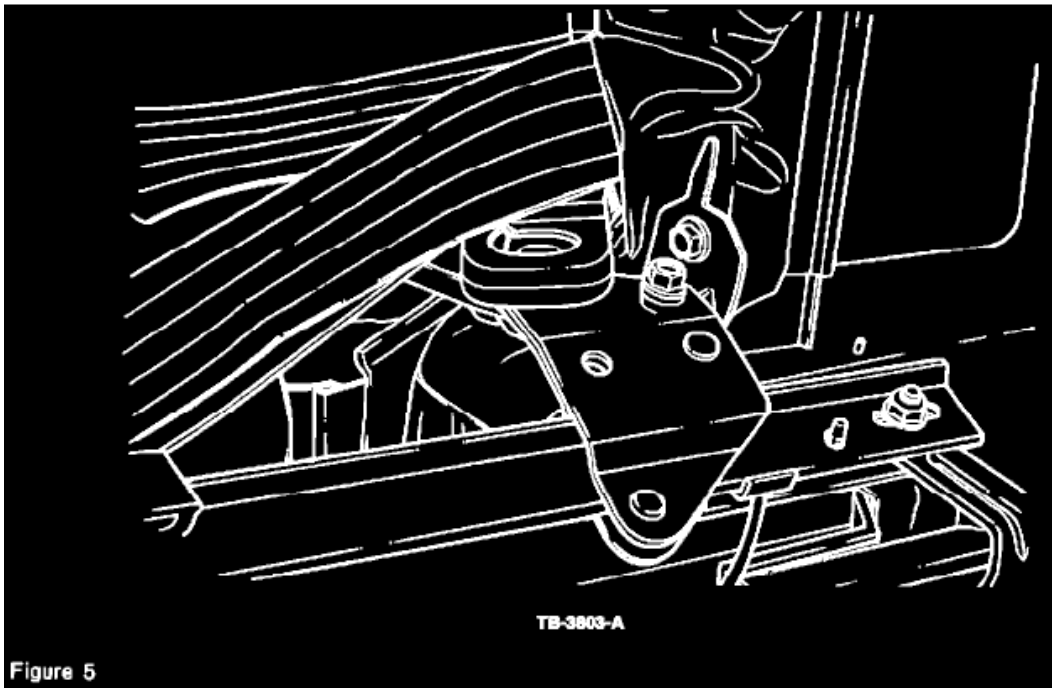


Figure 5

1. Install the new seat belt buckle support bracket (F37Z-13610D11-A) Figure 2, to the seat cushion frame using the M6 Torx head bolt and torque to 8-11 N-m (6-8 lb.ft.). Refer to Figures 3

and 4.

2. Lubricate the seat track assembly assembly with Multi-Purpose Grease Spray (D7AZ-19584-AA, or equivalent).

3. Position the slide bar assembly onto the seat track assembly. Refer to Figure 3.

NOTE:

THE SLIDE BAR MUST BE POSITIONED OVER THE STUD OF THE MOUNTING BRACKET ATTACHED TO THE SEAT TRACK ASSEMBLY.

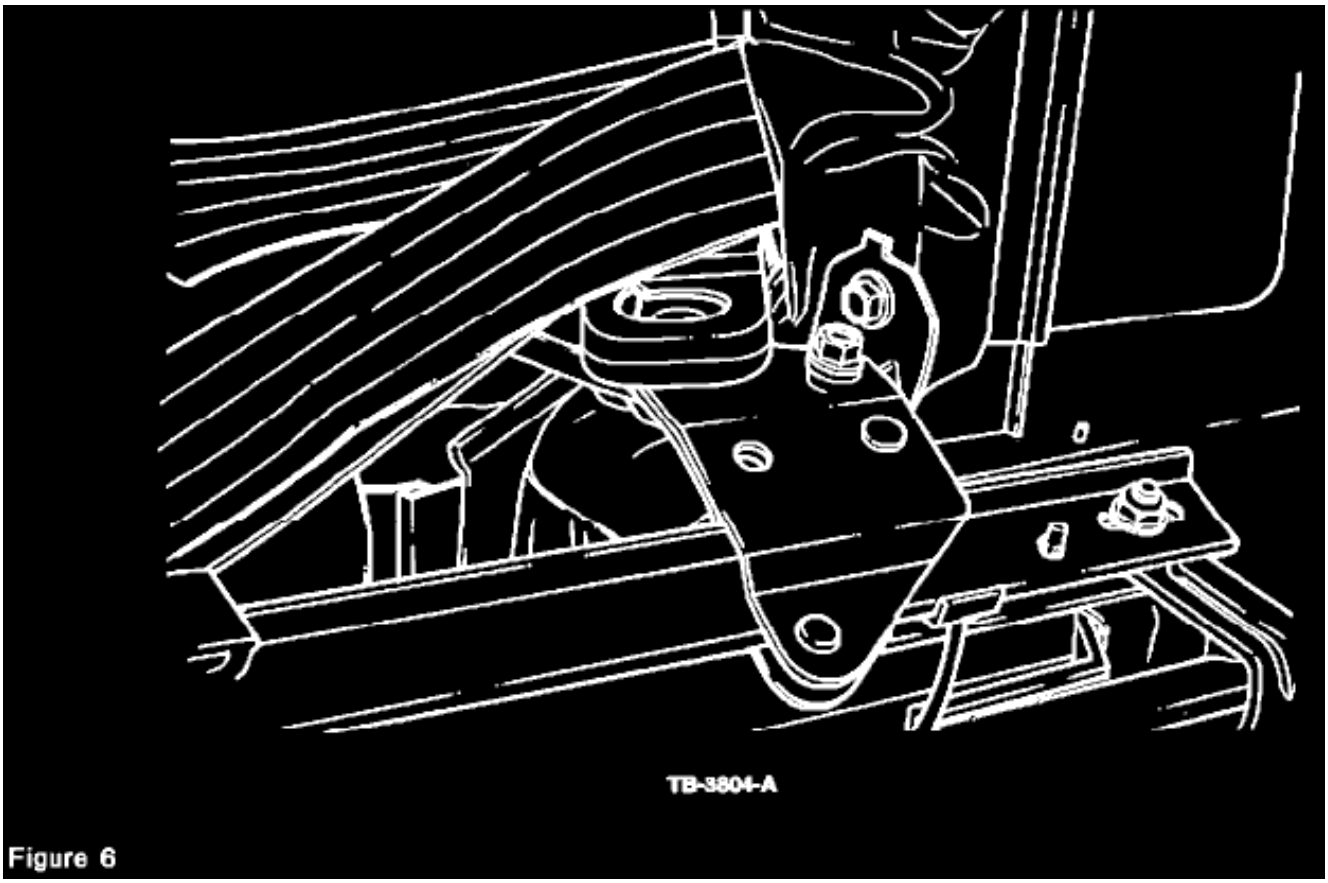


Figure 6

4. Secure the bolt required to retain the collar of the slide bar to the seat cushion seat belt buckle bracket as shown in Figures 5 and 6; torque to 8-11 N-m (6-8 lb.ft.).

5. Loosely install the nut required to retain the front end of the slide bar to the seat belt buckle support bracket located on the front of the seat track assembly.

NOTE:

THE SLIDE BAR MUST ABLE TO MOVE EASILY FORWARD AND REARWARD PRIOR TO INSTALLATION OF THE SEAT INTO THE VEHICLE.

6. Position the seat assembly into the vehicle.

7. Install the bolts needed to retain the seat track to the floor and torque the front retaining bolts to 12-23 N-m (9-17 lb.ft.).

a. Torque the rear seat track attaching bolts to 19-26 N-m (14-19 lb.ft.).

8. Position the anchor of the center seat belt assembly on the end of the slide bar.

9. Position the slide bar boot over both the anchor of the seat belt and the end of the slide bar.

10. Align the rear attaching hole in slide bar assembly with the attaching hole in the floor.

NOTE:

BE SURE THE RUBBER SPACER IS IN PLACE BETWEEN THE SLIDE BAR AND THE FLOOR ATTACHMENT.

11. Position the Torx head bolt through the boot, seat belt anchor, end of slide bar, rubber spacer and into the weld nut in the floor.

12. Pull the slide bar against the head of the shoulder bolt.

NOTE:

IF THE SLIDE BAR IS NOT HELD AGAINST THE BOLT HEAD, IT MAY BE POSSIBLE FOR THE SHOULDER OF THE BOLT TO BOTTOM OUT ON THE SLIDE BAR RESULTING THE SLIDE BAR NOT BEING IN REQUIRED ALIGNMENT.

13. Torque the bolt to 30-40 N-m (22-29 lb.ft.).

14. Install the boot plug.

15. Install the electrical connector for the lumbar support, if so equipped.

16. Connect the connector for the seat belt buckle switch.

17. Install the seat track covers on the seat tracks.

18. Move the seat rearward and forward at least ten (10) times to verify concern has been resolved.

PART NUMBER PART NAME CLASS

F37Z-13610D11-A Bracket Assembly C

F3TZ-1361OC85-A Slide Bar C

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage And Basic Warranty Coverage For 1991 Model

OPERATION DESCRIPTION TIME

941707A Replace Bracket Assembly 0.5 Hr.

(includes Time To Replace Slide Bar When Required)

DEALER CODING

BASIC PART NO. CONDITION CODE

721546 41

OASIS CODES: 101000

Antenna Cable: Customer Interest Radio - Poor AM Reception

Article No. 93-2-5

01/18/93

RADIO - POOR AM RECEPTION CAUSED BY POOR ANTENNA CONNECTIONS

FORD: 1990 CROWN VICTORIA

LINCOLN-MERCURY: 1990 GRAND MARQUIS

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 RANGER 1991-92 EXPLORER

ISSUE: Poor AM radio reception, such as fading or static, may be caused by poor antenna connections.

ACTION: Perform the following diagnostic and repair procedures. If necessary, replace the antenna and antenna cable as required.

VERIFICATION

In some cases, a customer's concern may be caused by normal radio operating conditions. This is especially true if the customer complains of static in certain locations or while tuned to certain stations.

Obtain as much information from the customer as possible regarding the audio system's performance. The following descriptions will then help the technician and the customer decide whether the radio system concerns are caused by a defective audio system or are the results of normal operating conditions.

FADING

AM fade will occur under viaducts and in urban areas with tall buildings. Certain AM stations may lower their power in the evening which will cause poor reception at night.

STATIC

AM static may be caused by power lines, electric fences, neon signs, and thunderstorms. Static may become very noticeable if the AM station is weak or distant.

AM Signal Issue - Diagnostic Tips

First, it is important that you compare the reception performance of the complaint vehicle with the reception performance of other vehicles with known good reception. Use the same set of test stations in the same locations when you test the vehicle, in order to become accustomed to how the stations should sound and what external interference is to be expected. This should be done with the engine running and with the engine not running in the same location.

It is important to note that even with a perfect AM radio receiver and a perfect antenna, reception conditions are constantly varying. Interference from noise sources, both internal and external to the vehicle, are often erratic and unpredictable.

The most important tool used in diagnosing AM radio concern is a reliable weak AM signal source. A high-power AM Broadcast station one or two hundred miles away is ideal. The station should be clear so that you can understand what is being said with little or no difficulty.

It is important to note that there are other sources of noise, external to the vehicle, that can interfere with the signal you are trying to receive. These external noises should be either taken into account or avoided. For example, power lines, transformers or fluorescent lights can radiate noise in the AM broadcast band. It is best to test the concern vehicle in an area well clear of such noise sources.

Summary:

Select a set of test stations, especially the stations that may be the reason for the customer concern, and some which are over 100 miles away.

^ Note the reception performance of a known good vehicle in the desired locations. Note the presence of any local external noise sources (eg. power lines, etc.).

^ Compare the performance of the concern vehicle when receiving the test stations in the same locations.

DIAGNOSIS

If a vehicle's audio system has been verified to have an AM fading or static concern that is not found in a comparably equipped vehicle under similar conditions, perform the following diagnosis.

VISUAL INSPECTION

Poor AM radio reception may be caused by poor antenna cable connections at the various antenna cable connectors, and/or at the antenna base. Visually inspect all the connectors of the antenna system. This includes...

^ The antenna connector at the rear of the radio

^ The in-line antenna connector (if equipped)

^ The connector at the base of the antenna

^ The base of the antenna for signs of poor grounding (Some antenna bases "bite" into the underside of the fender for grounding. To ensure proper installation, refer to the appropriate Service Manual, Sections 35-10 or 15-02, depending on model year.)

^ The antenna for any loose screws or station nuts

^ Improper connections (repair if found and verify the effectiveness of repair).

CORROSION INSPECTION

Inspect all of the connectors of the antenna system. These include...

^ Connector at the rear of the radio

^ The in-line antenna connector (if equipped)

^ The connector at the base of the antenna

^ If there are signs of corrosion (severe discoloration, rust or white powder from the zinc die-cast bases) on any antenna components, repair the concern by replacing any antenna component where evidence of corrosion is found. Verify effectiveness of repair.

ELECTRICAL TESTS

Perform the following antenna conductivity/resistance diagnosis and testing procedures.

ANTENNA TEST # 1 - ALL ANTENNA TYPES

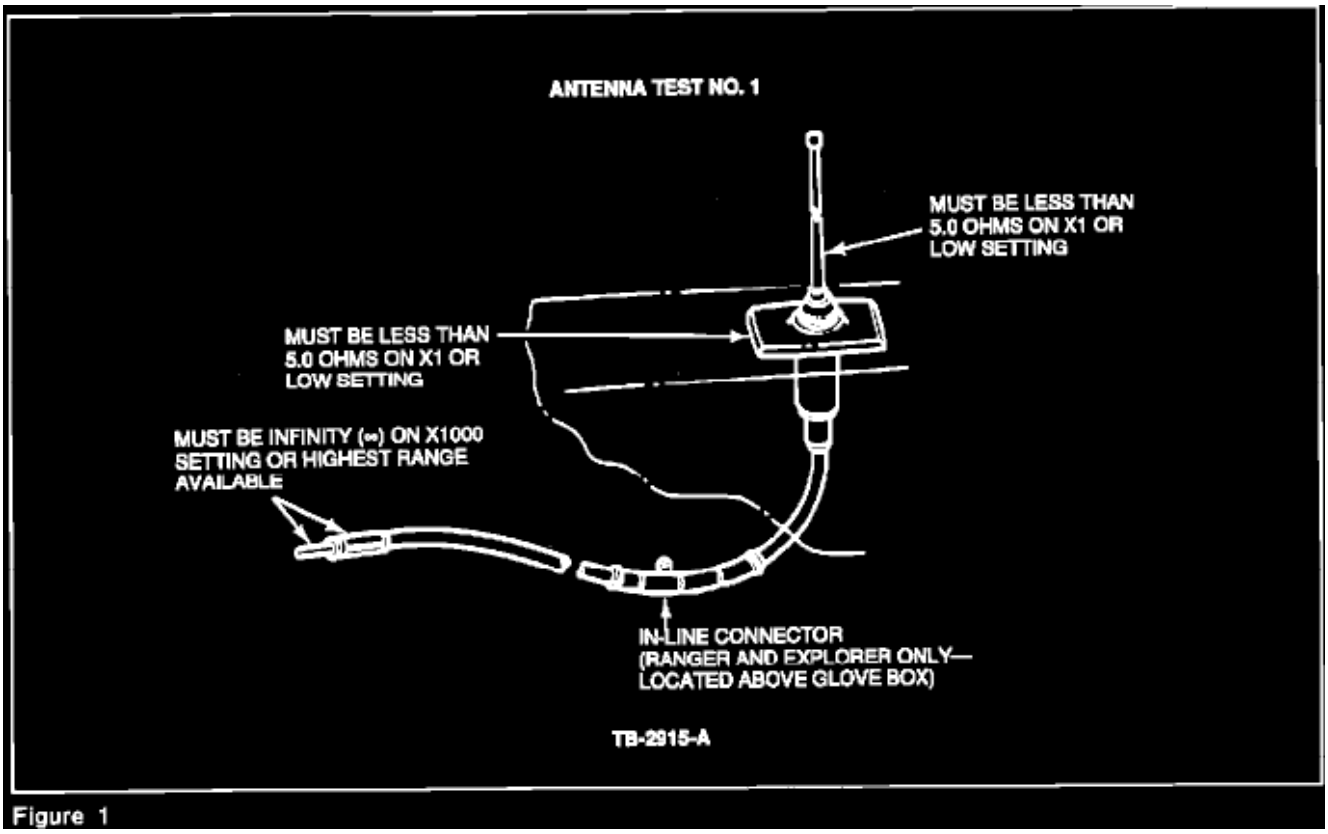


Figure 1

1. With the antenna installed on the vehicle and the cable unplugged from the radio, perform the following resistance tests with an ohmmeter. Probes must contact antenna at points specified by arrowheads in Figure 1.

2. If ohmmeter tests are satisfactory, the antenna is good.

3. If any ohmmeter is unsatisfactory, take the following action:

a. If it is a one-piece assembly, replace the complete antenna and cable assembly.

b. If it is a detachable cable and mast, perform Antenna Tests # 2 and # 3.

c. If it is a manual antenna with an extension cable, perform Antenna Test # 4.

ANTENNA TEST # 2 - ANTENNA EQUIPPED WITH DETACHABLE CABLE AND MAST

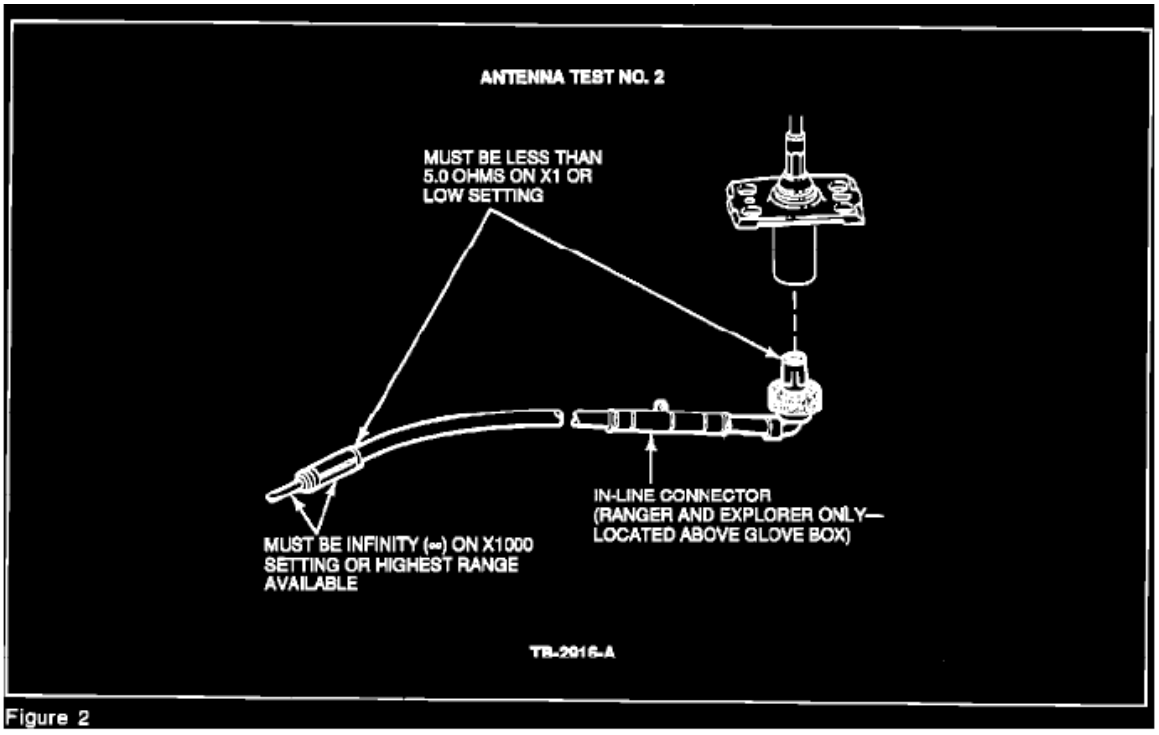


Figure 2

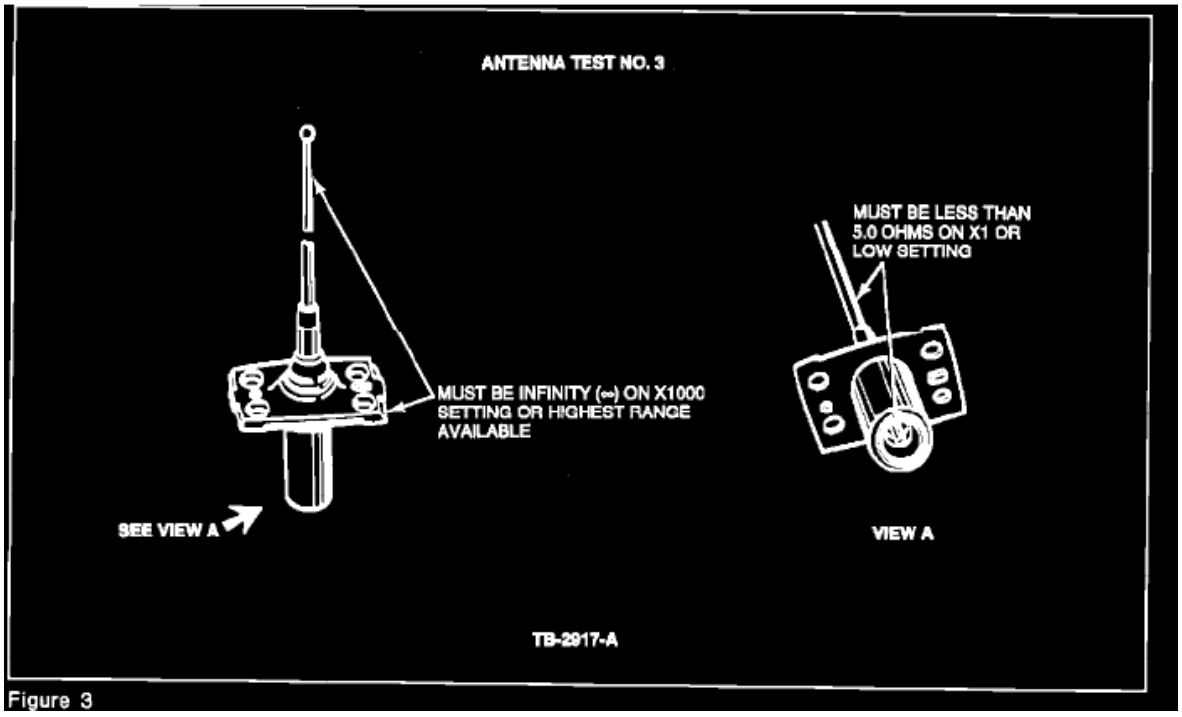


Figure 3

1. When the results in Antenna Test # 1 have been unsatisfactory, disconnect the antenna mast and base from the cable and perform the tests shown in Figure 2.

2. If ohmmeter readings are satisfactory, the antenna is good. Perform Antenna Test # 3.

3. If either of the readings are unsatisfactory, replace the cable.

ANTENNA TEST # 3 - ANTENNA MAST AND BASE

1. Perform the tests shown in Figure 3.

2. If ohmmeter readings are satisfactory, the antenna mast and base are good. Replace the cable.

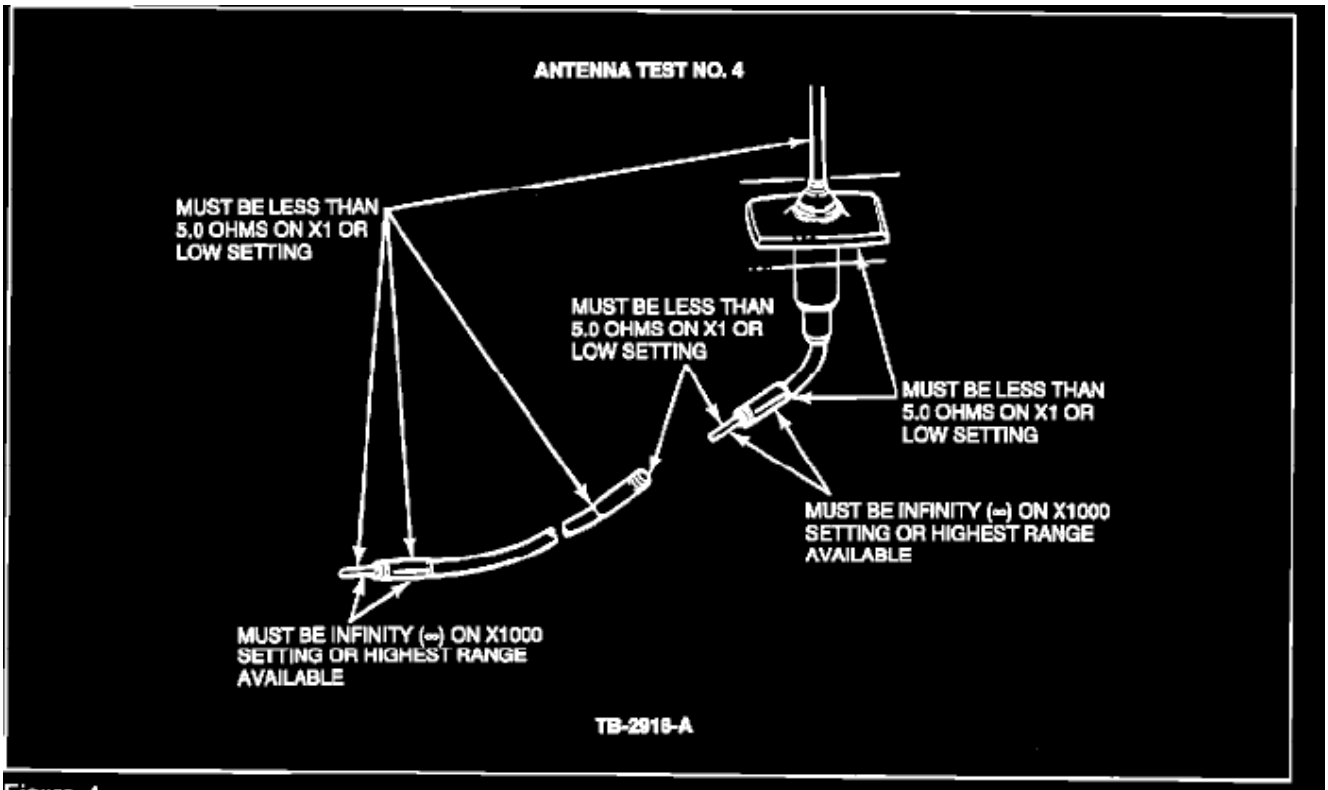


Figure 4

3. If either reading is unsatisfactory, replace only the base assembly. The mast should be good.

ANTENNA TEST # 4 - ANTENNA WITH EXTENSION CABLE

1. When the results in Antenna Test # 2 have been unsatisfactory, disconnect the extension cable from the main cable and perform the tests shown in Figure 4.

2. If ohmmeter readings are satisfactory, the extension cable and main antenna cable are good. Perform Antenna Test # 3.

3. If either reading on the extension cable is unsatisfactory, replace the extension cable.

4. If either reading on the main antenna cable is unsatisfactory, take the following action:

a. If it is a one-piece assembly, replace the complete antenna and main cable assembly.

b. If the main cable is detachable, perform Antenna Test # 2 and # 3.

Service as needed per the appropriate Service Manual, section 35-10 or 15-02. Verify the effectiveness of the repair.

IN-LINE CONNECTOR

If diagnosis and repair procedures above have not been effective, the in-line connector of the subject vehicles may be intermittent. Service it as outlined in the following repair procedure.

STATIC CONCERNS - ALL RANGER, BRONCO II AND EXPLORER VEHICLES

1. Remove the radio. Refer to the appropriate Service Manual, Sections 35-01 or 15-02, for removal procedure.

2. Disconnect the antenna cable at the in-line connector located above the glove box.

3. Unbolt the in-line connector from its mounting location above the glove box. A 7 mm straight/open ended wrench can be used.

4. Remove the instrument panel portion of the antenna cable. Detach the antenna cable from the two locators, one to the right of the radio opening and the other behind the center heat duct.

5. Remove the antenna base and lead-in cable. Refer to the appropriate Service Manual for the removal procedure.

6. Remove the instrument panel using the appropriate Service Manual procedure.

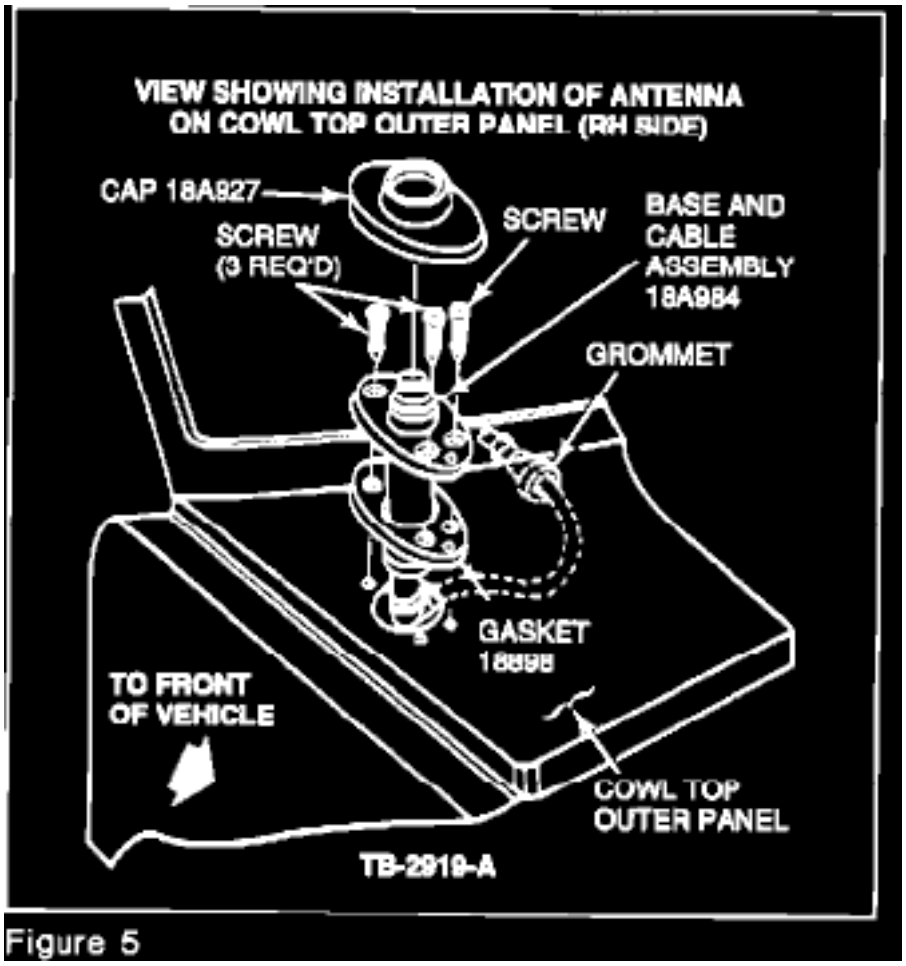


Figure 5

NOTE: THE HOLE WHERE THE ANTENNA PASSES THROUGH THE COWL IS JUST BELOW THE WINDSHIELD, ABOUT 4" (101.6 MM) FROM THE RIGHT SIDE. IT IS ONLY NECESSARY TO GAIN ACCESS TO THE HOLE, SO THE INSTRUMENT PANEL DOES NOT HAVE TO BE TOTALLY REMOVED FROM THE VEHICLE.

7. Replace the antenna cable with a one-piece cable provided in Service Kit (E3TZ-18813-B).

a. Route the new antenna cable through the fender and cowl hole.

b. Seat the grommet. See Figure 5 for details.

8. Route the new cable in the instrument panel along the same path as the original to the radio opening.

CAUTION: DO NOT POSITION THE CABLE USING THE RETAINERS INCLUDED WITH THE ANTENNA KIT AS SHOWN IN THE ACCOMPANYING INSTRUCTION SHEET IS-5082-B.

9. Reinstall the instrument panel.

10. Reinstall the radio.

11. Install the antenna base on the cowl top outer panel per service Manual.

NOTE: THE KIT INCLUDES A NEW MAST AND BASE COVER. USING THE NEW WHIP MAY CAUSE INCREASED WIND NOISE. THEREFORE, ITS USE IS NOT RECOMMENDED. THE BASE COVERS DIFFER ONLY IN COLOR, AND MAY BE INTERCHANGED IF THE CUSTOMER WISHES TO DO SO.

1990 CROWN VICTORIA/GRAND MARQUIS

1. Replace the existing antenna system with instrument panel cable (F1VY-18812-D).

2. Replace the antenna using the following components.

^ Power Antenna: F0AZ-18850-A

^ Fixed Antenna: F0AZ-18A984-A

3. Use the replace procedure outlined in the 1990 Crown Victoria/Grand Marquis Service Manual, Sections 35-10 or 15-02.

PART NUMBER PART NAME CLASS

F1VY-18812-D Instrument Panel Cable C

F0AZ-18850-A Power Antenna B

FOAZ-18A984-A Fixed Antenna C

E3TZ-18813-B Radio Antenna Service Kit AN

OTHER APPLICABLE ARTICLES: 91-5-5 WARRANTY STATUS: Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

930205A Replace Antenna Assembly 1.3 Hrs.

DEALER CODING

BASIC PART NO. CONDITION CODE

18812 93

OASIS CODES: 207000

Antenna Cable: All Technical Service Bulletins Radio - Poor AM Reception

Article No. 93-2-5

01/18/93

RADIO - POOR AM RECEPTION CAUSED BY POOR ANTENNA CONNECTIONS

FORD: 1990 CROWN VICTORIA

LINCOLN-MERCURY: 1990 GRAND MARQUIS

LIGHT TRUCK: 1989-90 BRONCO II 1989-92 RANGER 1991-92 EXPLORER

ISSUE: Poor AM radio reception, such as fading or static, may be caused by poor antenna connections.

ACTION: Perform the following diagnostic and repair procedures. If necessary, replace the antenna and antenna cable as required.

VERIFICATION

In some cases, a customer's concern may be caused by normal radio operating conditions. This is especially true if the customer complains of static in certain locations or while tuned to certain stations.

Obtain as much information from the customer as possible regarding the audio system's performance. The following descriptions will then help the technician and the customer decide whether the radio system concerns are caused by a defective audio system or are the results of normal operating conditions.

FADING

AM fade will occur under viaducts and in urban areas with tall buildings. Certain AM stations may lower their power in the evening which will cause poor reception at night.

STATIC

AM static may be caused by power lines, electric fences, neon signs, and thunderstorms. Static may become very noticeable if the AM station is weak or distant.

AM Signal Issue - Diagnostic Tips

First, it is important that you compare the reception performance of the complaint vehicle with the reception performance of other vehicles with known good reception. Use the same set of test stations in the same locations when you test the vehicle, in order to become accustomed to how the stations should sound and what external interference is to be expected. This should be done with the engine running and with the engine not running in the same location.

It is important to note that even with a perfect AM radio receiver and a perfect antenna, reception conditions are constantly varying. Interference from noise sources, both internal and external to the vehicle, are often erratic and unpredictable.

The most important tool used in diagnosing AM radio concern is a reliable weak AM signal source. A high-power AM Broadcast station one or two hundred miles away is ideal. The station should be clear so that you can understand what is being said with little or no difficulty.

It is important to note that there are other sources of noise, external to the vehicle, that can interfere with the signal you are trying to receive. These external noises should be either taken into account or avoided. For example, power lines, transformers or fluorescent lights can radiate noise in the AM broadcast band. It is best to test the concern vehicle in an area well clear of such noise sources.

Summary:

Select a set of test stations, especially the stations that may be the reason for the customer concern, and some which are over 100 miles away.

^ Note the reception performance of a known good vehicle in the desired locations. Note the presence of any local external noise sources (eg. power lines, etc.).

^ Compare the performance of the concern vehicle when receiving the test stations in the same locations.

DIAGNOSIS

If a vehicle's audio system has been verified to have an AM fading or static concern that is not found in a comparably equipped vehicle under similar conditions, perform the following diagnosis.

VISUAL INSPECTION

Poor AM radio reception may be caused by poor antenna cable connections at the various antenna cable connectors, and/or at the antenna base. Visually inspect all the connectors of the antenna system. This includes...

^ The antenna connector at the rear of the radio

^ The in-line antenna connector (if equipped)

^ The connector at the base of the antenna

^ The base of the antenna for signs of poor grounding (Some antenna bases "bite" into the underside of the fender for grounding. To ensure proper installation, refer to the appropriate Service Manual, Sections 35-10 or 15-02, depending on model year.)

^ The antenna for any loose screws or station nuts

^ Improper connections (repair if found and verify the effectiveness of repair).

CORROSION INSPECTION

Inspect all of the connectors of the antenna system. These include...

^ Connector at the rear of the radio

^ The in-line antenna connector (if equipped)

^ The connector at the base of the antenna

^ If there are signs of corrosion (severe discoloration, rust or white powder from the zinc die-cast bases) on any antenna components, repair the concern by replacing any antenna component where evidence of corrosion is found. Verify effectiveness of repair.

ELECTRICAL TESTS

Perform the following antenna conductivity/resistance diagnosis and testing procedures.

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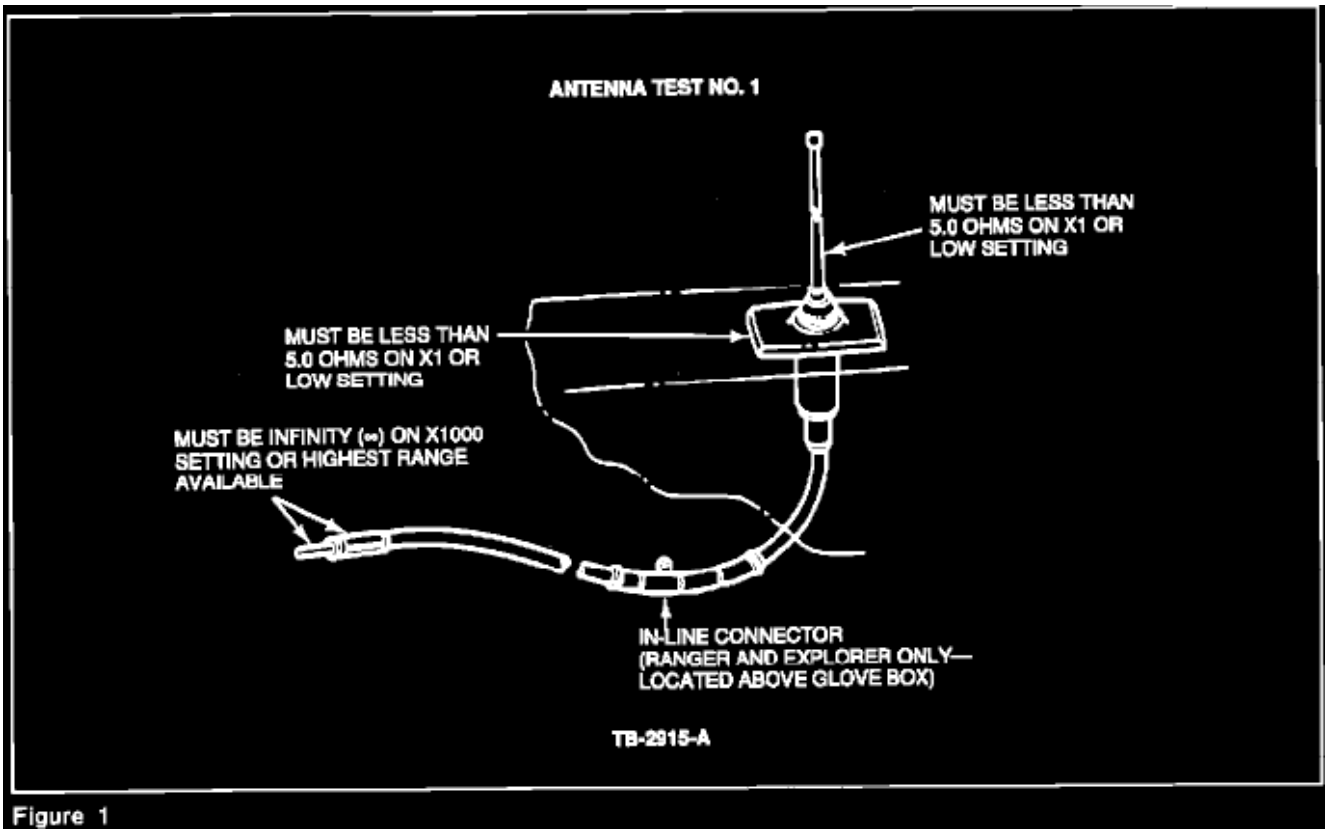


Figure 1

1. With the antenna installed on the vehicle and the cable unplugged from the radio, perform the following resistance tests with an ohmmeter. Probes must contact antenna at points specified by arrowheads in Figure 1.

2. If ohmmeter tests are satisfactory, the antenna is good.

3. If any ohmmeter is unsatisfactory, take the following action:

a. If it is a one-piece assembly, replace the complete antenna and cable assembly.

b. If it is a detachable cable and mast, perform Antenna Tests # 2 and # 3.

c. If it is a manual antenna with an extension cable, perform Antenna Test # 4.

ANTENNA TEST # 2 - ANTENNA EQUIPPED WITH DETACHABLE CABLE AND MAST

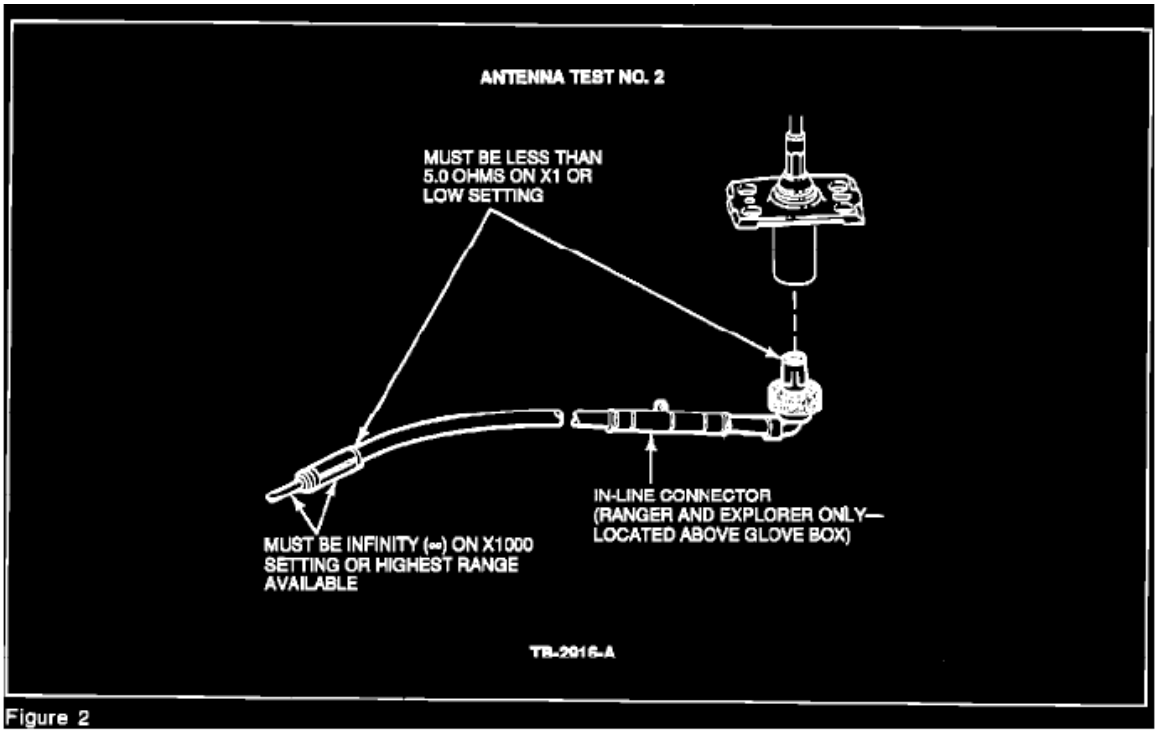


Figure 2

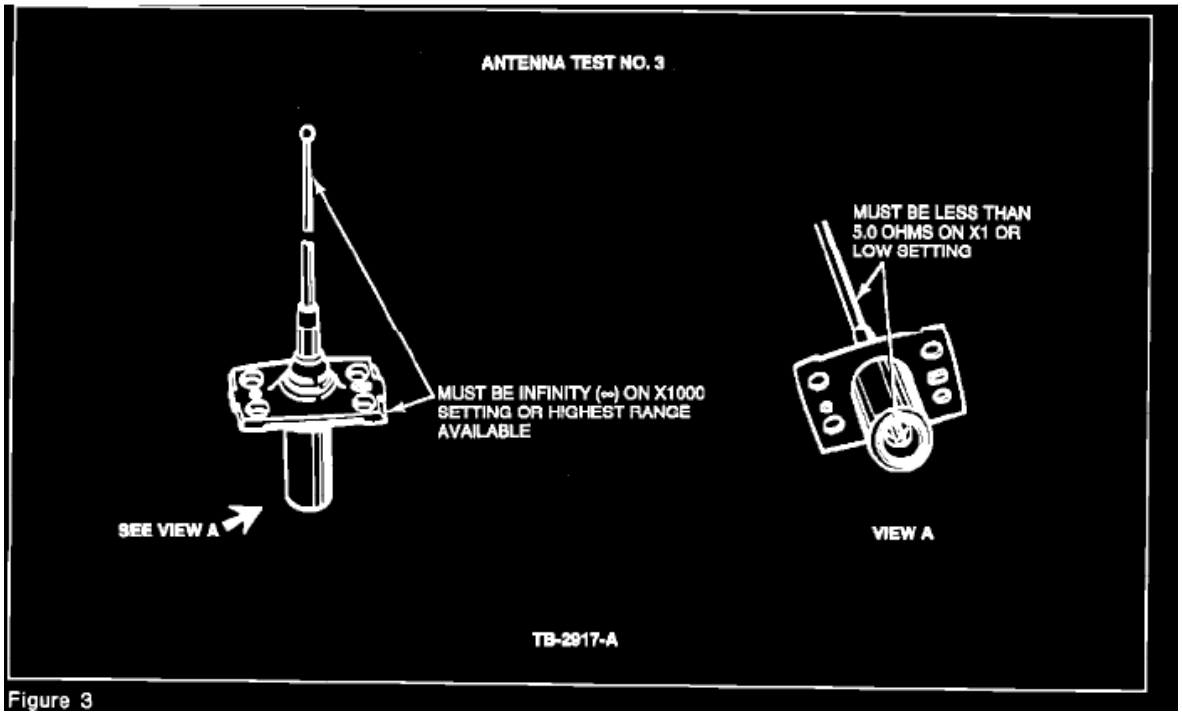


Figure 3

1. When the results in Antenna Test # 1 have been unsatisfactory, disconnect the antenna mast and base from the cable and perform the tests shown in Figure 2.

2. If ohmmeter readings are satisfactory, the antenna is good. Perform Antenna Test # 3.

3. If either of the readings are unsatisfactory, replace the cable.

ANTENNA TEST # 3 - ANTENNA MAST AND BASE

1. Perform the tests shown in Figure 3.

2. If ohmmeter readings are satisfactory, the antenna mast and base are good. Replace the cable.

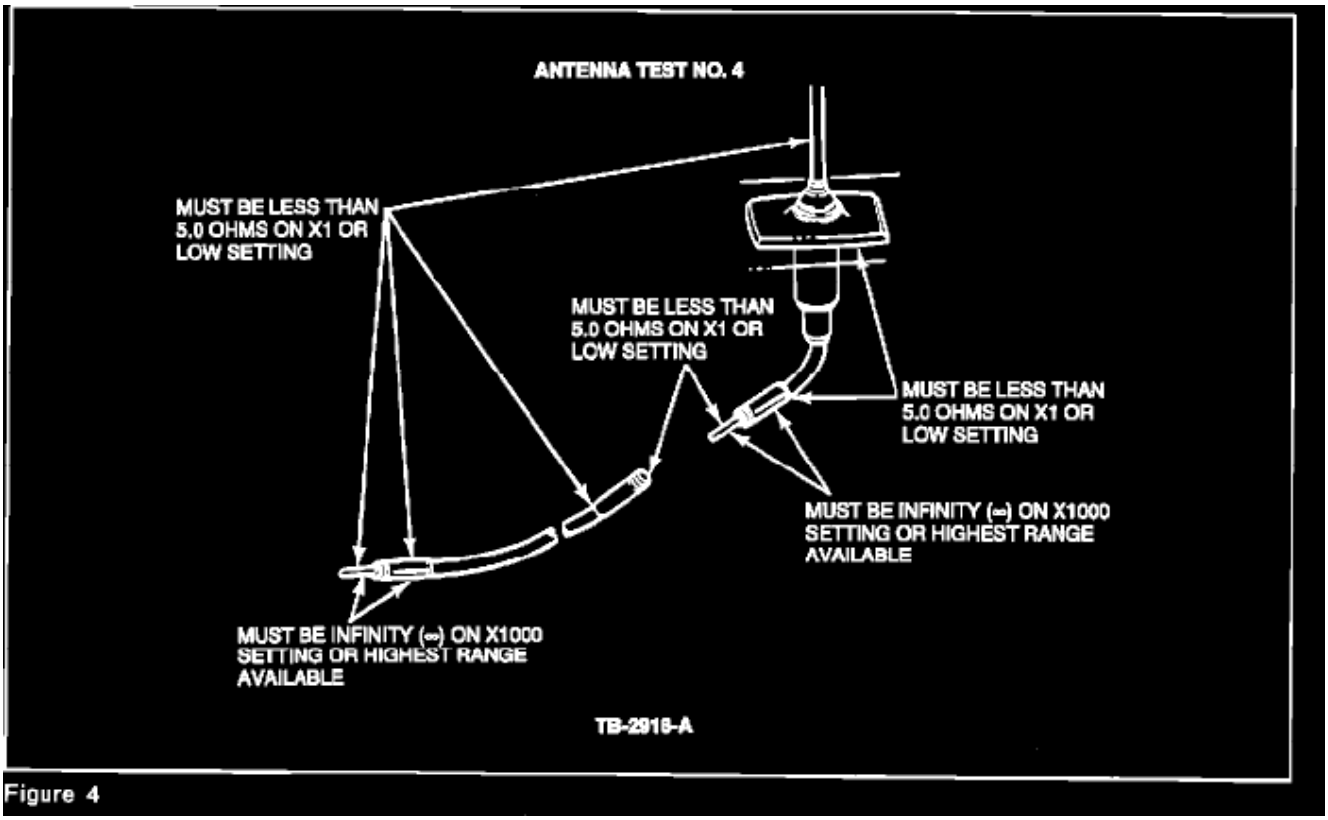


Figure 4

3. If either reading is unsatisfactory, replace only the base assembly. The mast should be good.

ANTENNA TEST # 4 - ANTENNA WITH EXTENSION CABLE

1. When the results in Antenna Test # 2 have been unsatisfactory, disconnect the extension cable from the main cable and perform the tests shown in Figure 4.

2. If ohmmeter readings are satisfactory, the extension cable and main antenna cable are good. Perform Antenna Test # 3.

3. If either reading on the extension cable is unsatisfactory, replace the extension cable.

4. If either reading on the main antenna cable is unsatisfactory, take the following action:

a. If it is a one-piece assembly, replace the complete antenna and main cable assembly.

b. If the main cable is detachable, perform Antenna Test # 2 and # 3.

Service as needed per the appropriate Service Manual, section 35-10 or 15-02. Verify the effectiveness of the repair.

IN-LINE CONNECTOR

If diagnosis and repair procedures above have not been effective, the in-line connector of the subject vehicles may be intermittent. Service it as outlined in the following repair procedure.

STATIC CONCERNS - ALL RANGER, BRONCO II AND EXPLORER VEHICLES

1. Remove the radio. Refer to the appropriate Service Manual, Sections 35-01 or 15-02, for removal procedure.

2. Disconnect the antenna cable at the in-line connector located above the glove box.

3. Unbolt the in-line connector from its mounting location above the glove box. A 7 mm straight/open ended wrench can be used.

4. Remove the instrument panel portion of the antenna cable. Detach the antenna cable from the two locators, one to the right of the radio opening and the other behind the center heat duct.

5. Remove the antenna base and lead-in cable. Refer to the appropriate Service Manual for the removal procedure.

6. Remove the instrument panel using the appropriate Service Manual procedure.

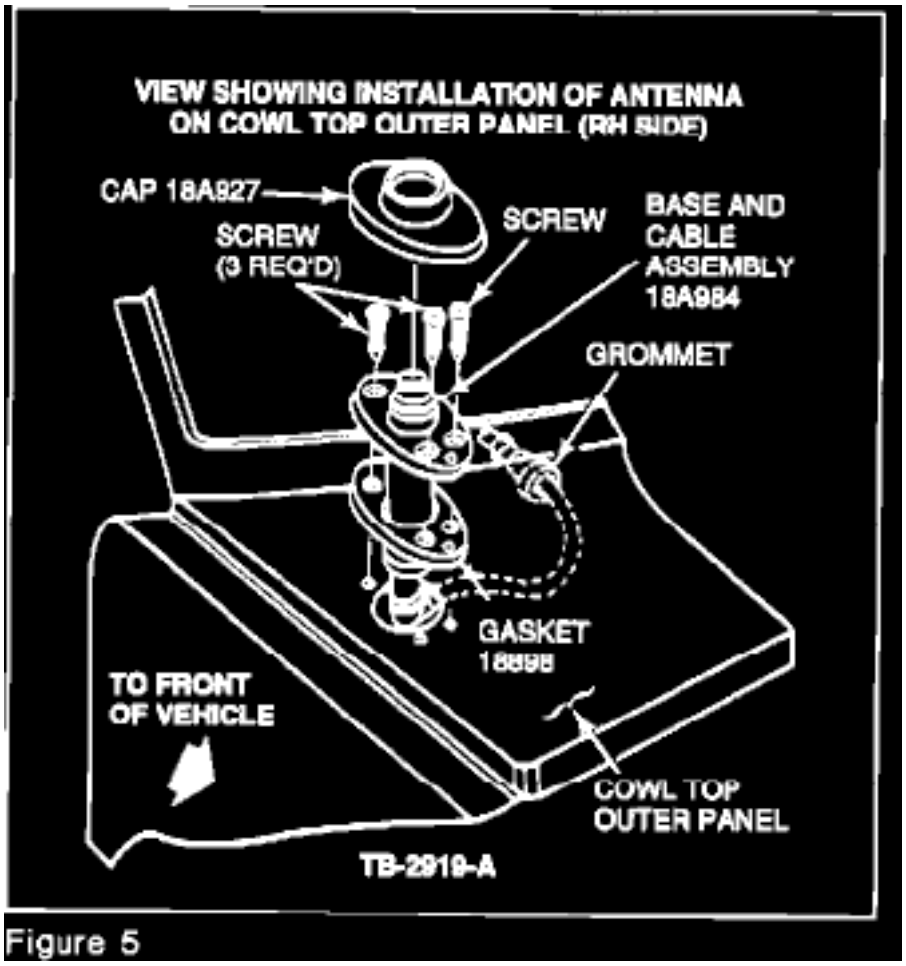


Figure 5

NOTE: THE HOLE WHERE THE ANTENNA PASSES THROUGH THE COWL IS JUST BELOW THE WINDSHIELD, ABOUT 4" (101.6 MM) FROM THE RIGHT SIDE. IT IS ONLY NECESSARY TO GAIN ACCESS TO THE HOLE, SO THE INSTRUMENT PANEL DOES NOT HAVE TO BE TOTALLY REMOVED FROM THE VEHICLE.

7. Replace the antenna cable with a one-piece cable provided in Service Kit (E3TZ-18813-B).

a. Route the new antenna cable through the fender and cowl hole.

b. Seat the grommet. See Figure 5 for details.

8. Route the new cable in the instrument panel along the same path as the original to the radio opening.

CAUTION: DO NOT POSITION THE CABLE USING THE RETAINERS INCLUDED WITH THE ANTENNA KIT AS SHOWN IN THE ACCOMPANYING INSTRUCTION SHEET IS-5082-B.

9. Reinstall the instrument panel.

10. Reinstall the radio.

11. Install the antenna base on the cowl top outer panel per service Manual.

NOTE: THE KIT INCLUDES A NEW MAST AND BASE COVER. USING THE NEW WHIP MAY CAUSE INCREASED WIND NOISE. THEREFORE, ITS USE IS NOT RECOMMENDED. THE BASE COVERS DIFFER ONLY IN COLOR, AND MAY BE INTERCHANGED IF THE CUSTOMER WISHES TO DO SO.

1990 CROWN VICTORIA/GRAND MARQUIS

1. Replace the existing antenna system with instrument panel cable (F1VY-18812-D).

2. Replace the antenna using the following components.

^ Power Antenna: F0AZ-18850-A

^ Fixed Antenna: F0AZ-18A984-A

3. Use the replace procedure outlined in the 1990 Crown Victoria/Grand Marquis Service Manual, Sections 35-10 or 15-02.

PART NUMBER PART NAME CLASS

F1VY-18812-D Instrument Panel Cable C

F0AZ-18850-A Power Antenna B

FOAZ-18A984-A Fixed Antenna C

E3TZ-18813-B Radio Antenna Service Kit AN

OTHER APPLICABLE ARTICLES: 91-5-5 WARRANTY STATUS: Eligible Under Basic Warranty Coverage

OPERATION DESCRIPTION TIME

930205A Replace Antenna Assembly 1.3 Hrs.

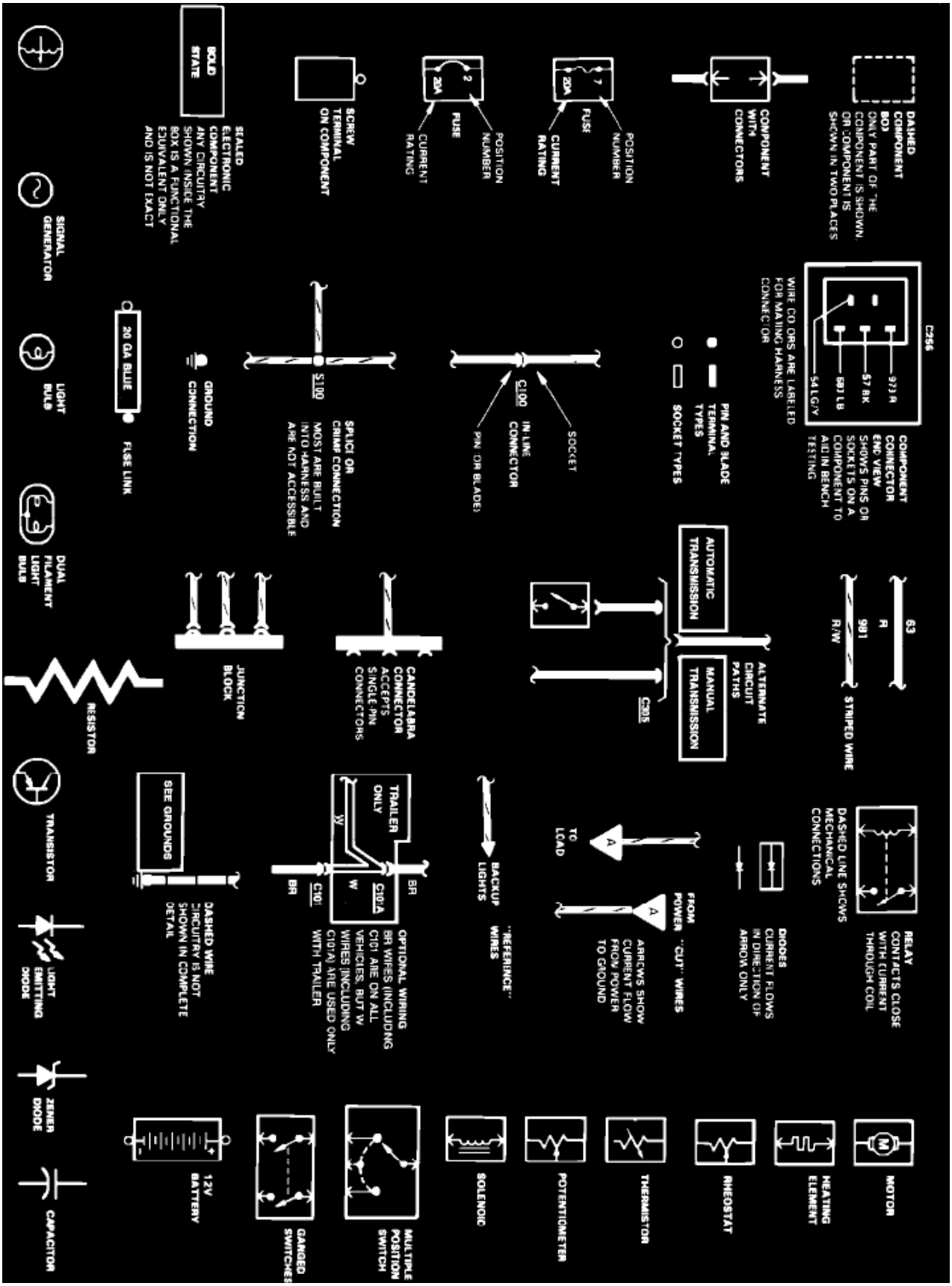
DEALER CODING

BASIC PART NO. CONDITION CODE

18812 93

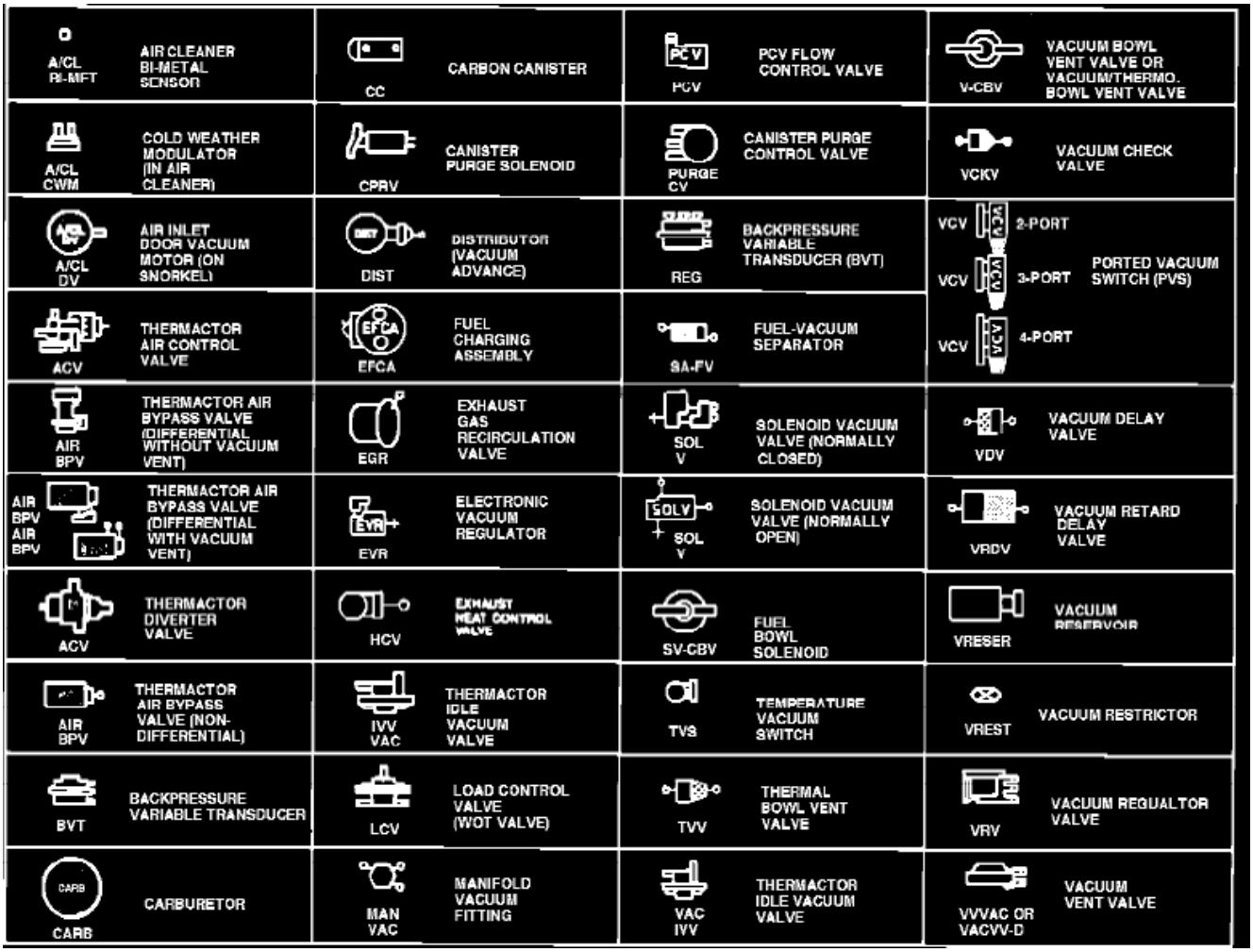
OASIS CODES: 207000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Accessories and Optional Equipment > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions

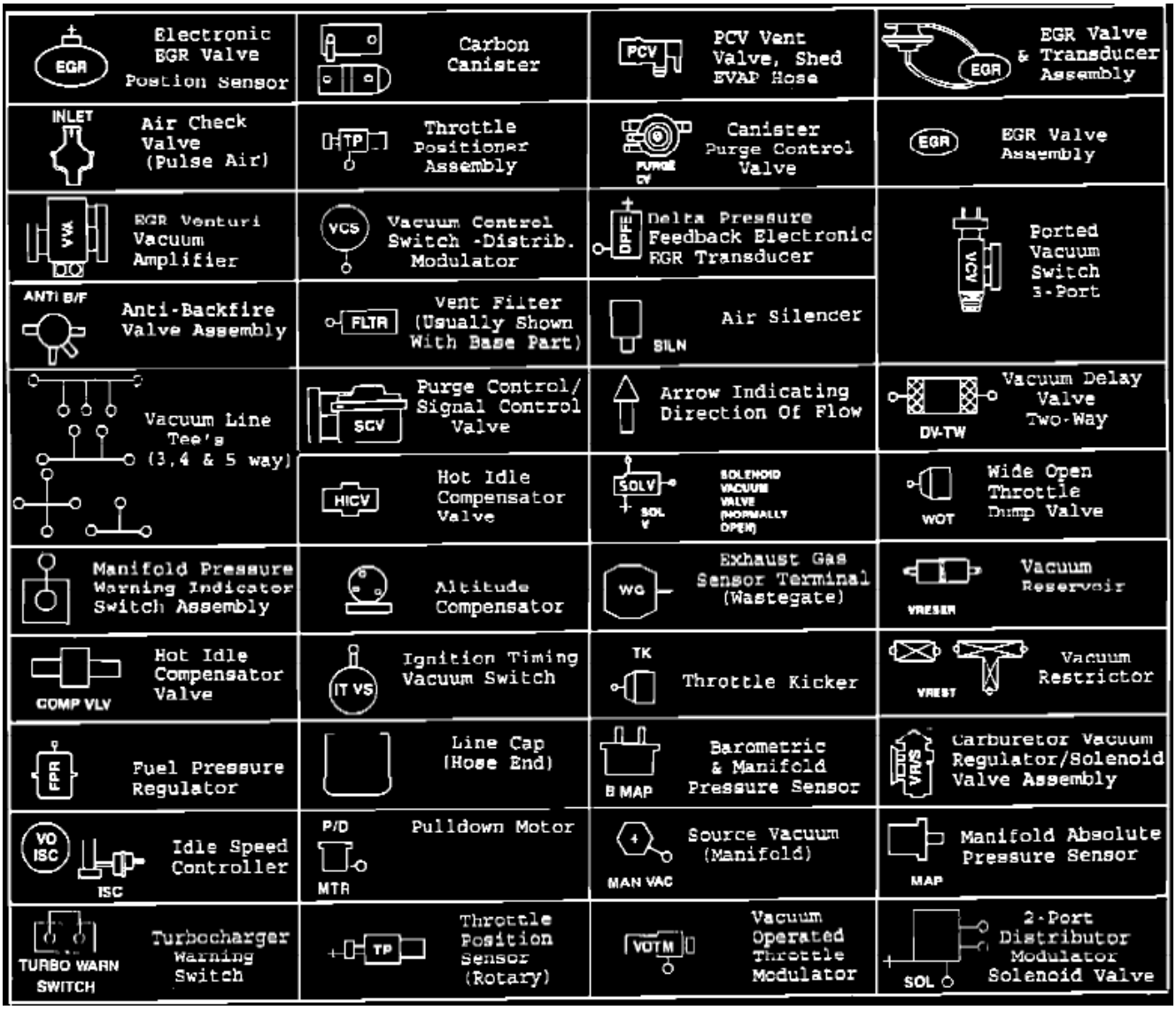


Driver/Vehicle Information Display: Diagram Information and Instructions

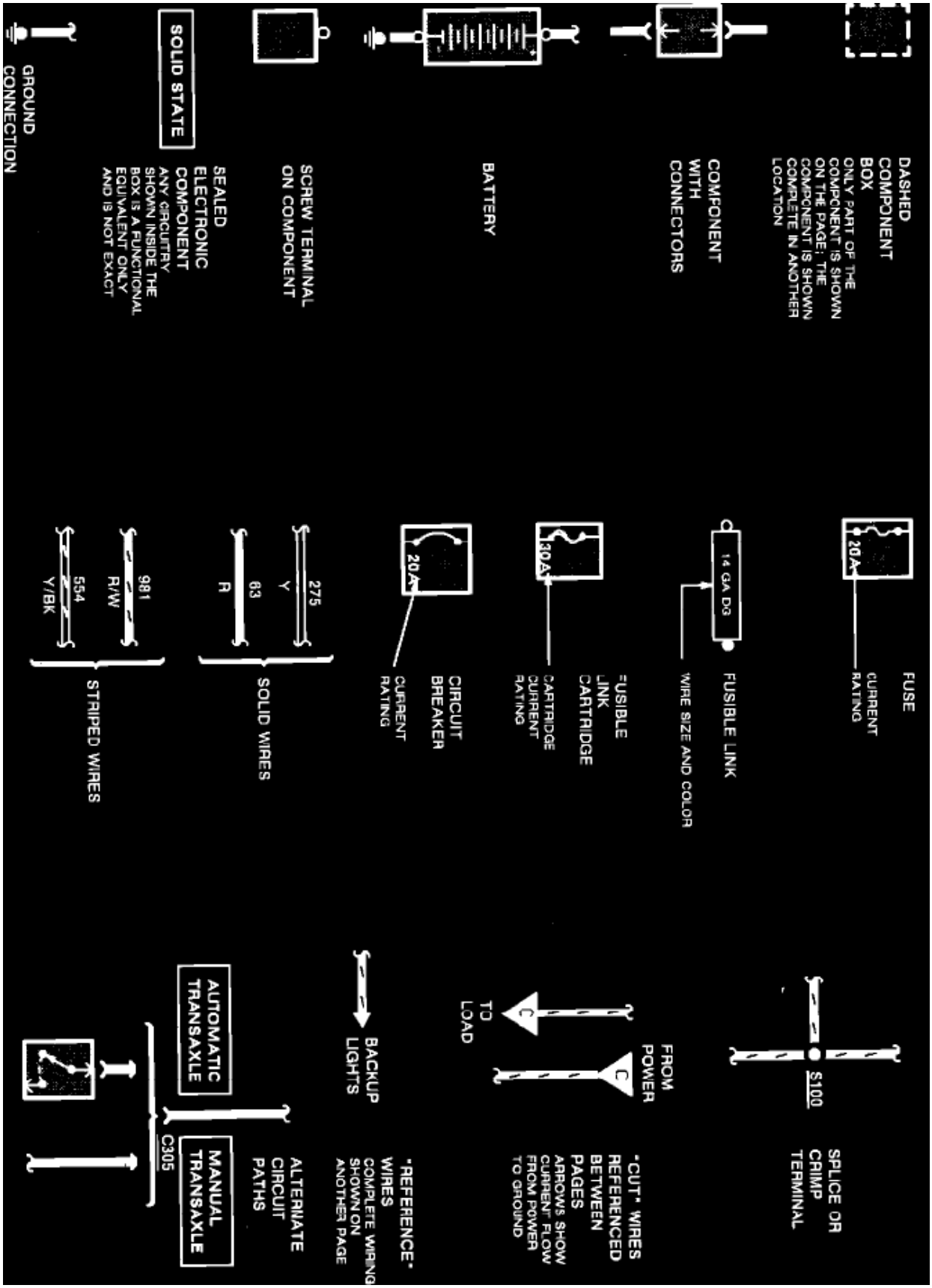
Symbol Identification



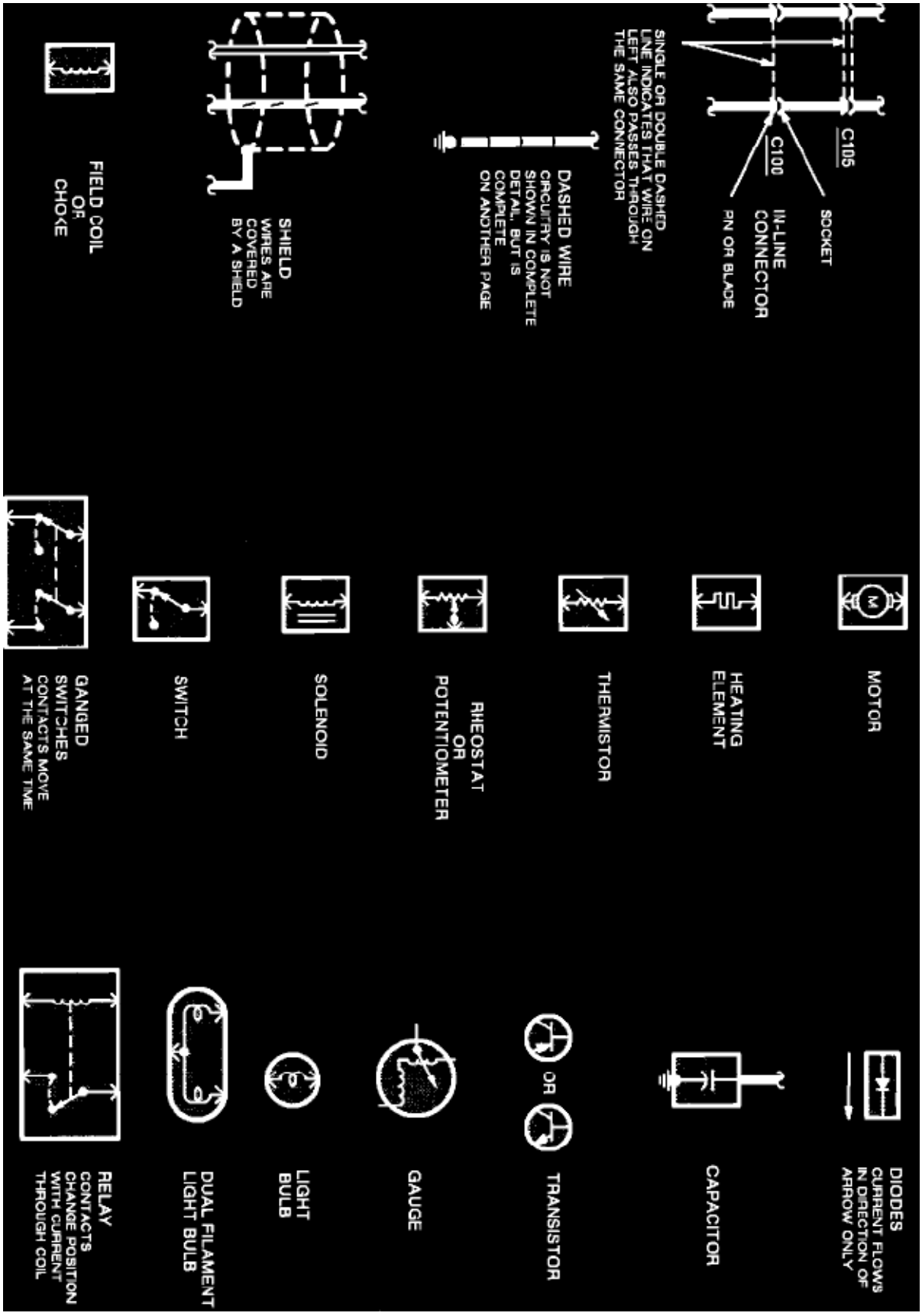
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
SOLID STATE
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

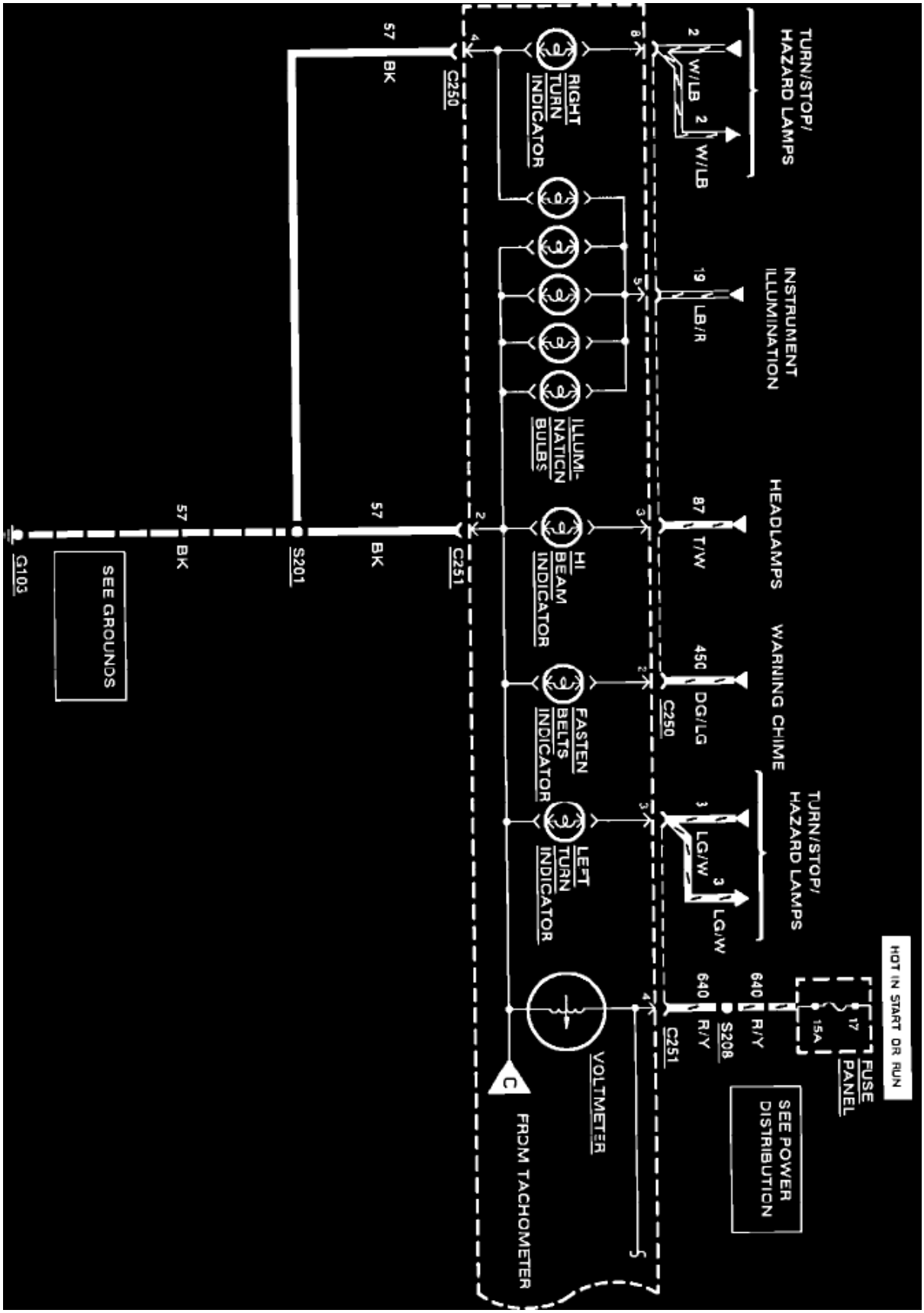
P: Purple

T: Tan

V: Violet

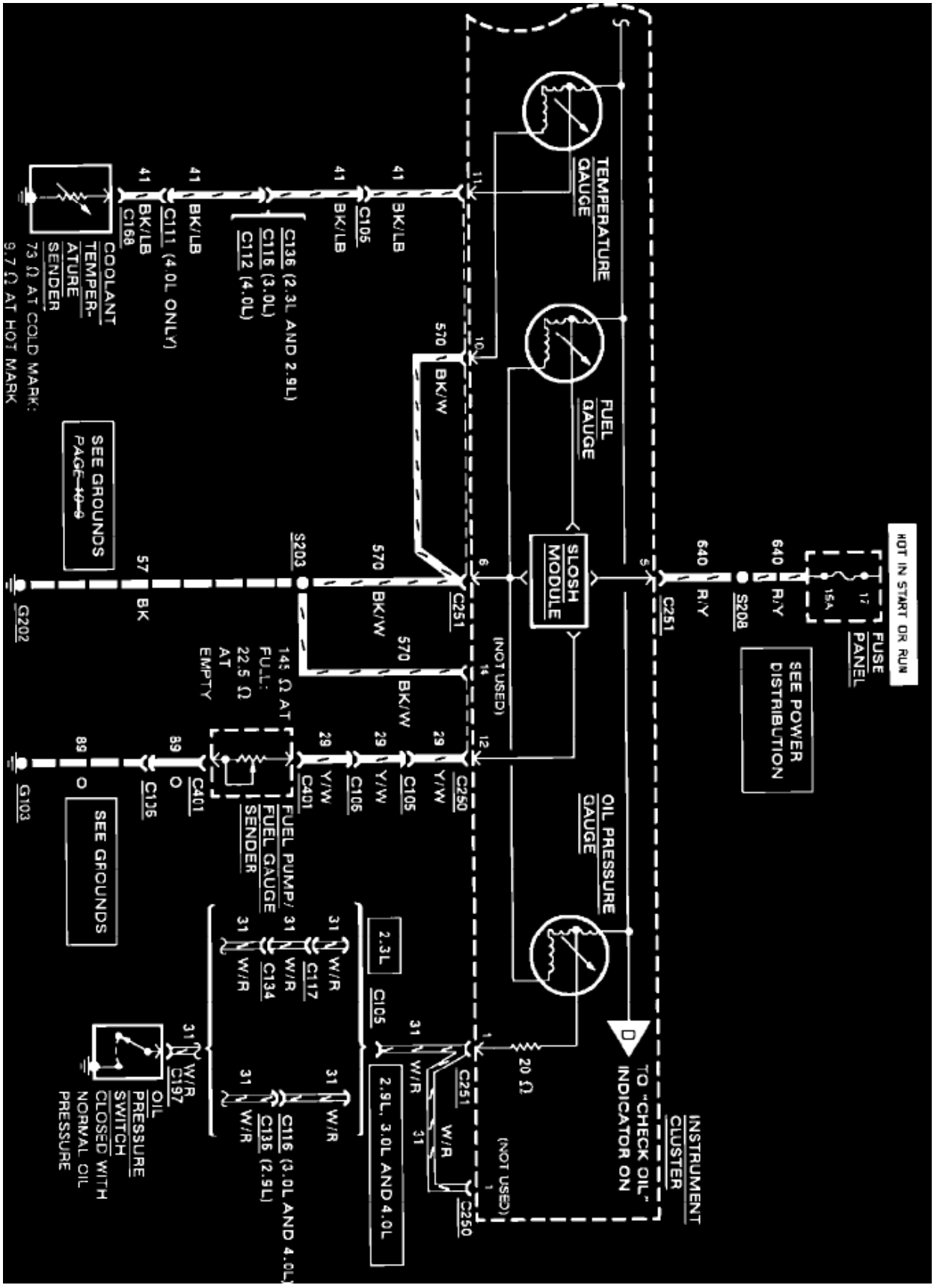
W: White

Y: Yellow

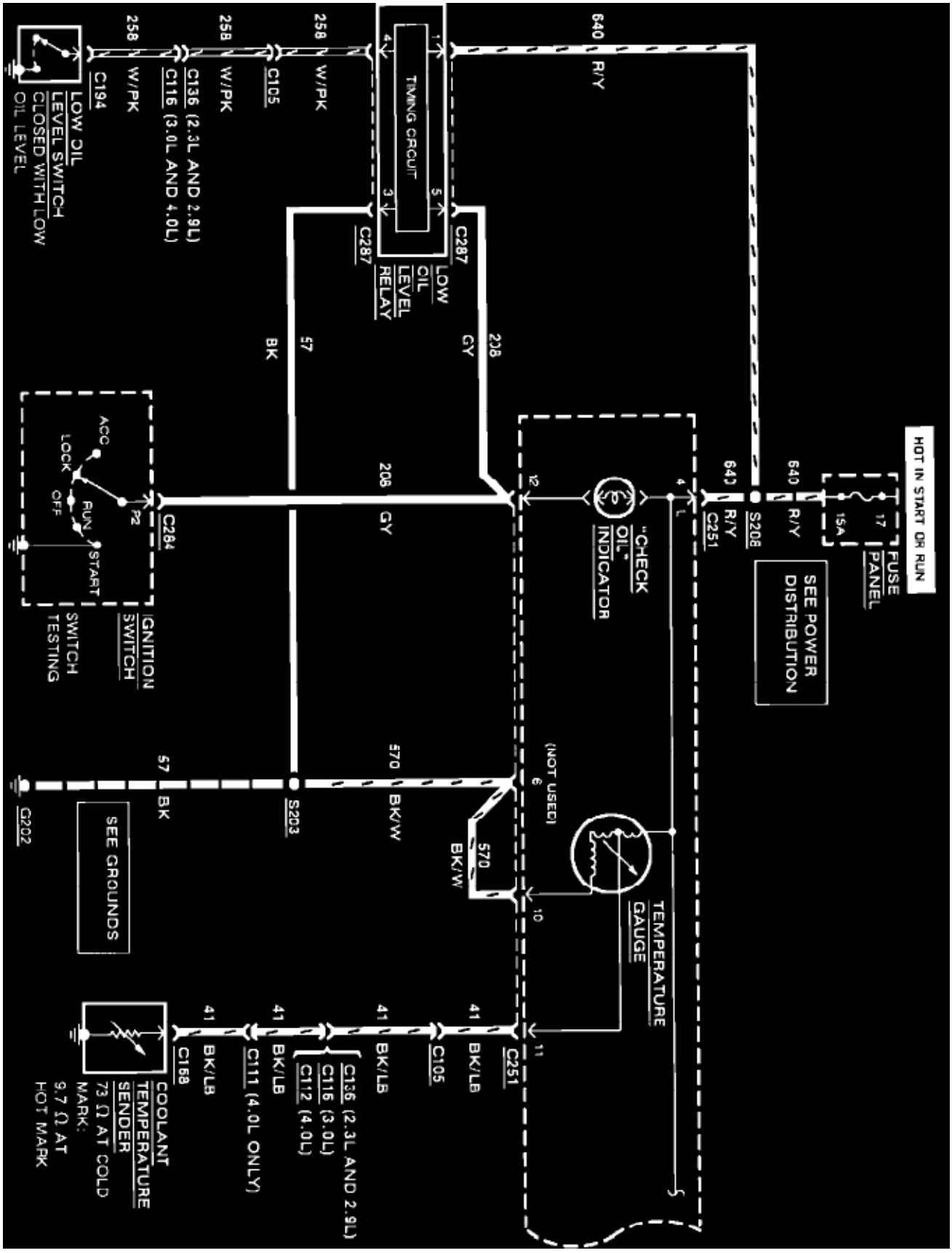

HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
C251
SEE POWER DISTRIBUTION
TURN/STOP/ HAZARD LAMPS
W/LB
INSTRUMENT ILLUMINATION
LB/R
HEADLAMPS
T/W
WARNING CHIME
DG/LG
C250
LG/W
RIGHT TURN INDICATOR
ILLUMI-NATION BULBS
HI BEAM INDICATOR
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
VOLTMETER
FROM TACHOMETER
57
BK
S201
G103
SEE GROUNDS

Driver/Vehicle Information Display: Electrical Diagrams

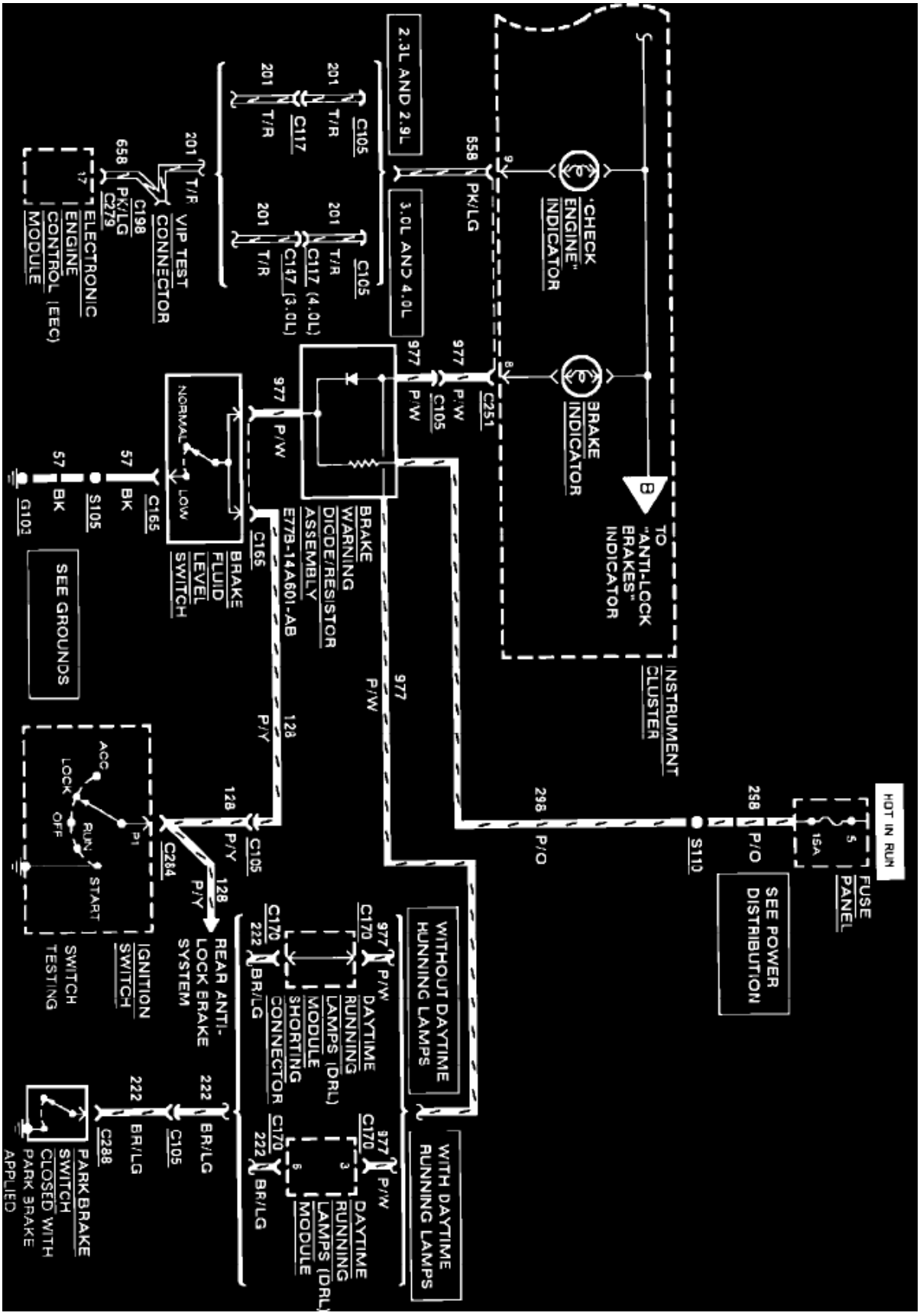
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
C251
INSTRUMENT CLUSTER
TO "CHECK OIL" INDICATOR ON
TEMPERATURE GAUGE
FUEL GAUGE
SLOSH MODULE
OIL PRESSURE GAUGE
20 Ω
(NOT USED)
C250
570
BK/W
C105
41
BK/LB
C136 (2.3L AND 2.9L)
C116 (3.0L)
C112 (4.0L)
C111 (4.0L ONLY)
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD MARK;
9.7 Ω AT HOT MARK
SEE GROUNDS
PAGE 10-9
S203
57
BK
G202
14
(NOT USED)
29
Y/W
C401
FUEL PUMP/ FUEL GAUGE SENDER
145 Ω AT FULL;
22.5 Ω AT EMPTY
89
O
C136
G103
SEE GROUNDS
2.3L
C105
2.9L, 3.0L AND 4.0L
31
W/R
C117
C134
C116 (3.0L AND 4.0L)
C135 (2.5L)
C197
OIL PRESSURE SWITCH
CLOSED WITH NORMAL OIL PRESSURE

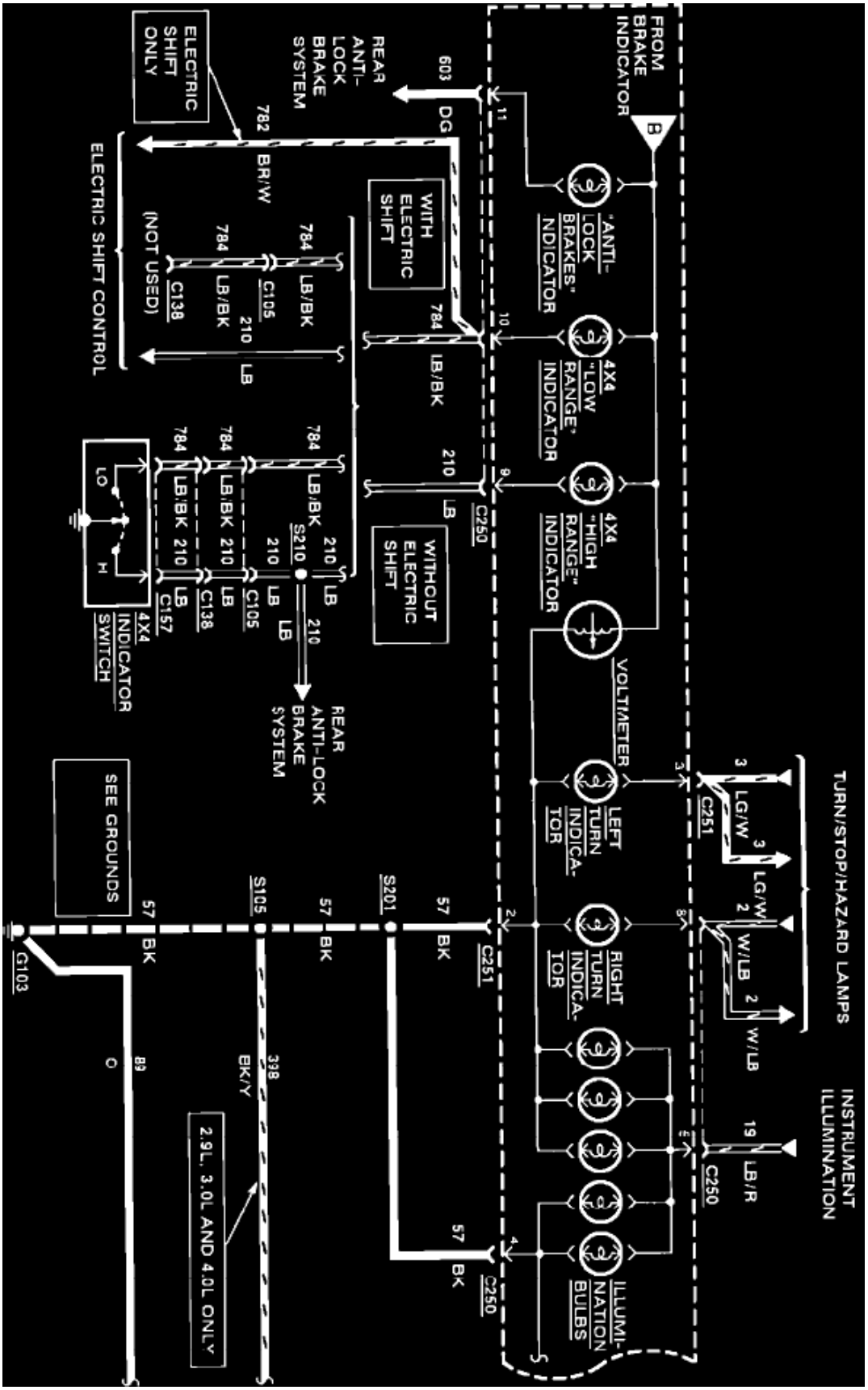
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
C251
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
238
GY
57
BK
208
258
W/PK
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
C284
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
SWITCH TESTING
(NOT USED)
570
BK/W
S203
G202
SEE GROUNDS
41
BK/LB
C111 (4.0L ONLY)
C112 (4.0L)
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD MARK:
9.7 Ω AT HOT MARK

Instrument Panel (Standard)

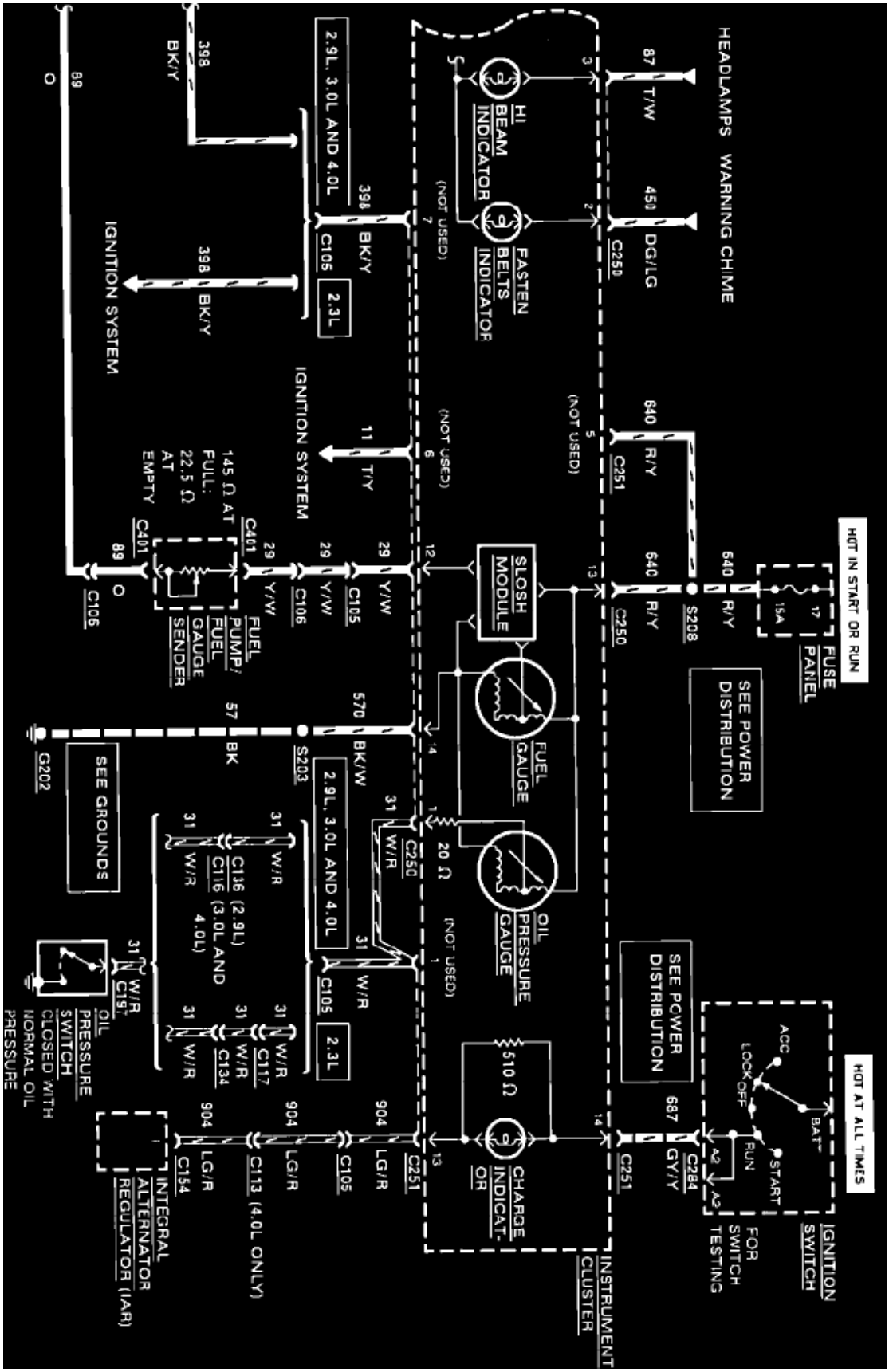

HOT IN RUN
FUSE PANEL
5
15A
SEE POWER DISTRIBUTION
298 P/O
S110
INSTRUMENT CLUSTER
"CHECK ENGINE" INDICATOR
BRAKE INDICATOR
TO "ANTI-LOCK BRAKES" INDICATOR
2.3L AND 2.9L
3.0L AND 4.0L
C105
C117
C117 (4.0L)
C147 (3.0L)
201 T/R
658 PK/LG
977 P/W
C251
C198
C279
VIP TEST CONNECTOR
ELECTRONIC ENGINE CONTROL (EEC) MODULE
BRAKE FLUID LEVEL SWITCH
NORMAL
LOW
C165
57 BK
G103
S105
SEE GROUNDS
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
128 P/Y
C284
ACC
LOCK
RUN
START
OFF
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
222 BR/LG
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
SHORTING CONNECTOR
C288
PARK BRAKE SWITCH
CLOSED WITH PARK BRAKE APPLIED

Instrument Panel (Standard)

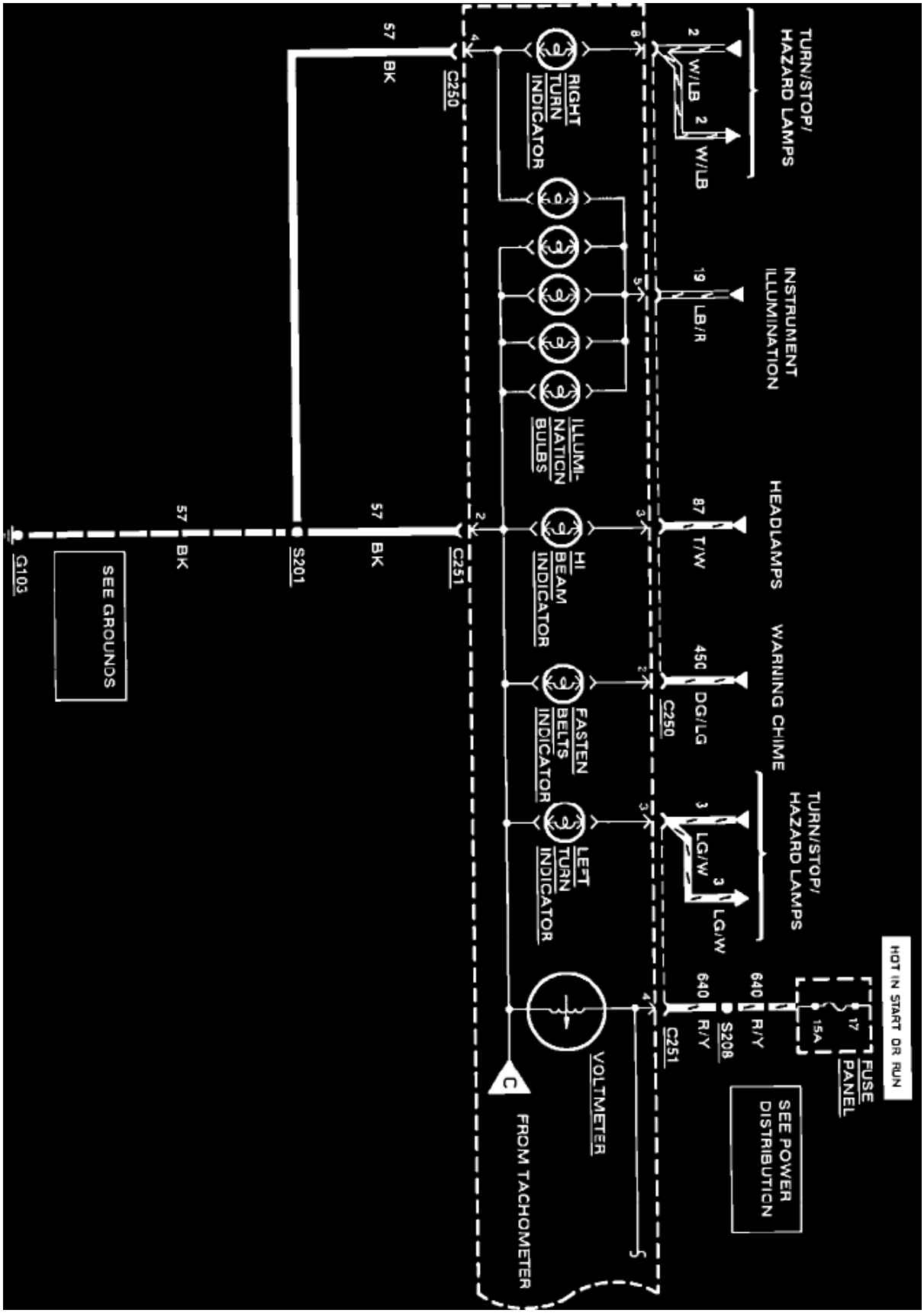

TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C105
C138
C157
C250
C251
S105
S201
S210
G103
LG/W
W/LB
LB/R
LB/BK
BR/W
BK/Y
DG
BK
LB
O

Instrument Panel (Standard)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Accessories and Optional Equipment > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 6466

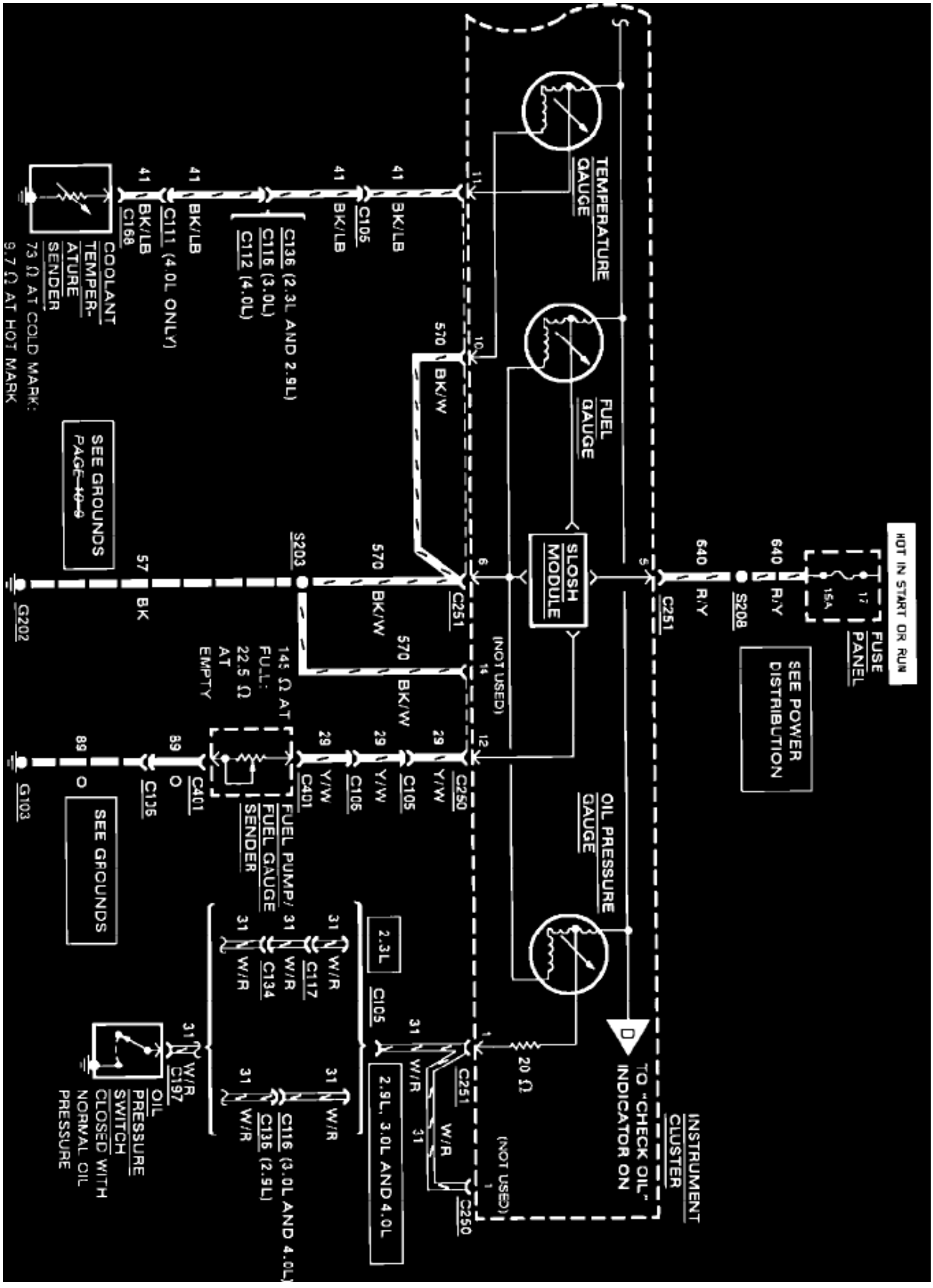


Instrument Panel (Standard)

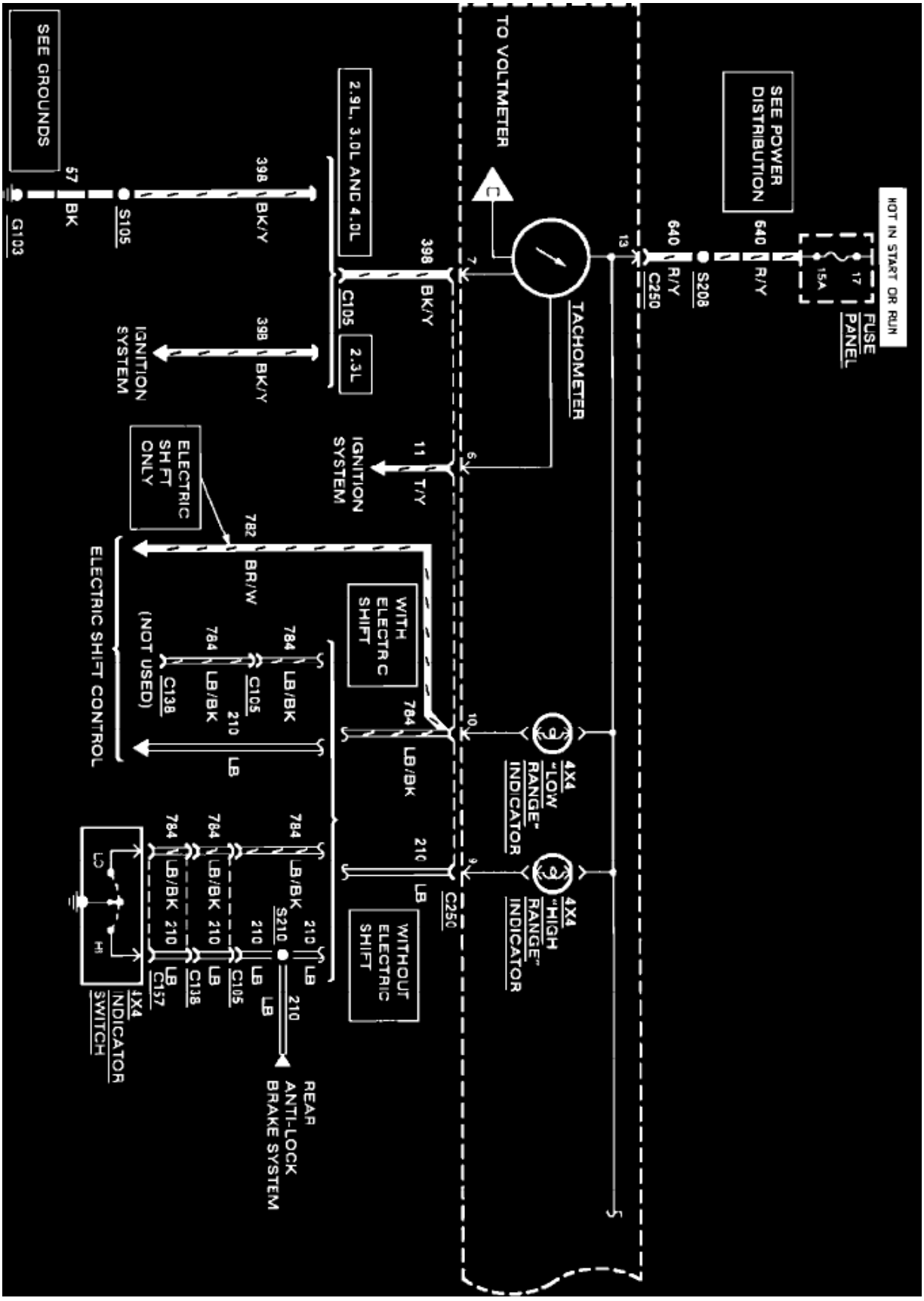

HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
C251
SEE POWER DISTRIBUTION
TURN/STOP/ HAZARD LAMPS
W/LB
2
INSTRUMENT ILLUMINATION
LB/R
19
HEADLAMPS
T/W
87
WARNING CHIME
DG/LG
450
C250
LG/W
3
RIGHT TURN INDICATOR
ILLUMI-NATION BULBS
HI BEAM INDICATOR
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
VOLTMETER
C
FROM TACHOMETER
57
BK
S201
C251
G103
SEE GROUNDS

Instrument Panel (Sport)

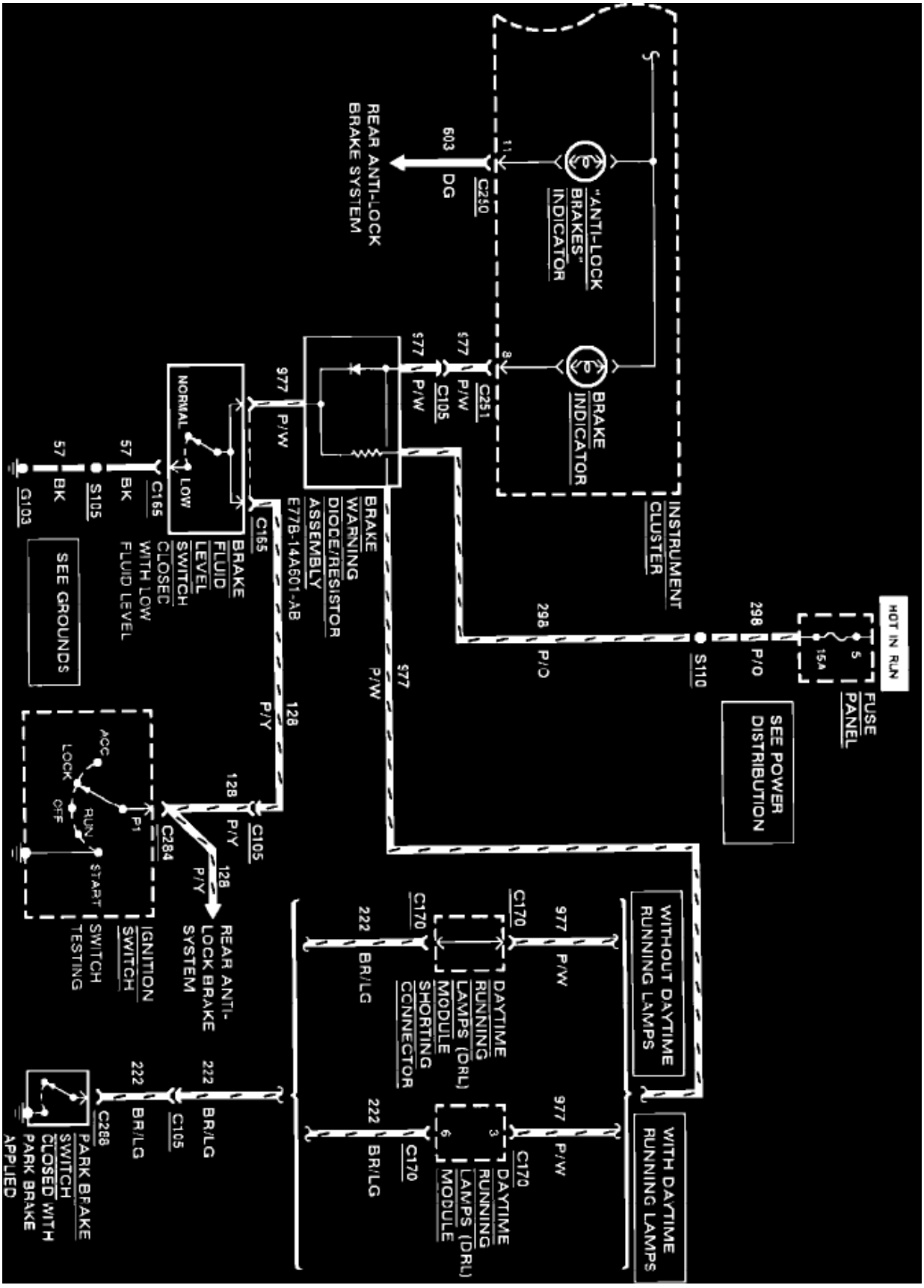
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Accessories and Optional Equipment > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 6468



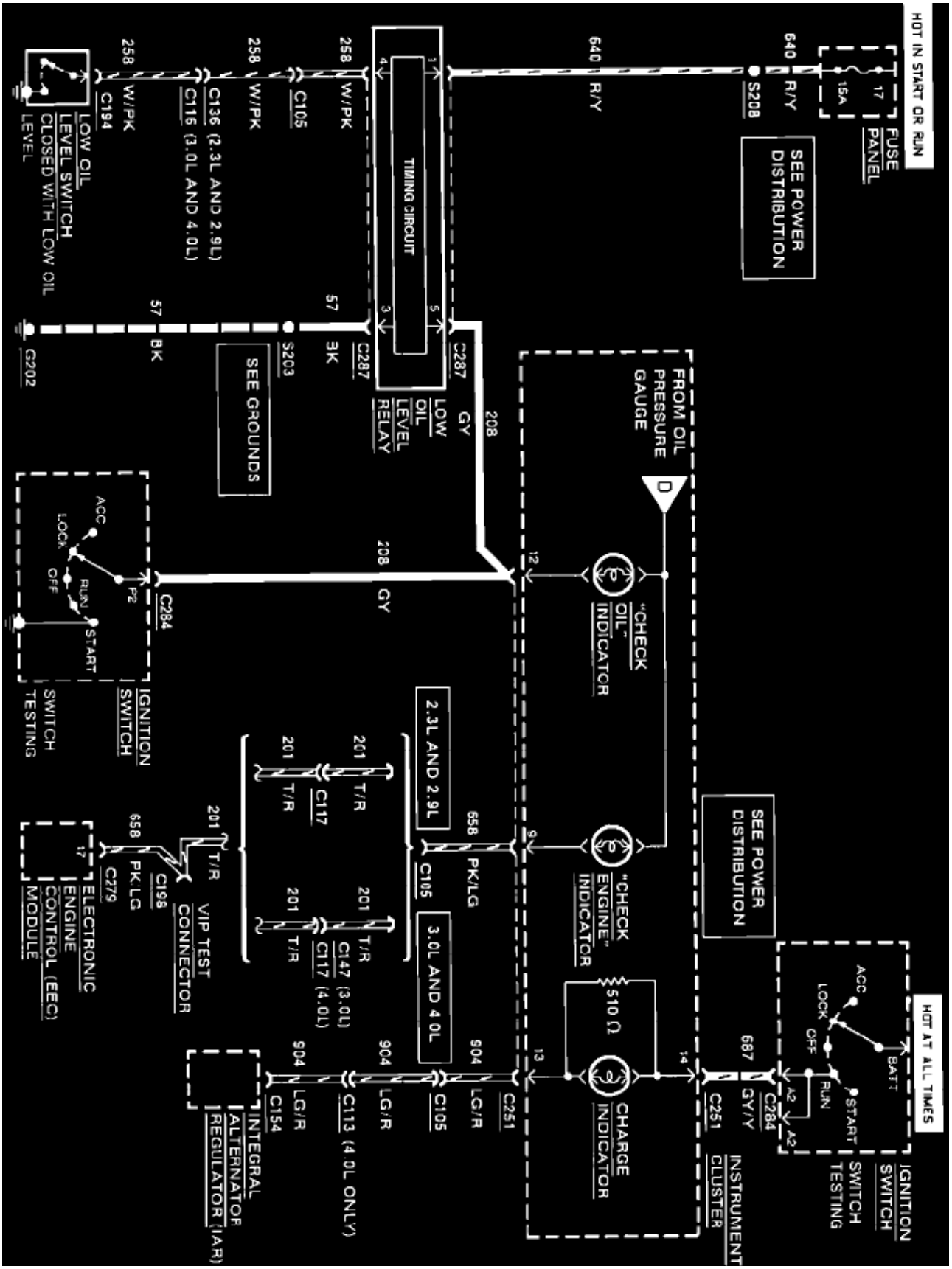
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640
R/Y
S208
C250
13
TO VOLTMETER
TACHOMETER
C
7
398
BK/Y
2.9L, 3.0L AND 4.0L
C105
2.3L
IGNITION SYSTEM
11
T/Y
6
SEE GROUNDS
57
BK
G103
S105
ELECTRIC SHIFT ONLY
782
BR/W
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
784
LB/BK
C138
210
LB
10
9
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
C250
S210
C105
C138
C157
LO
HI
4X4 INDICATOR SWITCH
REAR ANTI-LOCK BRAKE SYSTEM

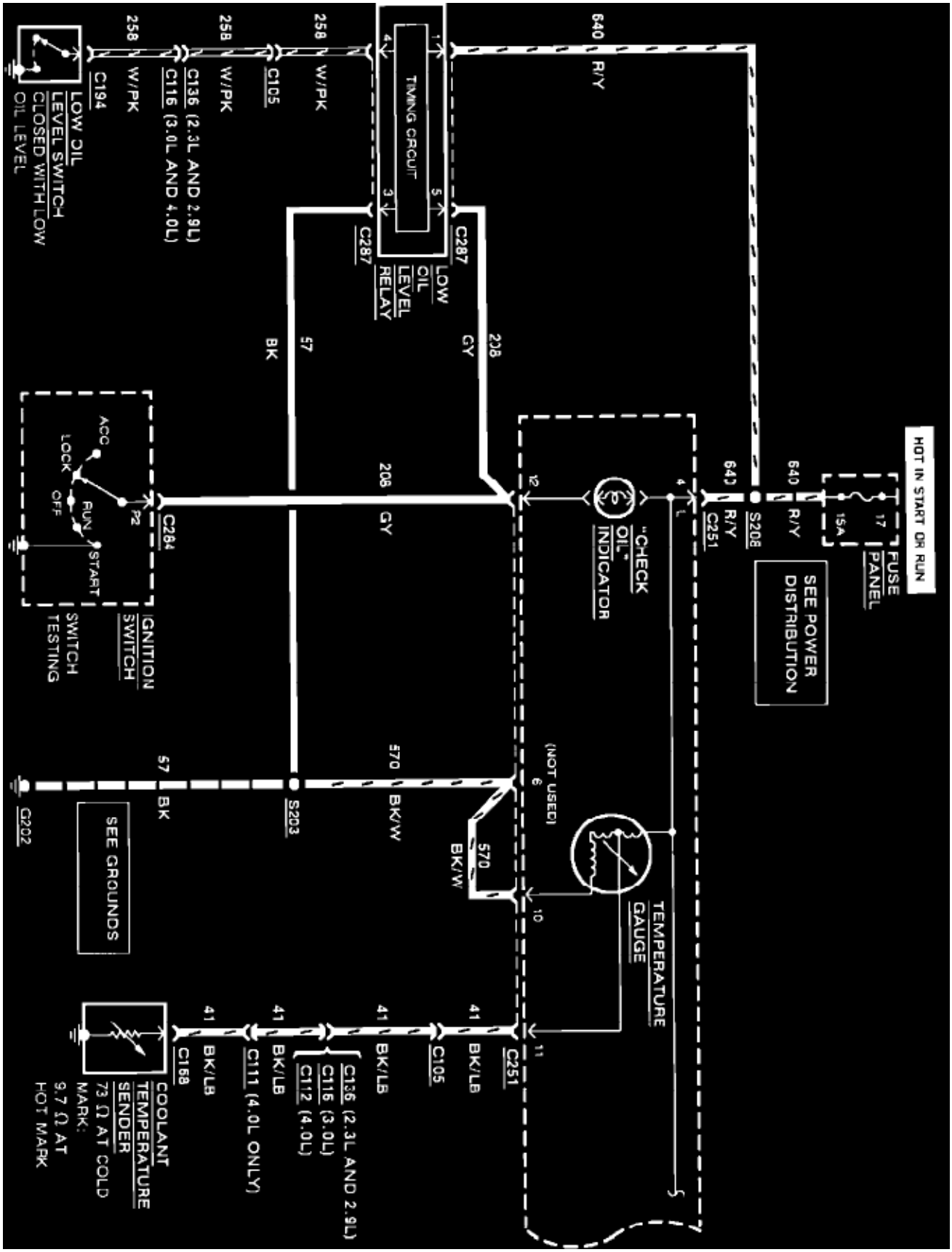
Instrument Panel (Sport)


HOT IN RUN
FUSE PANEL
5
15A
298 P/O
SEE POWER DISTRIBUTION
S110
INSTRUMENT CLUSTER
"ANTI-LOCK BRAKES" INDICATOR
BRAKE INDICATOR
603 DG
C250
11
REAR ANTI-LOCK BRAKE SYSTEM
C251
8
577 P/W
C105
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
977 P/W
C165
BRAKE FLUID LEVEL SWITCH CLOSED WITH LOW FLUID LEVEL
NORMAL
LOW
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
OFF
RUN
START
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
C170
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
222 BR/LG
DAYTIME RUNNING LAMPS (DRL) MODULE
C105
PARK BRAKE SWITCH CLOSED WITH PARK BRAKE APPLIED
C268

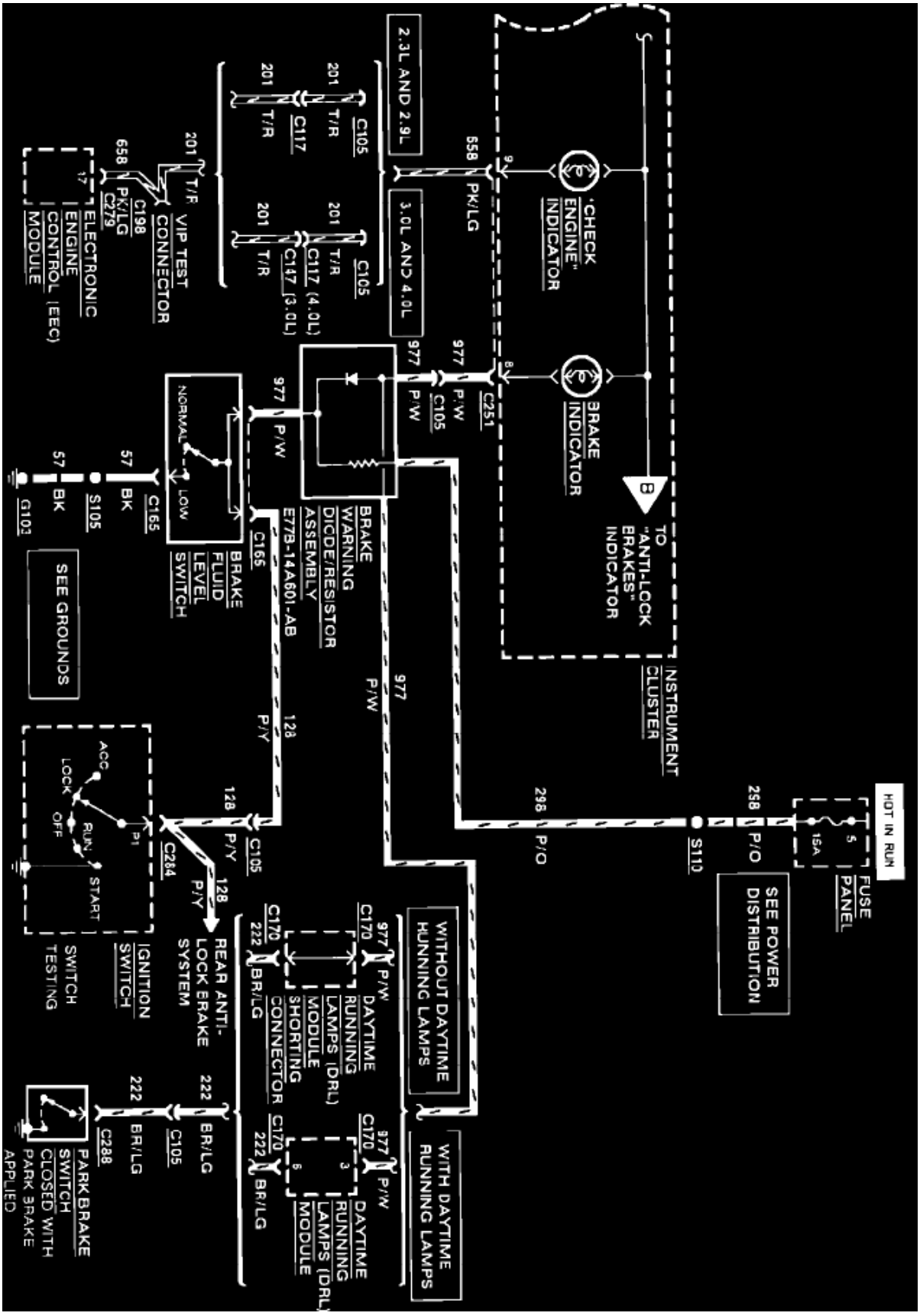
Instrument Panel (Sport)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
IGNITION SWITCH
BATT
ACC
LOCK
OFF
RUN
START
SWITCH TESTING
A2
C284
687
GY/Y
C251
INSTRUMENT CLUSTER
SEE POWER DISTRIBUTION
TIMING CIRCUIT
1
2
3
4
5
C287
LOW OIL LEVEL RELAY
258
W/PK
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
57
BK
G202
S203
SEE GROUNDS
208
GY
FROM OIL PRESSURE GAUGE
D
"CHECK OIL" INDICATOR
12
"CHECK ENGINE" INDICATOR
9
510 Ω
CHARGE INDICATOR
13
14
C284
P2
IGNITION SWITCH
SWITCH TESTING
2.3L AND 2.9L
3.0L AND 4.0L
658
PK/LG
C105
201
T/R
C117
C147 (3.0L)
C117 (4.0L)
904
LG/R
C113 (4.0L ONLY)
C154
INTEGRAL ALTERNATOR REGULATOR (IAR)
VIP TEST CONNECTOR
C196
C279
17
ELECTRONIC ENGINE CONTROL (EEC) MODULE

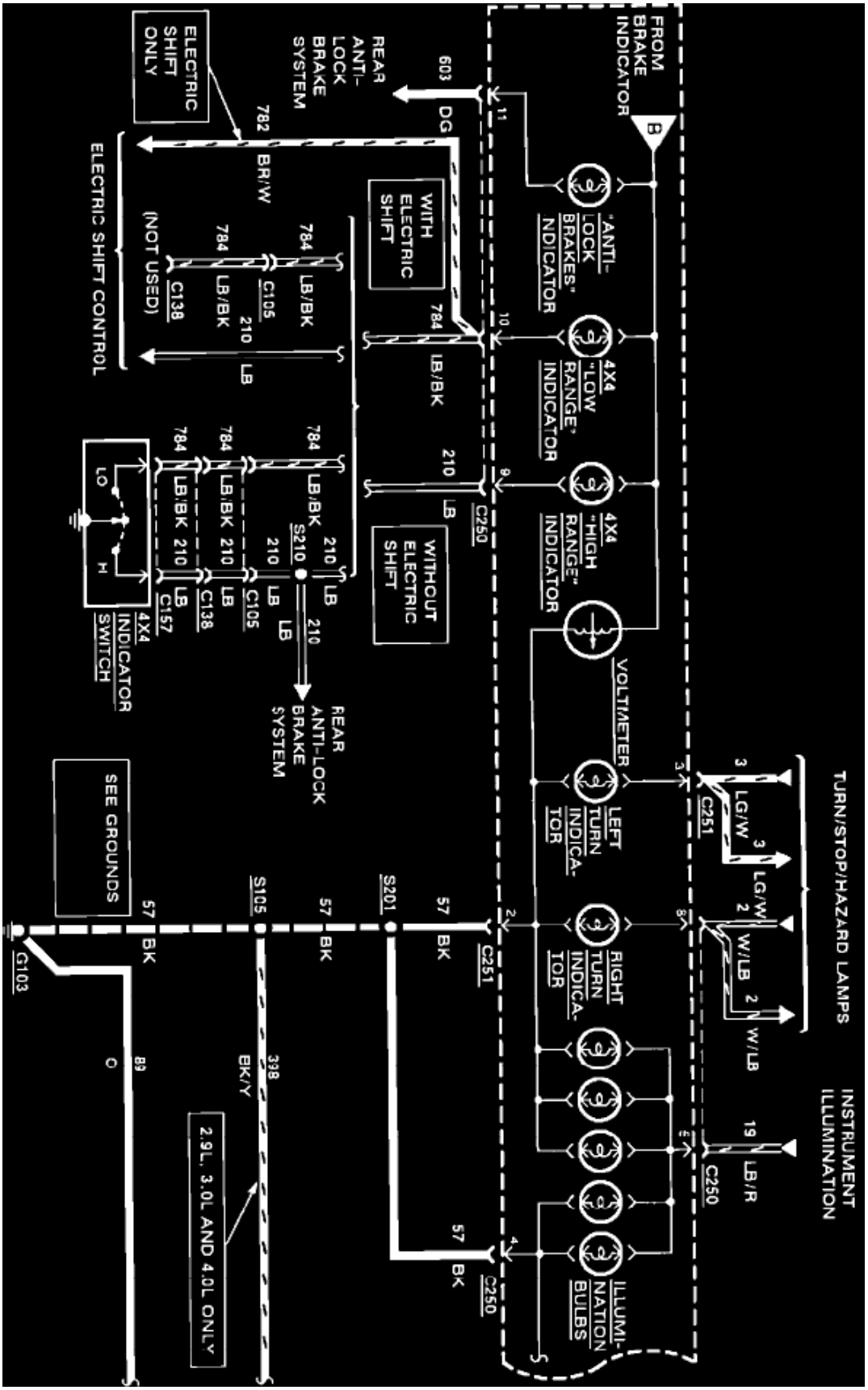
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
C251
SEE POWER DISTRIBUTION
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
(NOT USED)
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
P2
C284
SWITCH TESTING
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
C194
258
W/PK
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
57
BK
238
GY
208
570
BK/W
S203
G202
SEE GROUNDS
41
BK/LB
C111 (4.0L ONLY)
C112 (4.0L)
C116 (3.0L)
C136 (2.3L AND 2.9L)
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD
MARK:
9.7 Ω AT HOT MARK

Instrument Panel (Standard)

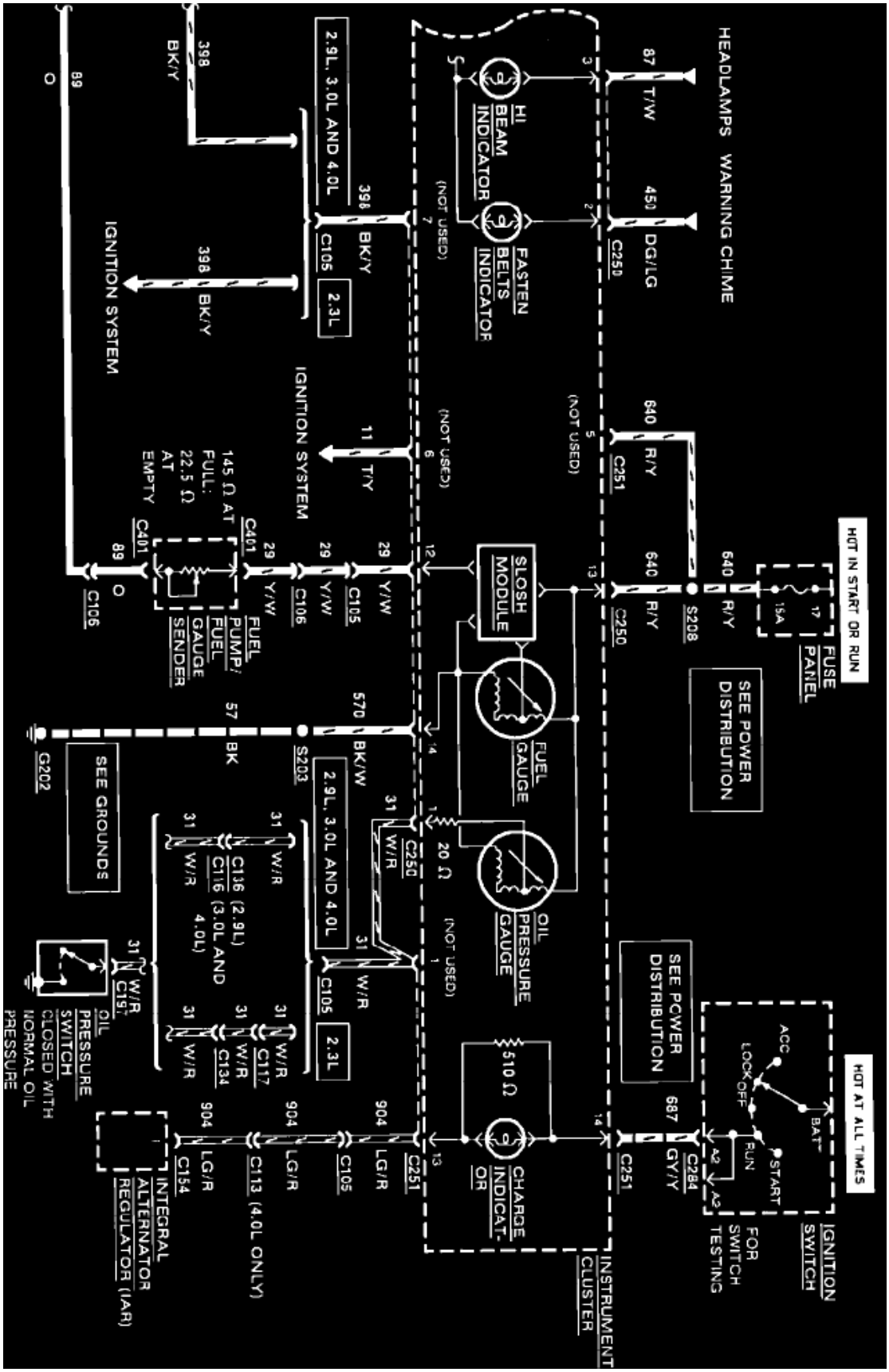

HOT IN RUN
FUSE PANEL
5
15A
SEE POWER DISTRIBUTION
298 P/O
S110
INSTRUMENT CLUSTER
"CHECK ENGINE" INDICATOR
BRAKE INDICATOR
TO "ANTI-LOCK BRAKES" INDICATOR
2.3L AND 2.9L
3.0L AND 4.0L
C105
C117
C117 (4.0L)
C147 (3.0L)
C251
658 PK/LG
977 P/W
201 T/R
201 T/F
VIP TEST CONNECTOR
C198
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
BRAKE FLUID LEVEL SWITCH
NORMAL
LOW
C165
57 BK
G103
S105
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
RUN
START
OFF
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
C170
222 BR/LG
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE
SHORTING CONNECTOR
C288
PARK BRAKE SWITCH
CLOSED WITH PARK BRAKE APPLIED

Instrument Panel (Standard)

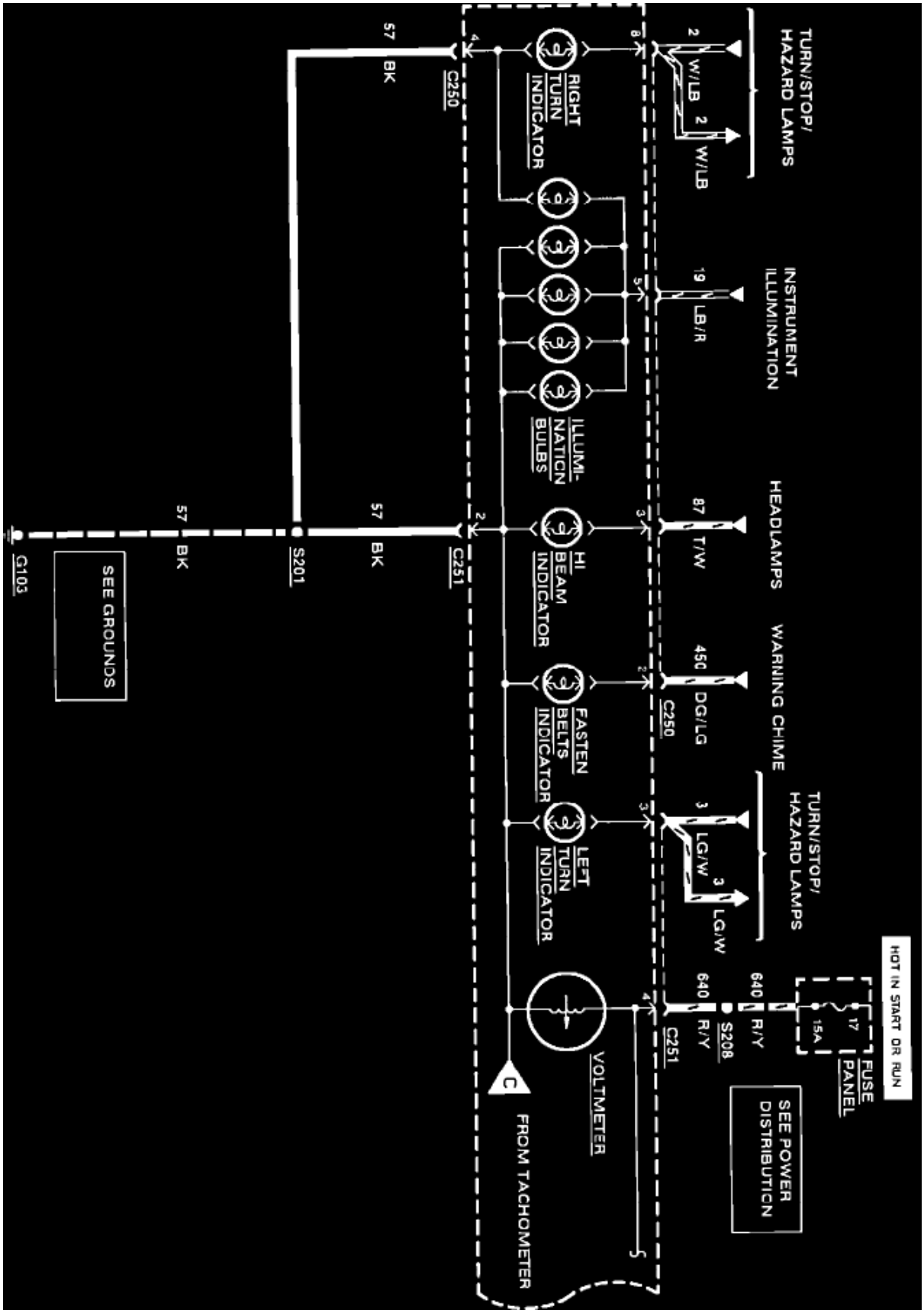

TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C105
C138
C157
C250
C251
G103
S105
S201
S210

Instrument Panel (Standard)

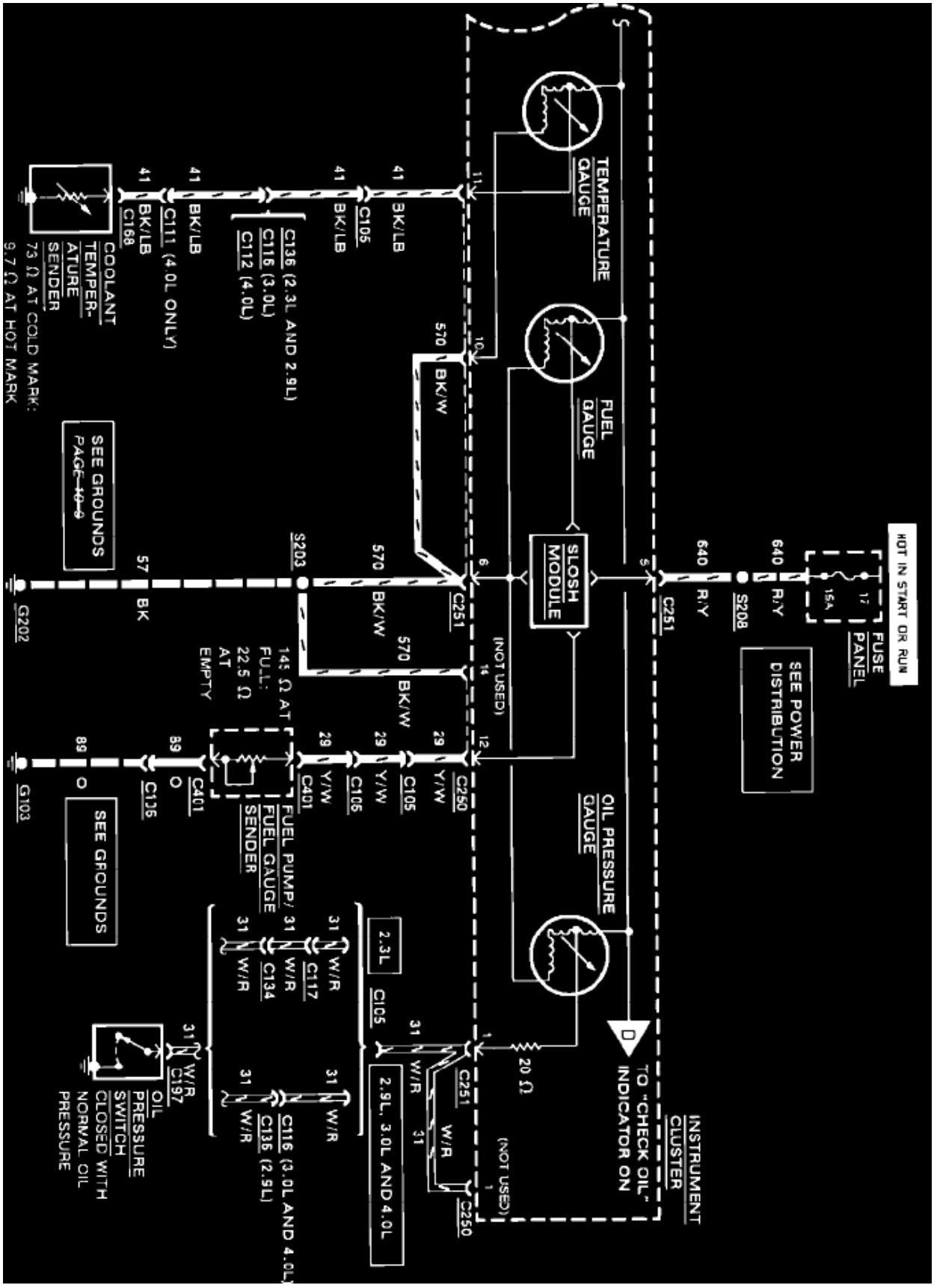
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Accessories and Optional Equipment > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 6475



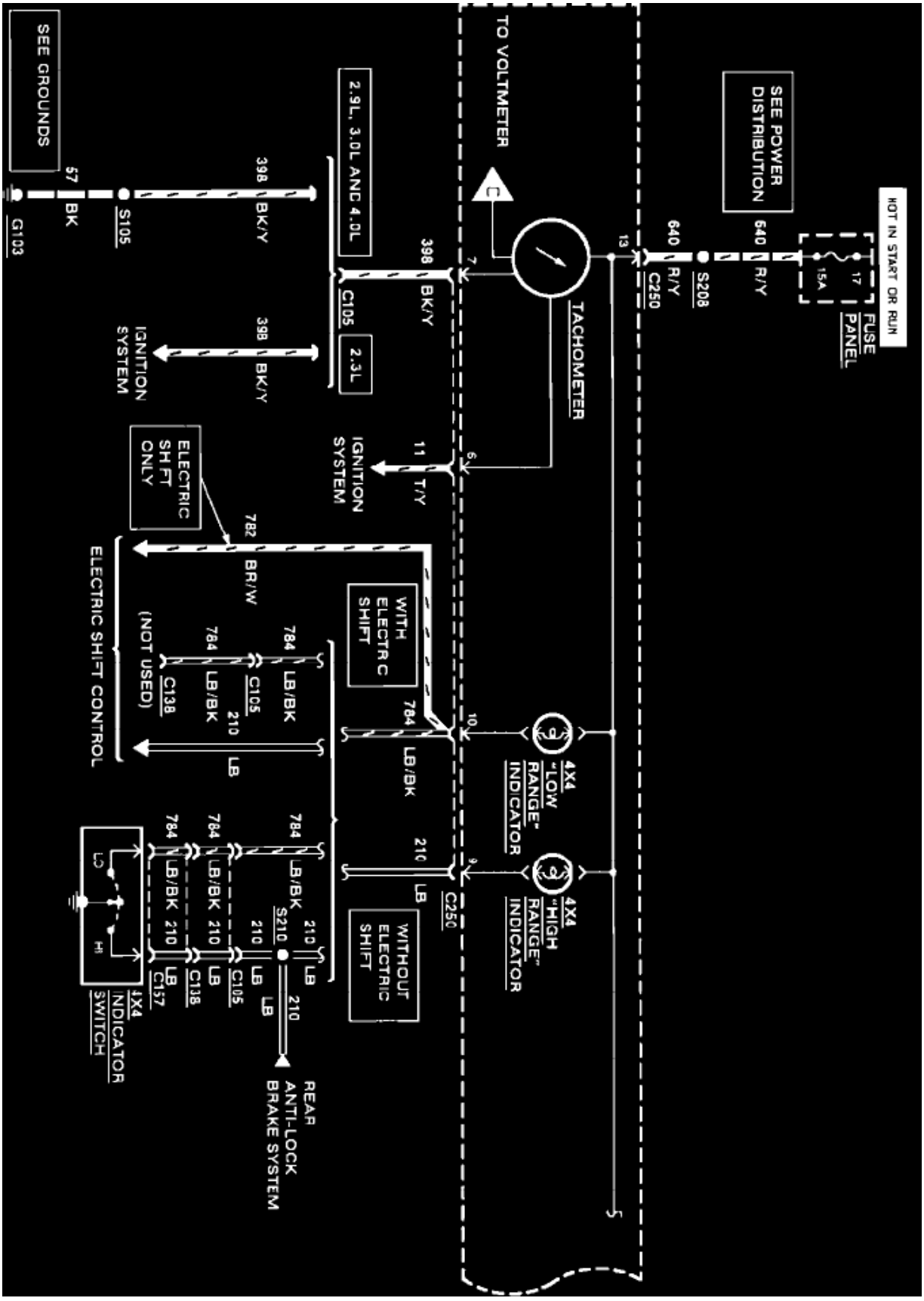
Instrument Panel (Standard)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
C251
SEE POWER DISTRIBUTION
TURN/STOP/ HAZARD LAMPS
LG/W
3
VOLTMETER
C
FROM TACHOMETER
WARNING CHIME
DG/LG
450
C250
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
HEADLAMPS
T/W
87
HI BEAM INDICATOR
INSTRUMENT ILLUMINATION
LB/R
19
ILLUMI-NATION BULBS
RIGHT TURN INDICATOR
W/LB
2
57
BK
S201
G103
SEE GROUNDS

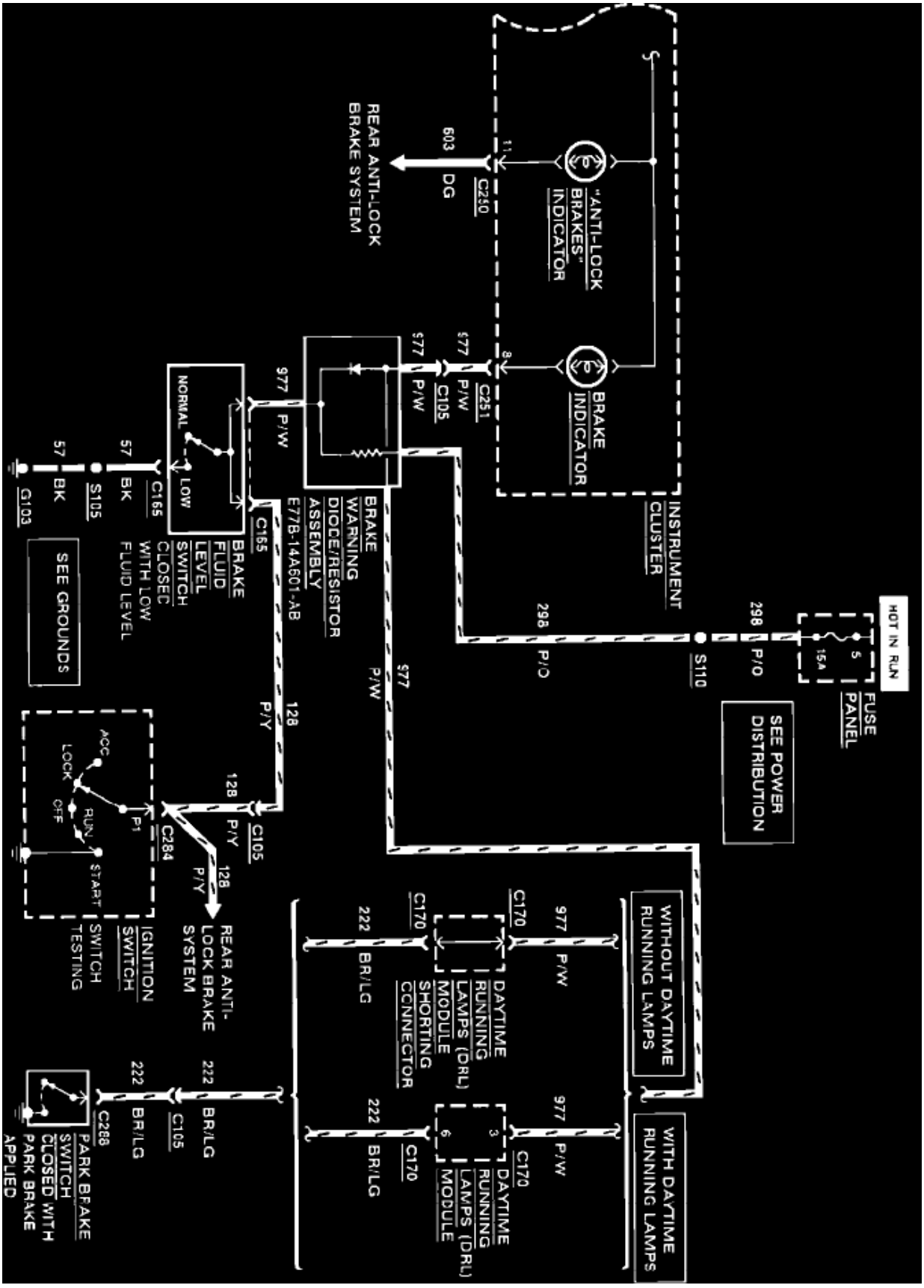
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
15A
640 R/Y
S208
SEE POWER DISTRIBUTION
640 R/Y
C251
TEMPERATURE GAUGE
FUEL GAUGE
SLOSH MODULE
OIL PRESSURE GAUGE
INSTRUMENT CLUSTER
TO "CHECK OIL" INDICATOR ON
20 Ω
(NOT USED)
C250
41 BK/LB
C105
C136 (2.3L AND 2.9L)
C116 (3.0L)
C112 (4.0L)
41 BK/LB
C111 (4.0L ONLY)
41 BK/LB
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD MARK;
9.7 Ω AT HOT MARK
570 BK/W
570 BK/W
570 BK/W
(NOT USED)
S203
57 BK
G202
SEE GROUNDS PAGE 10-9
14.5 Ω AT FULL; 22.5 Ω AT EMPTY
89 O
C136
C401
89 O
G103
SEE GROUNDS
FUEL PUMP/ FUEL GAUGE SENDER
29 Y/W
C401
29 Y/W
C105
29 Y/W
C250
2.3L
C105
2.9L, 3.0L AND 4.0L
31 W/R
C117
31 W/R
C134
31 W/R
31 W/R
C116 (3.0L AND 4.0L)
C135 (2.5L)
31 W/R
C197
OIL PRESSURE SWITCH
CLOSED WITH NORMAL OIL PRESSURE

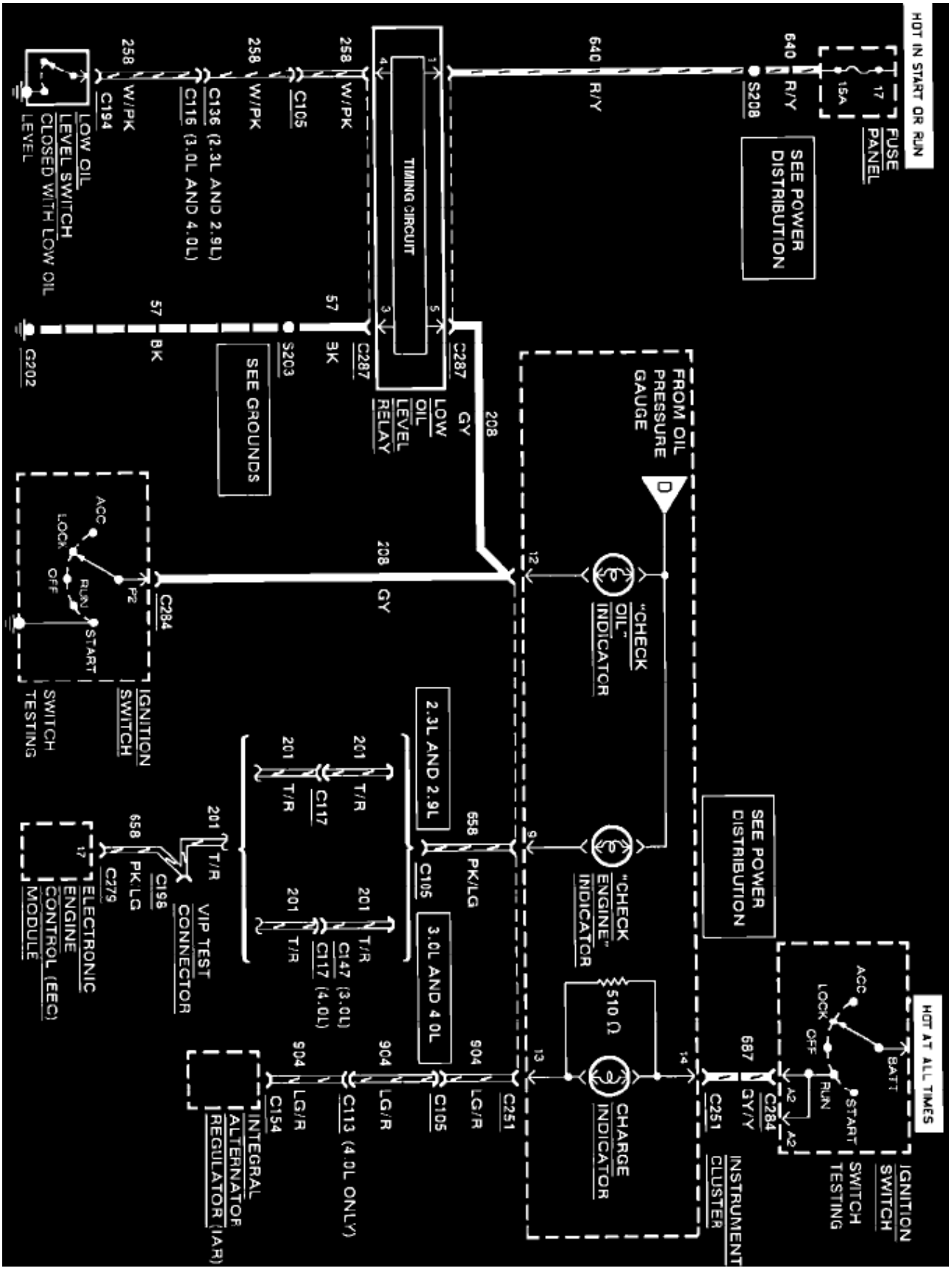
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640
R/Y
S208
C250
13
TO VOLTMETER
TACHOMETER
C
7
398
BK/Y
2.9L, 3.0L AND 4.0L
C105
2.3L
IGNITION SYSTEM
11
T/Y
6
SEE GROUNDS
57
BK
G103
S105
ELECTRIC SHIFT ONLY
782
BR/W
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
784
LB/BK
(NOT USED)
C138
210
LB
10
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
9
C250
WITHOUT ELECTRIC SHIFT
S210
REAR ANTI-LOCK BRAKE SYSTEM
C157
4X4 INDICATOR SWITCH
LO
HI

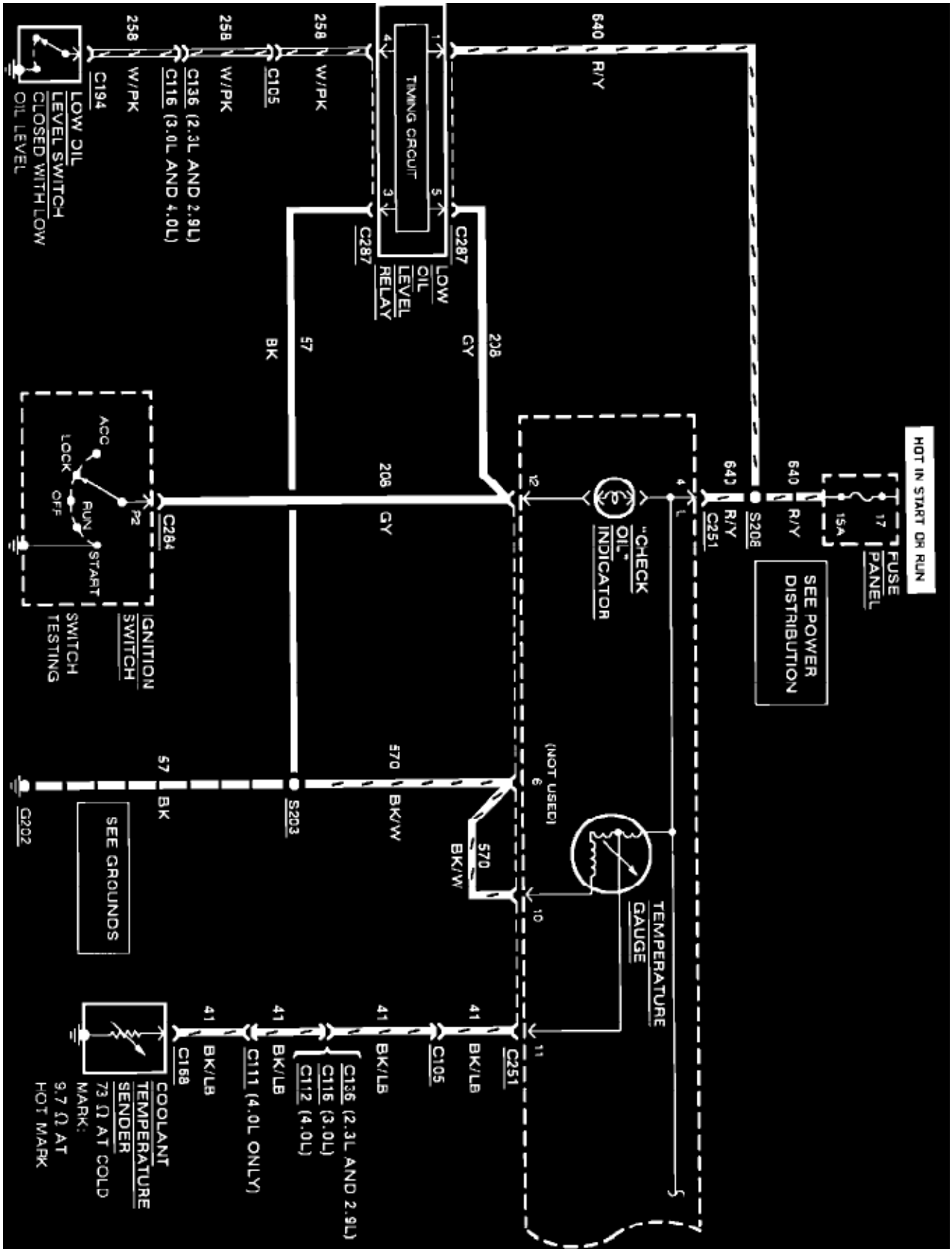
Instrument Panel (Sport)


HOT IN RUN
FUSE PANEL
5
15A
298 P/O
SEE POWER DISTRIBUTION
S110
INSTRUMENT CLUSTER
"ANTI-LOCK BRAKES" INDICATOR
BRAKE INDICATOR
603 DG
C250
11
REAR ANTI-LOCK BRAKE SYSTEM
C251
8
577 P/W
C105
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
977 P/W
C165
BRAKE FLUID LEVEL SWITCH CLOSED WITH LOW FLUID LEVEL
NORMAL
LOW
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
OFF
RUN
START
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
C170
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
222 BR/LG
DAYTIME RUNNING LAMPS (DRL) MODULE
PARK BRAKE SWITCH CLOSED WITH PARK BRAKE APPLIED
C268

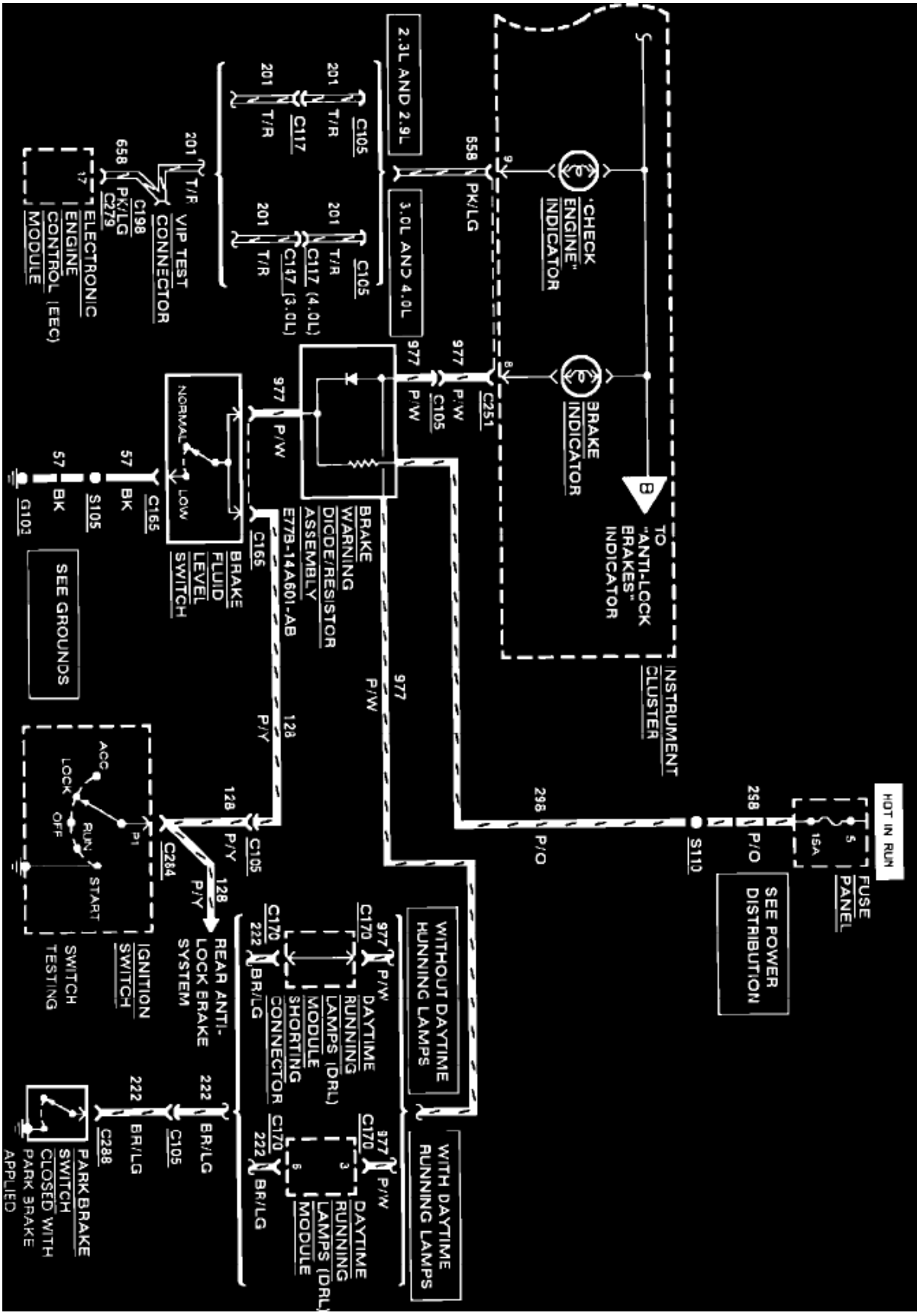
Instrument Panel (Sport)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
IGNITION SWITCH
BATT
ACC
LOCK
OFF
RUN
START
SWITCH TESTING
A2
C284
687
GY/Y
C251
INSTRUMENT CLUSTER
SEE POWER DISTRIBUTION
510 Ω
CHARGE INDICATOR
"CHECK ENGINE" INDICATOR
"CHECK OIL" INDICATOR
FROM OIL PRESSURE GAUGE
D
208
GY
LOW OIL LEVEL RELAY
TIMING CIRCUIT
C287
57
BK
S203
G202
SEE GROUNDS
258
W/PK
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
LOW OIL LEVEL SWITCH CLOSED WITH LOW OIL LEVEL
P2
C284
IGNITION SWITCH
SWITCH TESTING
2.3L AND 2.9L
3.0L AND 4.0L
658
PK/LG
201
T/R
C117
C147 (3.0L)
C117 (4.0L)
VIP TEST CONNECTOR
C196
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
904
LG/R
C113 (4.0L ONLY)
C154
INTEGRAL ALTERNATOR REGULATOR (IAR)

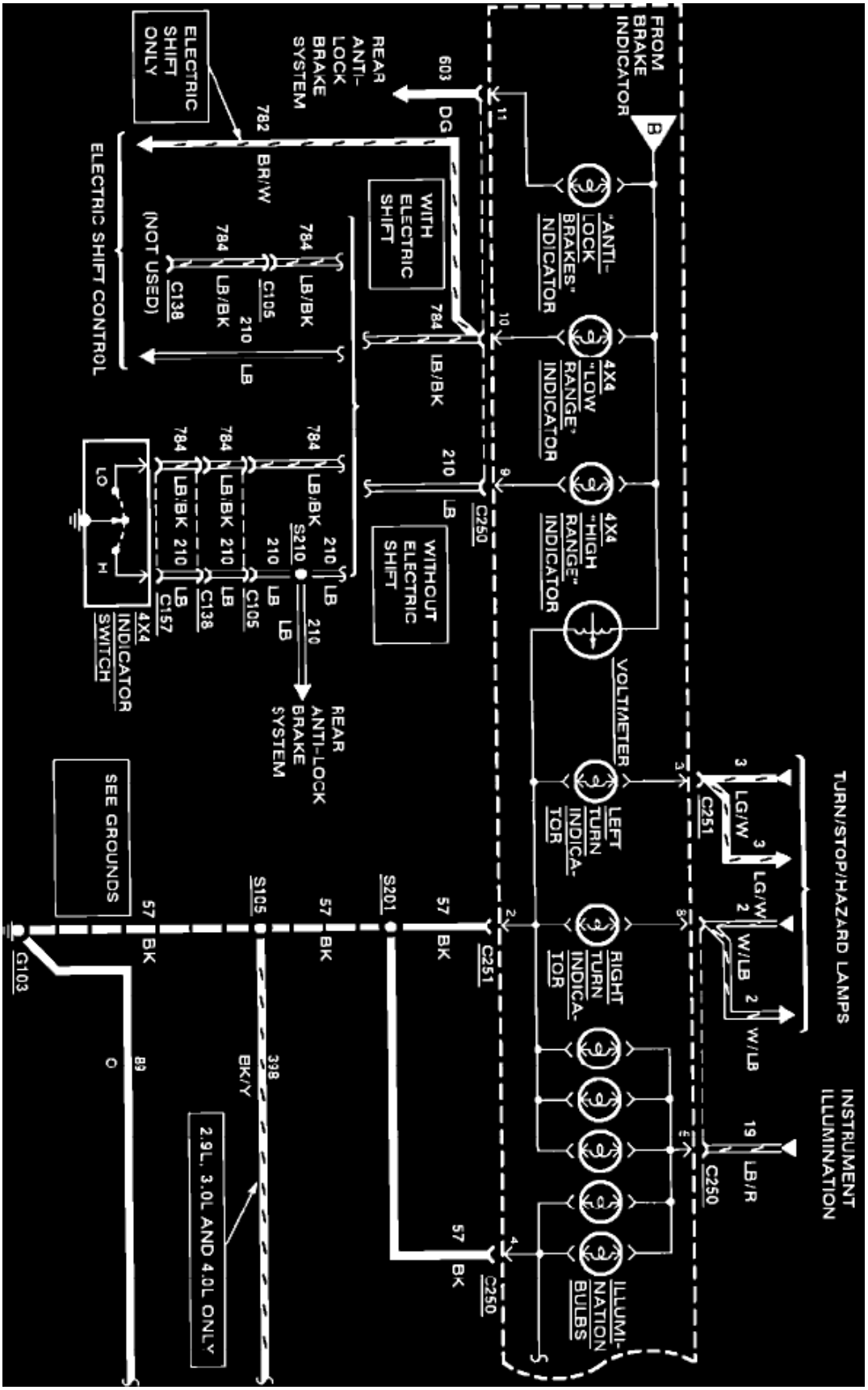
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
C251
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
(NOT USED)
LOW OIL LEVEL SWITCH CLOSED WITH LOW OIL LEVEL
C194
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
258
W/PK
238
GY
57
BK
208
570
BK/W
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
P2
C284
SWITCH TESTING
SEE GROUNDS
G202
S203
C112 (4.0L)
C111 (4.0L ONLY)
C168
BK/LB
41
COOLANT TEMPERATURE SENDER
73 Ω AT COLD
MARK:
9.7 Ω AT HOT MARK

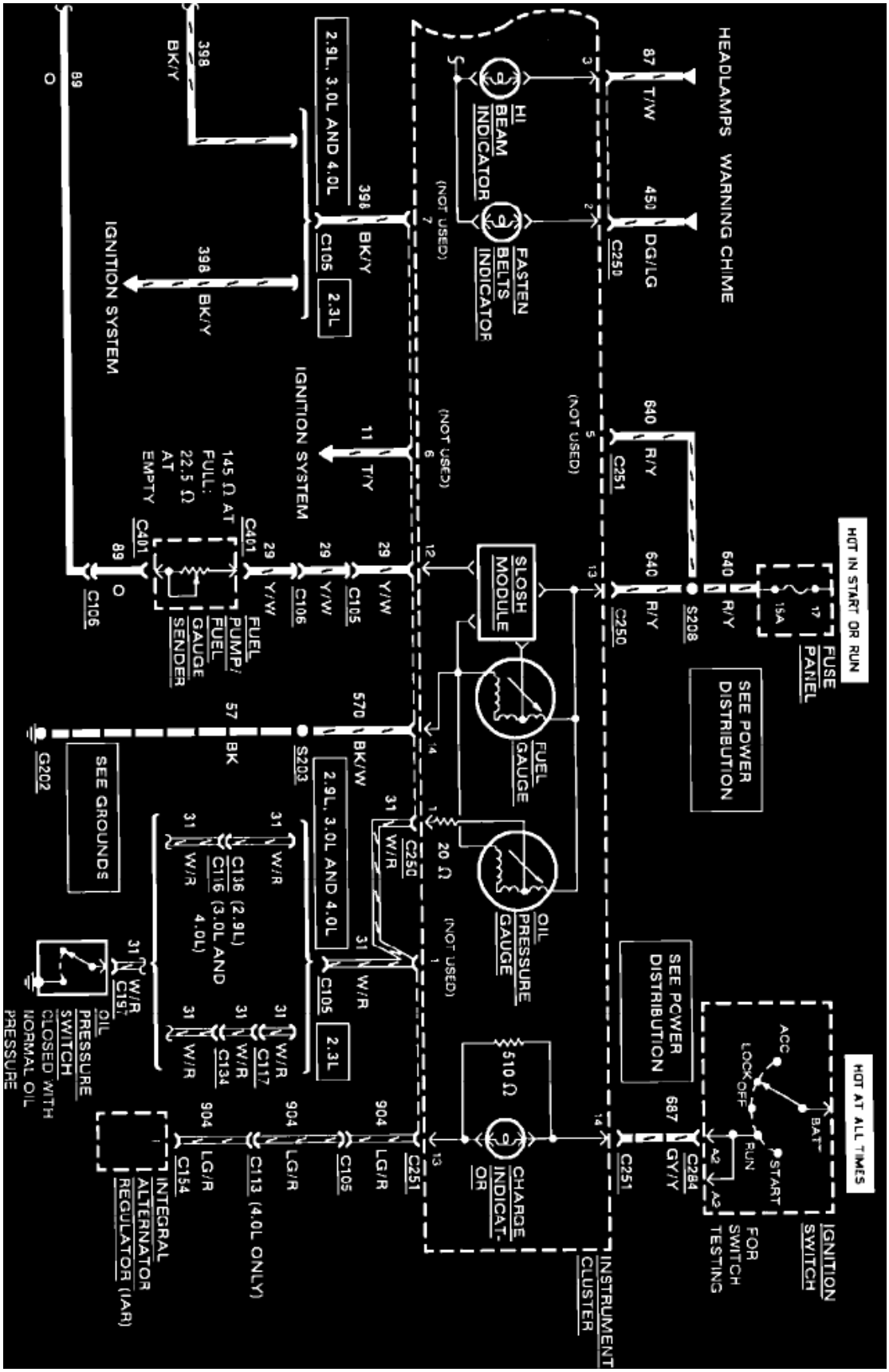
Instrument Panel (Standard)


HOT IN RUN
FUSE PANEL
5
15A
SEE POWER DISTRIBUTION
S110
INSTRUMENT CLUSTER
"CHECK ENGINE" INDICATOR
BRAKE INDICATOR
TO "ANTI-LOCK BRAKES" INDICATOR
2.3L AND 2.9L
3.0L AND 4.0L
C105
C117
C117 (4.0L)
C147 (3.0L)
VIP TEST CONNECTOR
C198
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
C251
BRAKE FLUID LEVEL SWITCH
NORMAL
LOW
C165
S105
G103
SEE GROUNDS
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
C284
REAR ANTI-LOCK BRAKE SYSTEM
SWITCH TESTING
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE
SHORTING CONNECTOR
C170
C105
C288
PARK BRAKE SWITCH
CLOSED WITH PARK BRAKE APPLIED
P/O
T/R
T/F
PK/LG
BK
BR/LG
P/W
P/Y

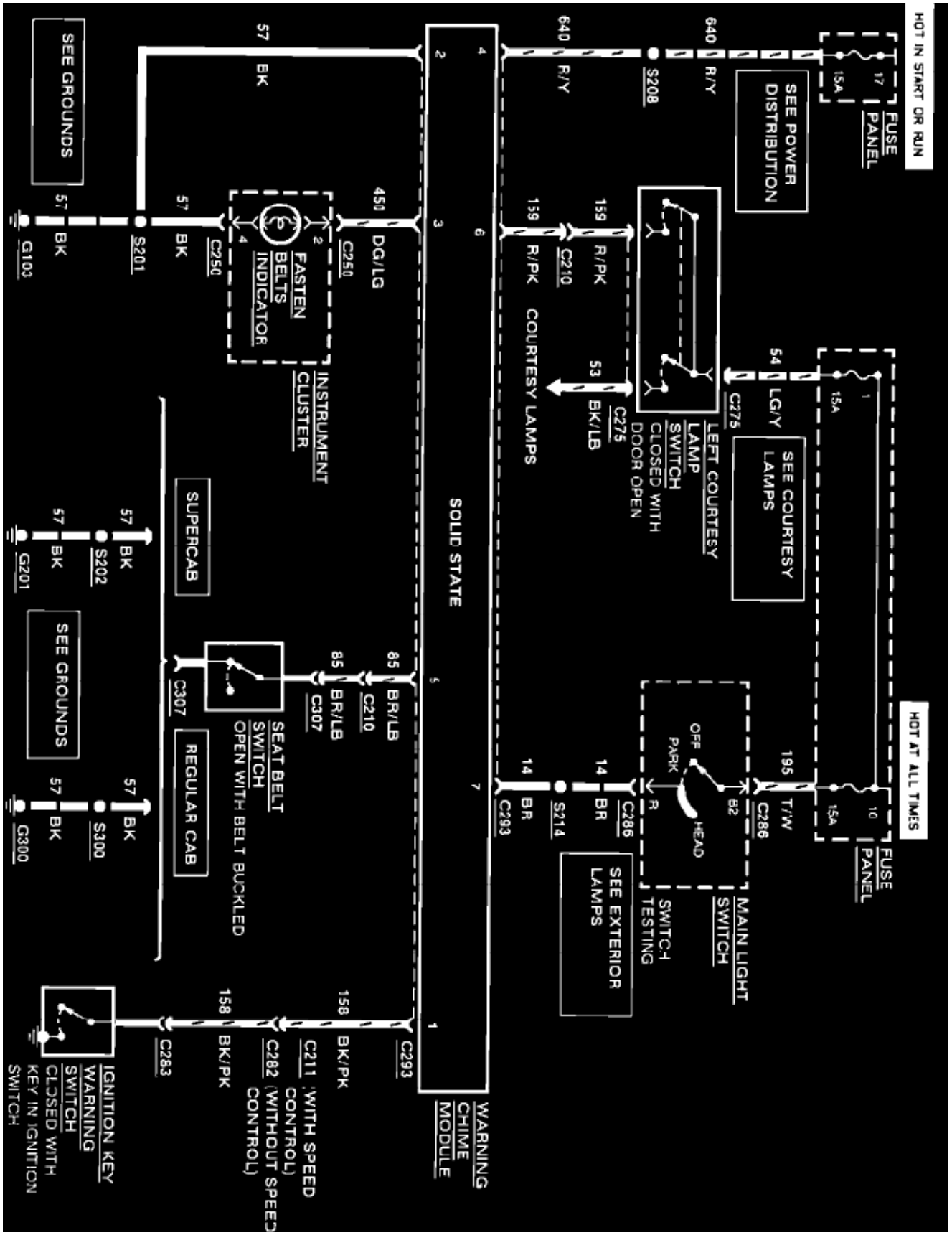
Instrument Panel (Standard)


TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C105
C138
C157
C250
C251
S105
S201
S210
G103
LG/W
W/LB
LB/R
LB/BK
BR/W
BK/Y
DG
BK
O

Instrument Panel (Standard)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
IGNITION SWITCH
HEADLAMPS WARNING CHIME
HI BEAM INDICATOR
FASTEN BELTS INDICATOR
SEE POWER DISTRIBUTION
SLOSH MODULE
FUEL GAUGE
OIL PRESSURE GAUGE
CHARGE INDICATOR
INSTRUMENT CLUSTER
FUEL PUMP/ FUEL GAUGE SENDER
IGNITION SYSTEM
2.9L, 3.0L AND 4.0L
2.3L
SEE GROUNDS
OIL PRESSURE SWITCH
CLOSED WITH NORMAL OIL PRESSURE
INTEGRAL ALTERNATOR REGULATOR (IAR)
FOR SWITCH TESTING
ACC
LOCK
RUN
START
BAT
T/W
DG/LG
R/Y
T/Y
Y/W
BK/Y
BK/W
W/R
LG/R
GY/Y
BK
O
145 Ω AT FULL; 22.5 Ω AT EMPTY
20 Ω
510 Ω
(NOT USED)
C105
C106
C110
C113 (4.0L ONLY)
C116 (2.9L)
C116 (3.0L AND 4.0L)
C117
C134
C154
C250
C251
C284
C401
S203
S208
G202

Instrument Panel (Standard)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640 R/Y
S208
SEE COURTESY LAMPS
54 LG/Y
C275
LEFT COURTESY LAMP SWITCH CLOSED WITH DOOR OPEN
53 BK/LB
159 R/PK
C210
COURTESY LAMPS
SOLID STATE
4
2
3
6
5
7
1
WARNING CHIME MODULE
C293
158 BK/PK
C211 (WITH SPEED CONTROL)
C282 (WITHOUT SPEED CONTROL)
C283
IGNITION KEY WARNING SWITCH CLOSED WITH KEY IN IGNITION SWITCH
85 BR/LB
C307
SEAT BELT SWITCH OPEN WITH BELT BUCKLED
SUPERCAB
REGULAR CAB
450 DG/LG
C250
FASTEN BELTS INDICATOR
INSTRUMENT CLUSTER
57 BK
S201
G103
S202
G201
S300
G300
SEE GROUNDS
10
195 T/W
C286
B2
MAIN LIGHT SWITCH
OFF
PARK
HEAD
R
14 BR
S214
SWITCH TESTING
SEE EXTERIOR LAMPS

Warning Chime

Radio/Stereo Noise Filter: Customer Interest Fuel Pump - Whine Heard Through Radio Speakers

Article No. 01-7-3

04/16/01

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO - WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO - WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994

TEMPO

1990-1997 PROBE, THUNDERBIRD

1990-1999 ESCORT, MUSTANG, TAURUS

1990-2001 CROWN VICTORIA

1997-1999 CONTOUR

2001 TAURUS

1990 BRONCO II

1990-1996 BRONCO

1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350

1990-1999 F-250 LD

1990-2001 ECONOLINE, F-150, RANGER

1991-2001 EXPLORER

1995-2001 WINDSTAR

1997-2001 EXPEDITION

1999-2001 SUPER DUTY F SERIES

2000-2001 EXCURSION

2001 ESCAPE

LINCOLN: 1990-1992

MARK VII

1990-1999 CONTINENTAL

1990-2001 TOWN CAR

1997-1998 MARK VIII

1998-2001 NAVIGATOR

MERCURY: 1990-1994

TOPAZ

1990-1997 COUGAR

1990-1999 SABLE

1990-2001 GRAND MARQUIS

1991-1999 TRACER

1997-1999 MYSTIQUE

1999 COUGAR

2001 SABLE

1993-2001 VILLAGER

1997-2001 MOUNTAINEER

This TSB article is being republished in its entirety to update the model year vehicles.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists,

then refer to the Service Procedure for repair details.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

SERVICE PROCEDURE

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

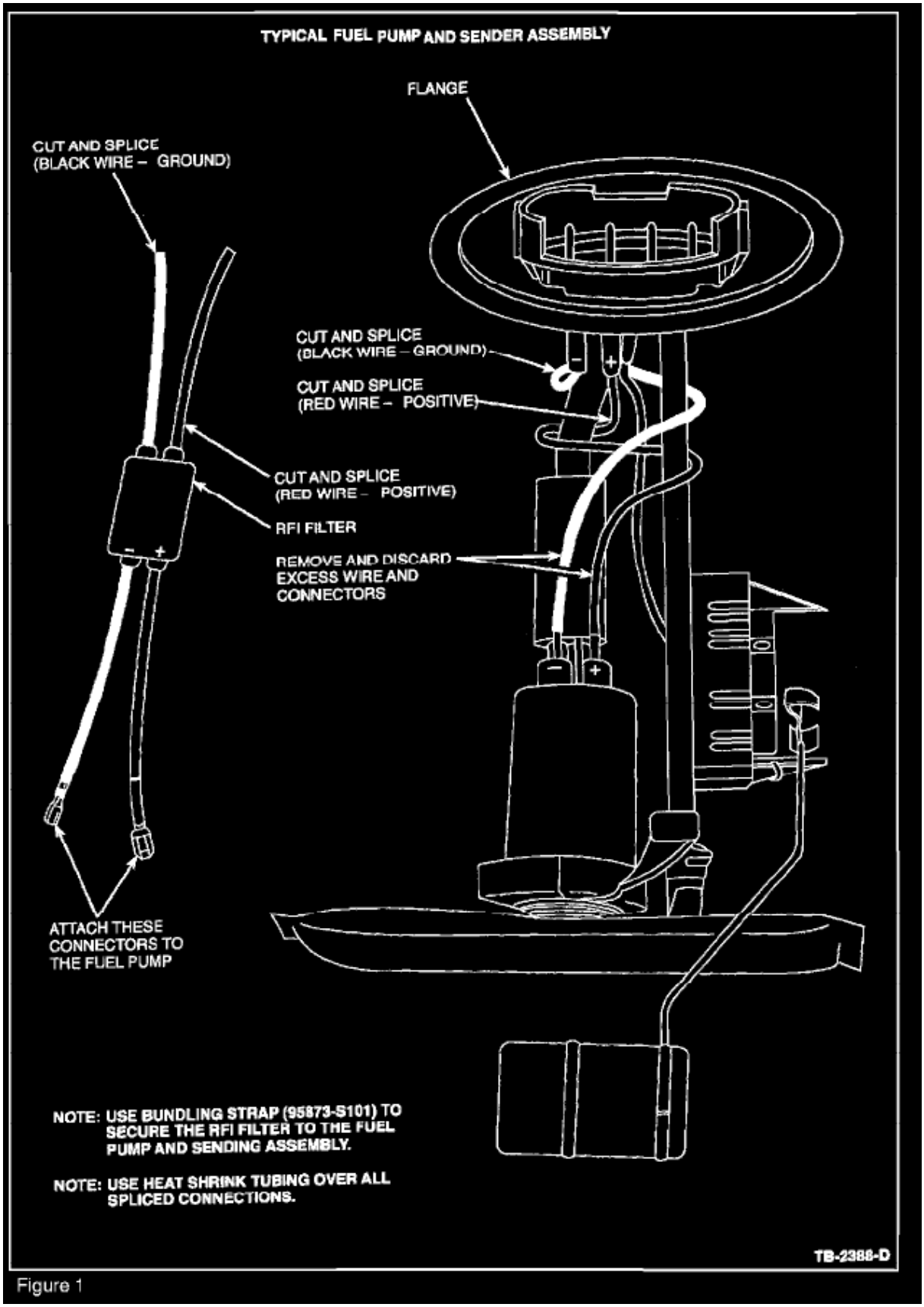


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-M) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT

TUBING (ABOUT 50 mm (2",)) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF

THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

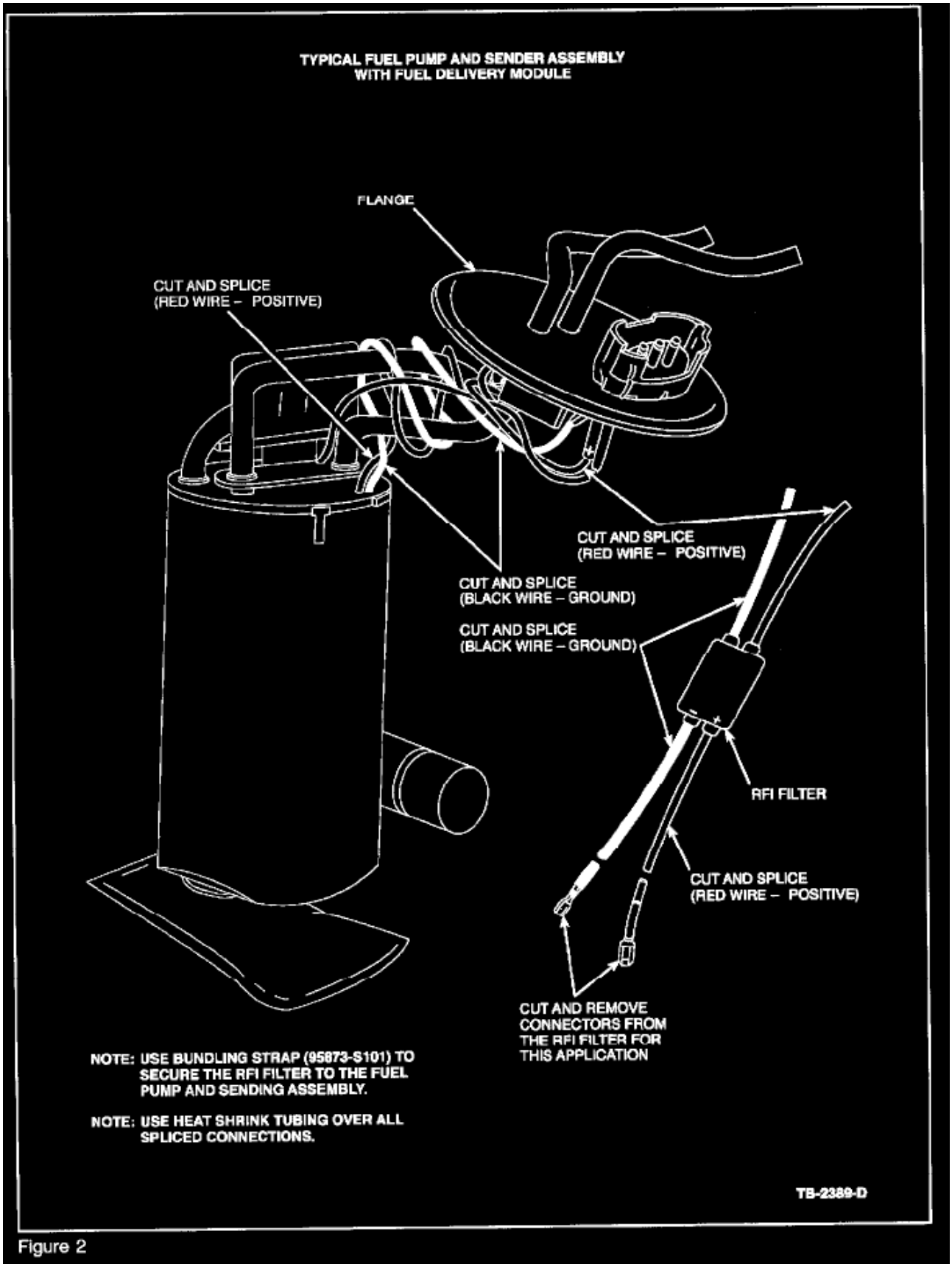


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over soldering connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE:

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

010703AA	Diagnose And Install RFI Filter (1990-1995 Thunderbird Super Coupe)	2.1 Hrs.
010703AB	Diagnose And Install RFI Filter (1991-1993 Thunderbird/Cougar 5.0L HO)	2.1 Hrs.
010703AC	Diagnose And Install RFI Filter (1994-1997 Thunderbird/Cougar 4.6L MFI)	2.1 Hrs.
010703AD	Diagnose And Install RFI Filter (1990-1997 Thunderbird/Cougar 3.8L)	1.9 Hrs.
010703BA	Diagnose And Install RFI Filter (1990-1995 Taurus/Sable)	1.4 Hrs.
010703BB	Diagnose And Install RFI Filter (1996-1999 Taurus/Sable)	1.4 Hrs.
010703BC	Diagnose And Install RFI Filter (2001 Taurus/Sable)	1.4 Hrs.
010703CA	Diagnose And Install RFI Filter (1992-1997 Crown Victoria/Grand Marquis, Town Car)	1.2 Hrs.

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE:

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE WIRE TO A POINT CLOSE TO THE FUEL TANK IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION. SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and vacuum troubleshooting manual (EVTM) (or other Service Literature) for the location of the fuel pump pump ground. If ground is more than 0.9m (3') from the tank, cut wire and ground fuel pump end within 0.9m (3') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop manual.

PARTS BLOCK

OTHER APPLICABLE ARTICLES: 90-18-3, 91-17-5 SUPERSEDES: 99-12-9 WARRANTY STATUS: Eligible Under The Provisions of Bumper To Bumper Warranty Coverage

010703CB	Diagnose And Install RFI Filter (1990-1991 Crown Victoria/Grand Marquis, Town Car)	1.6 Hrs.	010703LF	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Front))	1.6 Hrs.
010703CC	Diagnose And Install RFI Filter (1998-2001 Town Car)	1.9 Hrs.	010703LT	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Both))	2.6 Hrs.
010703CD	Diagnose And Install RFI Filter (1998-2001 Crown Victoria/Grand Marquis)	2.2 Hrs.	010703L	Diagnose And Install RFI Filter (1990-1991 Econoline - Single Tank)	1.6 Hrs.
010703DA	Diagnose And Install RFI Filter (1990-1999 Mustang)	1.7 Hrs.	010703MA	Diagnose And Install RFI Filter (1990-1996 Bronco)	2.0 Hrs.
010703EA	Diagnose And Install RFI Filter (1990-1994 Tempo/Topaz)	1.6 Hrs.	010703NA	Diagnose And Install RFI Filter (1991-1994 Explorer)	1.8 Hrs.
010703FA	Diagnose And Install RFI Filter (1990-1992 Mark VII)	1.5 Hrs.	010703NB	Diagnose And Install RFI Filter (1995-2001 Explorer)	1.5 Hrs.
010703FB	Diagnose And Install RFI Filter (1997-1998 Mark VIII LSC)	2.0 Hrs.	010703NC	Diagnose And Install RFI Filter (1997-2001 Mountaineer)	1.5 Hrs.
010703FC	Diagnose And Install RFI Filter (1997-1998 Mark VIII Base)	2.5 Hrs.	010703PA	Diagnose And Install RFI Filter (1995-2001 Windstar)	1.4 Hrs.
010703GA	Diagnose And Install RFI Filter (1990-1994 Continental)	1.5 Hrs.	010703RA	Diagnose And Install RFI Filter (1993-2001 Villager)	1.9 Hrs.
010703GB	Diagnose And Install RFI Filter (1995-1999 Continental)	1.5 Hrs.	010703SA	Diagnose And Install RFI Filter (1997-2001 Expedition)	1.7 Hrs.
010703HA	Diagnose And Install RFI Filter (1990 Escort)	1.6 Hrs.	010703SB	Diagnose And Install RFI Filter (1998-2001 Navigator)	1.7 Hrs.
010703HB	Diagnose And Install RFI Filter (1991-1996 Escort/Tracer)	0.8 Hr.	010703TA	Diagnose And Install RFI Filter (1990-1997 Ranger Standard Cab)	1.3 Hrs.
010703HC	Diagnose And Install RFI Filter (1997-1999 Escort/Tracer)	1.6 Hrs.	010703TB	Diagnose And Install RFI Filter (1990-1997 Ranger Super Cab)	1.8 Hrs.
010703JA	Diagnose And Install RFI Filter (1997 Contour/Mystique)	0.8 Hr.	010703TC	Diagnose And Install RFI Filter (1998-2001 Ranger 4X2)	1.6 Hrs.
010703JB	Diagnose And Install RFI Filter (1998-1999 Contour/Mystique)	1.8 Hrs.	010703TD	Diagnose And Install RFI Filter (1998-2001 Ranger 4X4)	1.8 Hrs.
010703KA	Diagnose And Install RFI Filter (1990-1992 Probe)	0.8 Hr.	010703VA	Diagnose And Install RFI Filter (1990-1997 Aerostar)	1.5 Hrs.
010703KB	Diagnose And Install RFI Filter (1993-1997 Probe)	1.6 Hrs.	010703WA	Diagnose And Install RFI Filter (1990 Bronco II)	1.9 Hrs.
010703LB	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Rear))	1.5 Hrs.	010703XB	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Rear) And 1997 F-350/Super Duty (Rear))	1.4 Hrs.
010703LC	Diagnose And Install RFI Filter (1992-2001 Econoline)	1.6 Hrs.	010703XC	Diagnose And Install RFI Filter (2000-2001 Excursion)	1.6 Hrs.

010703XF	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Front) And 1997 F-350/Super Duty (Front))	1.3 Hrs.
010703XL	Diagnose And Install RFI Filter (2001 Escape)	0.8 Hrs.
010703XT	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Both) And 1997 F-350/Super Duty (Both))	2.1 Hrs.
010703X	Diagnose And Install RFI Filter (1999-2001 Super Duty F-Series)	1.6 Hrs.

BASIC PART NO.	CONDITION CODE
18B925	42

OPERATION/DESCRIPTION/TIME

DEALER CODING

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Radio/Stereo Noise Filter: All Technical Service Bulletins Fuel Pump - Whine Heard Through Radio Speakers

Article No. 01-7-3

04/16/01

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO - WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO - WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994

TEMPO

1990-1997 PROBE, THUNDERBIRD

1990-1999 ESCORT, MUSTANG, TAURUS

1990-2001 CROWN VICTORIA

1997-1999 CONTOUR

2001 TAURUS

1990 BRONCO II

1990-1996 BRONCO

1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350

1990-1999 F-250 LD

1990-2001 ECONOLINE, F-150, RANGER

1991-2001 EXPLORER

1995-2001 WINDSTAR

1997-2001 EXPEDITION

1999-2001 SUPER DUTY F SERIES

2000-2001 EXCURSION

2001 ESCAPE

LINCOLN: 1990-1992

MARK VII

1990-1999 CONTINENTAL

1990-2001 TOWN CAR

1997-1998 MARK VIII

1998-2001 NAVIGATOR

MERCURY: 1990-1994

TOPAZ

1990-1997 COUGAR

1990-1999 SABLE

1990-2001 GRAND MARQUIS

1991-1999 TRACER

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2001 SABLE

1993-2001 VILLAGER

1997-2001 MOUNTAINEER

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ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists,

then refer to the Service Procedure for repair details.

NOTE

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NOTE

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1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

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1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

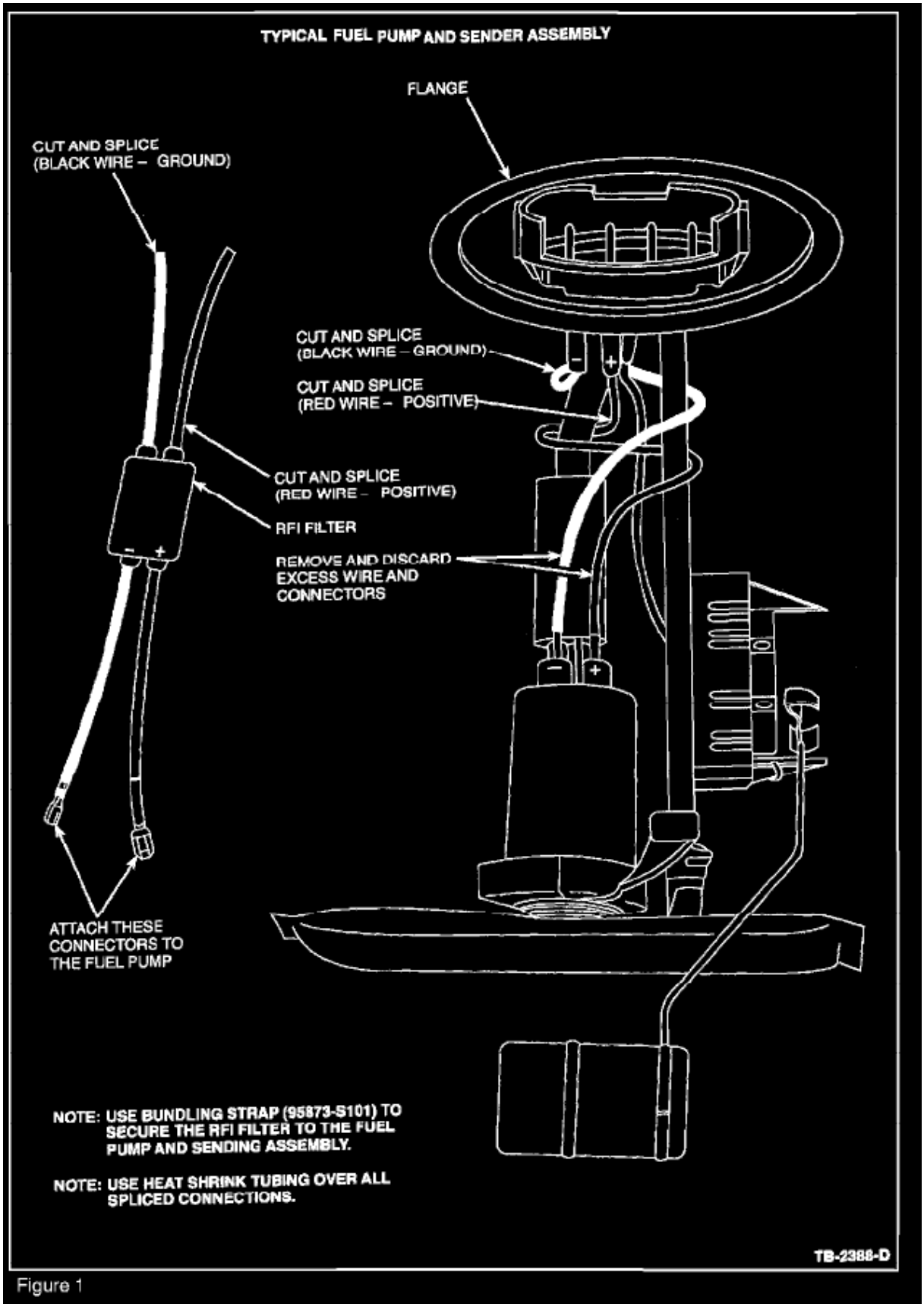

Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-M) over the solder connections.

NOTE

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TUBING (ABOUT 50 mm (2",)) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF

THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

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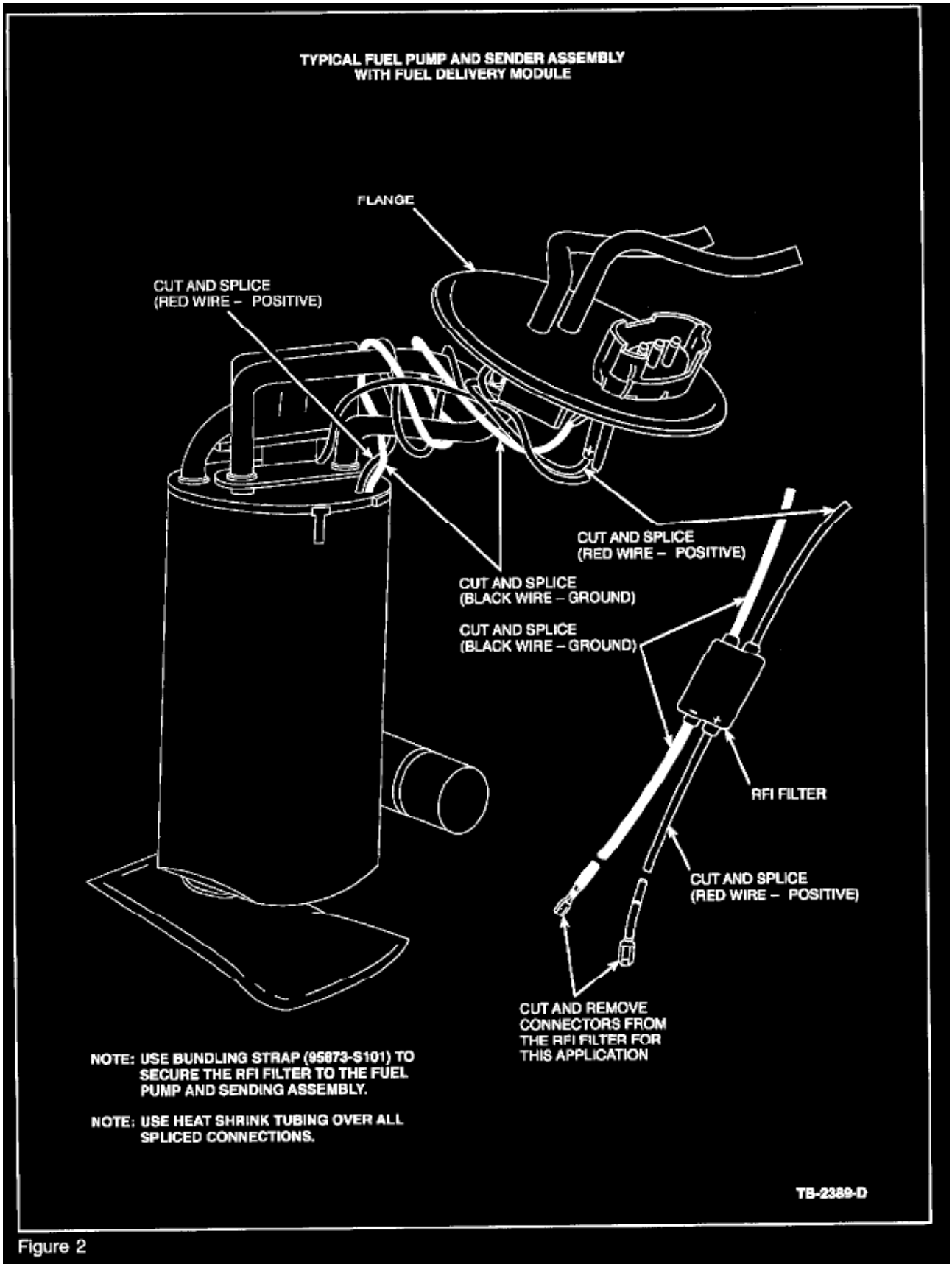


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over soldering connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE:

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95B73-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

010703AA	Diagnose And Install RFI Filter (1990-1995 Thunderbird Super Coupe)	2.1 Hrs.
010703AB	Diagnose And Install RFI Filter (1991-1993 Thunderbird/Cougar 5.0L HO)	2.1 Hrs.
010703AC	Diagnose And Install RFI Filter (1994-1997 Thunderbird/Cougar 4.6L MFI)	2.1 Hrs.
010703AD	Diagnose And Install RFI Filter (1990-1997 Thunderbird/Cougar 3.8L)	1.9 Hrs.
010703BA	Diagnose And Install RFI Filter (1990-1995 Taurus/Sable)	1.4 Hrs.
010703BB	Diagnose And Install RFI Filter (1996-1999 Taurus/Sable)	1.4 Hrs.
010703BC	Diagnose And Install RFI Filter (2001 Taurus/Sable)	1.4 Hrs.
010703CA	Diagnose And Install RFI Filter (1992-1997 Crown Victoria/Grand Marquis, Town Car)	1.2 Hrs.

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE:

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE WIRE TO A POINT CLOSE TO THE FUEL TANK IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION. SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and vacuum troubleshooting manual (EVTM) (or other Service Literature) for the location of the fuel pump pump ground. If ground is more than 0.9m (3') from the tank, cut wire and ground fuel pump end within 0.9m (3') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop manual.

PARTS BLOCK

OTHER APPLICABLE ARTICLES: 90-18-3, 91-17-5 SUPERSEDES: 99-12-9 WARRANTY STATUS: Eligible Under The Provisions of Bumper To Bumper Warranty Coverage

010703CB	Diagnose And Install RFI Filter (1990-1991 Crown Victoria/Grand Marquis, Town Car)	1.6 Hrs.	010703LF	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Front))	1.6 Hrs.
010703CC	Diagnose And Install RFI Filter (1998-2001 Town Car)	1.9 Hrs.	010703LT	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Both))	2.6 Hrs.
010703CD	Diagnose And Install RFI Filter (1998-2001 Crown Victoria/Grand Marquis)	2.2 Hrs.	010703L	Diagnose And Install RFI Filter (1990-1991 Econoline - Single Tank)	1.6 Hrs.
010703DA	Diagnose And Install RFI Filter (1990-1999 Mustang)	1.7 Hrs.	010703MA	Diagnose And Install RFI Filter (1990-1996 Bronco)	2.0 Hrs.
010703EA	Diagnose And Install RFI Filter (1990-1994 Tempo/Topaz)	1.6 Hrs.	010703NA	Diagnose And Install RFI Filter (1991-1994 Explorer)	1.8 Hrs.
010703FA	Diagnose And Install RFI Filter (1990-1992 Mark VII)	1.5 Hrs.	010703NB	Diagnose And Install RFI Filter (1995-2001 Explorer)	1.5 Hrs.
010703FB	Diagnose And Install RFI Filter (1997-1998 Mark VIII LSC)	2.0 Hrs.	010703NC	Diagnose And Install RFI Filter (1997-2001 Mountaineer)	1.5 Hrs.
010703FC	Diagnose And Install RFI Filter (1997-1998 Mark VIII Base)	2.5 Hrs.	010703PA	Diagnose And Install RFI Filter (1995-2001 Windstar)	1.4 Hrs.
010703GA	Diagnose And Install RFI Filter (1990-1994 Continental)	1.5 Hrs.	010703RA	Diagnose And Install RFI Filter (1993-2001 Villager)	1.9 Hrs.
010703GB	Diagnose And Install RFI Filter (1995-1999 Continental)	1.5 Hrs.	010703SA	Diagnose And Install RFI Filter (1997-2001 Expedition)	1.7 Hrs.
010703HA	Diagnose And Install RFI Filter (1990 Escort)	1.6 Hrs.	010703SB	Diagnose And Install RFI Filter (1998-2001 Navigator)	1.7 Hrs.
010703HB	Diagnose And Install RFI Filter (1991-1996 Escort/Tracer)	0.8 Hr.	010703TA	Diagnose And Install RFI Filter (1990-1997 Ranger Standard Cab)	1.3 Hrs.
010703HC	Diagnose And Install RFI Filter (1997-1999 Escort/Tracer)	1.6 Hrs.	010703TB	Diagnose And Install RFI Filter (1990-1997 Ranger Super Cab)	1.8 Hrs.
010703JA	Diagnose And Install RFI Filter (1997 Contour/Mystique)	0.8 Hr.	010703TC	Diagnose And Install RFI Filter (1998-2001 Ranger 4X2)	1.6 Hrs.
010703JB	Diagnose And Install RFI Filter (1998-1999 Contour/Mystique)	1.8 Hrs.	010703TD	Diagnose And Install RFI Filter (1998-2001 Ranger 4X4)	1.8 Hrs.
010703KA	Diagnose And Install RFI Filter (1990-1992 Probe)	0.8 Hr.	010703VA	Diagnose And Install RFI Filter (1990-1997 Aerostar)	1.5 Hrs.
010703KB	Diagnose And Install RFI Filter (1993-1997 Probe)	1.6 Hrs.	010703WA	Diagnose And Install RFI Filter (1990 Bronco II)	1.9 Hrs.
010703LB	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Rear))	1.5 Hrs.	010703XB	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Rear) And 1997 F-350/Super Duty (Rear))	1.4 Hrs.
010703LC	Diagnose And Install RFI Filter (1992-2001 Econoline)	1.6 Hrs.	010703XC	Diagnose And Install RFI Filter (2000-2001 Excursion)	1.6 Hrs.

010703XF	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Front) And 1997 F-350/Super Duty (Front))	1.3 Hrs.
010703XL	Diagnose And Install RFI Filter (2001 Escape)	0.8 Hrs.
010703XT	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Both) And 1997 F-350/Super Duty (Both))	2.1 Hrs.
010703X	Diagnose And Install RFI Filter (1999-2001 Super Duty F-Series)	1.6 Hrs.

BASIC PART NO.	CONDITION CODE
18B925	42

OPERATION/DESCRIPTION/TIME

DEALER CODING

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Speaker: Customer Interest Fuel Pump - Whine Heard Through Radio Speakers

Article No. 01-7-3

04/16/01

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO - WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO - WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994

TEMPO

1990-1997 PROBE, THUNDERBIRD

1990-1999 ESCORT, MUSTANG, TAURUS

1990-2001 CROWN VICTORIA

1997-1999 CONTOUR

2001 TAURUS

1990 BRONCO II

1990-1996 BRONCO

1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350

1990-1999 F-250 LD

1990-2001 ECONOLINE, F-150, RANGER

1991-2001 EXPLORER

1995-2001 WINDSTAR

1997-2001 EXPEDITION

1999-2001 SUPER DUTY F SERIES

2000-2001 EXCURSION

2001 ESCAPE

LINCOLN: 1990-1992

MARK VII

1990-1999 CONTINENTAL

1990-2001 TOWN CAR

1997-1998 MARK VIII

1998-2001 NAVIGATOR

MERCURY: 1990-1994

TOPAZ

1990-1997 COUGAR

1990-1999 SABLE

1990-2001 GRAND MARQUIS

1991-1999 TRACER

1997-1999 MYSTIQUE

1999 COUGAR

2001 SABLE

1993-2001 VILLAGER

1997-2001 MOUNTAINEER

This TSB article is being republished in its entirety to update the model year vehicles.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists,

then refer to the Service Procedure for repair details.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

SERVICE PROCEDURE

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

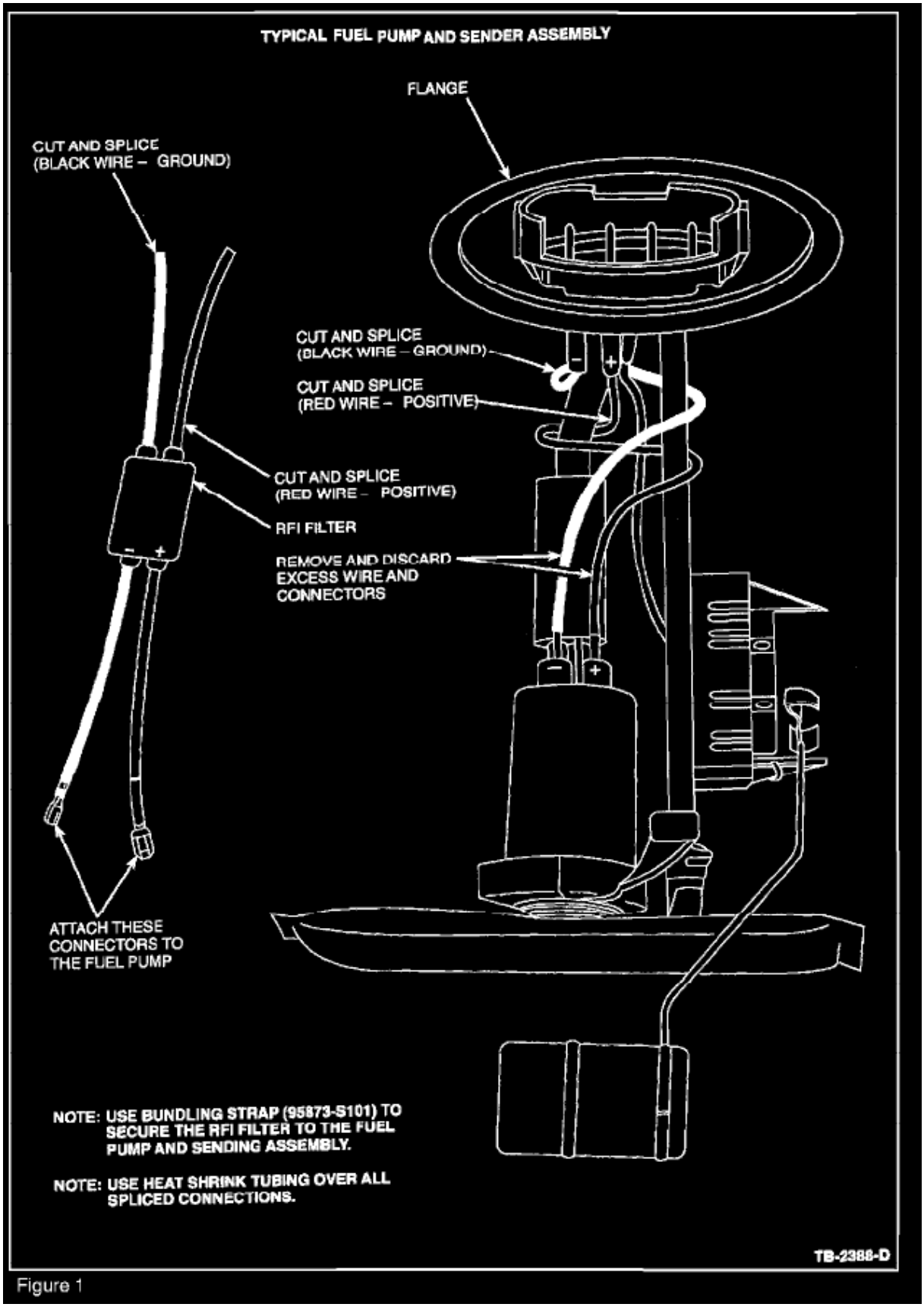


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-M) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT

TUBING (ABOUT 50 mm (2",)) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF

THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

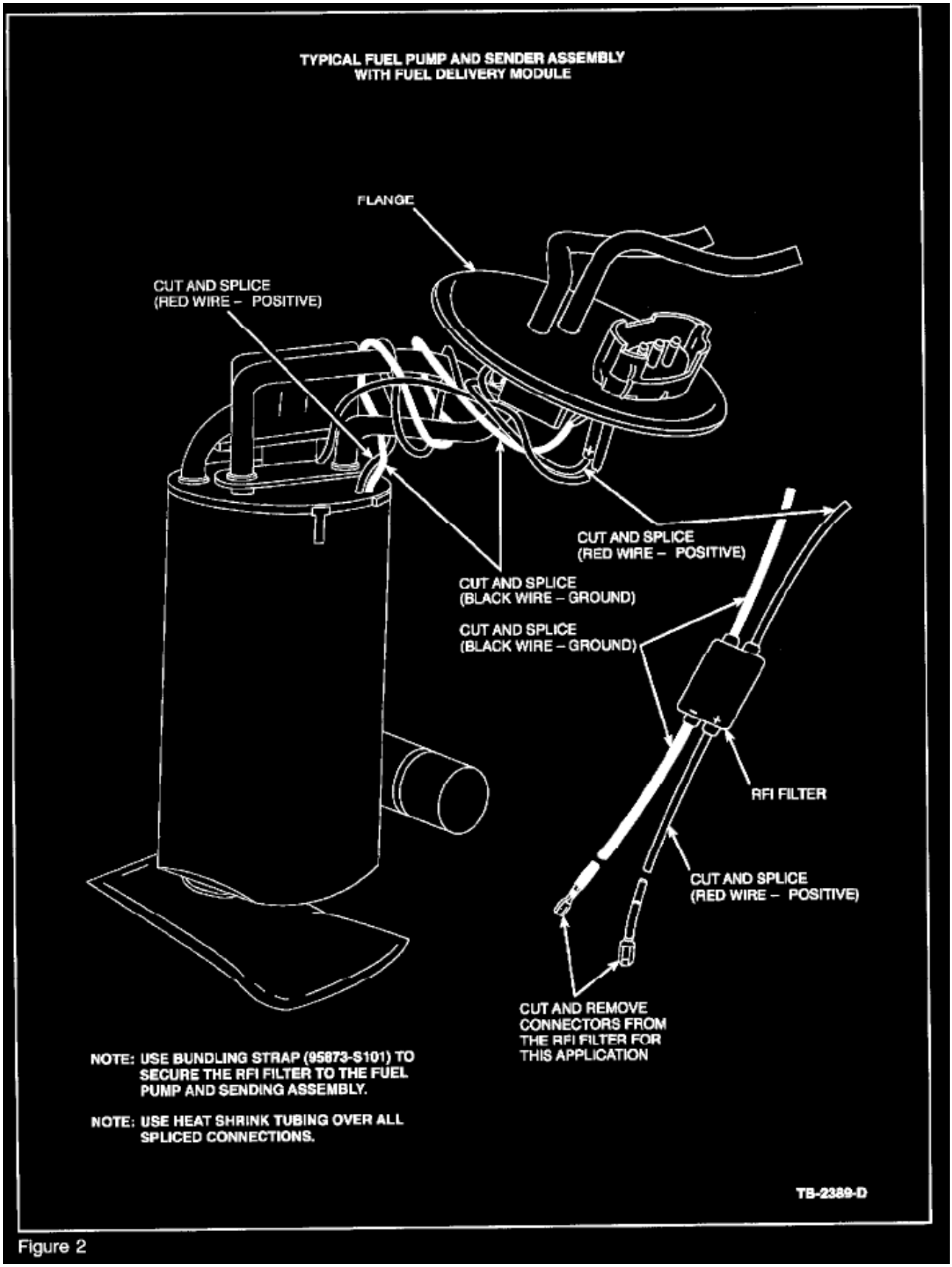


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over soldering connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE:

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95873-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

010703AA	Diagnose And Install RFI Filter (1990-1995 Thunderbird Super Coupe)	2.1 Hrs.
010703AB	Diagnose And Install RFI Filter (1991-1993 Thunderbird/Cougar 5.0L HO)	2.1 Hrs.
010703AC	Diagnose And Install RFI Filter (1994-1997 Thunderbird/Cougar 4.6L MFI)	2.1 Hrs.
010703AD	Diagnose And Install RFI Filter (1990-1997 Thunderbird/Cougar 3.8L)	1.9 Hrs.
010703BA	Diagnose And Install RFI Filter (1990-1995 Taurus/Sable)	1.4 Hrs.
010703BB	Diagnose And Install RFI Filter (1996-1999 Taurus/Sable)	1.4 Hrs.
010703BC	Diagnose And Install RFI Filter (2001 Taurus/Sable)	1.4 Hrs.
010703CA	Diagnose And Install RFI Filter (1992-1997 Crown Victoria/Grand Marquis, Town Car)	1.2 Hrs.

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE:

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE WIRE TO A POINT CLOSE TO THE FUEL TANK IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION. SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and vacuum troubleshooting manual (EVTM) (or other Service Literature) for the location of the fuel pump pump ground. If ground is more than 0.9m (3') from the tank, cut wire and ground fuel pump end within 0.9m (3') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop manual.

PARTS BLOCK

OTHER APPLICABLE ARTICLES: 90-18-3, 91-17-5 SUPERSEDES: 99-12-9 WARRANTY STATUS: Eligible Under The Provisions of Bumper To Bumper Warranty Coverage

010703CB	Diagnose And Install RFI Filter (1990-1991 Crown Victoria/Grand Marquis, Town Car)	1.6 Hrs.	010703LF	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Front))	1.6 Hrs.
010703CC	Diagnose And Install RFI Filter (1998-2001 Town Car)	1.9 Hrs.	010703LT	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Both))	2.6 Hrs.
010703CD	Diagnose And Install RFI Filter (1998-2001 Crown Victoria/Grand Marquis)	2.2 Hrs.	010703L	Diagnose And Install RFI Filter (1990-1991 Econoline - Single Tank)	1.6 Hrs.
010703DA	Diagnose And Install RFI Filter (1990-1999 Mustang)	1.7 Hrs.	010703MA	Diagnose And Install RFI Filter (1990-1996 Bronco)	2.0 Hrs.
010703EA	Diagnose And Install RFI Filter (1990-1994 Tempo/Topaz)	1.6 Hrs.	010703NA	Diagnose And Install RFI Filter (1991-1994 Explorer)	1.8 Hrs.
010703FA	Diagnose And Install RFI Filter (1990-1992 Mark VII)	1.5 Hrs.	010703NB	Diagnose And Install RFI Filter (1995-2001 Explorer)	1.5 Hrs.
010703FB	Diagnose And Install RFI Filter (1997-1998 Mark VIII LSC)	2.0 Hrs.	010703NC	Diagnose And Install RFI Filter (1997-2001 Mountaineer)	1.5 Hrs.
010703FC	Diagnose And Install RFI Filter (1997-1998 Mark VIII Base)	2.5 Hrs.	010703PA	Diagnose And Install RFI Filter (1995-2001 Windstar)	1.4 Hrs.
010703GA	Diagnose And Install RFI Filter (1990-1994 Continental)	1.5 Hrs.	010703RA	Diagnose And Install RFI Filter (1993-2001 Villager)	1.9 Hrs.
010703GB	Diagnose And Install RFI Filter (1995-1999 Continental)	1.5 Hrs.	010703SA	Diagnose And Install RFI Filter (1997-2001 Expedition)	1.7 Hrs.
010703HA	Diagnose And Install RFI Filter (1990 Escort)	1.6 Hrs.	010703SB	Diagnose And Install RFI Filter (1998-2001 Navigator)	1.7 Hrs.
010703HB	Diagnose And Install RFI Filter (1991-1996 Escort/Tracer)	0.8 Hr.	010703TA	Diagnose And Install RFI Filter (1990-1997 Ranger Standard Cab)	1.3 Hrs.
010703HC	Diagnose And Install RFI Filter (1997-1999 Escort/Tracer)	1.6 Hrs.	010703TB	Diagnose And Install RFI Filter (1990-1997 Ranger Super Cab)	1.8 Hrs.
010703JA	Diagnose And Install RFI Filter (1997 Contour/Mystique)	0.8 Hr.	010703TC	Diagnose And Install RFI Filter (1998-2001 Ranger 4X2)	1.6 Hrs.
010703JB	Diagnose And Install RFI Filter (1998-1999 Contour/Mystique)	1.8 Hrs.	010703TD	Diagnose And Install RFI Filter (1998-2001 Ranger 4X4)	1.8 Hrs.
010703KA	Diagnose And Install RFI Filter (1990-1992 Probe)	0.8 Hr.	010703VA	Diagnose And Install RFI Filter (1990-1997 Aerostar)	1.5 Hrs.
010703KB	Diagnose And Install RFI Filter (1993-1997 Probe)	1.6 Hrs.	010703WA	Diagnose And Install RFI Filter (1990 Bronco II)	1.9 Hrs.
010703LB	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Rear))	1.5 Hrs.	010703XB	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Rear) And 1997 F-350/Super Duty (Rear))	1.4 Hrs.
010703LC	Diagnose And Install RFI Filter (1992-2001 Econoline)	1.6 Hrs.	010703XC	Diagnose And Install RFI Filter (2000-2001 Excursion)	1.6 Hrs.

010703XF	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Front) And 1997 F-350/Super Duty (Front))	1.3 Hrs.
010703XL	Diagnose And Install RFI Filter (2001 Escape)	0.8 Hrs.
010703XT	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Both) And 1997 F-350/Super Duty (Both))	2.1 Hrs.
010703X	Diagnose And Install RFI Filter (1999-2001 Super Duty F-Series)	1.6 Hrs.

BASIC PART NO.	CONDITION CODE
18B925	42

OPERATION/DESCRIPTION/TIME

DEALER CODING

OASIS CODES: 205000, 207000, 404000, 702000, 702300

Speaker: All Technical Service Bulletins Fuel Pump - Whine Heard Through Radio Speakers

Article No. 01-7-3

04/16/01

^ FUEL SYSTEM - FUEL PUMP "WHINING"/"BUZZING" NOISE COMES THROUGH ENTERTAINMENT OR TWO - WAY RADIO SPEAKER

^ RADIO - ENTERTAINMENT OR TWO - WAY COMMUNICATION - "WHINING"/"BUZZING" NOISE IN SPEAKERS CAUSED BY FUEL PUMP

^ NOISE - "WHINING"/"BUZZING" - COMES THROUGH SPEAKERS OF ENTERTAINMENT OR TWO-WAY RADIO

FORD: 1990-1994

TEMPO

1990-1997 PROBE, THUNDERBIRD

1990-1999 ESCORT, MUSTANG, TAURUS

1990-2001 CROWN VICTORIA

1997-1999 CONTOUR

2001 TAURUS

1990 BRONCO II

1990-1996 BRONCO

1990-1997 AEROSTAR, F SUPER DUTY, F-250 HD, F-350

1990-1999 F-250 LD

1990-2001 ECONOLINE, F-150, RANGER

1991-2001 EXPLORER

1995-2001 WINDSTAR

1997-2001 EXPEDITION

1999-2001 SUPER DUTY F SERIES

2000-2001 EXCURSION

2001 ESCAPE

LINCOLN: 1990-1992

MARK VII

1990-1999 CONTINENTAL

1990-2001 TOWN CAR

1997-1998 MARK VIII

1998-2001 NAVIGATOR

MERCURY: 1990-1994

TOPAZ

1990-1997 COUGAR

1990-1999 SABLE

1990-2001 GRAND MARQUIS

1991-1999 TRACER

1997-1999 MYSTIQUE

1999 COUGAR

2001 SABLE

1993-2001 VILLAGER

1997-2001 MOUNTAINEER

This TSB article is being republished in its entirety to update the model year vehicles.

ISSUE

A "whining"/"buzzing" noise in the speakers of the entertainment radio or two-way radio on vehicles with an in-tank electric fuel pump may be caused by electrical noise from the fuel pump.

ACTION

Install an electronic noise Radio Frequency Interference (RFI) Filter (F1PZ-18B925-A) on the fuel pump inside the fuel tank. Refer to the following Test Procedure to confirm that the concern exists,

then refer to the Service Procedure for repair details.

NOTE

SOME LIGHT TRUCKS REQUIRE ONE (1) RFI FILTER FOR EACH IN-TANK ELECTRIC FUEL PUMP ON MULTI-TANK VEHICLES.

NOTE

THIS TSB DOES NOT INCLUDE TAURUS FLEXIBLE FUEL VEHICLES (FFVS) OR 1999 RANGER 3.0L FFVS.

TEST PROCEDURE

Fuel pump radio noise is relatively constant and changes only slightly with vehicle speed. If the frequency of the noise varies or the noise comes and goes with the vehicle speed, then it is not the fuel pump and this fix will not be effective. The following procedure will help determine if the fuel pump is the cause of the radio noise:

1. Turn on the radio before the key is turned on (assuming the radio will operate without the ignition key - you may need to put the ignition key in the Accessory position).

2. Turn the ignition key to the Run position (do not start the engine).

3. The fuel pump should run for about 1 second with the key in the Run position with the engine not running. Listen for noise in the radio. If noise is present while the pump is running and stops when the pump stops, then the noise is being generated by the pump and this procedure should help.

SERVICE PROCEDURE

1. Remove the fuel pump sender assembly from the fuel tank. Refer to the appropriate model year Workshop Manual for removal procedure.

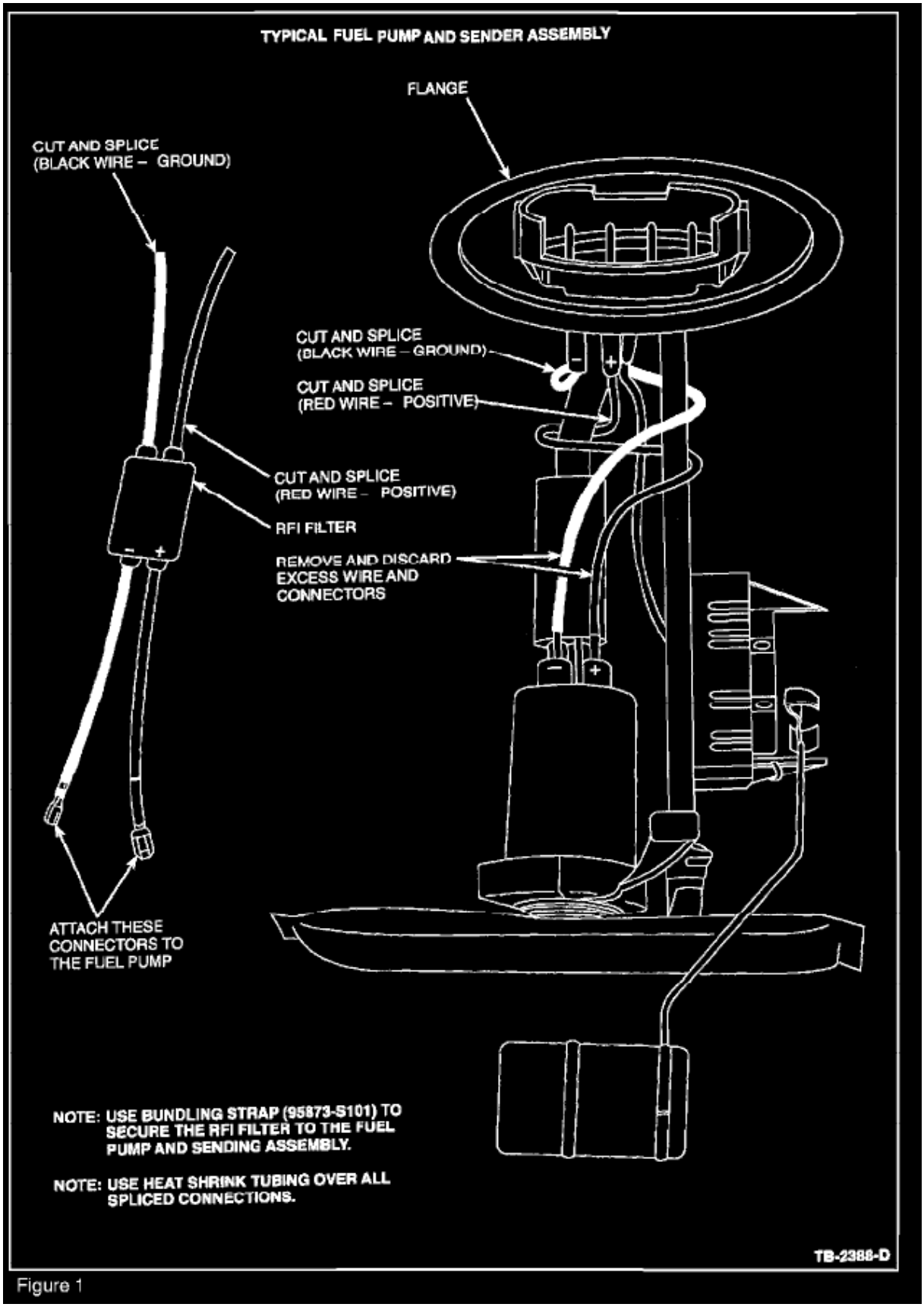


Figure 1

2. On vehicles without a fuel delivery module, remove the negative and positive connectors from the fuel pump, Figure 1.

a. Cut the wires to the fuel pump 76 mm (3") from the flange of the fuel pump and discard the wires.

b. Connect the RFI filter connectors to the spade terminal on the fuel pump.

c. Cut and solder both the red and black wires of the RFI filter to the red and black wires of the flange. Use Heat Shrink Tubing (F5AZ-14A099-M) over the solder connections.

NOTE

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT

TUBING (ABOUT 50 mm (2",)) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF

THE CONNECTIONS.

NOTE

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE GROUND WIRE TO A POINT CLOSE TO THE FUEL TANK. IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

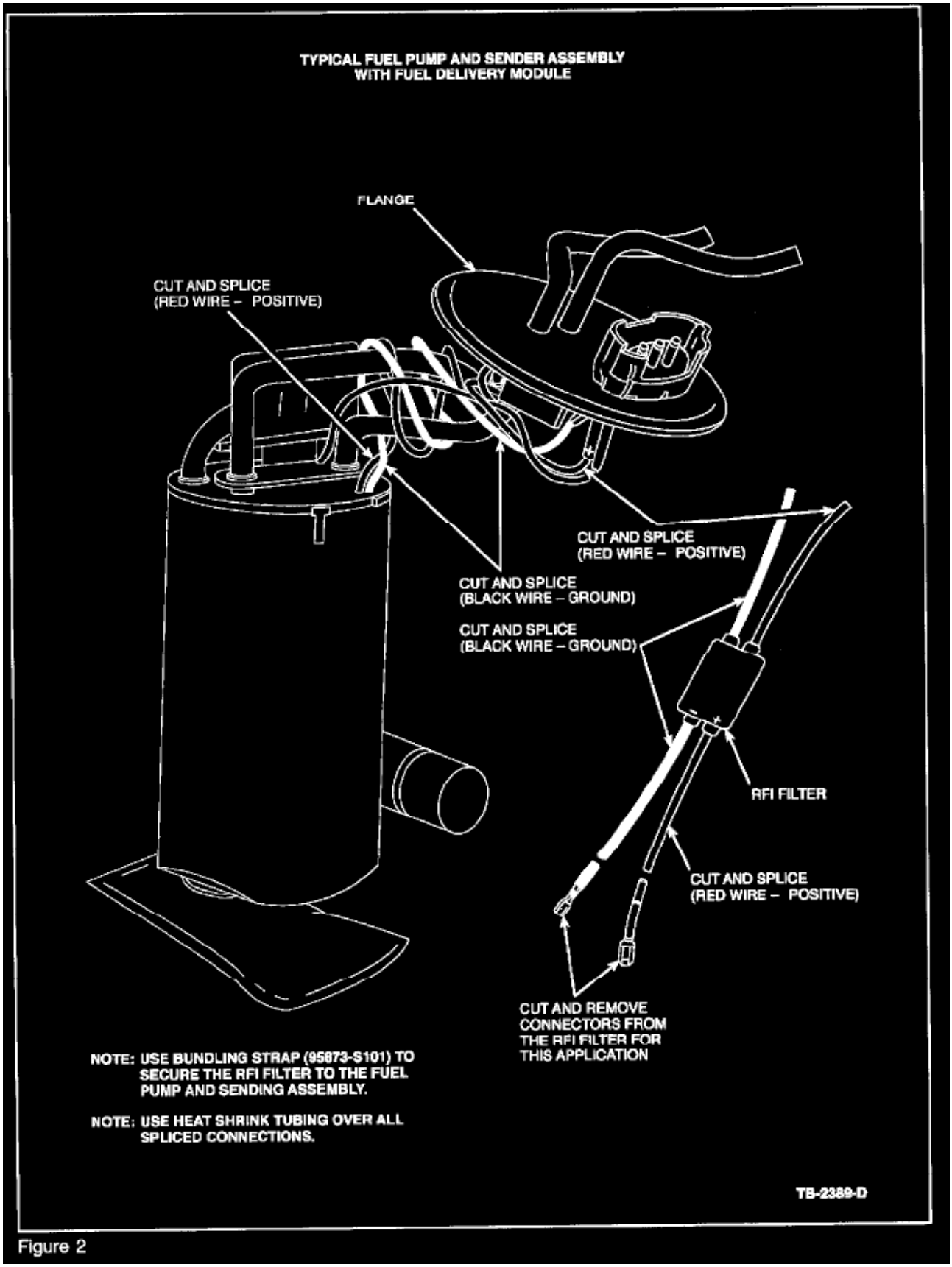


Figure 2

3. On light trucks and compact trucks with a fuel delivery module, cut the fuel pump wires to the fuel delivery module 50 mm (2") from the flange and discard the wires, Figure 2.

a. Cut the connectors from the RFI filter and solder wires to the fuel delivery module (red to red and black to black). Use heat shrink tubing over soldering connections.

b. Solder wires from the RFI filter to the flange wires (red to red and black to black). Use heat shrink tubing over soldered connections.

NOTE:

PART NUMBER	PART NAME
F1PZ-18B925-A	Radio Frequency Interference (RFI) Filter
95B73-S101	Bundling Strap
F5AZ-14A099-AA	Heat Shrink Tubing

010703AA	Diagnose And Install RFI Filter (1990-1995 Thunderbird Super Coupe)	2.1 Hrs.
010703AB	Diagnose And Install RFI Filter (1991-1993 Thunderbird/Cougar 5.0L HO)	2.1 Hrs.
010703AC	Diagnose And Install RFI Filter (1994-1997 Thunderbird/Cougar 4.6L MFI)	2.1 Hrs.
010703AD	Diagnose And Install RFI Filter (1990-1997 Thunderbird/Cougar 3.8L)	1.9 Hrs.
010703BA	Diagnose And Install RFI Filter (1990-1995 Taurus/Sable)	1.4 Hrs.
010703BB	Diagnose And Install RFI Filter (1996-1999 Taurus/Sable)	1.4 Hrs.
010703BC	Diagnose And Install RFI Filter (2001 Taurus/Sable)	1.4 Hrs.
010703CA	Diagnose And Install RFI Filter (1992-1997 Crown Victoria/Grand Marquis, Town Car)	1.2 Hrs.

HEAT SHRINK TUBING MUST BE USED OVER ALL SOLDERED CONNECTIONS MADE PRIOR TO THIS TSB. USE SUFFICIENT TUBING (ABOUT 50 mm (2")) OF THE SPECIFIED TYPE TO ENTIRELY COVER EACH SOLDERED CONNECTION AND SHRINK APPROPRIATELY TO PREVENT EXPOSURE OF THE CONNECTIONS.

NOTE:

FOR SOME VEHICLES WITH EXTREMELY LONG FUEL PUMP GROUND WIRE CIRCUITS, IT MAY BE NECESSARY TO SHORTEN THE WIRE TO A POINT CLOSE TO THE FUEL TANK IF THE GROUND IS MOVED, BE SURE IT IS SECURE AND PROTECTED FROM CORROSION. SINCE IT IS THE OPERATING GROUND FOR THE PUMP. CHECK SERVICE LITERATURE (EVTM, ETC.) FOR GROUND LOCATIONS.

WARNING

ALL SOLDERING AND HEAT SHRINKING MUST BE COMPLETED AWAY FROM THE FUEL TANK AREA. USE A SOLDERING IRON ONLY FOR SOLDERING AND HEAT GUN ONLY FOR APPLYING SHRINK TUBING.

4. Secure the RFI filter to the fuel pump and sender assembly with a Bundling Strap (95873-S101) to prevent rattling in the tank, Figures 1 and 2.

5. Reinstall the fuel pump sender assembly into the fuel tank.

CAUTION

INSTALL NEW GASKETS WHEN REINSTALLING SENDER TO PREVENT LEAKS. REFER TO THE PARTS CATALOG FOR PROPER APPLICATIONS.

6. Check the appropriate Electrical and vacuum troubleshooting manual (EVTM) (or other Service Literature) for the location of the fuel pump pump ground. If ground is more than 0.9m (3') from the tank, cut wire and ground fuel pump end within 0.9m (3') of the tank to prevent ground wire from acting as an antenna. Be sure ground is secure and protected from corrosion since it is the operating ground for the fuel pump.

7. Install the fuel tank in the vehicle as outlined in the appropriate Service or Workshop manual.

PARTS BLOCK

OTHER APPLICABLE ARTICLES: 90-18-3, 91-17-5 SUPERSEDES: 99-12-9 WARRANTY STATUS: Eligible Under The Provisions of Bumper To Bumper Warranty Coverage

010703CB	Diagnose And Install RFI Filter (1990-1991 Crown Victoria/Grand Marquis, Town Car)	1.6 Hrs.	010703LF	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Front))	1.6 Hrs.
010703CC	Diagnose And Install RFI Filter (1998-2001 Town Car)	1.9 Hrs.	010703LT	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Both))	2.6 Hrs.
010703CD	Diagnose And Install RFI Filter (1998-2001 Crown Victoria/Grand Marquis)	2.2 Hrs.	010703L	Diagnose And Install RFI Filter (1990-1991 Econoline - Single Tank)	1.6 Hrs.
010703DA	Diagnose And Install RFI Filter (1990-1999 Mustang)	1.7 Hrs.	010703MA	Diagnose And Install RFI Filter (1990-1996 Bronco)	2.0 Hrs.
010703EA	Diagnose And Install RFI Filter (1990-1994 Tempo/Topaz)	1.6 Hrs.	010703NA	Diagnose And Install RFI Filter (1991-1994 Explorer)	1.8 Hrs.
010703FA	Diagnose And Install RFI Filter (1990-1992 Mark VII)	1.5 Hrs.	010703NB	Diagnose And Install RFI Filter (1995-2001 Explorer)	1.5 Hrs.
010703FB	Diagnose And Install RFI Filter (1997-1998 Mark VIII LSC)	2.0 Hrs.	010703NC	Diagnose And Install RFI Filter (1997-2001 Mountaineer)	1.5 Hrs.
010703FC	Diagnose And Install RFI Filter (1997-1998 Mark VIII Base)	2.5 Hrs.	010703PA	Diagnose And Install RFI Filter (1995-2001 Windstar)	1.4 Hrs.
010703GA	Diagnose And Install RFI Filter (1990-1994 Continental)	1.5 Hrs.	010703RA	Diagnose And Install RFI Filter (1993-2001 Villager)	1.9 Hrs.
010703GB	Diagnose And Install RFI Filter (1995-1999 Continental)	1.5 Hrs.	010703SA	Diagnose And Install RFI Filter (1997-2001 Expedition)	1.7 Hrs.
010703HA	Diagnose And Install RFI Filter (1990 Escort)	1.6 Hrs.	010703SB	Diagnose And Install RFI Filter (1998-2001 Navigator)	1.7 Hrs.
010703HB	Diagnose And Install RFI Filter (1991-1996 Escort/Tracer)	0.8 Hr.	010703TA	Diagnose And Install RFI Filter (1990-1997 Ranger Standard Cab)	1.3 Hrs.
010703HC	Diagnose And Install RFI Filter (1997-1999 Escort/Tracer)	1.6 Hrs.	010703TB	Diagnose And Install RFI Filter (1990-1997 Ranger Super Cab)	1.8 Hrs.
010703JA	Diagnose And Install RFI Filter (1997 Contour/Mystique)	0.8 Hr.	010703TC	Diagnose And Install RFI Filter (1998-2001 Ranger 4X2)	1.6 Hrs.
010703JB	Diagnose And Install RFI Filter (1998-1999 Contour/Mystique)	1.8 Hrs.	010703TD	Diagnose And Install RFI Filter (1998-2001 Ranger 4X4)	1.8 Hrs.
010703KA	Diagnose And Install RFI Filter (1990-1992 Probe)	0.8 Hr.	010703VA	Diagnose And Install RFI Filter (1990-1997 Aerostar)	1.5 Hrs.
010703KB	Diagnose And Install RFI Filter (1993-1997 Probe)	1.6 Hrs.	010703WA	Diagnose And Install RFI Filter (1990 Bronco II)	1.9 Hrs.
010703LB	Diagnose And Install RFI Filter (1990-1991 Econoline - With Dual Tanks (Rear))	1.5 Hrs.	010703XB	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Rear) And 1997 F-350/Super Duty (Rear))	1.4 Hrs.
010703LC	Diagnose And Install RFI Filter (1992-2001 Econoline)	1.6 Hrs.	010703XC	Diagnose And Install RFI Filter (2000-2001 Excursion)	1.6 Hrs.

010703XF	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Front) And 1997 F-350/Super Duty (Front))	1.3 Hrs.
010703XL	Diagnose And Install RFI Filter (2001 Escape)	0.8 Hrs.
010703XT	Diagnose And Install RFI Filter (1990-1996 F-150/250/350/Super Duty (Both) And 1997 F-350/Super Duty (Both))	2.1 Hrs.
010703X	Diagnose And Install RFI Filter (1999-2001 Super Duty F-Series)	1.6 Hrs.

BASIC PART NO.	CONDITION CODE
18B925	42

OPERATION/DESCRIPTION/TIME

DEALER CODING

OASIS CODES: 205000, 207000, 404000, 702000, 702300

TROUBLESHOOTING HINTS

CONDITION	POSSIBLE CAUSE	ACTION
• Both Power Windows don't operate from either switch.	• No voltage to Front Window Switches. • Open Ground.	• Check Circuit Breaker 14 and check/repair 400 (LB/BK) wire for an open or short. • Check/repair 57 (BK) wire and check ground connection for an open.
• One or both Power Windows don't operate from Master Window Control Switch.	• No voltage to Master Window Control Switch. • Open ground at switch. • Open feed/return wire from switch to Window Motors. • Inoperative Master Window Control Switch. • Inoperative Left Window Motor.	• Check/repair 400 (LB/BK) wire for an open. • Check/repair 57 (BK) wire for an open. • Check/repair 226 (W/BK) and/or 227 (Y) wires for an open (Left Window) and/or check/repair 313 (W/Y) and/or 314 (T/LB) wires for an open (Right Window). • Check continuity of Master Window Control Switch. **REVISED** • Check Left Window Motor.
• Right Window doesn't operate from Right Front Window Switch.	• No voltage to Right Front Window Switch. • Open feed/return wires from switch to Right Window Motor. • Inoperative Right Front Window Switch. • Inoperative Right Window Motor.	• Check/repair 400 (LB/BK) wire for an open. • Check/repair 333 (Y/R) and/or 334 (R/Y) wires for an open. • Check continuity of Right Front Window Switch. • Check Right Window Motor.

Revised 12/90

Technical Service Bulletin # 9025B35 Date: 901221

Power Window/Speaker - Manual Revision

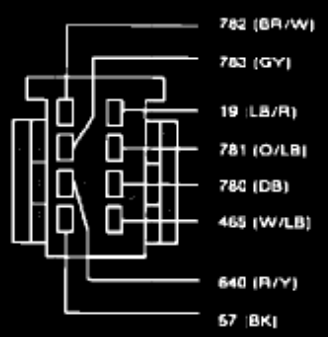
ELECTRICAL/VACUUM TROUBLESHOOTING MANUAL - 1991 - CIRCUIT COLOR CODE CHANGES Article No. 90-25B LIGHT TRUCK:

1991 EXPLORER, RANGER

ISSUE: The wiring color codes on several circuits (power windows and speakers) have been changed during the model year. This affects service information in the 1991 Ranger EVTM and the 1991 Explorer EVTM.

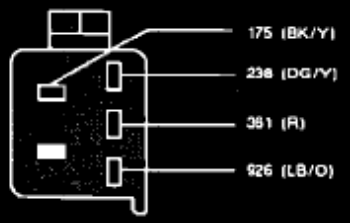
ACTION: Refer to the pages following this TSB article for the updated wiring color codes.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY



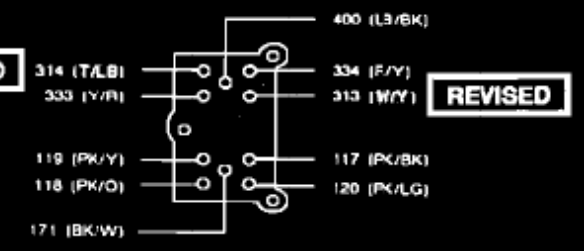
C278

ELECTRIC SHIFT CONTROL SWITCH



C186

FUEL PUMP RELAY



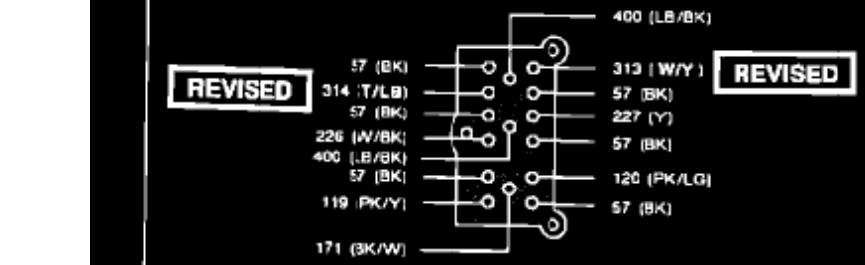
C602

FRONT WINDOW/DOOR LOCK SWITCH (RIGHT)

	CIRCUIT	CIRCUIT FUNCTION
REVISED	314 (T/LB)	Feed/Return From Left Switch
REVISED	400 (LB/BK)	Power
REVISED	334 (R/Y)	Right Window Motor Feed/Return
REVISED	313 (W/Y)	Feed/Return From Left Switch
	333 (Y/R)	Right Window Motor Feed/Return
	119 (PK/Y)	Feed/Return From Left Switch
	117 (PK/BK)	Lock Motors Feed/Return
	120 (PK/LG)	Feed/Return From Left Switch
	171 (BK/W)	Power
	118 (PK/O)	Lock Motors Feed/Return

Revised 12/90

REVISED

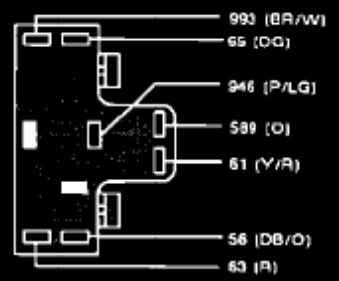


REVISED

C502

MASTER WINDOW CONTROL SWITCH/ FRONT DOOR LOCK SWITCH (LEFT)

CIRCUIT	CIRCUIT FUNCTION
226 (W/BK)	Left Window Motor Feed/Return
57 (BK)	Ground
314 (T/LB)	Right Window Motor Feed/Return
57 (BK)	Ground
400 (LB/BK)	Power
313 (W/Y)	Right Window Motor Feed/Return
57 (BK)	Ground
227 (Y)	Left Window Motor Feed/Return
57 (BK)	Ground
400 (LB/BK)	Power
57 (BK)	Ground
120 (PK/LG)	Lock Motors Feed/Return
57 (BK)	Ground
171 (BK/W)	Power
119 (PK/Y)	Lock Motors Feed/Return

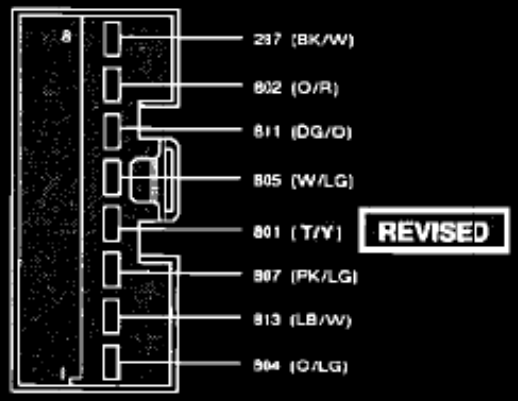


C270

MULTI-FUNCTION SWITCH

CIRCUIT	CIRCUIT FUNCTION
993 (BR/W)	LO-HI Output To Windshield Wiper Module
65 (DG)	Interval Output To Windshield Wiper Module
946 (P/LG)	Output To Windshield Washer Pump
589 (O)	Interval Adjust Input
61 (Y/R)	Interval Adjust Output
56 (DB/O)	HI Output To Windshield Wiper Motor
63 (R)	Power

Revised 12/90



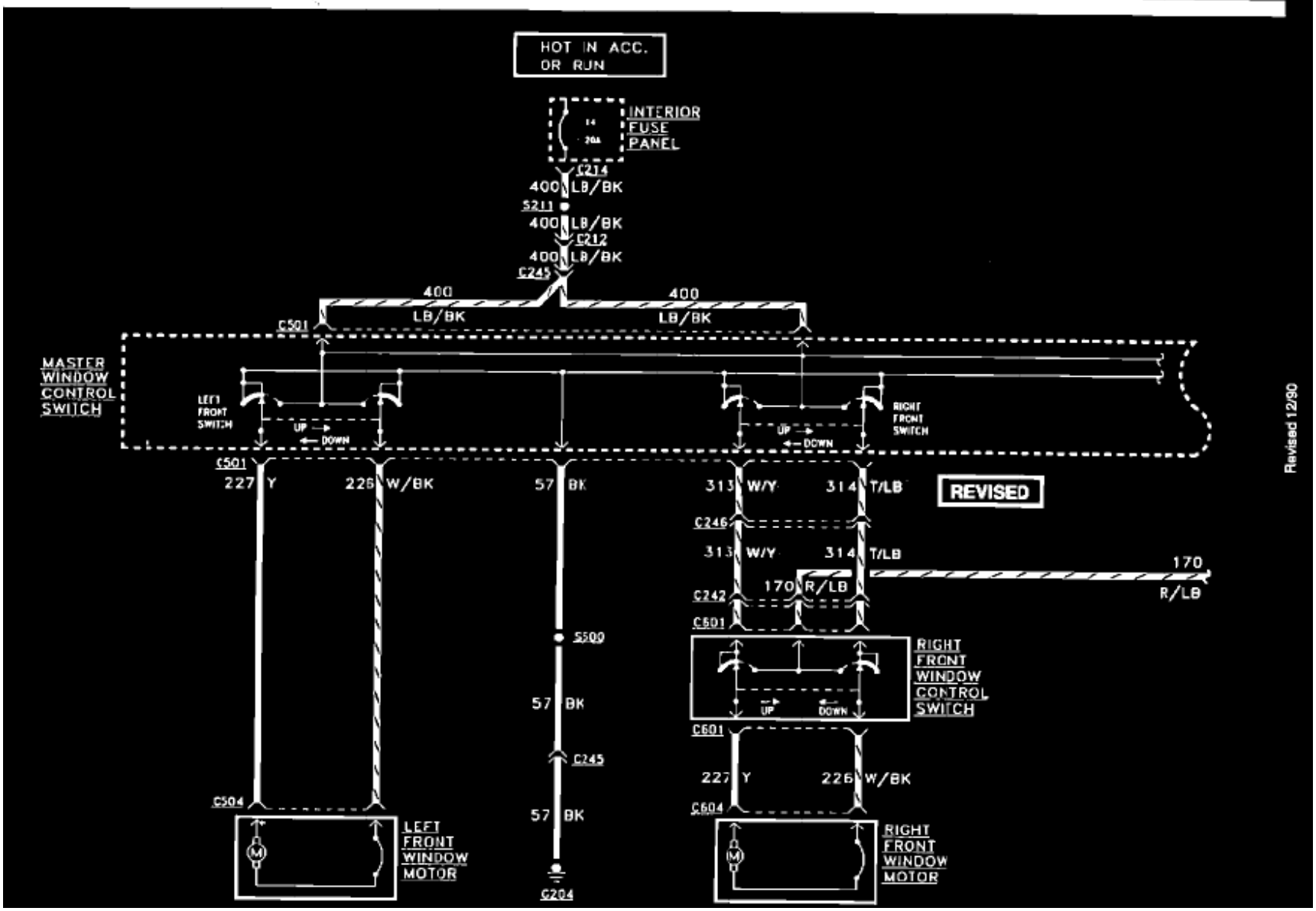
C258

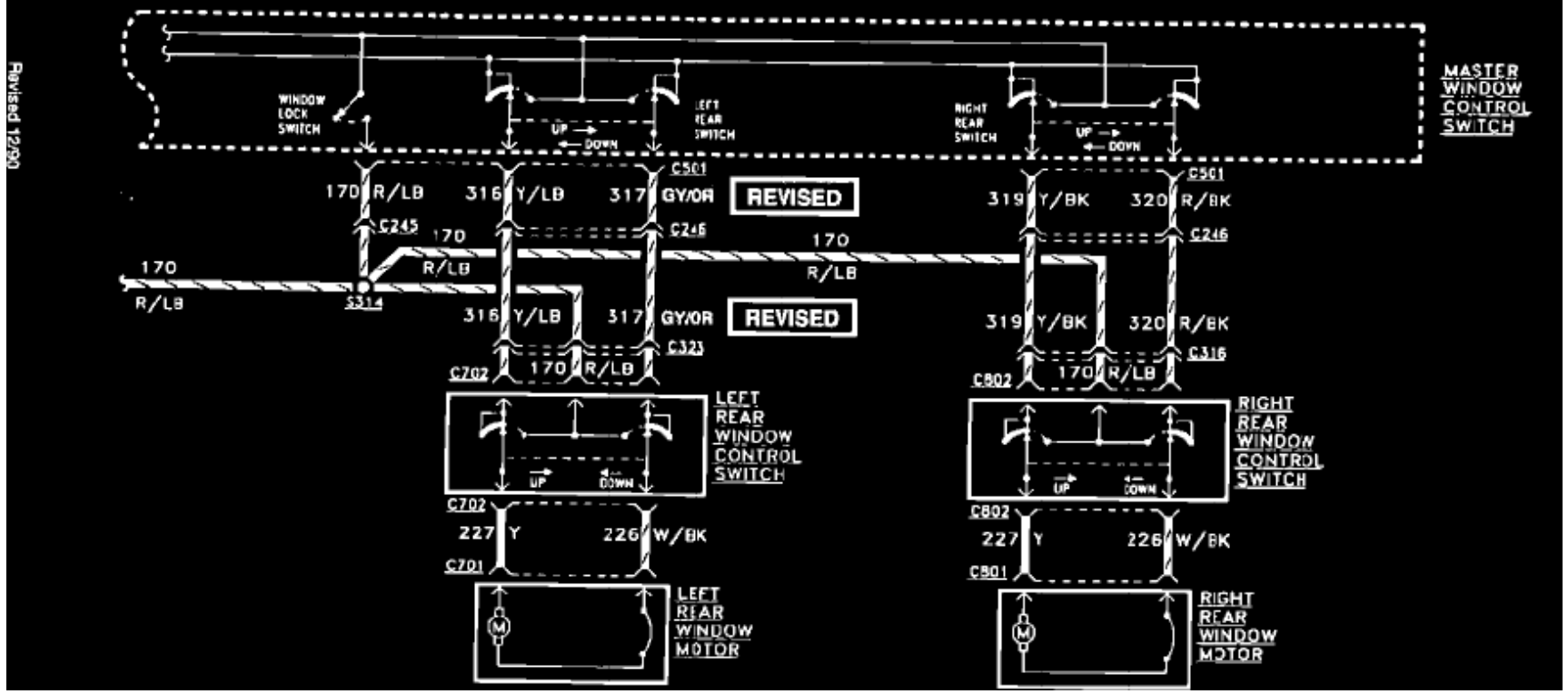
RADIO
(AM, AM/FM STEREO)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	804 (O/LG)	Left Door Speaker Signal (+)
2	813 (LB/W)	Left Door Speaker Signal (-)
3	807 (PK/LG)	Left Rear Speaker Signal (+)
4	801 (T/Y)	Left Rear Speaker Signal (-)
5	805 (W/LG)	Right Door Speaker Signal (+)
6	811 (DG/O)	Right Door Speaker Signal (-)
7	802 (O/R)	Right Rear Speaker (+)
8	287 (BK/W)	Right Rear Speaker (-)

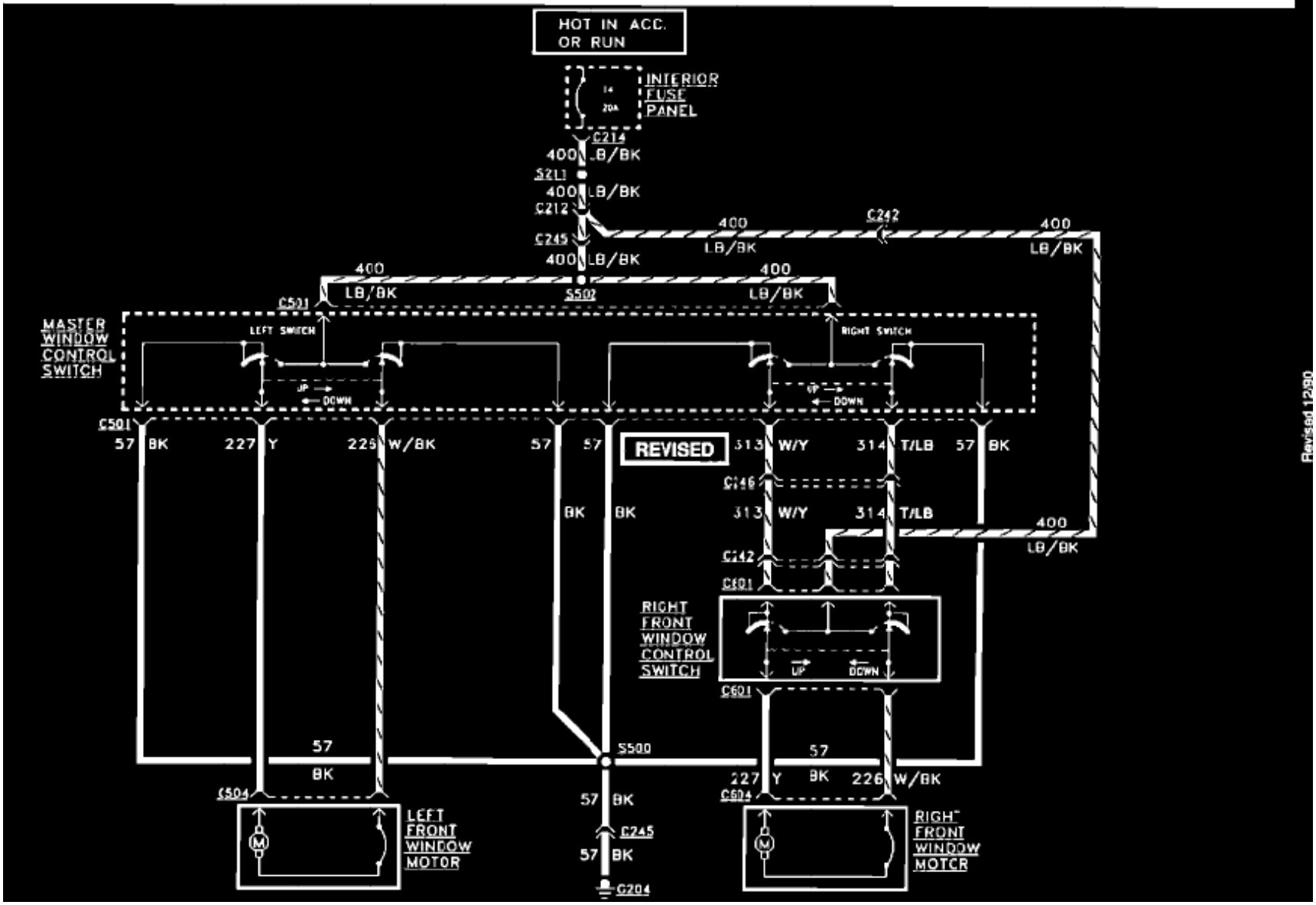
REVISED

100-1 POWER WINDOWS (4 DOOR) 1991 EXPLORER




Revised 12/90
WINDOW LOCK SWITCH
UP
DOWN
LEFT REAR SWITCH
RIGHT REAR SWITCH
MASTER WINDOW CONTROL SWITCH
C501
170 R/LB
316 Y/LB
317 GY/OR
REVISED
C245
C246
170 R/LB
S314
C323
C316
C702
C802
LEFT REAR WINDOW CONTROL SWITCH
RIGHT REAR WINDOW CONTROL SWITCH
227 Y
226 W/BK
C701
C801
LEFT REAR WINDOW MOTOR
RIGHT REAR WINDOW MOTOR
319 Y/BK
320 R/BK

100-3 POWER WINDOWS (2 DOOR) 1991 EXPLORER



TROUBLESHOOTING HINTS

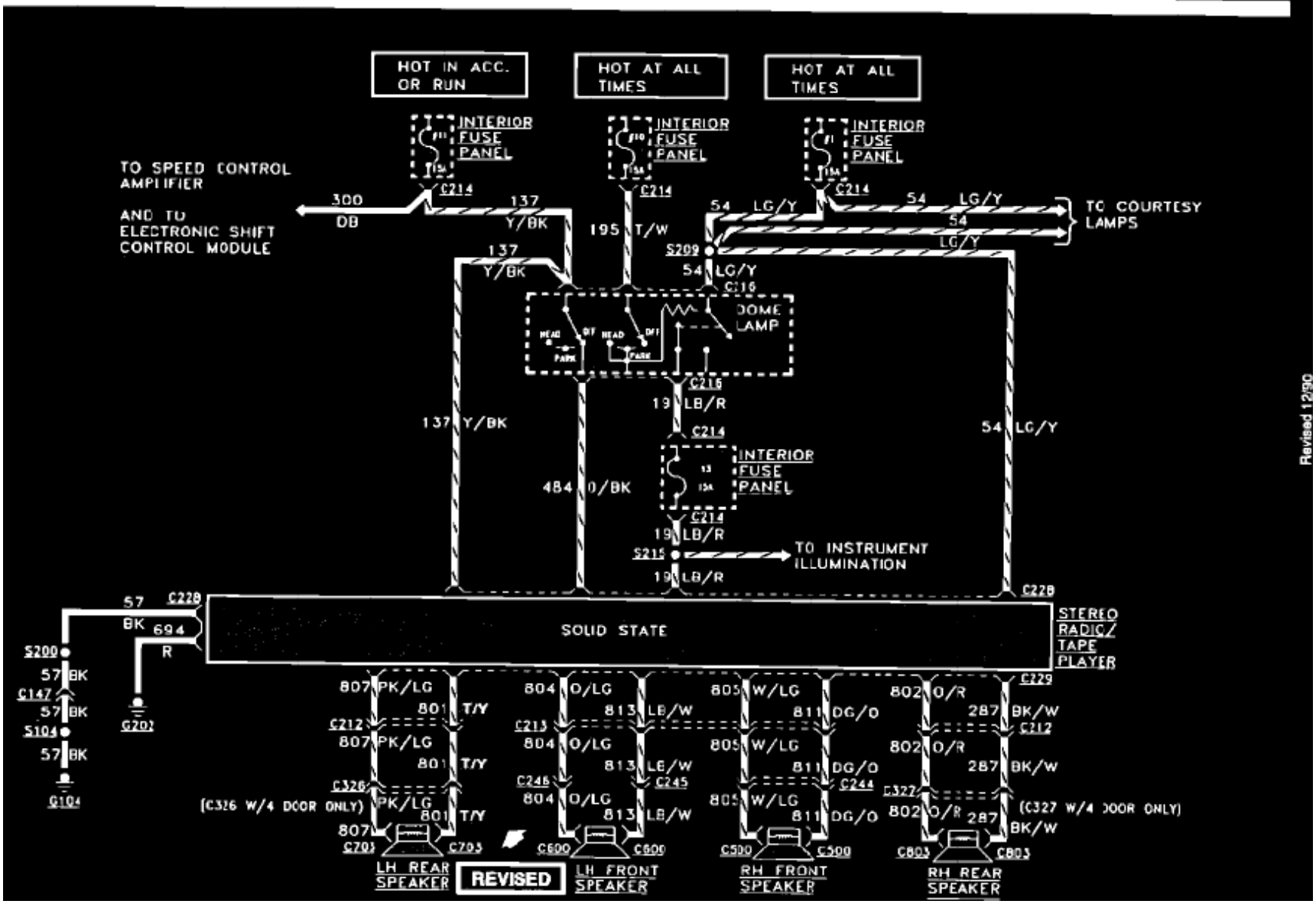
CONDITION	POSSIBLE CAUSE	ACTION
• Power Windows do not work	• Tripped circuit breaker	• Check 30A Circuit Breaker 14 in the Interior Fuse Panel.
	• Open circuit	• Check for 12V on 400 (LB/BK) wire at Master Window Control Switch
• One Power Window does not work	• Open circuit	• Check for continuity from Master Window Control Switch to Control Switch of inoperative window. -Right front 313 (W/Y) and 314 (T/LB) wires. -Left rear 316 (Y/LB) and 317 (GY/OR) wires. -Right rear 319 (Y/BK) and 320 (R/BK) wires. REVISED • Check for continuity in 226 (W/BK) and 227 (Y) wires from Window Control Switch to Window Motor.
	• Faulty ground	• Check for continuity to ground in 57 (BK) wires at Master Window Control Switch.
	• Faulty Master Window Control Switch	• Check Master Window Control Switch
• Passenger's Window Control Switches do not work	• Faulty Window Lock Switch	• Check Window Lock Switch
	• Open circuit	• Check for 12V on 170 (R/LB) wire at Window Control Switches
	• Faulty Master Window Control Switch	• Check Master Window Control Switch
• One Window Control Switch does not work	• Faulty Window Control Switch	• Check Window Control Switch

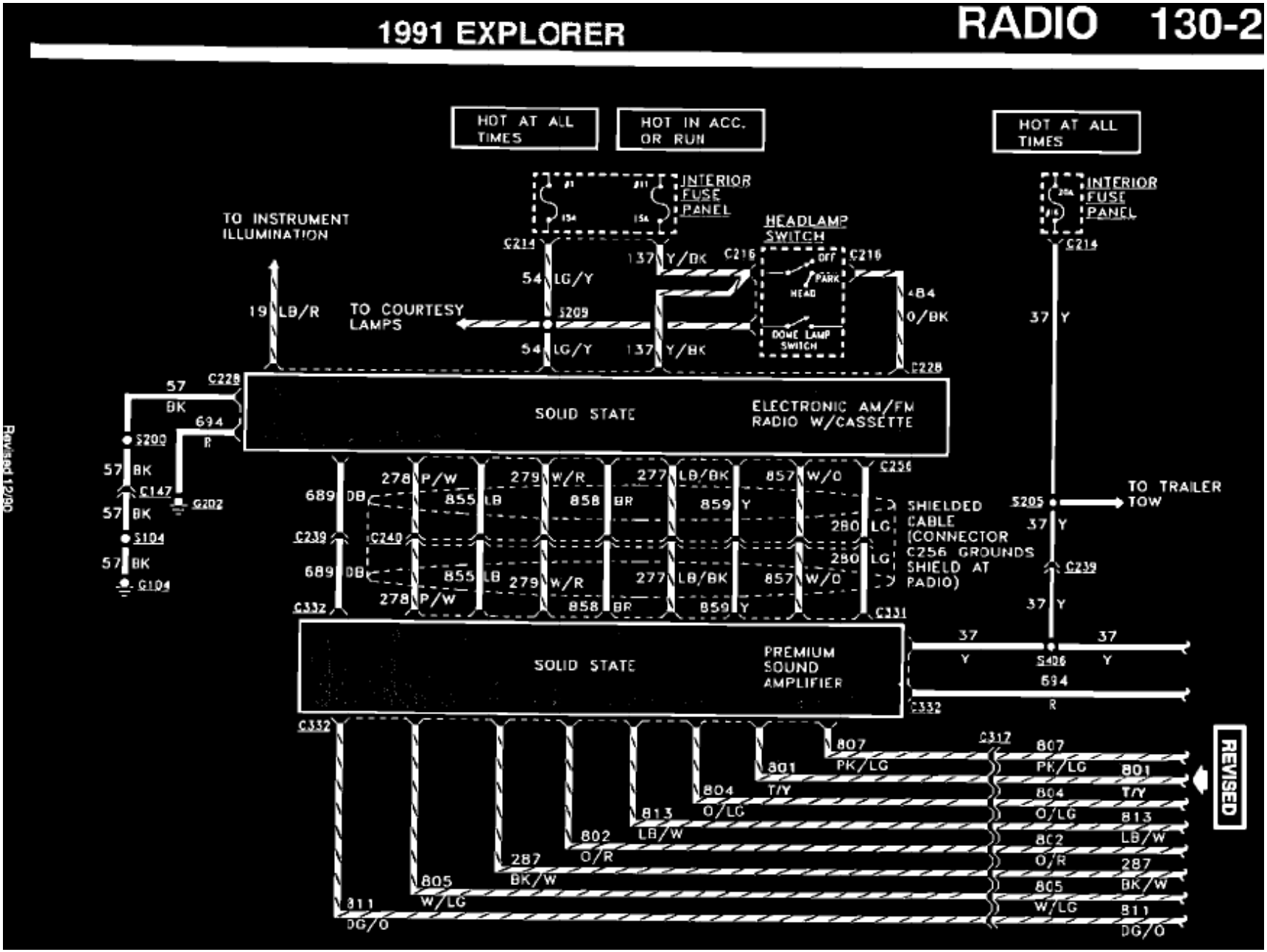
For further diagnostic information refer to section 01-11 of shop manual.

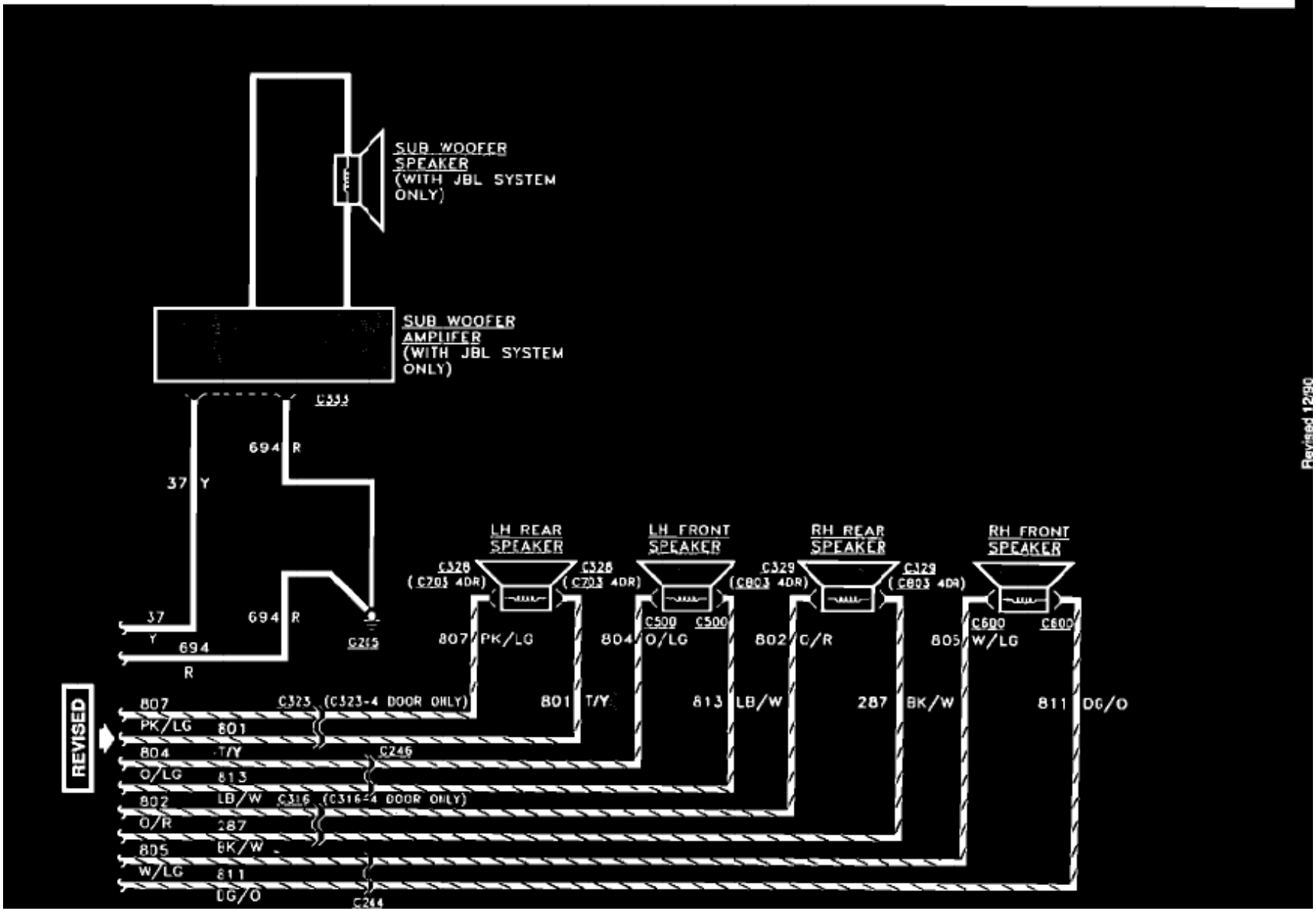
Revised 12/90

130-1 RADIO

1991 EXPLORER



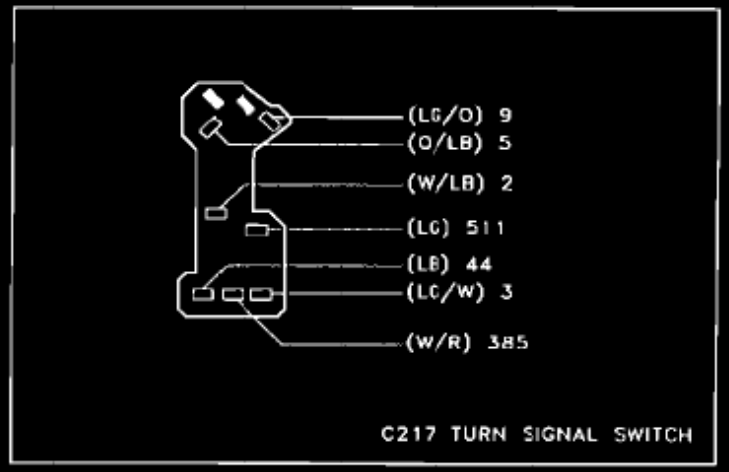

HOT AT ALL TIMES
HOT IN ACC. OR RUN
HOT AT ALL TIMES
INTERIOR FUSE PANEL
INTERIOR FUSE PANEL
HEADLAMP SWITCH
TO INSTRUMENT ILLUMINATION
TO COURTESY LAMPS
19 LB/R
54 LG/Y
137 Y/BK
484 O/BK
37 Y
OFF
PARK
HEAD
DOME LAMP SWITCH
C214
C216
C228
S209
57 BK
694 R
S200
S147
G202
S104
G104
SOLID STATE ELECTRONIC AM/FM RADIO W/CASSETTE
SOLID STATE PREMIUM SOUND AMPLIFIER
C256
C239
C240
C332
C331
278 P/W
279 W/R
277 LB/BK
857 W/O
689 DB
855 LB
858 BR
859 Y
280 LG
SHIELDED CABLE (CONNECTOR C256 GROUNDS SHIELD AT RADIO)
TO TRAILER TOW
S205
37 Y
S406
694 R
C317
807 PK/LG
801 T/Y
804 O/LG
813 LB/W
802 O/R
287 BK/W
805 W/LG
811 DG/O
REVISED
Revised 12/90



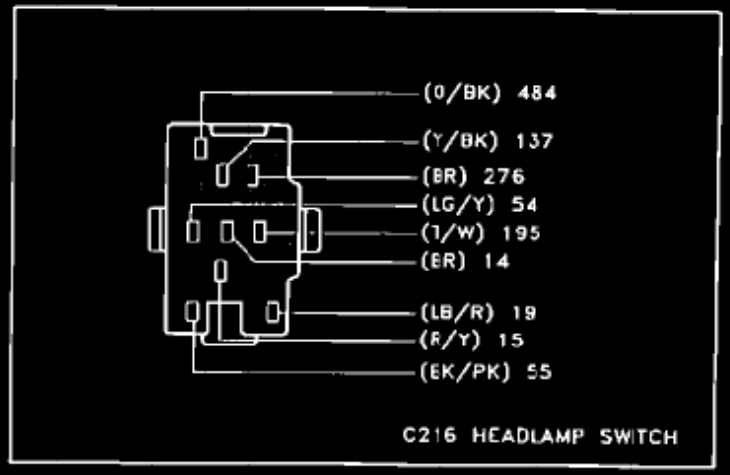
Revised 12/90

150-3 CONNECTOR FACES

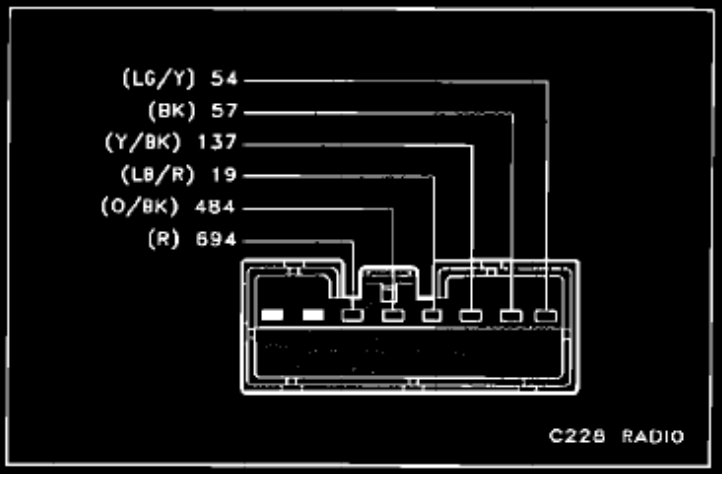
1991 EXPLORER



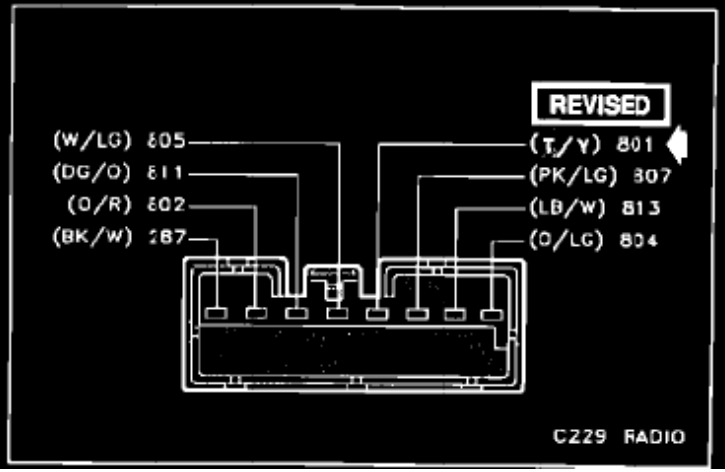
C217 TURN SIGNAL SWITCH



C216 HEADLAMP SWITCH

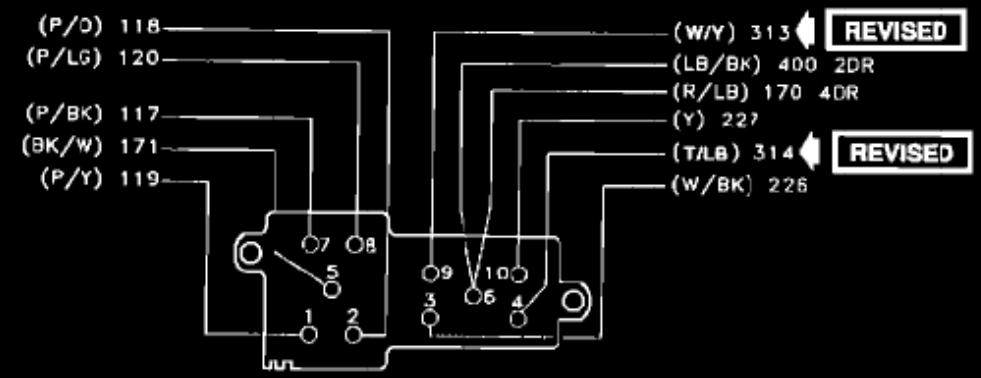


C228 RADIO



C229 RADIO

Revised 12/90



C601 RH Power Door Window and Lock Switches

Pin #	Circuit	Circuit Function
1	119 (P-Y)	Door Lock Switch (Lock)
2	118 (P-O)	Door Lock Motor (Unlock)
3	226 (W-BK)	LF Window Regulator Switch to LF Window Regulator Motor
4	314 (T-LB)	LF Window Regulator Switch to RF Window Regulator Motor
5	171 (BK-W)	Circuit Breaker to Seat Latch Relay
6	400 (LB-BK) (2 Door) 170 (R-BK) (4 Door)	Safety Relay Load Term. to Wind. Regulator Switch Feed
7	117 (P-BK)	Door Lock Motor (Unlock)
8	120 (P-LG)	Door Lock Switch (Lock)
9	313 (W-Y)	LF Window Regulator Switch to RF Window Regulator Motor
10	227 (Y)	LF Window Regulator Switch to LF Window Regulator Motor

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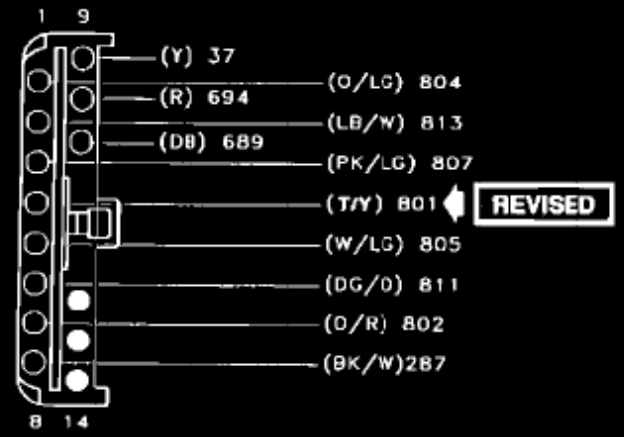


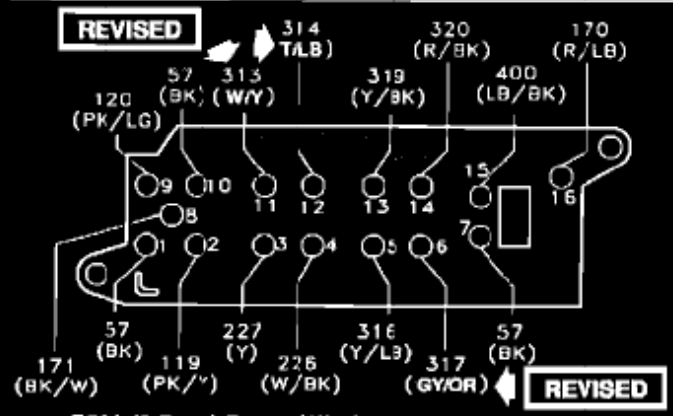
C332 Premium Sound Amplifier

Revised 12/90

REVISED

Pin #	Circuit	Circuit Function
1	804 (O-LG)	Speaker Voice Coil Feed (FL)
2	813 (LB-W)	Spkr. Sw. GND to LF Spkr.
3	807 (PK-LG)	Speaker Voice Coil Feed (RL)
4	801 (T-Y)	Amp/Spkr. Sw. GND to LR Spkr.
5	805 (W-LG)	Spkr. Voice Coil Feed
6	811 (DG-O)	Spkr. Sw. GND to RF Spkr.
7	802 (O-R)	Amp/Spkr. Sw. Feed to RR Spkr.
8	287 (BK-W)	Spkr. Voice Coil Return
9	37 (Y)	Battery to Load
10	694 (R)	Amplifier Power Return
11	689 (DB)	Logic Mode

1991 EXPLORER CONNECTOR FACES 150-16



C501 (2 Door) Power Window & Door Lock Switch

Pin Number	Circuit	Circuit Function
1	57 (BK)	Ground Circuit
2	119 (PK-Y)	Door Lock Switch (Lock)
3	227 (Y)	LF Window Regulator Switch to LF Window Regulator Motor
4	226 (W-BK)	LF Window Regulator Switch to LF Window Regulator Motor
5	316 (Y-LB)	LF Window Regulator Switch to LR Window Regulator Motor
6	317 (GY-OR)	LF Window Regulator Switch to LR Window Regulator Motor
7	57 (BK)	Ground Circuit
8	171 (BK-W)	Circuit Breaker to Seat Latch Relay
9	120 (PK-LG)	Door Lock Switch (Unlock)
10	57 (BK)	Ground Circuit
11	313 (W-Y)	LF Window Regulator Switch to RF Window Regulator Motor
12	314 (T-LB)	LF Window Regulator Switch to RF Window Regulator Motor
13	319 (Y-BK)	LF Window Regulator Switch to RR Window Regulator Motor
14	320 (R-BK)	LF Window Regulator Switch to RR Window Regulator Motor
15	400 (LB-BK)	Safety Relay Load Terminal to Window Regulator Switch Feed
16	170 (R-LB)	Window Regulator Switch Feed

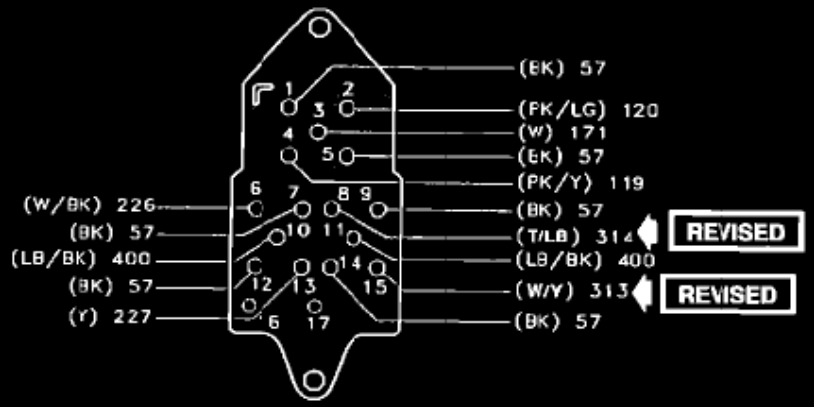
REVISED

REVISED

Revised 12/90

150-17 CONNECTOR FACES

1991 EXPLORER



C501 (4 Door) Power Window and Door Lock Switches

Pin Number	Circuit	Circuit Function
1	57 (BK)	Circuit Ground
2	120 (PK-LG)	Door Lock Switch (unlock)
3	171 (W-BK)	Circuit Breaker to Seat Latch Relay
4	119 (PK-Y)	Door Lock Switch (Lock)
5	57 (BK)	Circuit Ground
6	226 (W-BK)	LF Window Regulator Switch to LF Window Regulator Motor
7	57 (BK)	Circuit Ground
8	314 (T-LB)	LF Window Regulator Switch to RF Window Regulator Motor
9	57 (BK)	Circuit Ground
10	400 (LB-BK)	Safety Relay Load Term. to Window Regulator Switch Feed
11	400 (LB-BK)	Safety Relay Load Term. to Window Regulator Switch Feed
12	57 (BK)	Circuit Ground
13	227 (Y)	LF Window Regulator Switch to LF Window Regulator Motor
14	57 (BK)	Circuit Ground
15	313 (W-Y)	LF Window Regulator Switch to RF Window Regulator Motor

REVISED

REVISED

Revised 12/90

TROUBLESHOOTING HINTS

CONDITION	POSSIBLE CAUSE	ACTION
• Both Power Windows don't operate from either switch.	• No voltage to Front Window Switches. • Open Ground.	• Check Circuit Breaker 14 and check/repair 400 (LB/BK) wire for an open or short. • Check/repair 57 (BK) wire and check ground connection for an open.
• One or both Power Windows don't operate from Master Window Control Switch.	• No voltage to Master Window Control Switch. • Open ground at switch. • Open feed/return wire from switch to Window Motors. • Inoperative Master Window Control Switch. • Inoperative Left Window Motor.	• Check/repair 400 (LB/BK) wire for an open. • Check/repair 57 (BK) wire for an open. • Check/repair 226 (W/BK) and/or 227 (Y) wires for an open (Left Window) and/or check/repair 313 (W/Y) and/or 314 (T/LB) wires for an open (Right Window). • Check continuity of Master Window Control Switch. **REVISED** • Check Left Window Motor.
• Right Window doesn't operate from Right Front Window Switch.	• No voltage to Right Front Window Switch. • Open feed/return wires from switch to Right Window Motor. • Inoperative Right Front Window Switch. • Inoperative Right Window Motor.	• Check/repair 400 (LB/BK) wire for an open. • Check/repair 333 (Y/R) and/or 334 (R/Y) wires for an open. • Check continuity of Right Front Window Switch. • Check Right Window Motor.

Revised 12/90

Technical Service Bulletin # 9025B35 Date: 901221

Power Window/Speaker - Manual Revision

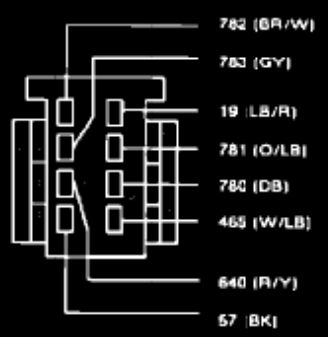
ELECTRICAL/VACUUM TROUBLESHOOTING MANUAL - 1991 - CIRCUIT COLOR CODE CHANGES Article No. 90-25B LIGHT TRUCK:

1991 EXPLORER, RANGER

ISSUE: The wiring color codes on several circuits (power windows and speakers) have been changed during the model year. This affects service information in the 1991 Ranger EVTM and the 1991 Explorer EVTM.

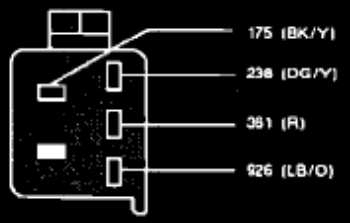
ACTION: Refer to the pages following this TSB article for the updated wiring color codes.

OTHER APPLICABLE ARTICLES: None WARRANTY STATUS: INFORMATION ONLY



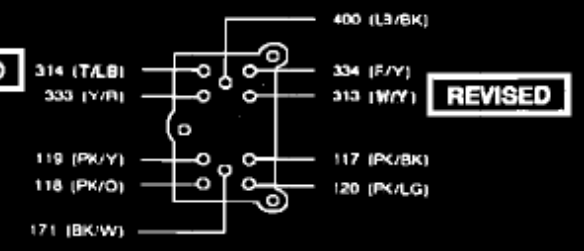
C278

ELECTRIC SHIFT CONTROL SWITCH



C186

FUEL PUMP RELAY



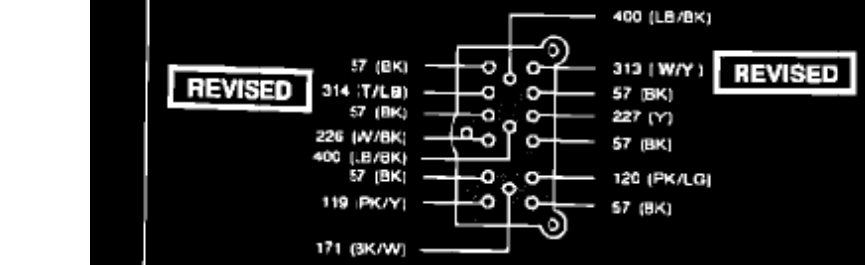
C602

FRONT WINDOW/DOOR LOCK SWITCH (RIGHT)

	CIRCUIT	CIRCUIT FUNCTION
REVISED	314 (T/LB)	Feed/Return From Left Switch
REVISED	400 (LB/BK)	Power
REVISED	334 (R/Y)	Right Window Motor Feed/Return
REVISED	313 (W/Y)	Feed/Return From Left Switch
	333 (Y/R)	Right Window Motor Feed/Return
	119 (PK/Y)	Feed/Return From Left Switch
	117 (PK/BK)	Lock Motors Feed/Return
	120 (PK/LG)	Feed/Return From Left Switch
	171 (BK/W)	Power
	118 (PK/O)	Lock Motors Feed/Return

Revised 12/90

REVISED

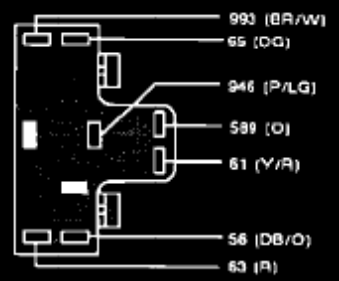


REVISED

C502

MASTER WINDOW CONTROL SWITCH/ FRONT DOOR LOCK SWITCH (LEFT)

CIRCUIT	CIRCUIT FUNCTION
226 (W/BK)	Left Window Motor Feed/Return
57 (BK)	Ground
314 (T/LB)	Right Window Motor Feed/Return
57 (BK)	Ground
400 (LB/BK)	Power
313 (W/Y)	Right Window Motor Feed/Return
57 (BK)	Ground
227 (Y)	Left Window Motor Feed/Return
57 (BK)	Ground
400 (LB/BK)	Power
57 (BK)	Ground
120 (PK/LG)	Lock Motors Feed/Return
57 (BK)	Ground
171 (BK/W)	Power
119 (PK/Y)	Lock Motors Feed/Return



C270

MULTI-FUNCTION SWITCH

CIRCUIT	CIRCUIT FUNCTION
993 (BR/W)	LO-HI Output To Windshield Wiper Module
65 (DG)	Interval Output To Windshield Wiper Module
946 (P/LG)	Output To Windshield Washer Pump
589 (O)	Interval Adjust Input
61 (Y/R)	Interval Adjust Output
56 (DB/O)	HI Output To Windshield Wiper Motor
63 (R)	Power

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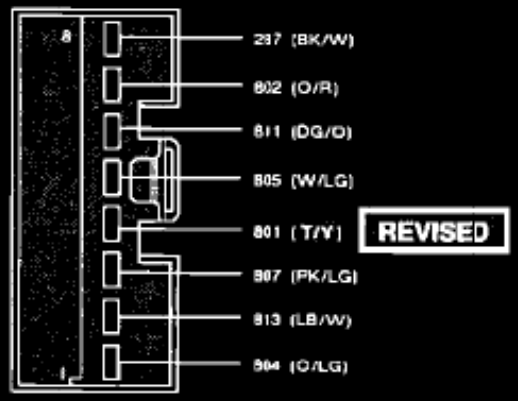


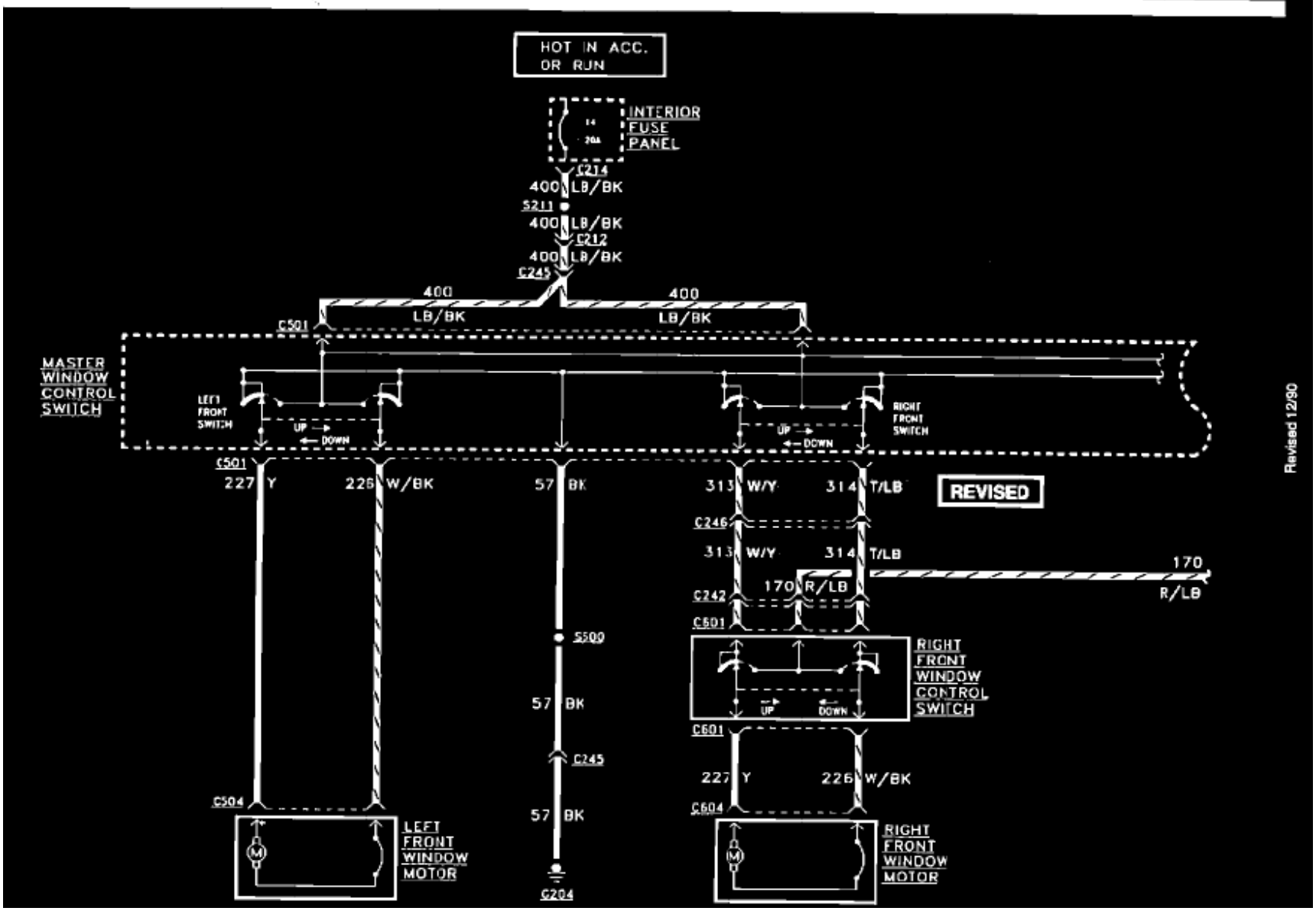
C258

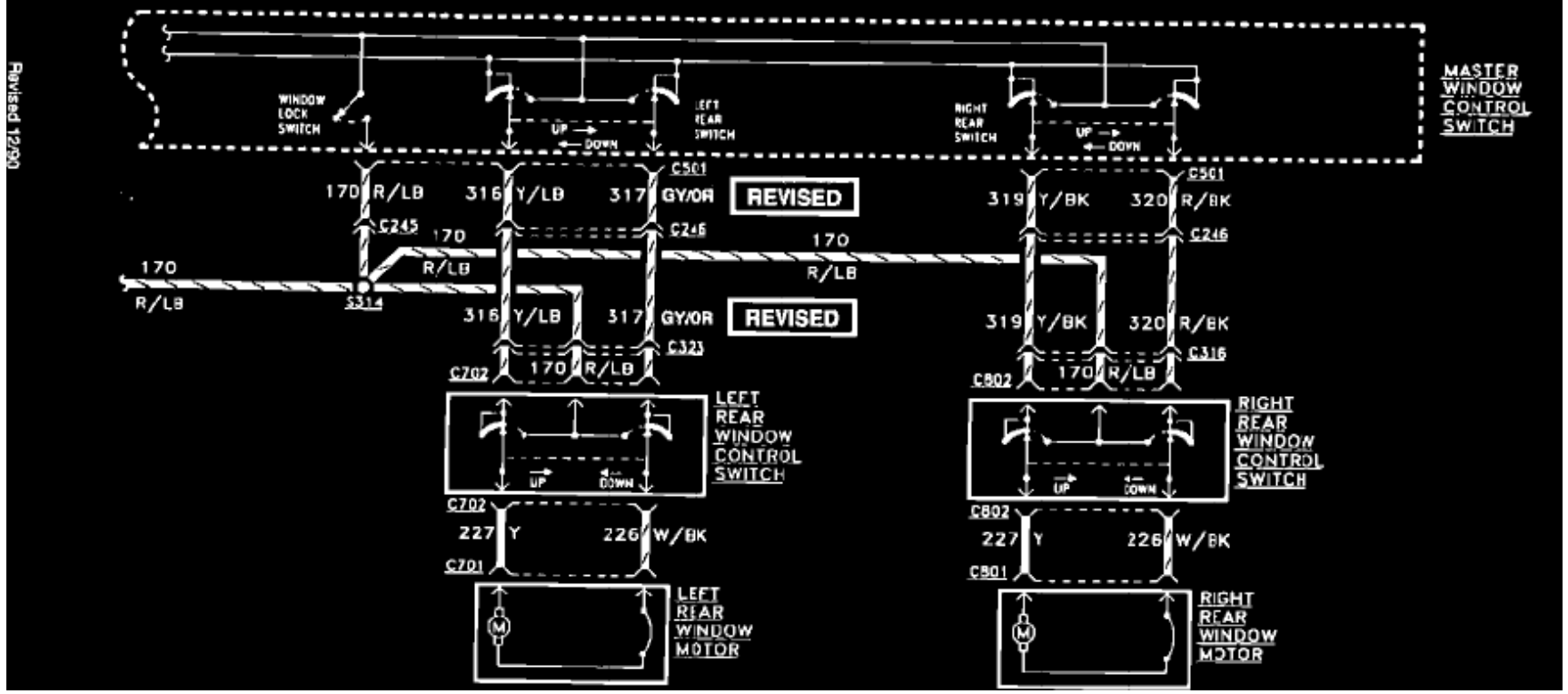
RADIO
(AM, AM/FM STEREO)

PIN NUMBER	CIRCUIT	CIRCUIT FUNCTION
1	804 (O/LG)	Left Door Speaker Signal (+)
2	813 (LB/W)	Left Door Speaker Signal (-)
3	807 (PK/LG)	Left Rear Speaker Signal (+)
4	801 (T/Y)	Left Rear Speaker Signal (-)
5	805 (W/LG)	Right Door Speaker Signal (+)
6	811 (DG/O)	Right Door Speaker Signal (-)
7	802 (O/R)	Right Rear Speaker (+)
8	287 (BK/W)	Right Rear Speaker (-)

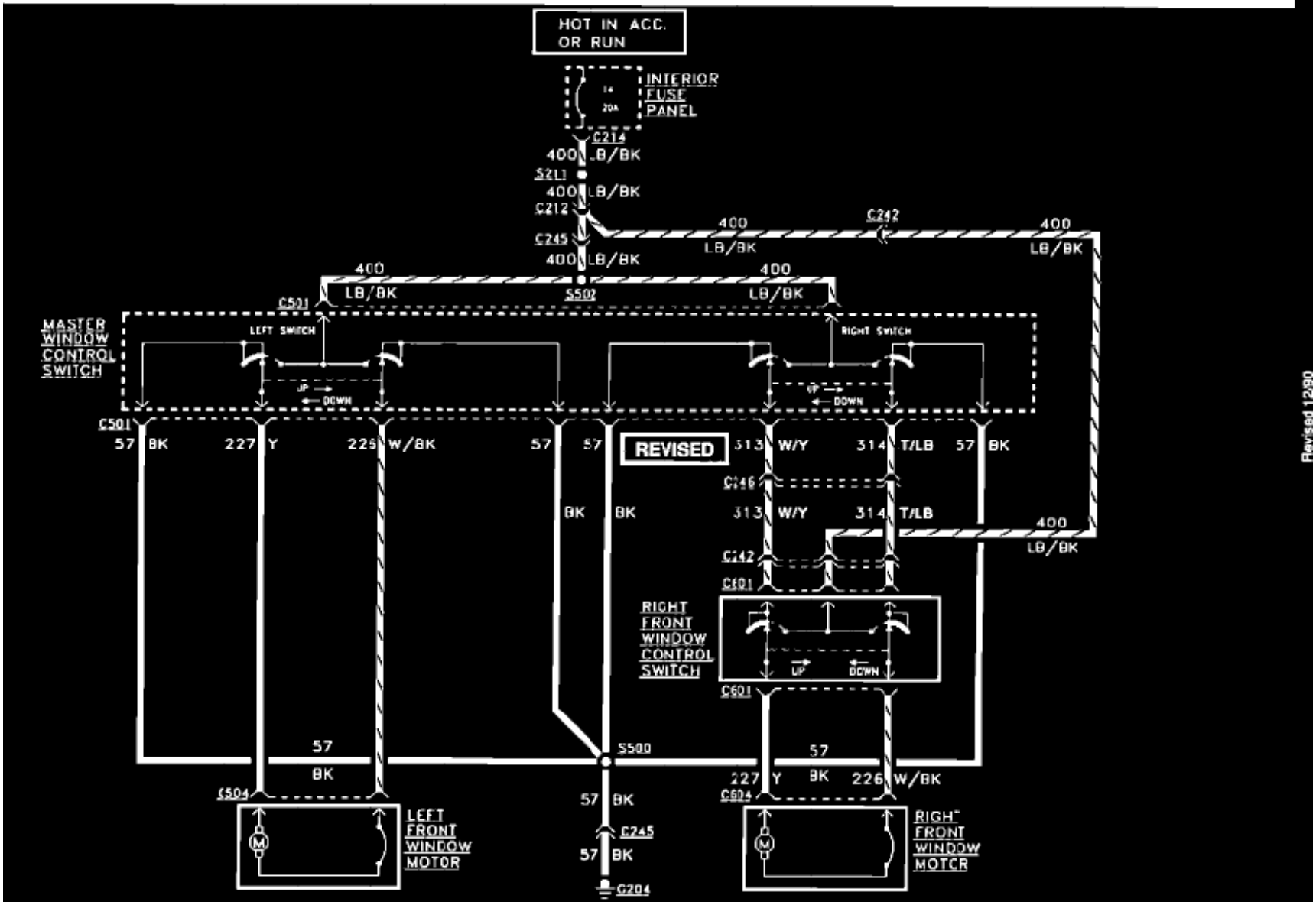
REVISED

100-1 POWER WINDOWS (4 DOOR) 1991 EXPLORER




Revised 12/90
WINDOW LOCK SWITCH
UP
DOWN
LEFT REAR SWITCH
RIGHT REAR SWITCH
MASTER WINDOW CONTROL SWITCH
C501
170 R/LB
316 Y/LB
317 GY/OR
REVISED
C245
C246
170 R/LB
S314
C323
C316
C702
C802
LEFT REAR WINDOW CONTROL SWITCH
RIGHT REAR WINDOW CONTROL SWITCH
227 Y
226 W/BK
C701
C801
LEFT REAR WINDOW MOTOR
RIGHT REAR WINDOW MOTOR
319 Y/BK
320 R/BK

100-3 POWER WINDOWS (2 DOOR) 1991 EXPLORER



TROUBLESHOOTING HINTS

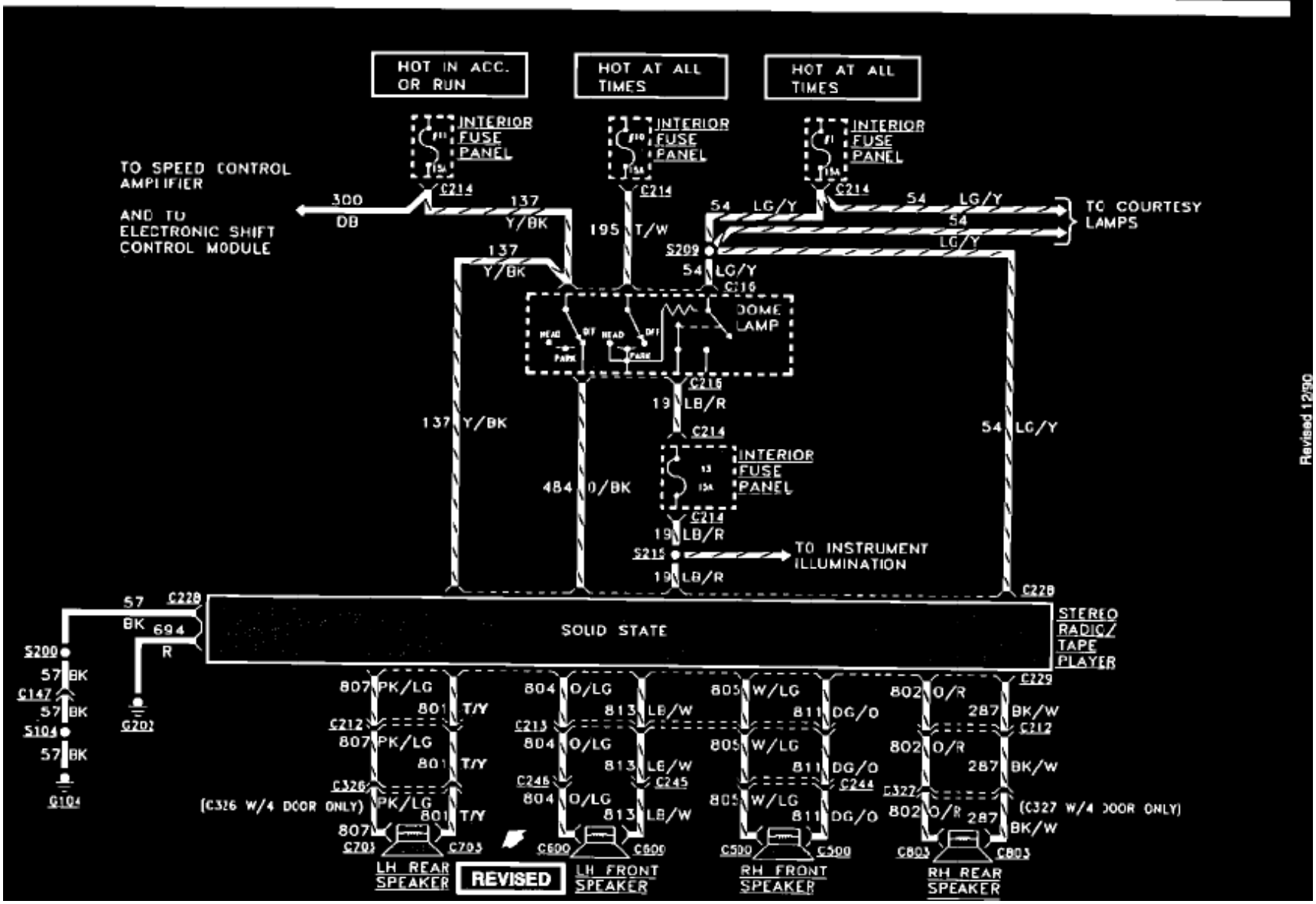
CONDITION	POSSIBLE CAUSE	ACTION
• Power Windows do not work	• Tripped circuit breaker	• Check 30A Circuit Breaker 14 in the Interior Fuse Panel.
	• Open circuit	• Check for 12V on 400 (LB/BK) wire at Master Window Control Switch
• One Power Window does not work	• Open circuit	• Check for continuity from Master Window Control Switch to Control Switch of inoperative window. -Right front 313 (W/Y) and 314 (T/LB) wires. -Left rear 316 (Y/LB) and 317 (GY/OR) wires. -Right rear 319 (Y/BK) and 320 (R/BK) wires. REVISED • Check for continuity in 226 (W/BK) and 227 (Y) wires from Window Control Switch to Window Motor.
	• Faulty ground	• Check for continuity to ground in 57 (BK) wires at Master Window Control Switch.
	• Faulty Master Window Control Switch	• Check Master Window Control Switch
• Passenger's Window Control Switches do not work	• Faulty Window Lock Switch	• Check Window Lock Switch
	• Open circuit	• Check for 12V on 170 (R/LB) wire at Window Control Switches
	• Faulty Master Window Control Switch	• Check Master Window Control Switch
• One Window Control Switch does not work	• Faulty Window Control Switch	• Check Window Control Switch

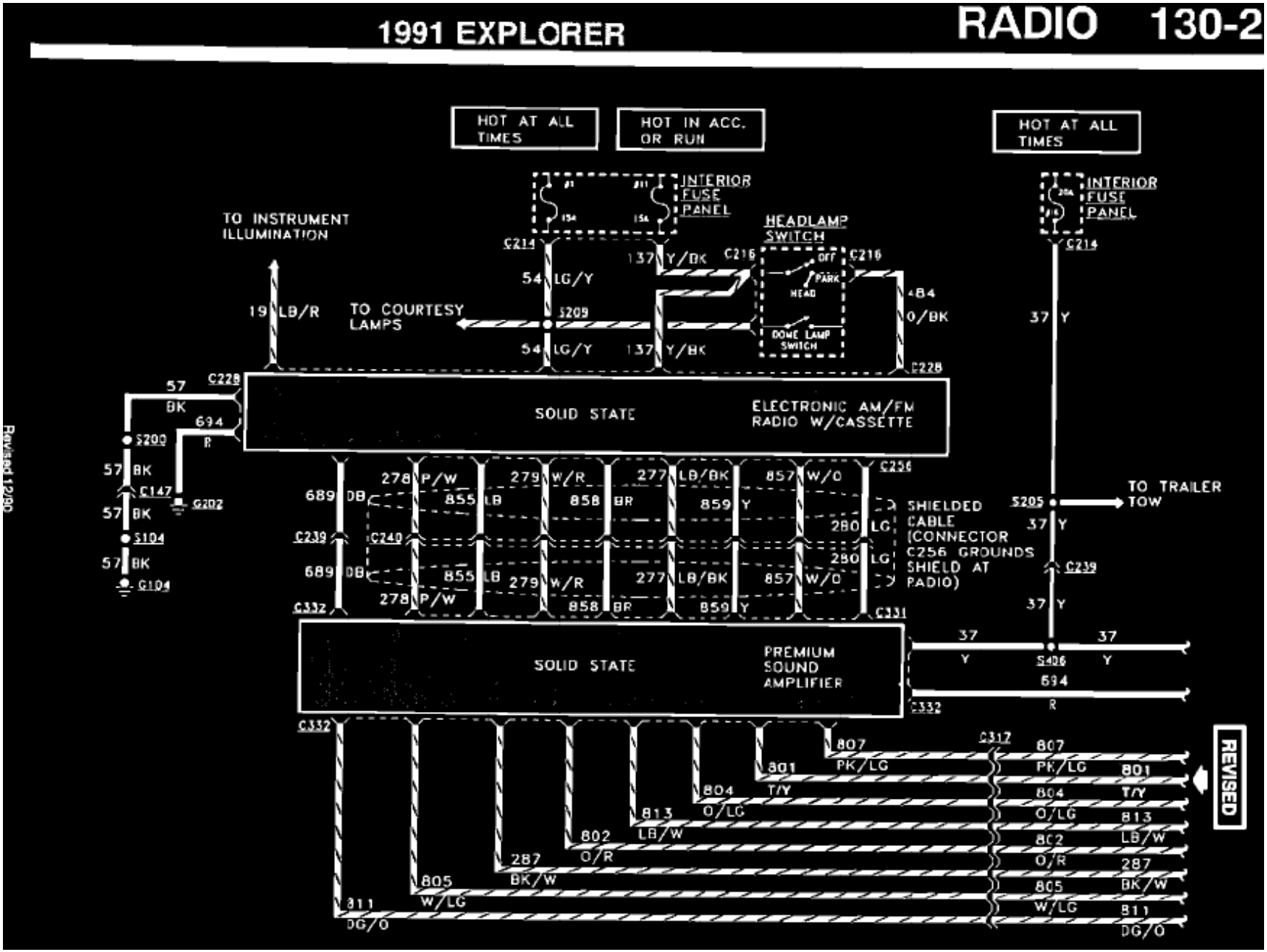
For further diagnostic information refer to section 01-11 of shop manual.

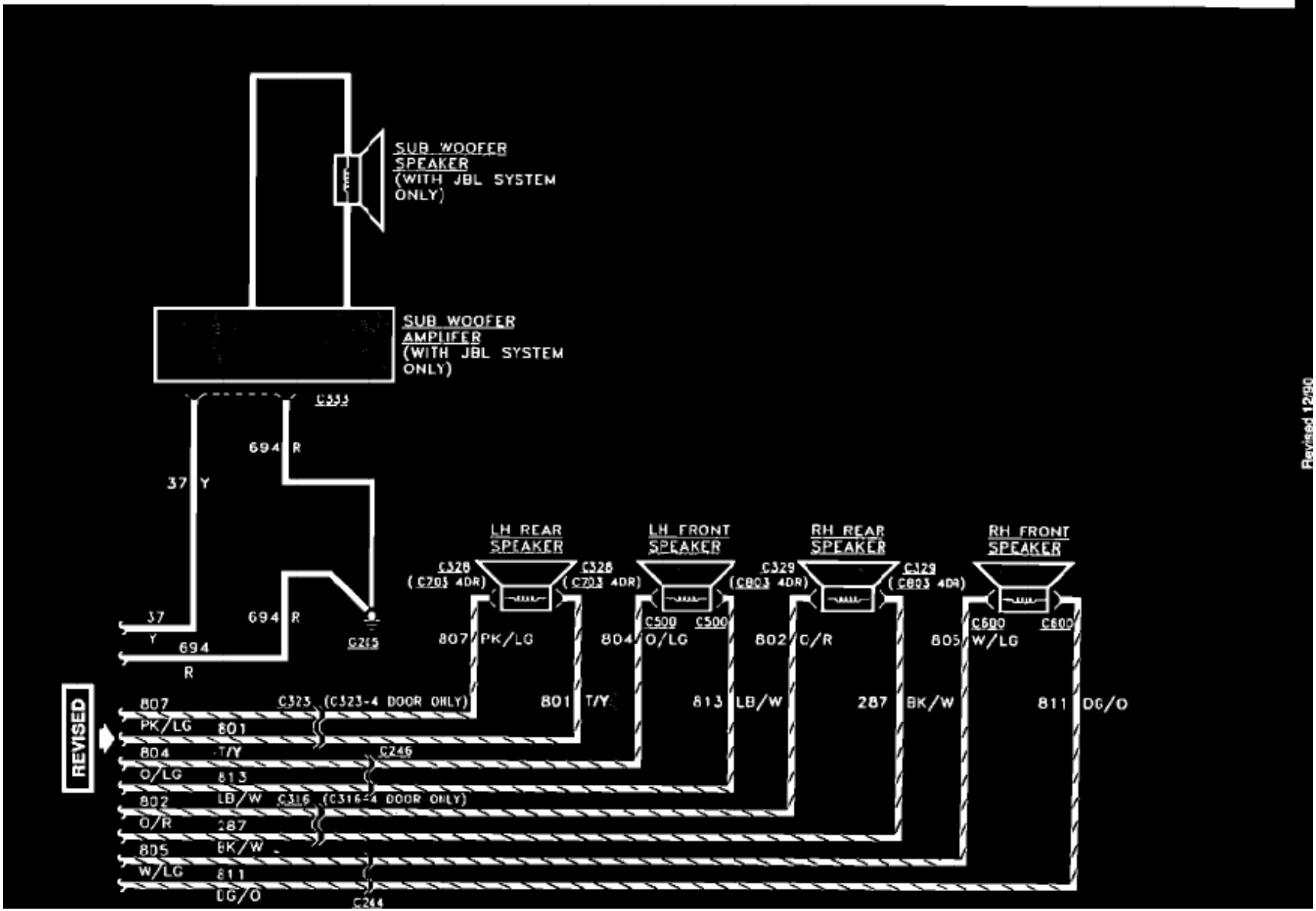
Revised 12/90

130-1 RADIO

1991 EXPLORER



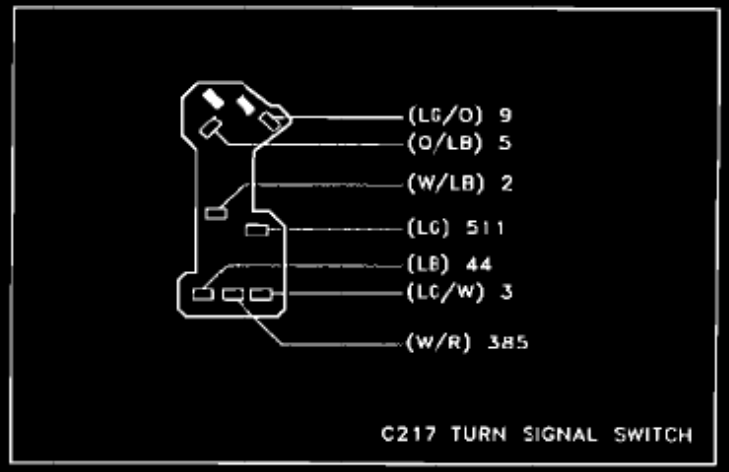

HOT AT ALL TIMES
HOT IN ACC. OR RUN
HOT AT ALL TIMES
INTERIOR FUSE PANEL
INTERIOR FUSE PANEL
HEADLAMP SWITCH
TO INSTRUMENT ILLUMINATION
TO COURTESY LAMPS
19 LB/R
54 LG/Y
137 Y/BK
484 O/BK
37 Y
OFF
PARK
HEAD
DOME LAMP SWITCH
C214
C216
C228
S209
57 BK
694 R
S200
S147
G202
S104
G104
SOLID STATE ELECTRONIC AM/FM RADIO W/CASSETTE
SOLID STATE PREMIUM SOUND AMPLIFIER
C256
C239
C240
C332
C331
278 P/W
279 W/R
277 LB/BK
857 W/O
689 DB
855 LB
858 BR
859 Y
280 LG
SHIELDED CABLE (CONNECTOR C256 GROUNDS SHIELD AT RADIO)
TO TRAILER TOW
S205
37 Y
S406
694 R
C317
807 PK/LG
801 T/Y
804 O/LG
813 LB/W
802 O/R
287 BK/W
805 W/LG
811 DG/O
REVISED
Revised 12/90



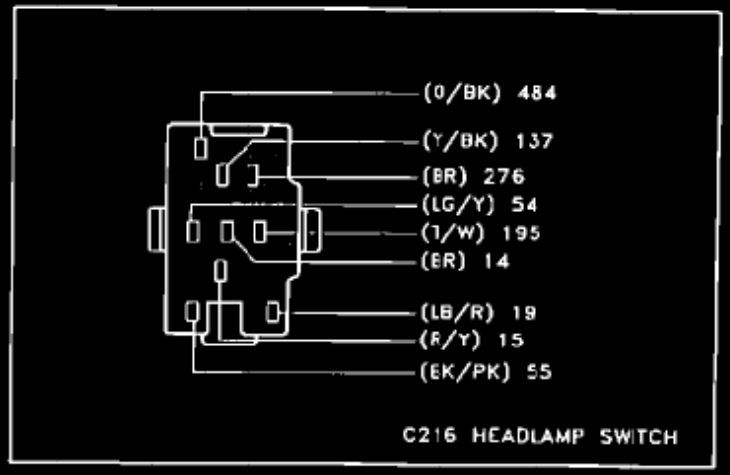
Revised 12/90

150-3 CONNECTOR FACES

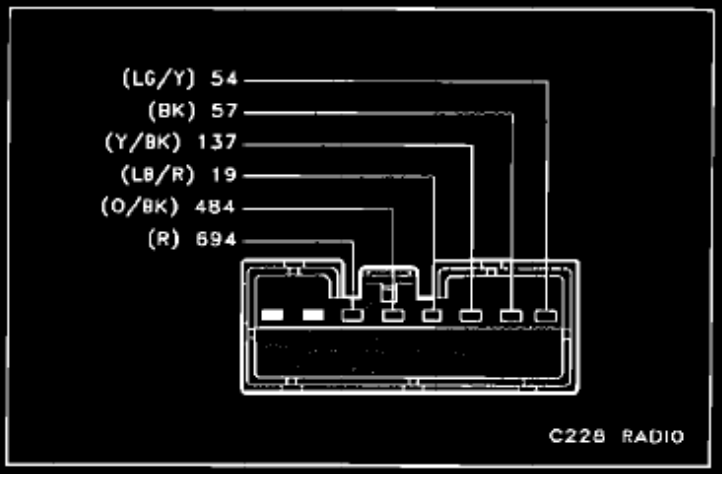
1991 EXPLORER



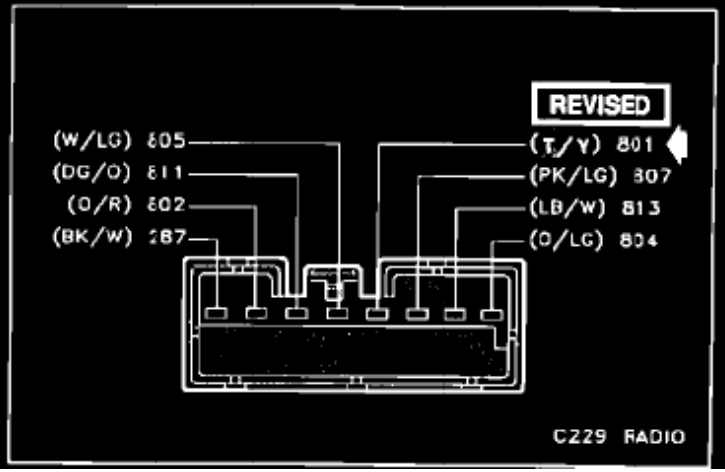
C217 TURN SIGNAL SWITCH



C216 HEADLAMP SWITCH

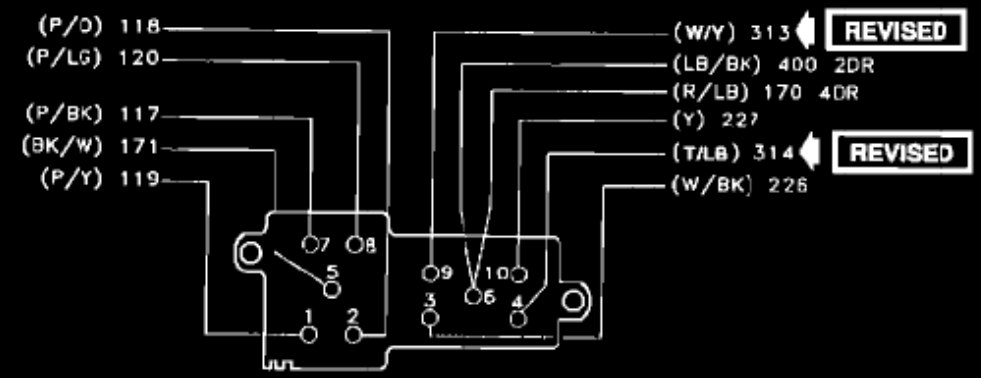


C228 RADIO



C229 RADIO

Revised 12/90



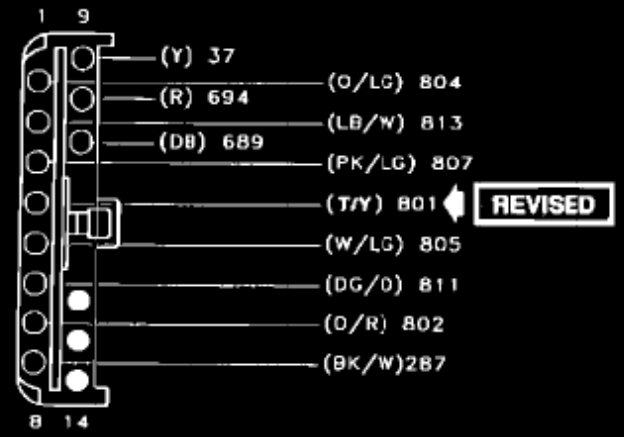
C601 RH Power Door Window and Lock Switches

Pin #	Circuit	Circuit Function
1	119 (P-Y)	Door Lock Switch (Lock)
2	118 (P-O)	Door Lock Motor (Unlock)
3	226 (W-BK)	LF Window Regulator Switch to LF Window Regulator Motor
4	314 (T-LB)	LF Window Regulator Switch to RF Window Regulator Motor
5	171 (BK-W)	Circuit Breaker to Seat Latch Relay
6	400 (LB-BK) (2 Door) 170 (R-BK) (4 Door)	Safety Relay Load Term. to Wind. Regulator Switch Feed
7	117 (P-BK)	Door Lock Motor (Unlock)
8	120 (P-LG)	Door Lock Switch (Lock)
9	313 (W-Y)	LF Window Regulator Switch to RF Window Regulator Motor
10	227 (Y)	LF Window Regulator Switch to LF Window Regulator Motor

REVISED

REVISED

Revised 12/90



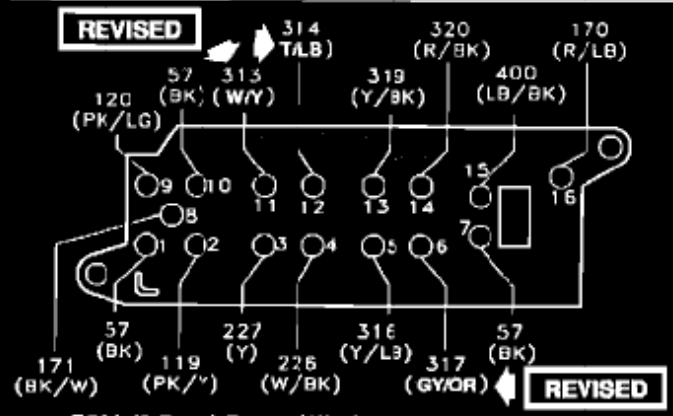
C332 Premium Sound Amplifier

Revised 12/90

REVISED

Pin #	Circuit	Circuit Function
1	804 (O-LG)	Speaker Voice Coil Feed (FL)
2	813 (LB-W)	Spkr. Sw. GND to LF Spkr.
3	807 (PK-LG)	Speaker Voice Coil Feed (RL)
4	801 (T-Y)	Amp/Spkr. Sw. GND to LR Spkr.
5	805 (W-LG)	Spkr. Voice Coil Feed
6	811 (DG-O)	Spkr. Sw. GND to RF Spkr.
7	802 (O-R)	Amp/Spkr. Sw. Feed to RR Spkr.
8	287 (BK-W)	Spkr. Voice Coil Return
9	37 (Y)	Battery to Load
10	694 (R)	Amplifier Power Return
11	689 (DB)	Logic Mode

1991 EXPLORER CONNECTOR FACES 150-16



C501 (2 Door) Power Window & Door Lock Switch

Pin Number	Circuit	Circuit Function
1	57 (BK)	Ground Circuit
2	119 (PK-Y)	Door Lock Switch (Lock)
3	227 (Y)	LF Window Regulator Switch to LF Window Regulator Motor
4	226 (W-BK)	LF Window Regulator Switch to LF Window Regulator Motor
5	316 (Y-LB)	LF Window Regulator Switch to LR Window Regulator Motor
6	317 (GY-OR)	LF Window Regulator Switch to LR Window Regulator Motor
7	57 (BK)	Ground Circuit
8	171 (BK-W)	Circuit Breaker to Seat Latch Relay
9	120 (PK-LG)	Door Lock Switch (Unlock)
10	57 (BK)	Ground Circuit
11	313 (W-Y)	LF Window Regulator Switch to RF Window Regulator Motor
12	314 (T-LB)	LF Window Regulator Switch to RF Window Regulator Motor
13	319 (Y-BK)	LF Window Regulator Switch to RR Window Regulator Motor
14	320 (R-BK)	LF Window Regulator Switch to RR Window Regulator Motor
15	400 (LB-BK)	Safety Relay Load Terminal to Window Regulator Switch Feed
16	170 (R-LB)	Window Regulator Switch Feed

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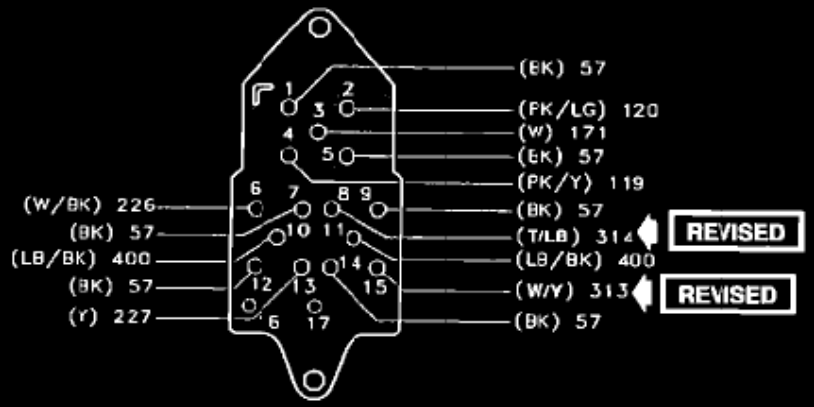
REVISED

Revised 12/90

150-17 CONNECTOR FACES

1991 EXPLORER



C501 (4 Door) Power Window and Door Lock Switches

Pin Number	Circuit	Circuit Function
1	57 (BK)	Circuit Ground
2	120 (PK-LG)	Door Lock Switch (unlock)
3	171 (W-BK)	Circuit Breaker to Seat Latch Relay
4	119 (PK-Y)	Door Lock Switch (Lock)
5	57 (BK)	Circuit Ground
6	226 (W-BK)	LF Window Regulator Switch to LF Window Regulator Motor
7	57 (BK)	Circuit Ground
8	314 (T-LB)	LF Window Regulator Switch to RF Window Regulator Motor
9	57 (BK)	Circuit Ground
10	400 (LB-BK)	Safety Relay Load Term. to Window Regulator Switch Feed
11	400 (LB-BK)	Safety Relay Load Term. to Window Regulator Switch Feed
12	57 (BK)	Circuit Ground
13	227 (Y)	LF Window Regulator Switch to LF Window Regulator Motor
14	57 (BK)	Circuit Ground
15	313 (W-Y)	LF Window Regulator Switch to RF Window Regulator Motor

REVISED

REVISED

Revised 12/90

Towing Information: Technical Service Bulletins Vehicle - Towing Behind RVs Guidelines

Article No. 98-5A-12

03/18/98

^ BRAKES - WEIGHT LIMITATIONS FOR TOWING

^ RECREATIONAL VEHICLES - WEIGHT RATINGS FOR UNBRAKED TOWING LESS THAN GROSS COMBINATION WEIGHT RATING (GCWR)

^ TOWING BEHIND RECREATIONAL VEHICLES - RECOMMENDED GUIDELINES

^ TRANSAXLE/TRANSMISSION/TRANSFER CASE - VEHICLES TOWED BEHIND RECREATIONAL VEHICLES - RECOMMENDED TOWING GUIDELINES

FORD: 1988-93 FESTIVA 1988-94 TEMPO 1989-96 PROBE, TAURUS SHO 1991-97 ESCORT 1994-96 ASPIRE

LINCOLN-MERCURY: 1988-94 TOPAZ 1991-94 CAPRI 1991-97 TRACER

LIGHT TRUCK: 1988-96 AEROSTAR, BRONCO, E-350, F SUPER DUTY, F-250, F-350, F-53 MOTORHOME, RANGER 1988-97 F-150 1991-96 EXPLORER 1997 MOUNTAINEER

ISSUE: Many motorhome owners tow a vehicle when traveling. Improper techniques can "overload" the brake system of the tow vehicle or damage the drivetrain of the vehicle being towed.

ACTION: Use the information and charts shown in this TSB article to properly match tow vehicle, towed vehicle and towing method.

TOWING METHODS

1. TRAILER - The vehicle is loaded onto and secured to a trailer and simply acts as "secured" cargo.

2. DOLLY - The vehicle is "partially" loaded and partially towed. Either front or rear wheels are loaded and secured to a "towing dolly" and the other wheels roll on the road.

3. TOW BAR - All of the vehicle wheels roll on the pavement. The towed vehicle's steering column must be unlocked so that it can track correctly behind the tow vehicle.

WEIGHT RATINGS AND BRAKES

^ GVWR (Gross Vehicle Weight Rating) - is the MAXIMUM allowable weight of the towing vehicle, passengers and cargo

^ GCWR (Gross Combined Weight Rating) - is the MAXIMUM allowable weight of the towing vehicle and the weight of the trailer or vehicle being towed, including all passengers and cargo

^ BRAKES - The motorhome brakes are designed and rated for the GVWR of that vehicle and will provide adequate braking for trailers and towing vehicles up to 680 kg (1500 lb)

FORD-BUILT VEHICLES APPROVED FOR DINGHY TOWING

VEHICLE	MANUAL TRANSMISSION	AUTOMATIC TRANSMISSION
FORD CARS		
ASPIRE	YES	NO
FESTIVA	YES	NO
ESCORT	YES	NO
TEMPO	YES	NO
PROBE	YES	NO
TAURUS (SHO ONLY)	YES	NO
LINCOLN-MERCURY CARS		
TRACER	YES	NO
TOPAZ	YES	NO
CAPRI	YES	NO
FORD TRUCKS		
RANGER 4X2	YES	NO
RANGER 4X4	YES	YES**
EXPLORER 4X2	YES	NO
EXPLORER 4X4	YES	YES**
AEROSTAR 2WD	YES	NO
F-SERIES 4X4	YES**	YES**
BRONCO 4X4	YES**	YES**
E-350	YES	NO
MOUNTAINEER 4X2	YES	NO
MOUNTAINEER 4X4	YES	YES**

**Manual transfer case only (not Touch Drive Electric Shift).

CAUTION:

SEPARATE AUXILIARY BRAKES ARE REQUIRED ON TRAILERS OR TOWED VEHICLES OVER 680 KG (1500 LBS). DO NOT CONNECT A TRAILER'S, DOLLY'S OR OTHER TOWED VEHICLE'S BRAKE SYSTEM TO THE TOWING VEHICLE'S BRAKE SYSTEM.

TOWED VEHICLES

1. Trailer-towed - The vehicle should be loaded on the trailer in a manner to:

a. achieve a trailer tongue load of 10-15% of total trailer weight,

b. not exceed the trailer or hitch ratings and

c. be securely tied down.

2. Dolly-towed - For front wheel drive vehicles, towing an automatic transaxle (ATX)-equipped vehicle behind another vehicle, such as a Recreational Vehicle (RV), requires that a front wheel dolly or trailer be used.

NOTE:

TEMPO ALL-WHEEL DRIVE MODELS MUST BE TRAILER-TOWED. DO NOT TOW THESE VEHICLES USING A TWO-WHEEL TOWING DOLLY.

CAUTION:

DO NOT TOW A VEHICLE WITH AN AUTOMATIC (ATX) TRANSAXLE WITH THE DRIVE WHEELS ON THE GROUND. DAMAGE TO THE TRANSAXLE MAY RESULT.

3. Tow Bar-towed - Vehicles which can be successfully towed with a tow bar are listed in the following chart. Additional vehicle-specific information follows the chart.

ALL VEHICLES

NOTE:

DO NOT TOW ANY VEHICLE AT A SPEED FASTER THAN 88 KM/H (55 MPH). THE MAXIMUM TOWING DISTANCE (WHEN TOWED CORRECTLY) IS UNLIMITED.

WARNING:

NEVER USE A TOW BAR THAT ATTACHES ONLY TO THE BUMPER.

MTX-EQUIPPED VEHICLES

Towing a manual transaxle (MTX)-equipped vehicle with the drive wheels on the ground is acceptable only if the vehicle is towed in a forward direction. The parking brake must be released and the gear shift lever must be in Neutral.

^ For Aspire, Festiva, Escort and Tracer, the ignition key must be in the ACO position, the battery must be disconnected to eliminate battery drain, and the steering wheel must be unlocked

^ For Capri, the ignition key must be in the OFF position and the steering wheel unlocked

^ Refer to the specific vehicle Owner Guide for complete details

CAUTION:

TOWING MTX-EQUIPPED VEHICLES INCORRECTLY MAY RESULT IN TRANSAXLE DAMAGE.

TRUCKS

^ The steering wheel must be unlocked by placing the ignition key in the OFF position

^ Manual transmission shift lever must be in Neutral

^ On 4X4 manual shift transfer cases, the shift lever must be in Neutral

^ 4X4 locking hubs (both manual and automatic) must be unlocked

^ Refer to the specific vehicle Owner Guide for complete details

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 93-24-6 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 504000

Auxiliary Step / Running Board: Technical Service Bulletins Running Boards - Noise/Vibration Installation Tips

Article No. 95-8-6

04/24/95

^ RUNNING BOARDS - INCORRECTLY INSTALLED - NVH CONCERNS

^ NOISE - VIBRATION - RUNNING BOARDS - INCORRECTLY INSTALLED

LIGHT TRUCK: 1987-90 BRONCO II 1987-95 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1988-95 F SUPER DUTY 1991-95 EXPLORER

This TSB is being republished in its entirety to include vehicles through the 1995 model year.

ISSUE: Running boards which are incorrectly installed may result in noise/vibration complaints.

ACTION: Install running boards to either the body or frame; NEVER to both unless the mounting system uses isolated mounts. A manufacturer's instruction to attach running boards to both body and frame should be immediately questioned because such action provides a direct path from chassis to body for road vibration and noise.

OTHER APPLICABLE ARTICLES: NONE SUPERSEDES: 91-4-11 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 108000, 702000, 703000

Front Door Latch: Technical Service Bulletins Door Latches - Adjustment/Modification Prohibition

Article No. 91-8-4

04/17/91

LATCHES - DOOR - REPLACEMENT REQUIRED

FORD: 1985-88 EXP 1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986 LTD 1986-91 TAURUS 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1985-87 LYNX

1985-91 CAPRI, CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1989-91 F SUPER DUTY 1991 EXPLORER

MEDIUM/HEAVY TRUCK:1985-90 C SERIES

1985-91 CL-9000, F & B SERIES, L SERIES 1986-91 CARGO SERIES

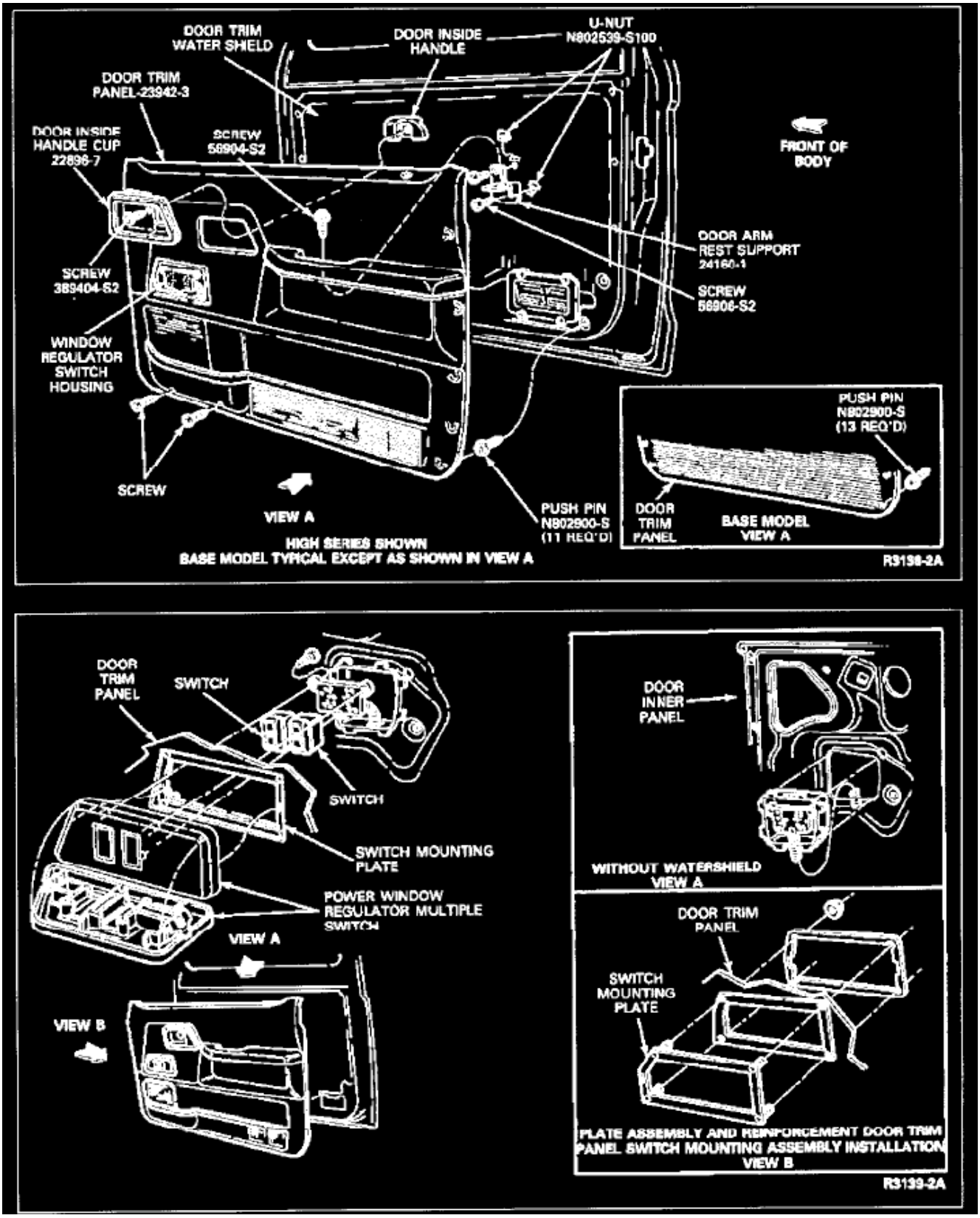
ISSUE: Rework of door latches has been reported from Service Investigation Reports. This is unacceptable as it may affect proper latch function.

ACTION: Replace latches which function improperly and can not be adjusted.

WARNING: NEVER REWORK OR MODIFY A LATCH ASSEMBLY, ALWAYS REPLACE THE LATCH ASSEMBLY.

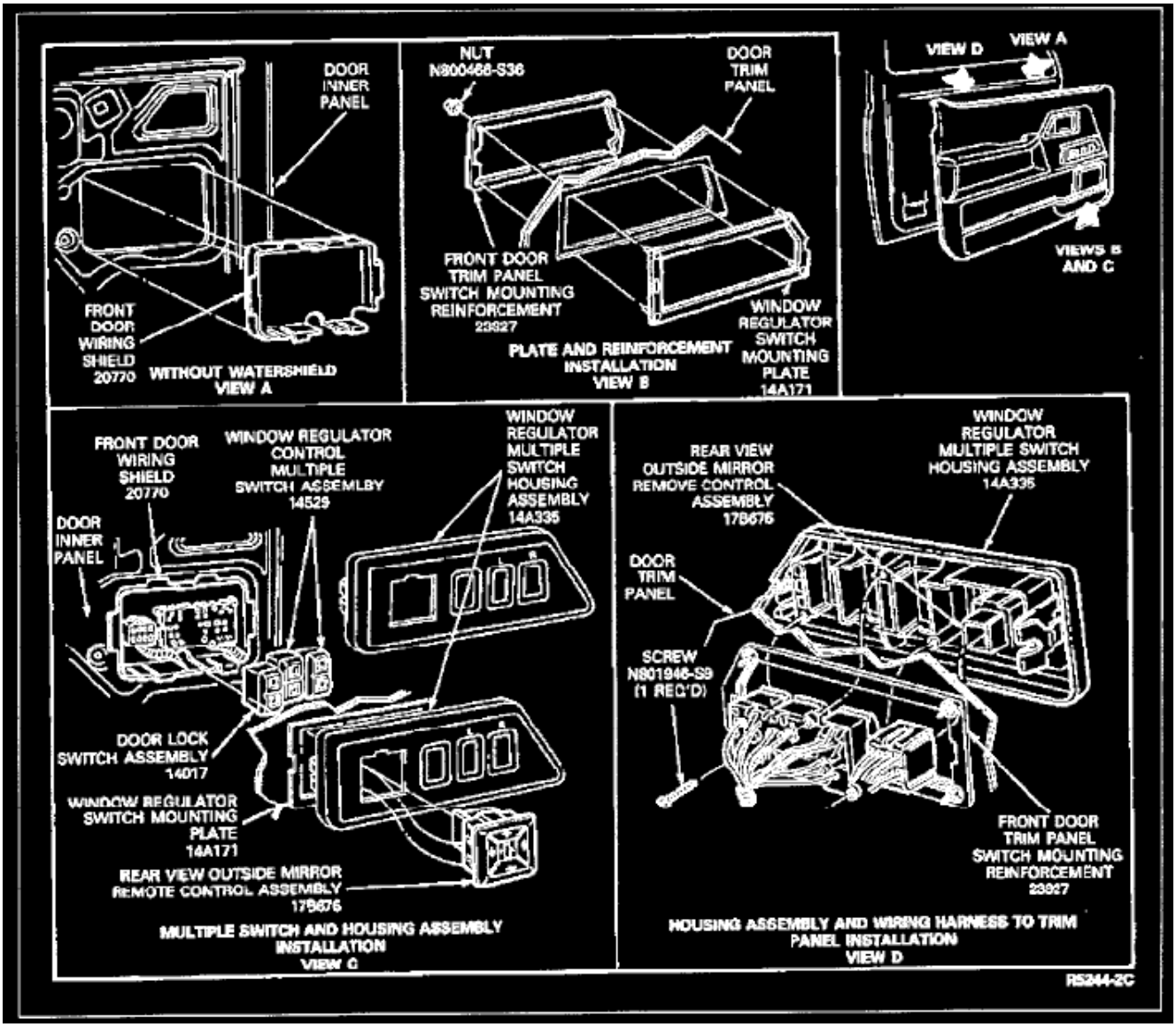
OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Doors, Hood and Trunk > Doors > Front Door > Front Door Panel > System Information > Service and Repair



Front Door Panel: Service and Repair

Door Trim Panel



Removal

1. Remove the screws retaining the armrest area of the trim panel to the door inner panel.

2. Remove the screw retaining the door inside handle cup.

3. Remove the screw retaining the door window regulator handle. Remove the handle and washer.

4. Remove the power door lock control and/or power window control, if so equipped.

5. At each plastic clip location, carefully pry the trim panel away from the door inner panel using the Trim Pad Removing Tool from Rotunda

Moulding/Trim Kit 107-00401 or equivalent. Remove the trim panel.

NOTE: At no time should the trim panel be used to pull the clips from the inner panel holes.

Installation

1. Replace any bent, damaged, or missing push pins on the door trim panel. Position the trim panel to the door inner panel, locating the push pins in

the countersunk holes. Firmly push the trim panel at the push pin locations to seat each push pin into the holes in the door inner panel.

2. To complete installation, reverse Steps 1 through 4 as outlined under Removal.

Rear Door Latch: Technical Service Bulletins Door Latches - Adjustment/Modification Prohibition

Article No. 91-8-4

04/17/91

LATCHES - DOOR - REPLACEMENT REQUIRED

FORD: 1985-88 EXP 1985-91 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986 LTD 1986-91 TAURUS 1988-91 FESTIVA 1989-91 PROBE

LINCOLN-MERCURY: 1985-87 LYNX

1985-91 CAPRI, CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-91 SABLE 1987-91 TRACER

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1989-91 F SUPER DUTY 1991 EXPLORER

MEDIUM/HEAVY TRUCK:1985-90 C SERIES

1985-91 CL-9000, F & B SERIES, L SERIES 1986-91 CARGO SERIES

ISSUE: Rework of door latches has been reported from Service Investigation Reports. This is unacceptable as it may affect proper latch function.

ACTION: Replace latches which function improperly and can not be adjusted.

WARNING: NEVER REWORK OR MODIFY A LATCH ASSEMBLY, ALWAYS REPLACE THE LATCH ASSEMBLY.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

Old Service Part Number	New Service Part Number
F6TZ-15702-AA E7DZ-15702-A	1U5Z-15702-AA 1U5Z-15702-AA

PART NUMBER	PART NAME
1U5Z-15702-AA	27 degree Mechanical Hood Lamp Switch

Underhood Lamp Switch: Technical Service Bulletins Hood Lamp Switch - Revised

Article No. 01-21-6

10/29/01

ELECTRICAL - REVISED MECHANICAL HOOD LAMP SWITCH TO REPLACE OLD STYLE MERCURY HOOD LAMP SWITCH

FORD: 1987-1995 TAURUS 1988-1991 CROWN VICTORIA 1989 THUNDERBIRD 1989-1996 MUSTANG 1994-1996 THUNDERBIRD 1990 BRONCO II 1990-1996 RANGER 1991-1996 BRONCO 1994-2001 EXPLORER 1997-2001 F-150 2000-2001 EXCURSION 2002 EXPEDITION

LINCOLN: 1989-1994 CONTINENTAL 1990-1992 MARK VII 1990-1996 TOWN CAR 1993-1995 MARK VIII 2002 NAVIGATOR

MERCURY: 1987-1995 SABLE 1988-1991 GRAND MARQUIS 1989 COUGAR 1994-1996 COUGAR 1997-2001 MOUNTAINEER

ISSUE

This article is to provide information on replacement hood lamp switches. The 27 degree Mercury style hood switches will no longer be available. Replacement 27 degree Mechanical switches will be available as a service replacement.

ACTION

For vehicles requiring hood lamp switch replacement, replace the 27 degree Mercury switch with new 27 degree Mechanical switch. Replace hood lamp switch per the appropriate model year Workshop Manual as needed.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 201000, 201200

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE			
Model Year *	A4LD Trans -4R602-	Mazda R1 Trans -4R602-	TSB Reference
1989 Models (Excluding Mitsubishi 5-Speed)	E8TZ-U	E9TZ-L	91-13-11
1990 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	F0TZ-F	F0TZ-B	91-13-11
1990-93 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	F37Z-B	F37Z-A	94-2-24
1994 Models			
2.3L Splash 125" WB 4X2	F47Z-DA		
2.3L 125" WB 4X2	F37Z-B		
2.3L 125" WB 4X2		F37Z-A	
3.0L Splash 125" WB 4X2	F47Z-DA		
3.0L 125" WB 4X2	F37Z-B		
3.0L 125" WB 4X4	F37Z-C		
3.0L 125" WB 4X2		F37Z-A	
3.0L 125" WB 4X4		F37Z-C	
4.0L Splash 125" WB 4X2	F47Z-DA		
4.0L 125" WB 4X2	F37Z-B		
4.0L 125" WB 4X4	F37Z-C		
4.0L 125" WB 4X2		F37Z-A	
4.0L 125" WB 4X4		F37Z-C	
*1989 model part numbers are provided for convenience			

Technical Service Bulletin # 97-21-16 Date: 971013

Driveshaft - Boom/Vibration At 20-65 MPH

Article No. 97-21-16

10/13/97

^ NOISE - "BOOM" WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ DRIVESHAFT - "BOOM" VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH)-SUPERCAB MODELS ONLY

LIGHT TRUCK: 1989-97 RANGER

This TSB article is being republished in its entirety to remove mention of build dates in title.

ISSUE: A driveline "boom" or vibration may be experienced when driving 32-105 km/h (20-65 mph) in some vehicles. This may occur because of driveline sensitivity of the vehicle.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1995 Models		
2.3L Splash 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C
1996 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1997 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
2.3L 125" WB 4X2		F77Z-AA
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A

ACTION: Follow the Diagnostic Chart in this TSB article. Install revised design components as required to provide better isolation and improved driveline angles to resolve the concern. Refer to

the following Service Procedure for details.

NOTE:

THE SERVICE REPLACEMENT DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE WILL NOT FIT VEHICLES EQUIPPED WITH A MITSUBISHI MANUAL TRANSMISSION. IF DRIVESHAFT REPLACEMENT IS REQUIRED ON MITSUBISHI EQUIPPED MODELS, REFER TO THE PARTS CATALOG FOR CORRECT APPLICATION.

PARTS BLOCK AND TORQUE SPECIFICATION

Part Number	Part Name	Torque Spec.	Class
390066-S2	Screw - Transmission Mount-To-Crossmember (Pk/2)	103 N•m (76 lb-ft)	S
N605800-S100	Bolt - Center Bearing Bracket-To-Frame	50 N•m (37 lb-ft)	BS
N802594-S56	Frame Cap Bolts	50 N•m (37 lb-ft)	C
N800594-S100	Cap Screws - Driveshaft-to-Rear Axle	100 N•m (74 lb-ft)	AM
N621945-S2	M12-1.75 Nut (Transmission Mount-To-Crossmember) (Pk/4)	103 N•m (76 lb-ft)	RS
N620482-S2	Frame Cap Nuts (Pk/8)	50 N•m (37 lb-ft)	BG
N801673-S2	Nut (Pk/8)	50 N•m (37 lb-ft)	BS
F37Z-6068-A	Transmission Mount	-	A
F37Z-4831-B	Frame - Crossmember Cap	-	C
E8TZ-4R602-U	Driveshaft - 1989 Models With Automatic Transmission	-	B
E9TZ-4R602-L	Driveshaft - 1989 Models With Manual Transmission	-	C
FOTZ-4R602-F	*Driveshaft - 1990 Models With Automatic Transmission - Vehicles Built Before 12/15/89*	-	B
FOTZ-4R602-B	Driveshaft - 1990 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	-	C
F37Z-4R602-A	Driveshaft - 1990-93 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	-	C
F37Z-4R602-B	Driveshaft - 1990-93 Models With Automatic Transmission - Vehicles Built From 12/15/89 Through 3/30/93	-	C

Parts Block

OTHER APPLICABLE ARTICLES: 91-13-11, 93-18-15

SUPERSEDES: 97-20-16

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

For 1992-97 Models, Basic And Powertrain Warranty Coverage For 1989-91 Models

OPERATION DESCRIPTION TIME

972116A Replace Driveshaft 1.3 Hrs.

Assembly, And Replace Center Bearing Crossmember Cap As Outlined

DEALER CODING

CONDITION

BASIC PART NO. CODE

4R602 D9

OASIS CODES: 304000, 509000, 597997, 703000, 703200

Service Procedure

NOTE:

BEFORE DIAGNOSING A 4-WHEEL-DRIVE VEHICLE, MAKE SURE IT IS IN 2WD AND THE FRONT HUBS ARE UNLOCKED.

1. On smooth pavement, drive the vehicle at a constant speed and feel for the "float" condition:

a. This is the narrow, neutral range where the driveline can be said to "float" because neither accel nor decel forces are being applied to the driveline.

b. It is important to accurately identify vehicle behavior in "float" mode because the diagnostic routine to be used will depend on Noise/Vibration/Harshness (NVH) characteristics during float.

c. It may be necessary to drive the vehicle several minutes before the sensation can be clearly identified.

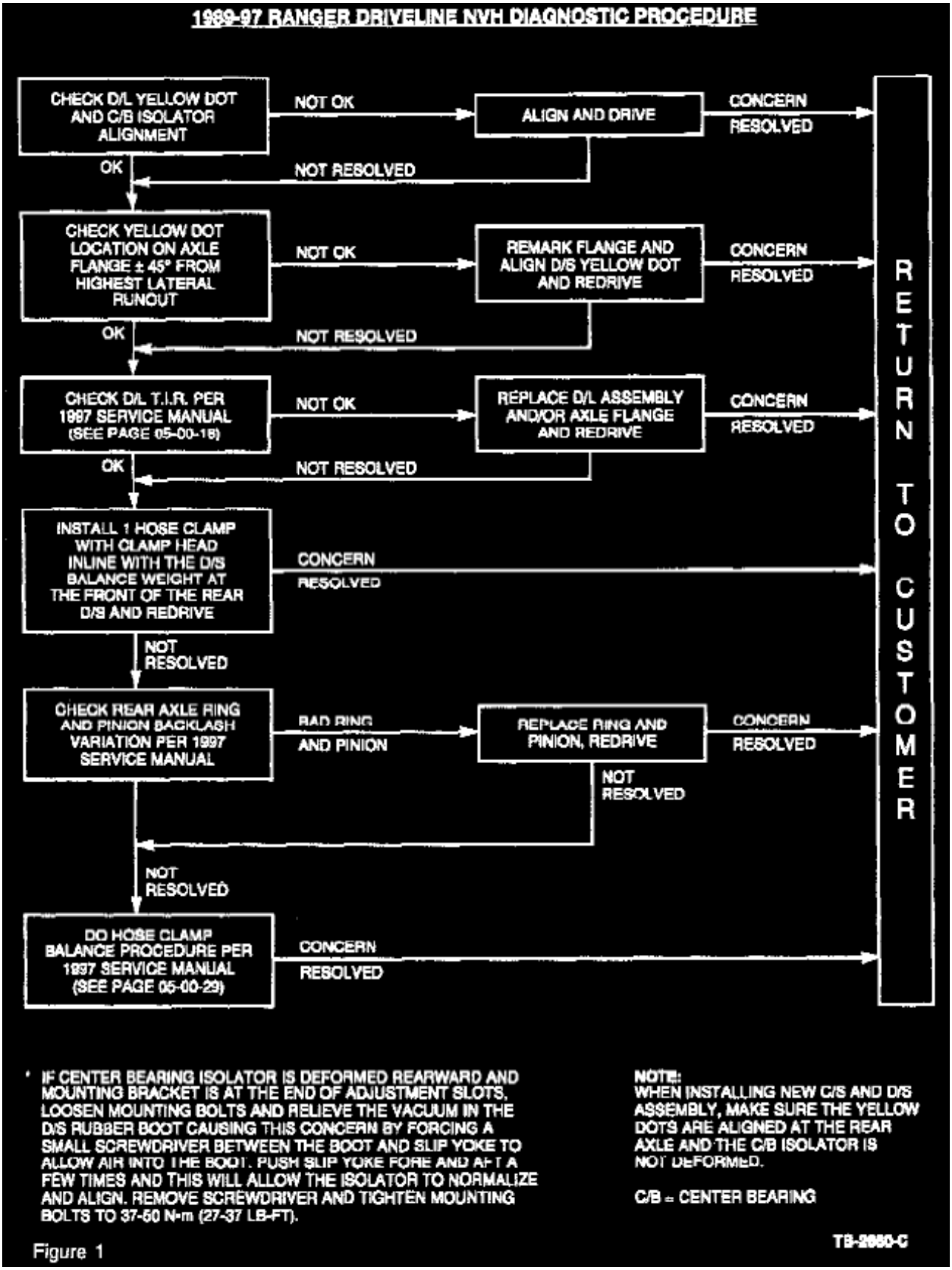


Figure 1

2. Perform the Driveline NVH Diagnostic Procedure shown in Figure 1 BEFORE replacing any components.

Vibration

Vibration, technically, is a high-frequency trembling, shaking or grounding condition, felt or heard, that is constant or variable in level and occurs during a portion of the total operating speed range. The types of vibrations that can be felt in the vehicle can be divided into three groups:

^ Vibrations of various unbalanced rotating parts of the vehicle

^ Body and frame vibrations excited by the powertrain, wind or road inputs

^ Tip-in moans or resonance vibrations from stressed engine or exhaust system mounts

If vibration is gone, check the front driveshaft, transfer case, front axle, or halfshafts for loose components. Refer to the 1997 Ranger Service Manual, Section 05-03B, for details.

NOTE:

DRIVING A 4-WHEEL-DRIVE VEHICLE WITH THE REAR DRIVESHAFT REMOVED FURTHER CONFIRMS ANY VIBRATION CONCERNS WITH THE FRONT DRIVE SYSTEM.

These vehicle vibrations can also be subdivided into those that occur at low speeds and those that are most noticeable at higher speeds. Since the dividing line between low and higher speed vibrations is not clear, there will be vibrations that overlap the two ranges.

Typical Low Speed Vibrations (less than 72 km/h (45 mph))

^ Exhaust vibration

^ Engine harshness

^ Driveline vibration due to improper driveline angles

^ Power steering pump disturbances

^ Air conditioner compressor or drive belt vibrations

^ Takeoff shudder (clutch or driveline problems)

^ Brake roughness or harshness

^ Driveline roughness

^ Clutch torsion vibration

^ Driveline slip-yoke or U-joints

Typical High Speed Vibrations (above than 72 km/h (45 mph))

^ Axle and companion flange runout or imbalance

^ Driveshaft imbalance

^ Excessive tire-wheel and drum assembly imbalance

^ Tire roughness due to high non-uniformity (force variation) or out-of-balance condition

^ Rear axle pinion gear pitch line runout

^ Excessive tire and wheel run out

^ Worn suspension components

^ Front end accessory vibrations

^ Exhaust vibration - Exhaust vibration is greatly reduced in Ranger exhaust systems de-coupled by a flexible coupling and mounted with blade and block hangers

Driveshaft Vibrates

1. Road test vehicle to determine critical vibration points. Note road speed, engine rpm and shift lever positions at which vibration occurs.

2. Stop vehicle and run engine with clutch depressed (automatic transmission in Neutral) through critical speed ranges determined in Step 1 of Driveshaft Vibrates.

3. If vibration is gone, the driveshaft must be balanced as described in the 1997 Ranger Service Manual, Page 05-00-29.

Component Test

Driveline Vibration

^ Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake

^ Driveline vibration is directly related to the speed of the vehicle and is usually noticed at speeds of 72 km/h (45 mph) or higher

^ Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum or boom

^ Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. If the vibration is

particularly noticeable during acceleration or deceleration, especially at lower speeds, then driveline angle should be checked

^ Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jackstands, though the brakes may need to be applied lightly in order to simulate road resistance. Refer to the 1997 Ranger Service Manual, Page 05-00-15, Steps 1-10

Driveshaft Runout and Balance

Vibration or shudder which is noticeable either on fast acceleration, when coasting, or when using the engine for braking, may be caused by the rear axle housing being loose on the rear suspension, improper tire balance, improper driveline installation, or driveline balance.

If driveshaft components are replaced and shaft vibration is encountered after installation, disconnect and remove the driveshaft. Rotate the rear axle companion flange 180 degrees; then, reconnect the driveshaft to the driveshaft slip-yoke and reinstall in vehicle. If the vibration persists, disconnect the driveshaft at the rear axle companion flange. Rotate the rear axle companion flange 180 degrees and reconnect the driveshaft to the rear axle companion flange.

If rotating the driveshaft 180 degrees does not eliminate vibration, the driveshaft may be balanced by referring to the 1997 Ranger Service Manual, Page 05-00-29, Steps 1-9, for details.

Slip-Yoke Spline

Vehicle noise and vibration can be caused by a seized driveshaft slip-yoke spline. The service resolution to minimize driveshaft slip-yoke spline contamination and ultimate seizure can be found in the 1997 Ranger Service Manual, Page 05-00-32, Steps 1-11.

Driveline Angularity

Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height (rear spring) and engine mounts.

Low speed vibration, less than 72 km/h (45 mph), especially when the vehicle is subjected to heavy acceleration or deceleration, is an indication of improper driveline angles. When these conditions exist, check the universal joints for proper seating, mounting and operation.

Center Bearing, Supercab 4X2 and 4X4

1. Unbolt the center bearing mount and spin the bearing. If bearing does not rotate freely it must be replaced.

2. Inspect the rubber insulator for evidence of hardening, cracking or deterioration before removing shaft. Replace if damaged. Refer to the 1997 Ranger Workshop Manual, Pages 05-01-14 and -15, for center bearing and rubber insulator service.

NOTE:

IF DRIVESHAFT AND COUPLING SHAFT ARE REMOVED, MAKE SURE THE YOKE IS REINSTALLED ON THE COUPLING SHAFT IN THE SAME ORIENTATION AS IT WAS ORIGINALLY INSTALLED. THE ORIENTATION IS CRITICAL SO THAT PROPER DRIVESHAFT BALANCE AND UNIVERSAL JOINT PHASING IS MAINTAINED. TORQUE THE ATTACHING NUT TO 136-163 N.m (100-120 LB-FT).

NOTE:

THE DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE ARE THE MOST RECENT RELEASED FOR SERVICE. REFER TO OTHER TSB ARTICLES LISTED FOR 1993 AND PRIOR MODELS.

Cross-Member: Customer Interest Frame/Crossmember - Snapping/Popping Noise

Article No. 94-8-13

^ FRAME - # 1 CROSSMEMBER - RIVET REPLACEMENT

^ NOISE - "POPPING/CREAKING" SOUNDS - FRAME # 1 CROSSMEMBER

LIGHT TRUCK: 1980-94 BRONCO, F-150-350 SERIES 1988-94 F SUPER DUTY, F-47

This TSB article is being republished in its entirety to add certain 1992/94 model year vehicles, to revise the nut specified in the article and its torque specification, and to expand the diagnostic and repair procedures contained in the article.

ISSUE:

A "popping/creaking" sound may come from the area of the # 1 crossmember attachment to the left frame rail. This occurs because of a slip/stick motion at a loose rivet in the lower flange of the frame near the steering gear. The rivet could be either a standard cold head rivet in light duty applications or a "huck" rivet, which has the appearance of a large "pop" Civet.

ACTION:

Use the following diagnostic procedure to determine if the noise is originating in this rivet area. If so, replace the rivet with a nut, bolt and washer assembly. The revised parts increase the clamp load at the joint, minimizing the motion that causes the noise. Refer to the following procedure for service details.

SOURCES OF VARIOUS FRONT UNDERBODY NOISES:

Various front underbody noises may originate from several different sources. Several noises have been misdiagnosed as # 1 crossmember rivet "pop/creak" because the noise tends to propagate to the shock tower area and the shock tower area acts as an amplifier such that the noises all appear to be coming from that area. Other underbody areas that produce similar noises include:

^ loose or improperly seated shock tower rivets

^ loose or misaligned transmission crossmembers

^ loose radius arm brackets

^ loose axle pivot brackets

Other service bulletins have been published to address the proper repair of these concerns.

DESCRIPTION OF # 1 CROSSMEMBER NOISES:

"Pop/creak" - A metal-to-metal rubbing motion which slip/sticks when a twist is induced into the frame.

DIAGNOSTIC PROCEDURE:

1. INTERVIEW THE CUSTOMER:

a. Understand the customer's description of the noise and of the conditions under which it is heard.

b. Road test the vehicle with the customer to fully understand where, how and when the noise occurs.

2. DUPLICATE THE NOISE CONCERN:

a. Drive the vehicle around for at least 15 minutes to warm-up and stress the frame joints, so that any frame noise is more likely to be repeatable in the garage.

b. Test the following situations:

^ Can the noise be duplicated while stationary and on dry pavement by repeatedly turning the steering wheel from steering stop to steering stop?

^ Can the noise be repeated while on the hoist without the suspension loaded by repeatedly turning the steering wheel from steering stop to steering stop?

Typically, the twist in the frame can be induced by turning the steering wheel back and forth from steering stop to steering stop to duplicate the noise at the # 1 crossmember attachment. IF THE NOISE IS NOT DUPLICATED UNDER ONE OF THESE SITUATIONS, INVESTIGATE OTHER AREAS FOR THE NOISE BEFORE PROCEEDING TO REPAIR THE # 1 CROSSMEMBER RIVET.

3. INSPECT FRAME BOLTS FOR PROPER INSTALLATION TORQUE:

a. Inspect and tighten all front end components which bolt to the frame to confirm they are at the proper torque. This includes, but is not limited to:

^ Radius arm bracket bolts - 135 +/- 20 N-m (100 +/- 15 lb.ft.)

^ Axle pivot bracket bolts (torques vary by model - refer to the appropriate light truck Service Manual for proper torque specifications)

^ Bumper bracket bolts - (refer to the appropriate light truck Service Manual for proper torque specifications)

b. Inspect the transmission crossmember for proper alignment and bolt torques. If misaligned:

^ Loosen all transmission crossmember fasteners (including to the transmission).

^ Lift the transmission to remove any load on the crossmember.

^ Lift and reposition the transmission crossmember to be centered on the frame attachment holes.

^ Tighten all frame fasteners to the 63 +/- 9 N-m (46 +/- 7 lb.ft.).

^ Lower the transmission and tighten fasteners to 95 +/- 15 N-m (70 +/- 11 lb.ft.).

4. TEST DRIVE THE VEHICLE

Road test the vehicle again to duplicate the concern. If the noise is still present, continue.

5. INSPECT THE FRAME RIVETS

a. Repeat Step 2 to duplicate the noise in the garage.

b. Use a stethoscope or chassis ears to isolate the area of the chassis that the noise appears to be originating from. Areas to check include the shock tower rivets and all # 1 crossmember rivets.

6. SERVICE THE VEHICLE

a. If the noise appears to be from the lower left-front # 1 crossmember fastener, follow the procedure outlined below.

b. If the noise appears to be coming from another rivet (other than the lower left front # 1 crossmember rivet), refer to TSB 93-6-10 for the proper rivet repair procedure.

LOWER LEFT FRONT # 1 CROSSMEMBER RIVET REPLACEMENT:

NOTE:

THIS SERVICE PROCEDURE DOES NOT APPLY TO STEERING GEAR LINER REPLACEMENT. REFER TO TSB 90-11-10 FOR STEERING GEAR LINER REPAIR PROCEDURE.

1. Remove damaged or loose COLD HEAD RIVETS:

a. Drill a 1/8" (3.175 mm) hole through the rivet.

b. Redrill the same hole through the shank of the rivet with a 3/8" (9.525 mm) drill.

c. Remove the rivet head with an air chisel.

d. Drive out the rivet with a punch and hammer.

2. Remove damaged or loose "HUCK" RIVETS:

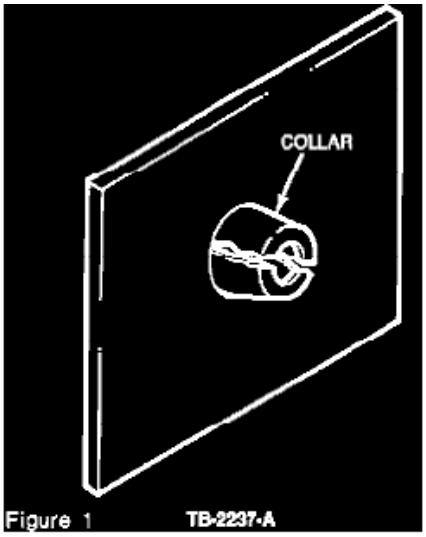


Figure 1 TB-2237-A

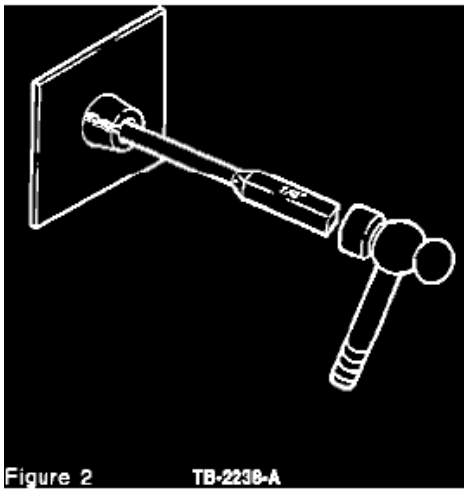


Figure 2 TB-2238-A

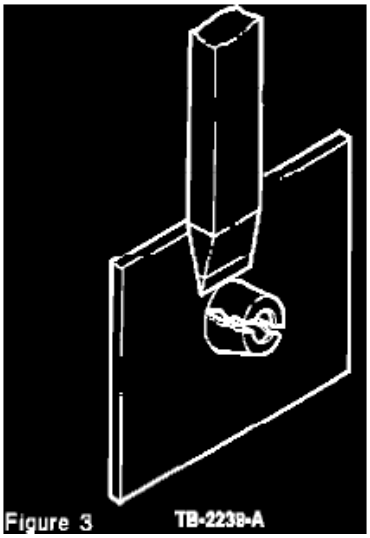
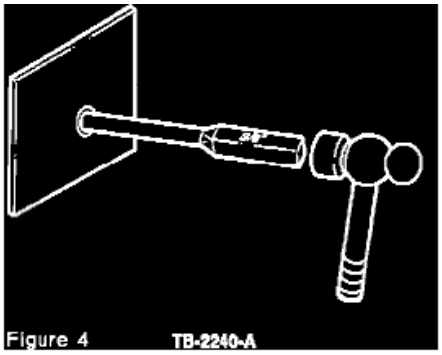


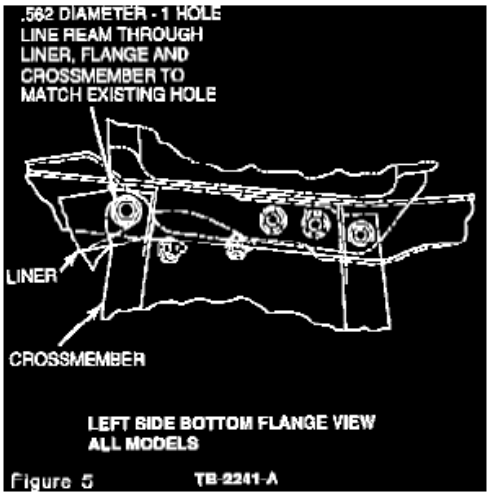
Figure 3 TB-2238-A

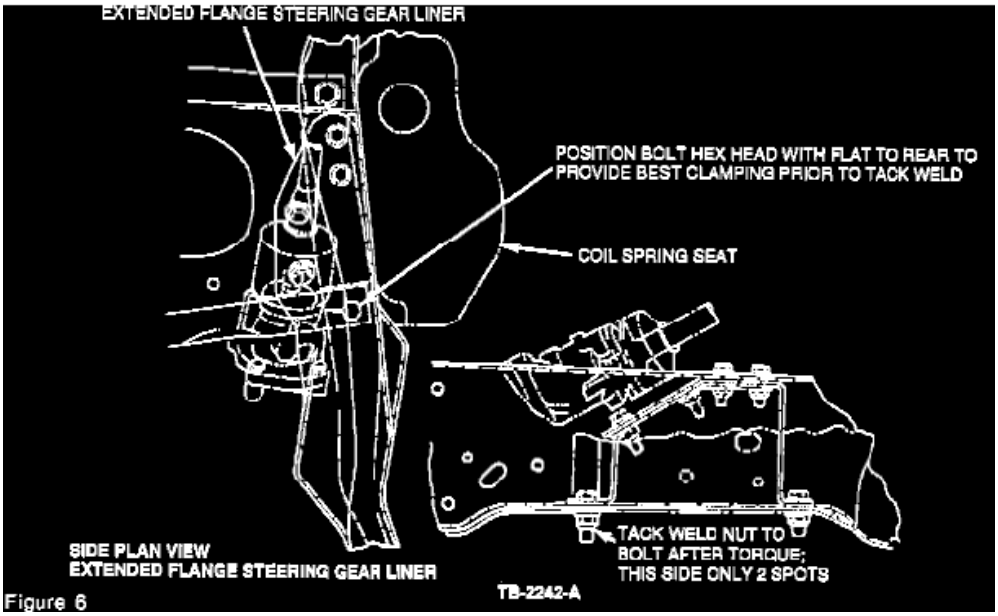
a. Use a flat chisel and hammer (or air chisel) to split the exposed collar of the huck fastener, Figure 1.

b. Knock the rivet pin out of the blind side with a 1/4" (6.35 mm) drift punch and hammer, Figure 2.

c. Cut the rivet's head off with a hammer and flat chisel, Figure 3.







d. Knock the sleeve out of the blind side with a 3/8" (9.525 mm) drift punch and hammer, Figure 4.

CAUTION:

REMOVAL OF THE FASTENER WITH A CUTTING TORCH IS NOT RECOMMENDED BECAUSE OF PROBABLE DAMAGE TO THE FRAME STRUCTURE.

3. Line ream the existing hole through the liner, frame flange and crossmember to 9/16" (14.228 mm), Figure 5.

4. Install a 9/16" Grade 8 nut (34990-S4), bolt (58698-S2) and washer (44880-S2), with nut/washer on the bottom, Figure 6.

a. Push the bolt into place using a brazing rod to hold the bolt.

PART NUMBER	PART NAME	CLASS
34990-S4	Nut 9/16 - 12 Hex (Pkg. 5)	RG
44880-S2	Washer 9/16 (Pkg. 12)	BG
58698-S2	Bolt 9/16-12 x 1.75" (Pkg. 4)	BG

b. Slide the bolt into the opening between the front face of the crossmember and frame liner.

c. Tighten the nut to 140 4-3 lb.ft. (190 4-4 N-m) and tack weld the nut to the bolt after tightening.

CAUTION:

DO NOT WELD THE NUT/WASHER TO THE FRAME.

OTHER APPLICABLE ARTICLES: 91-11-10

SUPERSEDES: 91-25-18

WARRANTY STATUS:

Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 19 2-94 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940813A Perform Diagnostics And 1.9 Hrs.

Replace Rivet

DEALER CODING

BASIC PART NO. CONDITION CODE

5005 56

OASIS CODES: 305000, 390000, 702000, 702100

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE			
Model Year *	A4LD Trans -4R602-	Mazda R 1 Trans -4R602-	TSB Reference
1989 Models (Excluding Mitsubishi 5-Speed)	E8TZ-U	E9TZ-L	91-13-11
1990 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	F0TZ-F	F0TZ-B	91-13-11
1990-93 Models (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	F37Z-B	F37Z-A	94-2-24
1994 Models			
2.3L Splash 125" WB 4X2	F47Z-DA		
2.3L 125" WB 4X2	F37Z-B		
2.3L 125" WB 4X2		F37Z-A	
3.0L Splash 125" WB 4X2	F47Z-DA		
3.0L 125" WB 4X2	F37Z-B		
3.0L 125" WB 4X4	F37Z-C		
3.0L 125" WB 4X2		F37Z-A	
3.0L 125" WB 4X4		F37Z-C	
4.0L Splash 125" WB 4X2	F47Z-DA		
4.0L 125" WB 4X2	F37Z-B		
4.0L 125" WB 4X4	F37Z-C		
4.0L 125" WB 4X2		F37Z-A	
4.0L 125" WB 4X4		F37Z-C	
*1989 model part numbers are provided for convenience			

Technical Service Bulletin # 97-21-16 Date: 971013

Driveshaft - Boom/Vibration At 20-65 MPH

Article No. 97-21-16

10/13/97

^ NOISE - "BOOM" WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH) - SUPERCAB MODELS ONLY

^ DRIVESHAFT - "BOOM" VIBRATION WHEN DRIVING 32-105 KM/H (20-65 MPH)-SUPERCAB MODELS ONLY

LIGHT TRUCK: 1989-97 RANGER

This TSB article is being republished in its entirety to remove mention of build dates in title.

ISSUE: A driveline "boom" or vibration may be experienced when driving 32-105 km/h (20-65 mph) in some vehicles. This may occur because of driveline sensitivity of the vehicle.

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1995 Models		
2.3L Splash 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C
1996 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A
4.0L 125" WB 4X4		F57Z-C

RANGER SUPERCAB (-4R602-) DRIVESHAFT USAGE (Continued)

Model Year	A4LD Trans -4R602-	Mazda R-1 Trans -4R602-
1997 Models		
2.3L Splash 125" WB 4X2	F47Z-DA	
2.3L 125" WB 4X2	F57Z-B	
2.3L 125" WB 4X2		F57Z-A
2.3L 125" WB 4X2		F77Z-AA
3.0L Splash 125" WB 4X2	F47Z-DA	
3.0L 125" WB 4X2	F37Z-B	
3.0L 125" WB 4X4	F57Z-C	
3.0L 125" WB 4X2		F57Z-A
3.0L 125" WB 4X4		F57Z-C
4.0L Splash 125" WB 4X2	F47Z-DA	
4.0L 125" WB 4X2	F57Z-B	
4.0L 125" WB 4X4	F57Z-C	
4.0L 125" WB 4X2		F57Z-A

ACTION: Follow the Diagnostic Chart in this TSB article. Install revised design components as required to provide better isolation and improved driveline angles to resolve the concern. Refer to

the following Service Procedure for details.

NOTE:

THE SERVICE REPLACEMENT DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE WILL NOT FIT VEHICLES EQUIPPED WITH A MITSUBISHI MANUAL TRANSMISSION. IF DRIVESHAFT REPLACEMENT IS REQUIRED ON MITSUBISHI EQUIPPED MODELS, REFER TO THE PARTS CATALOG FOR CORRECT APPLICATION.

PARTS BLOCK AND TORQUE SPECIFICATION			
Part Number	**Part Name**	**Torque Spec.**	**Class**
390066-S2	Screw - Transmission Mount-To-Crossmember (Pk/2)	103 N•m (76 lb-ft)	S
N605800-S100	Bolt - Center Bearing Bracket-To-Frame	50 N•m (37 lb-ft)	BS
N802594-S56	Frame Cap Bolts	50 N•m (37 lb-ft)	C
N800594-S100	Cap Screws - Driveshaft-to-Rear Axle	100 N•m (74 lb-ft)	AM
N621945-S2	M12-1.75 Nut (Transmission Mount-To-Crossmember) (Pk/4)	103 N•m (76 lb-ft)	RS
N620482-S2	Frame Cap Nuts (Pk/8)	50 N•m (37 lb-ft)	BG
N801673-S2	Nut (Pk/8)	50 N•m (37 lb-ft)	BS
F37Z-6068-A	Transmission Mount	-	A
F37Z-4831-B	Frame - Crossmember Cap	-	C
E8TZ-4R602-U	Driveshaft - 1989 Models With Automatic Transmission	-	B
E9TZ-4R602-L	Driveshaft - 1989 Models With Manual Transmission	-	C
FOTZ-4R602-F	*Driveshaft - 1990 Models With Automatic Transmission - Vehicles Built Before 12/15/89*	-	B
FOTZ-4R602-B	Driveshaft - 1990 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built Before 12/15/89	-	C
F37Z-4R602-A	Driveshaft - 1990-93 Models With Manual Transmission (Excluding Mitsubishi 5-Speed) - Vehicles Built From 12/15/89 Through 3/30/93	-	C
F37Z-4R602-B	Driveshaft - 1990-93 Models With Automatic Transmission - Vehicles Built From 12/15/89 Through 3/30/93	-	C

Parts Block

OTHER APPLICABLE ARTICLES: 91-13-11, 93-18-15

SUPERSEDES: 97-20-16

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

For 1992-97 Models, Basic And Powertrain Warranty Coverage For 1989-91 Models

OPERATION DESCRIPTION TIME

972116A Replace Driveshaft 1.3 Hrs.

Assembly, And Replace Center Bearing Crossmember Cap As Outlined

DEALER CODING

CONDITION

BASIC PART NO. CODE

4R602 D9

OASIS CODES: 304000, 509000, 597997, 703000, 703200

Service Procedure

NOTE:

BEFORE DIAGNOSING A 4-WHEEL-DRIVE VEHICLE, MAKE SURE IT IS IN 2WD AND THE FRONT HUBS ARE UNLOCKED.

1. On smooth pavement, drive the vehicle at a constant speed and feel for the "float" condition:

a. This is the narrow, neutral range where the driveline can be said to "float" because neither accel nor decel forces are being applied to the driveline.

b. It is important to accurately identify vehicle behavior in "float" mode because the diagnostic routine to be used will depend on Noise/Vibration/Harshness (NVH) characteristics during float.

c. It may be necessary to drive the vehicle several minutes before the sensation can be clearly identified.

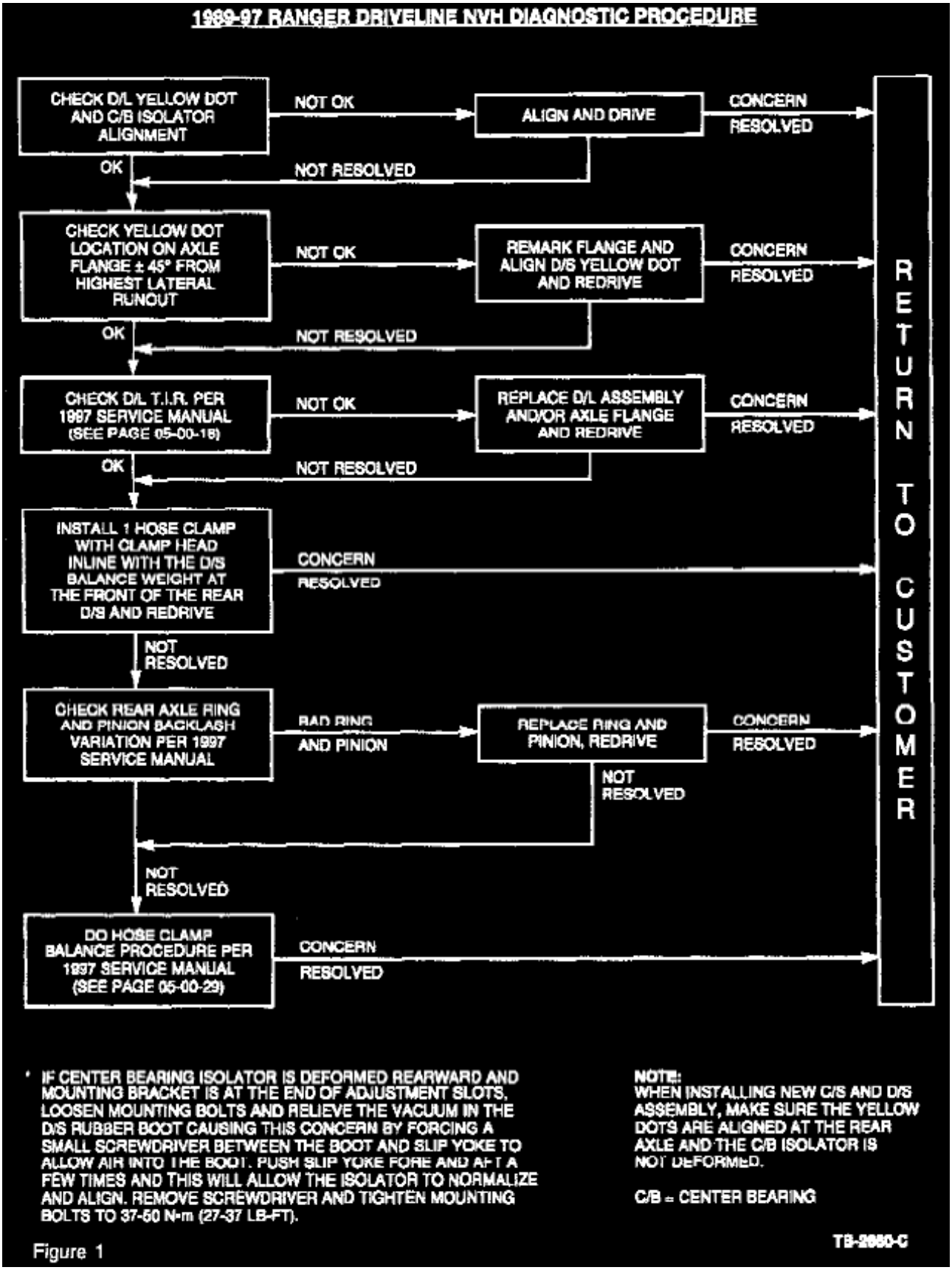


Figure 1

2. Perform the Driveline NVH Diagnostic Procedure shown in Figure 1 BEFORE replacing any components.

Vibration

Vibration, technically, is a high-frequency trembling, shaking or grounding condition, felt or heard, that is constant or variable in level and occurs during a portion of the total operating speed range. The types of vibrations that can be felt in the vehicle can be divided into three groups:

^ Vibrations of various unbalanced rotating parts of the vehicle

^ Body and frame vibrations excited by the powertrain, wind or road inputs

^ Tip-in moans or resonance vibrations from stressed engine or exhaust system mounts

If vibration is gone, check the front driveshaft, transfer case, front axle, or halfshafts for loose components. Refer to the 1997 Ranger Service Manual, Section 05-03B, for details.

NOTE:

DRIVING A 4-WHEEL-DRIVE VEHICLE WITH THE REAR DRIVESHAFT REMOVED FURTHER CONFIRMS ANY VIBRATION CONCERNS WITH THE FRONT DRIVE SYSTEM.

These vehicle vibrations can also be subdivided into those that occur at low speeds and those that are most noticeable at higher speeds. Since the dividing line between low and higher speed vibrations is not clear, there will be vibrations that overlap the two ranges.

Typical Low Speed Vibrations (less than 72 km/h (45 mph))

^ Exhaust vibration

^ Engine harshness

^ Driveline vibration due to improper driveline angles

^ Power steering pump disturbances

^ Air conditioner compressor or drive belt vibrations

^ Takeoff shudder (clutch or driveline problems)

^ Brake roughness or harshness

^ Driveline roughness

^ Clutch torsion vibration

^ Driveline slip-yoke or U-joints

Typical High Speed Vibrations (above than 72 km/h (45 mph))

^ Axle and companion flange runout or imbalance

^ Driveshaft imbalance

^ Excessive tire-wheel and drum assembly imbalance

^ Tire roughness due to high non-uniformity (force variation) or out-of-balance condition

^ Rear axle pinion gear pitch line runout

^ Excessive tire and wheel run out

^ Worn suspension components

^ Front end accessory vibrations

^ Exhaust vibration - Exhaust vibration is greatly reduced in Ranger exhaust systems de-coupled by a flexible coupling and mounted with blade and block hangers

Driveshaft Vibrates

1. Road test vehicle to determine critical vibration points. Note road speed, engine rpm and shift lever positions at which vibration occurs.

2. Stop vehicle and run engine with clutch depressed (automatic transmission in Neutral) through critical speed ranges determined in Step 1 of Driveshaft Vibrates.

3. If vibration is gone, the driveshaft must be balanced as described in the 1997 Ranger Service Manual, Page 05-00-29.

Component Test

Driveline Vibration

^ Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake

^ Driveline vibration is directly related to the speed of the vehicle and is usually noticed at speeds of 72 km/h (45 mph) or higher

^ Driveline vibration can be perceived as a tremor in the floor pan or is heard as a rumble, hum or boom

^ Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. If the vibration is

particularly noticeable during acceleration or deceleration, especially at lower speeds, then driveline angle should be checked

^ Driveline vibration can be duplicated by supporting the axle upon a hoist or upon jackstands, though the brakes may need to be applied lightly in order to simulate road resistance. Refer to the 1997 Ranger Service Manual, Page 05-00-15, Steps 1-10

Driveshaft Runout and Balance

Vibration or shudder which is noticeable either on fast acceleration, when coasting, or when using the engine for braking, may be caused by the rear axle housing being loose on the rear suspension, improper tire balance, improper driveline installation, or driveline balance.

If driveshaft components are replaced and shaft vibration is encountered after installation, disconnect and remove the driveshaft. Rotate the rear axle companion flange 180 degrees; then, reconnect the driveshaft to the driveshaft slip-yoke and reinstall in vehicle. If the vibration persists, disconnect the driveshaft at the rear axle companion flange. Rotate the rear axle companion flange 180 degrees and reconnect the driveshaft to the rear axle companion flange.

If rotating the driveshaft 180 degrees does not eliminate vibration, the driveshaft may be balanced by referring to the 1997 Ranger Service Manual, Page 05-00-29, Steps 1-9, for details.

Slip-Yoke Spline

Vehicle noise and vibration can be caused by a seized driveshaft slip-yoke spline. The service resolution to minimize driveshaft slip-yoke spline contamination and ultimate seizure can be found in the 1997 Ranger Service Manual, Page 05-00-32, Steps 1-11.

Driveline Angularity

Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height (rear spring) and engine mounts.

Low speed vibration, less than 72 km/h (45 mph), especially when the vehicle is subjected to heavy acceleration or deceleration, is an indication of improper driveline angles. When these conditions exist, check the universal joints for proper seating, mounting and operation.

Center Bearing, Supercab 4X2 and 4X4

1. Unbolt the center bearing mount and spin the bearing. If bearing does not rotate freely it must be replaced.

2. Inspect the rubber insulator for evidence of hardening, cracking or deterioration before removing shaft. Replace if damaged. Refer to the 1997 Ranger Workshop Manual, Pages 05-01-14 and -15, for center bearing and rubber insulator service.

NOTE:

IF DRIVESHAFT AND COUPLING SHAFT ARE REMOVED, MAKE SURE THE YOKE IS REINSTALLED ON THE COUPLING SHAFT IN THE SAME ORIENTATION AS IT WAS ORIGINALLY INSTALLED. THE ORIENTATION IS CRITICAL SO THAT PROPER DRIVESHAFT BALANCE AND UNIVERSAL JOINT PHASING IS MAINTAINED. TORQUE THE ATTACHING NUT TO 136-163 N.m (100-120 LB-FT).

NOTE:

THE DRIVESHAFTS CONTAINED IN THIS TSB ARTICLE ARE THE MOST RECENT RELEASED FOR SERVICE. REFER TO OTHER TSB ARTICLES LISTED FOR 1993 AND PRIOR MODELS.

Cross-Member: All Technical Service Bulletins Frame/Crossmember - Snapping/Popping Noise

Article No. 94-8-13

^ FRAME - # 1 CROSSMEMBER - RIVET REPLACEMENT

^ NOISE - "POPPING/CREAKING" SOUNDS - FRAME # 1 CROSSMEMBER

LIGHT TRUCK: 1980-94 BRONCO, F-150-350 SERIES 1988-94 F SUPER DUTY, F-47

This TSB article is being republished in its entirety to add certain 1992/94 model year vehicles, to revise the nut specified in the article and its torque specification, and to expand the diagnostic and repair procedures contained in the article.

ISSUE:

A "popping/creaking" sound may come from the area of the # 1 crossmember attachment to the left frame rail. This occurs because of a slip/stick motion at a loose rivet in the lower flange of the frame near the steering gear. The rivet could be either a standard cold head rivet in light duty applications or a "huck" rivet, which has the appearance of a large "pop" Civet.

ACTION:

Use the following diagnostic procedure to determine if the noise is originating in this rivet area. If so, replace the rivet with a nut, bolt and washer assembly. The revised parts increase the clamp load at the joint, minimizing the motion that causes the noise. Refer to the following procedure for service details.

SOURCES OF VARIOUS FRONT UNDERBODY NOISES:

Various front underbody noises may originate from several different sources. Several noises have been misdiagnosed as # 1 crossmember rivet "pop/creak" because the noise tends to propagate to the shock tower area and the shock tower area acts as an amplifier such that the noises all appear to be coming from that area. Other underbody areas that produce similar noises include:

^ loose or improperly seated shock tower rivets

^ loose or misaligned transmission crossmembers

^ loose radius arm brackets

^ loose axle pivot brackets

Other service bulletins have been published to address the proper repair of these concerns.

DESCRIPTION OF # 1 CROSSMEMBER NOISES:

"Pop/creak" - A metal-to-metal rubbing motion which slip/sticks when a twist is induced into the frame.

DIAGNOSTIC PROCEDURE:

1. INTERVIEW THE CUSTOMER:

a. Understand the customer's description of the noise and of the conditions under which it is heard.

b. Road test the vehicle with the customer to fully understand where, how and when the noise occurs.

2. DUPLICATE THE NOISE CONCERN:

a. Drive the vehicle around for at least 15 minutes to warm-up and stress the frame joints, so that any frame noise is more likely to be repeatable in the garage.

b. Test the following situations:

^ Can the noise be duplicated while stationary and on dry pavement by repeatedly turning the steering wheel from steering stop to steering stop?

^ Can the noise be repeated while on the hoist without the suspension loaded by repeatedly turning the steering wheel from steering stop to steering stop?

Typically, the twist in the frame can be induced by turning the steering wheel back and forth from steering stop to steering stop to duplicate the noise at the # 1 crossmember attachment. IF THE NOISE IS NOT DUPLICATED UNDER ONE OF THESE SITUATIONS, INVESTIGATE OTHER AREAS FOR THE NOISE BEFORE PROCEEDING TO REPAIR THE # 1 CROSSMEMBER RIVET.

3. INSPECT FRAME BOLTS FOR PROPER INSTALLATION TORQUE:

a. Inspect and tighten all front end components which bolt to the frame to confirm they are at the proper torque. This includes, but is not limited to:

^ Radius arm bracket bolts - 135 +/- 20 N-m (100 +/- 15 lb.ft.)

^ Axle pivot bracket bolts (torques vary by model - refer to the appropriate light truck Service Manual for proper torque specifications)

^ Bumper bracket bolts - (refer to the appropriate light truck Service Manual for proper torque specifications)

b. Inspect the transmission crossmember for proper alignment and bolt torques. If misaligned:

^ Loosen all transmission crossmember fasteners (including to the transmission).

^ Lift the transmission to remove any load on the crossmember.

^ Lift and reposition the transmission crossmember to be centered on the frame attachment holes.

^ Tighten all frame fasteners to the 63 +/- 9 N-m (46 +/- 7 lb.ft.).

^ Lower the transmission and tighten fasteners to 95 +/- 15 N-m (70 +/- 11 lb.ft.).

4. TEST DRIVE THE VEHICLE

Road test the vehicle again to duplicate the concern. If the noise is still present, continue.

5. INSPECT THE FRAME RIVETS

a. Repeat Step 2 to duplicate the noise in the garage.

b. Use a stethoscope or chassis ears to isolate the area of the chassis that the noise appears to be originating from. Areas to check include the shock tower rivets and all # 1 crossmember rivets.

6. SERVICE THE VEHICLE

a. If the noise appears to be from the lower left-front # 1 crossmember fastener, follow the procedure outlined below.

b. If the noise appears to be coming from another rivet (other than the lower left front # 1 crossmember rivet), refer to TSB 93-6-10 for the proper rivet repair procedure.

LOWER LEFT FRONT # 1 CROSSMEMBER RIVET REPLACEMENT:

NOTE:

THIS SERVICE PROCEDURE DOES NOT APPLY TO STEERING GEAR LINER REPLACEMENT. REFER TO TSB 90-11-10 FOR STEERING GEAR LINER REPAIR PROCEDURE.

1. Remove damaged or loose COLD HEAD RIVETS:

a. Drill a 1/8" (3.175 mm) hole through the rivet.

b. Redrill the same hole through the shank of the rivet with a 3/8" (9.525 mm) drill.

c. Remove the rivet head with an air chisel.

d. Drive out the rivet with a punch and hammer.

2. Remove damaged or loose "HUCK" RIVETS:

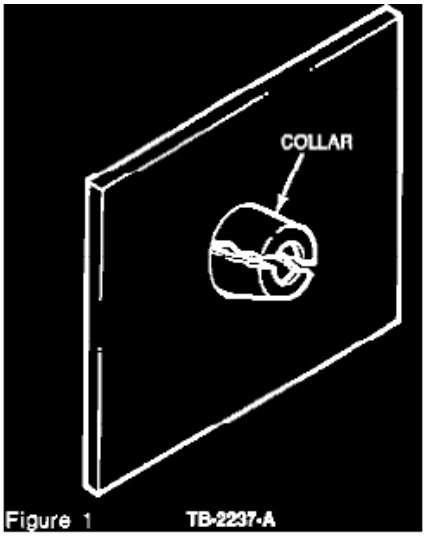


Figure 1 TB-2237-A

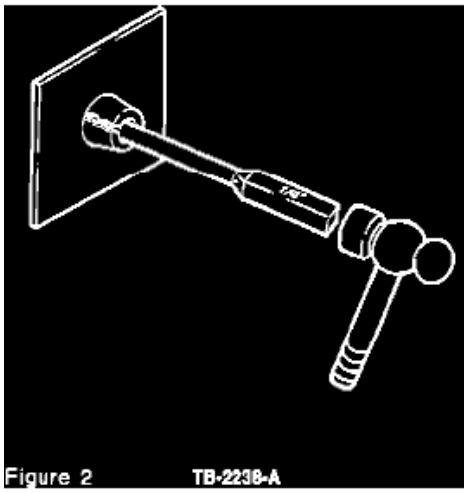


Figure 2 TB-2238-A

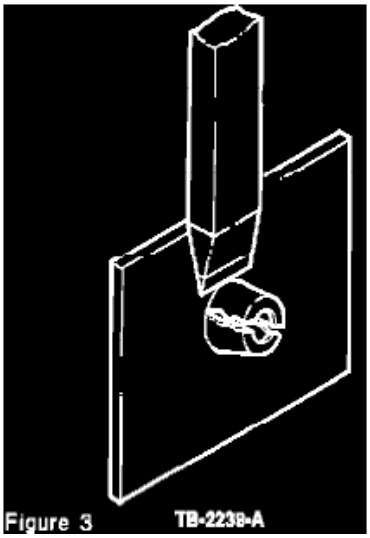
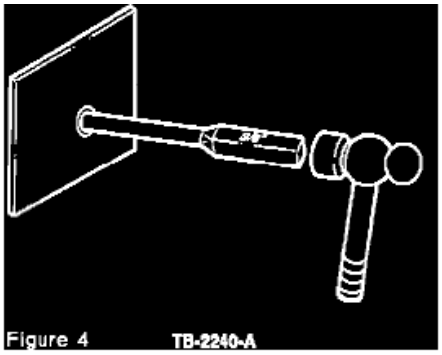


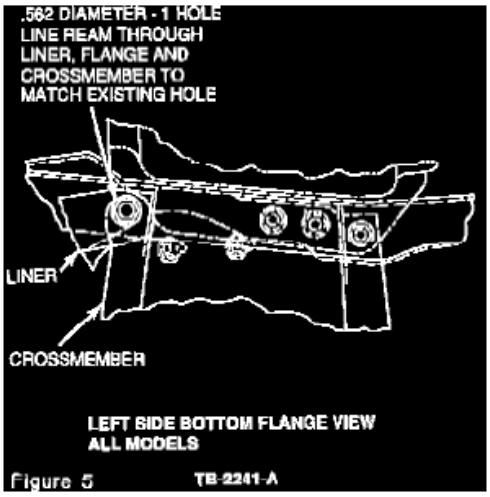
Figure 3 TB-2238-A

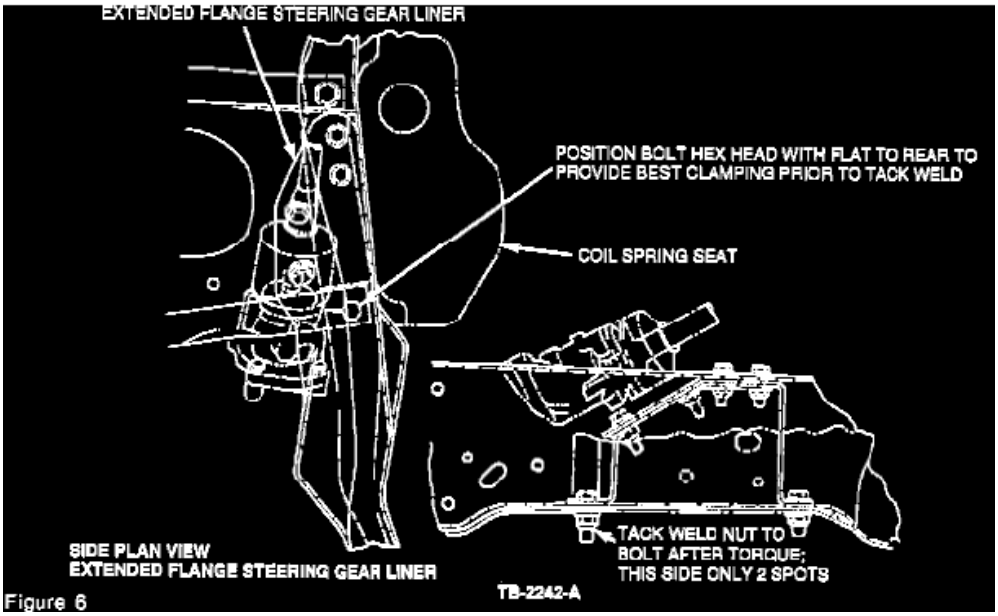
a. Use a flat chisel and hammer (or air chisel) to split the exposed collar of the huck fastener, Figure 1.

b. Knock the rivet pin out of the blind side with a 1/4" (6.35 mm) drift punch and hammer, Figure 2.

c. Cut the rivet's head off with a hammer and flat chisel, Figure 3.







d. Knock the sleeve out of the blind side with a 3/8" (9.525 mm) drift punch and hammer, Figure 4.

CAUTION:

REMOVAL OF THE FASTENER WITH A CUTTING TORCH IS NOT RECOMMENDED BECAUSE OF PROBABLE DAMAGE TO THE FRAME STRUCTURE.

3. Line ream the existing hole through the liner, frame flange and crossmember to 9/16" (14.228 mm), Figure 5.

4. Install a 9/16" Grade 8 nut (34990-S4), bolt (58698-S2) and washer (44880-S2), with nut/washer on the bottom, Figure 6.

a. Push the bolt into place using a brazing rod to hold the bolt.

PART NUMBER	PART NAME	CLASS
34990-S4	Nut 9/16 - 12 Hex (Pkg. 5)	RG
44880-S2	Washer 9/16 (Pkg. 12)	BG
58698-S2	Bolt 9/16-12 x 1.75" (Pkg. 4)	BG

b. Slide the bolt into the opening between the front face of the crossmember and frame liner.

c. Tighten the nut to 140 4-3 lb.ft. (190 4-4 N-m) and tack weld the nut to the bolt after tightening.

CAUTION:

DO NOT WELD THE NUT/WASHER TO THE FRAME.

OTHER APPLICABLE ARTICLES: 91-11-10

SUPERSEDES: 91-25-18

WARRANTY STATUS:

Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 19 2-94 Models, Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

940813A Perform Diagnostics And 1.9 Hrs.

Replace Rivet

DEALER CODING

BASIC PART NO. CONDITION CODE

5005 56

OASIS CODES: 305000, 390000, 702000, 702100

Arm Rest: Customer Interest Front Seat Center Armrest - Loose/Wobbles

Article No. 94-24-10

11/28/94

FRONT SEAT CENTER ARMREST - LOOSE AND WOBBLES - VEHICLES WITH BUCKET SEATS AND FLOOR CONSOLE

LIGHT TRUCK: 1989-90 BRONCO II 1989-94 RANGER 1991-94 EXPLORER

ISSUE: The front seat center console may become loose and wobble from side to side. This may be caused by the console armrest mounting bracket becoming loose and/or weak under extreme load conditions.

ACTION: Replace the center armrest console bracket with a new, more robust center armrest console bracket. Refer to the following for service details.

SERVICE PROCEDURE

REMOVAL

1. Verify the concern.

NOTE:

ALSO INSPECT THE ARMREST MOUNTING BRACKET WHICH RETAINS THE ARMREST TO THE CONSOLE. IF THE ARMREST BRACKET IS CONSTRUCTED OF PLASTIC, REFER TO TSB 93-23-19 FOR MORE DETAILS.

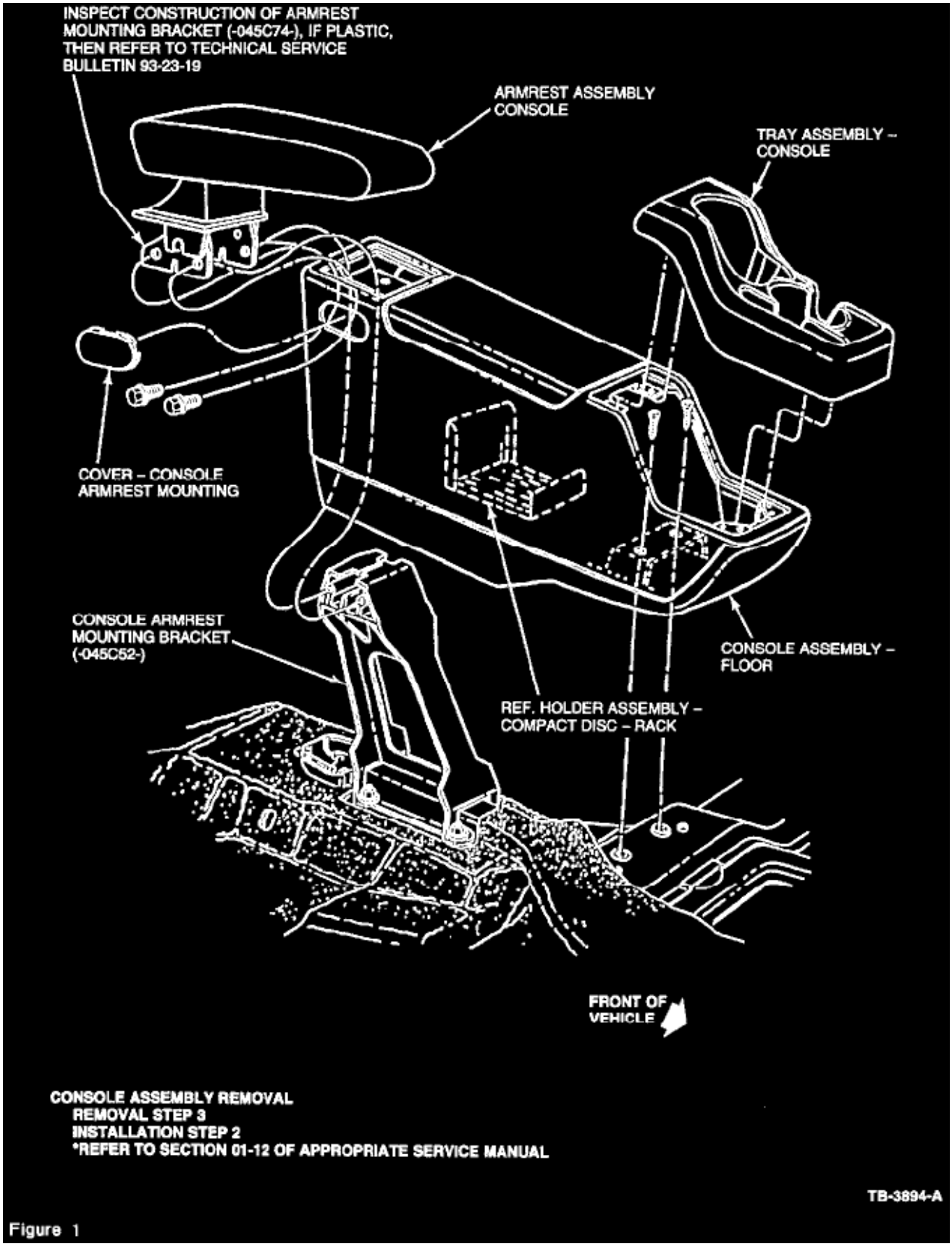

INSPECT CONSTRUCTION OF ARMREST MOUNTING BRACKET (-045C74-), IF PLASTIC, THEN REFER TO TECHNICAL SERVICE BULLETIN 93-23-19
ARMREST ASSEMBLY CONSOLE
TRAY ASSEMBLY – CONSOLE
COVER – CONSOLE ARMREST MOUNTING
CONSOLE ARMREST MOUNTING BRACKET (-045C52-)
CONSOLE ASSEMBLY – FLOOR
REF. HOLDER ASSEMBLY – COMPACT DISC – RACK
FRONT OF VEHICLE
CONSOLE ASSEMBLY REMOVAL
REMOVAL STEP 3
INSTALLATION STEP 2
*REFER TO SECTION 01-12 OF APPROPRIATE SERVICE MANUAL
TB-3894-A

Figure 1

2. Remove the floor console assembly from the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for removal procedures.

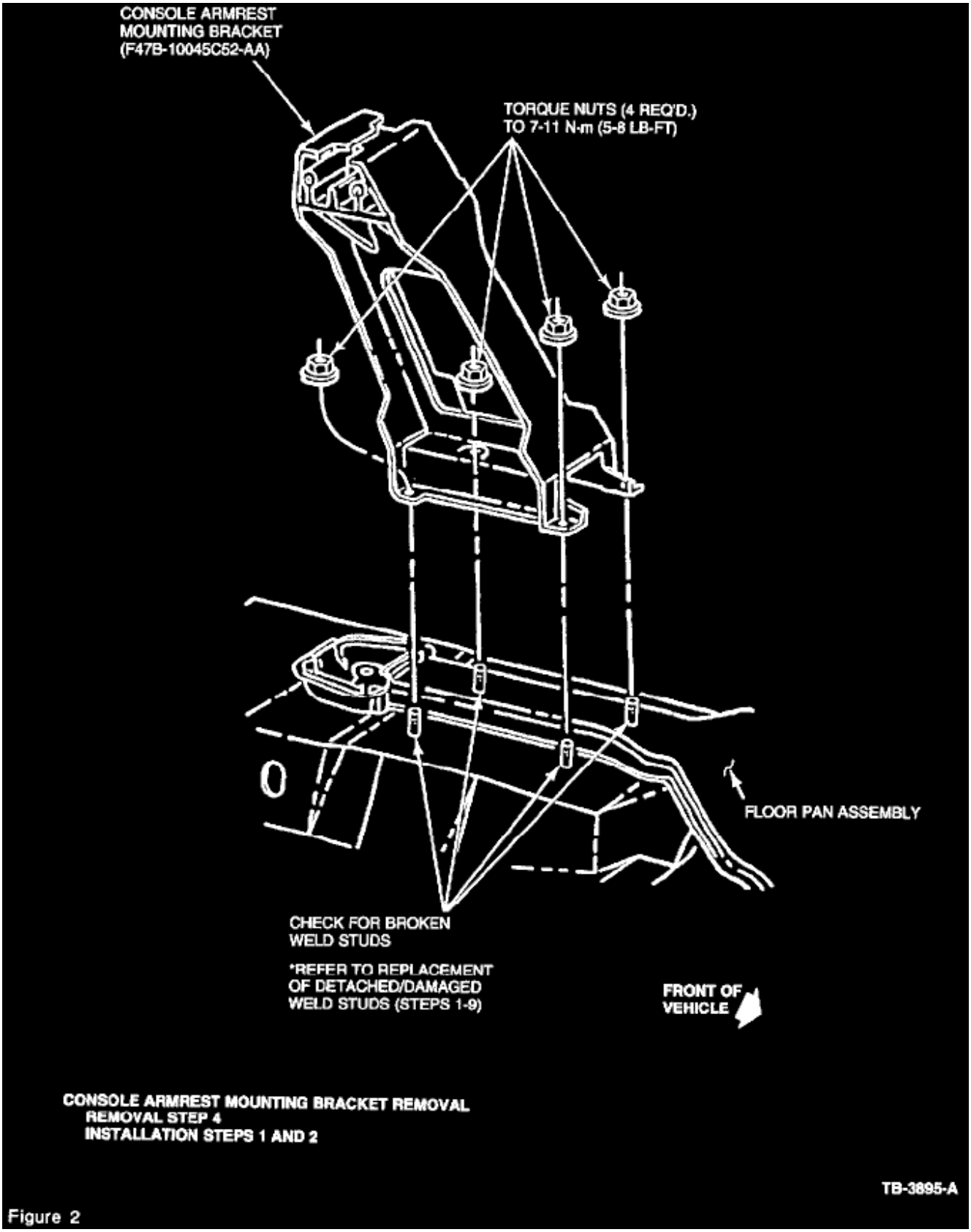

CONSOLE ARMREST
MOUNTING BRACKET
(F47B-10045C52-AA)
TORQUE NUTS (4 REQ'D.)
TO 7-11 N·m (5-8 LB-FT)
FLOOR PAN ASSEMBLY
CHECK FOR BROKEN
WELD STUDS
*REFER TO REPLACEMENT
OF DETACHED/DAMAGED
WELD STUDS (STEPS 1-9)
FRONT OF
VEHICLE
CONSOLE ARMREST MOUNTING BRACKET REMOVAL
REMOVAL STEP 4
INSTALLATION STEPS 1 AND 2
TB-3895-A

Figure 2

3. Remove the four (4) nuts retaining the old console armrest mounting bracket to the floor pan. Save the nuts and discard the bracket. Refer to Figure 2.

INSTALLATION

NOTE:

BEFORE PROCEEDING, THE WELD STUDS MUST BE INSPECTED FOR DAMAGE (BENT, STRIPPED, SHEARED). IF ANY OF THESE CONDITIONS EXIST, THE WELD STUD(S) MUST BE REPLACED. REFER TO THE REPLACEMENT OF WELD STUD(S) SERVICE PROCEDURE LOCATED IN THIS ARTICLE BEFORE INSTALLING THE NEW BRACKET.

1. Position the armrest mounting bracket onto the weld studs and tighten nuts to 7-11 N-m (5-8 lb.ft.). Refer to Figure 2.

2. Install the floor console assembly into the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for installation procedures.

PART NUMBER	PART NAME	CLASS
F47Z-10045C52-A	Bracket - Console Armrest Mounting - Ranger (Std. Cab)	C
F47Z-78045C52-A	Bracket - Console Armrest Mounting - Ranger (Super Cab), Explorer, Bronco II	A
N606676-S36	Bolt	BR
N621905-S2	Nut	BS
F3AZ-19515-SA	SuperSeal	B

3. Verify proper function of the armrest.

4. Following the instructions and precautions on the can, apply SuperSeal (F3AZ-19515-SA) to the affected area to ensure a proper seal.

REPLACEMENT OF WELD STUD(S)

1. Use a grinding wheel or equivalent tool to remove damaged weld stud(s) from floor pan.

2. Use a punch and hammer to center punch location of damaged weld stud(s).

3. Drill 1/4 inch diameter hole(s) at center punch mark(s).

4. Insert repair bolt(s) (N606676-S36) and washer(s) through hole(s) and new console bracket from underside of vehicle.

5. Install repair nut(s) (N621905-S2) and torque to 9-11 N-m (6-8 lb.ft.).

6. Refer to the Installation Procedure in this TSB to complete the installation procedure.

Parts Block

OTHER APPLICABLE ARTICLES: 93-23-19 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

942410A Replace Armrest Bracket 0.6 Hr.

942410B Additional Time To Replace 0.2 Hr.

One Damaged Weld Stud

942410C Additional Time To Replace 0.3 Hr.

Two Or Three Damaged Weld Studs

942410D Additional Time To Replace 0.4 Hr.

All Four Damaged Studs

DEALER CODING

BASIC PART NO. CONDITION CODE

7045C52 01

OASIS CODES: 101000, 107000

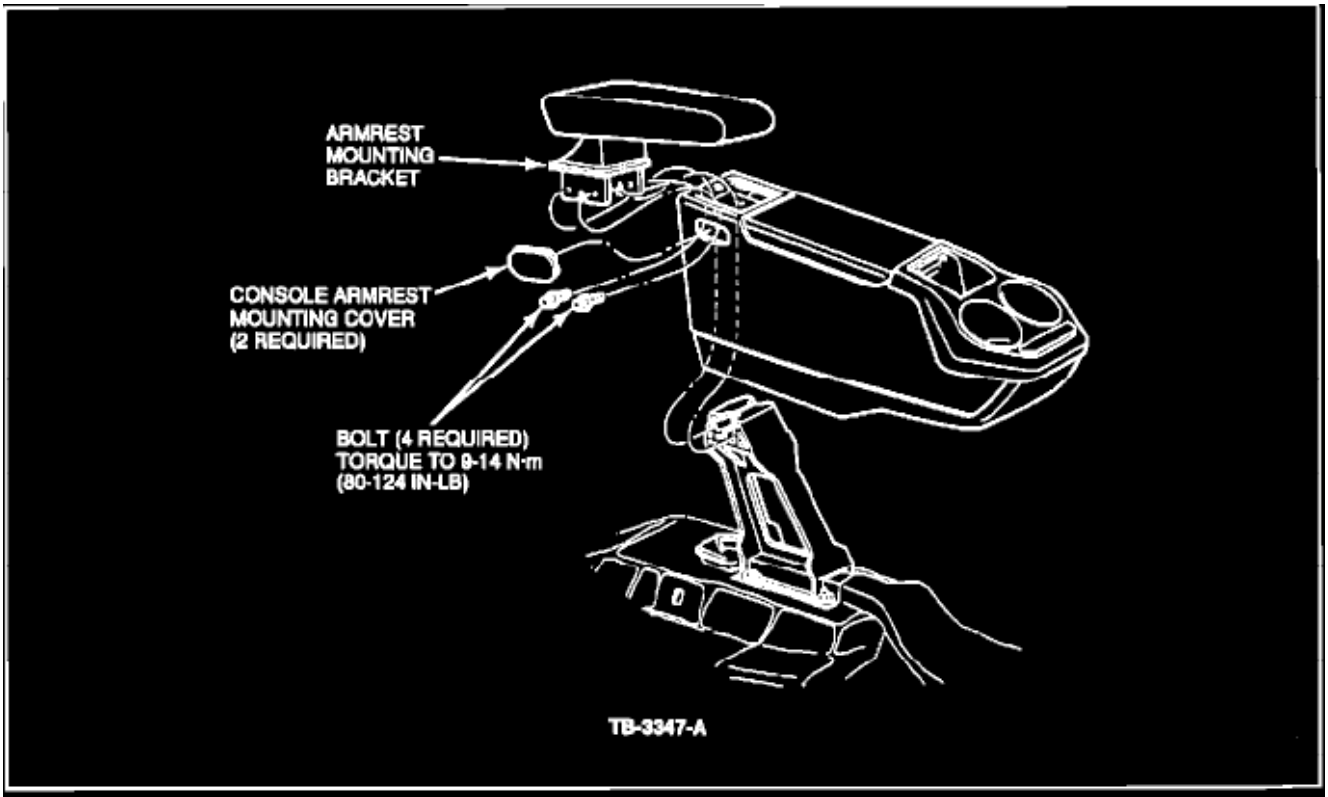


Figure 1

Arm Rest: Customer Interest Armrest Mounting Bracket - Broken

Article No. 93-23-19

11/10/93

INTERIOR TRIM - ARMREST - PLASTIC MOUNTING BRACKET BREAKS

LIGHT TRUCK: 1991-93 EXPLORER, RANGER

ISSUE: The plastic mounting bracket which retains the armrest to the console may break. It is now possible to replace the console armrest mounting bracket independently of the entire assembly.

ACTION: Replace the broken armrest bracket with a new steel reinforced armrest bracket. Refer to the following procedure for service details.

1. Remove the console armrest covers, Figure 1.

2. Remove the four (4) bolts retaining the armrest assembly to the console, Figure 1.

3. Remove the armrest assembly.

4. Follow Instruction Sheet # 6489 included in each armrest service kit for bracket replacement.

5. Reinstall the armrest and bracket assembly to console.

6. Reinstall console armrest mounting covers.

PART NUMBER	PART NAME	CLASS
F37Z-10047A20-A	Armrest Bracket Service Kit (1991-92 Crystal Blue)	A
F37Z-10047A20-B	Armrest Bracket Service Kit (1991-92 Sandalwood)	A
F37Z-10047A20-C	Armrest Bracket Service Kit (1991-92 Scarlet)	A
F37Z-10047A20-D	Armrest Bracket Service Kit (1991-92 Smoke)	A
F37Z-10047A20-E	Armrest Bracket Service Kit (1993-94 Blue "Lapis")	A
F37Z-10047A20-F	Armrest Bracket Service Kit (1993-94 Mocha)	A
F37Z-10047A20-G	Armrest Bracket Service Kit (1993-94 Opal)	A
F37Z-10047A20-H	Armrest Bracket Service Kit (1993-94 Ruby)	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992/1993 Models And Eligible Under Basic Warranty Coverage For 1991 Models

OPERATION DESCRIPTION TIME

932319A Replace Armrest Bracket 0.4 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

70047A20 01

OASIS CODES: 101000, 107000

Arm Rest: All Technical Service Bulletins Front Seat Center Armrest - Loose/Wobbles

Article No. 94-24-10

11/28/94

FRONT SEAT CENTER ARMREST - LOOSE AND WOBBLES - VEHICLES WITH BUCKET SEATS AND FLOOR CONSOLE

LIGHT TRUCK: 1989-90 BRONCO II 1989-94 RANGER 1991-94 EXPLORER

ISSUE: The front seat center console may become loose and wobble from side to side. This may be caused by the console armrest mounting bracket becoming loose and/or weak under extreme load conditions.

ACTION: Replace the center armrest console bracket with a new, more robust center armrest console bracket. Refer to the following for service details.

SERVICE PROCEDURE

REMOVAL

1. Verify the concern.

NOTE:

ALSO INSPECT THE ARMREST MOUNTING BRACKET WHICH RETAINS THE ARMREST TO THE CONSOLE. IF THE ARMREST BRACKET IS CONSTRUCTED OF PLASTIC, REFER TO TSB 93-23-19 FOR MORE DETAILS.

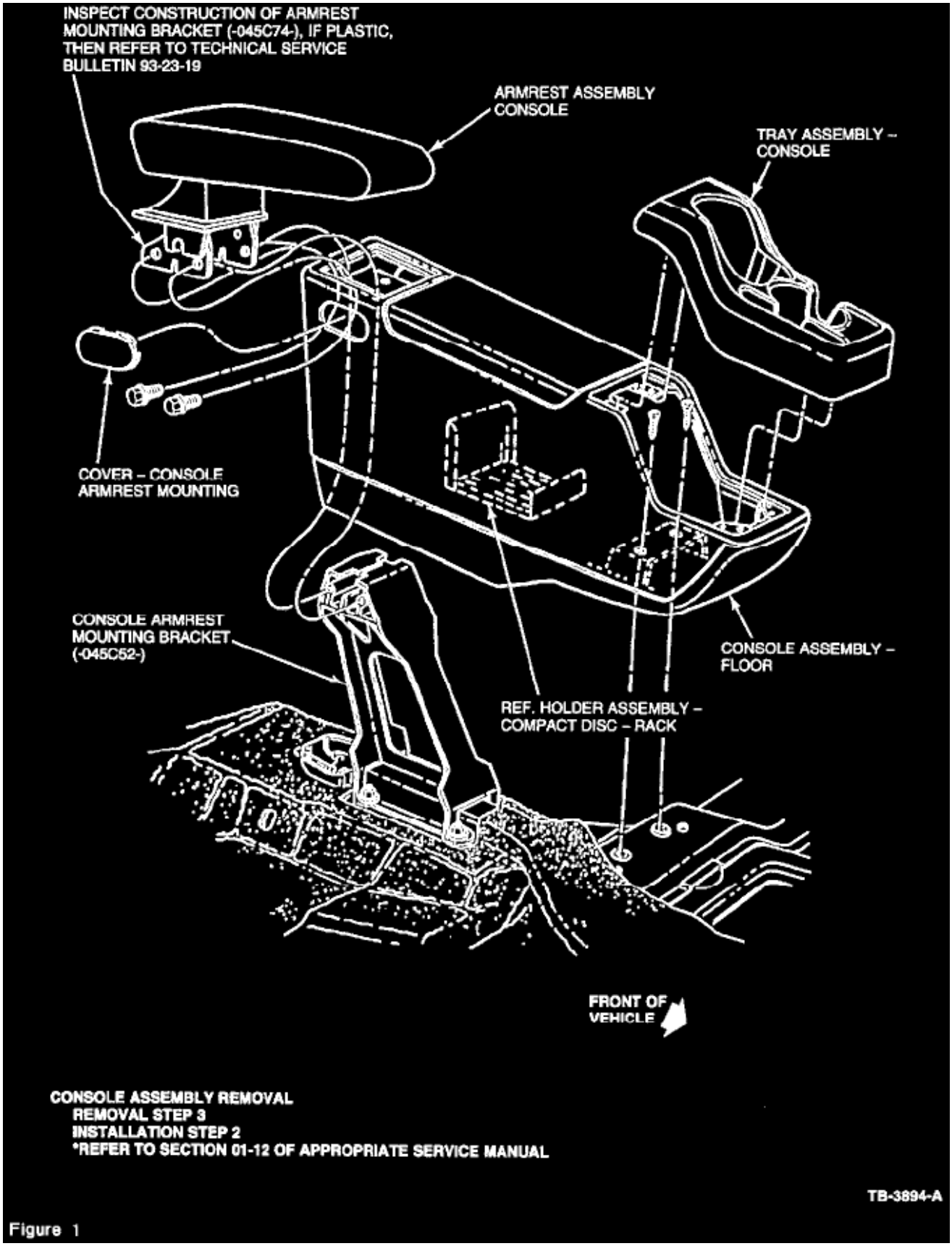


Figure 1

2. Remove the floor console assembly from the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for removal procedures.

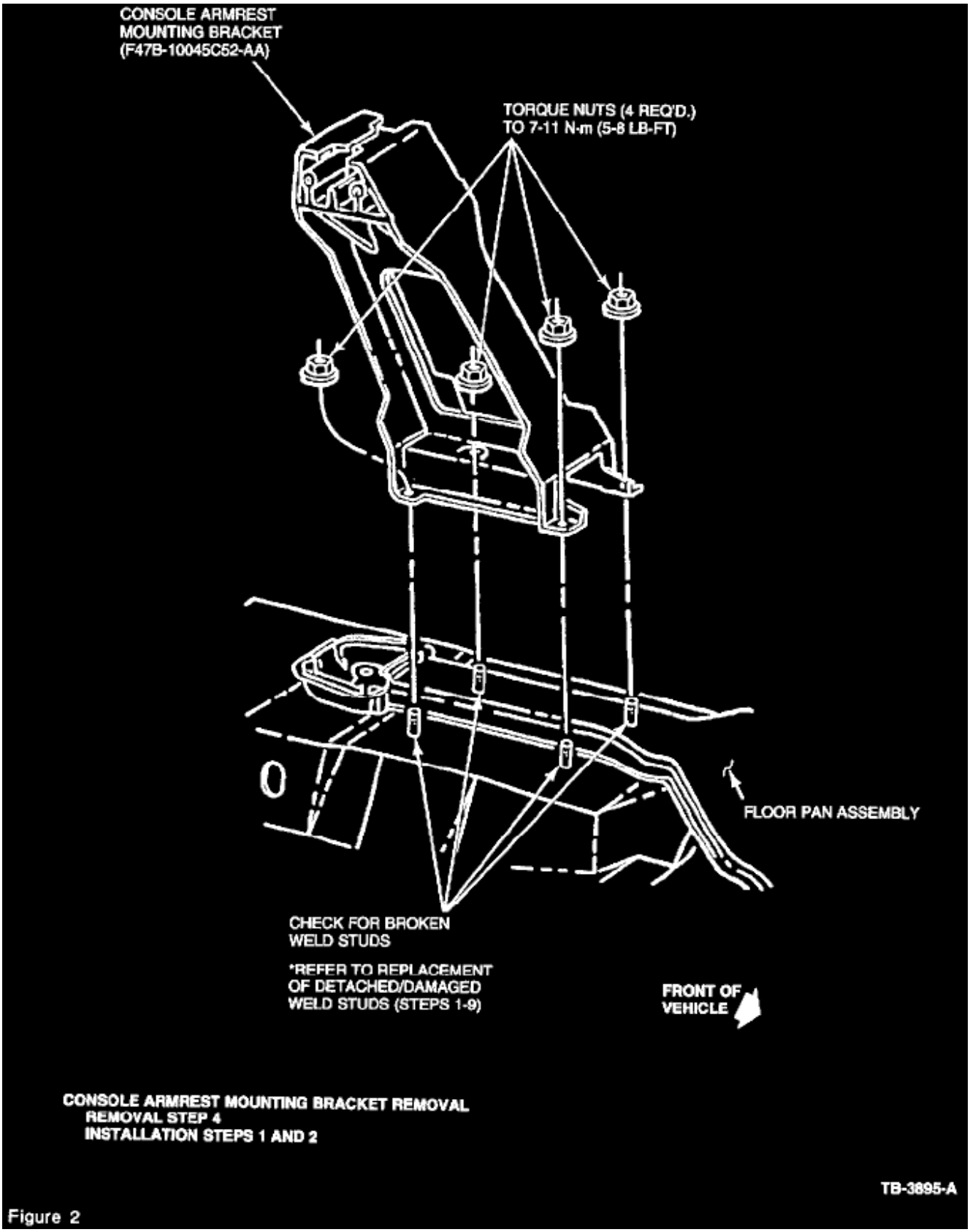

CONSOLE ARMREST
MOUNTING BRACKET
(F47B-10045C52-AA)
TORQUE NUTS (4 REQ'D.)
TO 7-11 N·m (5-8 LB-FT)
FLOOR PAN ASSEMBLY
CHECK FOR BROKEN
WELD STUDS
*REFER TO REPLACEMENT
OF DETACHED/DAMAGED
WELD STUDS (STEPS 1-9)
FRONT OF
VEHICLE
CONSOLE ARMREST MOUNTING BRACKET REMOVAL
REMOVAL STEP 4
INSTALLATION STEPS 1 AND 2
TB-3895-A

Figure 2

3. Remove the four (4) nuts retaining the old console armrest mounting bracket to the floor pan. Save the nuts and discard the bracket. Refer to Figure 2.

INSTALLATION

NOTE:

BEFORE PROCEEDING, THE WELD STUDS MUST BE INSPECTED FOR DAMAGE (BENT, STRIPPED, SHEARED). IF ANY OF THESE CONDITIONS EXIST, THE WELD STUD(S) MUST BE REPLACED. REFER TO THE REPLACEMENT OF WELD STUD(S) SERVICE PROCEDURE LOCATED IN THIS ARTICLE BEFORE INSTALLING THE NEW BRACKET.

1. Position the armrest mounting bracket onto the weld studs and tighten nuts to 7-11 N-m (5-8 lb.ft.). Refer to Figure 2.

2. Install the floor console assembly into the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for installation procedures.

PART NUMBER	PART NAME	CLASS
F47Z-10045C52-A	Bracket - Console Armrest Mounting - Ranger (Std. Cab)	C
F47Z-78045C52-A	Bracket - Console Armrest Mounting - Ranger (Super Cab), Explorer, Bronco II	A
N606676-S36	Bolt	BR
N621905-S2	Nut	BS
F3AZ-19515-SA	SuperSeal	B

3. Verify proper function of the armrest.

4. Following the instructions and precautions on the can, apply SuperSeal (F3AZ-19515-SA) to the affected area to ensure a proper seal.

REPLACEMENT OF WELD STUD(S)

1. Use a grinding wheel or equivalent tool to remove damaged weld stud(s) from floor pan.

2. Use a punch and hammer to center punch location of damaged weld stud(s).

3. Drill 1/4 inch diameter hole(s) at center punch mark(s).

4. Insert repair bolt(s) (N606676-S36) and washer(s) through hole(s) and new console bracket from underside of vehicle.

5. Install repair nut(s) (N621905-S2) and torque to 9-11 N-m (6-8 lb.ft.).

6. Refer to the Installation Procedure in this TSB to complete the installation procedure.

Parts Block

OTHER APPLICABLE ARTICLES: 93-23-19 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

942410A Replace Armrest Bracket 0.6 Hr.

942410B Additional Time To Replace 0.2 Hr.

One Damaged Weld Stud

942410C Additional Time To Replace 0.3 Hr.

Two Or Three Damaged Weld Studs

942410D Additional Time To Replace 0.4 Hr.

All Four Damaged Studs

DEALER CODING

BASIC PART NO. CONDITION CODE

7045C52 01

OASIS CODES: 101000, 107000

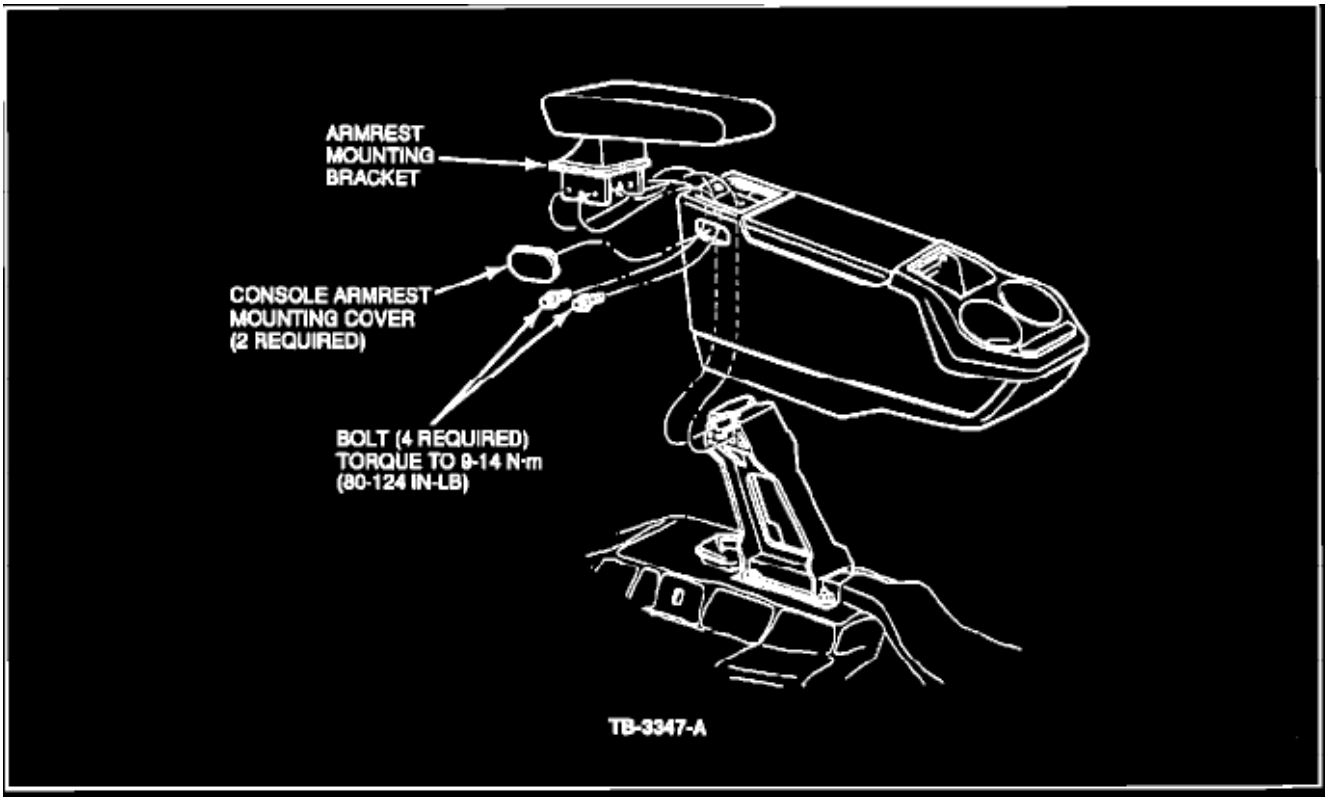


Figure 1

Arm Rest: All Technical Service Bulletins Armrest Mounting Bracket - Broken

Article No. 93-23-19

11/10/93

INTERIOR TRIM - ARMREST - PLASTIC MOUNTING BRACKET BREAKS

LIGHT TRUCK: 1991-93 EXPLORER, RANGER

ISSUE: The plastic mounting bracket which retains the armrest to the console may break. It is now possible to replace the console armrest mounting bracket independently of the entire assembly.

ACTION: Replace the broken armrest bracket with a new steel reinforced armrest bracket. Refer to the following procedure for service details.

1. Remove the console armrest covers, Figure 1.

2. Remove the four (4) bolts retaining the armrest assembly to the console, Figure 1.

3. Remove the armrest assembly.

4. Follow Instruction Sheet # 6489 included in each armrest service kit for bracket replacement.

5. Reinstall the armrest and bracket assembly to console.

6. Reinstall console armrest mounting covers.

PART NUMBER	PART NAME	CLASS
F37Z-10047A20-A	Armrest Bracket Service Kit (1991-92 Crystal Blue)	A
F37Z-10047A20-B	Armrest Bracket Service Kit (1991-92 Sandalwood)	A
F37Z-10047A20-C	Armrest Bracket Service Kit (1991-92 Scarlet)	A
F37Z-10047A20-D	Armrest Bracket Service Kit (1991-92 Smoke)	A
F37Z-10047A20-E	Armrest Bracket Service Kit (1993-94 Blue "Lapis")	A
F37Z-10047A20-F	Armrest Bracket Service Kit (1993-94 Mocha)	A
F37Z-10047A20-G	Armrest Bracket Service Kit (1993-94 Opal)	A
F37Z-10047A20-H	Armrest Bracket Service Kit (1993-94 Ruby)	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992/1993 Models And Eligible Under Basic Warranty Coverage For 1991 Models

OPERATION DESCRIPTION TIME

932319A Replace Armrest Bracket 0.4 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

70047A20 01

OASIS CODES: 101000, 107000

Synchronizer Ring: All Technical Service Bulletins M/T - Crunching Shifting From 2nd to 3rd Gear

Article No. 91-18-11 09/05/91

^ NOISE-INTERMITTENT "CRUNCHING" WHEN SHIFTING FROM 2ND TO 3RD-VEHICLES WITH M50D (MAZDA R1 AND R2) TRANSMISSION

^ TRANSMISSION-M50D (MAZDA R1 AND R2)- INTERMITTENT "CRUNCHING" NOISE WHEN SHIFTING FROM 2ND TO 3RD

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, RANGER 1991 EXPLORER

ISSUE: A slight intermittent "crunch" or grinding noise may be heard when shifting from 2nd to 3rd. This is caused by improper synchronizer engagement.

ACTION: Install a new synchronizer service kit. Refer to the Parts Block for correct parts usage and the following procedure for service details.

INSPECTION

1. Drive the vehicle to warm the transmission oil temperature to about 125~F (52~C). This can usually be done after driving about 10 miles at highway speed when the outside temperature is above freezing.

2. On a smooth road surface, accelerate the vehicle from a stop to 3rd gear at normal shift speeds as defined in the owners guide.

3. If a slight "crunch" is heard or grinding sensation is felt in the shift lever when shifting from 2nd to 3rd, proceed with the following synchronizer kit installation procedure.

SYNCHRONIZER KIT INSTALLATION

1. Remove the transmission from the vehicle. Refer to the appropriate Light Truck Shop Manual, Section 07-03A, for removal procedure.

2. Remove the 1st/2nd and 3rd/4th clutch hub and sleeve assembly along with the corresponding synchronizer ring.

3. Install all parts from the appropriate synchronizer kit. The kits contain new 1, 2, 3, and 4 synchronizer rings, a new 3/4 synchronizer sleeve and an instruction sheet. The original 1/2 clutch hub sleeve assembly and 3/4 clutch hub must be reused.

4. Put a label on the transmission showing it was updated per TSB 91-18-11 and to refer to this TSB before servicing.

NOTE: THE NEW 3RD GEAR SYNCHRONIZER RING AND 3/4 SYNCHRONIZER SLEEVE ARE UNIQUE FROM THE ORIGINAL COMPONENTS. THE NEW COMPONENTS MUST BE INSTALLED AS A SET IN THE PROPER POSITION. FAILURE TO DO SO WILL RESULT IN THE INABILITY TO SHIFT THE TRANSMISSION INTO ONE OF THE GEARS. note>

PART NUMBER PART NAME CLASS

FOTZ-7C391-H Synchronizer Kit - R2 (F-150, C

Bronco, Econoline)

FOTZ-7C391-F Synchronizer Kit - R1 (Ranger, C

Bronco II, Explorer)

FOTZ-7C391-G Synchronizer Kit - R1 C

(Aerostar)

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage

OPERATION DESCRIPTION TIME

911811A Inspect Transmission 0.3 Hr.

911811B Install Synchronizer Kit 5.0 Hr.

Ranger 4X2 With 2.OL, 2.3L, 2.9L, or 3.OL And

Aerostar With 3.OL

911811C Install Synchronizer Kit 6.7 Hr.

Ranger 4X4 With 2.3L or 4.OL and Explorer 4X4

911811D Install Synchronizer Kit - 6.9 Hr.

Ranger 4X4 With 2.9L

911811E Install Synchronizer Kit - 6.0 Hr.

Ranger 4X2 And Explorer 4X2 With 4.OL

911811F Install Synchronizer Kit - 6.5 Hr.

Bronco II 4X2 With 2.9L And Bronco With 5.OL

911811G Install Synchronizer Kit - 6.9 Hr.

Bronco II 4X4 With 2.9L

911811H Install Synchronizer Kit 5.1 Hr.

F-150 4X2 With 4.9L

911811I Install Synchronizer Kit 6.3 Hr.

F-150 4X4 With 4.9L or 5.OL And Bronco With 4.9L

911811J Install Synchronizer Kit - 5.3 Hr.

F-150 4X2 With 5.OL

911811K Install Synchronizer Kit - 5.2 Hr.

Econoline With 4.9L

DEALER CODING

BASIC PART NO. CONDITION CODE

7C391 56

OASIS CODES: 505000, 505200, 506000, 702000

Synchronizer Ring: All Technical Service Bulletins M/T - M50D Hard Shift Condition

Article No. 91-10-15

5/15/91

TRANSMISSION - M50D - HARD SHIFT TO REVERSE OR FIFTH GEAR

LIGHT TRUCK: 1988-89 ECONOLINE 1988-90 BRONCO II 1988-91 AEROSTAR, BRONCO, F-150, F-250, RANGER 1991 EXPLORER

ISSUE: The 5-R synchronizer sliding sleeve clutching teeth may wear on the reverse side. This may cause a hard to engage or partial engagement of fifth or reverse gear and could result in the transmission jumping out of gear. If the wear is allowed to continue, it may become difficult or impossible to engage 1-2-3 or 4th gear.

ACTION: Inspect the 5-R synchronizer sliding sleeve for wear and replace if excessive wear is found. Refer to the following procedure for service details.

INSPECTION PROCEDURE:

1. Remove necessary components so that the transmission extension housing can be removed without removing the entire transmission. Refer to the

Light Truck Shop Manual Section 07-03A for service details.

NOTE: COMPACT VEHICLES MAY REQUIRE REMOVAL OF TRANSMISSION

2. Remove the transmission extension housing.

3. Inspect the 5-R synchronizer sliding sleeve for wear of the reverse clutching teeth.

REPAIR PROCEDURE

1. If wear is observed, remove speedometer drive gear (4 x 2 only).

2. Remove the top cover (if repairing on the bench).

3. Carefully remove the main shaft and counter shaft locking nuts.

4. Remove and replace the following transmission parts. Refer to the Light Truck Shop Manual for service procedures.

^ 5th Counter Shaft Gear

^ 5-R Synchronizer, hub and ring assembly

NOTE: INSTALL WITH THE DOT ON THE SYNCHRONIZER SLEEVE FACING REVERSE GEAR.

^ Reverse counter shaft gear

^ 5-R Counter Lever

^ 5-R Shift fork and rod

NOTE: USE THE SPRING AND BALL FROM THE EXISTING ASSEMBLY.

^ Replace the idler shaft in the reverse idler gear assembly (R1 only).

NOTE: THERE ARE EXTRA ADJUSTING SHIMS PROVIDED IN CASE IT IS NECESSARY TO RESET THE 5-R SYNCHRONIZER HUB AND CONTROL REVERSE GEAR END PLAYS TO

SPECIFICATION. USE THE NEW MAIN SHAFT AND COUNTER SHAFT LOCKING NUTS UPON ASSEMBLY.

CAUTION: USE ALL THE PARTS CONTAINED IN THE SERVICE KIT INCLUDING THE COUNTER REVERSE LEVER. ALTHOUGH THE

NEW LEVER LOOKS THE SAME AS THE ONE CONTAINED IN THE TRANSMISSION, CONTACT ANGLES ARE SLIGHTLY DIFFERENT TO INSURE PROPER TIMING AND

ENGAGEMENT.

PART NUMBER PART NAME CLASS

F0TZ-7C391-E Synchronizer Service Kit - R2 C

F0TZ-7C391-C Synchronizer Service Kit - 2.3L, C

2.9L, 3.0L, R1

F0TZ-7C391-D Synchronizer Service Kit - 4.0L C

R1

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage OPERATION DESCRIPTION

TIME

911015A Install Synchronizer Service 2.1 Hr.

Kit - 4 x 2

911015A Install Synchronizer Service 2.9 Hr.

Kit - 4 x 4

DEALER CODING

BASIC PART NO. CONDITION CODE

7124 30

OASIS CODES: 505000

Aerostar With 3.OL

911811C Install Synchronizer Kit 6.7 Hr.

Ranger 4X4 With 2.3L or 4.OL and Explorer 4X4

911811D Install Synchronizer Kit - 6.9 Hr.

Ranger 4X4 With 2.9L

911811E Install Synchronizer Kit - 6.0 Hr.

Ranger 4X2 And Explorer 4X2 With 4.OL

911811F Install Synchronizer Kit - 6.5 Hr.

Bronco II 4X2 With 2.9L And Bronco With 5.OL

911811G Install Synchronizer Kit - 6.9 Hr.

Bronco II 4X4 With 2.9L

911811H Install Synchronizer Kit 5.1 Hr.

F-150 4X2 With 4.9L

911811I Install Synchronizer Kit 6.3 Hr.

F-150 4X4 With 4.9L or 5.OL And Bronco With 4.9L

911811J Install Synchronizer Kit - 5.3 Hr.

F-150 4X2 With 5.OL

911811K Install Synchronizer Kit - 5.2 Hr.

Econoline With 4.9L

DEALER CODING

BASIC PART NO. CONDITION CODE

7C391 56

OASIS CODES: 505000, 505200, 506000, 702000

NEW LEVER LOOKS THE SAME AS THE ONE CONTAINED IN THE TRANSMISSION, CONTACT ANGLES ARE SLIGHTLY DIFFERENT TO INSURE PROPER TIMING AND

ENGAGEMENT.

PART NUMBER PART NAME CLASS

F0TZ-7C391-E Synchronizer Service Kit - R2 C

F0TZ-7C391-C Synchronizer Service Kit - 2.3L, C

2.9L, 3.0L, R1

F0TZ-7C391-D Synchronizer Service Kit - 4.0L C

R1

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage, Powertrain Warranty Coverage OPERATION DESCRIPTION

TIME

911015A Install Synchronizer Service 2.1 Hr.

Kit - 4 x 2

911015A Install Synchronizer Service 2.9 Hr.

Kit - 4 x 4

DEALER CODING

BASIC PART NO. CONDITION CODE

7124 30

OASIS CODES: 505000

Console: Customer Interest Front Seat Center Armrest - Loose/Wobbles

Article No. 94-24-10

11/28/94

FRONT SEAT CENTER ARMREST - LOOSE AND WOBBLES - VEHICLES WITH BUCKET SEATS AND FLOOR CONSOLE

LIGHT TRUCK: 1989-90 BRONCO II 1989-94 RANGER 1991-94 EXPLORER

ISSUE: The front seat center console may become loose and wobble from side to side. This may be caused by the console armrest mounting bracket becoming loose and/or weak under extreme load conditions.

ACTION: Replace the center armrest console bracket with a new, more robust center armrest console bracket. Refer to the following for service details.

SERVICE PROCEDURE

REMOVAL

1. Verify the concern.

NOTE:

ALSO INSPECT THE ARMREST MOUNTING BRACKET WHICH RETAINS THE ARMREST TO THE CONSOLE. IF THE ARMREST BRACKET IS CONSTRUCTED OF PLASTIC, REFER TO TSB 93-23-19 FOR MORE DETAILS.

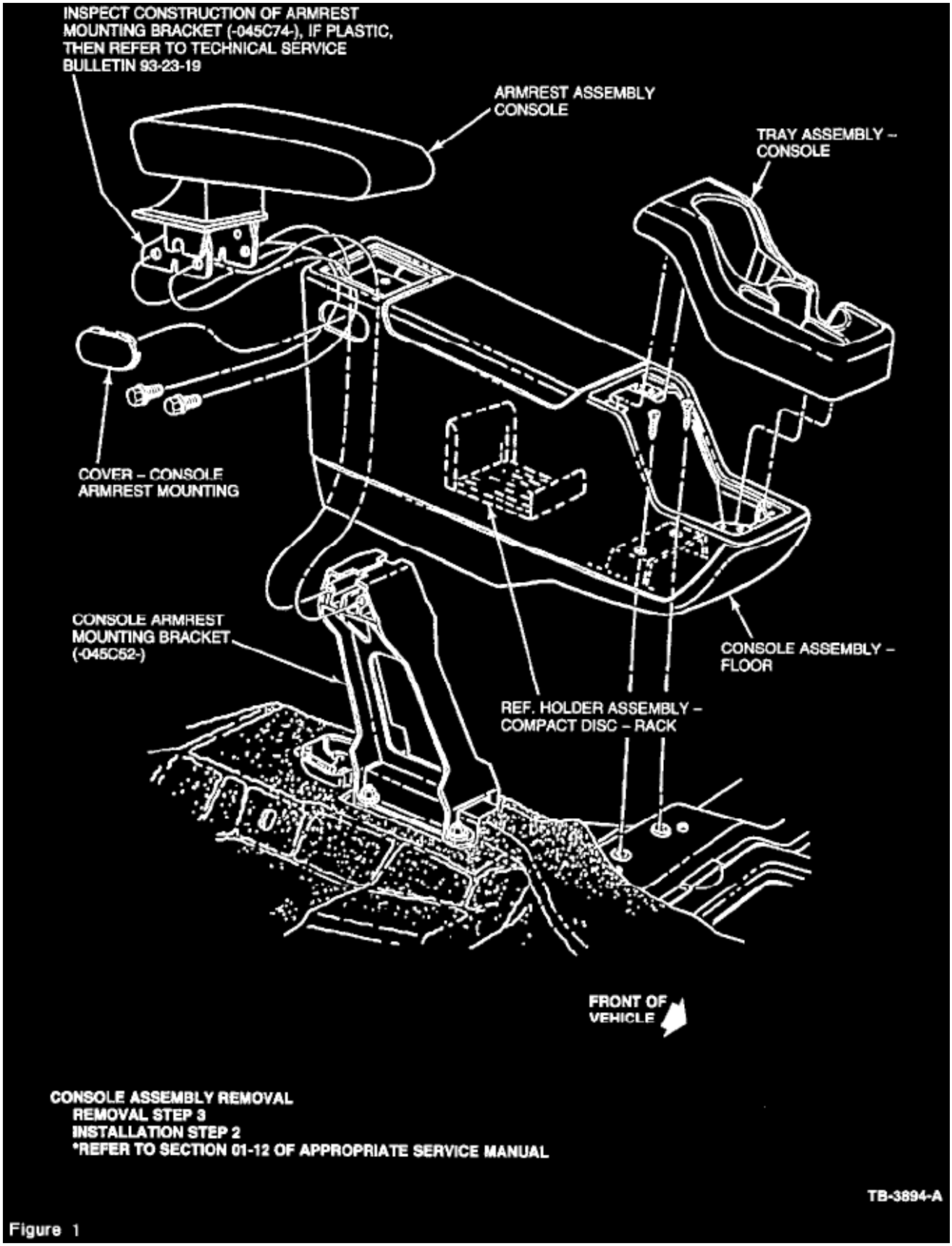


Figure 1

2. Remove the floor console assembly from the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for removal procedures.

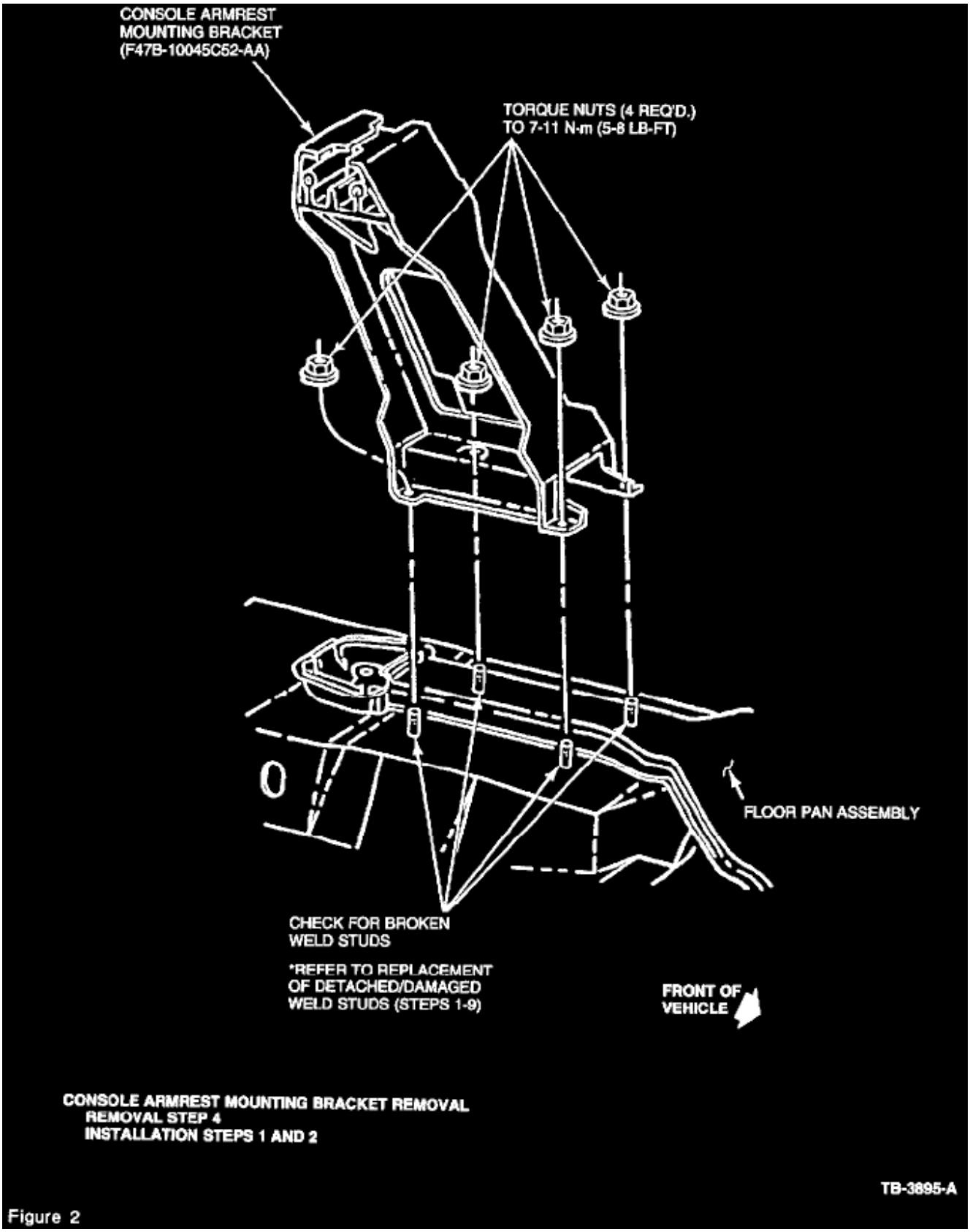

CONSOLE ARMREST MOUNTING BRACKET (F47B-10045C52-AA)
TORQUE NUTS (4 REQ'D.) TO 7-11 N·m (5-8 LB-FT)
FLOOR PAN ASSEMBLY
CHECK FOR BROKEN WELD STUDS
*REFER TO REPLACEMENT OF DETACHED/DAMAGED WELD STUDS (STEPS 1-9)
FRONT OF VEHICLE
CONSOLE ARMREST MOUNTING BRACKET REMOVAL
REMOVAL STEP 4
INSTALLATION STEPS 1 AND 2
TB-3895-A

Figure 2

3. Remove the four (4) nuts retaining the old console armrest mounting bracket to the floor pan. Save the nuts and discard the bracket. Refer to Figure 2.

INSTALLATION

NOTE:

BEFORE PROCEEDING, THE WELD STUDS MUST BE INSPECTED FOR DAMAGE (BENT, STRIPPED, SHEARED). IF ANY OF THESE CONDITIONS EXIST, THE WELD STUD(S) MUST BE REPLACED. REFER TO THE REPLACEMENT OF WELD STUD(S) SERVICE PROCEDURE LOCATED IN THIS ARTICLE BEFORE INSTALLING THE NEW BRACKET.

1. Position the armrest mounting bracket onto the weld studs and tighten nuts to 7-11 N-m (5-8 lb.ft.). Refer to Figure 2.

2. Install the floor console assembly into the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for installation procedures.

PART NUMBER	PART NAME	CLASS
F47Z-10045C52-A	Bracket - Console Armrest Mounting - Ranger (Std. Cab)	C
F47Z-78045C52-A	Bracket - Console Armrest Mounting - Ranger (Super Cab), Explorer, Bronco II	A
N606676-S36	Bolt	BR
N621905-S2	Nut	BS
F3AZ-19515-SA	SuperSeal	B

3. Verify proper function of the armrest.

4. Following the instructions and precautions on the can, apply SuperSeal (F3AZ-19515-SA) to the affected area to ensure a proper seal.

REPLACEMENT OF WELD STUD(S)

1. Use a grinding wheel or equivalent tool to remove damaged weld stud(s) from floor pan.

2. Use a punch and hammer to center punch location of damaged weld stud(s).

3. Drill 1/4 inch diameter hole(s) at center punch mark(s).

4. Insert repair bolt(s) (N606676-S36) and washer(s) through hole(s) and new console bracket from underside of vehicle.

5. Install repair nut(s) (N621905-S2) and torque to 9-11 N-m (6-8 lb.ft.).

6. Refer to the Installation Procedure in this TSB to complete the installation procedure.

Parts Block

OTHER APPLICABLE ARTICLES: 93-23-19 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

942410A Replace Armrest Bracket 0.6 Hr.

942410B Additional Time To Replace 0.2 Hr.

One Damaged Weld Stud

942410C Additional Time To Replace 0.3 Hr.

Two Or Three Damaged Weld Studs

942410D Additional Time To Replace 0.4 Hr.

All Four Damaged Studs

DEALER CODING

BASIC PART NO. CONDITION CODE

7045C52 01

OASIS CODES: 101000, 107000

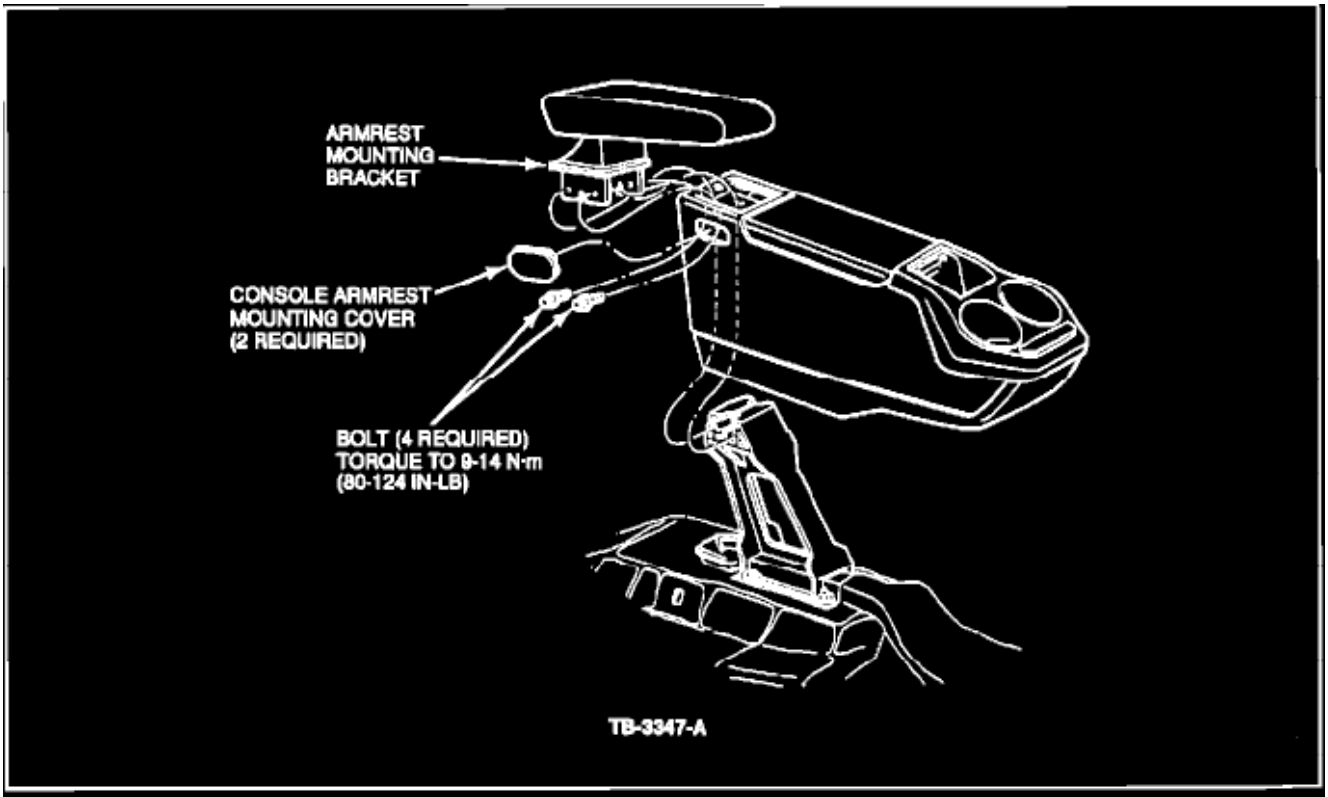


Figure 1

Console: Customer Interest Armrest Mounting Bracket - Broken

Article No. 93-23-19

11/10/93

INTERIOR TRIM - ARMREST - PLASTIC MOUNTING BRACKET BREAKS

LIGHT TRUCK: 1991-93 EXPLORER, RANGER

ISSUE: The plastic mounting bracket which retains the armrest to the console may break. It is now possible to replace the console armrest mounting bracket independently of the entire assembly.

ACTION: Replace the broken armrest bracket with a new steel reinforced armrest bracket. Refer to the following procedure for service details.

1. Remove the console armrest covers, Figure 1.

2. Remove the four (4) bolts retaining the armrest assembly to the console, Figure 1.

3. Remove the armrest assembly.

4. Follow Instruction Sheet # 6489 included in each armrest service kit for bracket replacement.

5. Reinstall the armrest and bracket assembly to console.

6. Reinstall console armrest mounting covers.

PART NUMBER	PART NAME	CLASS
F37Z-10047A20-A	Armrest Bracket Service Kit (1991-92 Crystal Blue)	A
F37Z-10047A20-B	Armrest Bracket Service Kit (1991-92 Sandalwood)	A
F37Z-10047A20-C	Armrest Bracket Service Kit (1991-92 Scarlet)	A
F37Z-10047A20-D	Armrest Bracket Service Kit (1991-92 Smoke)	A
F37Z-10047A20-E	Armrest Bracket Service Kit (1993-94 Blue "Lapis")	A
F37Z-10047A20-F	Armrest Bracket Service Kit (1993-94 Mocha)	A
F37Z-10047A20-G	Armrest Bracket Service Kit (1993-94 Opal)	A
F37Z-10047A20-H	Armrest Bracket Service Kit (1993-94 Ruby)	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992/1993 Models And Eligible Under Basic Warranty Coverage For 1991 Models

OPERATION DESCRIPTION TIME

932319A Replace Armrest Bracket 0.4 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

70047A20 01

OASIS CODES: 101000, 107000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Interior Moulding / Trim > Console > Component Information > Technical Service Bulletins > All Technical Service Bulletins for Console: > 942410 > Nov > 94 > Front Seat Center Armrest - Loose/Wobbles

Console: All Technical Service Bulletins Front Seat Center Armrest - Loose/Wobbles

Article No. 94-24-10

11/28/94

FRONT SEAT CENTER ARMREST - LOOSE AND WOBBLES - VEHICLES WITH BUCKET SEATS AND FLOOR CONSOLE

LIGHT TRUCK: 1989-90 BRONCO II 1989-94 RANGER 1991-94 EXPLORER

ISSUE: The front seat center console may become loose and wobble from side to side. This may be caused by the console armrest mounting bracket becoming loose and/or weak under extreme load conditions.

ACTION: Replace the center armrest console bracket with a new, more robust center armrest console bracket. Refer to the following for service details.

SERVICE PROCEDURE

REMOVAL

1. Verify the concern.

NOTE:

ALSO INSPECT THE ARMREST MOUNTING BRACKET WHICH RETAINS THE ARMREST TO THE CONSOLE. IF THE ARMREST BRACKET IS CONSTRUCTED OF PLASTIC, REFER TO TSB 93-23-19 FOR MORE DETAILS.

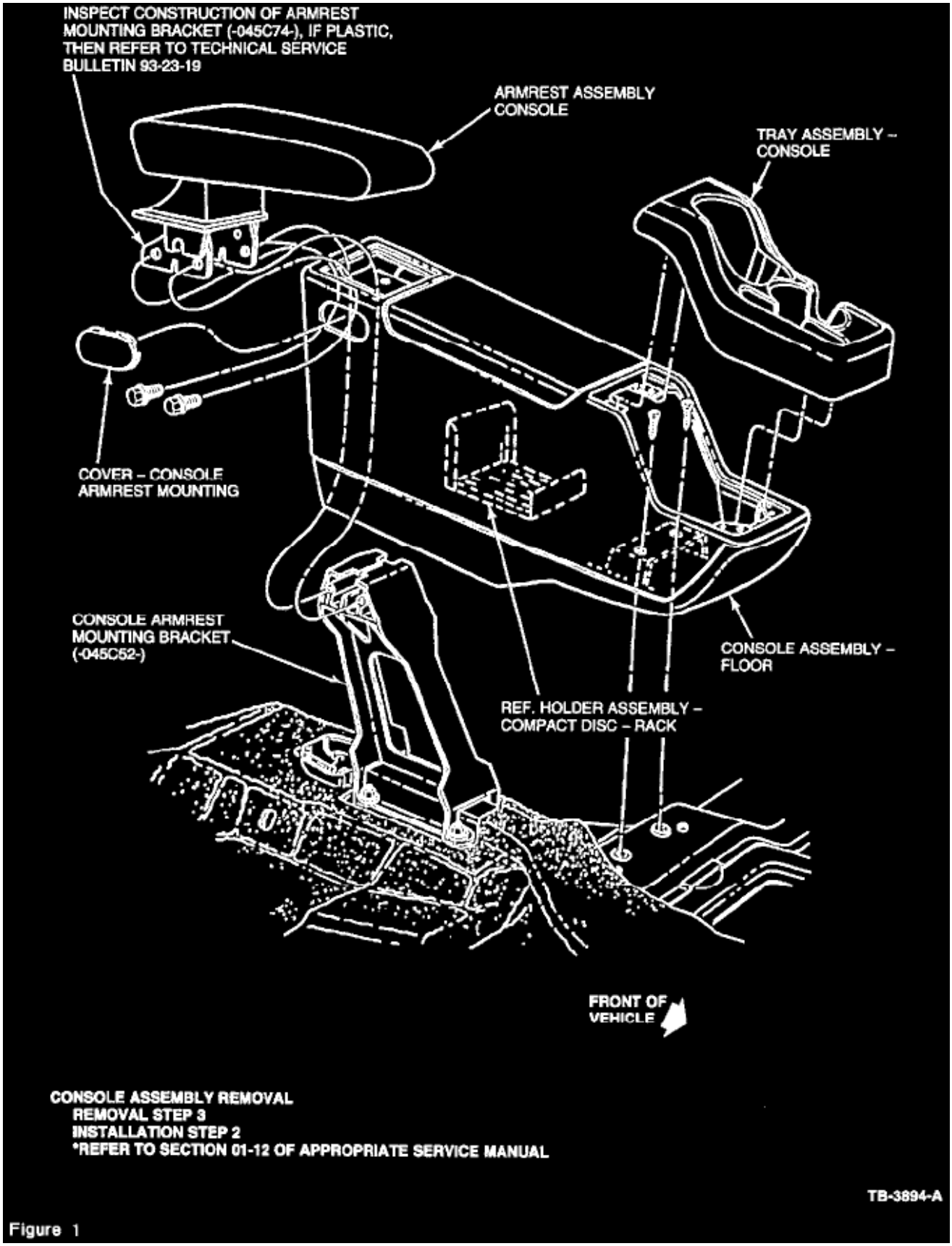


Figure 1

2. Remove the floor console assembly from the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for removal procedures.

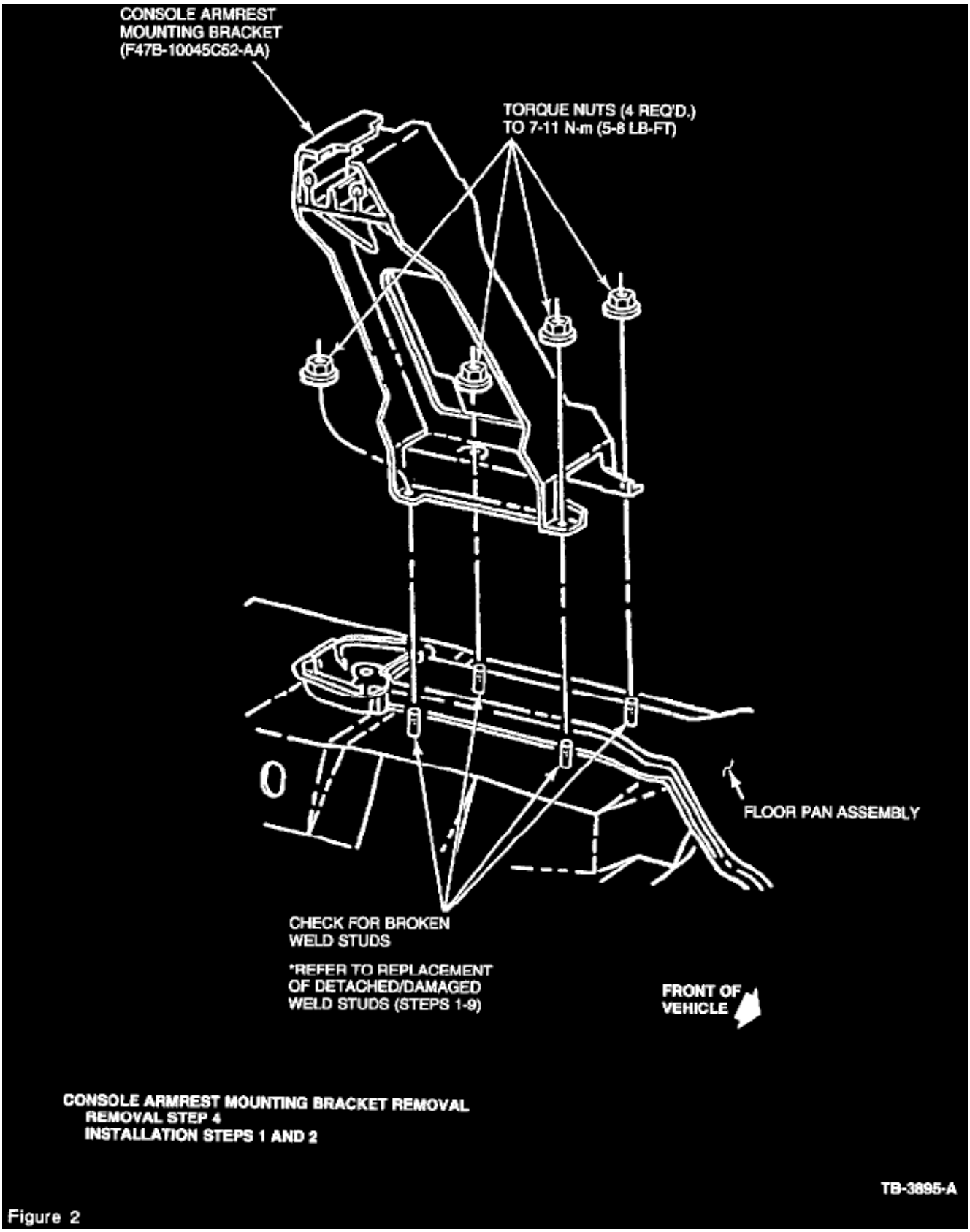

CONSOLE ARMREST
MOUNTING BRACKET
(F47B-10045C52-AA)
TORQUE NUTS (4 REQ'D.)
TO 7-11 N·m (5-8 LB-FT)
FLOOR PAN ASSEMBLY
CHECK FOR BROKEN
WELD STUDS
*REFER TO REPLACEMENT
OF DETACHED/DAMAGED
WELD STUDS (STEPS 1-9)
FRONT OF
VEHICLE
CONSOLE ARMREST MOUNTING BRACKET REMOVAL
REMOVAL STEP 4
INSTALLATION STEPS 1 AND 2
TB-3895-A

Figure 2

3. Remove the four (4) nuts retaining the old console armrest mounting bracket to the floor pan. Save the nuts and discard the bracket. Refer to Figure 2.

INSTALLATION

NOTE:

BEFORE PROCEEDING, THE WELD STUDS MUST BE INSPECTED FOR DAMAGE (BENT, STRIPPED, SHEARED). IF ANY OF THESE CONDITIONS EXIST, THE WELD STUD(S) MUST BE REPLACED. REFER TO THE REPLACEMENT OF WELD STUD(S) SERVICE PROCEDURE LOCATED IN THIS ARTICLE BEFORE INSTALLING THE NEW BRACKET.

1. Position the armrest mounting bracket onto the weld studs and tighten nuts to 7-11 N-m (5-8 lb.ft.). Refer to Figure 2.

2. Install the floor console assembly into the vehicle. Refer to Section 01-12 of the appropriate Service Manual and Figure 1 for installation procedures.

PART NUMBER	PART NAME	CLASS
F47Z-10045C52-A	Bracket - Console Armrest Mounting - Ranger (Std. Cab)	C
F47Z-78045C52-A	Bracket - Console Armrest Mounting - Ranger (Super Cab), Explorer, Bronco II	A
N606676-S36	Bolt	BR
N621905-S2	Nut	BS
F3AZ-19515-SA	SuperSeal	B

3. Verify proper function of the armrest.

4. Following the instructions and precautions on the can, apply SuperSeal (F3AZ-19515-SA) to the affected area to ensure a proper seal.

REPLACEMENT OF WELD STUD(S)

1. Use a grinding wheel or equivalent tool to remove damaged weld stud(s) from floor pan.

2. Use a punch and hammer to center punch location of damaged weld stud(s).

3. Drill 1/4 inch diameter hole(s) at center punch mark(s).

4. Insert repair bolt(s) (N606676-S36) and washer(s) through hole(s) and new console bracket from underside of vehicle.

5. Install repair nut(s) (N621905-S2) and torque to 9-11 N-m (6-8 lb.ft.).

6. Refer to the Installation Procedure in this TSB to complete the installation procedure.

Parts Block

OTHER APPLICABLE ARTICLES: 93-23-19 WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Models And Basic Warranty Coverage For All Other Models

OPERATION DESCRIPTION TIME

942410A Replace Armrest Bracket 0.6 Hr.

942410B Additional Time To Replace 0.2 Hr.

One Damaged Weld Stud

942410C Additional Time To Replace 0.3 Hr.

Two Or Three Damaged Weld Studs

942410D Additional Time To Replace 0.4 Hr.

All Four Damaged Studs

DEALER CODING

BASIC PART NO. CONDITION CODE

7045C52 01

OASIS CODES: 101000, 107000

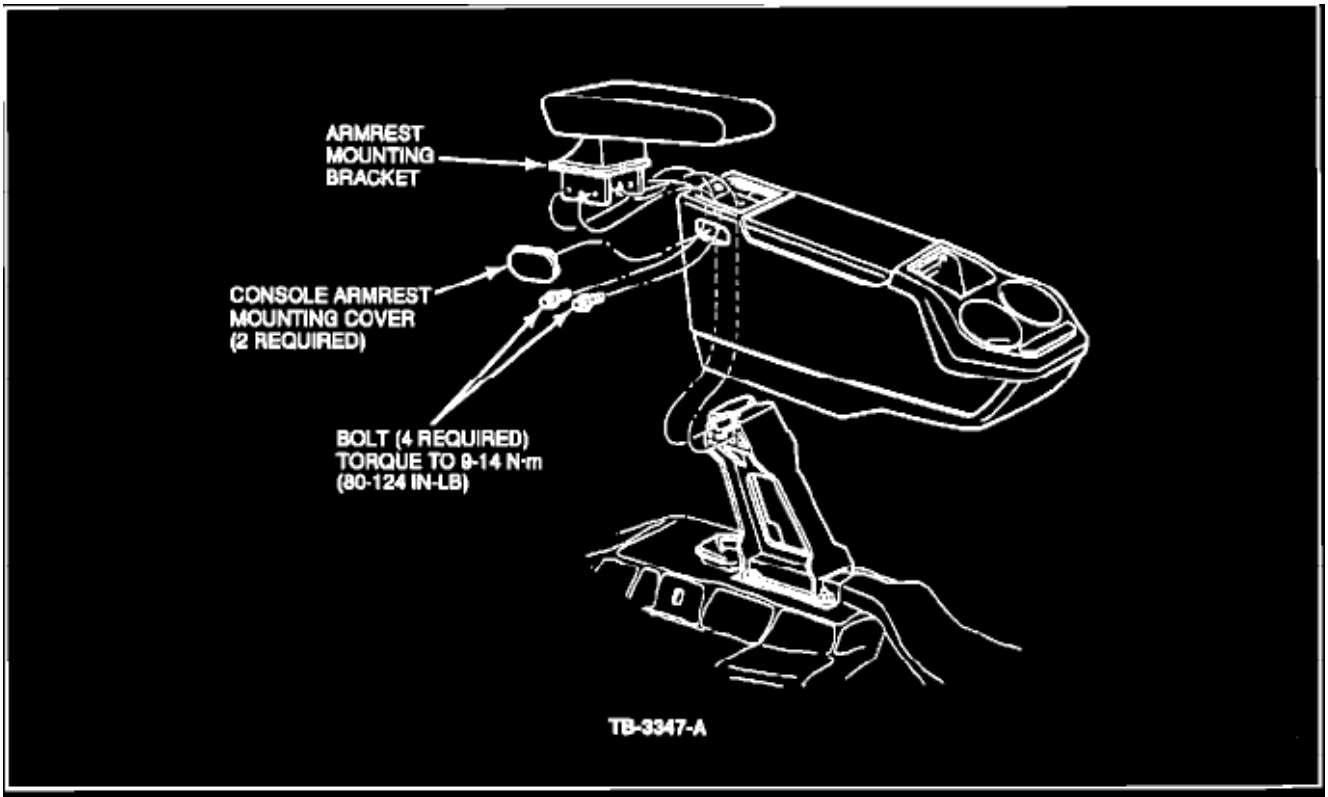


Figure 1

Console: All Technical Service Bulletins Armrest Mounting Bracket - Broken

Article No. 93-23-19

11/10/93

INTERIOR TRIM - ARMREST - PLASTIC MOUNTING BRACKET BREAKS

LIGHT TRUCK: 1991-93 EXPLORER, RANGER

ISSUE: The plastic mounting bracket which retains the armrest to the console may break. It is now possible to replace the console armrest mounting bracket independently of the entire assembly.

ACTION: Replace the broken armrest bracket with a new steel reinforced armrest bracket. Refer to the following procedure for service details.

1. Remove the console armrest covers, Figure 1.

2. Remove the four (4) bolts retaining the armrest assembly to the console, Figure 1.

3. Remove the armrest assembly.

4. Follow Instruction Sheet # 6489 included in each armrest service kit for bracket replacement.

5. Reinstall the armrest and bracket assembly to console.

6. Reinstall console armrest mounting covers.

PART NUMBER	PART NAME	CLASS
F37Z-10047A20-A	Armrest Bracket Service Kit (1991-92 Crystal Blue)	A
F37Z-10047A20-B	Armrest Bracket Service Kit (1991-92 Sandalwood)	A
F37Z-10047A20-C	Armrest Bracket Service Kit (1991-92 Scarlet)	A
F37Z-10047A20-D	Armrest Bracket Service Kit (1991-92 Smoke)	A
F37Z-10047A20-E	Armrest Bracket Service Kit (1993-94 Blue "Lapis")	A
F37Z-10047A20-F	Armrest Bracket Service Kit (1993-94 Mocha)	A
F37Z-10047A20-G	Armrest Bracket Service Kit (1993-94 Opal)	A
F37Z-10047A20-H	Armrest Bracket Service Kit (1993-94 Ruby)	A

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992/1993 Models And Eligible Under Basic Warranty Coverage For 1991 Models

OPERATION DESCRIPTION TIME

932319A Replace Armrest Bracket 0.4 Hr.

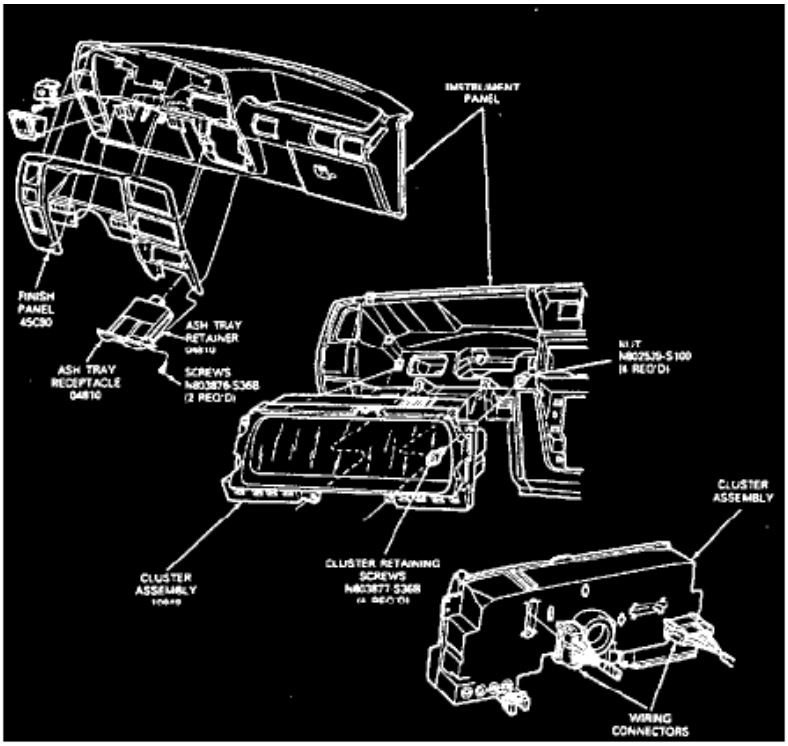
DEALER CODING

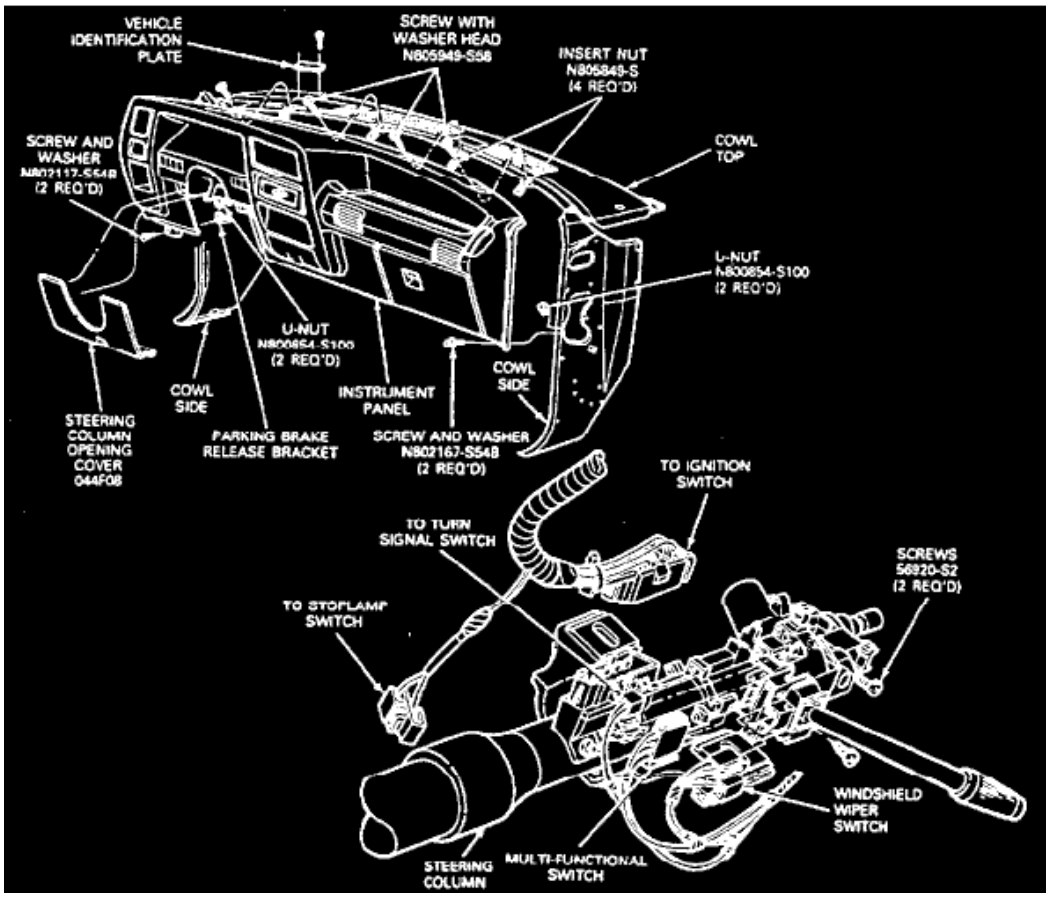
BASIC PART NO. CONDITION CODE

70047A20 01

OASIS CODES: 101000, 107000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Interior Moulding / Trim > Dashboard / Instrument Panel > Component Information > Service and Repair





Dashboard / Instrument Panel: Service and Repair

Fig 10. Exploded View Of Instrument Panel & Cluster, 1988-91 Bronco II, Explorer & Ranger.

Fig. 11 Exploded View Of Instrument Panel & Steering Coluum Connectors, 1988-91 Bronco II, Explorer & Ranger.

1. Disconnect negative battery cable. 2. Remove ashtray and retainer assembly, Fig. 10. 3. Remove cluster finish panel by unsnapping retainers.

4. Remove cluster retaining screws Fig. 10. 5. Pull cluster rearward, then disconnect speedometer cable and electrical connectors. It may be necessary to disconnect the speedometer cable from

the transmission and wiring harness in the engine corn partment

6. Remove cluster. 7. Remove steering column opening cover, then remove the instrument panel to brake and clutch pedal support attaching screw. 8. Remove steering column upper and lower shrouds. 9. Disconnect wiring from steering column switches, Fig. 11.

10. Remove righthand and lefthand cowl side trim covers, Fig. 11. 11. Remove righthand and lefthand lower corner instrument panel to cowl side retaining bolts. 12. Remove righthand lower insulator, if equipped. 13. Remove hood opening cable from instrument panel. 14. Remove screws retaining top of panel. 15. Support panel assembly, then disconnect wiring, vacuum lines, antenna, heater and A/C control cables. 16. Reverse procedure to install.

Door Locks: Customer Interest Door Lock Cylinder - Loose in Replacement Door

Article No. 95-24-4

12/04/95

^ DOOR - REPLACEMENT DOOR HAS LOOSE FITTING DOOR LOCK CYLINDER - SERVICE TIP

^ LOCK - LOOSE FITTING DOOR LOCK CYLINDER - SERVICE TIP

LIGHT TRUCK: 1981-96 F-150-350 SERIES 1983-96 BRONCO, RANGER 1986-95 AEROSTAR 1988-96 F SUPER DUTY 1992-96 ECONOLINE 1995-96 WINDSTAR

MEDIUM/HEAVY TRUCK: 1990-96 F & B SERIES

ISSUE: New replacement doors for past model years have a larger lock cylinder hole diameter. A loose fit will occur when installing the door lock cylinder. The lock cylinder mounting hole diameter in new doors has been increased in preparation for a new style lock cylinder. New locks will be phased in for future production.

ACTION: Install a spacer for the larger diameter door lock cylinder mounting hole. Refer to the following Service Procedure for details.

NOTE:

THE DOOR LOCK CYLINDER SPACER HAS BEEN ADDED TO CERTAIN 1996 MODEL YEAR VEHICLES TO ELIMINATE THE LOOSE FIT CONDITION FROM THE SMALLER DOOR LOCK CYLINDER. SOME VEHICLES MAY BE BUILT WITH SPACERS ON ONE SIDE ONLY. THIS IS DUE TO THE BALANCE OF SUPPLIES OF RIGHT AND LEFT DOORS AT THE ASSEMBLY PLANTS AT THE TIME OF MODEL YEAR CHANGEOVER.

SERVICE PROCEDURE

DOOR LOCK CYLINDER

INSTALLATION/REMOVAL

1. Whenever the door lock cylinder is removed, check for presence of lock cylinder spacer in the door in the lock hole. If one is present, check for damage and replace if necessary.

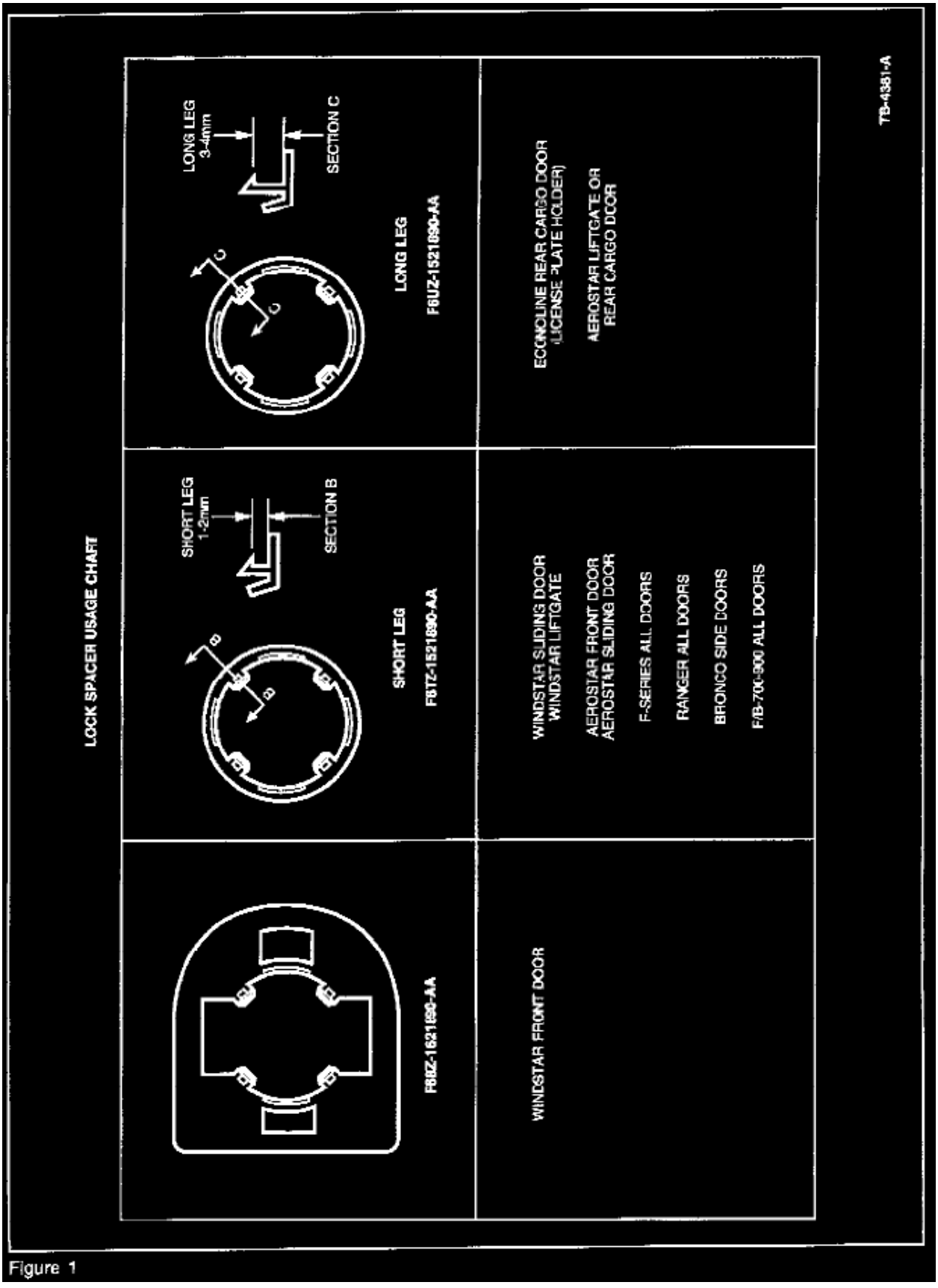

LOCK SPACER USAGE CHART
F8UZ-1521890-AA
WINDSTAR FRONT DOOR
SHORT LEG
1-2mm
SECTION B
F8TZ-1521890-AA
SHORT LEG
WINDSTAR SLIDING DOOR
WINDSTAR LIFTGATE
AEROSTAR FRONT DOOR
AEROSTAR SLIDING DOOR
F-SERIES ALL DOORS
RANGER ALL DOORS
BRONCO SIDE DOORS
F/B-700-900 ALL DOORS
LONG LEG
3-4mm
SECTION C
F6UZ-1521890-AA
LONG LEG
ECONOLINE REAR CARGO DOOR
(LICENSE PLATE HOLDER)
AEROSTAR LIFTGATE OR
REAR CARGO DOOR
TB-4381-A

Figure 1

2. If replacement is necessary, refer to the Lock Spacer Usage Chart (Figure 1) for proper part number application.

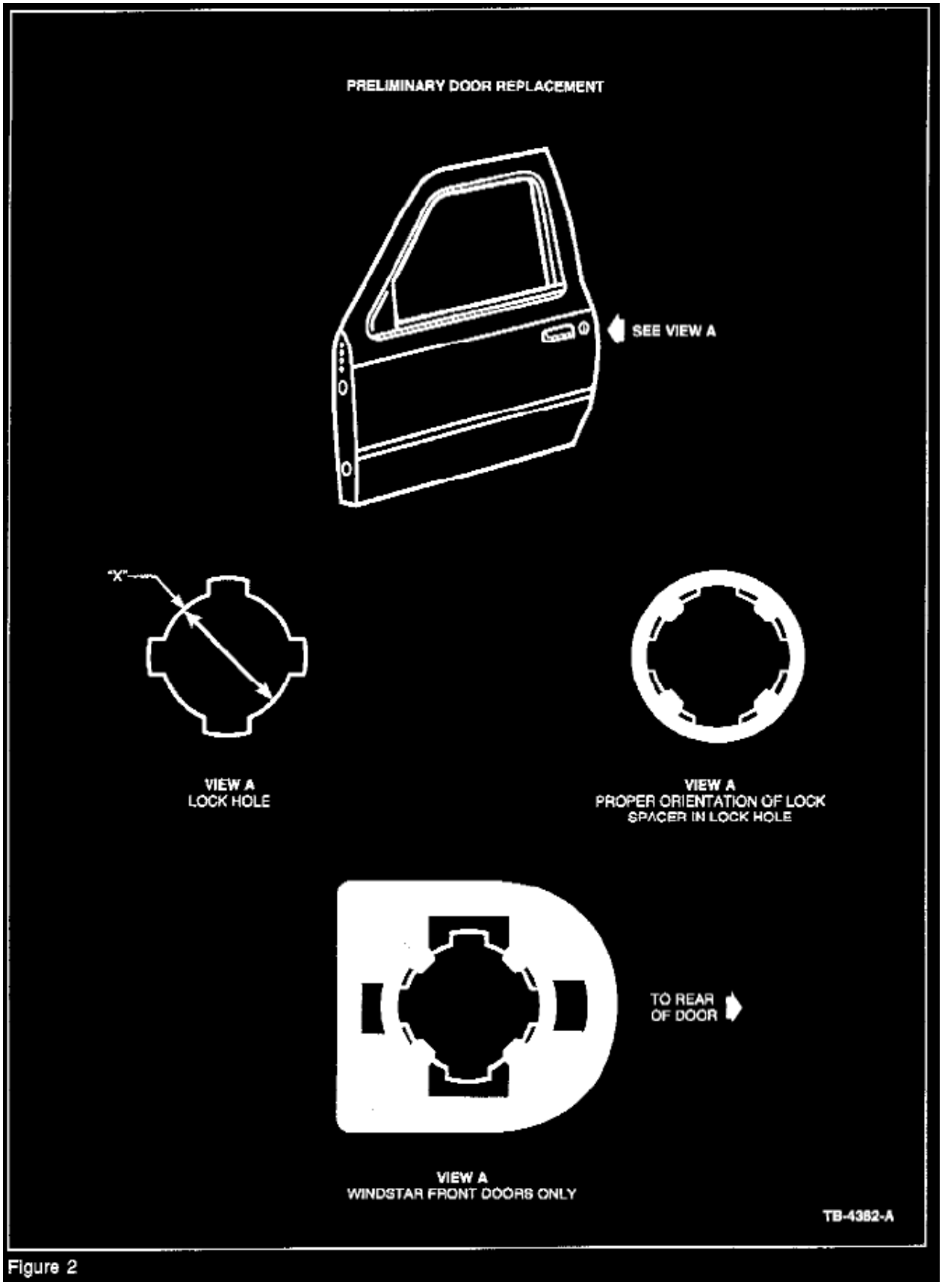

PRELIMINARY DOOR REPLACEMENT
SEE VIEW A
"X"
VIEW A
LOCK HOLE
VIEW A
PROPER ORIENTATION OF LOCK SPACER IN LOCK HOLE
TO REAR OF DOOR
VIEW A
WINDSTAR FRONT DOORS ONLY
TB-4382-A

Figure 2

3. Snap a new spacer into the hole from outside the door (Figure 2).

DOOR OR LIFTGATE INSTALLATION/REMOVAL

When replacing the door of liftgate assembly, the new door or liftgate may have the larger lock cylinder hole. Measure the hole diameter (Figure 2). If dimension "X" is more than 24 mm, then a spacer is required. If it is less than 24 mm, then a spacer cannot be used.

NOTE:

EVEN IF THE ORIGINAL DOOR HAS A SPACER, ONE IS NOT NEEDED IF THE "X" DIMENSION IS LESS THAN 24 mm IN THE NEW DOOR.

GENERAL INFORMATION REGARDING SPACER USAGE

The purpose of the spacer is to allow the flexibility of phasing in future lock designs without having to coordinate doors and locks in production or having to maintain two unique service doors. In general, the spacers are to be used with new doors (large hole) and old locks. The new doors are being phased in ahead of the new locks.

PART NUMBER PART NAME

F6TZ-1521890-AA Door Lock cylinder Spacer

F6UZ-1521890-AA Door Lock Cylinder Spacer

F68Z-1621890-AA Door Lock Cylinder Spacer

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 111000, 112000

Door Locks: All Technical Service Bulletins Door Lock Cylinder - Loose in Replacement Door

Article No. 95-24-4

12/04/95

^ DOOR - REPLACEMENT DOOR HAS LOOSE FITTING DOOR LOCK CYLINDER - SERVICE TIP

^ LOCK - LOOSE FITTING DOOR LOCK CYLINDER - SERVICE TIP

LIGHT TRUCK: 1981-96 F-150-350 SERIES 1983-96 BRONCO, RANGER 1986-95 AEROSTAR 1988-96 F SUPER DUTY 1992-96 ECONOLINE 1995-96 WINDSTAR

MEDIUM/HEAVY TRUCK: 1990-96 F & B SERIES

ISSUE: New replacement doors for past model years have a larger lock cylinder hole diameter. A loose fit will occur when installing the door lock cylinder. The lock cylinder mounting hole diameter in new doors has been increased in preparation for a new style lock cylinder. New locks will be phased in for future production.

ACTION: Install a spacer for the larger diameter door lock cylinder mounting hole. Refer to the following Service Procedure for details.

NOTE:

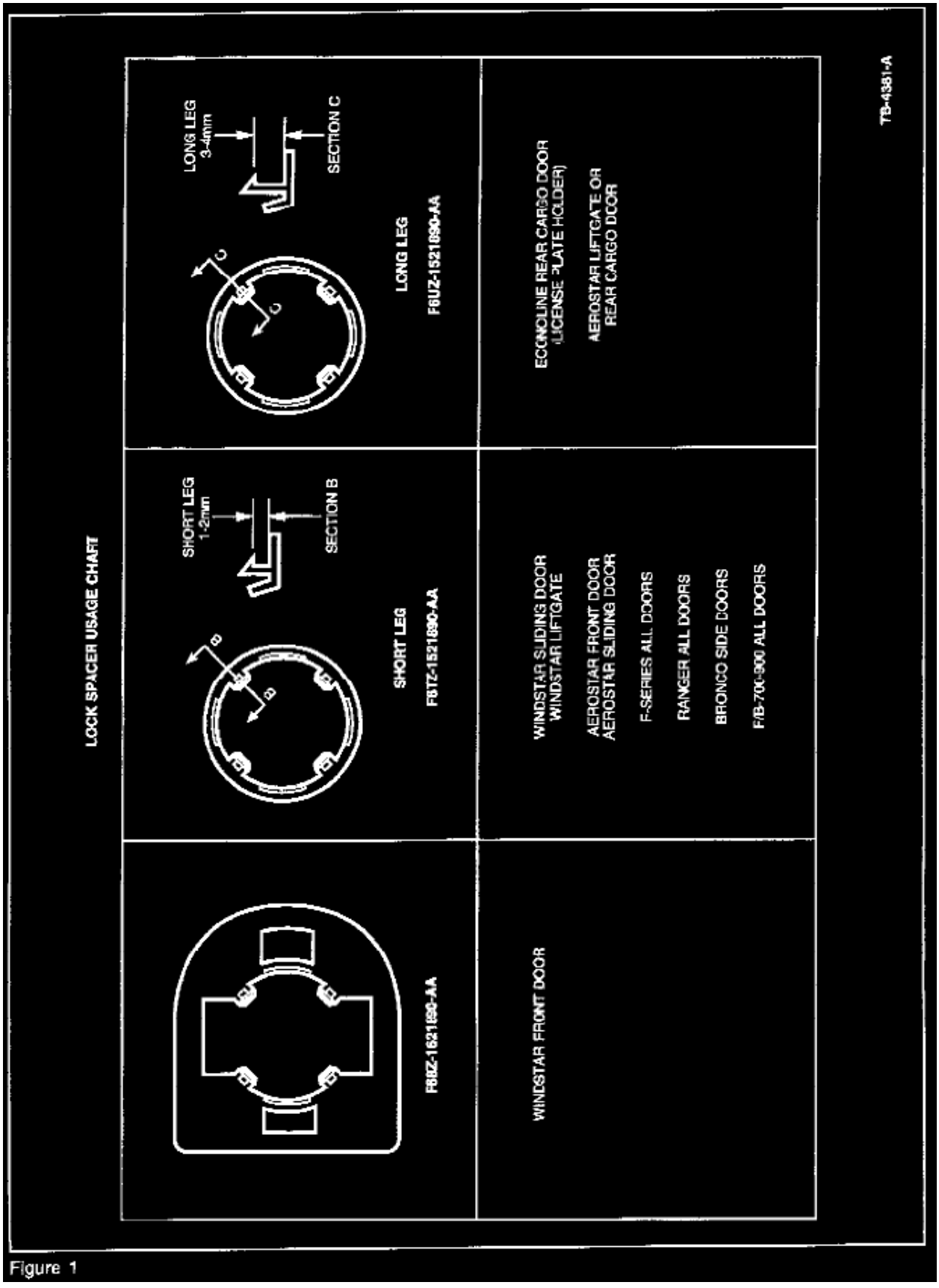
THE DOOR LOCK CYLINDER SPACER HAS BEEN ADDED TO CERTAIN 1996 MODEL YEAR VEHICLES TO ELIMINATE THE LOOSE FIT CONDITION FROM THE SMALLER DOOR LOCK CYLINDER. SOME VEHICLES MAY BE BUILT WITH SPACERS ON ONE SIDE ONLY. THIS IS DUE TO THE BALANCE OF SUPPLIES OF RIGHT AND LEFT DOORS AT THE ASSEMBLY PLANTS AT THE TIME OF MODEL YEAR CHANGEOVER.

SERVICE PROCEDURE

DOOR LOCK CYLINDER

INSTALLATION/REMOVAL

1. Whenever the door lock cylinder is removed, check for presence of lock cylinder spacer in the door in the lock hole. If one is present, check for damage and replace if necessary.


LOCK SPACER USAGE CHART
F8UZ-1521890-AA
WINDSTAR FRONT DOOR
SHORT LEG
1-2mm
SECTION B
F8TZ-1521890-AA
SHORT LEG
WINDSTAR SLIDING DOOR
WINDSTAR LIFTGATE
AEROSTAR FRONT DOOR
AEROSTAR SLIDING DOOR
F-SERIES ALL DOORS
RANGER ALL DOORS
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LONG LEG
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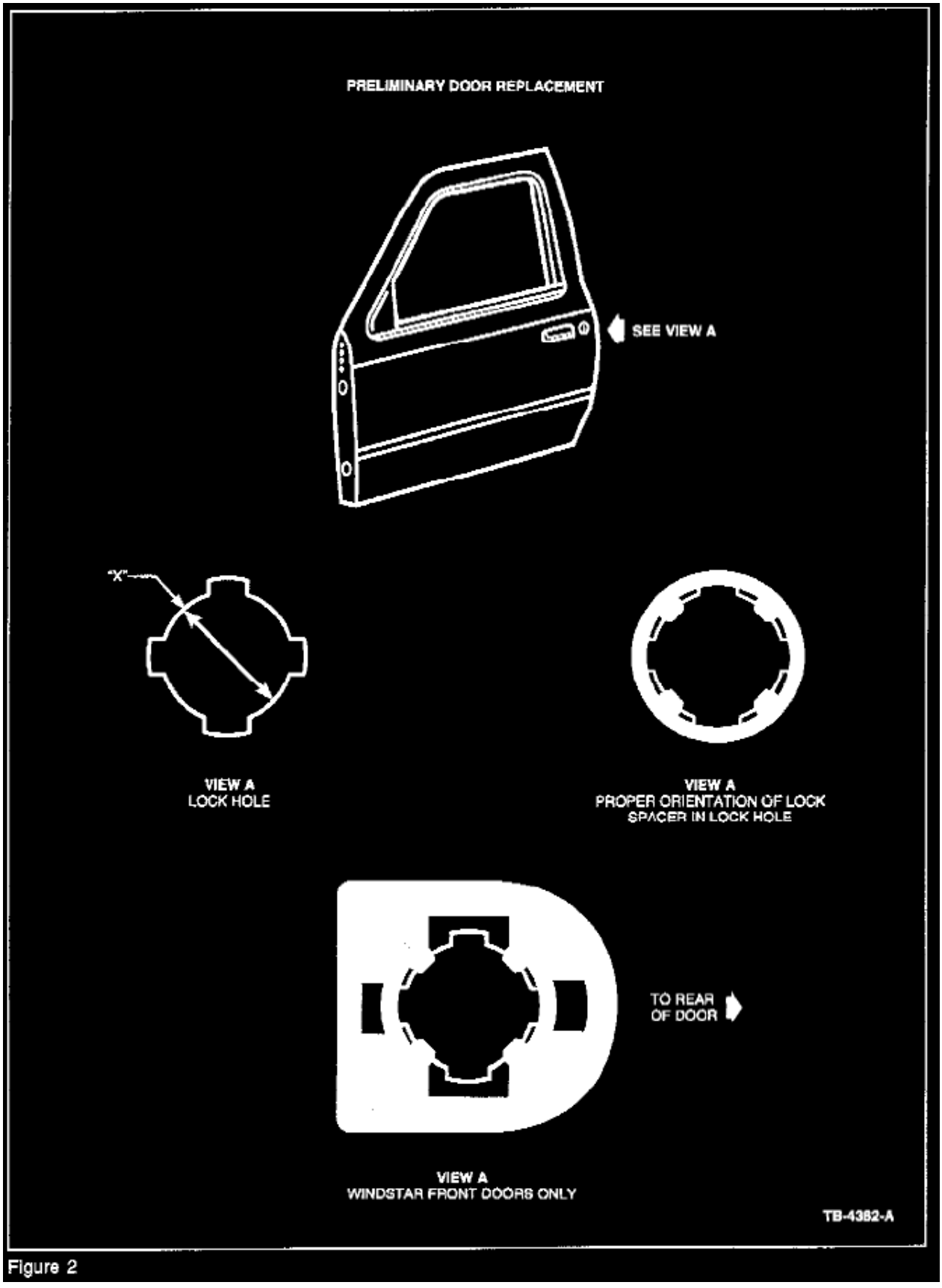
F6UZ-1521890-AA
LONG LEG
ECONOLINE REAR CARGO DOOR
(LICENSE PLATE HOLDER)
AEROSTAR LIFTGATE OR
REAR CARGO DOOR
TB-4381-A

Figure 1

2. If replacement is necessary, refer to the Lock Spacer Usage Chart (Figure 1) for proper part number application.


PRELIMINARY DOOR REPLACEMENT
SEE VIEW A
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VIEW A
PROPER ORIENTATION OF LOCK
SPACER IN LOCK HOLE
TO REAR
OF DOOR
VIEW A
WINDSTAR FRONT DOORS ONLY
TB-4382-A

Figure 2

3. Snap a new spacer into the hole from outside the door (Figure 2).

DOOR OR LIFTGATE INSTALLATION/REMOVAL

When replacing the door of liftgate assembly, the new door or liftgate may have the larger lock cylinder hole. Measure the hole diameter (Figure 2). If dimension "X" is more than 24 mm, then a spacer is required. If it is less than 24 mm, then a spacer cannot be used.

NOTE:

EVEN IF THE ORIGINAL DOOR HAS A SPACER, ONE IS NOT NEEDED IF THE "X" DIMENSION IS LESS THAN 24 mm IN THE NEW DOOR.

GENERAL INFORMATION REGARDING SPACER USAGE

The purpose of the spacer is to allow the flexibility of phasing in future lock designs without having to coordinate doors and locks in production or having to maintain two unique service doors. In general, the spacers are to be used with new doors (large hole) and old locks. The new doors are being phased in ahead of the new locks.

PART NUMBER PART NAME

F6TZ-1521890-AA Door Lock cylinder Spacer

F6UZ-1521890-AA Door Lock Cylinder Spacer

F68Z-1621890-AA Door Lock Cylinder Spacer

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 111000, 112000

Clutch Slave Cylinder: All Technical Service Bulletins M/T Clutch Housing - Fluid Inside

Article No. 91-18-14 09/05/91

^ CLUTCH-SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

^ LEAKS-CLUTCH SLAVE CYLINDER "LEAKS"- VEHICLES USED IN MUDDY OR DUSTY ENVIRONMENTS

LIGHT TRUCK: 1988-89 ECONOLINE 1988-91 AEROSTAR, BRONCO, F-150-350 SERIES, RANGER 1989-90 BRONCO II 1991 EXPLORER

ISSUE: Fluid detected inside the clutch housing may be caused by a leaking clutch slave cylinder. This may occur when vehicles are driven in severely muddy or dusty environments or when operated with extensive idle time. Vehicles include...

^ 1988-1991 Ranger, 1988-1990 Bronco II, 1988-1991 Aerostar and 1991 Explorer with manual transmissions.

^ 1988-1991 Bronco, F-150-350, and 1988-1989 Econoline with 5-Speed Manual Transmissions, except 7.3L Diesel and 7.5L engines.

ACTION: Replace the clutch slave cylinder if inspection confirms the cylinder is leaking. The new clutch slave cylinder contains a guide seal which improves durability and resistance to dirt entry. Refer to the following procedures for service details.

INSPECTION PROCEDURE:

1. If the vehicle is a Bronco or F-150, the repair will only involve 5 speed manual transmissions. Other vehicles described include all manual transmissions.

This slave cylinder is the internal "Concentric" and not the external style. Inspect vehicle to visually verify the style of slave cylinder installed.

2. Determine if the slave cylinder is leaking by checking for a fluid trace inside the bottom of the clutch housing.

REPAIR PROCEDURE

1. Remove the clutch slave cylinder. Refer to the appropriate Light Truck Shop Manual for service details.

2. Replace the clutch slave cylinder with a new slave cylinder (F1TZ-7A564-A). Refer to the appropriate Light Truck Shop Manual for service details.

PART NUMBER PART NAME CLASS

F1TZ-7A564-A Slave Cylinder B

NOTE: APPPROPRIATE SUPPLIMENT OPERATIONS SHOULD BE USED WITH THE LABOR OPERATIONS LISTED.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION

DESCRIPTION TIME

911814A Inspect For Fluid Leak - All 0.3 Hr.

Vehicles

911814B Replace Clutch Slave 1.8 Hr.

Cylinder - Ranger 4X2 With 2.3L

911814C Replace Clutch Slave 3.2 Hr.

Cylinder - Ranger 4X4 With

2.3L And F-Series 4X2 With 5.8L

911814D Replace Clutch Slave 2.0 Hr.

Cylinder - Ranger 4X2 With 2.9L Or 3.0L And Aerostar With 3.0L

911814E Replace Clutch Slave 2.6 Hr.

Cylinder - Bronco II With 2.9L

911814F Replace Clutch Slave 3.5 Hr.

Cylinder - Ranger 4X4 And Bronco II 4X4 With 2.9L And F-Series 4X4 And Bronco With 5.0L

911814G Replace Clutch Slave 2.9 Hr.

Cylinder - Ranger 4X2 And Explorer 4X2 With 4.0L

911814H Replace Clutch Slave 3.7 Hr.

Cylinder - Ranger 4X4 And

911814I Replace Clutch Slave 2.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And Mazda Transmission

911814J Replace Clutch Slave 2.3 Hr.

Cylinder - F-Series 4X2 With 5.0L

911814K Replace Clutch Slave 3.3 Hr.

Cylinder - F-Series 4X4 And Bronco With 4.9L And Mazda Transmission

911814L Replace Clutch Slave 3.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And ZF Transmission

911814M Replace Clutch Slave 4.1 Hr.

Cylinder - F-Series 4X4 With 4.9L And ZF Transmission

911814N Replace Clutch Slave 4.3 Hr.

Cylinder - F-Series 4X4 With 5.8L

911814O Replace Clutch Slave 2.8 Hr.

Cylinder - Econoline

DEALER CODING

BASIC PART NO. CONDITION CODE

7A564 77

OASIS CODES: 505000

2.3L And F-Series 4X2 With 5.8L

911814D Replace Clutch Slave 2.0 Hr.

Cylinder - Ranger 4X2 With 2.9L Or 3.0L And Aerostar With 3.0L

911814E Replace Clutch Slave 2.6 Hr.

Cylinder - Bronco II With 2.9L

911814F Replace Clutch Slave 3.5 Hr.

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911814G Replace Clutch Slave 2.9 Hr.

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911814H Replace Clutch Slave 3.7 Hr.

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911814I Replace Clutch Slave 2.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And Mazda Transmission

911814J Replace Clutch Slave 2.3 Hr.

Cylinder - F-Series 4X2 With 5.0L

911814K Replace Clutch Slave 3.3 Hr.

Cylinder - F-Series 4X4 And Bronco With 4.9L And Mazda Transmission

911814L Replace Clutch Slave 3.1 Hr.

Cylinder - F-Series 4X2 With 4.9L And ZF Transmission

911814M Replace Clutch Slave 4.1 Hr.

Cylinder - F-Series 4X4 With 4.9L And ZF Transmission

911814N Replace Clutch Slave 4.3 Hr.

Cylinder - F-Series 4X4 With 5.8L

911814O Replace Clutch Slave 2.8 Hr.

Cylinder - Econoline

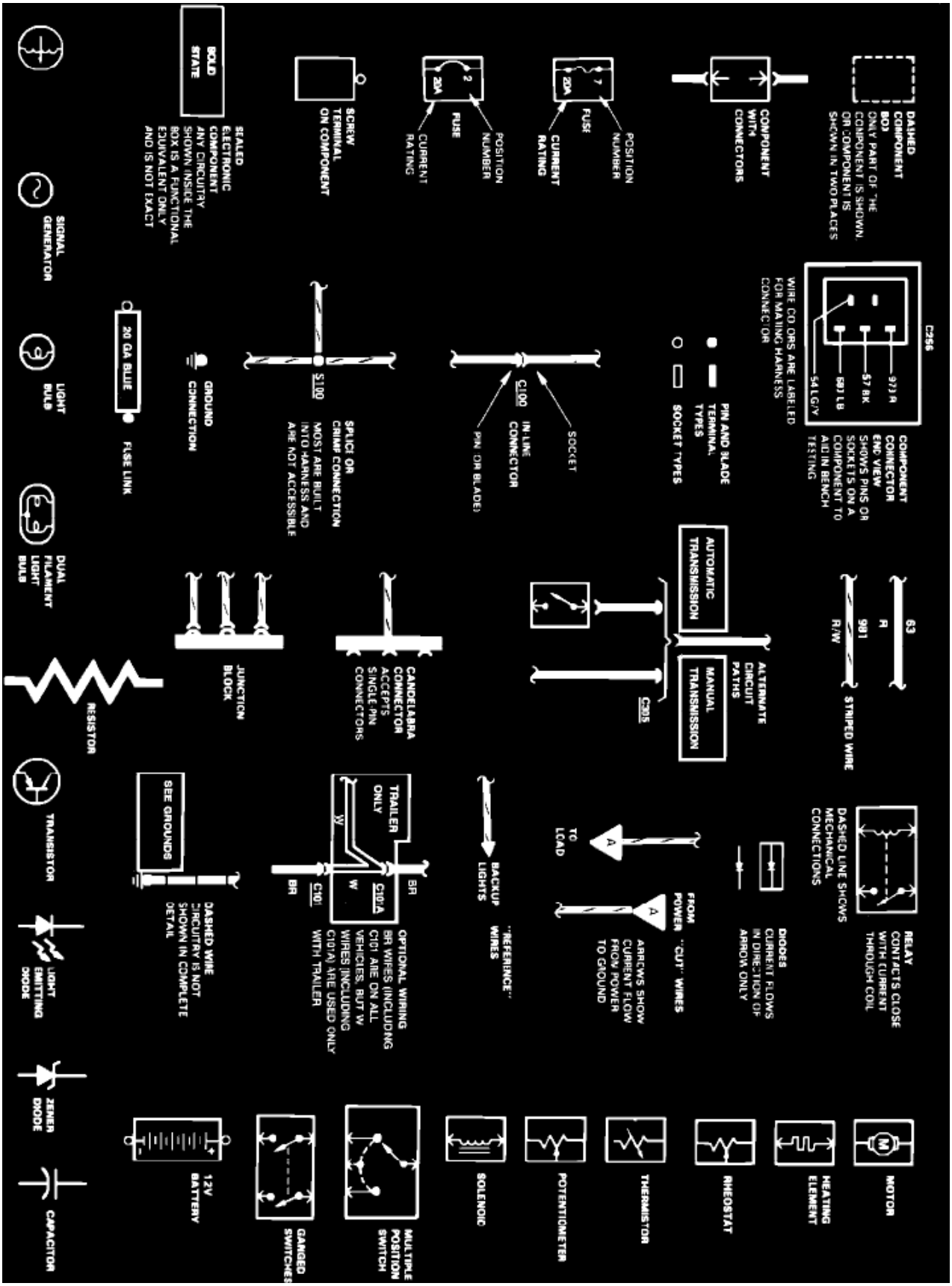
DEALER CODING

BASIC PART NO. CONDITION CODE

7A564 77

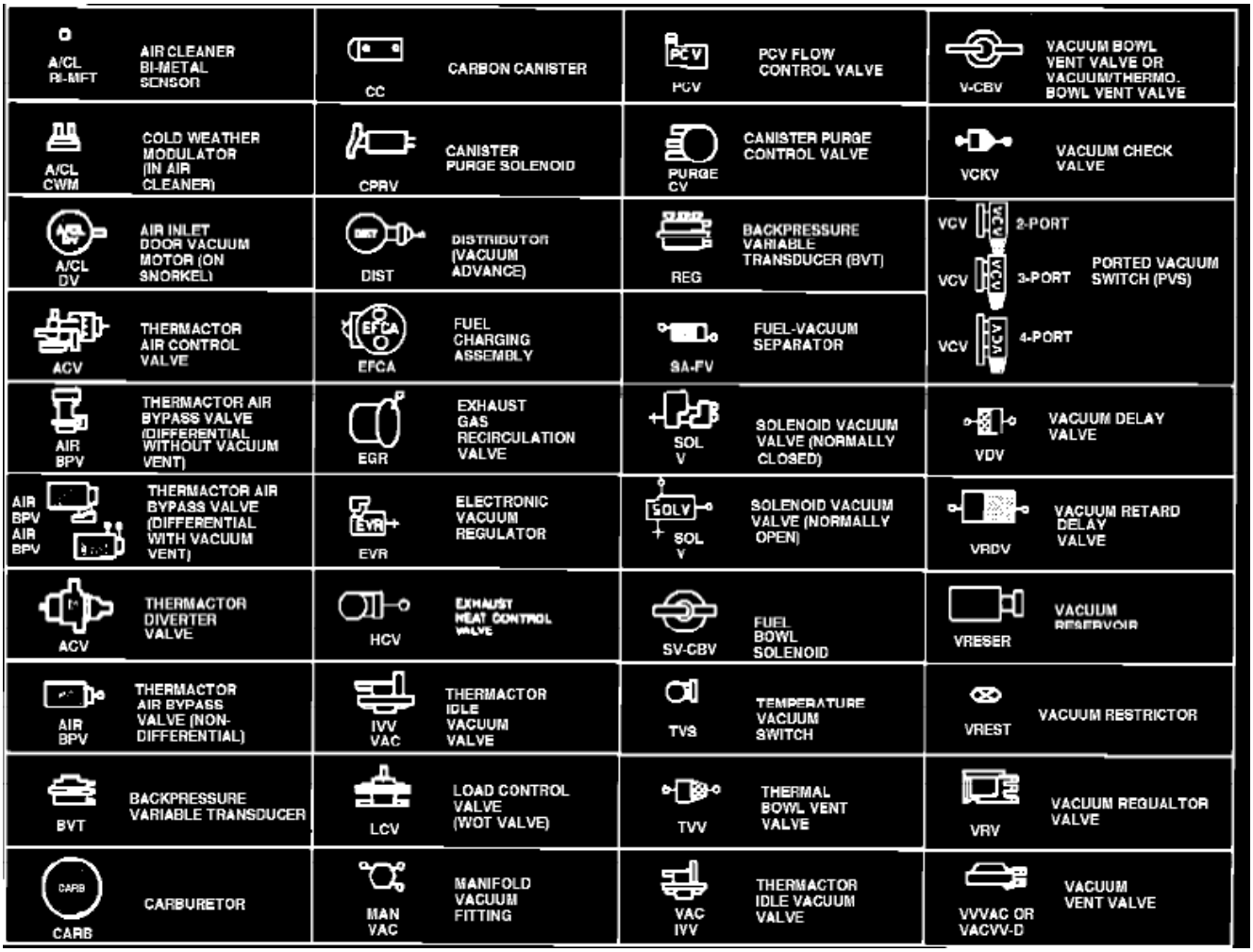
OASIS CODES: 505000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Locks > Power Locks > Power Door Lock Actuator > Component Information > Diagrams > Diagram Information and Instructions

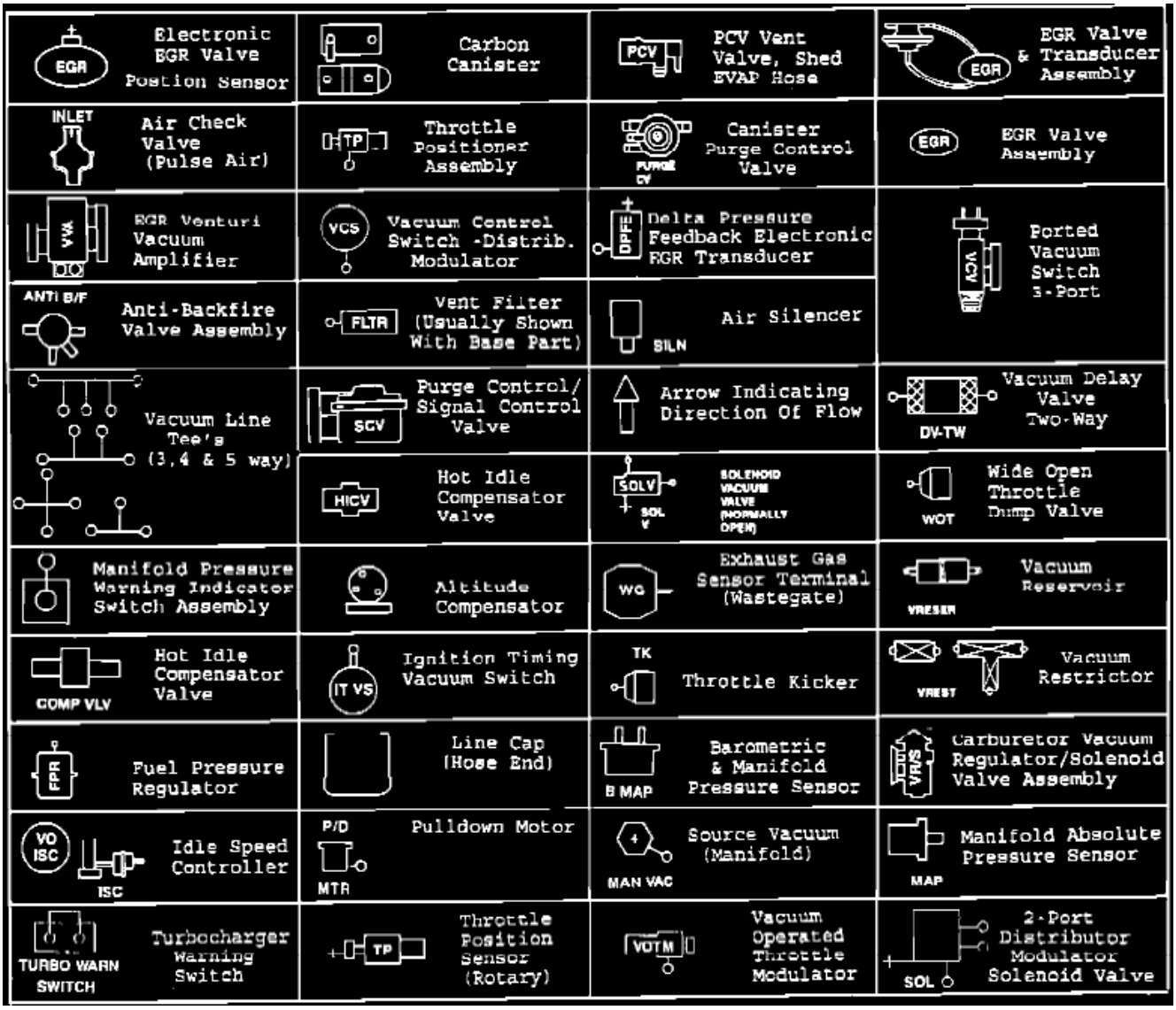


Power Door Lock Actuator: Diagram Information and Instructions

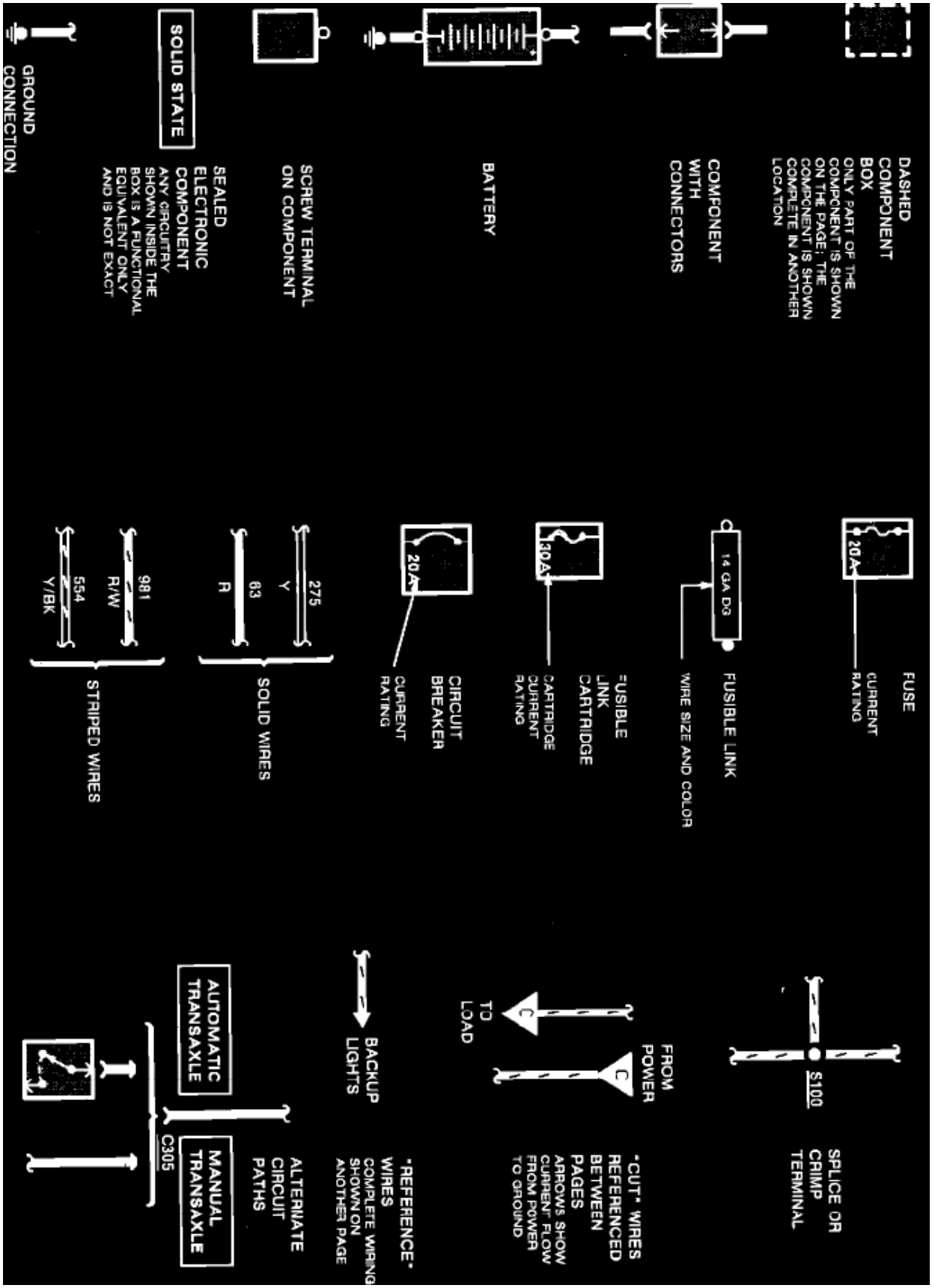
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
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ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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"REFERENCE" WIRES
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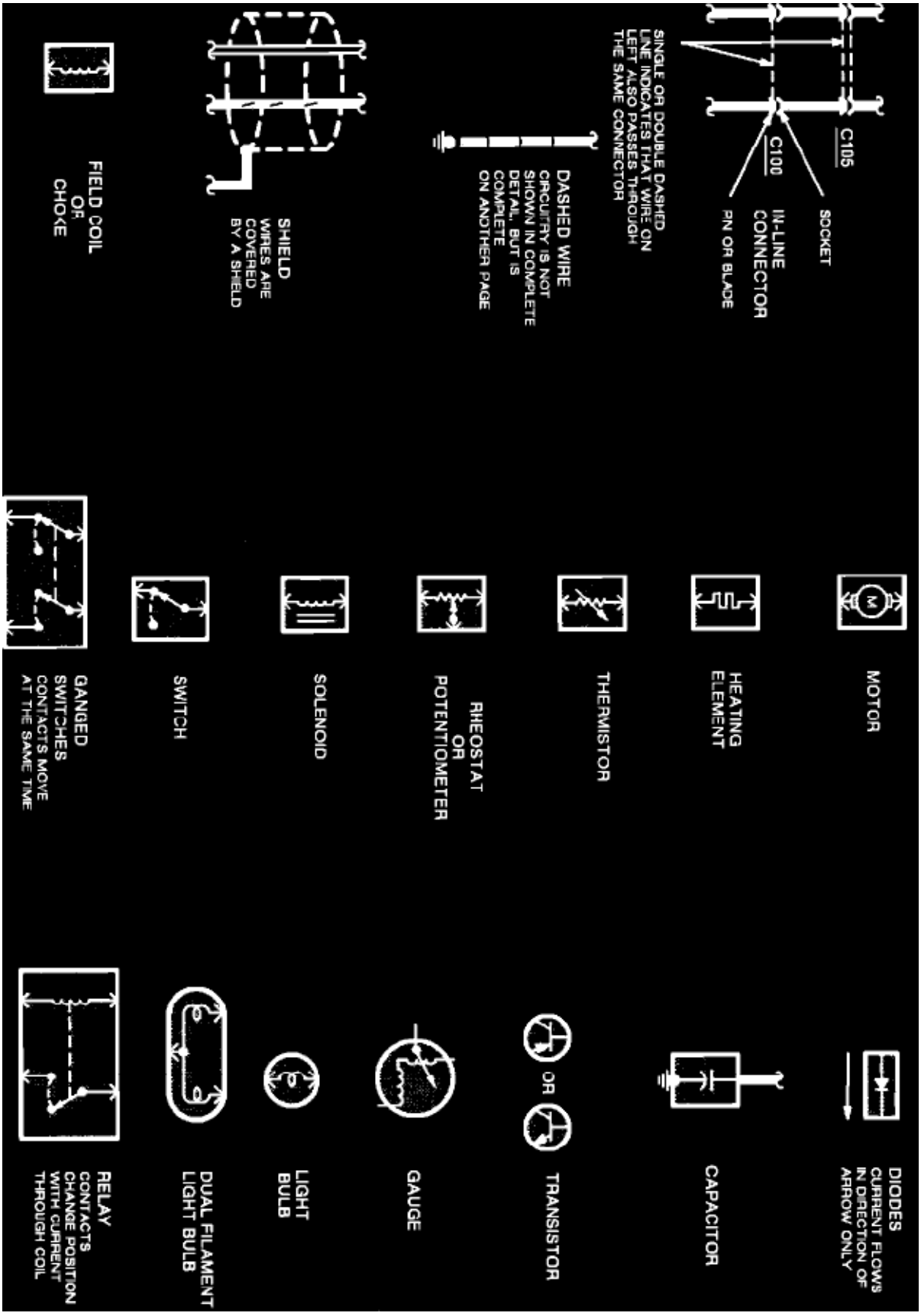
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
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C100
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SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
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THERMISTOR
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SOLENOID
SWITCH
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OR
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LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

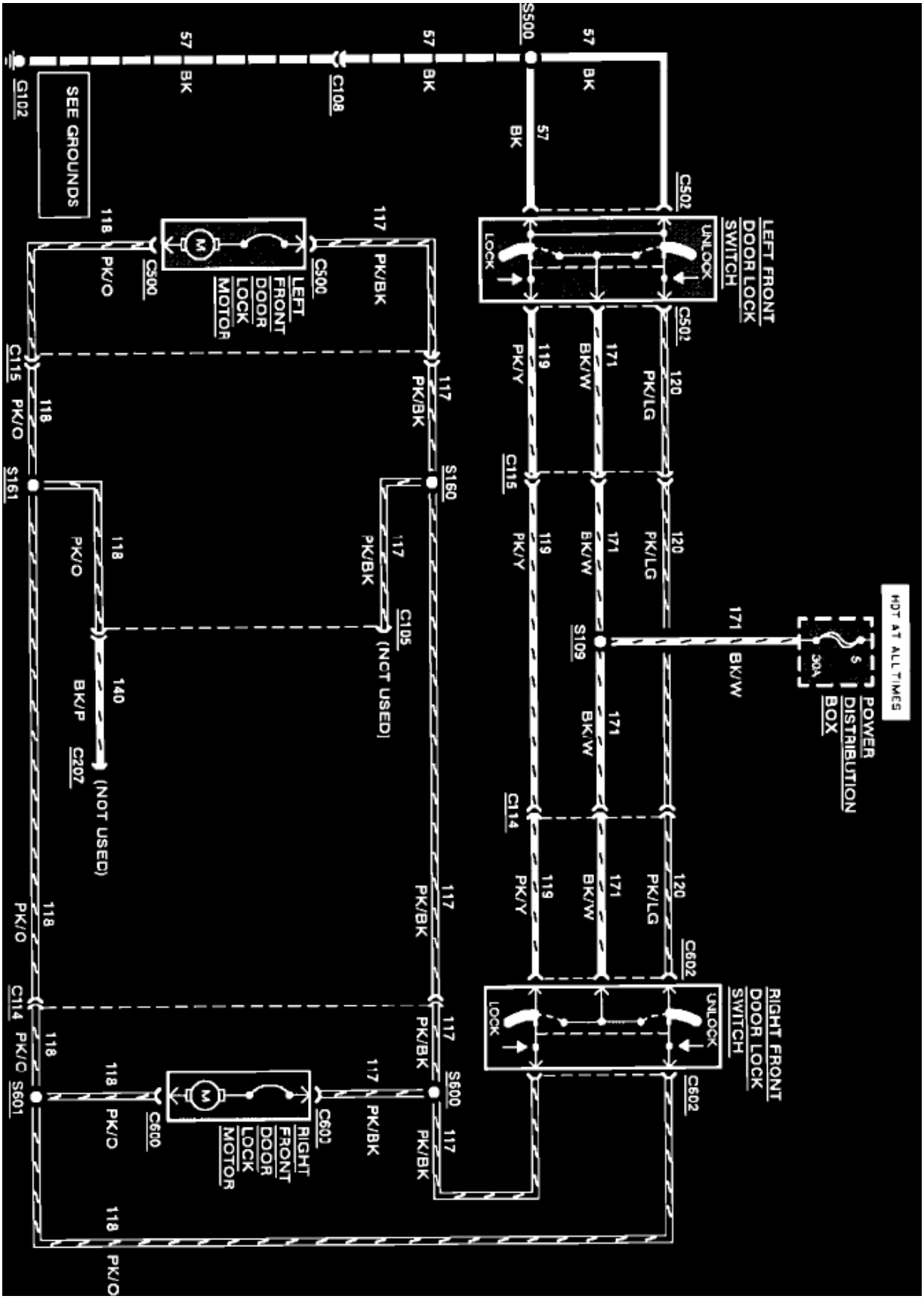
T: Tan

V: Violet

W: White

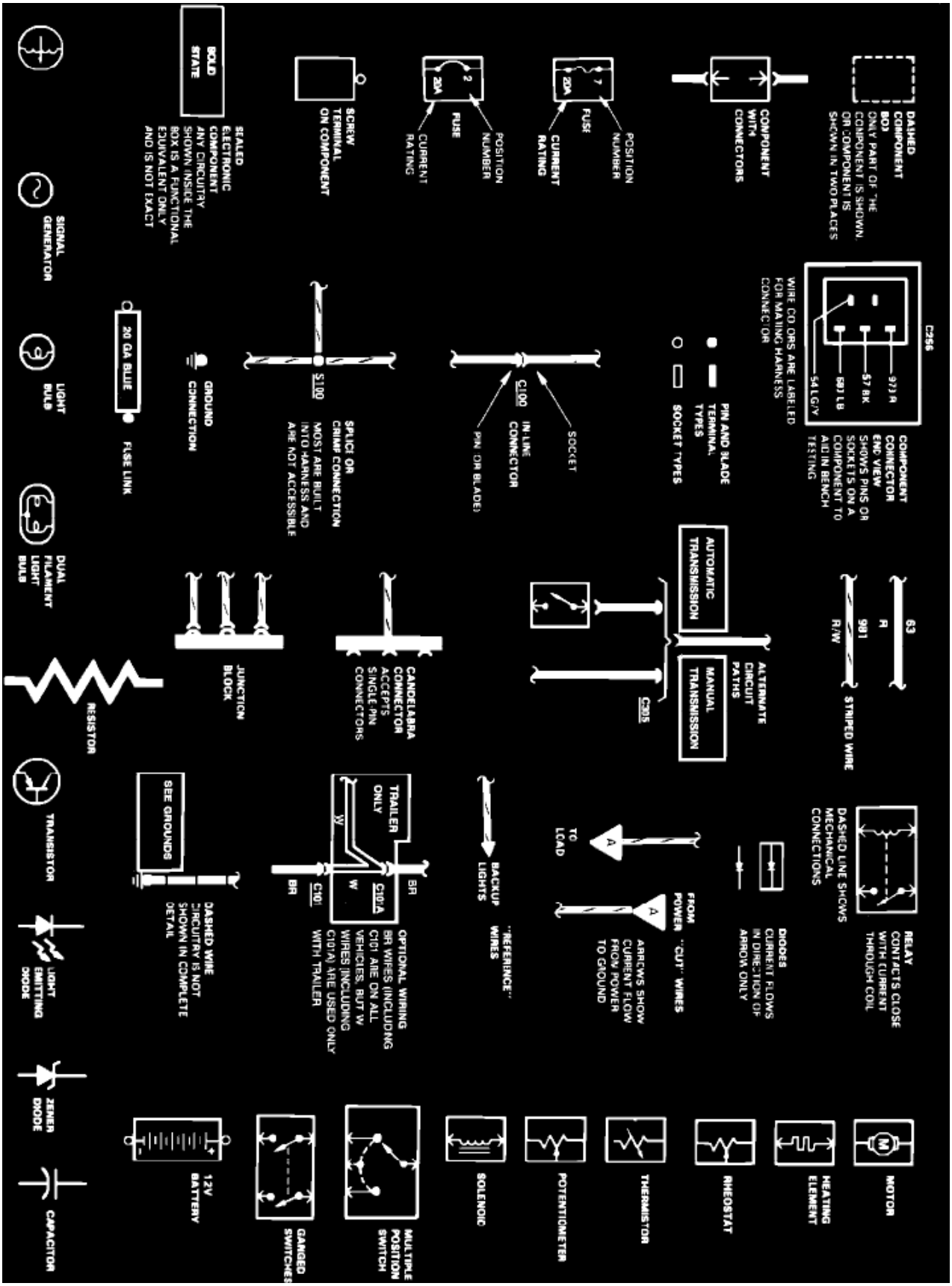
Y: Yellow

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Locks > Power Locks > Power Door Lock Actuator > Component Information > Diagrams > Diagram Information and Instructions > Page 6783



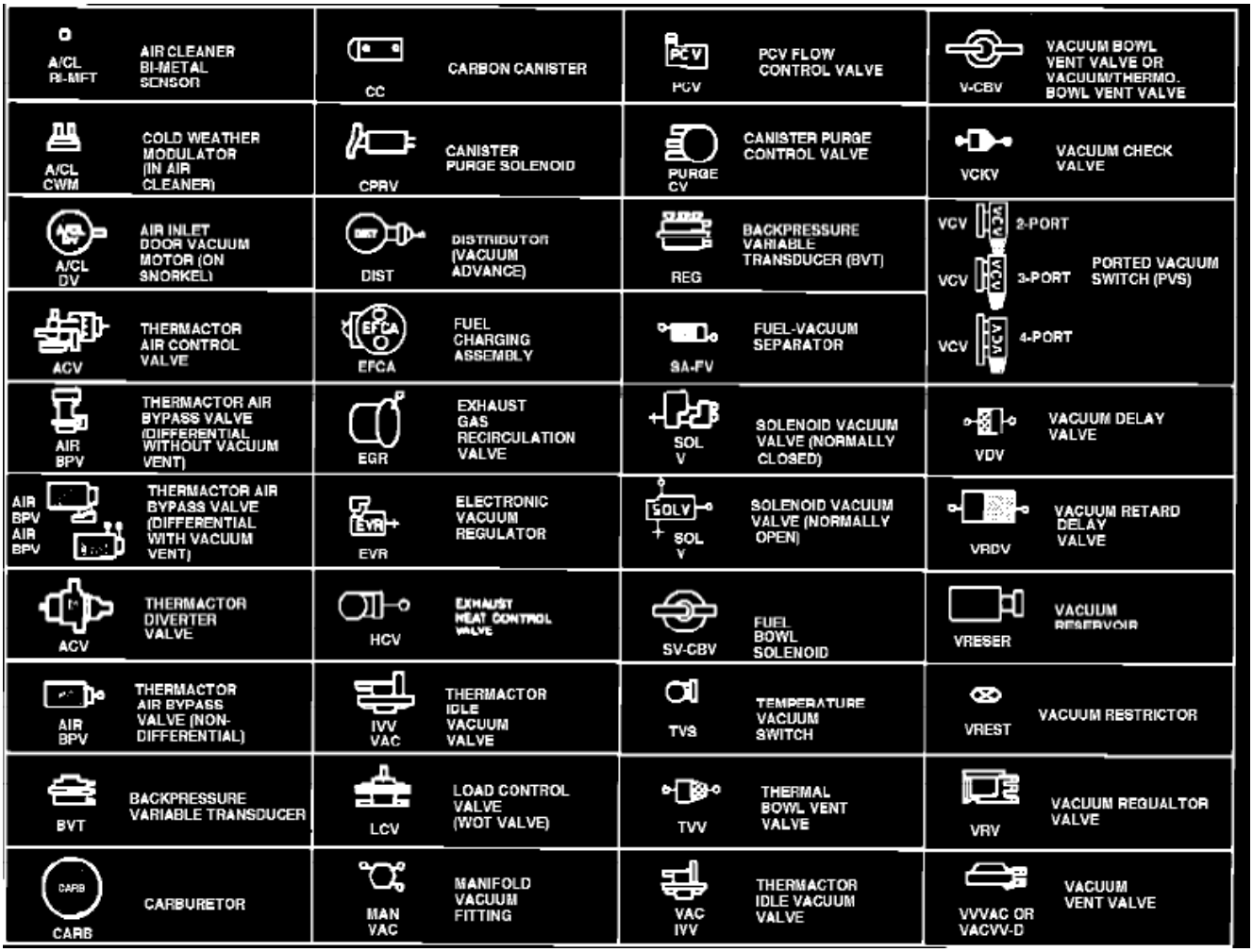
Power Door Locks

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Locks > Power Locks > Power Door Lock Switch > Component Information > Diagrams > Diagram Information and Instructions



Power Door Lock Switch: Diagram Information and Instructions

Symbol Identification



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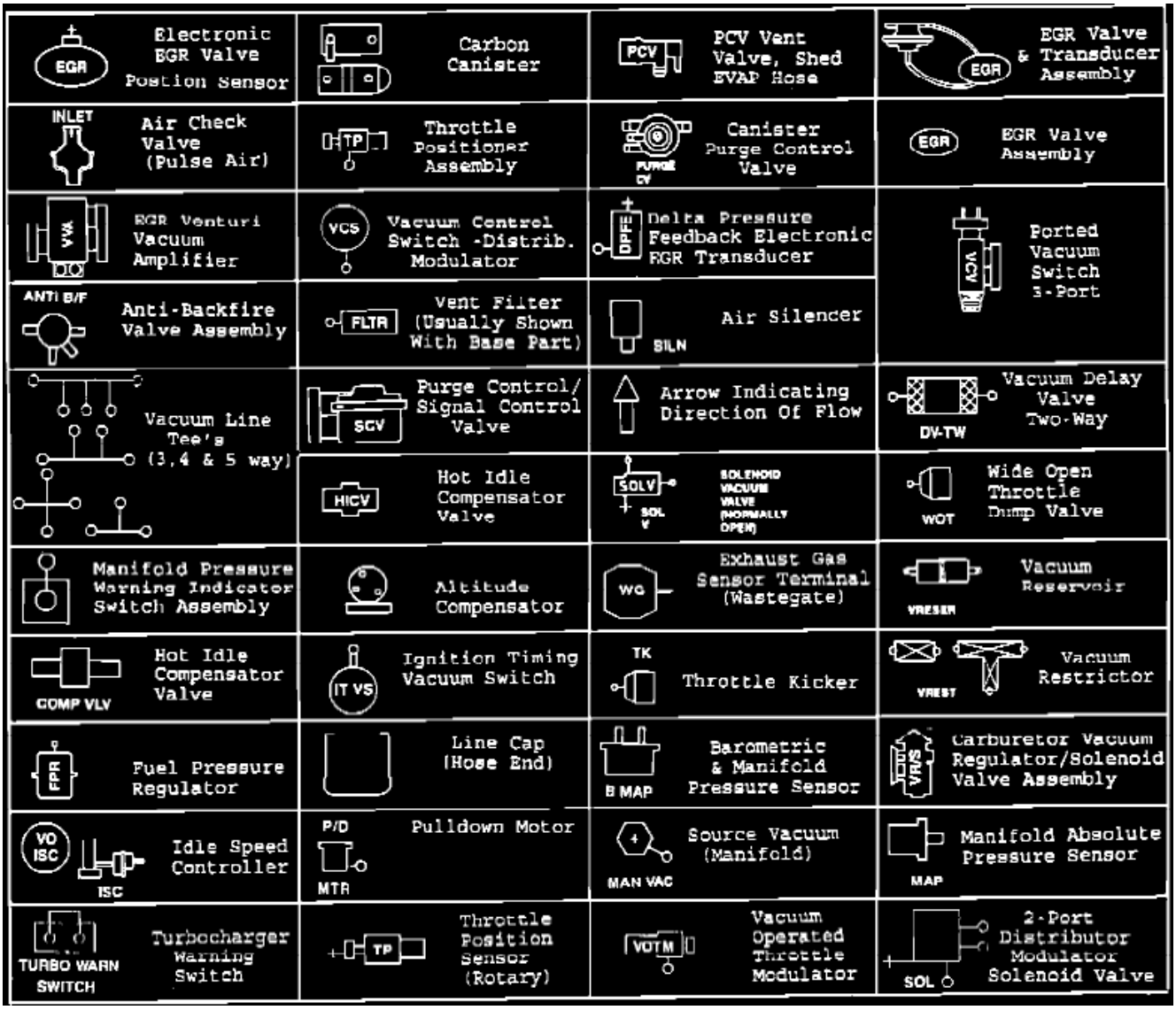

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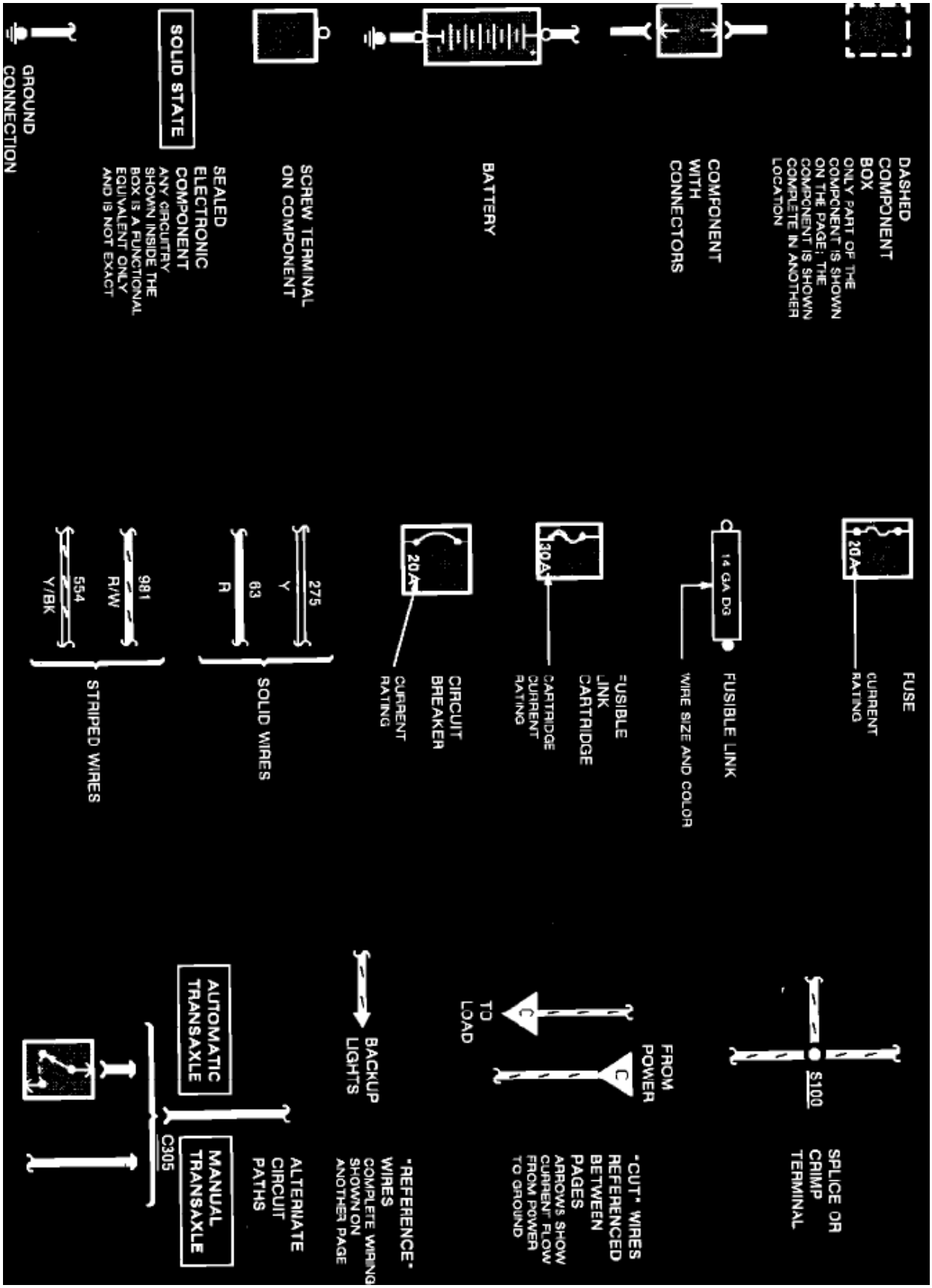
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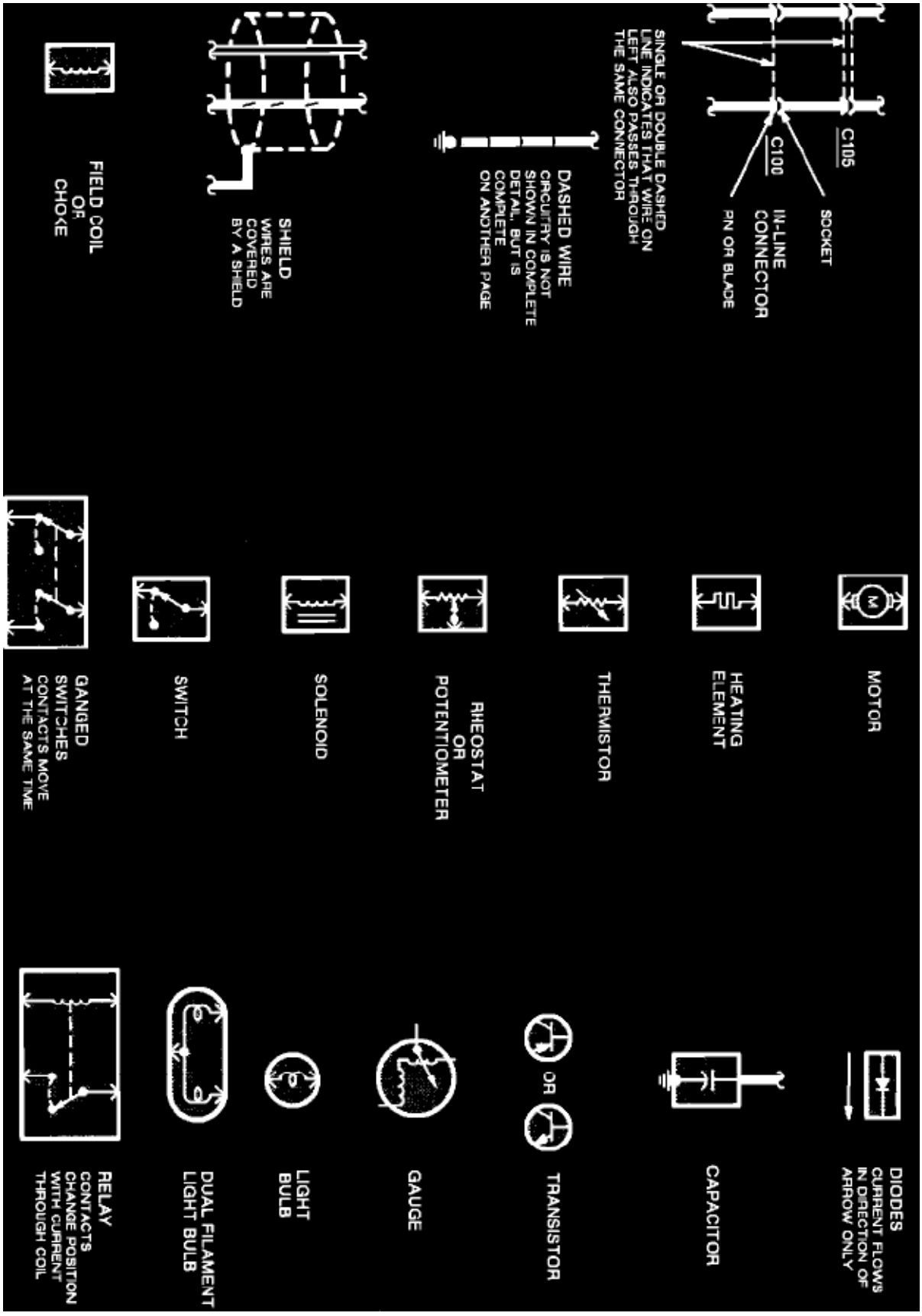
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Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
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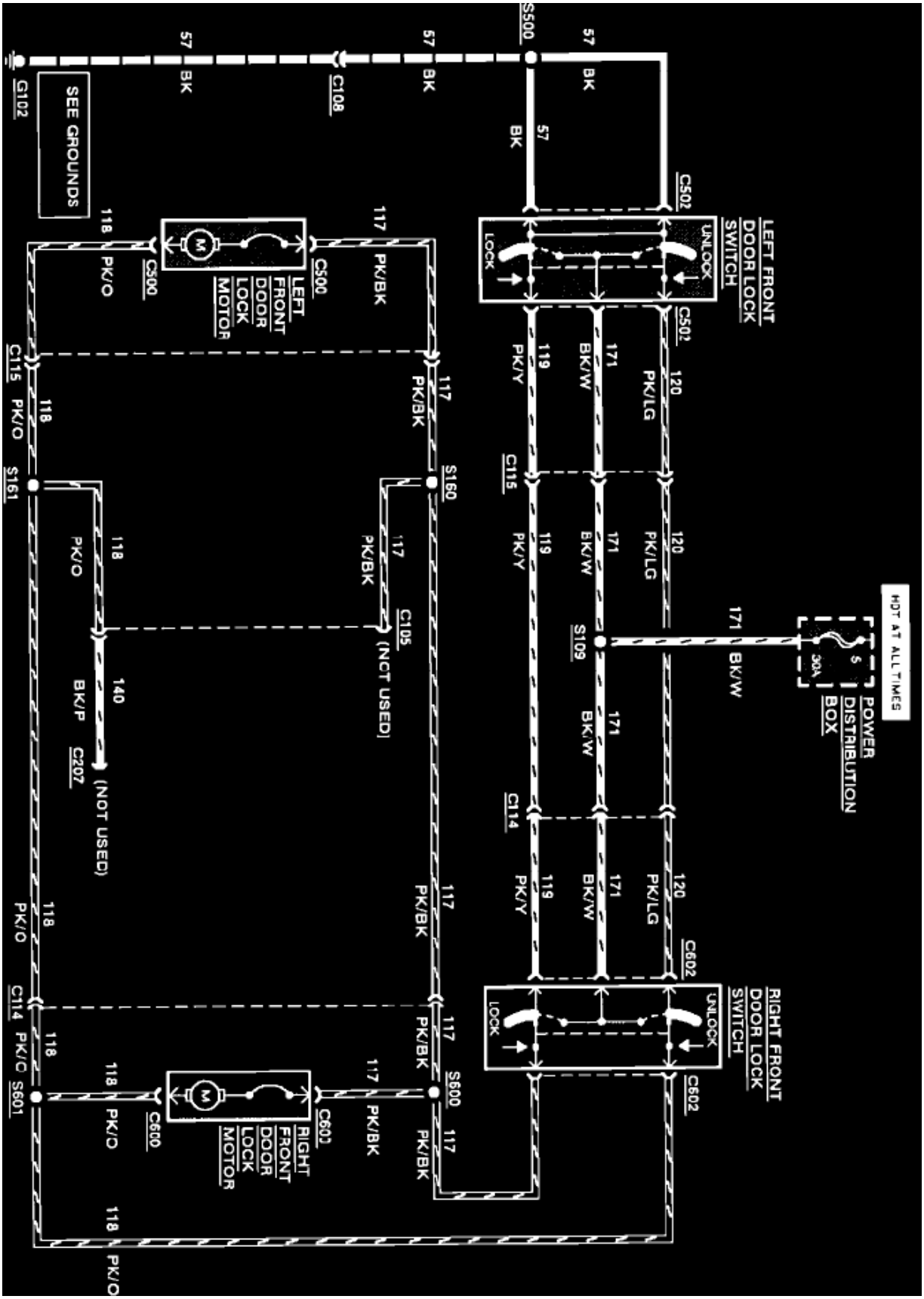


Power Door Locks

Mirrors: Customer Interest Rear View Mirror - Detaches From Windshield

Article No. 94-17-2

08/24/94

REAR VIEW MIRROR - DETACHES FROM WINDSHIELD - SERVICE TIP

FORD: 1990-94 TEMPO 1990-95 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, THUNDERBIRD 1992-95 PROBE 1995 CONTOUR

LINCOLN-MERCURY: 1990-92 MARK VII 1990-94 TOPAZ 1990-95 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOWN CAR 1991-95 TRACER 1993-95 MARK VIII 1995 MYSTIQUE

LIGHT TRUCK: 1990-95 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F-150-350 SERIES, RANGER 1993-95 VILLAGER 1995 WINDSTAR

ISSUE: The rear view mirror assembly may detach from the windshield. This may be caused by:

^ High humidity conditions, which may cause the production adhesive to fail

^ Improper cleaning of the glass and the mirror button during repair process may cause the Rear View Mirror Adhesive service chemical to fail, resulting in repeat repairs

^ Use of expired or improperly stored service kits

^ Improper use of service kit.

ACTION: Review the service kit expiration date, and use the revised cleaning and application procedures. Refer to the following procedures for service.

WARNING:

USE WITH ADEQUATE VENTILATION. AVOID EYE CONTACT AND CONTACT WITH SKIN.

SERVICE KIT STORAGE AND EXPIRATION PROCEDURES

1. Avoid prolonged storage of Rear View Mirror Adhesive kits. Over time, the adhesive performance will degrade. Excessive storage temperatures and exposure to sunlight will also degrade the unused material. For these reasons, Ford recommends:

^ Rotating stock, using the oldest material first

^ Storing the adhesive kits in a cool, dry, dark place

^ Avoiding placement of display racks in direct sunlight

^ Using only repair kits that are less than one (1) year old.

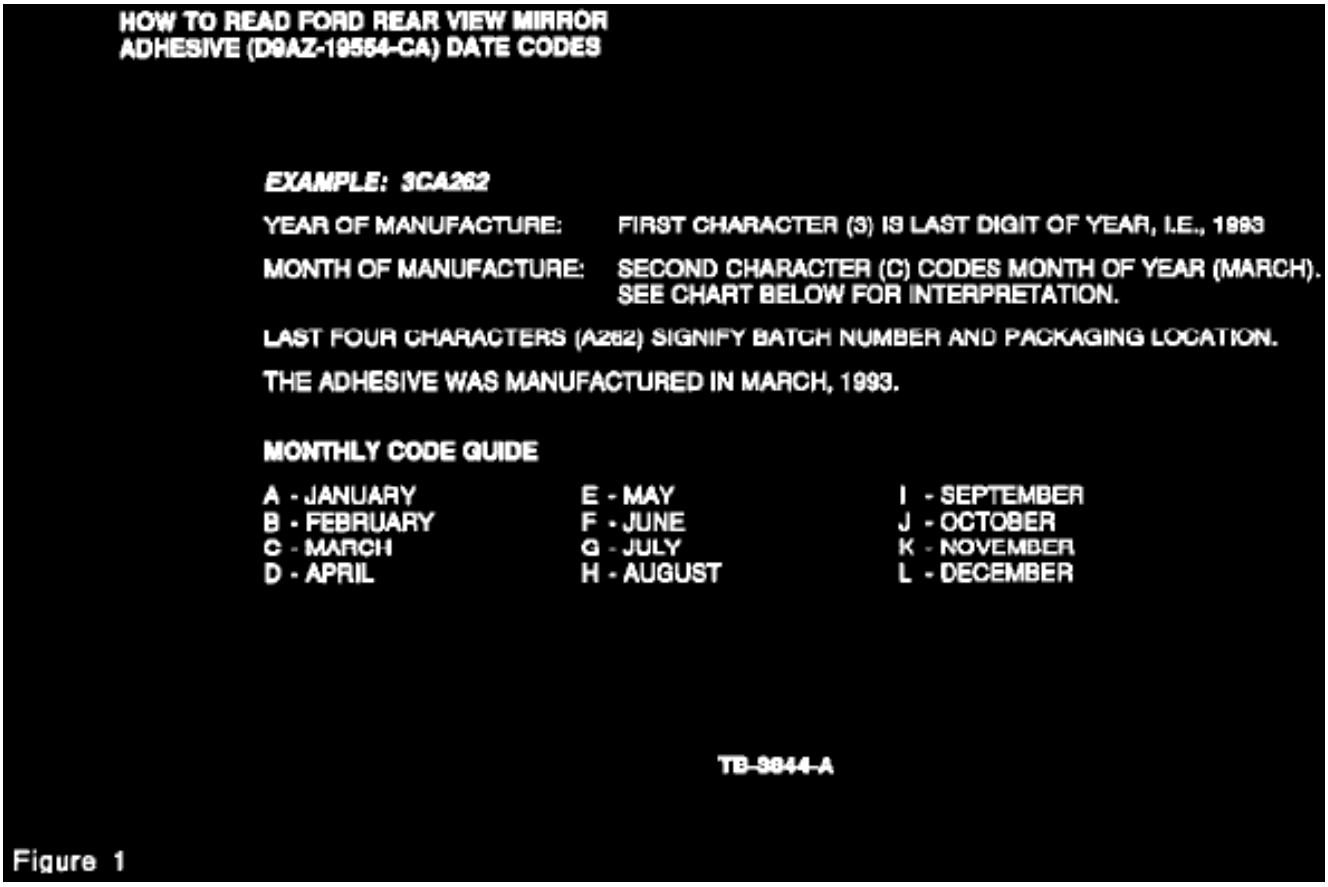


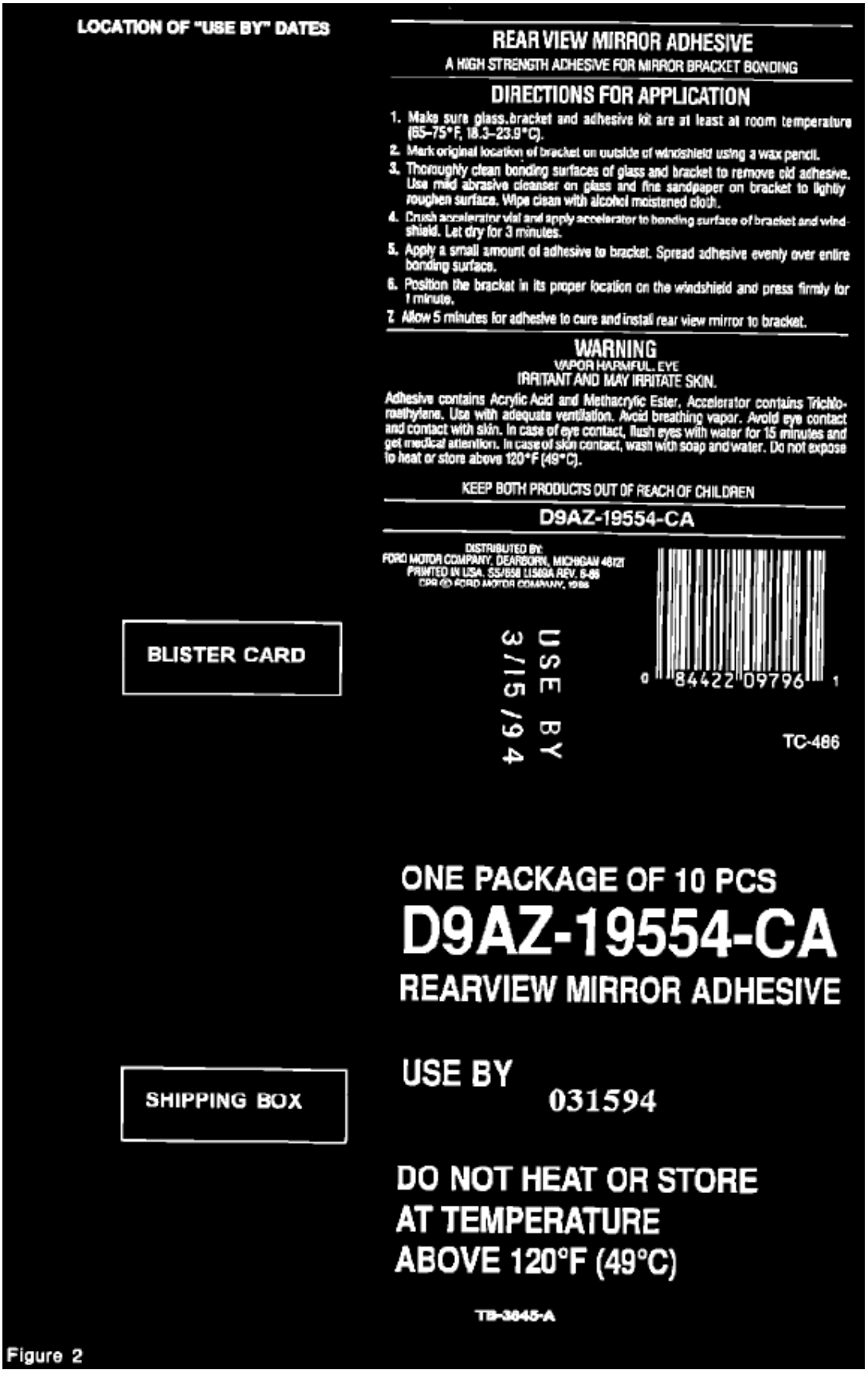
Figure 1

2. You can determine the age of the material in the kit by checking the date code crimped in the plastic seal at the bottom of the adhesive squeeze tube. The date code format is shown in Figure 1.

^ The first character is a digit representing the last digit of the year the material was manufactured.

^ The second character is a letter representing the month of manufacture.

^ The remaining characters indicate the location where the material was produced.


LOCATION OF "USE BY" DATES
REAR VIEW MIRROR ADHESIVE
A HIGH STRENGTH ADHESIVE FOR MIRROR BRACKET BONDING
DIRECTIONS FOR APPLICATION
1. Make sure glass, bracket and adhesive kit are at least at room temperature (65–75°F, 18.3–23.9°C).
2. Mark original location of bracket on outside of windshield using a wax pencil.
3. Thoroughly clean bonding surfaces of glass and bracket to remove old adhesive. Use mild abrasive cleanser on glass and fine sandpaper on bracket to lightly roughen surface. Wipe clean with alcohol moistened cloth.
4. Crush accelerator vial and apply accelerator to bonding surface of bracket and windshield. Let dry for 3 minutes.
5. Apply a small amount of adhesive to bracket. Spread adhesive evenly over entire bonding surface.
6. Position the bracket in its proper location on the windshield and press firmly for 1 minute.
7. Allow 5 minutes for adhesive to cure and install rear view mirror to bracket.
WARNING
VAPOR HARMFUL. EYE
IRRITANT AND MAY IRRITATE SKIN.
Adhesive contains Acrylic Acid and Methacrylic Ester. Accelerator contains Trichloroethylene. Use with adequate ventilation. Avoid breathing vapor. Avoid eye contact and contact with skin. In case of eye contact, flush eyes with water for 15 minutes and get medical attention. In case of skin contact, wash with soap and water. Do not expose to heat or store above 120°F (49°C).
KEEP BOTH PRODUCTS OUT OF REACH OF CHILDREN
D9AZ-19554-CA
DISTRIBUTED BY:
FORD MOTOR COMPANY, DEARBORN, MICHIGAN 48121
PRINTED IN USA. 55/658 LI560A REV. 5-86
CPR © FORD MOTOR COMPANY, 1986
0 84422 09796 1
BLISTER CARD
USE BY
3/15/94
TC-486
ONE PACKAGE OF 10 PCS
D9AZ-19554-CA
REARVIEW MIRROR ADHESIVE
SHIPPING BOX
USE BY
031594
DO NOT HEAT OR STORE
AT TEMPERATURE
ABOVE 120°F (49°C)
TB-3845-A
Figure 2

This date represents the date the material was manufactured. Ford recommends that material older than one year old not be used to install interior rear view mirror assemblies. To enable dealership personnel to more easily determine the suitability of the material, the individual kits and the shipping box will be stamped with a "Use By" date. The new "Use By" label will be on all products made after June, 1994. Figure 2 shows the location of the "Use By" date on the back of each individual blister card and the shipping box.

SERVICE PROCEDURES

NOTE:

THE FOLLOWING PROCEDURES SUPERSEDE THE INSTRUCTIONS ON THE BACK OF THE ORIGINAL REAR VIEW MIRROR ADHESIVE PACKAGE.

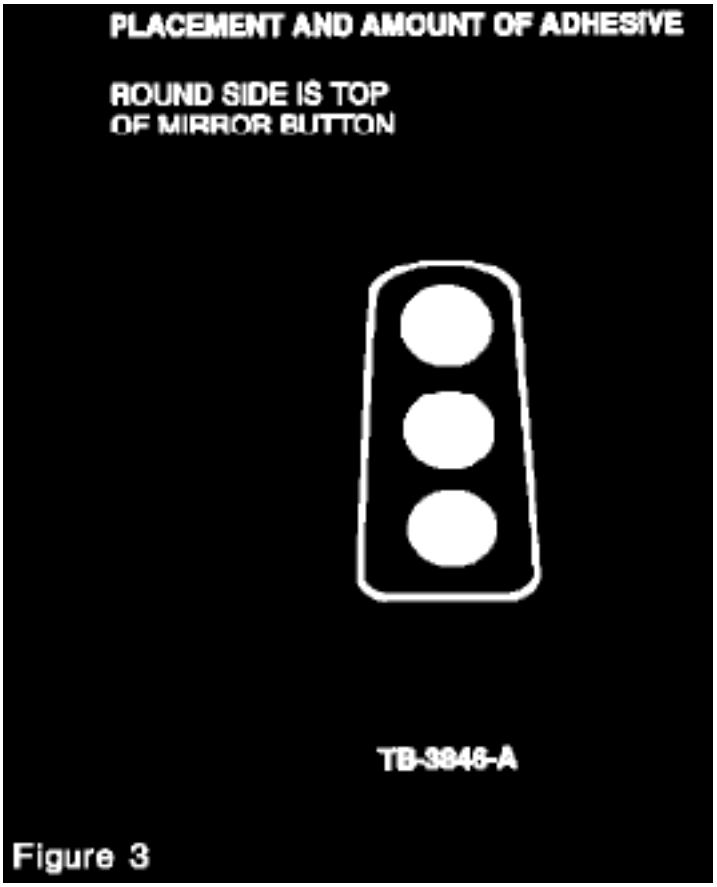


Figure 3

NOTE:

THE MIRROR BUTTON IS OFTEN CALLED A BRACKET, AND THE WINDSHIELD IS SOMETIMES REFERRED TO AS GLASS.

1. Make sure glass, bracket, and rear view mirror adhesive are at room temperature (65-75~F, 18-24~C).

^ If possible, the repair should be performed indoors. Do not perform the repair in direct sunlight.

^ If you must work outside, park the vehicle in a shaded area out of the direct sunlight.

^ The adhesive will not bond at temperatures less than 45~F (7~C), and will bond too quickly in direct sunlight.

2. Mark original location of bracket on outside of windshield with any appropriate marking tool (e.g., crayon, magic marker) before you begin.

NOTE:

SURFACES MUST BE CLEAN FOR PROPER BONDING TO OCCUR.

3. Use the following steps to ensure proper cleaning of glass and button:

a. Carefully remove thick layers of the old adhesive from the glass and the mirror button using a single edge razor blade.

b. Using a clean cloth saturated with isopropyl alcohol (obtain 70% isopropyl rubbing alcohol locally), rub the glass and the mirror button to remove any remaining old adhesive. Soaking the mirror button in isopropyl alcohol may speed the adhesive removal process.

c. Rub the mirror button and the glass with a non-abrasive bathroom cleanser (obtain locally) to ensure all traces of the old adhesive have been removed.

NOTE:

IT IS ESSENTIAL THAT NO TRACES OF CLEANSER OR ADHESIVE REMAIN ON THE GLASS OR THE MIRROR BUTTON.

d. Wipe the glass and the mirror button with a new, clean cloth saturated with isopropyl alcohol (or rubbing alcohol).

4. The accelerator vial contains a priming agent which speeds the adhesive curing process.

a. Grasp the paper wrapper around the vial and squeeze until the vial inside the paper wrapper breaks, releasing the accelerator to the felt tip on the end of the cylinder.

b. Cover the entire bonding area by applying a barely visible, but uniform, film of accelerator to an area larger than the mirror button "footprint" on the glass and to the entire mirror button bonding surface.

c. Let the accelerator dry for 3 minutes.

NOTE:

DO NOT TOUCH THE PRIMED SURFACES.

5. Squeeze only three (3) drops of adhesive in a line from top to bottom on the mirror button (Figure 3). It is not necessary to spread the adhesive.

NOTE:

MAKE SURE THE BUTTON IS POSITIONED PROPERLY FOR STEP 6. REPOSITIONING THE BUTTON, ONCE IN CONTACT WITH GLASS, WILL CAUSE THE ADHESIVE TO FAIL.

6. Position the mirror button in its proper location on the windshield (the rounded edge is pointing up). Press firmly for one full minute to ensure complete bonding. If mirror button is not firmly attached after more than one minute, remove button and repeat Steps 2 through 5.

7. Allow 5 minutes for adhesive to cure (with temperatures above 65~F, 18~C) and install rear view mirror to button. If temperature is between 45-65~F (7-18~C), use masking tape to firmly hold the button to the windshield and allow the adhesive to cure for at least 15 minutes.

PART NUMBER PART NAME CLASS

D9AZ-19554-CA Rear View Mirror Adhesive B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage For 1990 Luxury; 1990 And 1991 Non-Luxury, All Others Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

941702A Re-Attach Rear View Mirror 0.5 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

17698 03

OASIS CODES: 102000, 103000, 107000

Mirrors: All Technical Service Bulletins Rear View Mirror - Reattachment

Article No. 97-17-2

08/18/97

REAR VIEW MIRROR - NEW PROCEDURE FOR PREFERRED REATTACHMENT METHOD

FORD: 1990-94 TEMPO 1990-97 CROWN VICTORIA, MUSTANG, TAURUS, THUNDERBIRD 1990-98 ESCORT 1992-97 PROBE 1995-98 CONTOUR

LINCOLN-MERCURY: 1990-92 MARK VII 1990-94 TOPAZ 1990-97 COUGAR, GRAND MARQUIS, SABLE 1990-98 CONTINENTAL, TOWN CAR 1991-98 TRACER 1993-97 MARK VIII 1995-98 MYSTIQUE

LIGHT TRUCK: 1990-96 BRONCO 1990-97 AEROSTAR, ECONOLINE, F-150-350 SERIES, RANGER 1991-97 EXPLORER 1993-97 VILLAGER 1995-98 WINDSTAR 1997 EXPEDITION, MOUNTAINEER 1998 NAVIGATOR

ISSUE: This TSB article introduces a new procedure and tool for reattaching the inside rear view mirror assembly in the event the mirror detaches.

ACTION: Utilize the new Rotunda Mirror Button Applicator (164-R3925) to bond the mirror button to the windshield. This preferred method provides improved adhesion performance. Refer to the following Service Procedure for details.

SERVICE PROCEDURE

CAUTION:

DO NOT USE THIS PROCEDURE IF WINDSHIELD IS DAMAGED (e.g., CHIPPED, CRACKED, OR EXHIBITS STAR BREAKS) WITHIN 152 mm (61 OF THE MIRROR BUTTON, AND IF PLASTIC FILMS HAVE BEEN APPLIED TO THE INSIDE SURFACE OF THE WINDSHIELD (SUCH AS ADDITIONAL GRADIENT BANDS) WITHIN 51 mm (2") OF THE MIRROR BUTTON.

1. Mark original location of bracket on outside of windshield with any appropriate marking tool (e.g., white china marker) before you begin.

NOTE:

SURFACES MUST BE CLEAN FOR PROPER BONDING TO OCCUR.

2. Use the following steps to ensure proper cleaning of windshield:

a. Carefully remove any adhesive residue from the windshield using a new single edge razor blade.

b. Spray the inside surface of the windshield with a glass cleaner and wipe with a clean, soft, lint free cloth.

3. Remove the liner from the pre-applied tape and apply the button directly onto the windshield at the marked location.

Button sizes:

^ F7AZ-17698-AA Small Footprint Size (16 mm X 33 mm)

^ F7AZ-17698-BA Large Footprint Size (21 mm X 29 mm)

4. Center the curing head of the Rotunda Mirror Button Applicator (164-R3925) over the button.

5. Hold the curing head in place and press the "ON" button to activate the vacuum pump. Press the "START" button of the time/temperature controller to begin the cure cycle. Immediately clean the mirror button location marks from the outside of the windshield. Do not release the curing head until the cycle is completed. The AUTOMATIC CYCLE (once the start button is pressed) is as follows:

a. Time of curing cycle will be displayed.

b. Time will stay constant until cure temperature 185°C (365°F) is reached.

c. Once the cure temperature is reached, display will reflect time remaining for complete cure.

CAUTION:

THE HEATER BLOCK MAY STILL BE WARM. HANDLE WITH A GLOVE AND AVOID CONTACT WITH ANY SURFACE THAT MAY BE DAMAGED BY HIGH TEMPERATURE.

6. Turn the applicator off. Press the vacuum release button and remove the curing head from the windshield.

7. Once the button has cooled to ambient temperature (about 5 minutes), reattach the mirror assembly.

PART NUMBER PART NAME

F7AZ-17698-AA Rear view Mirror Button (Small 16 mm X 33 mm)

F7AZ-17698-BA Rear view Mirror Button (Large - 21 mm X 29 mm)

OTHER APPLICABLE ARTICLES: 94-17-2 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 102000, 103000, 107000

Mirrors: All Technical Service Bulletins Rear View Mirror - Detaches From Windshield

Article No. 94-17-2

08/24/94

REAR VIEW MIRROR - DETACHES FROM WINDSHIELD - SERVICE TIP

FORD: 1990-94 TEMPO 1990-95 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, THUNDERBIRD 1992-95 PROBE 1995 CONTOUR

LINCOLN-MERCURY: 1990-92 MARK VII 1990-94 TOPAZ 1990-95 CONTINENTAL, COUGAR, GRAND MARQUIS, SABLE, TOWN CAR 1991-95 TRACER 1993-95 MARK VIII 1995 MYSTIQUE

LIGHT TRUCK: 1990-95 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F-150-350 SERIES, RANGER 1993-95 VILLAGER 1995 WINDSTAR

ISSUE: The rear view mirror assembly may detach from the windshield. This may be caused by:

^ High humidity conditions, which may cause the production adhesive to fail

^ Improper cleaning of the glass and the mirror button during repair process may cause the Rear View Mirror Adhesive service chemical to fail, resulting in repeat repairs

^ Use of expired or improperly stored service kits

^ Improper use of service kit.

ACTION: Review the service kit expiration date, and use the revised cleaning and application procedures. Refer to the following procedures for service.

WARNING:

USE WITH ADEQUATE VENTILATION. AVOID EYE CONTACT AND CONTACT WITH SKIN.

SERVICE KIT STORAGE AND EXPIRATION PROCEDURES

1. Avoid prolonged storage of Rear View Mirror Adhesive kits. Over time, the adhesive performance will degrade. Excessive storage temperatures and exposure to sunlight will also degrade the unused material. For these reasons, Ford recommends:

^ Rotating stock, using the oldest material first

^ Storing the adhesive kits in a cool, dry, dark place

^ Avoiding placement of display racks in direct sunlight

^ Using only repair kits that are less than one (1) year old.

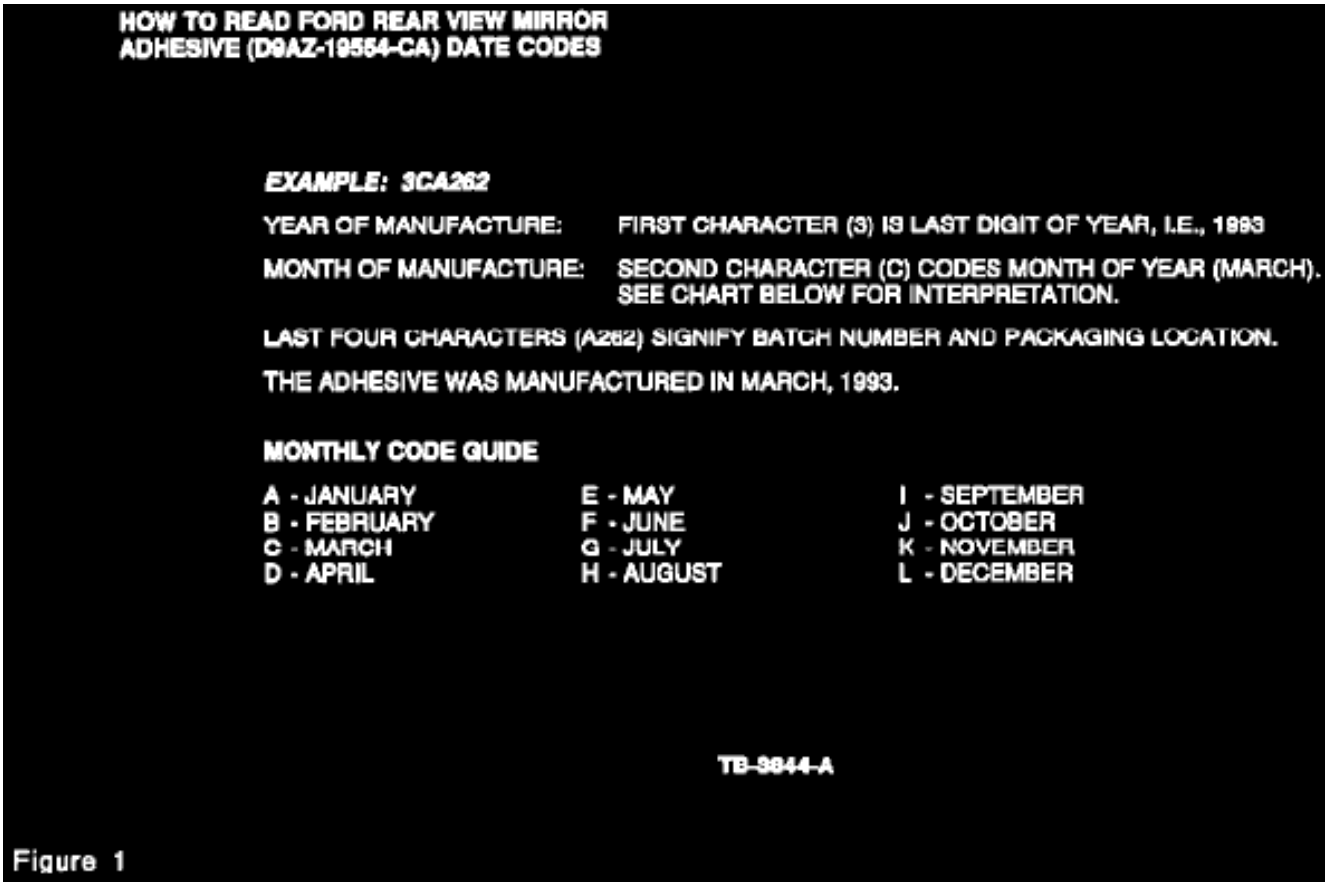


Figure 1

2. You can determine the age of the material in the kit by checking the date code crimped in the plastic seal at the bottom of the adhesive squeeze tube. The date code format is shown in Figure 1.

^ The first character is a digit representing the last digit of the year the material was manufactured.

^ The second character is a letter representing the month of manufacture.

^ The remaining characters indicate the location where the material was produced.

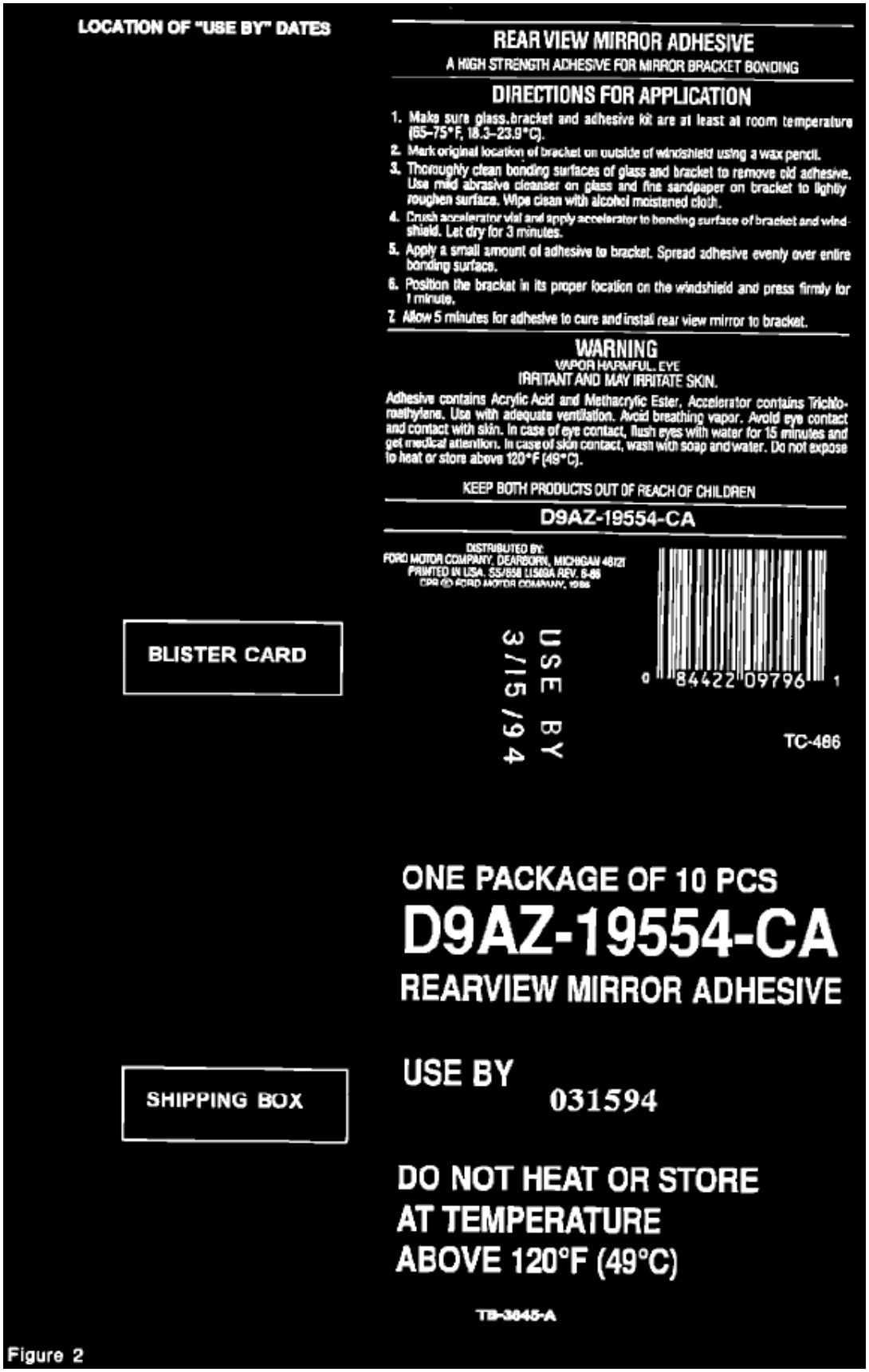

LOCATION OF "USE BY" DATES
REAR VIEW MIRROR ADHESIVE
A HIGH STRENGTH ADHESIVE FOR MIRROR BRACKET BONDING
DIRECTIONS FOR APPLICATION
1. Make sure glass, bracket and adhesive kit are at least at room temperature (65–75°F, 18.3–23.9°C).
2. Mark original location of bracket on outside of windshield using a wax pencil.
3. Thoroughly clean bonding surfaces of glass and bracket to remove old adhesive. Use mild abrasive cleanser on glass and fine sandpaper on bracket to lightly roughen surface. Wipe clean with alcohol moistened cloth.
4. Crush accelerator vial and apply accelerator to bonding surface of bracket and windshield. Let dry for 3 minutes.
5. Apply a small amount of adhesive to bracket. Spread adhesive evenly over entire bonding surface.
6. Position the bracket in its proper location on the windshield and press firmly for 1 minute.
7. Allow 5 minutes for adhesive to cure and install rear view mirror to bracket.
WARNING
VAPOR HARMFUL. EYE IRRITANT AND MAY IRRITATE SKIN.
Adhesive contains Acrylic Acid and Methacrylic Ester. Accelerator contains Trichloroethylene. Use with adequate ventilation. Avoid breathing vapor. Avoid eye contact and contact with skin. In case of eye contact, flush eyes with water for 15 minutes and get medical attention. In case of skin contact, wash with soap and water. Do not expose to heat or store above 120°F (49°C).
KEEP BOTH PRODUCTS OUT OF REACH OF CHILDREN
D9AZ-19554-CA
DISTRIBUTED BY:
FORD MOTOR COMPANY, DEARBORN, MICHIGAN 48121
PRINTED IN USA. 55/658 LI560A REV. 5-86
CPR © FORD MOTOR COMPANY, 1986
0 84422 09796 1
TC-486
BLISTER CARD
USE BY 3/15/94
ONE PACKAGE OF 10 PCS
D9AZ-19554-CA
REARVIEW MIRROR ADHESIVE
SHIPPING BOX
USE BY 031594
DO NOT HEAT OR STORE AT TEMPERATURE ABOVE 120°F (49°C)
TB-3845-A

Figure 2

This date represents the date the material was manufactured. Ford recommends that material older than one year old not be used to install interior rear view mirror assemblies. To enable dealership personnel to more easily determine the suitability of the material, the individual kits and the shipping box will be stamped with a "Use By" date. The new "Use By" label will be on all products made after June, 1994. Figure 2 shows the location of the "Use By" date on the back of each individual blister card and the shipping box.

SERVICE PROCEDURES

NOTE:

THE FOLLOWING PROCEDURES SUPERSEDE THE INSTRUCTIONS ON THE BACK OF THE ORIGINAL REAR VIEW MIRROR ADHESIVE PACKAGE.

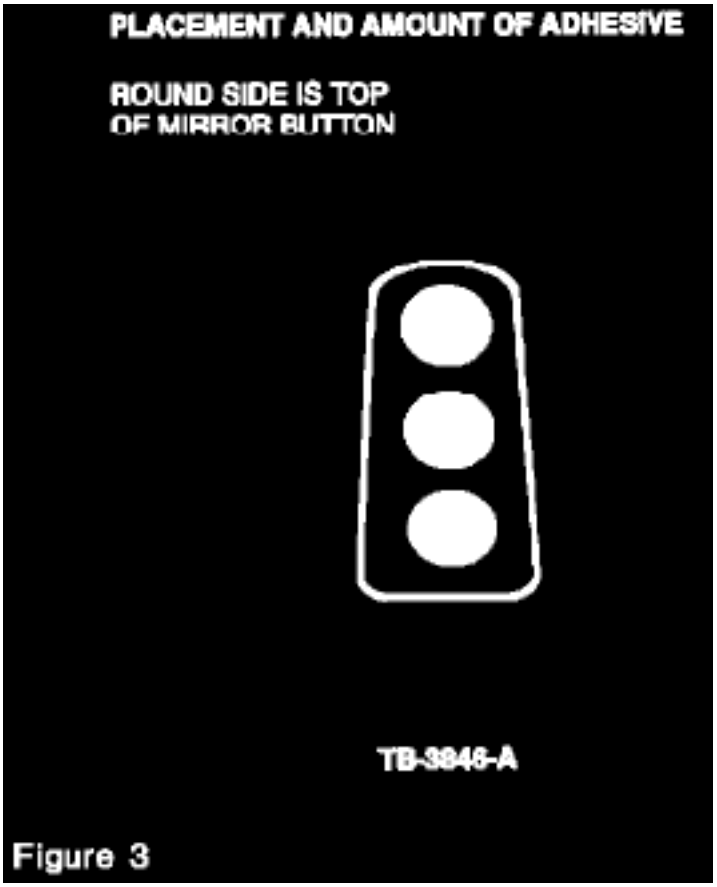


Figure 3

NOTE:

THE MIRROR BUTTON IS OFTEN CALLED A BRACKET, AND THE WINDSHIELD IS SOMETIMES REFERRED TO AS GLASS.

1. Make sure glass, bracket, and rear view mirror adhesive are at room temperature (65-75~F, 18-24~C).

^ If possible, the repair should be performed indoors. Do not perform the repair in direct sunlight.

^ If you must work outside, park the vehicle in a shaded area out of the direct sunlight.

^ The adhesive will not bond at temperatures less than 45~F (7~C), and will bond too quickly in direct sunlight.

2. Mark original location of bracket on outside of windshield with any appropriate marking tool (e.g., crayon, magic marker) before you begin.

NOTE:

SURFACES MUST BE CLEAN FOR PROPER BONDING TO OCCUR.

3. Use the following steps to ensure proper cleaning of glass and button:

a. Carefully remove thick layers of the old adhesive from the glass and the mirror button using a single edge razor blade.

b. Using a clean cloth saturated with isopropyl alcohol (obtain 70% isopropyl rubbing alcohol locally), rub the glass and the mirror button to remove any remaining old adhesive. Soaking the mirror button in isopropyl alcohol may speed the adhesive removal process.

c. Rub the mirror button and the glass with a non-abrasive bathroom cleanser (obtain locally) to ensure all traces of the old adhesive have been removed.

NOTE:

IT IS ESSENTIAL THAT NO TRACES OF CLEANSER OR ADHESIVE REMAIN ON THE GLASS OR THE MIRROR BUTTON.

d. Wipe the glass and the mirror button with a new, clean cloth saturated with isopropyl alcohol (or rubbing alcohol).

4. The accelerator vial contains a priming agent which speeds the adhesive curing process.

a. Grasp the paper wrapper around the vial and squeeze until the vial inside the paper wrapper breaks, releasing the accelerator to the felt tip on the end of the cylinder.

b. Cover the entire bonding area by applying a barely visible, but uniform, film of accelerator to an area larger than the mirror button "footprint" on the glass and to the entire mirror button bonding surface.

c. Let the accelerator dry for 3 minutes.

NOTE:

DO NOT TOUCH THE PRIMED SURFACES.

5. Squeeze only three (3) drops of adhesive in a line from top to bottom on the mirror button (Figure 3). It is not necessary to spread the adhesive.

NOTE:

MAKE SURE THE BUTTON IS POSITIONED PROPERLY FOR STEP 6. REPOSITIONING THE BUTTON, ONCE IN CONTACT WITH GLASS, WILL CAUSE THE ADHESIVE TO FAIL.

6. Position the mirror button in its proper location on the windshield (the rounded edge is pointing up). Press firmly for one full minute to ensure complete bonding. If mirror button is not firmly attached after more than one minute, remove button and repeat Steps 2 through 5.

7. Allow 5 minutes for adhesive to cure (with temperatures above 65~F, 18~C) and install rear view mirror to button. If temperature is between 45-65~F (7-18~C), use masking tape to firmly hold the button to the windshield and allow the adhesive to cure for at least 15 minutes.

PART NUMBER PART NAME CLASS

D9AZ-19554-CA Rear View Mirror Adhesive B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage For 1990 Luxury; 1990 And 1991 Non-Luxury, All Others Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage

OPERATION DESCRIPTION TIME

941702A Re-Attach Rear View Mirror 0.5 Hr.

DEALER CODING

BASIC PART NO. CONDITION CODE

17698 03

OASIS CODES: 102000, 103000, 107000

Mirrors: All Technical Service Bulletins Rear View Mirror - Reattachment

Article No. 97-17-2

08/18/97

REAR VIEW MIRROR - NEW PROCEDURE FOR PREFERRED REATTACHMENT METHOD

FORD: 1990-94 TEMPO 1990-97 CROWN VICTORIA, MUSTANG, TAURUS, THUNDERBIRD 1990-98 ESCORT 1992-97 PROBE 1995-98 CONTOUR

LINCOLN-MERCURY: 1990-92 MARK VII 1990-94 TOPAZ 1990-97 COUGAR, GRAND MARQUIS, SABLE 1990-98 CONTINENTAL, TOWN CAR 1991-98 TRACER 1993-97 MARK VIII 1995-98 MYSTIQUE

LIGHT TRUCK: 1990-96 BRONCO 1990-97 AEROSTAR, ECONOLINE, F-150-350 SERIES, RANGER 1991-97 EXPLORER 1993-97 VILLAGER 1995-98 WINDSTAR 1997 EXPEDITION, MOUNTAINEER 1998 NAVIGATOR

ISSUE: This TSB article introduces a new procedure and tool for reattaching the inside rear view mirror assembly in the event the mirror detaches.

ACTION: Utilize the new Rotunda Mirror Button Applicator (164-R3925) to bond the mirror button to the windshield. This preferred method provides improved adhesion performance. Refer to the following Service Procedure for details.

SERVICE PROCEDURE

CAUTION:

DO NOT USE THIS PROCEDURE IF WINDSHIELD IS DAMAGED (e.g., CHIPPED, CRACKED, OR EXHIBITS STAR BREAKS) WITHIN 152 mm (61 OF THE MIRROR BUTTON, AND IF PLASTIC FILMS HAVE BEEN APPLIED TO THE INSIDE SURFACE OF THE WINDSHIELD (SUCH AS ADDITIONAL GRADIENT BANDS) WITHIN 51 mm (2") OF THE MIRROR BUTTON.

1. Mark original location of bracket on outside of windshield with any appropriate marking tool (e.g., white china marker) before you begin.

NOTE:

SURFACES MUST BE CLEAN FOR PROPER BONDING TO OCCUR.

2. Use the following steps to ensure proper cleaning of windshield:

a. Carefully remove any adhesive residue from the windshield using a new single edge razor blade.

b. Spray the inside surface of the windshield with a glass cleaner and wipe with a clean, soft, lint free cloth.

3. Remove the liner from the pre-applied tape and apply the button directly onto the windshield at the marked location.

Button sizes:

^ F7AZ-17698-AA Small Footprint Size (16 mm X 33 mm)

^ F7AZ-17698-BA Large Footprint Size (21 mm X 29 mm)

4. Center the curing head of the Rotunda Mirror Button Applicator (164-R3925) over the button.

5. Hold the curing head in place and press the "ON" button to activate the vacuum pump. Press the "START" button of the time/temperature controller to begin the cure cycle. Immediately clean the mirror button location marks from the outside of the windshield. Do not release the curing head until the cycle is completed. The AUTOMATIC CYCLE (once the start button is pressed) is as follows:

a. Time of curing cycle will be displayed.

b. Time will stay constant until cure temperature 185°C (365°F) is reached.

c. Once the cure temperature is reached, display will reflect time remaining for complete cure.

CAUTION:

THE HEATER BLOCK MAY STILL BE WARM. HANDLE WITH A GLOVE AND AVOID CONTACT WITH ANY SURFACE THAT MAY BE DAMAGED BY HIGH TEMPERATURE.

6. Turn the applicator off. Press the vacuum release button and remove the curing head from the windshield.

7. Once the button has cooled to ambient temperature (about 5 minutes), reattach the mirror assembly.

PART NUMBER PART NAME

F7AZ-17698-AA Rear view Mirror Button (Small 16 mm X 33 mm)

F7AZ-17698-BA Rear view Mirror Button (Large - 21 mm X 29 mm)

OTHER APPLICABLE ARTICLES: 94-17-2 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 102000, 103000, 107000

Paint: Customer Interest Exterior Clearcoat - Cracking/Eroding/Peeling Off

Article No. 93-8-4

April 14, 1993

PAINT - EXTERIOR CLEARCOAT "MICROCHECKING", HAZING OR PEELING

FORD: 1983-93 THUNDERBIRD 1984-93 TEMPO 1985-93 ESCORT 1986 LTD 1986-93 TAURUS 1989-93 CROWN VICTORIA, MUSTANG, PROBE

LINCOLN-MERCURY: 1983-93 COUGAR 1984-92 MARK VII 1984-93 TOPAZ 1985-89 TRACER 1986 MARQUIS 1986-93 SABLE 1988-93 CONTINENTAL, TOWN CAR 1989-93 GRAND MARQUIS 1991-93 TRACER 1993 MARK VIII

LIGHT TRUCK: 1983-93 RANGER 1986-93 AEROSTAR 1987-90 BRONCO II 1988-93 F SUPER DUTY, F-47 1991-93 ECONOLINE, EXPLORER 1992-93 F-150-350 SERIES 1993 VILLAGER

ISSUE: The clearcoat layer of the basecoat/clearcoat paint system may "microcheck" (crack and erode), turn white, flake or peel off the vehicle. This condition is noticeable on the horizontal surfaces only.

ACTION: Inspect the vehicle and if repair is necessary, refer to the following procedure for service details. This is a wet on wet procedure. Sanding is not required after the seal coat is applied.

NOTE: READ THE ENTIRE SERVICE REPAIR PROCEDURE BEFORE STARTING REPAIRS.

REPAIR PROCEDURE

WARNING: ALWAYS WEAR A NIOSH/OSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE OTHER RECOMMENDED SAFETY EQUIPMENT.

1. Wash the vehicle with soap and water.

2. Verify clearcoat to basecoat or primer adhesion by applying a 2" wide masking tape strip on all horizontal body panels.

a. Pull the tape up quickly

b. Inspect the adhesive side for paint removal.

NOTE: IF PAINT WAS REMOVED DURING TAPE TEST, THE ENTIRE CLEARCOAT AND BASECOAT SHOULD BE REMOVED FROM THE

PANEL.

3. Wipe down the areas to be repainted with wax and grease remover.

^ BASF product # 900 PreKleano or equivalent

4. Sand the affected surface with 150/240 grit sand paper. Remove only clearcoat and colorcoat, featheredge areas with 320 grit paper.

NOTE: DO NOT REMOVE SPRAY PRIMER OR E-COAT.

5. Blow off the area to remove loose dust or debris.

6. Wipe the sanded surface with wax or grease remover.

^ BASF product # 901 Prekleano or equivalent

7. Tack off area.

8. Mix and apply one coat of epoxy primer for adhesion and let dry per manufacturer's label instruction (20 - 30 minutes).

^ BASF product # DE 15, PA16, PR80 or equivalent

NOTE: DO NOT SAND THE NEWLY PRIMED AREAS.

9. Mix and apply two coats of the appropriate colored primer surface sealer.

^ BASF product # DP 21, Solo Color 1:1, then 2 parts of mixture 1 part DH 60, 30% PR80 or equivalent.

10. Mix and apply 2 coats or until hiding of basecoat per manufacturer's label instructions. Apply first coat to repair area only. Apply second coat over entire area. Allow a minimum of 15 minutes flash time before applying the clearcoat.

^ BASF # Diamont Basecoat Color and Diamont Reducer 1:1 or equivalent.

11. Mix and apply 2 coats of urethane clearcoat per manufacturer's label instructions.

^ BASF product # DC90 Diamond Clear, LH50 Diamond Hardener 2:1 or equivalent.

12. Polish if necessary.

13. Clean and detail the vehicle and return it to the customer.

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 106000

Paint: All Technical Service Bulletins Paint - Iron Particle Removal

Article No. 95-6-1

03/27/95

^ PAINT - IRON PARTICLE REMOVAL - INDUSTRIAL FALLOUT - ACID RAIN NEUTRALIZATION

^ PAINT - ROUGH TEXTURE/FERROUS METAL CONTAMINATION - ACID RAIN DISCOLORATION OR ETCHING

FORD: 1980 and after CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1982-88 EXP 1984-94 TEMPO 1986 and after TAURUS 1988-93 FESTIVA 1989 and after PROBE 1994-95 ASPIRE 1995 CONTOUR

LINCOLN-MERCURY: 1980 and after CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1986 and after SABLE 1987-89 TRACER 1991-94 CAPRI 1991 and after TRACER 1993 and after MARK VIII 1995 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1980 and after F-150-350 SERIES 1981 and after ECONOLINE 1982 and after BRONCO 1983 and after RANGER 1984-90 BRONCO II 1986 and after AEROSTAR 1988 and after F SUPER DUTY 1991 and after EXPLORER 1993 and after VILLAGER 1995 and after WINDSTAR

MEDIUM/HEAVY TRUCK: 1980-91 C SERIES, CL-CLT-9000 SERIES 1980 and after F & B SERIES, L SERIES 1986 and after CARGO SERIES

ISSUE: Ferrous metal particles (hot iron dust) are generated by manufacturing facilities, rail shipments, combustion engines, jet engines, body shops, etc. These particles mechanically/magnetically bond to vehicles' painted surfaces. Moisture and temperature combine with the particles to create a chemical reaction. The reaction causes the particles to corrode and enter into the physical paint film.

ACTION: To remove these particles/contaminants, USE ONLY the following procedure. The procedure must be performed before any buffing, polishing, color sanding or refinishing is attempted. The materials in this procedure are alkaline, acidic and neutral. They must be used in the specified order.

CAUTION:

ANY CHANGES TO THIS PROCEDURE WILL CAUSE AN INCOMPLETE OR UNSATISFACTORY REPAIR AND MAY RESULT IN

POSSIBLE DAMAGE TO THE PAINTED SURFACES AND TRIM.

WARNING:

THE TECHNICIAN MUST WEAR PROTECTIVE CLOTHING AND EYE PROTECTION TO PREVENT SKIN IRRITATION.

CAUTION:

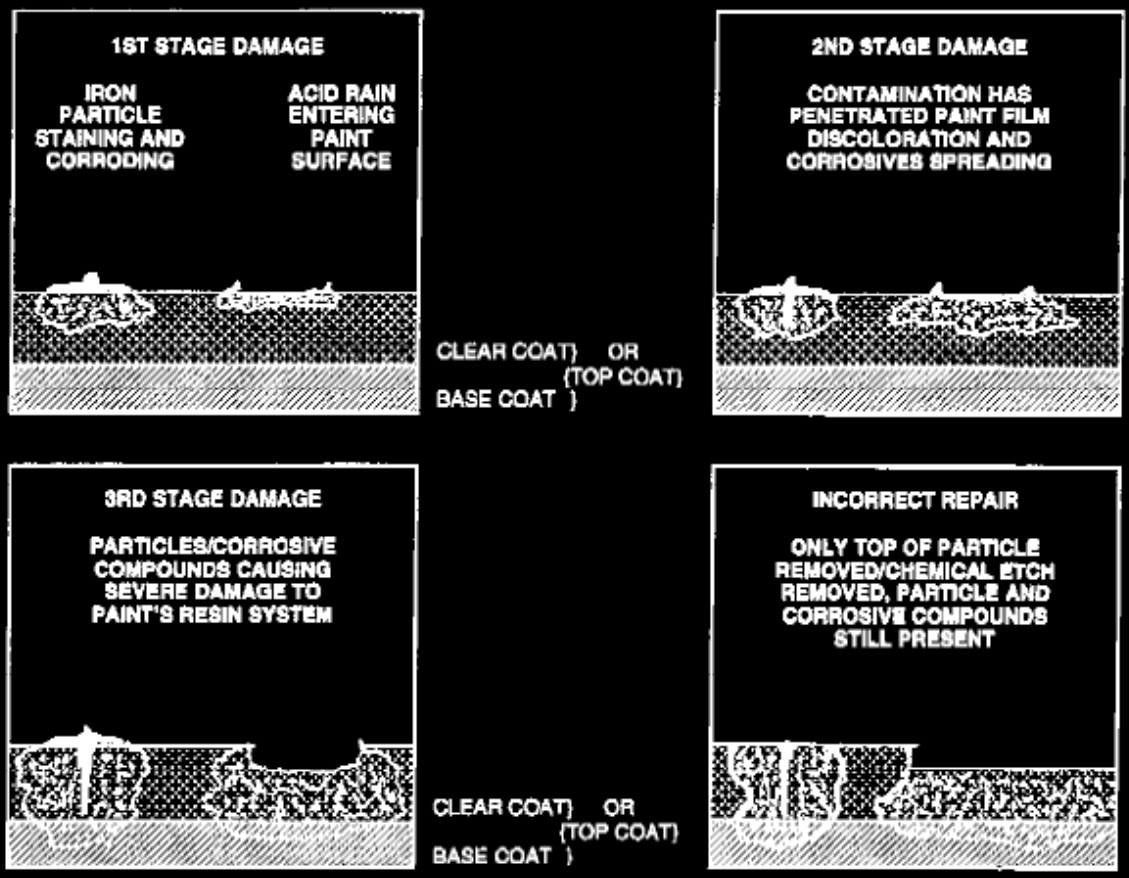
THE USE OF ANY OTHER PRODUCT OR PROCEDURE MAY CAUSE DAMAGE TO ALUMINUM, FLEXIBLE PAINTED SURFACES OR OTHER PAINTED SURFACES. FOLLOW DIRECTIONS EXACTLY AND RINSE THOROUGHLY AFTER EACH STEP.

NOTE:

THIS DECONTAMINATION PROCEDURE IS DESIGNED TO REMOVE SURFACE CONTAMINANTS FROM THE PAINT ON VEHICLES THAT HAVE BEEN CONTAMINATED UP TO 120 DAYS. VEHICLES WHICH HAVE EXPERIENCED THE CONDITION LONGER THAN THIS PERIOD MAY REQUIRE AN ADDITIONAL TREATMENT TO REMOVE FERROUS METAL CONTAMINANTS.

IDENTIFICATION

INDUSTRIAL FALLOUT (IFO) is a general term used to identify Rail Dust, Brake Dust, Ferrous Metal, Alkaline/Crystalline Deposits, Water Spots, Acid Rain, and other types of Environmental Contamination.



Studies conducted have shown the use of Oxalic Acid ferrous metal removers actually contribute to further damage of the paint's resin system, creating long term damage, which may not be evident for months. Additionally, Oxalic Acid products may damage soft exterior trim, aluminum trim and soften the paint.

The use of "clay" type products does not remove the entire ferrous particle or environmental contamination. Clay removes only the top of the particle and stain generated by the contamination, leaving the particle imbedded and the corrosive chemical compounds generated by the contamination in the paint system.

The particles and/or chemical compounds are still present and they continue to generate damage. Color sanding, buffing or compounding the paint film to remove ferrous metal, industrial fallout or acid rain damage may not remove the entire cause of the damage (they treat only the symptom and not the cause). The chemical compounds are still in the paint system and will continue to damage the paint. Color sanding and buffing may result in excessive removal of clear coat film. Removal of OEM clear coat in excess of 0.03 mil may contribute to premature clear coat failure and is not recommended.

THE DECONTAMINATION PROCEDURE DIRECTED IN THIS BULLETIN MUST BE PERFORMED BEFORE ANY BUFFING, POLISHING, COLOR SANDING OR REFINISHING IS ATTEMPTED.

TB-4187-A

Figure 1

For ease of identifying, the Radio Shack Model 63-851, 30X, lighted, magnifier is recommended.

1. Ferrous Metal

^ Light colored vehicles: Small rust orange dots with black in center of stain.

^ Dark colored vehicles: Small white or silver dots with a "rainbow hue" around the particle. The surface will also feel rough to the touch.

2. Industrial Fallout

^ The surface feels rough to the touch and may exhibit crystalline deposits.

^ Usually ferrous metal is present, as well as water spots.

MANUFACTURERS			
PROCEDURE	FINISH KARE (818)-443-8983, CUSTOMER SERVICE	3M (800)-364-3577	MEGUIAR'S (800)-347-5700, CUSTOMER SERVICE
Decontamination	#1119, #883, #11830	None	None
Coarse Compounds	#340 Compound, FK-7503G Pad	Imperial Micro-Finishing Compound	#4 Heavy, #1 Medium, #2 Light
Light	#338 Compound, FK-7503G Pad	Finesse-It II Finishing Compound	#4 Heavy, #1 Medium, #2 Light
Polish	#330, FK-8110G Pad, FK-2500G Pad	Perfect-It Foam Polishing Pad Glaze	#9
Protectant	#218 Or #2180	Imperial Hand Glaze	#9 Or #7
Color Sanding Lubricant	#780 Sand Lube	None	None

3. Acid Rain

^ Surface will exhibit irregular discolored spotting.

^ Dark colored vehicles will show cloudy or greying spots where the acids have started to etch away the paint.

NOTE:

IN EXTREME CASES ETCHING OF THE SURFACE WILL BE VISIBLE OR FELT.

DECONTAMINATION

Use Finish Kare Inc. products 1119/883/11850 to decontaminate the paint surface. Follow the manufacturer's recommended procedures.

NOTE:

FORD DOES NOT RECOMMEND THE USE OF OXALIC ACIDS OR OTHER "FALLOUT REMOVERS".

1. Rinse off dust and debris with cold water. Be sure to start at the bottom and work up.

2. Prepare product "1119" by mixing one (1) part "1119" with four (4) parts cold water.

3. Use clean wash mitt and apply mixture to entire car, starting at the bottom and working up to the top surface. Keep car wet with the solution for 5 to 10 minutes. Do not allow product to dry on the car, and do not allow it to streak down the sides. Rewipe with mitt if necessary to avoid streaks.

4. Rinse car with cold water.

5. Dry the flat surfaces of the vehicle hood, roof and deck lid.

6. Apply product "883" directly to the contaminated surfaces using a clean dry sponge, wash mitt, or soft truck brush ("883" is ready to use from the bottle, with no mixing involved). Keep the areas wet with the "883" for 5 to 7 minutes. Do not allow to dry on the car. Wipe down to the body line on the sides.

7. Prepare product "118SC" by mixing 1 oz (0.03 L) with 1 gal (3.785 L) of water.

8. Shampoo the vehicle with "118SC" shampoo mixture using a clean wash mitt and then rinse with cold water.

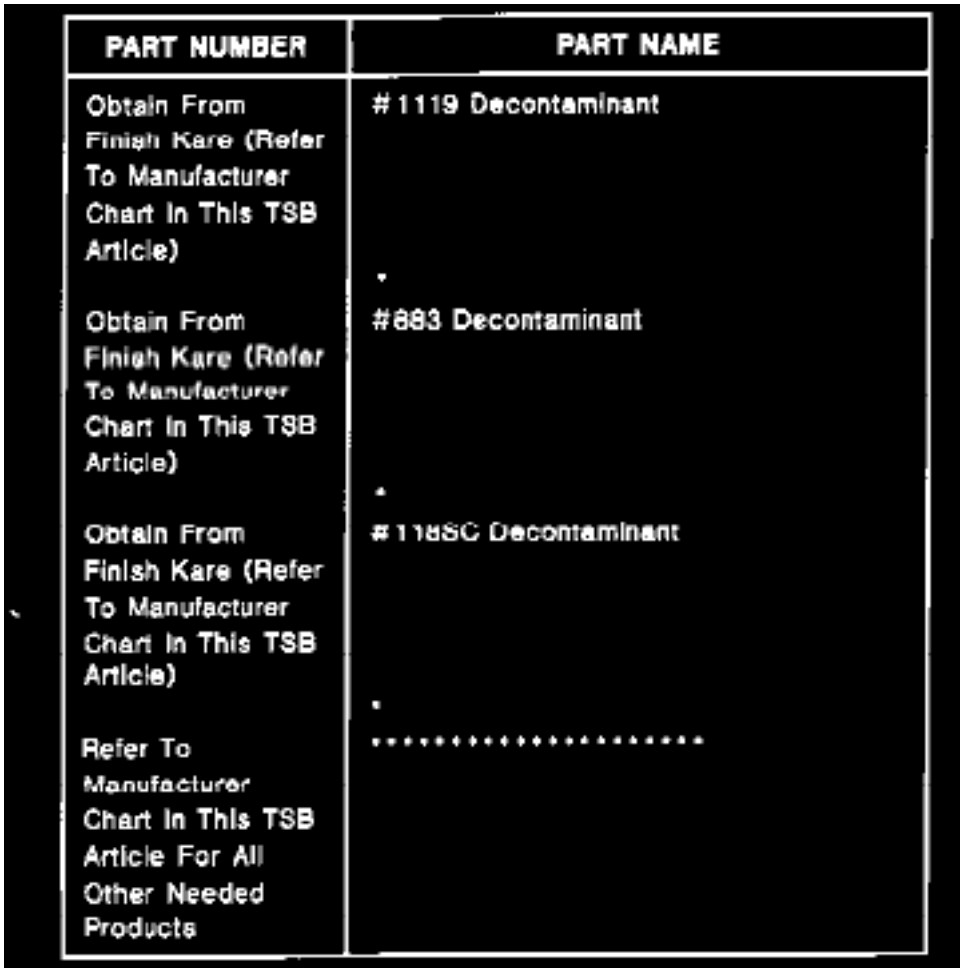
NOTE:

DO NOT USE "1185C" MITT WITH "1119" OR "883" SOLUTIONS. USE SEPARATE MITTS AND ALWAYS KEEP THEM SEPARATE.

9. Inspect paint surface to see if rust particles have been removed. If rust particles have been on the vehicle for a long time, it may be necessary to repeat each of the above steps.

NOTE:

THE NEUTRALIZER CONCENTRATE IS A HEAVY DUTY SHAMPOO AND CAN BE USED IN AN AUTOMATIC CAR WASH SYSTEM.



PART NUMBER	PART NAME
Obtain From Finish Kare (Refer To Manufacturer Chart In This TSB Article)	#1119 Decontaminant
Obtain From Finish Kare (Refer To Manufacturer Chart In This TSB Article)	#883 Decontaminant
Obtain From Finish Kare (Refer To Manufacturer Chart In This TSB Article)	#1188C Decontaminant
Refer To Manufacturer Chart In This TSB Article For All Other Needed Products	**********

CORRECTION OF SURFACE FOLLOWING DECONTAMINATION:

1. Visually inspect surface for evidence of removal of ferrous metal particles, crystalline deposits and water spots. Acid rain discoloring or etching will require either buffing, color sanding or refinishing if etching is visible.

2. Use the buffing products from only one (1) manufacturer. Do not intermix products.

3. Always follow the manufacturer's product sequence. Use appropriate pads with each product as recommended by the manufacturer.

NOTE:

DO NOT REMOVE MORE THAN 0.3 OF A MIL OF PAINT MATERIAL, OR REPAINTING WILL BE REQUIRED.

4. Use a dual action sander (D/A Sander) with a velcro-mount backing plate and appropriate foam pad for final polishing swirl removal.

5. Use an alcohol and water mixture (1:4 ratio) to clean buffed areas to verify removal of scratches and swirls before application of final protective glaze.

NOTE:

FREQUENT WASHING OF VEHICLES IS IMPORTANT. CONTAMINANTS SETTLE ONTO THE VEHICLE EVERY DAY. USE CLEAN WATER (DEIONIZED, REVERSE OSMOSIS, ETC.) TWICE WEEKLY TO REMOVE HEAVY DUST, AND PARTICULATES. THE USE OF A NEUTRAL pH CAR WASH SOAP EVERY TWO (2) WEEKS IS RECOMMENDED TO NEUTRALIZE VEHICLE CONTAMINATION.

Parts Block

NOTE:

DEALERS SHOULD USE PROGRAM CODE R-23 AND CONDITION CODES C5 AND C6. REFER TO W & P MANUAL, SECTION 5-1, PAGE 3.

OTHER APPLICABLE ARTICLES: 91-18-1, 92-6-4 WARRANTY STATUS: Eligible Under The Provisions Of 12 Month/12,000 Mile Basic Warranty Coverage

OPERATION DESCRIPTION TIME

950601A Decontaminate And Surface 0.6 Hr.

Correction - Aspire

950601B Decontaminate And Surface 0.6 Hr.

Correction - Escort/Tracer

950601C Decontaminate And Surface 0.6 Hr.

Correction - Probe

950601D Decontaminate And Surface 0.6 Hr.

Correction - Contour/Mystique

950601E Decontaminate And Surface 0.6 Hr.

Correction - Mustang

950601F Decontaminate And Surface 0.7 Hr.

Correction - Taurus/Sable

950601G Decontaminate And Surface 0.7 Hr.

Correction - Thunderbird/Cougar

950601H Decontaminate And Surface 0.7 Hr.

Correction - Crown Victoria/Grand Marquis

950601I Decontaminate And Surface 0.7 Hr.

Correction - Mark VIII

950601J Decontaminate And Surface 0.7 Hr.

Correction - Continental

950601K Decontaminate And Surface 0.6 Hr.

Correction - Capri

950601L Decontaminate And Surface 0.8 Hr.

Correction - Town Car

950601M Decontaminate And Surface 0.7 Hr.

Correction - Villager

950601N Decontaminate And Surface 0.6 Hr.

Correction - Windstar

9506010 Decontaminate And Surface 0.7 Hr.

Correction - Aerostar

950601P Decontaminate And Surface 0.6 Hr.

Correction - Bronco

9506010 Decontaminate And Surface 1.1 Hrs.

Correction - Econoline

950601R Decontaminate And Surface 0.9 Hr.

Correction - F-Series

950601S Decontaminate And Surface 0.6 Hr.

Correction - Explorer

950601T Decontaminate And Surface 0.7 Hr.

Correction - Ranger

950601U Decontaminate And Surface 0.5 Hr.

Correction - F-Super Duty

950601V Decontaminate And Surface 0.7 Hr.

Correction - F/B-Series

950601W Decontaminate And Surface 0.7 Hr.

Correction - L-Series

950601X Decontaminate And Surface 0.5 Hr.

Correction - Cargo

950601Y Decontaminate And Surface 0.6 Hr.

Correction - Tempo/Topaz

DEALER CODING

BASIC PART NO. CONDITION CODE

ENTRE C5 OR C6

OASIS CODES: 106000

Paint: All Technical Service Bulletins Paint - Preparation Procedure And MSDS Information

Article No. 94-23-4

11/14/94

PAINT - PRIMED SHEET METAL - PREP PROCEDURE AND MSDS INFORMATION

FORD: 1980 and after CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1982-88 EXP 1984 and after TEMPO 1986 and after TAURUS 1988-93 FESTIVA 1989 and after PROBE

LINCOLN-MERCURY: 1980 and after CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1984-92 MARK VII 1984 and after TOPAZ 1986 and after SABLE 1987-89 TRACER 1991-94 CAPRI 1993 and after MARK VIII

MERKUR: 1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK: 1980 and after F-150-350 SERIES 1981 and after ECONOLINE 1982 and after BRONCO 1983 and after RANGER 1984-90 BRONCO II 1986 and after AEROSTAR 1988 and after F SUPER DUTY 1991 and after EXPLORER 1993 and after VILLAGER 1995 WINDSTAR

MEDIUM/HEAVY TRUCK: 1980-91 C SERIES, CL-CLT-9000 SERIES 1980 and after F & B SERIES, L SERIES 1986 and after CARGO SERIES

ISSUE: This procedure is being published to advise all body and paint technicians about proper procedures for preparation of sheet metal parts coated with electrodeposition primer (E-Coat).

ACTION: When prepping a replacement body panel for installation, it is mandatory to leave the E-Coat intact. DO NOT SAND OFF THE E-COAT.

Improper preparation with excessive sanding of the E-Coat to bare metal will jeopardize the sheet metal warranty and overall customer satisfaction. In particular, the E-Coat is necessary to protect the parts from rust. Light scuff sanding using a Scotch Brite pad or wet 320 grit sand paper is recommended for minor flaws. If a minor flaw exists, wet sand or scuff out the flaw and prime the repair area. Again, do not remove all of the E-Coat from the panel.

CAS: 7439-92-1 ★★★★★★ **LEAD** ★★★★★★ **CHEMICAL FACT SHEET**

Chemical Names (Synonyms): Lead.

Inorganic Compound Names: Lead carbonate (CAS 598-63-0)
Lead chloride (CAS 7758-95-4)
Lead monoxide (CAS 1317-36-8)
Lead sulfide (CAS 1314-87-0)
and others.

Trade Names: C.I. Pigment Metal 4, C.I. 77575, Lead flake, Whole lead, Litharge, and others.

Uses: Tank linings, piping and other chemical reaction equipment; petroleum refining, manufacture of gasoline additives; pigments for paint; storage batteries, solder and fusible alloys; radiation shielding; and others.

PHYSICAL INFORMATION

Appearance: Bluish white to silvery gray solid (lead metal).

Odor: None.

Minimum Detectable by Odor: Unknown.

Behavior in Water: Insoluble.

Evaporation: Unknown.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure – 0.05 mg/m³ (lead).

Note: Current OSHA regulations require that if an individual has a blood-lead level greater than or equal to .060 mg lead per 100 ml blood, he must be removed from all exposures to lead and cannot return to an exposed environment until the blood level falls to .040 mg lead per 100 ml blood or less.

NIOSH Recommended Limit: Average 10 hour day/40 hour week exposure – .01 mg/m³ (lead).

ACGIH Recommended Limit: Average 8 hour exposure – 0.15 mg/m³ (lead).

Short Term Exposure:

Note: Lead is a cumulative poison. Increasing amounts build up in the body and eventually a point is reached where symptoms and disability may occur. Lead dust carried home on contaminated clothing can cause symptoms in other family members. Standards only protect for inhalation exposure. Extra precautions should be taken if skin exposure also occurs.

Inhalation: The effects of exposure to fumes and dusts of inorganic lead may not develop quickly. Symptoms may include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains, and decreased appetite. These effects are reversible and complete recovery is possible. Inhalation of large amounts of lead may lead to seizures, coma, and death.

TB-3995-A

Figure 1

HEALTH HAZARD INFORMATION (CONT'D.)

Skin: May cause irritation.

Eyes: May cause irritation.

Ingestion: See effects listed for inhalation. Ingestion of large amounts of lead may lead to seizures, coma, and death.

Long Term Exposure:

Lead can accumulate in the body over a period of time. Therefore, long term exposures to lower levels can result in a build up of lead in the body and more severe symptoms. These may include anemia, pale skin, a blue line at the gum margin, decreased handgrip strength, abdominal pain, severe constipation, nausea, vomiting, and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected, usually due to very high exposures, the resulting effects include severe headache, convulsions, coma, delirium, and death. In non-fatal cases, recovery is slow and not always complete. Alcohol ingestion and physical exertion may bring on symptoms. Continuous exposure can result in decreased fertility. Lead exposure of either parent before pregnancy can increase the chances of miscarriage or birth defects. Exposure of the mother during pregnancy can cause birth defects.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move victim to fresh air. Give artificial respiration, as needed. Get medical attention immediately.

Skin: Wash area with plenty of soap and water. Remove any contaminated clothing immediately.

Eyes: Rinse eyes with plenty of water for 15 minutes. Seek medical attention, if necessary.

Ingestion: If victim is conscious, give water. Seek medical attention.

Note to Physician: Whole blood lead levels, circulating plasma/erythrocyte lead concentration ratio, urine ALA, and erythrocyte protoporphyrin fluorescent microscopy may all be useful in monitoring or assessing lead exposure. Chelating agents such as edetate disodium calcium and penicillamine are generally useful in the therapy of acute lead intoxication.

PROTECTIVE MEASURES

Storage and Handling: Store in an area away from heat and keep separate from potassium.

Engineering Controls: Adequate ventilation, sinks, showers and eyewash stations should be provided.

Protective Clothing: Full body work clothing should be worn including bump caps or hard hats, rubber gloves, and eye protection. Employees should routinely wash their skin thoroughly and change clothing at the end of each work shift.

Figure 2

CAS: 7439-92-1 ★★★★★★ LEAD ★★★★★★ CHEMICAL FACT SHEET

PROTECTIVE MEASURES (CONT'D.)

Protective Equipment:

For levels up to 0.5 mg/m³, use any dust and mist respirator, except single-use.

For up to 1 mg/m³, use any dust and mist respirator, except single-use or quarter mask, or any fume respirator or high efficiency particulate filter respirator.

For up to 5 mg/m³, use a high efficiency particulate filter respirator with a full facepiece.

For up to 100 mg/m³, use a powered air-purifying respirator with a high efficiency particulate filter or a Type C supplied-air respirator operated in pressure-demand or other positive-pressure or continuous-flow mode.

For up to 200 mg/m³, use a Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive-pressure mode, or with a full facepiece, helmet or hood operated in continuous-flow mode.

For levels greater than 200 mg/m³, escape, or entry into unknown concentrations, use a self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode or a combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive-pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Other Precautions: No eating, drinking, or smoking in areas where the dusts or fumes of lead or its compounds are present.

FIRE AND EXPLOSION INFORMATION

General: Not combustible. If exposed to fire, may release toxic fumes of sulfur and lead oxides.

Explosive Limits: Unknown.

Extinguisher: Use extinguisher appropriate to burning material. When fighting fire, wear a self-contained breathing apparatus with full facepiece and operated in positive-pressure mode.

REACTIVITY INFORMATION

Conditions to Avoid: Excessive heat.

Materials to Avoid: Reacts violently with potassium.

SOURCE: Chemical Fact Sheet as prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health; modified by the Toxicology Department, Ford Motor Company.

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Figure 3

WARNING:

LEAD CONTAMINATION POTENTIAL: THE ELECTRODEPOSITION PRIMER USED BY FORD MOTOR COMPANY OVER BASE METAL ON SERVICE REPLACEMENT PARTS OR COMPLETED VEHICLES CONTAINS SMALL AMOUNTS OF LEAD FOR CORROSION PROTECTION OF STEEL. EXCESSIVE DUSTS GENERATED BY UNNECESSARY AND IMPROPER SANDING MAY CONTAIN AIRBORNE LEAD CONTAMINATION IN EXCESS OF OSHA STANDARDS. INFORMATION REGARDING THE HAZARDS OF LEAD CAN BE FOUND IN THE CHEMICAL FACT SHEETS IN THE FIGURES IN THIS ARTICLE.

NOTE:

READ ALL INFORMATION IN THIS TECHNICAL SERVICE BULLETIN CAREFULLY AND FORWARD TO ALL EMPLOYEES PERFORMING PAINT PREPPING OPERATIONS. DEALERS SHOULD CONTACT LEGAL COUNSEL AND/OR LOCAL OSHA

AUTHORITIES FOR DIRECTION REGARDING OSHA LEAD STANDARD REQUIREMENTS.

If a replacement body panel contains more than a minor flaw in the E-coat, it should be returned. Contact your Customer Service representative for instructions.

If more extensive sanding, other than that described above, is necessary, (e.g., refinishing original vehicle sheet metal) follow the procedures outlined below:

ALTERNATIVE SANDING PROCEDURES WHEN EXTENSIVE SANDING IS REQUIRED

The following procedures for sheet metal preparation by sanding or media blasting are based on tests conducted by Ford Motor Company in accordance with requirements set forth in the Federal OSHA Inorganic Lead Standard 29 CFR 1910.1025.

SANDING PROCEDURE

1. Each technician performing the sanding operation MUST wear an approved respirator with high efficiency particulate filter (HEPA).

2. Technicians should use dual action sander with vacuum collection.

3. The vacuum equipment MUST be equipped with a HEPA filter on the air exhaust. Dealers are cautioned not to exhaust vacuum air into the atmosphere. Operators are cautioned to follow the manufacturer's guidelines for maintenance and the replacement of filters.

MEDIA BLASTING PROCEDURE

1. Testing has shown that plastic media blasting meets OSHA lead standard requirements and is efficient when the manufacturer's published procedures are followed.

2. The operator must wear an air supplied hood using compressed air free from carbon monoxide, oil, water, and other contamination when performing this operation. Specifics of the media blasting procedure for whole body paint removal have been previously published.

NOTE:

PLEASE READ THE CHEMICAL FACT SHEETS IN THE FIGURES.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 106000

Paint: All Technical Service Bulletins Exterior Clearcoat - Cracking/Eroding/Peeling Off

Article No. 93-8-4

April 14, 1993

PAINT - EXTERIOR CLEARCOAT "MICROCHECKING", HAZING OR PEELING

FORD: 1983-93 THUNDERBIRD 1984-93 TEMPO 1985-93 ESCORT 1986 LTD 1986-93 TAURUS 1989-93 CROWN VICTORIA, MUSTANG, PROBE

LINCOLN-MERCURY: 1983-93 COUGAR 1984-92 MARK VII 1984-93 TOPAZ 1985-89 TRACER 1986 MARQUIS 1986-93 SABLE 1988-93 CONTINENTAL, TOWN CAR 1989-93 GRAND MARQUIS 1991-93 TRACER 1993 MARK VIII

LIGHT TRUCK: 1983-93 RANGER 1986-93 AEROSTAR 1987-90 BRONCO II 1988-93 F SUPER DUTY, F-47 1991-93 ECONOLINE, EXPLORER 1992-93 F-150-350 SERIES 1993 VILLAGER

ISSUE: The clearcoat layer of the basecoat/clearcoat paint system may "microcheck" (crack and erode), turn white, flake or peel off the vehicle. This condition is noticeable on the horizontal surfaces only.

ACTION: Inspect the vehicle and if repair is necessary, refer to the following procedure for service details. This is a wet on wet procedure. Sanding is not required after the seal coat is applied.

NOTE: READ THE ENTIRE SERVICE REPAIR PROCEDURE BEFORE STARTING REPAIRS.

REPAIR PROCEDURE

WARNING: ALWAYS WEAR A NIOSH/OSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE OTHER RECOMMENDED SAFETY EQUIPMENT.

1. Wash the vehicle with soap and water.

2. Verify clearcoat to basecoat or primer adhesion by applying a 2" wide masking tape strip on all horizontal body panels.

a. Pull the tape up quickly

b. Inspect the adhesive side for paint removal.

NOTE: IF PAINT WAS REMOVED DURING TAPE TEST, THE ENTIRE CLEARCOAT AND BASECOAT SHOULD BE REMOVED FROM THE

PANEL.

3. Wipe down the areas to be repainted with wax and grease remover.

^ BASF product # 900 PreKleano or equivalent

4. Sand the affected surface with 150/240 grit sand paper. Remove only clearcoat and colorcoat, featheredge areas with 320 grit paper.

NOTE: DO NOT REMOVE SPRAY PRIMER OR E-COAT.

5. Blow off the area to remove loose dust or debris.

6. Wipe the sanded surface with wax or grease remover.

^ BASF product # 901 Prekleano or equivalent

7. Tack off area.

8. Mix and apply one coat of epoxy primer for adhesion and let dry per manufacturer's label instruction (20 - 30 minutes).

^ BASF product # DE 15, PA16, PR80 or equivalent

NOTE: DO NOT SAND THE NEWLY PRIMED AREAS.

9. Mix and apply two coats of the appropriate colored primer surface sealer.

^ BASF product # DP 21, Solo Color 1:1, then 2 parts of mixture 1 part DH 60, 30% PR80 or equivalent.

10. Mix and apply 2 coats or until hiding of basecoat per manufacturer's label instructions. Apply first coat to repair area only. Apply second coat over entire area. Allow a minimum of 15 minutes flash time before applying the clearcoat.

^ BASF # Diamont Basecoat Color and Diamont Reducer 1:1 or equivalent.

11. Mix and apply 2 coats of urethane clearcoat per manufacturer's label instructions.

^ BASF product # DC90 Diamond Clear, LH50 Diamond Hardener 2:1 or equivalent.

12. Polish if necessary.

13. Clean and detail the vehicle and return it to the customer.

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 106000

Exterior Paint - Comprehensive Repair Procedures

Article No. 91-18-1 09/05/91

PAINT-EXTERIOR-COMPREHENSIVE REPAIR PROCEDURES

FORD: 1985-86 LTD 1985-92 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-92 TAURUS 1988-92 FESTIVA 1989-92 PROBE

LINCOLN-MERCURY: 1985-86 CAPRI, MARQUIS 1985-87 LYNX 1985-92 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-92 SABLE 1988-92 TRACER

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-92 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-92 AEROSTAR 1991 EXPLORER

ISSUE: A comprehensive paint repair procedure TSB has been developed for service use. It includes the following paint repair topics:

Section (A) has been superseded by TSB # 9264, dated 3/92.

(B) Exterior Color Peeling From Ultra Violet Light

(C) Lower Body Stone Protection Repair Tips

(D) Procedures For PVC Body Side Moldings

(E) Lower Body-Side Stone Chip Protection Program

(F) Surface Defect Removal Without Repainting

(G) 1991 Color Matched/Compatible Spray Primer Chart

(H) Repair For Tinted Clearcoat

(I) Frequently Used And Paintable Plastics

(J) 1992 Paint Codes

ACTION: If paint repair is required, refer to the following procedures for paint restoration.

Section A Has Been Superseded By TSB # 9264, Dated 3/92.

CAUTION: FAILURE TO THOROUGHLY RINSE THIS SURFACE COULD RESULT IN CORROSION OF ANODIZED ALUMINUM OR

STAINLESS STEEL PARTS

PROCEDURE # 2

FINISH KARE FORMULA # 1119 AND # 883 (Buffered solution not as harsh on aluminum parts)

WARNING: FOR YOUR SAFETY, USE RUBBER GLOVES, GOGGLES AND PROTECTIVE CLOTHING WHEN HANDLING THESE PRODUCTS.

1. Apply hot diluted solution with soft mitt.

2. Agitate to create suds. Suds hold the acid solution in suspension and to the surface creating greater and extended activity.

3. Allow 3 to 5 minutes dwell time.

4. Rinse with COLD WATER.

5. Apply # 883 per label instructions.

LIQUID NEUTRALIZER CONCENTRATE

1. Using a mitt, thoroughly go over the entire surface with the diluted solution (50-1) of water and # 118 Liquid Neutralizer Concentrate. Then wipe dry.

2. If the iron particles are not totally removed after 2 washings, use one or both of the following service actions.

a. Sand with micro fine sandpaper (1500 Grid or greater) in localized areas.

b. Buff with very light compound and polish with wax in localized areas.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C.'S) OR EXCESS MATERIALS.

(B) Paint Exterior Color Peeling From Ultra Violet Light

Paint may be damaged because of ultra violet light absorption through the color coat. This damage will cause the top coat to peel to the E-coat primer.

If service is required, use the following procedure to correct the concerns.

NOTE: READ THE ENTIRE SERVICE PROCEDURE BEFORE STARTING REPAIRS.

WARNING: ALWAYS WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE OTHER RECOMMENDED SAFETY EQUIPMENT.

1. Wash the vehicle with soap and water.

2. Verify topcoat adhesion by applying a 2 inch wide masking tape strip on all body panels above and below the beltline on each panel.

a. Pull the tape up quickly.

b. Inspect the adhesive side of the tape for paint removal.

NOTE: IF PAINT WAS REMOVED DURING THE TAPE TEST, THE ENTIRE PANEL SHOULD BE STRIPPED AND REFINISHED AS NECESSARY.

3. Remove all trim (mouldings, name plates, striping, etc.) from the areas which will be repainted.

NOTE: ALL REQUIRED REPLACEMENT MOULDINGS AND STRIPES SHOULD BE ORDERED AND RECEIVED PRIOR TO REPAIRING THE CUSTOMER'S VEHICLE.

4. Wipe the entire vehicle with wax and grease remover.

^ BASF Product # 900 Prekleano

^ PPG Product # DX300

^ S-W Product # R7-K156

^ DuPont Product # 3919 S

^ Sikkens Product # M 600

5. Mask off all areas on the vehicle which are not going to be painted or will be affected by overspray (engine compartment, wheels, etc.).

6. Remove the paint to bare metal from all the areas of the vehicle which are going to be repainted. Use one of the following methods.

SAND THE AFFECTED AREAS TO BARE METAL USING 40 GRIT 3M GREEN CORPS SANDING DISCS OR EQUIVALENT AND A SOFT PAD ON A 1700 RPM POLISHER. KEEP THE POLISHER MOVING TO AVOID DEVELOPING HOT SPOTS ON THE METAL.

NOTE: CHEMICAL STRIPPING IS NOT RECOMMENDED.

NOTE: IF AVAILABLE, PAINT MAY BE REMOVED USING A PLASTIC MEDIA BLAST SYSTEM. IF THIS PROCESS IS USED, EXTRA

CARE MUST BE TAKEN DURING THE MASKING PROCESS TO PREVENT DAMAGE TO GLASS, MOULDING, ETC.

7. Blow off the entire vehicle to remove loose dust and debris.

NOTE: IF RUST IS PRESENT, USE APPROPRIATE METAL CLEANER AND CONDITIONER (PHOSPHATE COATING) OVER BARE METAL AREAS.

8. Wipe all affected areas with a fast dry enamel reducer solvent, followed by a dry wipe using a clean, lint free cloth to remove all residue.

CAUTION: KEEP WIPING UNTIL SURFACE IS COMPLETELY DRY. ANY RESIDUE WILL RESULT IN POPPING OF THE COATINGS TO

BE APPLIED FOLLOWING THIS STEP.

NOTE: THIS STEP WILL REDUCE THE POSSIBILITY OF FLASH RUST.

^ BASF Product # BR 50

^ PPG Product # DX 300

^ S-W Product # R7 K156

^ DuPont Product # 3812 S

^ Sikkens Product # 123 FAST

9. Apply two medium wet coats (1.0 mil total) of self-etching, anti-corrosion primer using the manufacturer's recommendations and flash times.

^ BASF Product # DE-17

^ PPG Product # DP EPOXY PRIMER

^ S-W Product # E2-6980

^ DuPont Product # VARIPRIME

^ Sikkens Product # WASH FILLER 580

10. Apply three medium wet coats (2.0 mils total) of acrylic urethane primer surfacer following the manufacturer's recommended procedures.

^ BASF Product # DP-20 PRIMER/SUFACER

^ PPG Product # K-36

^ S-W Product # P6-M49 OR P6-A48

^ DuPont Product # URO PRIMERFILLER

^ Sikkens Product # AUTOCRYL 3+1 FILLER

11. Sand the vehicle using one of the following methods:

^ Wet-sand by hand using 400 grit or finer sandpaper.

^ Dry-sand by hand using 320 grit or finer sandpaper.

12. Blow the entire vehicle off to remove loose dust and debris.

13. Demask (remove all paper and tape) as necessary to remove the primer and dirt buildup on the paper and tape.

14. Wipe the entire vehicle with wax and grease remover, followed by a dry wipe using a clean, lint free cloth to remove all residue.

CAUTION: KEEP WIPING UNTIL SURFACE IS COMPLETELY DRY. ANY RESIDUE WILL RESULT IN POPPING OF THE COATINGS TO

BE APPLIED FOLLOWING THIS STEP.

^ BASF Product # 901 PRE-PAINT CLEANER

^ PPG Product # DX 330

^ S-W Product # R7-K156

^ DuPont Product # 3812 S

^ Sikkens Product # M 600

15. Mask all areas on the vehicle which are not to be painted or will be affected by paint overspray (engine compartment, wheels, etc.).

NOTE: APPLY BASECOAT/CLEAR COAT ONLY TO SURFACES WHICH ORIGINALLY HAD BASECOAT/CLEAR COAT

16. Apply three medium wet coats (enough material to hide primer) of acrylic enamel base coat or acrylic urethane monocoat following the manufacturer's recommended procedure.

^ BASF Product # DIAMONT BASECOAT/Solo

^ PPG Product # DELTRON BASECOAT DBC/Deltron

^ S-W Product # ULTRA BASE/Ultra One Stage

^ DuPont Product # CHROMABASE/Cronar

^ Sikkens Product # AUTO BASE/Autocryl

17. Apply two medium wet coats of 2K acrylic urethane enamel clear coat, following manufacturer's recommended procedure.

^ BASF Product # DIAMONT CLEAR 88/89

^ PPG Product # CONCEPT 2001 DCU

^ S-W Product # CC-650 OR CC-640

^ DuPont Product # 1080 S URO CLEAR

^ Sikkens Product # AUTO CLEAR

18. After the paint is dry, demask the entire vehicle and clean up any areas which have overspray.

19. Polish the vehicle as necessary to remove any defects in the paint which may create a customer concern.

CAUTION: USE LOW SPEED (1700 RPM MAXIMUM) POLISHER.

20. Install all trim (mouldings, name plates, striping, etc.) on the vehicle which were removed prior to repainting.

21. Clean the exterior and interior of the vehicle thoroughly, including air ducts and other areas which are prone to accumulating dust. This step is essential to ensure customer satisfaction.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS.

STRIP AND REFINISH CLAIMING METHODOLOGY

(See Figures 2 and 3 for Illustration of Claim Preparation)

LABOR

To calculate STRIP AND REFINISH Labor Hours/Labor Operations:

1. Refer to SLTS Manual REFINISH labor allowance for panel or panels being STRIPPED AND REFINISHED.

2. Multiply REFINISH labor hours by 1.6 to arrive at the TOTAL labor allowance for the STRIP AND REFINISH OPERATION.

   EXAMPLE
   Refinish Hood (Metallic) = 1.7 hrs (from SLTS Manual)
   => Strip and Refinish Hood (Metallic) = 1.7 hrs. x 1.6 = 2.7 hrs.

3. LABOR OPERATION - To indicate a STRIP AND REFINISH repair labor operation, take the REFINISH labor operation and replace the suffix with a "C".

   EXAMPLE
   Refinish Hood = P8P => Strip and Refinish Hood = P8C.

MATERIAL

To calculate strip and refinish Material Allowance:

1. Refer to SLTS Manual Refinish "Misc. Mat'l" column.

2. Divide "Misc. Mat'l" Amount by 10. Enter in "Qty" Column.

   EXAMPLE
   Misc. Mat'l for Refinish hood = 21, QTY for Strip and refinish = 21 ÷ 10 = 2.1.

3. Enter the appropriate "Unit Material Cost" from the *Material Cost Matrix* (shown below) in the "Each" column (e.g. 2k Urethane Monocoat = $17.50).

4. Multiply QTY by the appropriate UNIT MATERIAL COST. This number represents the TOTAL MATERIAL ALLOWANCE for the repair and should be entered in the "Amount" column (Qty of 2.1 x $17.50 = $36.75).

*Material Cost Matrix**

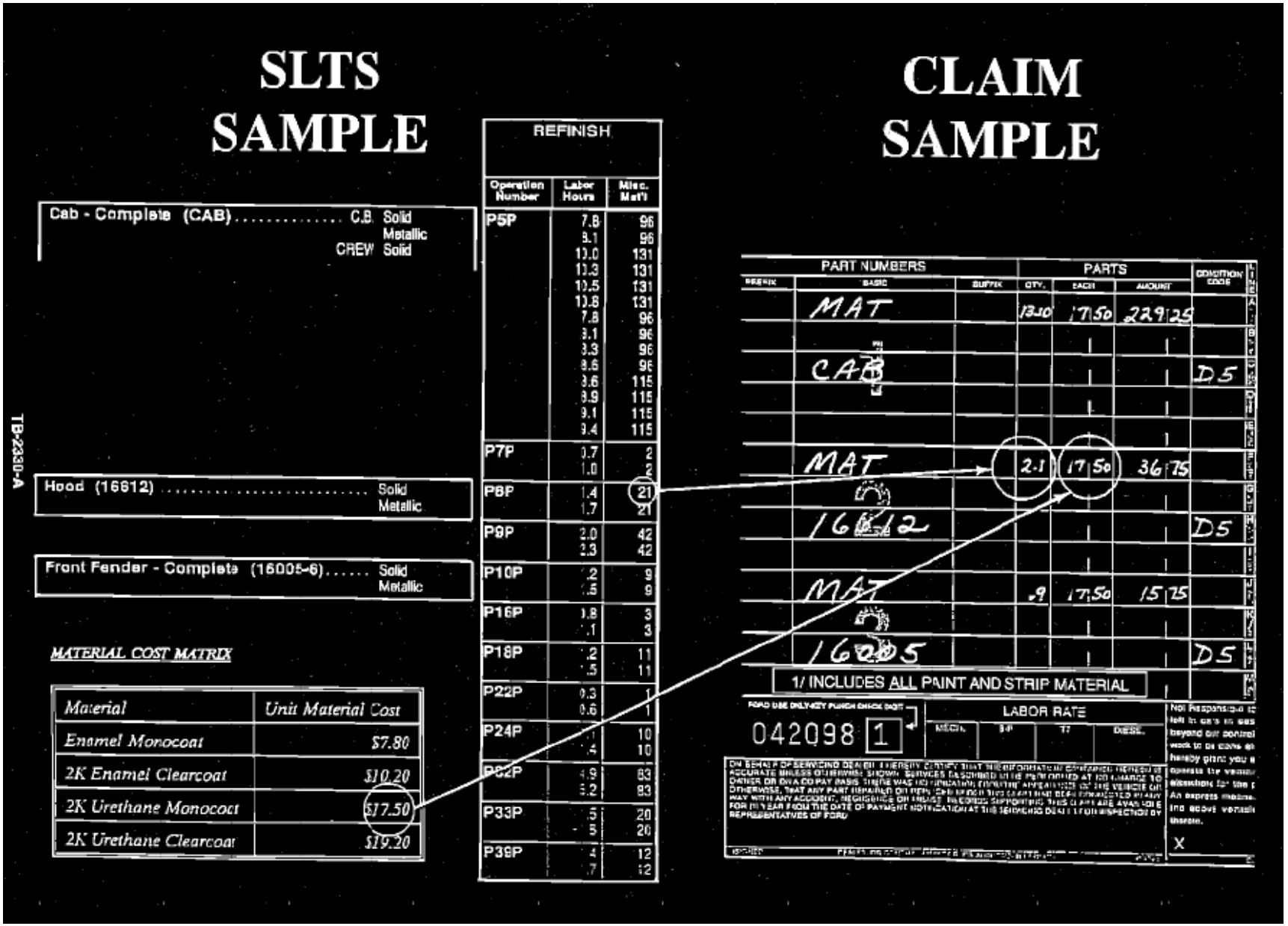
Material	*Unit Material Cost*
Enamel Monocoat	*$7.80*
2K Enamel Clearcoat	*$10.20*
2K Urethane Monocoat	*$17.50*
2K Urethane Clearcoat	*$19.20*

*UNIT MATERIAL COST MATRIX APPLIES TO STRIP AND REFINISH REPAIRS COVERED IN THIS TSB ONLY

TB-2329-B

Figure 1

Figure 2


SLTS SAMPLE
Cab - Complete (CAB)..... C.B. Solid Metallic
CREW Solid
Hood (16612)..... Solid Metallic
Front Fender - Complete (16005-6)..... Solid Metallic
TB-2330-A
MATERIAL COST MATRIX
Material
Unit Material Cost
Enamel Monocoat
$7.80
2K Enamel Clearcoat
$10.20
2K Urethane Monocoat
$17.50
2K Urethane Clearcoat
$19.20
REFINISH
Operation Number
Labor Hours
Misc. Mat'l
P5P
P7P
P8P
P9P
P10P
P16P
P18P
P22P
P24P
P33P
P39P
CLAIM SAMPLE
PART NUMBERS
PARTS
BASIC
SUFFIX
QTY.
EACH
AMOUNT
CONDITION CODE
MAT
1330
17 50
229 25
CAB
D5
MAT
2.1
17 50
36 75
16612
D5
MAT
.9
17 50
15 75
16005
D5
1/ INCLUDES ALL PAINT AND STRIP MATERIAL
042098 1
LABOR RATE

042098 1
STAPLE ATTACH-MENTS HERE
FORD CLAIM COPY
PART NUMBERS
PARTS
LABOR RATE
042098 1
CONCERN
Paint peeling to bare metal on cab
28.00
COMMENTS
Complete strip and refinish cab
CONCERN
Refinish Labor at 10.3 Hrs x 1.6 =
16.5 Hrs
CONCERN
Paint peeling to bare metal on hood
COMMENTS
Complete strip and refinish hood.
CONCERN
Refinish Labor at 1.7 Hrs x 1.6 =2.7 Hrs
CONCERN
Paint peeling to bare metal on RT Fnt fender
COMMENTS
Comp strip refinish fender
CONCERN
Refinish Labor at 1.5 Hrs x 1.6
2.4 Hrs
TB-2331-A

Figure 3

STRIP AND REFINISH CLAIMING METHODOLOGY

The claiming instructions shown in Figure 1 are applicable to the repair of the EXTERIOR COLOR PEELING FROM ULTRA VIOLET LIGHT concern covered in this TSB only. See the SAMPLE CLAIMS, Figures 2 and 3, for examples.

(C) Lower Body Stone Protection Repair Tips

Ford has introduced a vinyl anti-stone abrasion material for the lower exterior body surfaces of selected passenger vehicles and light trucks. The anti-stone abrasion material is applied to the lower fenders, rocker panels, lower doors, quarter panel dogleg, and lower rear of quarter panel behind the wheel. The anti-stone abrasion material will usually end at a body character line.

While primarily for servicing of factory-applied protective coating, the following provides installation information. If the vehicle has experienced body damage in the factory-applied material protective

area, the sheet metal damage must be serviced prior to the application of the new protective coating.

SMALL AREAS - MINOR DEFECTS (VEHICLES WITH FACTORY SPRAYED-ON VINYL)

A small dent in the sheet metal that did not mar the vinyl surface, can possibly be corrected with proper bumping tools without damage to the vinyl coating. However, noticeable scratches or gouges (not over 1/2 inch in diameter) or dings and dents that when "ironed out" show vinyl damage, can be satisfactorily serviced with the following procedure:

1. Solvent-wipe the damaged area with "Silicone and Wax Remover."

2. Using a heat gun or lamp, soften the vinyl coating of the damaged area until it can be scraped off with a putty knife or a similar tool. If necessary, sand off any hard to remove coating using an orbital disc sander (No. 80 Disc). (The spray-on vinyl protective coatings may not be suitable for "spot" application. See Manufacturer's label for instructions.)

3. Perform necessary servicing to correct the sheet metal damage.

4. Using white bodyfiller, fill the damaged area. Follow the instructions on the label and blend the bodyfiller with the surrounding sheet metal.

5. Allow the bodyfiller to completely cure and then carefully sand the area smooth, removing any high spots.

6. Refer to "Spray Procedure" for restoration of vinyl anti-stone abrasion material.

LARGE DAMAGED AREAS - VEHICLE WITH FACTORY SPRAYED ON VINYL

Peeling or damage over a large area will necessitate removal of the factory sprayed-on vinyl coating. The following procedure is suggested.

NOTE: WHERE SHEET METAL IS DAMAGED TO THE EXTENT THAT A FENDER, DOOR, OR QUARTER PANEL REPLACEMENT IS

REQUIRED (OR IN AN INITIAL INSTALLATION), DISREGARD STEPS NO. 1 AND NO. 2.

1. Using a heat gun or lamp, soften the vinyl coating until it is pliable. Scrape coating off with a putty knife or a similar tool. If necessary, sand off any hard to remove coating using an orbital disc sander (No. 80 Disc). (The vinyl material, abrasion resistant coating may not be suitable for "spot" applications. See manufacturer's label for instructions.)

2. Perform necessary servicing to correct the sheet metal damage.

3. Refer to "Spray Procedure" for restoration of vinyl anti-stone abrasion material.

COATING APPLICATIONS

Approximately two quarts will be required for an initial installation on a passenger car or F-Series. Slightly more will be required for an Econoline. The specified dry film thickness of 15 to 20 mils (.015 to .020 inch) will require at least three, possibly four, applications of coating material, with "flash off" time between coats. Spray coat complete panels only.

The coating must be applied with commercial equipment by an experienced automotive painter. The coating must be thoroughly agitated before application. The material is heavy bodied. A pressure cup spray gun or "Rocker Schutz Gun" is recommended.

COATING PREPARATION - MASKING VEHICLE

Install suitable covers over the wheels.

NOTE: IF THE VEHICLE HAS LOWER BODY SIDE MOULDINGS (12-14 INCHES ABOVE THE "TURN UNDER" OF THE ROCKER PANEL),

THE MOULDING CAN SERVE AS THE UPPER MARGIN OF THE AREA TO BE COATED. IF THE VEHICLE DOES NOT HAVE SUITABLE MOULDINGS, A SCULPTURE OR BREAK LINE IN THE SHEET METAL CAN BE UTILIZED. THIS LINE SHOULD BE SELECTED TO ENSURE ADEQUATE PROTECTION OF THE PAINTED SURFACES.

VEHICLES WITH BODY SIDE MOULDINGS

1. Masking tape should be positioned so that the moulding lower edge is also covered. The adjoining sheet metal should be left uncovered too so anti-stone, abrasion vinyl can be applied.

VEHICLES WITHOUT BODY SIDE MOULDINGS

2. If the contour of the body side has a break line, the upper coating margin must be masked off using 3M "Fine Line" Tape.

a. The normal masking tape and paper protection for the body side should be applied first and positioned about a quarter inch above the margin line.

b. The "Fine Line" tape should then be applied over the regular masking tape with the lower edge at the upper coating margin line. Extend this "Fine Line" tape into the wheel opening, in the absence of wheel opening mouldings, allowing the flange to be coated.

c. The anti-stone abrasion coating does not adhere well to flexible plastic parts. If left exposed, they must be masked off.

d. It is not necessary to mask off the body door openings in the coating area, as they will be uniformly coated where the door margins allow the coating to enter.

NOTE: DOOR OPENING AREAS SHOULD BE CLEANED TO ASSURE COATING ADHERENCE.

COATING PREPARATION - SHEET METAL

REPAIRED SHEETMETAL

1. Scuff sand (No. 180 Grit Paper) the glossy surface of the painted areas to be coated.

2. Using a clean, lint-free cloth, solvent wipe the area to be coated with wax and grease remover.

3. Remove sanding dust using compressed air and lint-free tack cloth.

NEW SHEET METAL

1. Sand off (No. 180 Grit Paper) the prime paint in the area to be coated.

2. Using a lint-free cloth, solvent wipe the area to be coated with wax and grease remover.

3. Remove sanding dust using compressed air and a lint-free tack cloth.

NEW INSTALLATION

1. The glossy surface of the paint in the coating area must be sanded with a D/A sander. A 220/240 Grit Disc does a good, fast job. DO NOT sand through the primer.

2. Using a clean, lint-free cloth, solvent wipe the area to be coated with wax and grease remover.

3. Remove sanding dust using compressed air and a lint-free tack cloth.

SPRAY PROCEDURE

The lower exposed painted fender, rocker, and quarter panel down flanges should be protected. The vehicle must be elevated high enough so that the painter can spray this area effectively. When an initial installation is to be made, a remote two-quart capacity pressure cup makes a much more efficient tool, as the spray gun can be used closer to the floor. The spray gun, fluid hose and/or cup must be cleaned immediately after use. Refer to manufacturer's recommended cleaning procedure. Lacquer thinner can be used when the suggested clean up material is unavailable.

WARNING: WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE ALL OTHER RECOMMENDED SAFETY EOUIPMENT.

1. After preparing the new or damaged area(s), mix either Epoxy primer or Self-etch prime, per manufacturer's label instructions, and spray bare metal areas.

^ BASF DE15 or DE17

^ Sikkens Metalflex CR Primer (1 coat only)

^ DuPont Variprime

^ S-W E2G 980 GBP Etching Filler

^ PPG DP 40 (only)

2. Apply 1-2 light prime coats over the bare metal areas.

LOWER BODY STONE PROTECTION CHART

Softening and Scraping	Coating Application			
	Two Sides	One Side	Total	Material
Door (2-door)	0.3	0.1	0.4 hr.	4/10 qt.
Door (4-door)	0.2	0.1	0.3 hr.	3/10 qt.
Rocker Panel	0.3	0.1	0.4 hr.	4/10 qt.
Fender	0.2	0.1	0.3 hr.	2/10 qt.
Quarter	0.2	0.3	0.3 hr.	2/10 qt.
Complete side (2-door)	1.0	0.3	1.3 hrs.	1 qt.
Complete side (4-door)	1.1	0.4	1.5 hrs.	1 qt.

Operation No.	Labor	Material
SP-19515-A78-Door (2-door)	0.4 hr.	4/10 qt.
SP-19515-B78-Door (4-door)	0.3 hr.	3/10 qt.
SP-19515-C78-Rocker Panel	0.4 hr.	4/10 qt.
SP-19515-D78-Fender	0.3 hr.	2/10 qt.
SP-19515-E78-Quarter	0.3 hr.	2/10 qt.
SP-19515-F78-Complete side (2-door)	1.3 hrs.	1 qt.
SP-19515-G78-Complete side (4-door)	1.5 hrs.	1 qt.

NOTE: THESE TIMES DO NOT INCLUDE METAL SERVICING OR COLORCOAT APPLICATION.

TB-2207-A

3. Allow the material to dry for 15-20 minutes before applying the anti-stone abrasion material.

4. Mix and apply anti-stone abrasion material per manufacturer's label instructions over the primed area.

NOTE: AN ORANGE PEELED FINISH IS NORMAL WITH THESE PRODUCTS.

^ BASF Glassohyd 1109-1240/6

^ Sikkens 0TO Bodycoat

^ DuPont 123-5 Vinyl

^ S-W G/W 295 Vinyl Gravel Guard

^ PPG DX 54 Roadguard

^ 3M Rocker Schutz

NOTE: SOME ANTI-STONE ABRASION MATERIAL MAY REQUIRE A SLIGHTLY DIFFERENT MIXING PREPARATION, PROCEDURE

AND APPLICATION. SOME ANTI-STONE ABRASION MATERIALS CAN NOT BE USED FOR SPOT REPAIR. CHECK WITH THE PAINT MANUFACTURER FOR RECOMMENDATIONS ABOUT THEIR PRODUCT.

5. Allow the stone abrasion material to dry. Heat can be used to accelerate the drying time. Check the manufacturer's instructions.

COLOR COAT

The complete coated area, as well as the upper raw edge, must be covered with color coat. Mask off the upper margin line using "Fine Line" tape positioned 1/16 inch above the coating edge. Using appropriate service paint and application procedures, the protective coating area can now be finish painted with monocoat or a basecoat/clearcoat urethane system.

NOTE: IF DAMAGED SHEET METAL EXTENDS ABOVE THE PROTECTIVE COATING AREA, NORMAL PRIME/COLOR PAINT PROCEDURES SHOULD BE FOLLOWED.

CAUTION: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC

COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS.

Figure 4

Refer to the Lower Body Stone Protection Chart, Figure 4, for the material and labor hours involved.

(D) Procedure For PVC Body Side Moldings

If replacement of the body side molding is necessary, some dealer service kits will be supplied "paint to match."

The painting procedures in the following instructions (also included with the part) address materials from five (5) major aftermarket paint suppliers. Use the paint system materials you are the most

familiar with.

NOTE: CAREFULLY READ ALL LABEL WARNINGS BEFORE APPLYING THESE PRODUCTS.

WARNING: ALWAYS WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE ALL OTHER RECOMMENDED SAFETY EQUIPMENT.

SIKKENS PRODUCTS

PREPARATION

1. Degrease with M600 wax and grease remover.

2. Scuff with # 320 dry paper or Scotchbrite 7447 (red).

3. Repeat degreasing step.

4. Spray two medium coats of Plastoflex primer. Allow 5 to 10 minutes flash between coats.

5. Allow 20 minutes flash-off at 70~ F before topcoating.

TOPCOATING

1. Mix Autocryl color with Elast-O-Actif 50:50 by volume.

2. Mix this material with 1.2.3 hardner and 1.2.3 reducer (use correct reducer for temperature) 100:50:30 by volume.

3. Apply three medium coats, allowing enough flash off to dry to a light touch.

4. Dry one hour at 140~F after 10 minutes flash off or dry 24 hours at 75~F.

PPG PRODUCTS

PPG MONO-COAT SYSTEMS

1. Solvent wipe with DX330 Acryli-clean.

2. Scuff with red Scotchbrite pad.

3. Repeat solvent wipe.

TOPCOATING

1. Mix and apply Deltron topcoat color with DX-369 Flexative per label instructions.

2. Use 40-50 PSI at the gun.

PPG BASECOAT/CLEARCOAT SYSTEMS

PREPARATION

1. Solvent wipe with SX330 Acryli-clean.

2. Scuff with red Scotchbrite pad.

3. Repeat solvent wipe.

TOPCOATING

1. Mix and apply Deltron basecoat color (DBU), with the recommended reducer for the temperature, per label instructions.

2. Mix and apply clearcoat material DBU-88 or DCU-2001, with DX-369 Flexative, per label instructions.

SHERWIN-WILLIAMS PRODUCTS

Ultrabase 7 Basecoat/Clearcoat or Ultra One Stage Acrylic Urethane Enamel

PREPARATION

1. Wash the material with a mild detergent and wipe dry.

2. Solvent wash with R7 K 156 and wipe dry.

3. Clean with a tack cloth.

4. Apply desired system with correct amount of Multi-flex, V6 V 299.

TOPCOATING

Prepare topcoating as follows:

^ S-W Ultra One Stage: (Mono-coat) 4 Parts Color 3 Parts SSR 650 Reducer 1 Part V6 V 440 or SSH 520 2 Parts V6 V 299

^ S-W UB7 Basecoat: 8 Parts Basecoat Color 8 Parts Stabilizer 1 Part V6 V 299

^ S-W UB7 Clearcoat: 4 Parts T1 C 650 Clearcoat 2 Parts T1 C 650 Reducer 1 Part CCH 690 1 Part V6 V 299

^ S-W Ultra One Stage: (Mono-coat) Apply 2-3 medium wet coats at 50 PSI

^ UB7 Basecoat: Apply 2-3 medium coats at 45 PSI

^ UB7 Clearcoat: Apply 2-3 medium coats at 50 PSI

DUPONT PRODUCTS

DUPONT CRONAR POLYOXITHANE MONOCOAT SYSTEM

PREPARATION

1. Wash the surface thoroughly with a mild detergent.

2. Clean with Prep Sol.

TOPCOATING

1. Add 8 parts of Cronar single stage enamel.

2. Add 1 part Cronar initiator 9404S.

3. Add two parts of (9475S, 9485S, or 9495S,) depending on shop temperature.

4. Add 2 parts flex-additive 9250S.

5. Mix thoroughly.

6. Spray at 45-55 PSI at the gun, 2-3 medium wet coats or until hiding.

7. If a clear coat is applied, use 9500S.

DUPONT CENTARI MONO-COAT ENAMEL SYSTEMS

PREPARATION

1. Wash the surface thoroughly with a mild detergent.

2. Clean with Prep Sol.

TOPCOATING (Follow Manufacturer's Recommendation)

1. Add 8 parts of Centari enamel color and 1 part 793S hardener.

2. Add 4 parts of (8022S, 8093S, or 8096S) reducer, depending on shop temperature.

3. Add 355S flex additive per label instructions.

4. Mix thoroughly.

5. Spray 2-3 wet coats, with 5 minutes flash time, at 50-65 PSI.

BASF PRODUCTS

The following procedure is applicable to 4 paint systems in the BASF paint line. Read individual "system" instructions carefully.

PREPARATION

1. Solvent wipe the molding with RM Pre-klean-o 900.

2. Sand with 400 grit sand paper and rinse with 901 pre-paint cleaner.

TOPCOATING BASECOAT

^ "Glasurit" 54-line color 2 vol. parts

^ 54-line reducer 1 vol. part

^ "Diamont" basecoat color 2 vol. parts

^ B R Diamont reducer 2 vol. parts

^ "Miracryl" basecoat color 2 vol. parts

^ BCR reducer 2 vol. parts

^ "Supreme Gold" basecoat color 2 vol. parts

^ LBR reducer 2 vol. parts

Apply basecoat color until hiding is achieved. Allow 3-5 minutes flash time between coats.

NOTE: USE APPROPRIATE REDUCER FOR SHOP CONDITIONS. ALLOW 15 MINUTES FLASH-OFF BEFORE SPRAYING CLEARCOAT.

TOPCOATING

Apply clearcoat per manufacturer's label instructions:

CLEARCOAT REDUCTIONS

^ DC-88 Diamont Clear 4 Vol. Parts

^ DH-44 Diamont Hardener 1 Vol. Part

^ MC-1000 Clear 4 Vol. Parts

^ 894 Hardener 1 Vol. Part

^ LC-1300 Supreme Gold Clear 4 Vol. Parts

^ LH-1301 Hardener 1 Vol. Part

^ 92354 Glasurit Clear 100 Parts

^ 521-111 Elastifier 20 Parts

^ 929-29 Hardener 60 Parts

Apply 2 wet coats with 5 to 10 minutes flash time between coats. Overnight dry or force dry at 140~F for 30 minutes.

CAUTION: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS.

(E) Lower Body-Side Stone Chip Protection Program

Ford Motor Company has recently initiated a program to provide improved stone-chip protection on some vehicles and to increase the corrosion protection on cars and trucks.

Some customers are unaware of body side anti-stone chip protection which appears as wavy orange peel texture on the lower body areas.

Ford is increasing the use of PVC (poly vinyl chloride) material which is applied in a thicker coating on the lower body-side. This material has been in use on vehicles destined for the Canadian market for many years.

This PVC material is now applied at the following plants on ALL vehicles.

^ Edison - Ranger

^ Hermosillo - Escort/Tracer

^ Louisville - Ranger and Explorer

^ Ohio Truck - Econoline

^ Wayne - Escort/Tracer

This process is also planned for Kansas City, Oakville, Twin Cities and Wixom.

This material can be identified by the "orange peel" appearance and a visible "break-line" between protected and unprotected areas in the lower body areas.

CAUTION: THIS PROTECTION MUST NOT BE REMOVED IF VEHICLE IS EXPECTED TO MAINTAIN THE CORROSION PROTECTION.

Some customers have expressed concerns due to the appearance of the treated areas. These customers did not know about the extra protection this material provides their vehicle. Once explained, customers were pleased with the added protection and accepted the orange peel finish.

NOTE: DEALERS SHOULD ADVISE THEIR SALES PEOPLE, SERVICE PEOPLE, AND CUSTOMERS, OF THE REASONS AND BENEFITS

OF THIS PROTECTION. CANADIAN DEALERS STRESS THIS AS A SELLING POINT WITH THEIR SALES PEOPLE. IT IS CONSIDERED A COMPETITIVE ADVANTAGE.

(F) Surface Defect Removal Without Repainting

Exterior paint surface damage or imperfections, where the primer coat does not show through, should be restored without repainting. The restoration of gloss and luster, after the condition has been repaired, is possible with new techniques and improved materials.

The following procedure is applicable to surface conditions such as dirt particles, orange peel, runs, sags, industrial fallout stains, swirl marks, light scratches and other minor surface imperfections. For dirt particles or scratches in several localized areas, the entire panel should be refinished to maintain a uniform appearance.

PREPARATION

To repair the affected surface it must be clean and dry. Mask off adjacent panels, mouldings, stripe and character lines as required.

CAUTION: EYE PROTECTION, AND FACE MASK SHOULD BE WORN. RINGS, BRACELETS, WATCHES AND BELT BUCKLES MUST BE

REMOVED TO PREVENT ACCIDENTAL DAMAGE TO PAINT FINISH.

SERVICE PROCEDURE

1. Remove sanding marks with rubbing compound.

2. Swirl marks, evident after buffing, are removed by polishing.

3. Remove light scratches and small dirt particles with a power buffer and medium buffing compound followed with polishing.

4. Remove deeper scratches and heavy dirt particles or orange peel, by wet sanding.

5. Buff with compound to remove the sanding marks and then polish to remove the swirl marks from the buffing operation.

NOTE: PERFORM A TRIAL REPAIR WITH A SMALL AREA. FIRST, TRY POLISHING; IF THIS IS NOT SUCCESSFUL, TRY BUFFING

AND, FINALLY, USE WET SANDING TO REMOVE THE CONDITION. USE MOST EFFECTIVE TECHNIQUE ON REMAINDER OF AREAS. AN OUTLINE OF THE COMPLETE PROCEDURE AND REQUIRED MATERIALS FOLLOWS.

POLISHING - VERY MINOR SCRATCHES OR SWIRL MARKS AND/OR RESTORING A DULL FINISH

1. Apply a small amount of Meguiar's Mirror Glaze, or equivalent, to the affected panel (or pad).

2. Use a suitable electric or air powered polish/buffing wheel (1750 max. RPM) and a Meguiar's Finesse Polishing Pad, or equivalent, to polish the affected area until all swirl marks are gone and desired luster is obtained.

3. When polishing, keep the pad flat against the surface. Do not bear down. The weight of the buffer is sufficient.

CAUTION: DO NOT MIX PRODUCTS! USE A SEPARATE, DEDICATED BUFFING PAD FOR EACH PRODUCT TO ACHIEVE DESIRED

RESULTS.

Variable speed buffers are available in a variety of buffing speeds. The recommended speed range is 1200-1750 RPM.

COMPOUNDING - LIGHT SCRATCHES, SMALL DIRT PARTICLES, MINOR GRIND MARKS, AND SANDING MARKS

1. Apply Meguiar's Rubbing Compound (medium) or equivalent to the panel with a clean compound pad on the wheel.

2. Spread the compound evenly and continue buffing until the condition is removed.

3. Keep the wheel flat to the surface and use light to moderate pressure and long strokes.

4. Periodically check the finish and add compound as required.

5. When buffing is complete, polish the panel as described previously.

Twisted wool cutting pads are the most effective compounding pads to use with Glaze Machine Cleaner for removing paint defects and heavy oxidation. Following the use of a wool compounding pad, it may be necessary to polish the finish with No. 2 Mirror Glaze Hi-Tech Cleaner using a Mirror Glaze Finesse Polishing Pad to remove the deep swirl marks.

GENERAL TECHNIQUES AND HINTS

^ "Foam" buffing pads create added gloss and depth of color on all types of paint finishes without creating buffer swirl marks.

^ When "buffing out" oxidation or other paint defects with a cleaning material, use a liberal amount of material, slower buffing motion and added downward pressure to increase cutting action.

^ Always apply cleaner to buffing pad, not directly on the oxidized paint surface. Dry paint absorbs material into pores upon contact.

^ Always keep the face of the buffing pad completely flat to the surface, reducing the risk of buffer swirl marks. Watch your pad, especially on angled surfaces, to be certain that it stays flat.

^ Avoid short rapid strokes. Move the buffer slowly across the surface using long straight motions and overlap by 50% the buffing pattern left by the previous pass. This insures uniform coverage and allows both material and buffer to perform at maximum efficiency.

^ Avoid buffing directly on raised character lines. The reduced paint film on these surfaces increases the risk of paint burn through. It is best to buff up to them from each side.

^ Always use a "wet buff" technique on a basecoat/clearcoat finish. This is a precaution against buffer swirls. Stop buffing just after the product begins to break down and before an overall dry, glossy finish appears. After "wet buffing", use a towel to wipe off the excess material.

^ Always use a "dry buff" technique on light colored, conventional paint finishes. Continue buffing until the material breaks down and only a slight film remains for final wipe off.

^ If a paint blemish remains after buffing, reapply a small amount of material over the blemish. Confine your buffing strokes to the immediate area of the blemish while applying additional

downward pressure and keeping the pad flat.

NOTE: ALWAYS KEEP THE PAD MOVING AND LIMIT YOUR STROKES OVER THE BLEMISH TO PREVENT EXCESSIVE HEAT

BUILD-UP AND POSSIBLE BURN THROUGH. STOP IMMEDIATELY IF THE SURFACE BECOMES TOO HOT TO LAY THE PALM OF YOUR HAND ON IT.

NOTE: HEAT BUILD-UP: WHEN BUFFING CREATES EXCESSIVE HEAT, HAZING MAY APPEAR ACROSS THE SURFACE BEING

BUFFED AND THE PRODUCT MAY DRY LIKE A FILM AND REFUSE TO BUFF OUT. TO REMEDY, WIPE THE AREA DOWN WITH COOL WATER, DRY THE SURFACE AND RESUME BUFFING ... AT A LOWER RPM IF POSSIBLE.

NOTE: STATIC: STATIC ELECTRICITY MAY BE PRESENT ON PAINTED FIBERGLASS/PLASTIC SURFACE BEING BUFFED, THE

MATERIAL MAY DRY LIKE A FILM OR TURN "GUMMY" AND BEGIN TO BALL UP. TO REMEDY, GROUND THE SURFACE BEING BUFFED TO METAL.

WET SANDING

Paint defects and sanding marks must be completely removed without using compounds and abrasive cleaners that scar the finish.

Mirror Glaze Hi-Tech Finesse Sanding Papers provide uniformity in grit particle size and distribution. Using these precision made sanding papers, water sanding marks can be removed with Meguiar's cleaner and finesse polishing pads.

^ Typical paint defects that are repaired with this system include: dirt-in paint, solvent pop, cratering, orange peel, drips, scratches, water spots, and acid rain.

^ Always use the least abrasive (highest grit) sanding products possible to do this job.

The following wet sanding procedure utilizes light grit sand paper or sanding blocks for removal of surface damage. These materials cut quickly leaving a uniform finish requiring a minimum of buffing to restore gloss.

PROCEDURE

1. Squeeze water to flush the area to be sanded. Continue to flush water to the surface during sanding for maximum lubrication.

2. Use small circular motions to contain the abrasion to the immediate area of the defect. Keep the blocks in water when not in use.

3. If the sanding block is cutting too slow, switch to a lower grade block and resume sanding. When 90% of the defect is removed, switch to a 2000 grade Finesse Sanding Paper or Sanding Block to finish smoothing and prepare the surface for buffing.

4. Finesse Sanding Blocks can be shaped to work on any angle. When the block is wet, rub it against a dry sanding block for shaping.

5. When using Finesse Sanding Papers, wrap the paper tightly around a E-7200 Backing Pad. This pad evenly distributes pressure over the entire surface of the sanding paper. This creates a uniform sanding pattern.

6. Plan your strokes to limit the abrasion to the smallest area possible.

NOTE: ALWAYS SAND IN ONE DIRECTION AND KEEP YOUR STROKES STRAIGHT.

7. Always finish sanding with 2000 Grit Finesse Sanding Paper. This eliminates the need for compounding.

8. Buff out sanding marks by applying Meguiar's Cleaner with a Finesse "Foam" Polishing Pad. Follow with a Mirror Glaze Polish for swirl-free gloss.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC

COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS

RUNS AND SAGS REMOVAL

This procedure consists of shaving the run or sag flush with a commercial single edge razor blade, shaving file or sanding with a hard block and then compounding.

NOTE: IF IT IS NECESSARY TO SHAVE RUNS AND SAGS WITH A RAZOR BLADE, FIRST DULL THE CORNERS WITH SANDPAPER TO AVOID SCRATCHING THE ADJACENT PANEL FINISH.

MEGUIAR'S PRODUCTS

PART

NUMBER GRADE PART NAME

S-1005 1000 Mirror Glaze Hi-Tech Finesse Sanding Papers - Half Sheets

S-1205 1200

S-1505 1600

S-2005 2000

S-1000 1000 Mirror Glaze Hi-Tech Finesse Sanding Papers - Full Sheets

8-1200 1200

8-1500 1500

S-2000 2000

E-7200 - Mirror Glaze Hi-Tech Finesse Backing Pad

E-2000 - Mirror Glaze Hi-Tech Tach Sponge

K-400 400 Mirror Glaze Hi-Tech Finesse Sanding Blocks

K-1000 1000

K-1500 1500

K-2000 2000

K-3000 3000

Other Applicable Articles: 82-3-3

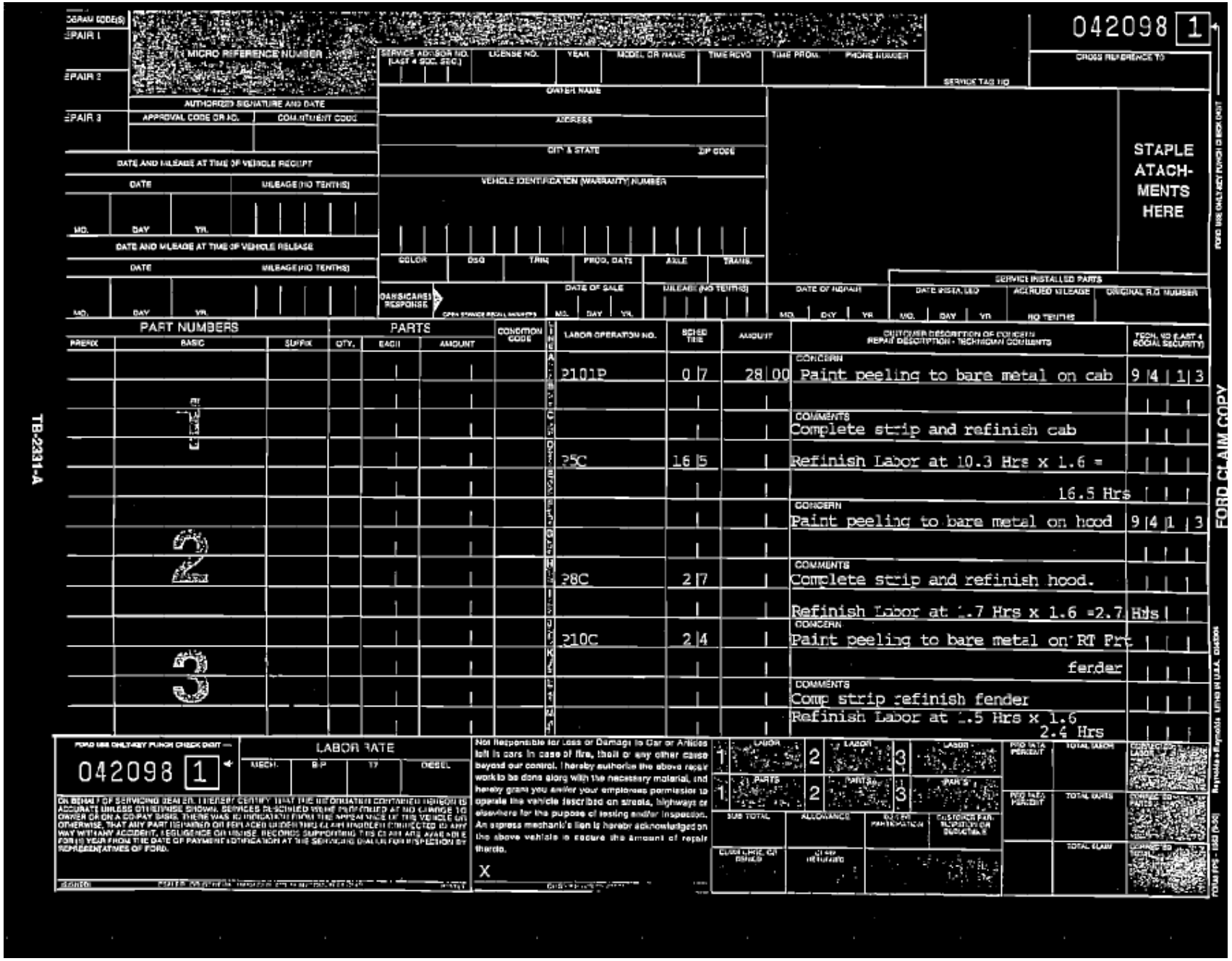
(G) Color Compatible Spray Primer Chart

Ford has released color compatible spray primers for exterior and some interior surfaces.

Colored sprayed primers are being used by our "Best-in-Class" competition and are now being implemented at Ford in order to improve process capability and to help in minimizing unsightly paint chipping from stone abrasion. Color keyed (matched) spray primer for exterior body colors is being used in an effort to help in the elimination of unsightly paint chipping from stone abrasion.

As with "Best-In-Class" competition, the engine compartment will be left with color compatible primer only and not be topcoated as per past practice.

Figure 5


042098 1
MICRO REFERENCE NUMBER
SERVICE ADVISOR NO. (LAST 4 SOC. SEC.)
LICENSE NO.
YEAR
MODEL OR NAME
TIME PROM
TIME PROM
PHONE NUMBER
SERVICE TAG I.D.
CROSS REFERENCE TO
REPAIR 1
REPAIR 2
REPAIR 3
AUTHORIZED SIGNATURE AND DATE
APPROVAL CODE OR NO.
COMMITMENT CODE
DATE AND MILEAGE AT TIME OF VEHICLE RECEIPT
DATE
MILEAGE (NO TENTHS)
MO. DAY YR.
DATE AND MILEAGE AT TIME OF VEHICLE RELEASE
DATE
MILEAGE (NO TENTHS)
OWNER NAME
ADDRESS
CITY & STATE
ZIP CODE
VEHICLE IDENTIFICATION (WARRANTY) NUMBER
COLOR
DSO
TRIM
PROD. DATE
AXLE
TRANS.
OWNER(S) RESPONSE
DATE OF SALE
MILEAGE (NO TENTHS)
DATE OF REPAIR
SERVICE INSTALLED PARTS
DATE INSTALLED
ACCRUED MILEAGE
ORIGINAL R.O. NUMBER
STAPLE ATACH-MENTS HERE
PART NUMBERS
PREFIX
BASIC
SUFFIX
PARTS
QTY.
EACH
AMOUNT
CONDITION CODE
LABOR OPERATION NO.
SCHED TIME
AMOUNT
CUSTOMER DESCRIPTION OF CONCERN REPAIR DESCRIPTION - TECHNICIAN COMMENTS
TECH. ID (LAST 4 SOCIAL SECURITY)
21 01P
0 7
28 00
CONCERN
Paint peeling to bare metal on cab
9 4 1 3
COMMENTS
Complete strip and refinish cab
25C
16 5
Refinish Labor at 10.3 Hrs x 1.6 =
16.5 Hrs
CONCERN
Paint peeling to bare metal on hood
9 4 1 3
28C
2 7
COMMENTS
Complete strip and refinish hood.
Refinish Labor at 1.7 Hrs x 1.6 =2.7 Hrs
21 0C
2 4
CONCERN
Paint peeling to bare metal on RT Frt fender
COMMENTS
Comp strip refinish fender
Refinish Labor at 1.5 Hrs x 1.6
2.4 Hrs
FORD USE ONLY-KEY PUNCH CHECK DIGIT
042098 1
LABOR RATE
MECH.
B.P.
T.T.
DIESEL
ON BEHALF OF SERVICING DEALER, I HEREBY CERTIFY THAT THE INFORMATION CONTAINED HEREON IS ACCURATE UNLESS OTHERWISE SHOWN. SERVICES RESCINDED WERE PERFORMED AT NO CHARGE TO OWNER OR ON A CO-PAY BASIS. THERE WAS NO INDICATION FROM THE APPEARANCE OF THE VEHICLE OR OTHERWISE, THAT ANY PART REMOVED OR REPLACED UNDER THIS CLAIM WAS/WERE CONNECTED IN ANY WAY WITH ANY ACCIDENT, NEGLIGENCE OR MISUSE. RECORDS SUPPORTING THIS CLAIM ARE AVAILABLE FOR ONE YEAR FROM THE DATE OF PAYMENT NOTIFICATION AT THE SERVICING DEALER FOR INSPECTION BY REPRESENTATIVES OF FORD.
SIGNED
Not Responsible for Loss or Damage to Car or Articles left in cars in case of fire, theft or any other cause beyond our control. I hereby authorize the above repair work to be done along with the necessary material, and hereby grant you and/or your employees permission to operate the vehicle described on streets, highways or elsewhere for the purpose of testing and/or inspection. An express mechanic's lien is hereby acknowledged on the above vehicle to secure the amount of repair thereto.
X
LABOR
PARTS
SUB TOTAL
ALLOWANCE
SALES TAX
CUSTOMER PAY PORTION OR DEDUCTIBLE
LUBRICANTS
OTHER
TOTAL LABOR
TOTAL PARTS
TOTAL CLAIM
TB-2331-A
FORD CLAIM COPY
FORD USE ONLY-KEY PUNCH CHECK DIGIT

When any paint repair is required, remember that the vehicle may have a colored primer. Refer to the Spray Primer Chart, Figure 5. This information may be of help in correction of exterior paint color match concerns.

(H) Paint Repair For Tinted Clear Coat

Ford introduced (Early Spring, 1991) a new paint color using a tinted clearcoat. The first color to use this new system is Rio Red.

If a paint repair is necessary, refer to the following procedure for repair instructions.

BACKGROUND

The Probe production paint system for Rio Red includes a Medium Green E-Coat primer, a Light Gray spray primer, bright Rio Red (E4) basecoat and a slightly Red tinted clearcoat topcoat.

NOTE: BEFORE ANY REPAIRS ARE BEGUN, IT IS CRITICAL THAT PRIMER, RED BASECOAT AND TINTED CLEARCOAT BE SPRAYED ON A TEST PANEL. THE COLOR MATCH IN EACH STEP IS VERY IMPORTANT FOR A SUCCESSFUL REPAIR.

WARNING: ALWAYS WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE ALL OTHER RECOMMENDED SAFETY EQUIPMENT.

SMALL SPOT REPAIR PROCEDURE

1 Wash the vehicle with detergent soap and

water.

2 Wipe the vehicle down with wax and grease

remover.

3. Sand the spot using 400 grit paper. Do not sand through the E-coat.

4. Wipe the sanded surface again with wax and grease remover/pre-cleaner.

^ BASF Product # 90 Pre-Kleano

^ PPG Product # DX 330

^ S-W Product # R7-K156

^ DuPont Product # 3919 S

^ Sikkens Product # M 600

5. Mix and apply tintable (Light Gray) self-etching or epoxy primer per manufacturer's label instructions.

NOTE: COLOR MATCH OF PRIME COAT IS KEY IN COLOR MATCH OF REPAIRED AREA.

^ BASF Product # DE 17

^ PPG Product # DP 40

^ S-W Product # E2-G973

^ DuPont Product # 615S

^ Sikkens Product # 1016

6. Mix and apply bright Rio Red base coat material per manufacturer's label instructions.

NOTE: COLOR MATCH OF BASE CLEAR COAT IS KEY IN COLOR MATCH OF REPAIRED AREA.

7. Mix and apply red tinted clearcoat material per manufacturer's label instructions.

NOTE: COLOR MATCH OF TINTED CLEAR COAT IS KEY IN COLOR MATCH OF REPAIRED AREA.

FULL PANEL REPAIR PROCEDURE

1. Wash the vehicle with detergent soap and water.

2. Wipe the vehicle down with wax and grease remover.

3. Sand the complete panel and feather edge into the next panel using 400 grit paper. Do not sand through the E-Coat primer.

4. Wipe the sanded surface with wax and grease remover.

5. Mix and apply tintable (light gray) primer per manufacturer's label instructions.

6. Mix and apply Rio Red basecoat per manufacturer's label instructions.

7. Mix and apply Red tinted clearcoat per manufacturer's label instructions.

8. Mix and apply one coat of non-tinted clearcoat per manufacturer's label instructions.

NOTE: COLOR MATCH OF EACH COAT ARE KEY TO COLOR MATCH OF FINISH REPAIR.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C's) OR EXCESS MATERIALS.

(I) Paintable Plastics

Standard Symbol	Plastic - "Family" Name	Plastic - Common/Trade Name	Typical Application	Can Be Painted
Thermoplastics				
ABS	Acrylonitrile Butadiene Styrene	ABS, Cycolac, Lustran, Kralastic	"A" Pillars, Consoles, Grilles	Yes
EMA	Ethylene /Methacrylic Acid	Ionomer, Surlyn	Bumper Guards	Yes
PA	Polyamide	Nylon, Capron, Vydyne, Zytel Minlon, Bexloy C		Yes
PAN	Polyacrylonitrite			
PBT	Polybutylene Terephthlate	Valox, Celanex, Gafite, Cpocan	Grilles, Nylon/sym.	Yes
PC/PBT	Polycarbonate/ Polybutylene Terephthlate	Xenoy	Bumpers	Yes
PC	Polycarbonae	Lexan, Merlon, Calibre (Solvent)	Tail Light Lenses, IP Trim	Yes
PE	Polyethylene	Alathon, Dylan, Marlex, Lupolen		
HDPE	High Density Polyethylene		Not painted (non-visual parts)	No
LDPE	Low Density Polyethylene		Not painted (non-visual parts)	No
LLDPE	Linear Low Density Polyethylene		Non-visual chassis parts	No
PET	Polyethylene Terephthlate	Petra, Rynite	Luggage Rack	Yes
PMMA	Poly(methylmethacrylate)	Acrylic, Acrylite, Lucite, Plexiglas	Tail Light	Yes
POM	Polyoxymethylene	Acetal, Celcon, Delrin, Hostaform		Yes
PTFE	Polytetraflurortethylene			
PP	Polypropylene	Azdel, Hostalen, Marlex, Profax	Interior Trim/Door Panel, Wheel Splash Shields, Steering Column Shrouds	Yes
PA/PPO	Polyamide/Polyphenylene Oxide		Mirrors (nylon)	Yes
PPO	Polyphenylene Oxide	Noryl	Grilles	Yes
PPS	Polyphenylene Sulfide			No
PPE	Polyphenylene Ether	Noryl, Prevex	Interior	Yes
PS	Polystyrene	Lustrex, Styron	Similar to ABS	Yes
HIPS	High Impact Polystyrene		Similar to ABS	Yes
PVA	Polyvinyl Acetate			Yes
PVC	Poly(vinyl chloride)	Apex, Geon, Vinylite	Bodyside Moldings, Wire Insulation, Steering Wheels	Yes
PVDC	Polyvinylidene Chloride			Yes
SAN	Styrene Acrylonitrile			Yes
SMA	Styrene Maleic Anhydride	Cadon, Dylark	Visors (Similar to ABS)	Yes
Thermoplastic Elastomer				
TES	Styrene Block Copolymer	Elexar, Kraton	Console Pads	Yes
TPO	Polyolefinic	Polytrope, Renflex, Santoprene, Telcar, Vistaflex	Bumper End Caps, Rub Strips, Sight Shields, Bodyside Cladding,	
TPU	Polyester Polyurethane	TPU, Hytrel, Texin, Estane	Interior "B" Post	Yes*
			Bumper BSM, Similar to RIM	Yes
Thermosetting Plastics				
PF	Phenol Formaldehyde	Phenolic, Bakelite, Durez, Genal	Ash Trays	Yes*
RIM	Reaction Injection Molded Polyurethane	RIM, Bayflex	Soft Front Fascias, Modular Windows	Yes
RRIM	Reinforced Reaction Injection Molded Polyurethane			Yes
UP	Unsaturated Polyester Thermosetting	BMC (Bulk Molding Cpd), SMC (Sheet Molding Cpd), TMC (Transfer Molding Cpd), ZMC, IMC, XSMC (Compound)	Grille Opening Panel Liftgates, Flareside Fenders, Fender Extensions	Yes*
Elastomers				
CR	Chloroprene	Neoprene		No
EPDM	Ethylene/Propylene	EPDM, Nordel Vistalon		No
NR	Natural Rubber			No
SBR	Styrene Butadiene Rubber	SBR, Buna S		No
NBR	Nitrile Rubber			No
SI	Silicone	Silicone		No

*Requires Prime Coat

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Figure 6

The Paintable Plastics Chart, Figure 6, is a summary of widely used plastics in our industry. The standard symbol should be located on the part for ease of material identification.

If painting or repair of these plastics is necessary, the following chart identifies those materials which can be painted. Refer to paint manufacturer for specific paint material recommendations.

NOTE: MATERIALS MAY REQUIRE PRIME COAT SEE "YES", UNDER "CAN BE PAINTED" COLUMN.

(J) 1992 Paint Color Codes

"M" NUMBER	COLOR	CO/ NEW	CAR CODE	BASECOAT CLEARCOAT	1992 PAINT COLOR PPG	DUPONT	SIKKENS	MARTIN SR. ACME/ROGERS SHERWIN WILLIAMS	RM	GLASURIT
1724	Solid Black	C	YC		9100/9300	99S	FA90YC	F10B1738	STD PKG	21-1240
5820	Oxford White Solid	C	YO		3620	B8424	FA90YO	33631	14110	FD-5820
6153	Med. Red	C	EM		3954	B8778	FA90EM	38434	17151	FD-6153
6156	Med. Cabernet Solid	C	EH		3936	B8750	FA90EH	36337	17131	FD-6156
6210	White	C	YY		3876	B8687	FA90YY	35521	16135	FD-6210
6263	Med Regatta Blue C/C	C	ME	•	4060	B8836	FA90ME	37274	18133	FD-6263
6290	Twilight Blue C/C	C	MK	•	4069	B8835	FA90MK	37290	18141	FD-6290
6325	Currant Red Solid	C	EG		4161	B8903	FA90EG	39067	19031	FD-6325
6327	Crystal Blue C/C	C	KA	•	4165	B8905	FA90KA	39070	19036	FD-6327
6328	Lt. Crystal Blue C/C	C	MA	•	4171	B8916	FA90MA	39074	19052	FD-6328
6329	Past Titanium Solid	C	YD		4281	B9107	FA90YD	44040	20330	FD-6329
6330	Lt. Titanium C/C	C	YF	•	4121	D8859	FA90YF	38806	18157	FD-6330
6342	Wild Strawberry C/C	C	EL	•	4168	D8829	FA90EL	38461	18134	FD-6342
6346	Vermillion Solid	C	EP	•	4183	B8902	FA90EP	39068	19060	FD-6346
6373	Ebony C/C	C	UA		9700	96S	FA90UA	38743	18183	FD-6373
6383	Ultra Blue	C	MM	•	4164	B8021	FA90MM	41969	20071	FD-6383
6392	Pastel Alabaster Solid	C	AH		4208	B8022	FA90AH	41961	20072	FD-6392
6401	Titanium Frost C/C	C	YX		4218	D8894	FA90YX	40299	19296	FD-6401
6406	Glacier White Solid	C	ZC	•	90677	B8951	FA90ZC	41116	20033	FD-6406
6414	Deep Jewel Green C/C	C	PA	•	4215	B9025	FA90PA	41970	20082	FD-6414
6415	Clear Crystal Blue Frost	C	MD	•	4214	B9026	FA90MD	41968	20070	FD-6415
6421	Woodrose C/C	C	CO	•	4212	B9029	FA90CD	41966	20079	FD-6421
6425	Elect. Currant Red C/C	C	EG	•	4213	B8031	FA90EG	41967	20078	FD-6425
6441	Atlantic Blue Solid	C	K2		4290	B8108	FA90K2	44083	21145	FD-6441
6442	Med. Titanium C/C	C	YG	•	4291	B8115	FA91YG	43986	20369	FD-6442
6443	Lt. Cranberry C/C	C	EW	•	4293	B8111	FA91EW	44084	21155	FD-6443
6444	Med. Cranberry C/C	C	EX	•	4287	B8113	FA91EX	44085	21156	FD-6444
6445	Dark Cranberry C/C	C	ER	•	4288	B8110	FA91ER	44086	21157	FD-6445
6446	Med. Amethyst Frost	C	K9	•	4286	B8104	FA91KB	44087	21154	FD-6446
6448	Sandalwood Spice C/C	C	A8	•	4292	B8112	FA91AB	43897	20361	FD-6448
6450	Med. Mocha C/C	C	DC	•	4283	B8109	FA90DC	44091	21147	FD-6450
6451	Newport Blue C/C	C	KP		4294	B8105	FA91KP	44310	21165	FD-6451
6453	Lt. Mocha Solid	C	DB		4439	B8208	FA92DB	45806	22004	FD-6453
6454	Med. Platinum C/C	C	RC	•	4296	B8109	FA91RC	44034	21162	FD-6454
6456	Jewel Green Met.	C	P3	•	4295	B8116	FA91PB	44095	21159	FD-6456
6464	Aquamarine Frost C/C	C	PN	•	4507	B8102	FA92PN	45872	21143	FD-6464
6465	Mocha Frost C/C	C	DD	•	4282	B8101	FA91DD	44092	21146	FD-6465
6466	White	C	YZ	•	4289	B8145	FA91YZ	44093	21158	FD-6466
6470	Vermillion C/C	C	E4	•	4217	B8954	FA90E4	42497	19079	FD-6470
6477	Dark Mocha Met.	C	DW	•	4442	B9226	FA92DW	45855	22017	FD-6477
6478	M. Seafoam M. C/C	C	NC	•	4470	B9246	FA92NC	46011	22011	FD-6478
6483	Aqua Solid	C	PF	•	4508	B9250	FA92PF	46007	22003	FD-6483
6485	Bimini Blue M. C/C	C	K3	•	4440	B9204	FA92K3	45755	22001	FD-6485
6486	Med. Aubergine C/C	C	GA	•	4472	B9205	FA92GA	45807	22005	FD-6486
6487	Cayman C/C	C	DA	•	4438	B9169	FA92DA	45667	22000	FD-6487
6500	Ultra Red Solid C/C	C	WH	•	4441	B9206	FA92WH	45805	22018	FD-6500
6501	Med. Opal C/C	C	WC	•	4471	B9202	FA92WC	45809	22007	FD-6501
6504	Med. Royal Blue C/C	C	LA	•	4473	B9207	FA92LA	45806	22015	FD-6504
6505	Silver C/C	C	YN	•	4262	B8806	FA90YN	43638	21169	FD-6505
6520	Med. Mocha Met.	C	DJ	•	4505	B9227	FA92DJ	45854	22016	FD-6520
6553	Lapis Met. C/C	C	KE	•	4506	B9236	FA92KE	46009	22009	FD-6553
6572	Dark Tourmaline C/C	C	NA	•	4503	B9239	FA92NA	46010	22010	FD-6572
6584	Chesapeake Blue M.	C	PK	•	4429	B9182	FA92PK	45361	22020	FD-6584
6585	Reef Blue	C	PC		4428	B9169	FA92PC	45360	22019	FD-6585
6597	Lt. Smoke Met.	C	MC		4494	B9171	FA91MC	45708	21661	FD-6597
6598	Smoke Met	C	MS		4495	B8172	FA91MS	45710	21662	FD-6598
6599	Brt. Calypso C/C	C	PM	•	4504	B8173	FA92PM	45764	22002	FD-6599
6609	Dark Shadow Blue M.	C	MK		4497	B8174	FA91MX	45946	22013	FD-6609
6596	Brt. Regatta Blue M.	C	MW		4496	B8176	FA91MW	45709	21660	FD-6596
6608	Med. Lt. Mocha Solid	C	DH		4561	B9248	FA92DH	46008	22012	FD-6608
6584	Performance Red	C	EY		4614		FA92EY	46496	22006	FD-6584

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Figure 7

The 1992 Paint Color Codes are listed in Figure 7.

NOTE: REFER TO THE SERVICE LABOR TIME STANDARDS MANUAL AND THE SPECIFIC PROCEDURE WITHIN THIS BULLETIN FOR REIMBURSEMENT.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OASIS CODES:

106000

Paint: All Technical Service Bulletins Paint - Color Code Chart Revision

Article No. 91-6-2

03/18/91

PAINT - CODES - REVISED 1991 FLEET COLOR PAINT

CODE NUMBERS

FORD: 1991 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOWN CAR

LIGHT TRUCK: 1991 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 C SERIES, CARGO SERIES, F & B SERIES, L SERIES

ISSUE: Revised 1991 Domestic and Fleet Color Paint Code Charts are now available.

ACTION: If service is required, Refer to the revised Domestic and Fleet Color Paint Code Charts shown.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

106000

SERVICE REFINISH CODES

Ford Acme- Martin Sherwin-

Code # Akzo Rogers Senour Williams BASF PPG DuPont

WHITES

W0046A FLNA4534 17204 10004 J5-1704 76768 8709 6729

W0069A FLNA4012 17206 10006 J5-1706 76770 8710 7168

W0071A FLNA4084 17208 11627 J5-1708 76772 8712 94126

W0091A FLNA4020 17209 10008 J5-1709 76773 8713 6733

W0115A FLNA4001 17213 10011 J5-1712 76777 8717 508

W0157A FLNA4083 17217 10016 J5-1717 76782 8722 6886

W0330A FLNA4003 26455 11008 J5-3362 79986 8835 7372

W0332A FLNA4027 28490 11722 J5-4944 77263 8857 7331

W0619A FLNA4203 9343 323398 JX-8618 83248 90553 H8941

CREAMS

W1030B FLNA1030 17221 10019 J5-1720 76785 81626 7173

W1100B FLNA1007 17224 10022 J5-1328 76788 81629 1222

W1677B FLNA1210 36907 36907 36907 80735 26130 G8828

GRAYS

W2007C FLNA7013 16133 94-8729 JX-9290 76793 32663 7180

W2032C FLNA7014 17232 10029 J5-1336 76796 32666 7183

W2101C FLNA7058 17237 10034 J5-1730 83343 32671 6737

W2166C FLNA7016 17244 90-9881 J5-357 76818 31953 7190

W2180C FLNA7011 17245 10041 J5-746 7681O 32678

W2323C FLNA7023 18271 11641 J5-5029 77278 32620 7808

BROWNS - BEIGES - TANS

W3004N FLNA7018 17253 10048 J5-1741 80215 22998 7195

W3028N FLNA7010 17255 10050 J5-1743 76826 21601 7196

W3029N FLNA7020 17256 90-488 J5-1744 76827 23000 7197

W3052N FLNA7201 17257 10051 J5-1745 76828 23001 96932

W3053N FLNA3053 17258 10052 J5-1746 76829 23002 7198

W3075N FLNA7012 17259 90-8461 JX-8085 76830 23003 6742

W3317N FLNA7025 18216 11650 J5-4957 79979 81963 7814

W3341N FLNA4032 16639 11651 J5-4958 77290 22675 74224

W3365N FLNA7208 18252 11655 J5-4961 77423 32976 67258

W3381K FLNA8015 44520 44520 44520 77558 23685 20168

W3663K FLNA8202 36909 36909 36909 80737 26132 G8831

BROWNS METALLICS

W3827N FLNA9012 17423 10205 J5-3962 76846 71669 7205

W3830N FLNA9004 17424 10206 J5-1866 76847 23020 4793

W3833N FLNA9213 17425 10207 J5-1867 76840 23021

W3837M FLNA9005 17427 10209 J5-1868 76850 23023 4807

W3860K FLNA9206 34672 13841 34672 833349 25533 C8223

W3875N FLNA9208 36910 36910 36910 80738 26133 G8829

SERVICE REFINISH CODES

Ford Acme- Martin Sherwin-

Code # Akzo Rogers Senour Williams BASF PPG DuPont

REDS

W4520D FLNA3038 34676 13845 34676 80767 50887 7854

W4632D FLNA3204 36911 36911 36911 80739 72984 G8834

W4640D FLNA3202 36912 36912 36912 80740 72985 G8832

W4650D FLNA3203 36913 36913 36913 83057 72986 G8833

W4672D FLNA3205 36914 36914 36914 80742 72987 G8835

RED METALLICS

W4860D FLNA9046 34680 13849 34680 83329 72686 45761

W4861D FLNA9011 34681 13850 34681 83330 50789 6787

ORANGES

W5607E FLNA2205 36915 36915 36915 80743 61154 G8838

W5615E FLNA2203 36916 36916 36916 80744 61155 G8836

W5684E FLNA2206 36918 36918 36918 80746 61157 G8839

W5685E FLNA2208 36919 36919 36919 80747 61158 G8841

W5694E FLNA2207 36920 36920 36920 80748 61159 G8840

YELLOWS

W6210F FLNA1028 17335 10121 J5-1796 76917 81661 6768

W6642F FLNA1202 36922 36922 36922 80750 82752 G8843

W6644F FLNA1201 38223 38223 38223 83262 82824 K8858

W6675F FLNA1206 36924 36924 36924 80752 82754 G8849

W6684F FLNA1205 36925 36925 36925 80753 82755 G8848

W6695F FLNA1203 36927 36927 36927 80755 82757 G8845

GREENS

W7080G FLNA6020 17345 10131 J5-1127 76927 43821 7233

W7094G FLNA6223 17348 10133 J5-1804 76930 43824 94121

W7168G FLNA6021 17361 10145 J5-1814 76943 43837 7240

W7202G FLNA6010 17368 10152 J5-1820 76950 43844 54738

W7327G FLNA6022 44524 44524 44524 77331 44567 7373

W7348G FLNA6030 18299 11676 J5-4981 77335 44570

W7361-G FLNA6031 18243 11678 J5-4983 77337 44572 7828

W7385G FLNA6019 15712 11685 J5-4990 77347 43273

W7406G FLNA6002 18244 11690 J5-4994 77353 44109 7722

W7514G FLNA6018 34693 13862 34693 81670 43812 6740

W7566G FLNA6214 34694 13863 34694 83333 45853 K8256

W7600G FLNA6202 36928 36928 36928 80756 46172 G8851

W7602G FLNA6206 38747 38747 38747 83267 46268 H8938

W7603G FLNA6201 36929 36929 36929 80757 46173 G8850

W7606G FLNA6204 36930 36930 36930 80758 46174 G8854

W7627G FLNA6209 38625 38625 38625 83270 46270 H8949

W7648G FLNA6210 38233 38233 38233 81376 46271 H8950

W7658G FLNA6203 36931 36931 36931 80759 46175 G8852

SERVICE REFINISH CODES

Ford Acme- Martin Sherwin-

Code # Akzo Rogers Senour Williams BASF PPG DuPont

GREEN METALLICS

W7809G FLNA9218 17430 10212 J5-1871 76957 43856 95610

W7814G FLNA9215 17431 10213 J5-1872 76958 43857 94886

W7819G FLNA9009 17432 10214 J5-1873 76959 43858 6529

W7824G FLNA9006 17433 10215 J5-1874 76960 43859 4814

W7847G FLNA9016 18803 11694 J5-4998 77359 44272 15394

W7862G FLNA9232 34696 13865 34696 83339 45855 43517

W7864G FLNA9204 34698 13867 34698 83340 45857 B8152

BLUES

W8002H FLNA5012 17375 10158 J5-1825 80007 13582 6544

W8025H FLNA5035 17378 10161 J5-1828 76965 13585 7247

W8026H FLNA5036 17379 10162 J5-1274 76966 12375 7248

W8049H FLNA5037 17382 10165 J5-1831 76969 13588 7250

W9096H FLNA5016 17389 10172 J5-1837 76976 12908 29509

W8118H FLNA5039 17391 10174 J5-1838 76978 13593 7253

W8119H FLNA5017 17392 10175 J5-1839 76979 13594 24160

W8140H FLNA5040 17394 10177 J5-1840 76981 13596 7255

W8161H FLNA5018 17399 10182 J5-1121 76986 13599 7260

W8177H FLNA5044 17400 10183 J5-1844 76987 13600 7262

W8304H FLNA5213 18233 11695 J5-4999 77360 14337 94937

W8319H FLNA5077 18227 11702 J5-5007 77368 14340 6820

W8342H FLNA5045 18315 11539 J5-4786 77374 14343 7270

W8345H FLNA5052 18231 11706 J5-5010 83350 13306 7844

W8347H FLNA5205 9652 90-1627 JX-9593 77377 12902 97332

W8355H FLNA5054 18234 11709 J5-5013 83351 14344 7846

W8363H FLNA5055 18316 11710 J5-5014 77381 14345 7847

W8381H FLNA5220 18318 11716 J5-5019 77178 13898 63203

W8520H FLNA5022 34699 13868 34699 83352 15903 4943

W8528H FLNA5202 34703 13872 34703 81231 15907 H8334

BLUE METALLICS

W8816H FLNA9002 17437 10219 J5-1878 76993 13607 95604

W8B29H FLNA9210 17440 10222 J5-1881 76996 13610 96926

W8832H FLNA9216 17441 10223 J5-1882 76997 13611 95181

W8836H FLNA9219 17443 10225 J5-1884 76999 13613 95805

W8847H FLNA9201 38751 38751 38751 83273 16563 H8954

W8866H FLNA9202 34708 13877 34708 80559 15912 K8462

1991 DOMESTIC PAINT CODES

"M" No.	Color Name	C/O or New	Car Code	Truck Code	PPG	DuPont	Sikkens	Martin-Senior Acme Rogers Sherwin-Williams	BASF R-M	Glasurit
6415	Crystal Blue Frost C/C	CO	MD	-	4214	B9028	FA90:MD	41988	20070	FD-6415
6416	Bisque Frost C/C	CO	AD	-	4206	B9027	FA90:AD		20074	FD-6416
6417	Alabaster Solid	CO	AJ	-	4209	B9029	FA90:AJ	41959	20073	FD-6417
6421	Woodrose C/C	CO	CD	-	4212	B9029	FA90:CD	41986	20079	FD-6421
6422	Med. Bisque C/C	CO	AC	-	4218	B9030	FA90:AC	41958	20077	FD-6422
6425	Elect. Currant Red C/C	CO	EG	EG	4213	B9031	FA90:EG	41987	20078	FD-6425
6434	Race Yellow C/C	CO	AG	-	4207	B9032	FD90:AG	41960	20081	FD-6434
6435	Past Alabaster Solid C/C	CO	AK	-	4219	B9033	FA90:AK	41963	20076	FD-6435
6441	Atlantic Blue Solid	N	K2	K2	4290	B9109	FA91:K2	44083	21145	FD-6441
6442	Med. Titanium C/C	CO	YG	-	4291	B9115	FA91:YG	43996	20359	FD-6442
6443	Lt. Cranberry C/C	N	EW	-	4293	B9111	FA91:EW	44084	21155	FD-6443
6444	Med. Cranberry C/C	N	EX	-	4287	B9113	FA91:EX	44085	21156	FD-6444
6445	Dk. Cranberry C/C	N	ER	-	4288	B9110	FA91:ER	44086	21157	FD-6445
6446	Med. Amethyst Frost	N	KB	-	4286	B9104	FA91:KB	44087	21154	FD-6446
6447	Past St. Blue Frost	N	MB	-	4284	B9114	FA91:MB	44088	21152	FD-6447
6448	Sandalwood Spice C/C	CO	AB	-	4292	B9112	FA90:AB	43997	20361	FD-6448
6450	Med. Mocha C/C	N	DC	DC	4283	B9103	FA91:DC	44091	21147	FD-6450
6451	Newport Blue C/C	CO	-	KP	4294	B9105	FA91:KP	44083	21165	FD-6451
6454	Med. Platinum C/C	CO	RC		4296	B9109	FA91:RC	44094	21162	FD-6454
6456	Jewel Green Met.	CO	PB		4285	B9116	FA91:PB	44095	21159	FD-6456
6465	Mocha Frost	N	DD	DD	4282	B9101	FA91:DD	44092	21158	FD-6465
6466	White C/C	N	YZ	-	4289	B9145	FA91:YZ	44093	19046	FD-6485
6470	Vermilion C/C Solid	CO	E4	-	4217	B8954	FA91:AL	42497	19079	FD-6470
6472	Med. Alabaster C/C	N	AL	-	4285	B9144	FA91:A4	44285	21153	FD-6472
6473	Desert Tan	N	A4		4297	B9147	FA90:YN	44097	21170	FD-6473
6505	Silver C/C	CO	YN		4262	D8808		38357	21189	FD-6505

1991 DOMESTIC PAINT CODES

"M" No.	Color Name	C/O or New	Car Code	Truck Code	PPG	DuPont	Sikkens	Martin-Senior Acme Rogers Sherwin-Williams	BASF R-M	Glasurit
1724	Black Solid	CO	YC	YC	9000/9300	99S	FA90:YC	F10B-1738 (SW)	PKG	21-1240
5916	Desert Tan Met.	CO	AT		3575	B8341	FA90:AT	32616	13223	FD-5916
5920	Oxford White Solid	CO	YO	YO	3520	B9424	FA90:YO	33631	14110	FD-5920
5979	Brt. Regatta Blue Met.	CO	MG	MG	3745	B9584	FA90:MG	34354	15119	FD-5979
6044	Smoke Met.	CO	YW		3842	B8541	FA90:YW	35360	18141	FD-6044
6153	Med. Red Solid	CO	EM	EM	3954	B8778	FA90:EM	36434	17151	FD-6153
6156	Med. Cabernet Solid	CO	EH	EH	3936	B8750	FA90:EH	36357	17131	FD-6156
6188	Dk. Shadow Blue Met.	CO	MJ		3946	B8775	FA90:MJ	36373	17144	FD-6188
6210	White	CO	YY		9978	B9887	FA90:YY	35521	18185	FD-6210
6214	Lt. Smoke Met.	CO	YV		3843	B8689	FA90:YV	35520	18180	FD-6214
6236	Med. Scarlet Solid	CO	EN		3935	B8753	FA90:EN	32356	17130	FD-6236
6253	Lt. Sandalwood C/C	CO	AX		4067	B8852	FA90:AX	37278	18139	FD-6253
6260	Chestnut C/C	N	A9		4077	B8855	FA91:A9	38161	18145	FD-6260
6261	Dk. Chestnut C/C	N	A8		4078	B8857	FA91:A8	38163	18148	FD-6261
6262	Dk. Chestnut Met.	CO	CE		4060	B8856	FA90:CE	37162	18146	FD-6262
6263	M. Regatta Blue C/C	CO	ME	-	4060	B8836	FA90:ME	37274	18133	FD-6263
6282	Med. Titanium Met.	N	YK	-	4125	D8856	FA91:YK	38807		
6290	Twilight Blue C/C	CO	MK	MK	4069	B8835	FA90:MK	37280	18141	FD-6290
6312	Med. Sandalwood C/C	CO	AW		4066	B8853	FA90:AW	37277	18138	FD-6312
6325	Currant Red Solid	CO	EC	EC	4161	B8903	FA90:EC	39067	19051	FD-6325
6327	Crystal Blue C/C	CO	KA	KA	4165	B9805	FA90:KA	39070	19066	FD-6327
6328	Lt. Crystal Blue C/C	CO	MA	MA	4171	B8910	FA90:MA	39074	19052	FD-6328
6329	Past Titanium Solid	CO	YD	-	4261	B9107	FA91:YD	44040	20360	FD-6329
6330	Lt. Titanium C/C	CO	YF	-	4121	D8859	FA90:YF	38806	18157	FD-6330
6342	Wild Strawberry C/C	CO	EL	EL	4166	D8829	FA90:EL	38461	18154	FD-6342
6346	Vermillion Solid	CO	EP	EP	4163	B8902	FA90:EP	39068	19060	FD-6346
6373	Ebony C/C	CO	UA	-	9700	99S	FA90:UA	38743	18163	FD-6373
6381	Med. Currant Red C/C	CO	EE	-	4173	B8910	FA90:EE	39076	19057	FD-6381
6383	Ultra Blue C/C	CO	MM	-	4164	B9021	FA90:MM	41969	20071	FD-6323
6390	Dk. Titanium C/C	CO	YU	-	4167	B9806	FA90:YU	39971	19062	FD-6390
6392	Pastel Alabaster Solid	CO	AH	AH	4208	B9022	FA90:AH	41961	20072	FD-6392
6395	Sandalwood Frost C/C	CO	AP	-	4210	B9023	FA90:AP	41984	20075	FD-6395
6397	M. Woodrose C/C	CO	CA	-	4211	B9024	FA90:CA	41965	20080	FD-6397
6401	Titanium Frost C/C	CO	YX	-	4216	D9894	FA90:YX	40299	19265	FD-6401
6403	Pawnee Tan Solid	CO	AV		4220	B9034	FA90:AV	42575	20085	FD-6403
6406	Glacier White Solid	CO	ZC		90577	B6951	FA90:ZC	41118	20063	FD-6406
6414	DP Jewel Green C/C	CO	PA	PA	4215	B9025	FA90:PA	41970	20062	FD-6414

1991 DOMESTIC PAINT CODES

1991 DOMESTIC PAINT CODES

Paint: All Technical Service Bulletins Paint - Iron Particle Removal

Article No. 95-6-1

03/27/95

^ PAINT - IRON PARTICLE REMOVAL - INDUSTRIAL FALLOUT - ACID RAIN NEUTRALIZATION

^ PAINT - ROUGH TEXTURE/FERROUS METAL CONTAMINATION - ACID RAIN DISCOLORATION OR ETCHING

FORD: 1980 and after CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1982-88 EXP 1984-94 TEMPO 1986 and after TAURUS 1988-93 FESTIVA 1989 and after PROBE 1994-95 ASPIRE 1995 CONTOUR

LINCOLN-MERCURY: 1980 and after CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1984-92 MARK VII 1984-94 TOPAZ 1986 and after SABLE 1987-89 TRACER 1991-94 CAPRI 1991 and after TRACER 1993 and after MARK VIII 1995 MYSTIQUE

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1980 and after F-150-350 SERIES 1981 and after ECONOLINE 1982 and after BRONCO 1983 and after RANGER 1984-90 BRONCO II 1986 and after AEROSTAR 1988 and after F SUPER DUTY 1991 and after EXPLORER 1993 and after VILLAGER 1995 and after WINDSTAR

MEDIUM/HEAVY TRUCK: 1980-91 C SERIES, CL-CLT-9000 SERIES 1980 and after F & B SERIES, L SERIES 1986 and after CARGO SERIES

ISSUE: Ferrous metal particles (hot iron dust) are generated by manufacturing facilities, rail shipments, combustion engines, jet engines, body shops, etc. These particles mechanically/magnetically bond to vehicles' painted surfaces. Moisture and temperature combine with the particles to create a chemical reaction. The reaction causes the particles to corrode and enter into the physical paint film.

ACTION: To remove these particles/contaminants, USE ONLY the following procedure. The procedure must be performed before any buffing, polishing, color sanding or refinishing is attempted. The materials in this procedure are alkaline, acidic and neutral. They must be used in the specified order.

CAUTION:

ANY CHANGES TO THIS PROCEDURE WILL CAUSE AN INCOMPLETE OR UNSATISFACTORY REPAIR AND MAY RESULT IN

POSSIBLE DAMAGE TO THE PAINTED SURFACES AND TRIM.

WARNING:

THE TECHNICIAN MUST WEAR PROTECTIVE CLOTHING AND EYE PROTECTION TO PREVENT SKIN IRRITATION.

CAUTION:

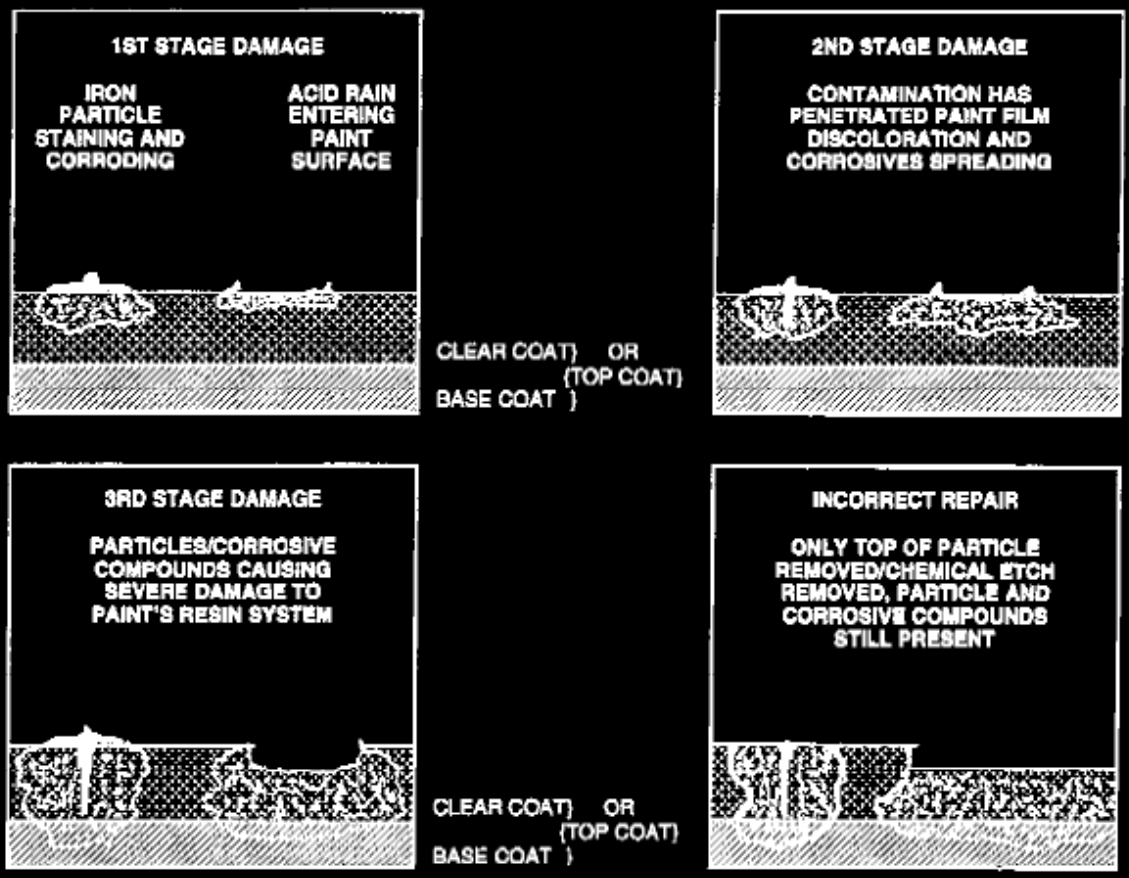
THE USE OF ANY OTHER PRODUCT OR PROCEDURE MAY CAUSE DAMAGE TO ALUMINUM, FLEXIBLE PAINTED SURFACES OR OTHER PAINTED SURFACES. FOLLOW DIRECTIONS EXACTLY AND RINSE THOROUGHLY AFTER EACH STEP.

NOTE:

THIS DECONTAMINATION PROCEDURE IS DESIGNED TO REMOVE SURFACE CONTAMINANTS FROM THE PAINT ON VEHICLES THAT HAVE BEEN CONTAMINATED UP TO 120 DAYS. VEHICLES WHICH HAVE EXPERIENCED THE CONDITION LONGER THAN THIS PERIOD MAY REQUIRE AN ADDITIONAL TREATMENT TO REMOVE FERROUS METAL CONTAMINANTS.

IDENTIFICATION

INDUSTRIAL FALLOUT (IFO) is a general term used to identify Rail Dust, Brake Dust, Ferrous Metal, Alkaline/Crystalline Deposits, Water Spots, Acid Rain, and other types of Environmental Contamination.



Studies conducted have shown the use of Oxalic Acid ferrous metal removers actually contribute to further damage of the paint's resin system, creating long term damage, which may not be evident for months. Additionally, Oxalic Acid products may damage soft exterior trim, aluminum trim and soften the paint.

The use of "clay" type products does not remove the entire ferrous particle or environmental contamination. Clay removes only the top of the particle and stain generated by the contamination, leaving the particle imbedded and the corrosive chemical compounds generated by the contamination in the paint system.

The particles and/or chemical compounds are still present and they continue to generate damage. Color sanding, buffing or compounding the paint film to remove ferrous metal, industrial fallout or acid rain damage may not remove the entire cause of the damage (they treat only the symptom and not the cause). The chemical compounds are still in the paint system and will continue to damage the paint. Color sanding and buffing may result in excessive removal of clear coat film. Removal of OEM clear coat in excess of 0.03 mil may contribute to premature clear coat failure and is not recommended.

THE DECONTAMINATION PROCEDURE DIRECTED IN THIS BULLETIN MUST BE PERFORMED BEFORE ANY BUFFING, POLISHING, COLOR SANDING OR REFINISHING IS ATTEMPTED.

TB-4187-A

Figure 1

For ease of identifying, the Radio Shack Model 63-851, 30X, lighted, magnifier is recommended.

1. Ferrous Metal

^ Light colored vehicles: Small rust orange dots with black in center of stain.

^ Dark colored vehicles: Small white or silver dots with a "rainbow hue" around the particle. The surface will also feel rough to the touch.

2. Industrial Fallout

^ The surface feels rough to the touch and may exhibit crystalline deposits.

^ Usually ferrous metal is present, as well as water spots.

MANUFACTURERS			
PROCEDURE	FINISH KARE (818)-443-8983, CUSTOMER SERVICE	3M (800)-364-3577	MEGUIAR'S (800)-347-5700, CUSTOMER SERVICE
Decontamination	#1119, #883, #11830	None	None
Coarse Compounds	#340 Compound, FK-7503G Pad	Imperial Micro-Finishing Compound	#4 Heavy, #1 Medium, #2 Light
Light	#338 Compound, FK-7503G Pad	Finesse-It II Finishing Compound	#4 Heavy, #1 Medium, #2 Light
Polish	#330, FK-8110G Pad, FK-2500G Pad	Perfect-It Foam Polishing Pad Glaze	#9
Protectant	#218 Or #2180	Imperial Hand Glaze	#9 Or #7
Color Sanding Lubricant	#780 Sand Lube	None	None

3. Acid Rain

^ Surface will exhibit irregular discolored spotting.

^ Dark colored vehicles will show cloudy or greying spots where the acids have started to etch away the paint.

NOTE:

IN EXTREME CASES ETCHING OF THE SURFACE WILL BE VISIBLE OR FELT.

DECONTAMINATION

Use Finish Kare Inc. products 1119/883/11850 to decontaminate the paint surface. Follow the manufacturer's recommended procedures.

NOTE:

FORD DOES NOT RECOMMEND THE USE OF OXALIC ACIDS OR OTHER "FALLOUT REMOVERS".

1. Rinse off dust and debris with cold water. Be sure to start at the bottom and work up.

2. Prepare product "1119" by mixing one (1) part "1119" with four (4) parts cold water.

3. Use clean wash mitt and apply mixture to entire car, starting at the bottom and working up to the top surface. Keep car wet with the solution for 5 to 10 minutes. Do not allow product to dry on the car, and do not allow it to streak down the sides. Rewipe with mitt if necessary to avoid streaks.

4. Rinse car with cold water.

5. Dry the flat surfaces of the vehicle hood, roof and deck lid.

6. Apply product "883" directly to the contaminated surfaces using a clean dry sponge, wash mitt, or soft truck brush ("883" is ready to use from the bottle, with no mixing involved). Keep the areas wet with the "883" for 5 to 7 minutes. Do not allow to dry on the car. Wipe down to the body line on the sides.

7. Prepare product "118SC" by mixing 1 oz (0.03 L) with 1 gal (3.785 L) of water.

8. Shampoo the vehicle with "118SC" shampoo mixture using a clean wash mitt and then rinse with cold water.

NOTE:

DO NOT USE "1185C" MITT WITH "1119" OR "883" SOLUTIONS. USE SEPARATE MITTS AND ALWAYS KEEP THEM SEPARATE.

9. Inspect paint surface to see if rust particles have been removed. If rust particles have been on the vehicle for a long time, it may be necessary to repeat each of the above steps.

NOTE:

THE NEUTRALIZER CONCENTRATE IS A HEAVY DUTY SHAMPOO AND CAN BE USED IN AN AUTOMATIC CAR WASH SYSTEM.

PART NUMBER	PART NAME
Obtain From Finish Kare (Refer To Manufacturer Chart In This TSB Article)	#1119 Decontaminant
Obtain From Finish Kare (Refer To Manufacturer Chart In This TSB Article)	#883 Decontaminant
Obtain From Finish Kare (Refer To Manufacturer Chart In This TSB Article)	#1188C Decontaminant
Refer To Manufacturer Chart In This TSB Article For All Other Needed Products	**********

CORRECTION OF SURFACE FOLLOWING DECONTAMINATION:

1. Visually inspect surface for evidence of removal of ferrous metal particles, crystalline deposits and water spots. Acid rain discoloring or etching will require either buffing, color sanding or refinishing if etching is visible.

2. Use the buffing products from only one (1) manufacturer. Do not intermix products.

3. Always follow the manufacturer's product sequence. Use appropriate pads with each product as recommended by the manufacturer.

NOTE:

DO NOT REMOVE MORE THAN 0.3 OF A MIL OF PAINT MATERIAL, OR REPAINTING WILL BE REQUIRED.

4. Use a dual action sander (D/A Sander) with a velcro-mount backing plate and appropriate foam pad for final polishing swirl removal.

5. Use an alcohol and water mixture (1:4 ratio) to clean buffed areas to verify removal of scratches and swirls before application of final protective glaze.

NOTE:

FREQUENT WASHING OF VEHICLES IS IMPORTANT. CONTAMINANTS SETTLE ONTO THE VEHICLE EVERY DAY. USE CLEAN WATER (DEIONIZED, REVERSE OSMOSIS, ETC.) TWICE WEEKLY TO REMOVE HEAVY DUST, AND PARTICULATES. THE USE OF A NEUTRAL pH CAR WASH SOAP EVERY TWO (2) WEEKS IS RECOMMENDED TO NEUTRALIZE VEHICLE CONTAMINATION.

Parts Block

NOTE:

DEALERS SHOULD USE PROGRAM CODE R-23 AND CONDITION CODES C5 AND C6. REFER TO W & P MANUAL, SECTION 5-1, PAGE 3.

OTHER APPLICABLE ARTICLES: 91-18-1, 92-6-4 WARRANTY STATUS: Eligible Under The Provisions Of 12 Month/12,000 Mile Basic Warranty Coverage

OPERATION DESCRIPTION TIME

950601A Decontaminate And Surface 0.6 Hr.

Correction - Aspire

950601B Decontaminate And Surface 0.6 Hr.

Correction - Escort/Tracer

950601C Decontaminate And Surface 0.6 Hr.

Correction - Probe

950601D Decontaminate And Surface 0.6 Hr.

Correction - Contour/Mystique

950601E Decontaminate And Surface 0.6 Hr.

Correction - Mustang

950601F Decontaminate And Surface 0.7 Hr.

Correction - Taurus/Sable

950601G Decontaminate And Surface 0.7 Hr.

Correction - Thunderbird/Cougar

950601H Decontaminate And Surface 0.7 Hr.

Correction - Crown Victoria/Grand Marquis

950601I Decontaminate And Surface 0.7 Hr.

Correction - Mark VIII

950601J Decontaminate And Surface 0.7 Hr.

Correction - Continental

950601K Decontaminate And Surface 0.6 Hr.

Correction - Capri

950601L Decontaminate And Surface 0.8 Hr.

Correction - Town Car

950601M Decontaminate And Surface 0.7 Hr.

Correction - Villager

950601N Decontaminate And Surface 0.6 Hr.

Correction - Windstar

9506010 Decontaminate And Surface 0.7 Hr.

Correction - Aerostar

950601P Decontaminate And Surface 0.6 Hr.

Correction - Bronco

9506010 Decontaminate And Surface 1.1 Hrs.

Correction - Econoline

950601R Decontaminate And Surface 0.9 Hr.

Correction - F-Series

950601S Decontaminate And Surface 0.6 Hr.

Correction - Explorer

950601T Decontaminate And Surface 0.7 Hr.

Correction - Ranger

950601U Decontaminate And Surface 0.5 Hr.

Correction - F-Super Duty

950601V Decontaminate And Surface 0.7 Hr.

Correction - F/B-Series

950601W Decontaminate And Surface 0.7 Hr.

Correction - L-Series

950601X Decontaminate And Surface 0.5 Hr.

Correction - Cargo

950601Y Decontaminate And Surface 0.6 Hr.

Correction - Tempo/Topaz

DEALER CODING

BASIC PART NO. CONDITION CODE

ENTRE C5 OR C6

OASIS CODES: 106000

Paint: All Technical Service Bulletins Paint - Preparation Procedure And MSDS Information

Article No. 94-23-4

11/14/94

PAINT - PRIMED SHEET METAL - PREP PROCEDURE AND MSDS INFORMATION

FORD: 1980 and after CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1982-88 EXP 1984 and after TEMPO 1986 and after TAURUS 1988-93 FESTIVA 1989 and after PROBE

LINCOLN-MERCURY: 1980 and after CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1981-87 LYNX 1984-92 MARK VII 1984 and after TOPAZ 1986 and after SABLE 1987-89 TRACER 1991-94 CAPRI 1993 and after MARK VIII

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LIGHT TRUCK: 1980 and after F-150-350 SERIES 1981 and after ECONOLINE 1982 and after BRONCO 1983 and after RANGER 1984-90 BRONCO II 1986 and after AEROSTAR 1988 and after F SUPER DUTY 1991 and after EXPLORER 1993 and after VILLAGER 1995 WINDSTAR

MEDIUM/HEAVY TRUCK: 1980-91 C SERIES, CL-CLT-9000 SERIES 1980 and after F & B SERIES, L SERIES 1986 and after CARGO SERIES

ISSUE: This procedure is being published to advise all body and paint technicians about proper procedures for preparation of sheet metal parts coated with electrodeposition primer (E-Coat).

ACTION: When prepping a replacement body panel for installation, it is mandatory to leave the E-Coat intact. DO NOT SAND OFF THE E-COAT.

Improper preparation with excessive sanding of the E-Coat to bare metal will jeopardize the sheet metal warranty and overall customer satisfaction. In particular, the E-Coat is necessary to protect the parts from rust. Light scuff sanding using a Scotch Brite pad or wet 320 grit sand paper is recommended for minor flaws. If a minor flaw exists, wet sand or scuff out the flaw and prime the repair area. Again, do not remove all of the E-Coat from the panel.

CAS: 7439-92-1 ★★★★★★ **LEAD** ★★★★★★ **CHEMICAL FACT SHEET**

Chemical Names (Synonyms): Lead.

Inorganic Compound Names: Lead carbonate (CAS 598-63-0)
Lead chloride (CAS 7758-95-4)
Lead monoxide (CAS 1317-36-8)
Lead sulfide (CAS 1314-87-0)
and others.

Trade Names: C.I. Pigment Metal 4, C.I. 77575, Lead flake, Whole lead, Litharge, and others.

Uses: Tank linings, piping and other chemical reaction equipment; petroleum refining, manufacture of gasoline additives; pigments for paint; storage batteries, solder and fusible alloys; radiation shielding; and others.

PHYSICAL INFORMATION

Appearance: Bluish white to silvery gray solid (lead metal).

Odor: None.

Minimum Detectable by Odor: Unknown.

Behavior in Water: Insoluble.

Evaporation: Unknown.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure – 0.05 mg/m³ (lead).

Note: Current OSHA regulations require that if an individual has a blood-lead level greater than or equal to .060 mg lead per 100 ml blood, he must be removed from all exposures to lead and cannot return to an exposed environment until the blood level falls to .040 mg lead per 100 ml blood or less.

NIOSH Recommended Limit: Average 10 hour day/40 hour week exposure – .01 mg/m³ (lead).

ACGIH Recommended Limit: Average 8 hour exposure – 0.15 mg/m³ (lead).

Short Term Exposure:

Note: Lead is a cumulative poison. Increasing amounts build up in the body and eventually a point is reached where symptoms and disability may occur. Lead dust carried home on contaminated clothing can cause symptoms in other family members. Standards only protect for inhalation exposure. Extra precautions should be taken if skin exposure also occurs.

Inhalation: The effects of exposure to fumes and dusts of inorganic lead may not develop quickly. Symptoms may include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains, and decreased appetite. These effects are reversible and complete recovery is possible. Inhalation of large amounts of lead may lead to seizures, coma, and death.

TB-3995-A

Figure 1

HEALTH HAZARD INFORMATION (CONT'D.)

Skin: May cause irritation.

Eyes: May cause irritation.

Ingestion: See effects listed for inhalation. Ingestion of large amounts of lead may lead to seizures, coma, and death.

Long Term Exposure:

Lead can accumulate in the body over a period of time. Therefore, long term exposures to lower levels can result in a build up of lead in the body and more severe symptoms. These may include anemia, pale skin, a blue line at the gum margin, decreased handgrip strength, abdominal pain, severe constipation, nausea, vomiting, and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected, usually due to very high exposures, the resulting effects include severe headache, convulsions, coma, delirium, and death. In non-fatal cases, recovery is slow and not always complete. Alcohol ingestion and physical exertion may bring on symptoms. Continuous exposure can result in decreased fertility. Lead exposure of either parent before pregnancy can increase the chances of miscarriage or birth defects. Exposure of the mother during pregnancy can cause birth defects.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move victim to fresh air. Give artificial respiration, as needed. Get medical attention immediately.

Skin: Wash area with plenty of soap and water. Remove any contaminated clothing immediately.

Eyes: Rinse eyes with plenty of water for 15 minutes. Seek medical attention, if necessary.

Ingestion: If victim is conscious, give water. Seek medical attention.

Note to Physician: Whole blood lead levels, circulating plasma/erythrocyte lead concentration ratio, urine ALA, and erythrocyte protoporphyrin fluorescent microscopy may all be useful in monitoring or assessing lead exposure. Chelating agents such as edetate disodium calcium and penicillamine are generally useful in the therapy of acute lead intoxication.

PROTECTIVE MEASURES

Storage and Handling: Store in an area away from heat and keep separate from potassium.

Engineering Controls: Adequate ventilation, sinks, showers and eyewash stations should be provided.

Protective Clothing: Full body work clothing should be worn including bump caps or hard hats, rubber gloves, and eye protection. Employees should routinely wash their skin thoroughly and change clothing at the end of each work shift.

Figure 2

CAS: 7439-92-1 ★★★★★★ LEAD ★★★★★★ CHEMICAL FACT SHEET

PROTECTIVE MEASURES (CONT'D.)

Protective Equipment:

For levels up to 0.5 mg/m³, use any dust and mist respirator, except single-use.

For up to 1 mg/m³, use any dust and mist respirator, except single-use or quarter mask, or any fume respirator or high efficiency particulate filter respirator.

For up to 5 mg/m³, use a high efficiency particulate filter respirator with a full facepiece.

For up to 100 mg/m³, use a powered air-purifying respirator with a high efficiency particulate filter or a Type C supplied-air respirator operated in pressure-demand or other positive-pressure or continuous-flow mode.

For up to 200 mg/m³, use a Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive-pressure mode, or with a full facepiece, helmet or hood operated in continuous-flow mode.

For levels greater than 200 mg/m³, escape, or entry into unknown concentrations, use a self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode or a combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive-pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Other Precautions: No eating, drinking, or smoking in areas where the dusts or fumes of lead or its compounds are present.

FIRE AND EXPLOSION INFORMATION

General: Not combustible. If exposed to fire, may release toxic fumes of sulfur and lead oxides.

Explosive Limits: Unknown.

Extinguisher: Use extinguisher appropriate to burning material. When fighting fire, wear a self-contained breathing apparatus with full facepiece and operated in positive-pressure mode.

REACTIVITY INFORMATION

Conditions to Avoid: Excessive heat.

Materials to Avoid: Reacts violently with potassium.

SOURCE: Chemical Fact Sheet as prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health; modified by the Toxicology Department, Ford Motor Company.

TB-3997-A

Figure 3

WARNING:

LEAD CONTAMINATION POTENTIAL: THE ELECTRODEPOSITION PRIMER USED BY FORD MOTOR COMPANY OVER BASE METAL ON SERVICE REPLACEMENT PARTS OR COMPLETED VEHICLES CONTAINS SMALL AMOUNTS OF LEAD FOR CORROSION PROTECTION OF STEEL. EXCESSIVE DUSTS GENERATED BY UNNECESSARY AND IMPROPER SANDING MAY CONTAIN AIRBORNE LEAD CONTAMINATION IN EXCESS OF OSHA STANDARDS. INFORMATION REGARDING THE HAZARDS OF LEAD CAN BE FOUND IN THE CHEMICAL FACT SHEETS IN THE FIGURES IN THIS ARTICLE.

NOTE:

READ ALL INFORMATION IN THIS TECHNICAL SERVICE BULLETIN CAREFULLY AND FORWARD TO ALL EMPLOYEES PERFORMING PAINT PREPPING OPERATIONS. DEALERS SHOULD CONTACT LEGAL COUNSEL AND/OR LOCAL OSHA

AUTHORITIES FOR DIRECTION REGARDING OSHA LEAD STANDARD REQUIREMENTS.

If a replacement body panel contains more than a minor flaw in the E-coat, it should be returned. Contact your Customer Service representative for instructions.

If more extensive sanding, other than that described above, is necessary, (e.g., refinishing original vehicle sheet metal) follow the procedures outlined below:

ALTERNATIVE SANDING PROCEDURES WHEN EXTENSIVE SANDING IS REQUIRED

The following procedures for sheet metal preparation by sanding or media blasting are based on tests conducted by Ford Motor Company in accordance with requirements set forth in the Federal OSHA Inorganic Lead Standard 29 CFR 1910.1025.

SANDING PROCEDURE

1. Each technician performing the sanding operation MUST wear an approved respirator with high efficiency particulate filter (HEPA).

2. Technicians should use dual action sander with vacuum collection.

3. The vacuum equipment MUST be equipped with a HEPA filter on the air exhaust. Dealers are cautioned not to exhaust vacuum air into the atmosphere. Operators are cautioned to follow the manufacturer's guidelines for maintenance and the replacement of filters.

MEDIA BLASTING PROCEDURE

1. Testing has shown that plastic media blasting meets OSHA lead standard requirements and is efficient when the manufacturer's published procedures are followed.

2. The operator must wear an air supplied hood using compressed air free from carbon monoxide, oil, water, and other contamination when performing this operation. Specifics of the media blasting procedure for whole body paint removal have been previously published.

NOTE:

PLEASE READ THE CHEMICAL FACT SHEETS IN THE FIGURES.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 106000

Technical Service Bulletin # 91181 Date: 910905

Exterior Paint - Comprehensive Repair Procedures

Article No. 91-18-1 09/05/91

PAINT-EXTERIOR-COMPREHENSIVE REPAIR PROCEDURES

FORD: 1985-86 LTD 1985-92 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-92 TAURUS 1988-92 FESTIVA 1989-92 PROBE

LINCOLN-MERCURY: 1985-86 CAPRI, MARQUIS 1985-87 LYNX 1985-92 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, TOPAZ, TOWN CAR 1986-92 SABLE 1988-92 TRACER

MERKUR: 1985-89 XR4TI 1988-89 SCORPIO

LIGHT TRUCK: 1985-90 BRONCO II 1985-92 BRONCO, ECONOLINE, F-150-350 SERIES, RANGER 1986-92 AEROSTAR 1991 EXPLORER

ISSUE: A comprehensive paint repair procedure TSB has been developed for service use. It includes the following paint repair topics:

Section (A) has been superseded by TSB # 9264, dated 3/92.

(B) Exterior Color Peeling From Ultra Violet Light

(C) Lower Body Stone Protection Repair Tips

(D) Procedures For PVC Body Side Moldings

(E) Lower Body-Side Stone Chip Protection Program

(F) Surface Defect Removal Without Repainting

(G) 1991 Color Matched/Compatible Spray Primer Chart

(H) Repair For Tinted Clearcoat

(I) Frequently Used And Paintable Plastics

(J) 1992 Paint Codes

ACTION: If paint repair is required, refer to the following procedures for paint restoration.

Section A Has Been Superseded By TSB # 9264, Dated 3/92.

CAUTION: FAILURE TO THOROUGHLY RINSE THIS SURFACE COULD RESULT IN CORROSION OF ANODIZED ALUMINUM OR

STAINLESS STEEL PARTS

PROCEDURE # 2

FINISH KARE FORMULA # 1119 AND # 883 (Buffered solution not as harsh on aluminum parts)

WARNING: FOR YOUR SAFETY, USE RUBBER GLOVES, GOGGLES AND PROTECTIVE CLOTHING WHEN HANDLING THESE PRODUCTS.

1. Apply hot diluted solution with soft mitt.

2. Agitate to create suds. Suds hold the acid solution in suspension and to the surface creating greater and extended activity.

3. Allow 3 to 5 minutes dwell time.

4. Rinse with COLD WATER.

5. Apply # 883 per label instructions.

LIQUID NEUTRALIZER CONCENTRATE

1. Using a mitt, thoroughly go over the entire surface with the diluted solution (50-1) of water and # 118 Liquid Neutralizer Concentrate. Then wipe dry.

2. If the iron particles are not totally removed after 2 washings, use one or both of the following service actions.

a. Sand with micro fine sandpaper (1500 Grid or greater) in localized areas.

b. Buff with very light compound and polish with wax in localized areas.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C.'S) OR EXCESS MATERIALS.

(B) Paint Exterior Color Peeling From Ultra Violet Light

Paint may be damaged because of ultra violet light absorption through the color coat. This damage will cause the top coat to peel to the E-coat primer.

If service is required, use the following procedure to correct the concerns.

NOTE: READ THE ENTIRE SERVICE PROCEDURE BEFORE STARTING REPAIRS.

WARNING: ALWAYS WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE OTHER RECOMMENDED SAFETY EQUIPMENT.

1. Wash the vehicle with soap and water.

2. Verify topcoat adhesion by applying a 2 inch wide masking tape strip on all body panels above and below the beltline on each panel.

a. Pull the tape up quickly.

b. Inspect the adhesive side of the tape for paint removal.

NOTE: IF PAINT WAS REMOVED DURING THE TAPE TEST, THE ENTIRE PANEL SHOULD BE STRIPPED AND REFINISHED AS NECESSARY.

3. Remove all trim (mouldings, name plates, striping, etc.) from the areas which will be repainted.

NOTE: ALL REQUIRED REPLACEMENT MOULDINGS AND STRIPES SHOULD BE ORDERED AND RECEIVED PRIOR TO REPAIRING THE CUSTOMER'S VEHICLE.

4. Wipe the entire vehicle with wax and grease remover.

^ BASF Product # 900 Prekleano

^ PPG Product # DX300

^ S-W Product # R7-K156

^ DuPont Product # 3919 S

^ Sikkens Product # M 600

5. Mask off all areas on the vehicle which are not going to be painted or will be affected by overspray (engine compartment, wheels, etc.).

6. Remove the paint to bare metal from all the areas of the vehicle which are going to be repainted. Use one of the following methods.

SAND THE AFFECTED AREAS TO BARE METAL USING 40 GRIT 3M GREEN CORPS SANDING DISCS OR EQUIVALENT AND A SOFT PAD ON A 1700 RPM POLISHER. KEEP THE POLISHER MOVING TO AVOID DEVELOPING HOT SPOTS ON THE METAL.

NOTE: CHEMICAL STRIPPING IS NOT RECOMMENDED.

NOTE: IF AVAILABLE, PAINT MAY BE REMOVED USING A PLASTIC MEDIA BLAST SYSTEM. IF THIS PROCESS IS USED, EXTRA

CARE MUST BE TAKEN DURING THE MASKING PROCESS TO PREVENT DAMAGE TO GLASS, MOULDING, ETC.

7. Blow off the entire vehicle to remove loose dust and debris.

NOTE: IF RUST IS PRESENT, USE APPROPRIATE METAL CLEANER AND CONDITIONER (PHOSPHATE COATING) OVER BARE METAL AREAS.

8. Wipe all affected areas with a fast dry enamel reducer solvent, followed by a dry wipe using a clean, lint free cloth to remove all residue.

CAUTION: KEEP WIPING UNTIL SURFACE IS COMPLETELY DRY. ANY RESIDUE WILL RESULT IN POPPING OF THE COATINGS TO

BE APPLIED FOLLOWING THIS STEP.

NOTE: THIS STEP WILL REDUCE THE POSSIBILITY OF FLASH RUST.

^ BASF Product # BR 50

^ PPG Product # DX 300

^ S-W Product # R7 K156

^ DuPont Product # 3812 S

^ Sikkens Product # 123 FAST

9. Apply two medium wet coats (1.0 mil total) of self-etching, anti-corrosion primer using the manufacturer's recommendations and flash times.

^ BASF Product # DE-17

^ PPG Product # DP EPOXY PRIMER

^ S-W Product # E2-6980

^ DuPont Product # VARIPRIME

^ Sikkens Product # WASH FILLER 580

10. Apply three medium wet coats (2.0 mils total) of acrylic urethane primer surfacer following the manufacturer's recommended procedures.

^ BASF Product # DP-20 PRIMER/SUFACER

^ PPG Product # K-36

^ S-W Product # P6-M49 OR P6-A48

^ DuPont Product # URO PRIMERFILLER

^ Sikkens Product # AUTOCRYL 3+1 FILLER

11. Sand the vehicle using one of the following methods:

^ Wet-sand by hand using 400 grit or finer sandpaper.

^ Dry-sand by hand using 320 grit or finer sandpaper.

12. Blow the entire vehicle off to remove loose dust and debris.

13. Demask (remove all paper and tape) as necessary to remove the primer and dirt buildup on the paper and tape.

14. Wipe the entire vehicle with wax and grease remover, followed by a dry wipe using a clean, lint free cloth to remove all residue.

CAUTION: KEEP WIPING UNTIL SURFACE IS COMPLETELY DRY. ANY RESIDUE WILL RESULT IN POPPING OF THE COATINGS TO

BE APPLIED FOLLOWING THIS STEP.

^ BASF Product # 901 PRE-PAINT CLEANER

^ PPG Product # DX 330

^ S-W Product # R7-K156

^ DuPont Product # 3812 S

^ Sikkens Product # M 600

15. Mask all areas on the vehicle which are not to be painted or will be affected by paint overspray (engine compartment, wheels, etc.).

NOTE: APPLY BASECOAT/CLEAR COAT ONLY TO SURFACES WHICH ORIGINALLY HAD BASECOAT/CLEAR COAT

16. Apply three medium wet coats (enough material to hide primer) of acrylic enamel base coat or acrylic urethane monocoat following the manufacturer's recommended procedure.

^ BASF Product # DIAMONT BASECOAT/Solo

^ PPG Product # DELTRON BASECOAT DBC/Deltron

^ S-W Product # ULTRA BASE/Ultra One Stage

^ DuPont Product # CHROMABASE/Cronar

^ Sikkens Product # AUTO BASE/Autocryl

17. Apply two medium wet coats of 2K acrylic urethane enamel clear coat, following manufacturer's recommended procedure.

^ BASF Product # DIAMONT CLEAR 88/89

^ PPG Product # CONCEPT 2001 DCU

^ S-W Product # CC-650 OR CC-640

^ DuPont Product # 1080 S URO CLEAR

^ Sikkens Product # AUTO CLEAR

18. After the paint is dry, demask the entire vehicle and clean up any areas which have overspray.

19. Polish the vehicle as necessary to remove any defects in the paint which may create a customer concern.

CAUTION: USE LOW SPEED (1700 RPM MAXIMUM) POLISHER.

20. Install all trim (mouldings, name plates, striping, etc.) on the vehicle which were removed prior to repainting.

21. Clean the exterior and interior of the vehicle thoroughly, including air ducts and other areas which are prone to accumulating dust. This step is essential to ensure customer satisfaction.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS.

STRIP AND REFINISH CLAIMING METHODOLOGY

(See Figures 2 and 3 for Illustration of Claim Preparation)

LABOR

To calculate STRIP AND REFINISH Labor Hours/Labor Operations:

1. Refer to SLTS Manual REFINISH labor allowance for panel or panels being STRIPPED AND REFINISHED.

2. Multiply REFINISH labor hours by 1.6 to arrive at the TOTAL labor allowance for the STRIP AND REFINISH OPERATION.

   EXAMPLE
   Refinish Hood (Metallic) = 1.7 hrs (from SLTS Manual)
   => Strip and Refinish Hood (Metallic) = 1.7 hrs. x 1.6 = 2.7 hrs.

3. LABOR OPERATION - To indicate a STRIP AND REFINISH repair labor operation, take the REFINISH labor operation and replace the suffix with a "C".

   EXAMPLE
   Refinish Hood = P8P => Strip and Refinish Hood = P8C.

MATERIAL

To calculate strip and refinish Material Allowance:

1. Refer to SLTS Manual Refinish "Misc. Mat'l" column.

2. Divide "Misc. Mat'l" Amount by 10. Enter in "Qty" Column.

   EXAMPLE
   Misc. Mat'l for Refinish hood = 21, QTY for Strip and refinish = 21 ÷ 10 = 2.1.

3. Enter the appropriate "Unit Material Cost" from the *Material Cost Matrix* (shown below) in the "Each" column (e.g. 2k Urethane Monocoat = $17.50).

4. Multiply QTY by the appropriate UNIT MATERIAL COST. This number represents the TOTAL MATERIAL ALLOWANCE for the repair and should be entered in the "Amount" column (Qty of 2.1 x $17.50 = $36.75).

*Material Cost Matrix**

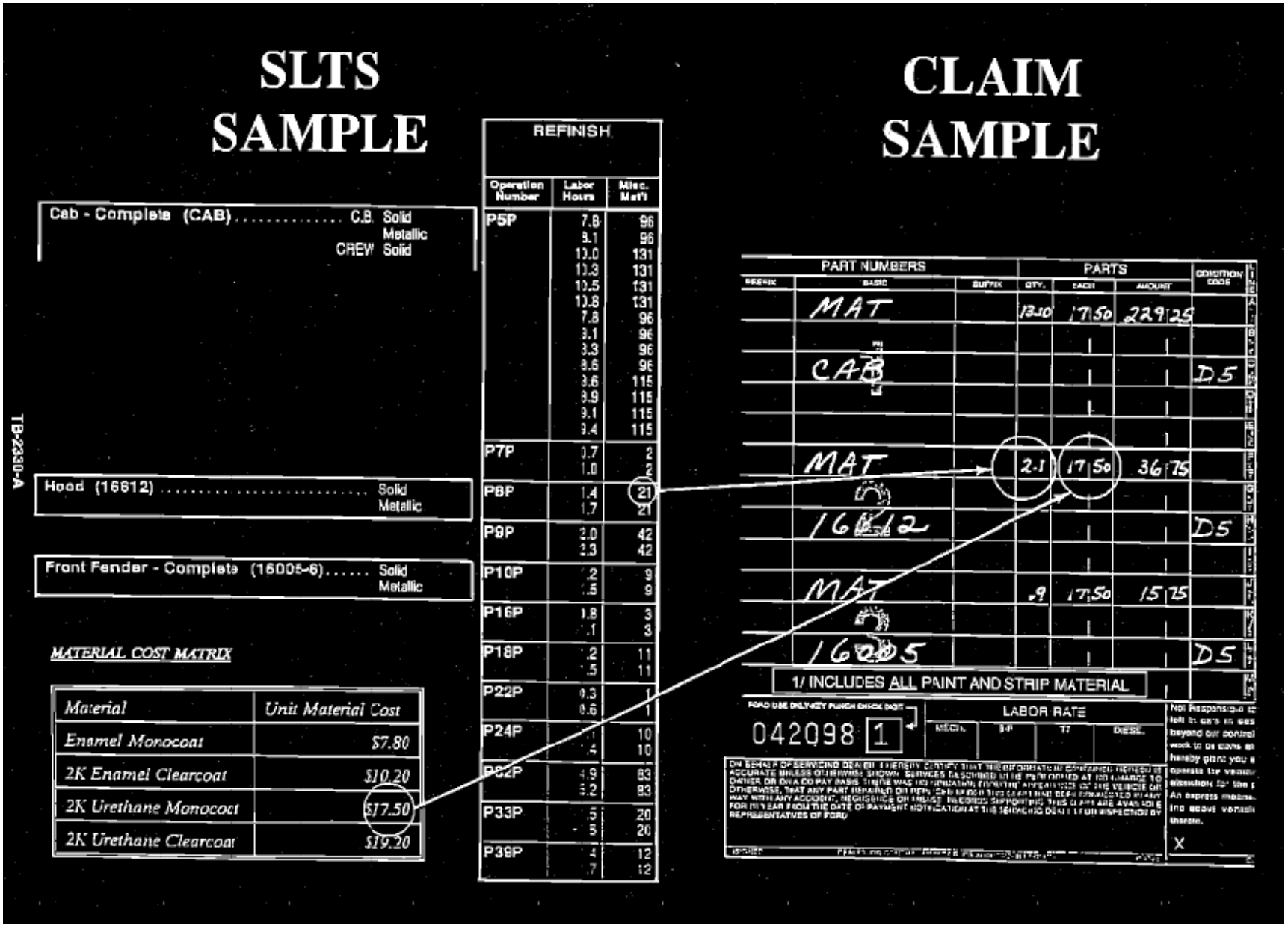
Material	*Unit Material Cost*
Enamel Monocoat	*$7.80*
2K Enamel Clearcoat	*$10.20*
2K Urethane Monocoat	*$17.50*
2K Urethane Clearcoat	*$19.20*

*UNIT MATERIAL COST MATRIX APPLIES TO STRIP AND REFINISH REPAIRS COVERED IN THIS TSB ONLY

TB-2329-B

Figure 1

Figure 2


SLTS SAMPLE
Cab - Complete (CAB)..... C.B. Solid Metallic
CREW Solid
Hood (16612)..... Solid Metallic
Front Fender - Complete (16005-6)..... Solid Metallic
TB-2330-A
MATERIAL COST MATRIX
Material
Unit Material Cost
Enamel Monocoat
$7.80
2K Enamel Clearcoat
$10.20
2K Urethane Monocoat
$17.50
2K Urethane Clearcoat
$19.20
REFINISH
Operation Number
Labor Hours
Misc. Mat'l
P5P
P7P
P8P
P9P
P10P
P16P
P18P
P22P
P24P
P33P
P39P
CLAIM SAMPLE
PART NUMBERS
PARTS
BASIC
SUFFIX
QTY.
EACH
AMOUNT
CONDITION CODE
MAT
1330
17 50
229 25
CAB
D5
MAT
2.1
17 50
36 75
16612
D5
MAT
.9
17 50
15 75
16005
D5
1/ INCLUDES ALL PAINT AND STRIP MATERIAL
042098 1
LABOR RATE

042098 1
STAPLE ATTACH-MENTS HERE
FORD CLAIM COPY
PART NUMBERS
PARTS
LABOR RATE
042098 1
CONCERN
Paint peeling to bare metal on cab
28.00
COMMENTS
Complete strip and refinish cab
CONCERN
Refinish Labor at 10.3 Hrs x 1.6 =
16.5 Hrs
CONCERN
Paint peeling to bare metal on hood
COMMENTS
Complete strip and refinish hood.
CONCERN
Refinish Labor at 1.7 Hrs x 1.6 =2.7 Hrs
CONCERN
Paint peeling to bare metal on RT Fnt fender
COMMENTS
Comp strip refinish fender
CONCERN
Refinish Labor at 1.5 Hrs x 1.6
2.4 Hrs
TB-2331-A

Figure 3

STRIP AND REFINISH CLAIMING METHODOLOGY

The claiming instructions shown in Figure 1 are applicable to the repair of the EXTERIOR COLOR PEELING FROM ULTRA VIOLET LIGHT concern covered in this TSB only. See the SAMPLE CLAIMS, Figures 2 and 3, for examples.

(C) Lower Body Stone Protection Repair Tips

Ford has introduced a vinyl anti-stone abrasion material for the lower exterior body surfaces of selected passenger vehicles and light trucks. The anti-stone abrasion material is applied to the lower fenders, rocker panels, lower doors, quarter panel dogleg, and lower rear of quarter panel behind the wheel. The anti-stone abrasion material will usually end at a body character line.

While primarily for servicing of factory-applied protective coating, the following provides installation information. If the vehicle has experienced body damage in the factory-applied material protective

area, the sheet metal damage must be serviced prior to the application of the new protective coating.

SMALL AREAS - MINOR DEFECTS (VEHICLES WITH FACTORY SPRAYED-ON VINYL)

A small dent in the sheet metal that did not mar the vinyl surface, can possibly be corrected with proper bumping tools without damage to the vinyl coating. However, noticeable scratches or gouges (not over 1/2 inch in diameter) or dings and dents that when "ironed out" show vinyl damage, can be satisfactorily serviced with the following procedure:

1. Solvent-wipe the damaged area with "Silicone and Wax Remover."

2. Using a heat gun or lamp, soften the vinyl coating of the damaged area until it can be scraped off with a putty knife or a similar tool. If necessary, sand off any hard to remove coating using an orbital disc sander (No. 80 Disc). (The spray-on vinyl protective coatings may not be suitable for "spot" application. See Manufacturer's label for instructions.)

3. Perform necessary servicing to correct the sheet metal damage.

4. Using white bodyfiller, fill the damaged area. Follow the instructions on the label and blend the bodyfiller with the surrounding sheet metal.

5. Allow the bodyfiller to completely cure and then carefully sand the area smooth, removing any high spots.

6. Refer to "Spray Procedure" for restoration of vinyl anti-stone abrasion material.

LARGE DAMAGED AREAS - VEHICLE WITH FACTORY SPRAYED ON VINYL

Peeling or damage over a large area will necessitate removal of the factory sprayed-on vinyl coating. The following procedure is suggested.

NOTE: WHERE SHEET METAL IS DAMAGED TO THE EXTENT THAT A FENDER, DOOR, OR QUARTER PANEL REPLACEMENT IS

REQUIRED (OR IN AN INITIAL INSTALLATION), DISREGARD STEPS NO. 1 AND NO. 2.

1. Using a heat gun or lamp, soften the vinyl coating until it is pliable. Scrape coating off with a putty knife or a similar tool. If necessary, sand off any hard to remove coating using an orbital disc sander (No. 80 Disc). (The vinyl material, abrasion resistant coating may not be suitable for "spot" applications. See manufacturer's label for instructions.)

2. Perform necessary servicing to correct the sheet metal damage.

3. Refer to "Spray Procedure" for restoration of vinyl anti-stone abrasion material.

COATING APPLICATIONS

Approximately two quarts will be required for an initial installation on a passenger car or F-Series. Slightly more will be required for an Econoline. The specified dry film thickness of 15 to 20 mils (.015 to .020 inch) will require at least three, possibly four, applications of coating material, with "flash off" time between coats. Spray coat complete panels only.

The coating must be applied with commercial equipment by an experienced automotive painter. The coating must be thoroughly agitated before application. The material is heavy bodied. A pressure cup spray gun or "Rocker Schutz Gun" is recommended.

COATING PREPARATION - MASKING VEHICLE

Install suitable covers over the wheels.

NOTE: IF THE VEHICLE HAS LOWER BODY SIDE MOULDINGS (12-14 INCHES ABOVE THE "TURN UNDER" OF THE ROCKER PANEL),

THE MOULDING CAN SERVE AS THE UPPER MARGIN OF THE AREA TO BE COATED. IF THE VEHICLE DOES NOT HAVE SUITABLE MOULDINGS, A SCULPTURE OR BREAK LINE IN THE SHEET METAL CAN BE UTILIZED. THIS LINE SHOULD BE SELECTED TO ENSURE ADEQUATE PROTECTION OF THE PAINTED SURFACES.

VEHICLES WITH BODY SIDE MOULDINGS

1. Masking tape should be positioned so that the moulding lower edge is also covered. The adjoining sheet metal should be left uncovered too so anti-stone, abrasion vinyl can be applied.

VEHICLES WITHOUT BODY SIDE MOULDINGS

2. If the contour of the body side has a break line, the upper coating margin must be masked off using 3M "Fine Line" Tape.

a. The normal masking tape and paper protection for the body side should be applied first and positioned about a quarter inch above the margin line.

b. The "Fine Line" tape should then be applied over the regular masking tape with the lower edge at the upper coating margin line. Extend this "Fine Line" tape into the wheel opening, in the absence of wheel opening mouldings, allowing the flange to be coated.

c. The anti-stone abrasion coating does not adhere well to flexible plastic parts. If left exposed, they must be masked off.

d. It is not necessary to mask off the body door openings in the coating area, as they will be uniformly coated where the door margins allow the coating to enter.

NOTE: DOOR OPENING AREAS SHOULD BE CLEANED TO ASSURE COATING ADHERENCE.

COATING PREPARATION - SHEET METAL

REPAIRED SHEETMETAL

1. Scuff sand (No. 180 Grit Paper) the glossy surface of the painted areas to be coated.

2. Using a clean, lint-free cloth, solvent wipe the area to be coated with wax and grease remover.

3. Remove sanding dust using compressed air and lint-free tack cloth.

NEW SHEET METAL

1. Sand off (No. 180 Grit Paper) the prime paint in the area to be coated.

2. Using a lint-free cloth, solvent wipe the area to be coated with wax and grease remover.

3. Remove sanding dust using compressed air and a lint-free tack cloth.

NEW INSTALLATION

1. The glossy surface of the paint in the coating area must be sanded with a D/A sander. A 220/240 Grit Disc does a good, fast job. DO NOT sand through the primer.

2. Using a clean, lint-free cloth, solvent wipe the area to be coated with wax and grease remover.

3. Remove sanding dust using compressed air and a lint-free tack cloth.

SPRAY PROCEDURE

The lower exposed painted fender, rocker, and quarter panel down flanges should be protected. The vehicle must be elevated high enough so that the painter can spray this area effectively. When an initial installation is to be made, a remote two-quart capacity pressure cup makes a much more efficient tool, as the spray gun can be used closer to the floor. The spray gun, fluid hose and/or cup must be cleaned immediately after use. Refer to manufacturer's recommended cleaning procedure. Lacquer thinner can be used when the suggested clean up material is unavailable.

WARNING: WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE ALL OTHER RECOMMENDED SAFETY EOUIPMENT.

1. After preparing the new or damaged area(s), mix either Epoxy primer or Self-etch prime, per manufacturer's label instructions, and spray bare metal areas.

^ BASF DE15 or DE17

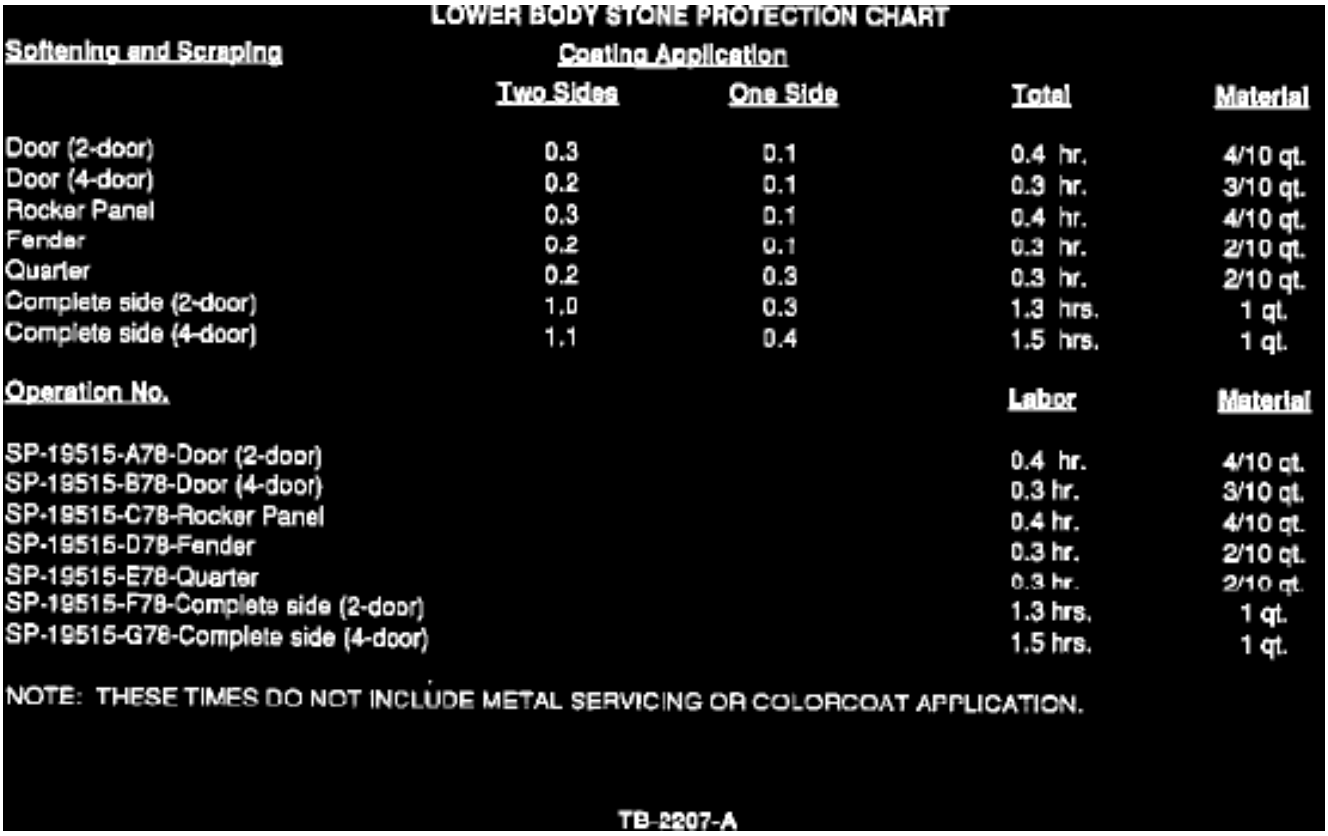
^ Sikkens Metalflex CR Primer (1 coat only)

^ DuPont Variprime

^ S-W E2G 980 GBP Etching Filler

^ PPG DP 40 (only)

2. Apply 1-2 light prime coats over the bare metal areas.



LOWER BODY STONE PROTECTION CHART

Softening and Scraping	Coating Application			
	Two Sides	One Side	Total	Material
Door (2-door)	0.3	0.1	0.4 hr.	4/10 qt.
Door (4-door)	0.2	0.1	0.3 hr.	3/10 qt.
Rocker Panel	0.3	0.1	0.4 hr.	4/10 qt.
Fender	0.2	0.1	0.3 hr.	2/10 qt.
Quarter	0.2	0.3	0.3 hr.	2/10 qt.
Complete side (2-door)	1.0	0.3	1.3 hrs.	1 qt.
Complete side (4-door)	1.1	0.4	1.5 hrs.	1 qt.

Operation No.	Labor	Material
SP-19515-A78-Door (2-door)	0.4 hr.	4/10 qt.
SP-19515-B78-Door (4-door)	0.3 hr.	3/10 qt.
SP-19515-C78-Rocker Panel	0.4 hr.	4/10 qt.
SP-19515-D78-Fender	0.3 hr.	2/10 qt.
SP-19515-E78-Quarter	0.3 hr.	2/10 qt.
SP-19515-F78-Complete side (2-door)	1.3 hrs.	1 qt.
SP-19515-G78-Complete side (4-door)	1.5 hrs.	1 qt.

NOTE: THESE TIMES DO NOT INCLUDE METAL SERVICING OR COLORCOAT APPLICATION.

TB-2207-A

3. Allow the material to dry for 15-20 minutes before applying the anti-stone abrasion material.

4. Mix and apply anti-stone abrasion material per manufacturer's label instructions over the primed area.

NOTE: AN ORANGE PEELED FINISH IS NORMAL WITH THESE PRODUCTS.

^ BASF Glassohyd 1109-1240/6

^ Sikkens 0TO Bodycoat

^ DuPont 123-5 Vinyl

^ S-W G/W 295 Vinyl Gravel Guard

^ PPG DX 54 Roadguard

^ 3M Rocker Schutz

NOTE: SOME ANTI-STONE ABRASION MATERIAL MAY REQUIRE A SLIGHTLY DIFFERENT MIXING PREPARATION, PROCEDURE

AND APPLICATION. SOME ANTI-STONE ABRASION MATERIALS CAN NOT BE USED FOR SPOT REPAIR. CHECK WITH THE PAINT MANUFACTURER FOR RECOMMENDATIONS ABOUT THEIR PRODUCT.

5. Allow the stone abrasion material to dry. Heat can be used to accelerate the drying time. Check the manufacturer's instructions.

COLOR COAT

The complete coated area, as well as the upper raw edge, must be covered with color coat. Mask off the upper margin line using "Fine Line" tape positioned 1/16 inch above the coating edge. Using appropriate service paint and application procedures, the protective coating area can now be finish painted with monocoat or a basecoat/clearcoat urethane system.

NOTE: IF DAMAGED SHEET METAL EXTENDS ABOVE THE PROTECTIVE COATING AREA, NORMAL PRIME/COLOR PAINT PROCEDURES SHOULD BE FOLLOWED.

CAUTION: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC

COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS.

Figure 4

Refer to the Lower Body Stone Protection Chart, Figure 4, for the material and labor hours involved.

(D) Procedure For PVC Body Side Moldings

If replacement of the body side molding is necessary, some dealer service kits will be supplied "paint to match."

The painting procedures in the following instructions (also included with the part) address materials from five (5) major aftermarket paint suppliers. Use the paint system materials you are the most

familiar with.

NOTE: CAREFULLY READ ALL LABEL WARNINGS BEFORE APPLYING THESE PRODUCTS.

WARNING: ALWAYS WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE ALL OTHER RECOMMENDED SAFETY EQUIPMENT.

SIKKENS PRODUCTS

PREPARATION

1. Degrease with M600 wax and grease remover.

2. Scuff with # 320 dry paper or Scotchbrite 7447 (red).

3. Repeat degreasing step.

4. Spray two medium coats of Plastoflex primer. Allow 5 to 10 minutes flash between coats.

5. Allow 20 minutes flash-off at 70~ F before topcoating.

TOPCOATING

1. Mix Autocryl color with Elast-O-Actif 50:50 by volume.

2. Mix this material with 1.2.3 hardner and 1.2.3 reducer (use correct reducer for temperature) 100:50:30 by volume.

3. Apply three medium coats, allowing enough flash off to dry to a light touch.

4. Dry one hour at 140~F after 10 minutes flash off or dry 24 hours at 75~F.

PPG PRODUCTS

PPG MONO-COAT SYSTEMS

1. Solvent wipe with DX330 Acryli-clean.

2. Scuff with red Scotchbrite pad.

3. Repeat solvent wipe.

TOPCOATING

1. Mix and apply Deltron topcoat color with DX-369 Flexative per label instructions.

2. Use 40-50 PSI at the gun.

PPG BASECOAT/CLEARCOAT SYSTEMS

PREPARATION

1. Solvent wipe with SX330 Acryli-clean.

2. Scuff with red Scotchbrite pad.

3. Repeat solvent wipe.

TOPCOATING

1. Mix and apply Deltron basecoat color (DBU), with the recommended reducer for the temperature, per label instructions.

2. Mix and apply clearcoat material DBU-88 or DCU-2001, with DX-369 Flexative, per label instructions.

SHERWIN-WILLIAMS PRODUCTS

Ultrabase 7 Basecoat/Clearcoat or Ultra One Stage Acrylic Urethane Enamel

PREPARATION

1. Wash the material with a mild detergent and wipe dry.

2. Solvent wash with R7 K 156 and wipe dry.

3. Clean with a tack cloth.

4. Apply desired system with correct amount of Multi-flex, V6 V 299.

TOPCOATING

Prepare topcoating as follows:

^ S-W Ultra One Stage: (Mono-coat) 4 Parts Color 3 Parts SSR 650 Reducer 1 Part V6 V 440 or SSH 520 2 Parts V6 V 299

^ S-W UB7 Basecoat: 8 Parts Basecoat Color 8 Parts Stabilizer 1 Part V6 V 299

^ S-W UB7 Clearcoat: 4 Parts T1 C 650 Clearcoat 2 Parts T1 C 650 Reducer 1 Part CCH 690 1 Part V6 V 299

^ S-W Ultra One Stage: (Mono-coat) Apply 2-3 medium wet coats at 50 PSI

^ UB7 Basecoat: Apply 2-3 medium coats at 45 PSI

^ UB7 Clearcoat: Apply 2-3 medium coats at 50 PSI

DUPONT PRODUCTS

DUPONT CRONAR POLYOXITHANE MONOCOAT SYSTEM

PREPARATION

1. Wash the surface thoroughly with a mild detergent.

2. Clean with Prep Sol.

TOPCOATING

1. Add 8 parts of Cronar single stage enamel.

2. Add 1 part Cronar initiator 9404S.

3. Add two parts of (9475S, 9485S, or 9495S,) depending on shop temperature.

4. Add 2 parts flex-additive 9250S.

5. Mix thoroughly.

6. Spray at 45-55 PSI at the gun, 2-3 medium wet coats or until hiding.

7. If a clear coat is applied, use 9500S.

DUPONT CENTARI MONO-COAT ENAMEL SYSTEMS

PREPARATION

1. Wash the surface thoroughly with a mild detergent.

2. Clean with Prep Sol.

TOPCOATING (Follow Manufacturer's Recommendation)

1. Add 8 parts of Centari enamel color and 1 part 793S hardener.

2. Add 4 parts of (8022S, 8093S, or 8096S) reducer, depending on shop temperature.

3. Add 355S flex additive per label instructions.

4. Mix thoroughly.

5. Spray 2-3 wet coats, with 5 minutes flash time, at 50-65 PSI.

BASF PRODUCTS

The following procedure is applicable to 4 paint systems in the BASF paint line. Read individual "system" instructions carefully.

PREPARATION

1. Solvent wipe the molding with RM Pre-klean-o 900.

2. Sand with 400 grit sand paper and rinse with 901 pre-paint cleaner.

TOPCOATING BASECOAT

^ "Glasurit" 54-line color 2 vol. parts

^ 54-line reducer 1 vol. part

^ "Diamont" basecoat color 2 vol. parts

^ B R Diamont reducer 2 vol. parts

^ "Miracryl" basecoat color 2 vol. parts

^ BCR reducer 2 vol. parts

^ "Supreme Gold" basecoat color 2 vol. parts

^ LBR reducer 2 vol. parts

Apply basecoat color until hiding is achieved. Allow 3-5 minutes flash time between coats.

NOTE: USE APPROPRIATE REDUCER FOR SHOP CONDITIONS. ALLOW 15 MINUTES FLASH-OFF BEFORE SPRAYING CLEARCOAT.

TOPCOATING

Apply clearcoat per manufacturer's label instructions:

CLEARCOAT REDUCTIONS

^ DC-88 Diamont Clear 4 Vol. Parts

^ DH-44 Diamont Hardener 1 Vol. Part

^ MC-1000 Clear 4 Vol. Parts

^ 894 Hardener 1 Vol. Part

^ LC-1300 Supreme Gold Clear 4 Vol. Parts

^ LH-1301 Hardener 1 Vol. Part

^ 92354 Glasurit Clear 100 Parts

^ 521-111 Elastifier 20 Parts

^ 929-29 Hardener 60 Parts

Apply 2 wet coats with 5 to 10 minutes flash time between coats. Overnight dry or force dry at 140~F for 30 minutes.

CAUTION: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS.

(E) Lower Body-Side Stone Chip Protection Program

Ford Motor Company has recently initiated a program to provide improved stone-chip protection on some vehicles and to increase the corrosion protection on cars and trucks.

Some customers are unaware of body side anti-stone chip protection which appears as wavy orange peel texture on the lower body areas.

Ford is increasing the use of PVC (poly vinyl chloride) material which is applied in a thicker coating on the lower body-side. This material has been in use on vehicles destined for the Canadian market for many years.

This PVC material is now applied at the following plants on ALL vehicles.

^ Edison - Ranger

^ Hermosillo - Escort/Tracer

^ Louisville - Ranger and Explorer

^ Ohio Truck - Econoline

^ Wayne - Escort/Tracer

This process is also planned for Kansas City, Oakville, Twin Cities and Wixom.

This material can be identified by the "orange peel" appearance and a visible "break-line" between protected and unprotected areas in the lower body areas.

CAUTION: THIS PROTECTION MUST NOT BE REMOVED IF VEHICLE IS EXPECTED TO MAINTAIN THE CORROSION PROTECTION.

Some customers have expressed concerns due to the appearance of the treated areas. These customers did not know about the extra protection this material provides their vehicle. Once explained, customers were pleased with the added protection and accepted the orange peel finish.

NOTE: DEALERS SHOULD ADVISE THEIR SALES PEOPLE, SERVICE PEOPLE, AND CUSTOMERS, OF THE REASONS AND BENEFITS

OF THIS PROTECTION. CANADIAN DEALERS STRESS THIS AS A SELLING POINT WITH THEIR SALES PEOPLE. IT IS CONSIDERED A COMPETITIVE ADVANTAGE.

(F) Surface Defect Removal Without Repainting

Exterior paint surface damage or imperfections, where the primer coat does not show through, should be restored without repainting. The restoration of gloss and luster, after the condition has been repaired, is possible with new techniques and improved materials.

The following procedure is applicable to surface conditions such as dirt particles, orange peel, runs, sags, industrial fallout stains, swirl marks, light scratches and other minor surface imperfections. For dirt particles or scratches in several localized areas, the entire panel should be refinished to maintain a uniform appearance.

PREPARATION

To repair the affected surface it must be clean and dry. Mask off adjacent panels, mouldings, stripe and character lines as required.

CAUTION: EYE PROTECTION, AND FACE MASK SHOULD BE WORN. RINGS, BRACELETS, WATCHES AND BELT BUCKLES MUST BE

REMOVED TO PREVENT ACCIDENTAL DAMAGE TO PAINT FINISH.

SERVICE PROCEDURE

1. Remove sanding marks with rubbing compound.

2. Swirl marks, evident after buffing, are removed by polishing.

3. Remove light scratches and small dirt particles with a power buffer and medium buffing compound followed with polishing.

4. Remove deeper scratches and heavy dirt particles or orange peel, by wet sanding.

5. Buff with compound to remove the sanding marks and then polish to remove the swirl marks from the buffing operation.

NOTE: PERFORM A TRIAL REPAIR WITH A SMALL AREA. FIRST, TRY POLISHING; IF THIS IS NOT SUCCESSFUL, TRY BUFFING

AND, FINALLY, USE WET SANDING TO REMOVE THE CONDITION. USE MOST EFFECTIVE TECHNIQUE ON REMAINDER OF AREAS. AN OUTLINE OF THE COMPLETE PROCEDURE AND REQUIRED MATERIALS FOLLOWS.

POLISHING - VERY MINOR SCRATCHES OR SWIRL MARKS AND/OR RESTORING A DULL FINISH

1. Apply a small amount of Meguiar's Mirror Glaze, or equivalent, to the affected panel (or pad).

2. Use a suitable electric or air powered polish/buffing wheel (1750 max. RPM) and a Meguiar's Finesse Polishing Pad, or equivalent, to polish the affected area until all swirl marks are gone and desired luster is obtained.

3. When polishing, keep the pad flat against the surface. Do not bear down. The weight of the buffer is sufficient.

CAUTION: DO NOT MIX PRODUCTS! USE A SEPARATE, DEDICATED BUFFING PAD FOR EACH PRODUCT TO ACHIEVE DESIRED

RESULTS.

Variable speed buffers are available in a variety of buffing speeds. The recommended speed range is 1200-1750 RPM.

COMPOUNDING - LIGHT SCRATCHES, SMALL DIRT PARTICLES, MINOR GRIND MARKS, AND SANDING MARKS

1. Apply Meguiar's Rubbing Compound (medium) or equivalent to the panel with a clean compound pad on the wheel.

2. Spread the compound evenly and continue buffing until the condition is removed.

3. Keep the wheel flat to the surface and use light to moderate pressure and long strokes.

4. Periodically check the finish and add compound as required.

5. When buffing is complete, polish the panel as described previously.

Twisted wool cutting pads are the most effective compounding pads to use with Glaze Machine Cleaner for removing paint defects and heavy oxidation. Following the use of a wool compounding pad, it may be necessary to polish the finish with No. 2 Mirror Glaze Hi-Tech Cleaner using a Mirror Glaze Finesse Polishing Pad to remove the deep swirl marks.

GENERAL TECHNIQUES AND HINTS

^ "Foam" buffing pads create added gloss and depth of color on all types of paint finishes without creating buffer swirl marks.

^ When "buffing out" oxidation or other paint defects with a cleaning material, use a liberal amount of material, slower buffing motion and added downward pressure to increase cutting action.

^ Always apply cleaner to buffing pad, not directly on the oxidized paint surface. Dry paint absorbs material into pores upon contact.

^ Always keep the face of the buffing pad completely flat to the surface, reducing the risk of buffer swirl marks. Watch your pad, especially on angled surfaces, to be certain that it stays flat.

^ Avoid short rapid strokes. Move the buffer slowly across the surface using long straight motions and overlap by 50% the buffing pattern left by the previous pass. This insures uniform coverage and allows both material and buffer to perform at maximum efficiency.

^ Avoid buffing directly on raised character lines. The reduced paint film on these surfaces increases the risk of paint burn through. It is best to buff up to them from each side.

^ Always use a "wet buff" technique on a basecoat/clearcoat finish. This is a precaution against buffer swirls. Stop buffing just after the product begins to break down and before an overall dry, glossy finish appears. After "wet buffing", use a towel to wipe off the excess material.

^ Always use a "dry buff" technique on light colored, conventional paint finishes. Continue buffing until the material breaks down and only a slight film remains for final wipe off.

^ If a paint blemish remains after buffing, reapply a small amount of material over the blemish. Confine your buffing strokes to the immediate area of the blemish while applying additional

downward pressure and keeping the pad flat.

NOTE: ALWAYS KEEP THE PAD MOVING AND LIMIT YOUR STROKES OVER THE BLEMISH TO PREVENT EXCESSIVE HEAT

BUILD-UP AND POSSIBLE BURN THROUGH. STOP IMMEDIATELY IF THE SURFACE BECOMES TOO HOT TO LAY THE PALM OF YOUR HAND ON IT.

NOTE: HEAT BUILD-UP: WHEN BUFFING CREATES EXCESSIVE HEAT, HAZING MAY APPEAR ACROSS THE SURFACE BEING

BUFFED AND THE PRODUCT MAY DRY LIKE A FILM AND REFUSE TO BUFF OUT. TO REMEDY, WIPE THE AREA DOWN WITH COOL WATER, DRY THE SURFACE AND RESUME BUFFING ... AT A LOWER RPM IF POSSIBLE.

NOTE: STATIC: STATIC ELECTRICITY MAY BE PRESENT ON PAINTED FIBERGLASS/PLASTIC SURFACE BEING BUFFED, THE

MATERIAL MAY DRY LIKE A FILM OR TURN "GUMMY" AND BEGIN TO BALL UP. TO REMEDY, GROUND THE SURFACE BEING BUFFED TO METAL.

WET SANDING

Paint defects and sanding marks must be completely removed without using compounds and abrasive cleaners that scar the finish.

Mirror Glaze Hi-Tech Finesse Sanding Papers provide uniformity in grit particle size and distribution. Using these precision made sanding papers, water sanding marks can be removed with Meguiar's cleaner and finesse polishing pads.

^ Typical paint defects that are repaired with this system include: dirt-in paint, solvent pop, cratering, orange peel, drips, scratches, water spots, and acid rain.

^ Always use the least abrasive (highest grit) sanding products possible to do this job.

The following wet sanding procedure utilizes light grit sand paper or sanding blocks for removal of surface damage. These materials cut quickly leaving a uniform finish requiring a minimum of buffing to restore gloss.

PROCEDURE

1. Squeeze water to flush the area to be sanded. Continue to flush water to the surface during sanding for maximum lubrication.

2. Use small circular motions to contain the abrasion to the immediate area of the defect. Keep the blocks in water when not in use.

3. If the sanding block is cutting too slow, switch to a lower grade block and resume sanding. When 90% of the defect is removed, switch to a 2000 grade Finesse Sanding Paper or Sanding Block to finish smoothing and prepare the surface for buffing.

4. Finesse Sanding Blocks can be shaped to work on any angle. When the block is wet, rub it against a dry sanding block for shaping.

5. When using Finesse Sanding Papers, wrap the paper tightly around a E-7200 Backing Pad. This pad evenly distributes pressure over the entire surface of the sanding paper. This creates a uniform sanding pattern.

6. Plan your strokes to limit the abrasion to the smallest area possible.

NOTE: ALWAYS SAND IN ONE DIRECTION AND KEEP YOUR STROKES STRAIGHT.

7. Always finish sanding with 2000 Grit Finesse Sanding Paper. This eliminates the need for compounding.

8. Buff out sanding marks by applying Meguiar's Cleaner with a Finesse "Foam" Polishing Pad. Follow with a Mirror Glaze Polish for swirl-free gloss.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC

COMPOUNDS (V.O.C.'s) OR EXCESS MATERIALS

RUNS AND SAGS REMOVAL

This procedure consists of shaving the run or sag flush with a commercial single edge razor blade, shaving file or sanding with a hard block and then compounding.

NOTE: IF IT IS NECESSARY TO SHAVE RUNS AND SAGS WITH A RAZOR BLADE, FIRST DULL THE CORNERS WITH SANDPAPER TO AVOID SCRATCHING THE ADJACENT PANEL FINISH.

MEGUIAR'S PRODUCTS

PART

NUMBER GRADE PART NAME

S-1005 1000 Mirror Glaze Hi-Tech Finesse Sanding Papers - Half Sheets

S-1205 1200

S-1505 1600

S-2005 2000

S-1000 1000 Mirror Glaze Hi-Tech Finesse Sanding Papers - Full Sheets

8-1200 1200

8-1500 1500

S-2000 2000

E-7200 - Mirror Glaze Hi-Tech Finesse Backing Pad

E-2000 - Mirror Glaze Hi-Tech Tach Sponge

K-400 400 Mirror Glaze Hi-Tech Finesse Sanding Blocks

K-1000 1000

K-1500 1500

K-2000 2000

K-3000 3000

Other Applicable Articles: 82-3-3

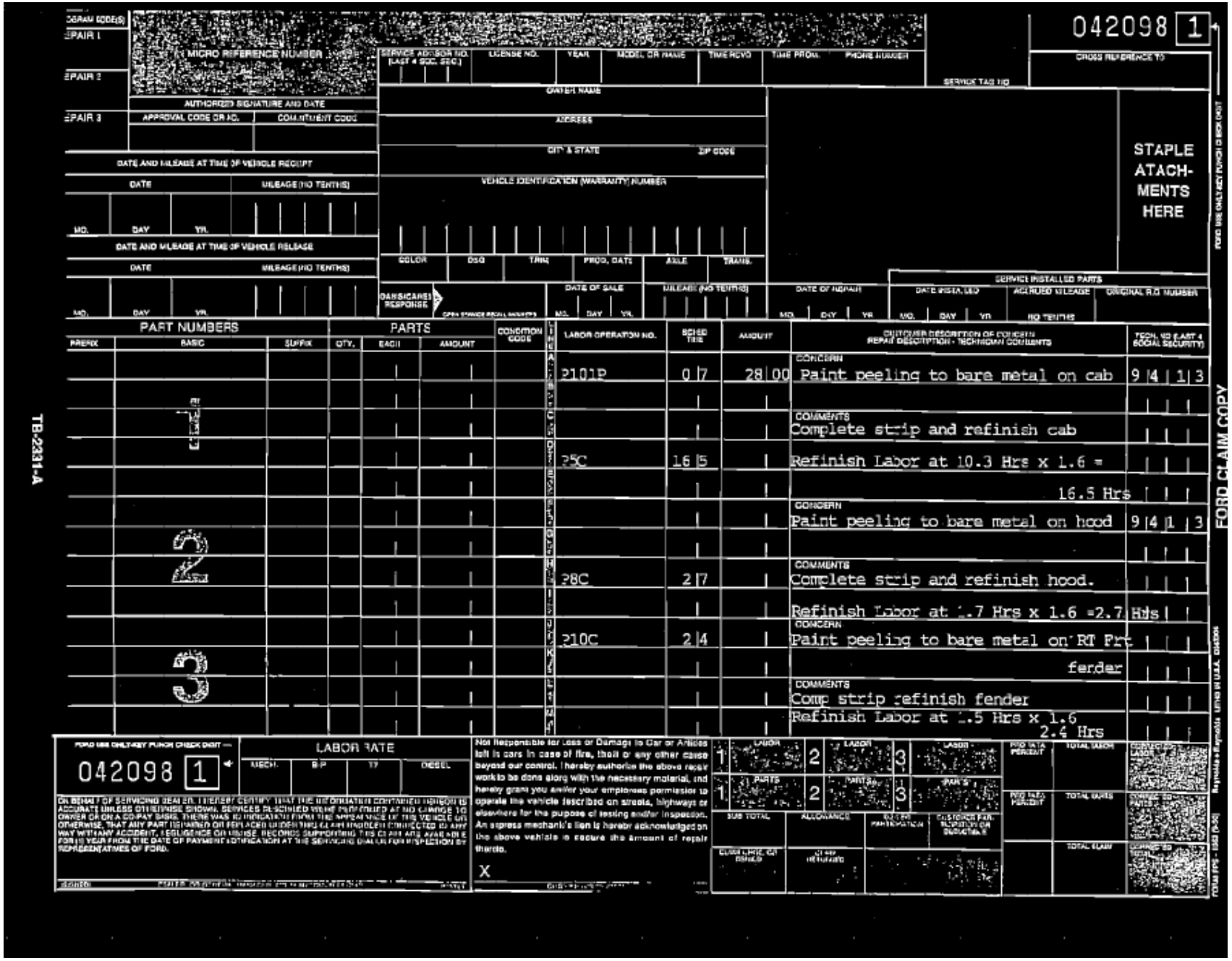
(G) Color Compatible Spray Primer Chart

Ford has released color compatible spray primers for exterior and some interior surfaces.

Colored sprayed primers are being used by our "Best-in-Class" competition and are now being implemented at Ford in order to improve process capability and to help in minimizing unsightly paint chipping from stone abrasion. Color keyed (matched) spray primer for exterior body colors is being used in an effort to help in the elimination of unsightly paint chipping from stone abrasion.

As with "Best-In-Class" competition, the engine compartment will be left with color compatible primer only and not be topcoated as per past practice.

Figure 5


042098 1
MICRO REFERENCE NUMBER
SERVICE ADVISOR NO. (LAST 4 SOC. SEC.)
LICENSE NO.
YEAR
MODEL OR NAME
TIME PROM
TIME PROM
PHONE NUMBER
SERVICE TAG I.D.
CROSS REFERENCE TO
REPAIR 1
REPAIR 2
REPAIR 3
AUTHORIZED SIGNATURE AND DATE
APPROVAL CODE OR NO.
COMMITMENT CODE
DATE AND MILEAGE AT TIME OF VEHICLE RECEIPT
DATE
MILEAGE (NO TENTHS)
MO. DAY YR.
DATE AND MILEAGE AT TIME OF VEHICLE RELEASE
DATE
MILEAGE (NO TENTHS)
OWNER NAME
ADDRESS
CITY & STATE
ZIP CODE
VEHICLE IDENTIFICATION (WARRANTY) NUMBER
COLOR
DSO
TRIM
PROD. DATE
AXLE
TRANS.
OWNER(S) RESPONSE
DATE OF SALE
MILEAGE (NO TENTHS)
DATE OF REPAIR
SERVICE INSTALLED PARTS
DATE INSTALLED
ACCRUED MILEAGE
ORIGINAL R.O. NUMBER
STAPLE ATACH-MENTS HERE
PART NUMBERS
PREFIX
BASIC
SUFFIX
PARTS
QTY.
EACH
AMOUNT
CONDITION CODE
LABOR OPERATION NO.
SCHED TIME
AMOUNT
CUSTOMER DESCRIPTION OF CONCERN REPAIR DESCRIPTION - TECHNICIAN COMMENTS
TECH. ID (LAST 4 SOCIAL SECURITY)
21 01P
0 7
28 00
CONCERN
Paint peeling to bare metal on cab
9 4 1 3
COMMENTS
Complete strip and refinish cab
25C
16 5
Refinish Labor at 10.3 Hrs x 1.6 =
16.5 Hrs
CONCERN
Paint peeling to bare metal on hood
9 4 1 3
28C
2 7
COMMENTS
Complete strip and refinish hood.
Refinish Labor at 1.7 Hrs x 1.6 =2.7 Hrs
21 0C
2 4
CONCERN
Paint peeling to bare metal on RT Frt fender
COMMENTS
Comp strip refinish fender
Refinish Labor at 1.5 Hrs x 1.6
2.4 Hrs
FORD USE ONLY-KEY PUNCH CHECK DIGIT
042098 1
LABOR RATE
MECH.
B.P.
T.T.
DIESEL
ON BEHALF OF SERVICING DEALER, I HEREBY CERTIFY THAT THE INFORMATION CONTAINED HEREON IS ACCURATE UNLESS OTHERWISE SHOWN. SERVICES RESCINDED WERE PERFORMED AT NO CHARGE TO OWNER OR ON A CO-PAY BASIS. THERE WAS NO INDICATION FROM THE APPEARANCE OF THE VEHICLE OR OTHERWISE, THAT ANY PART REMOVED OR REPLACED UNDER THIS CLAIM WAS/WERE CONNECTED IN ANY WAY WITH ANY ACCIDENT, NEGLIGENCE OR MISUSE. RECORDS SUPPORTING THIS CLAIM ARE AVAILABLE FOR ONE YEAR FROM THE DATE OF PAYMENT NOTIFICATION AT THE SERVICING DEALER FOR INSPECTION BY REPRESENTATIVES OF FORD.
SIGNED
Not Responsible for Loss or Damage to Car or Articles left in cars in case of fire, theft or any other cause beyond our control. I hereby authorize the above repair work to be done along with the necessary material, and hereby grant you and/or your employees permission to operate the vehicle described on streets, highways or elsewhere for the purpose of testing and/or inspection. An express mechanic's lien is hereby acknowledged on the above vehicle to secure the amount of repair thereto.
X
LABOR
PARTS
SUB TOTAL
ALLOWANCE
SALES TAX
CUSTOMER PAY PORTION OR DEDUCTIBLE
LUBRICANTS
OTHER
TOTAL LABOR
TOTAL PARTS
TOTAL CLAIM
TB-2331-A
FORD CLAIM COPY
FORD USE ONLY-KEY PUNCH CHECK DIGIT

When any paint repair is required, remember that the vehicle may have a colored primer. Refer to the Spray Primer Chart, Figure 5. This information may be of help in correction of exterior paint color match concerns.

(H) Paint Repair For Tinted Clear Coat

Ford introduced (Early Spring, 1991) a new paint color using a tinted clearcoat. The first color to use this new system is Rio Red.

If a paint repair is necessary, refer to the following procedure for repair instructions.

BACKGROUND

The Probe production paint system for Rio Red includes a Medium Green E-Coat primer, a Light Gray spray primer, bright Rio Red (E4) basecoat and a slightly Red tinted clearcoat topcoat.

NOTE: BEFORE ANY REPAIRS ARE BEGUN, IT IS CRITICAL THAT PRIMER, RED BASECOAT AND TINTED CLEARCOAT BE SPRAYED ON A TEST PANEL. THE COLOR MATCH IN EACH STEP IS VERY IMPORTANT FOR A SUCCESSFUL REPAIR.

WARNING: ALWAYS WEAR A NOISHA/MSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE ALL OTHER RECOMMENDED SAFETY EQUIPMENT.

SMALL SPOT REPAIR PROCEDURE

1 Wash the vehicle with detergent soap and

water.

2 Wipe the vehicle down with wax and grease

remover.

3. Sand the spot using 400 grit paper. Do not sand through the E-coat.

4. Wipe the sanded surface again with wax and grease remover/pre-cleaner.

^ BASF Product # 90 Pre-Kleano

^ PPG Product # DX 330

^ S-W Product # R7-K156

^ DuPont Product # 3919 S

^ Sikkens Product # M 600

5. Mix and apply tintable (Light Gray) self-etching or epoxy primer per manufacturer's label instructions.

NOTE: COLOR MATCH OF PRIME COAT IS KEY IN COLOR MATCH OF REPAIRED AREA.

^ BASF Product # DE 17

^ PPG Product # DP 40

^ S-W Product # E2-G973

^ DuPont Product # 615S

^ Sikkens Product # 1016

6. Mix and apply bright Rio Red base coat material per manufacturer's label instructions.

NOTE: COLOR MATCH OF BASE CLEAR COAT IS KEY IN COLOR MATCH OF REPAIRED AREA.

7. Mix and apply red tinted clearcoat material per manufacturer's label instructions.

NOTE: COLOR MATCH OF TINTED CLEAR COAT IS KEY IN COLOR MATCH OF REPAIRED AREA.

FULL PANEL REPAIR PROCEDURE

1. Wash the vehicle with detergent soap and water.

2. Wipe the vehicle down with wax and grease remover.

3. Sand the complete panel and feather edge into the next panel using 400 grit paper. Do not sand through the E-Coat primer.

4. Wipe the sanded surface with wax and grease remover.

5. Mix and apply tintable (light gray) primer per manufacturer's label instructions.

6. Mix and apply Rio Red basecoat per manufacturer's label instructions.

7. Mix and apply Red tinted clearcoat per manufacturer's label instructions.

8. Mix and apply one coat of non-tinted clearcoat per manufacturer's label instructions.

NOTE: COLOR MATCH OF EACH COAT ARE KEY TO COLOR MATCH OF FINISH REPAIR.

WARNING: OUR ENVIRONMENT IS PRECIOUS - PLEASE USE PROPER DISPOSAL TECHNIQUES FOR ANY VOLATILE ORGANIC COMPOUNDS (V.O.C's) OR EXCESS MATERIALS.

(I) Paintable Plastics

Standard Symbol	Plastic - "Family" Name	Plastic - Common/Trade Name	Typical Application	Can Be Painted
Thermoplastics				
ABS	Acrylonitrile Butadiene Styrene	ABS, Cycolac, Lustran, Kralastic	"A" Pillars, Consoles, Grilles	Yes
EMA	Ethylene /Methacrylic Acid	Ionomer, Surlyn	Bumper Guards	Yes
PA	Polyamide	Nylon, Capron, Vydyne, Zytel Minlon, Bexloy C		Yes
PAN	Polyacrylonitrite			
PBT	Polybutylene Terephthlate	Valox, Celanex, Gafite, Cpocan	Grilles, Nylon/sym.	Yes
PC/PBT	Polycarbonate/ Polybutylene Terephthlate	Xenoy	Bumpers	Yes
PC	Polycarbonae	Lexan, Merlon, Calibre (Solvent)	Tail Light Lenses, IP Trim	Yes
PE	Polyethylene	Alathon, Dylan, Marlex, Lupolen		
HDPE	High Density Polyethylene		Not painted (non-visual parts)	No
LDPE	Low Density Polyethylene		Not painted (non-visual parts)	No
LLDPE	Linear Low Density Polyethylene		Non-visual chassis parts	No
PET	Polyethylene Terephthlate	Petra, Rynite	Luggage Rack	Yes
PMMA	Poly(methylmethacrylate)	Acrylic, Acrylite, Lucite, Plexiglas	Tail Light	Yes
POM	Polyoxymethylene	Acetal, Celcon, Delrin, Hostaform		Yes
PTFE	Polytetraflurortethylene			
PP	Polypropylene	Azdel, Hostalen, Marlex, Profax	Interior Trim/Door Panel, Wheel Splash Shields, Steering Column Shrouds	Yes
PA/PPO	Polyamide/Polyphenylene Oxide		Mirrors (nylon)	Yes
PPO	Polyphenylene Oxide	Noryl	Grilles	Yes
PPS	Polyphenylene Sulfide			No
PPE	Polyphenylene Ether	Noryl, Prevex	Interior	Yes
PS	Polystyrene	Lustrex, Styron	Similar to ABS	Yes
HIPS	High Impact Polystyrene		Similar to ABS	Yes
PVA	Polyvinyl Acetate			Yes
PVC	Poly(vinyl chloride)	Apex, Geon, Vinylite	Bodyside Moldings, Wire Insulation, Steering Wheels	Yes
PVDC	Polyvinylidene Chloride			Yes
SAN	Styrene Acrylonitrile			Yes
SMA	Styrene Maleic Anhydride	Cadon, Dylark	Visors (Similar to ABS)	Yes
Thermoplastic Elastomer				
TES	Styrene Block Copolymer	Elexar, Kraton	Console Pads	Yes
TPO	Polyolefinic	Polytrope, Renflex, Santoprene, Telcar, Vistaflex	Bumper End Caps, Rub Strips, Sight Shields, Bodyside Cladding,	
TPU	Polyester Polyurethane	TPU, Hytrel, Texin, Estane	Interior "B" Post	Yes*
			Bumper BSM, Similar to RIM	Yes
Thermosetting Plastics				
PF	Phenol Formaldehyde	Phenolic, Bakelite, Durez, Genal	Ash Trays	Yes*
RIM	Reaction Injection Molded Polyurethane	RIM, Bayflex	Soft Front Fascias, Modular Windows	Yes
RRIM	Reinforced Reaction Injection Molded Polyurethane			Yes
UP	Unsaturated Polyester Thermosetting	BMC (Bulk Molding Cpd), SMC (Sheet Molding Cpd), TMC (Transfer Molding Cpd), ZMC, IMC, XSMC (Compound)	Grille Opening Panel Liftgates, Flareside Fenders, Fender Extensions	Yes*
Elastomers				
CR	Chloroprene	Neoprene		No
EPDM	Ethylene/Propylene	EPDM, Nordel Vistalon		No
NR	Natural Rubber			No
SBR	Styrene Butadiene Rubber	SBR, Buna S		No
NBR	Nitrile Rubber			No
SI	Silicone	Silicone		No

*Requires Prime Coat

TB-2210-A

Figure 6

The Paintable Plastics Chart, Figure 6, is a summary of widely used plastics in our industry. The standard symbol should be located on the part for ease of material identification.

If painting or repair of these plastics is necessary, the following chart identifies those materials which can be painted. Refer to paint manufacturer for specific paint material recommendations.

NOTE: MATERIALS MAY REQUIRE PRIME COAT SEE "YES", UNDER "CAN BE PAINTED" COLUMN.

(J) 1992 Paint Color Codes

"M" NUMBER	COLOR	CO/ NEW	CAR CODE	BASECOAT CLEARCOAT	1992 PAINT COLOR PPG	DUPONT	SIKKENS	MARTIN SR. ACME/ROGERS SHERWIN WILLIAMS	RM	GLASURIT
1724	Solid Black	C	YC		9100/9300	99S	FA90YC	F10B1738	STD PKG	21-1240
5820	Oxford White Solid	C	YO		3620	B8424	FA90YO	33631	14110	FD-5820
6153	Med. Red	C	EM		3954	B8778	FA90EM	38434	17151	FD-6153
6156	Med. Cabernet Solid	C	EH		3936	B8750	FA90EH	36337	17131	FD-6156
6210	White	C	YY		3876	B8687	FA90YY	35521	16135	FD-6210
6263	Med Regatta Blue C/C	C	ME	•	4060	B8836	FA90ME	37274	18133	FD-6263
6290	Twilight Blue C/C	C	MK	•	4069	B8835	FA90MK	37290	18141	FD-6290
6325	Currant Red Solid	C	EG		4161	B8903	FA90EG	39067	19031	FD-6325
6327	Crystal Blue C/C	C	KA	•	4165	B8905	FA90KA	39070	19036	FD-6327
6328	Lt. Crystal Blue C/C	C	MA	•	4171	B8916	FA90MA	39074	19052	FD-6328
6329	Past Titanium Solid	C	YD		4281	B9107	FA90YD	44040	20330	FD-6329
6330	Lt. Titanium C/C	C	YF	•	4121	D8859	FA90YF	38806	18157	FD-6330
6342	Wild Strawberry C/C	C	EL	•	4168	D8829	FA90EL	38461	18134	FD-6342
6346	Vermillion Solid	C	EP	•	4183	B8902	FA90EP	39068	19060	FD-6346
6373	Ebony C/C	C	UA		9700	96S	FA90UA	38743	18183	FD-6373
6383	Ultra Blue	C	MM	•	4164	B8021	FA90MM	41969	20071	FD-6383
6392	Pastel Alabaster Solid	C	AH		4208	B8022	FA90AH	41961	20072	FD-6392
6401	Titanium Frost C/C	C	YX		4218	D8894	FA90YX	40299	19296	FD-6401
6406	Glacier White Solid	C	ZC	•	90677	B8951	FA90ZC	41116	20033	FD-6406
6414	Deep Jewel Green C/C	C	PA	•	4215	B9025	FA90PA	41970	20082	FD-6414
6415	Clear Crystal Blue Frost	C	MD	•	4214	B9026	FA90MD	41968	20070	FD-6415
6421	Woodrose C/C	C	CO	•	4212	B9029	FA90CD	41966	20079	FD-6421
6425	Elect. Currant Red C/C	C	EG	•	4213	B8031	FA90EG	41967	20078	FD-6425
6441	Atlantic Blue Solid	C	K2		4290	B8108	FA90K2	44083	21145	FD-6441
6442	Med. Titanium C/C	C	YG	•	4291	B8115	FA91YG	43986	20369	FD-6442
6443	Lt. Cranberry C/C	C	EW	•	4293	B8111	FA91EW	44084	21155	FD-6443
6444	Med. Cranberry C/C	C	EX	•	4287	B8113	FA91EX	44085	21156	FD-6444
6445	Dark Cranberry C/C	C	ER	•	4288	B8110	FA91ER	44086	21157	FD-6445
6446	Med. Amethyst Frost	C	K9	•	4286	B8104	FA91KB	44087	21154	FD-6446
6448	Sandalwood Spice C/C	C	A8	•	4292	B8112	FA91AB	43897	20361	FD-6448
6450	Med. Mocha C/C	C	DC	•	4283	B8109	FA90DC	44091	21147	FD-6450
6451	Newport Blue C/C	C	KP		4294	B8105	FA91KP	44310	21165	FD-6451
6453	Lt. Mocha Solid	C	DB		4439	B8208	FA92DB	45806	22004	FD-6453
6454	Med. Platinum C/C	C	RC	•	4296	B8109	FA91RC	44034	21162	FD-6454
6456	Jewel Green Met.	C	P3	•	4295	B8116	FA91PB	44095	21159	FD-6456
6464	Aquamarine Frost C/C	C	PN	•	4507	B8102	FA92PN	45872	21143	FD-6464
6465	Mocha Frost C/C	C	DD	•	4282	B8101	FA91DD	44092	21146	FD-6465
6466	White	C	YZ	•	4289	B8145	FA91YZ	44093	21158	FD-6466
6470	Vermillion C/C	C	E4	•	4217	B8954	FA90E4	42497	19079	FD-6470
6477	Dark Mocha Met.	C	DW	•	4442	B9226	FA92DW	45855	22017	FD-6477
6478	M. Seafoam M. C/C	C	NC	•	4470	B9246	FA92NC	46011	22011	FD-6478
6483	Aqua Solid	C	PF	•	4508	B9250	FA92PF	46007	22003	FD-6483
6485	Bimini Blue M. C/C	C	K3	•	4440	B9204	FA92K3	45755	22001	FD-6485
6486	Med. Aubergine C/C	C	GA	•	4472	B9205	FA92GA	45807	22005	FD-6486
6487	Cayman C/C	C	DA	•	4438	B9169	FA92DA	45667	22000	FD-6487
6500	Ultra Red Solid C/C	C	WH	•	4441	B9206	FA92WH	45805	22018	FD-6500
6501	Med. Opal C/C	C	WC	•	4471	B9202	FA92WC	45809	22007	FD-6501
6504	Med. Royal Blue C/C	C	LA	•	4473	B9207	FA92LA	45806	22015	FD-6504
6505	Silver C/C	C	YN	•	4262	B8806	FA90YN	43638	21169	FD-6505
6520	Med. Mocha Met.	C	DJ	•	4505	B9227	FA92DJ	45854	22016	FD-6520
6553	Lapis Met. C/C	C	KE	•	4506	B9236	FA92KE	46009	22009	FD-6553
6572	Dark Tourmaline C/C	C	NA	•	4503	B9239	FA92NA	46010	22010	FD-6572
6584	Chesapeake Blue M.	C	PK	•	4429	B9182	FA92PK	45361	22020	FD-6584
6585	Reef Blue	C	PC		4428	B9169	FA92PC	45360	22019	FD-6585
6597	Lt. Smoke Met.	C	MC		4494	B9171	FA91MC	45708	21661	FD-6597
6598	Smoke Met	C	MS		4495	B8172	FA91MS	45710	21662	FD-6598
6599	Brt. Calypso C/C	C	PM	•	4504	B8173	FA92PM	45764	22002	FD-6599
6609	Dark Shadow Blue M.	C	MK		4497	B8174	FA91MX	45946	22013	FD-6609
6596	Brt. Regatta Blue M.	C	MW		4496	B8176	FA91MW	45709	21660	FD-6596
6608	Med. Lt. Mocha Solid	C	DH		4561	B9248	FA92DH	46008	22012	FD-6608
6584	Performance Red	C	EY		4614		FA92EY	46496	22006	FD-6584

TB-2302-A

Figure 7

The 1992 Paint Color Codes are listed in Figure 7.

NOTE: REFER TO THE SERVICE LABOR TIME STANDARDS MANUAL AND THE SPECIFIC PROCEDURE WITHIN THIS BULLETIN FOR REIMBURSEMENT.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OASIS CODES:

106000

Paint: All Technical Service Bulletins Paint - Color Code Chart Revision

Article No. 91-6-2

03/18/91

PAINT - CODES - REVISED 1991 FLEET COLOR PAINT

CODE NUMBERS

FORD: 1991 CROWN VICTORIA, ESCORT, MUSTANG, TAURUS, TEMPO, THUNDERBIRD

LINCOLN-MERCURY: 1991 CONTINENTAL, COUGAR, GRAND MARQUIS, MARK VII, SABLE, TOPAZ, TOWN CAR

LIGHT TRUCK: 1991 AEROSTAR, BRONCO, ECONOLINE, EXPLORER, F-150-350 SERIES, RANGER

MEDIUM/HEAVY TRUCK: 1991 C SERIES, CARGO SERIES, F & B SERIES, L SERIES

ISSUE: Revised 1991 Domestic and Fleet Color Paint Code Charts are now available.

ACTION: If service is required, Refer to the revised Domestic and Fleet Color Paint Code Charts shown.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

106000

SERVICE REFINISH CODES

Ford Acme- Martin Sherwin-

Code # Akzo Rogers Senour Williams BASF PPG DuPont

WHITES

W0046A FLNA4534 17204 10004 J5-1704 76768 8709 6729

W0069A FLNA4012 17206 10006 J5-1706 76770 8710 7168

W0071A FLNA4084 17208 11627 J5-1708 76772 8712 94126

W0091A FLNA4020 17209 10008 J5-1709 76773 8713 6733

W0115A FLNA4001 17213 10011 J5-1712 76777 8717 508

W0157A FLNA4083 17217 10016 J5-1717 76782 8722 6886

W0330A FLNA4003 26455 11008 J5-3362 79986 8835 7372

W0332A FLNA4027 28490 11722 J5-4944 77263 8857 7331

W0619A FLNA4203 9343 323398 JX-8618 83248 90553 H8941

CREAMS

W1030B FLNA1030 17221 10019 J5-1720 76785 81626 7173

W1100B FLNA1007 17224 10022 J5-1328 76788 81629 1222

W1677B FLNA1210 36907 36907 36907 80735 26130 G8828

GRAYS

W2007C FLNA7013 16133 94-8729 JX-9290 76793 32663 7180

W2032C FLNA7014 17232 10029 J5-1336 76796 32666 7183

W2101C FLNA7058 17237 10034 J5-1730 83343 32671 6737

W2166C FLNA7016 17244 90-9881 J5-357 76818 31953 7190

W2180C FLNA7011 17245 10041 J5-746 7681O 32678

W2323C FLNA7023 18271 11641 J5-5029 77278 32620 7808

BROWNS - BEIGES - TANS

W3004N FLNA7018 17253 10048 J5-1741 80215 22998 7195

W3028N FLNA7010 17255 10050 J5-1743 76826 21601 7196

W3029N FLNA7020 17256 90-488 J5-1744 76827 23000 7197

W3052N FLNA7201 17257 10051 J5-1745 76828 23001 96932

W3053N FLNA3053 17258 10052 J5-1746 76829 23002 7198

W3075N FLNA7012 17259 90-8461 JX-8085 76830 23003 6742

W3317N FLNA7025 18216 11650 J5-4957 79979 81963 7814

W3341N FLNA4032 16639 11651 J5-4958 77290 22675 74224

W3365N FLNA7208 18252 11655 J5-4961 77423 32976 67258

W3381K FLNA8015 44520 44520 44520 77558 23685 20168

W3663K FLNA8202 36909 36909 36909 80737 26132 G8831

BROWNS METALLICS

W3827N FLNA9012 17423 10205 J5-3962 76846 71669 7205

W3830N FLNA9004 17424 10206 J5-1866 76847 23020 4793

W3833N FLNA9213 17425 10207 J5-1867 76840 23021

W3837M FLNA9005 17427 10209 J5-1868 76850 23023 4807

W3860K FLNA9206 34672 13841 34672 833349 25533 C8223

W3875N FLNA9208 36910 36910 36910 80738 26133 G8829

SERVICE REFINISH CODES

Ford Acme- Martin Sherwin-

Code # Akzo Rogers Senour Williams BASF PPG DuPont

REDS

W4520D FLNA3038 34676 13845 34676 80767 50887 7854

W4632D FLNA3204 36911 36911 36911 80739 72984 G8834

W4640D FLNA3202 36912 36912 36912 80740 72985 G8832

W4650D FLNA3203 36913 36913 36913 83057 72986 G8833

W4672D FLNA3205 36914 36914 36914 80742 72987 G8835

RED METALLICS

W4860D FLNA9046 34680 13849 34680 83329 72686 45761

W4861D FLNA9011 34681 13850 34681 83330 50789 6787

ORANGES

W5607E FLNA2205 36915 36915 36915 80743 61154 G8838

W5615E FLNA2203 36916 36916 36916 80744 61155 G8836

W5684E FLNA2206 36918 36918 36918 80746 61157 G8839

W5685E FLNA2208 36919 36919 36919 80747 61158 G8841

W5694E FLNA2207 36920 36920 36920 80748 61159 G8840

YELLOWS

W6210F FLNA1028 17335 10121 J5-1796 76917 81661 6768

W6642F FLNA1202 36922 36922 36922 80750 82752 G8843

W6644F FLNA1201 38223 38223 38223 83262 82824 K8858

W6675F FLNA1206 36924 36924 36924 80752 82754 G8849

W6684F FLNA1205 36925 36925 36925 80753 82755 G8848

W6695F FLNA1203 36927 36927 36927 80755 82757 G8845

GREENS

W7080G FLNA6020 17345 10131 J5-1127 76927 43821 7233

W7094G FLNA6223 17348 10133 J5-1804 76930 43824 94121

W7168G FLNA6021 17361 10145 J5-1814 76943 43837 7240

W7202G FLNA6010 17368 10152 J5-1820 76950 43844 54738

W7327G FLNA6022 44524 44524 44524 77331 44567 7373

W7348G FLNA6030 18299 11676 J5-4981 77335 44570

W7361-G FLNA6031 18243 11678 J5-4983 77337 44572 7828

W7385G FLNA6019 15712 11685 J5-4990 77347 43273

W7406G FLNA6002 18244 11690 J5-4994 77353 44109 7722

W7514G FLNA6018 34693 13862 34693 81670 43812 6740

W7566G FLNA6214 34694 13863 34694 83333 45853 K8256

W7600G FLNA6202 36928 36928 36928 80756 46172 G8851

W7602G FLNA6206 38747 38747 38747 83267 46268 H8938

W7603G FLNA6201 36929 36929 36929 80757 46173 G8850

W7606G FLNA6204 36930 36930 36930 80758 46174 G8854

W7627G FLNA6209 38625 38625 38625 83270 46270 H8949

W7648G FLNA6210 38233 38233 38233 81376 46271 H8950

W7658G FLNA6203 36931 36931 36931 80759 46175 G8852

SERVICE REFINISH CODES

Ford Acme- Martin Sherwin-

Code # Akzo Rogers Senour Williams BASF PPG DuPont

GREEN METALLICS

W7809G FLNA9218 17430 10212 J5-1871 76957 43856 95610

W7814G FLNA9215 17431 10213 J5-1872 76958 43857 94886

W7819G FLNA9009 17432 10214 J5-1873 76959 43858 6529

W7824G FLNA9006 17433 10215 J5-1874 76960 43859 4814

W7847G FLNA9016 18803 11694 J5-4998 77359 44272 15394

W7862G FLNA9232 34696 13865 34696 83339 45855 43517

W7864G FLNA9204 34698 13867 34698 83340 45857 B8152

BLUES

W8002H FLNA5012 17375 10158 J5-1825 80007 13582 6544

W8025H FLNA5035 17378 10161 J5-1828 76965 13585 7247

W8026H FLNA5036 17379 10162 J5-1274 76966 12375 7248

W8049H FLNA5037 17382 10165 J5-1831 76969 13588 7250

W9096H FLNA5016 17389 10172 J5-1837 76976 12908 29509

W8118H FLNA5039 17391 10174 J5-1838 76978 13593 7253

W8119H FLNA5017 17392 10175 J5-1839 76979 13594 24160

W8140H FLNA5040 17394 10177 J5-1840 76981 13596 7255

W8161H FLNA5018 17399 10182 J5-1121 76986 13599 7260

W8177H FLNA5044 17400 10183 J5-1844 76987 13600 7262

W8304H FLNA5213 18233 11695 J5-4999 77360 14337 94937

W8319H FLNA5077 18227 11702 J5-5007 77368 14340 6820

W8342H FLNA5045 18315 11539 J5-4786 77374 14343 7270

W8345H FLNA5052 18231 11706 J5-5010 83350 13306 7844

W8347H FLNA5205 9652 90-1627 JX-9593 77377 12902 97332

W8355H FLNA5054 18234 11709 J5-5013 83351 14344 7846

W8363H FLNA5055 18316 11710 J5-5014 77381 14345 7847

W8381H FLNA5220 18318 11716 J5-5019 77178 13898 63203

W8520H FLNA5022 34699 13868 34699 83352 15903 4943

W8528H FLNA5202 34703 13872 34703 81231 15907 H8334

BLUE METALLICS

W8816H FLNA9002 17437 10219 J5-1878 76993 13607 95604

W8B29H FLNA9210 17440 10222 J5-1881 76996 13610 96926

W8832H FLNA9216 17441 10223 J5-1882 76997 13611 95181

W8836H FLNA9219 17443 10225 J5-1884 76999 13613 95805

W8847H FLNA9201 38751 38751 38751 83273 16563 H8954

W8866H FLNA9202 34708 13877 34708 80559 15912 K8462

1991 DOMESTIC PAINT CODES

"M" No.	Color Name	C/O or New	Car Code	Truck Code	PPG	DuPont	Sikkens	Martin-Senior Acme Rogers Sherwin-Williams	BASF R-M	Glasurit
6415	Crystal Blue Frost C/C	CO	MD	-	4214	B9028	FA90:MD	41988	20070	FD-6415
6416	Bisque Frost C/C	CO	AD	-	4206	B9027	FA90:AD		20074	FD-6416
6417	Alabaster Solid	CO	AJ	-	4209	B9029	FA90:AJ	41959	20073	FD-6417
6421	Woodrose C/C	CO	CD	-	4212	B9029	FA90:CD	41986	20079	FD-6421
6422	Med. Bisque C/C	CO	AC	-	4218	B9030	FA90:AC	41958	20077	FD-6422
6425	Elect. Currant Red C/C	CO	EG	EG	4213	B9031	FA90:EG	41987	20078	FD-6425
6434	Race Yellow C/C	CO	AG	-	4207	B9032	FD90:AG	41960	20081	FD-6434
6435	Past Alabaster Solid C/C	CO	AK	-	4219	B9033	FA90:AK	41963	20076	FD-6435
6441	Atlantic Blue Solid	N	K2	K2	4290	B9109	FA91:K2	44083	21145	FD-6441
6442	Med. Titanium C/C	CO	YG	-	4291	B9115	FA91:YG	43996	20359	FD-6442
6443	Lt. Cranberry C/C	N	EW	-	4293	B9111	FA91:EW	44084	21155	FD-6443
6444	Med. Cranberry C/C	N	EX	-	4287	B9113	FA91:EX	44085	21156	FD-6444
6445	Dk. Cranberry C/C	N	ER	-	4288	B9110	FA91:ER	44086	21157	FD-6445
6446	Med. Amethyst Frost	N	KB	-	4286	B9104	FA91:KB	44087	21154	FD-6446
6447	Past St. Blue Frost	N	MB	-	4284	B9114	FA91:MB	44088	21152	FD-6447
6448	Sandalwood Spice C/C	CO	AB	-	4292	B9112	FA90:AB	43997	20361	FD-6448
6450	Med. Mocha C/C	N	DC	DC	4283	B9103	FA91:DC	44091	21147	FD-6450
6451	Newport Blue C/C	CO	-	KP	4294	B9105	FA91:KP	44083	21165	FD-6451
6454	Med. Platinum C/C	CO	RC		4296	B9109	FA91:RC	44094	21162	FD-6454
6456	Jewel Green Met.	CO	PB		4285	B9116	FA91:PB	44095	21159	FD-6456
6465	Mocha Frost	N	DD	DD	4282	B9101	FA91:DD	44092	21158	FD-6465
6466	White C/C	N	YZ	-	4289	B9145	FA91:YZ	44093	19046	FD-6485
6470	Vermilion C/C Solid	CO	E4	-	4217	B8954	FA91:AL	42497	19079	FD-6470
6472	Med. Alabaster C/C	N	AL	-	4285	B9144	FA91:A4	44285	21153	FD-6472
6473	Desert Tan	N	A4		4297	B9147	FA90:YN	44097	21170	FD-6473
6505	Silver C/C	CO	YN		4262	D8808		38357	21189	FD-6505

1991 DOMESTIC PAINT CODES

"M" No.	Color Name	C/O or New	Car Code	Truck Code	PPG	DuPont	Sikkens	Martin-Senior Acme Rogers Sherwin-Williams	BASF R-M	Glasurit
1724	Black Solid	CO	YC	YC	9000/9300	99S	FA90:YC	F10B-1738 (SW)	PKG	21-1240
5916	Desert Tan Met.	CO	AT		3575	B8341	FA90:AT	32616	13223	FD-5916
5920	Oxford White Solid	CO	YO	YO	3520	B9424	FA90:YO	33631	14110	FD-5920
5979	Brt. Regatta Blue Met.	CO	MG	MG	3745	B9584	FA90:MG	34354	15119	FD-5979
6044	Smoke Met.	CO	YW		3842	B8541	FA90:YW	35360	18141	FD-6044
6153	Med. Red Solid	CO	EM	EM	3954	B8778	FA90:EM	36434	17151	FD-6153
6156	Med. Cabernet Solid	CO	EH	EH	3936	B8750	FA90:EH	36357	17131	FD-6156
6188	Dk. Shadow Blue Met.	CO	MJ		3946	B8775	FA90:MJ	36373	17144	FD-6188
6210	White	CO	YY		9978	B9887	FA90:YY	35521	18185	FD-6210
6214	Lt. Smoke Met.	CO	YV		3843	B8689	FA90:YV	35520	18180	FD-6214
6236	Med. Scarlet Solid	CO	EN		3935	B8753	FA90:EN	32356	17130	FD-6236
6253	Lt. Sandalwood C/C	CO	AX		4067	B8852	FA90:AX	37278	18139	FD-6253
6260	Chestnut C/C	N	A9		4077	B8855	FA91:A9	38161	18145	FD-6260
6261	Dk. Chestnut C/C	N	A8		4078	B8857	FA91:A8	38163	18148	FD-6261
6262	Dk. Chestnut Met.	CO	CE		4060	B8856	FA90:CE	37162	18146	FD-6262
6263	M. Regatta Blue C/C	CO	ME	-	4060	B8836	FA90:ME	37274	18133	FD-6263
6282	Med. Titanium Met.	N	YK	-	4125	D8856	FA91:YK	38807		
6290	Twilight Blue C/C	CO	MK	MK	4069	B8835	FA90:MK	37280	18141	FD-6290
6312	Med. Sandalwood C/C	CO	AW		4066	B8853	FA90:AW	37277	18138	FD-6312
6325	Currant Red Solid	CO	EC	EC	4161	B8903	FA90:EC	39067	19051	FD-6325
6327	Crystal Blue C/C	CO	KA	KA	4165	B9805	FA90:KA	39070	19066	FD-6327
6328	Lt. Crystal Blue C/C	CO	MA	MA	4171	B8918	FA90:MA	39074	19052	FD-6328
6329	Past Titanium Solid	CO	YD	-	4261	B9107	FA91:YD	44040	20360	FD-6329
6330	Lt. Titanium C/C	CO	YF	-	4121	D8859	FA90:YF	38806	18157	FD-6330
6342	Wild Strawberry C/C	CO	EL	EL	4166	D8829	FA90:EL	38461	18154	FD-6342
6346	Vermillion Solid	CO	EP	EP	4163	B8902	FA90:EP	39068	19060	FD-6346
6373	Ebony C/C	CO	UA	-	9700	99S	FA90:UA	38743	18163	FD-6373
6381	Med. Currant Red C/C	CO	EE	-	4173	B8910	FA90:EE	39076	19057	FD-6381
6383	Ultra Blue C/C	CO	MM	-	4164	B9021	FA90:MM	41969	20071	FD-6323
6390	Dk. Titanium C/C	CO	YU	-	4167	B9806	FA90:YU	39971	19062	FD-6390
6392	Pastel Alabaster Solid	CO	AH	AH	4208	B9022	FA90:AH	41961	20072	FD-6392
6395	Sandalwood Frost C/C	CO	AP	-	4210	B9023	FA90:AP	41984	20075	FD-6395
6397	M. Woodrose C/C	CO	CA	-	4211	B9024	FA90:CA	41965	20080	FD-6397
6401	Titanium Frost C/C	CO	YX	-	4216	D9894	FA90:YX	40299	19265	FD-6401
6403	Pawnee Tan Solid	CO	AV		4220	B9034	FA90:AV	42575	20065	FD-6403
6406	Glacier White Solid	CO	ZC		90577	B6951	FA90:ZC	41118	20063	FD-6406
6414	DP Jewel Green C/C	CO	PA	PA	4215	B9025	FA90:PA	41970	20062	FD-6414

1991 DOMESTIC PAINT CODES

1991 DOMESTIC PAINT CODES

Paint: By Symptom

Technical Service Bulletin # 9384 Date: 930414

Exterior Clearcoat - Cracking/Eroding/Peeling Off

Article No. 93-8-4

April 14, 1993

PAINT - EXTERIOR CLEARCOAT "MICROCHECKING", HAZING OR PEELING

FORD: 1983-93 THUNDERBIRD 1984-93 TEMPO 1985-93 ESCORT 1986 LTD 1986-93 TAURUS 1989-93 CROWN VICTORIA, MUSTANG, PROBE

LINCOLN-MERCURY: 1983-93 COUGAR 1984-92 MARK VII 1984-93 TOPAZ 1985-89 TRACER 1986 MARQUIS 1986-93 SABLE 1988-93 CONTINENTAL, TOWN CAR 1989-93 GRAND MARQUIS 1991-93 TRACER 1993 MARK VIII

LIGHT TRUCK: 1983-93 RANGER 1986-93 AEROSTAR 1987-90 BRONCO II 1988-93 F SUPER DUTY, F-47 1991-93 ECONOLINE, EXPLORER 1992-93 F-150-350 SERIES 1993 VILLAGER

ISSUE: The clearcoat layer of the basecoat/clearcoat paint system may "microcheck" (crack and erode), turn white, flake or peel off the vehicle. This condition is noticeable on the horizontal surfaces only.

ACTION: Inspect the vehicle and if repair is necessary, refer to the following procedure for service details. This is a wet on wet procedure. Sanding is not required after the seal coat is applied.

NOTE: READ THE ENTIRE SERVICE REPAIR PROCEDURE BEFORE STARTING REPAIRS.

REPAIR PROCEDURE

WARNING: ALWAYS WEAR A NIOSH/OSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE OTHER RECOMMENDED SAFETY EQUIPMENT.

1. Wash the vehicle with soap and water.

2. Verify clearcoat to basecoat or primer adhesion by applying a 2" wide masking tape strip on all horizontal body panels.

a. Pull the tape up quickly

b. Inspect the adhesive side for paint removal.

NOTE: IF PAINT WAS REMOVED DURING TAPE TEST, THE ENTIRE CLEARCOAT AND BASECOAT SHOULD BE REMOVED FROM THE PANEL.

3. Wipe down the areas to be repainted with wax and grease remover.

^ BASF product # 900 PreKleano or equivalent

4. Sand the affected surface with 150/240 grit sand paper. Remove only clearcoat and colorcoat, featheredge areas with 320 grit paper.

NOTE: DO NOT REMOVE SPRAY PRIMER OR E-COAT.

5. Blow off the area to remove loose dust or debris.

6. Wipe the sanded surface with wax or grease remover.

^ BASF product # 901 Prekleano or equivalent

7. Tack off area.

8. Mix and apply one coat of epoxy primer for adhesion and let dry per manufacturer's label instruction (20 - 30 minutes).

^ BASF product # DE 15, PA16, PR80 or equivalent

NOTE: DO NOT SAND THE NEWLY PRIMED AREAS.

9. Mix and apply two coats of the appropriate colored primer surface sealer.

^ BASF product # DP 21, Solo Color 1:1, then 2 parts of mixture 1 part DH 60, 30% PR80 or equivalent.

10. Mix and apply 2 coats or until hiding of basecoat per manufacturer's label instructions. Apply first coat to repair area only. Apply second coat over entire area. Allow a minimum of 15 minutes flash time before applying the clearcoat.

^ BASF # Diamont Basecoat Color and Diamont Reducer 1:1 or equivalent.

11. Mix and apply 2 coats of urethane clearcoat per manufacturer's label instructions.

^ BASF product # DC90 Diamond Clear, LH50 Diamond Hardener 2:1 or equivalent.

12. Polish if necessary.

13. Clean and detail the vehicle and return it to the customer.

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 106000

Technical Service Bulletin # 9384 Date: 930414

Exterior Clearcoat - Cracking/Eroding/Peeling Off

Article No. 93-8-4

April 14, 1993

PAINT - EXTERIOR CLEARCOAT "MICROCHECKING", HAZING OR PEELING

FORD: 1983-93 THUNDERBIRD 1984-93 TEMPO 1985-93 ESCORT 1986 LTD

1986-93 TAURUS 1989-93 CROWN VICTORIA, MUSTANG, PROBE

LINCOLN-MERCURY: 1983-93 COUGAR 1984-92 MARK VII 1984-93 TOPAZ 1985-89 TRACER 1986 MARQUIS 1986-93 SABLE 1988-93 CONTINENTAL, TOWN CAR 1989-93 GRAND MARQUIS 1991-93 TRACER 1993 MARK VIII

LIGHT TRUCK: 1983-93 RANGER 1986-93 AEROSTAR 1987-90 BRONCO II 1988-93 F SUPER DUTY, F-47 1991-93 ECONOLINE, EXPLORER 1992-93 F-150-350 SERIES 1993 VILLAGER

ISSUE: The clearcoat layer of the basecoat/clearcoat paint system may "microcheck" (crack and erode), turn white, flake or peel off the vehicle. This condition is noticeable on the horizontal surfaces only.

ACTION: Inspect the vehicle and if repair is necessary, refer to the following procedure for service details. This is a wet on wet procedure. Sanding is not required after the seal coat is applied.

NOTE: READ THE ENTIRE SERVICE REPAIR PROCEDURE BEFORE STARTING REPAIRS.

REPAIR PROCEDURE

WARNING: ALWAYS WEAR A NIOSH/OSHA RECOMMENDED VAPOR/PARTICULATE RESPIRATOR AND USE OTHER RECOMMENDED SAFETY EQUIPMENT.

1. Wash the vehicle with soap and water.

2. Verify clearcoat to basecoat or primer adhesion by applying a 2" wide masking tape strip on all horizontal body panels.

a. Pull the tape up quickly

b. Inspect the adhesive side for paint removal.

NOTE: IF PAINT WAS REMOVED DURING TAPE TEST, THE ENTIRE CLEARCOAT AND BASECOAT SHOULD BE REMOVED FROM THE PANEL.

3. Wipe down the areas to be repainted with wax and grease remover.

^ BASF product # 900 PreKleano or equivalent

4. Sand the affected surface with 150/240 grit sand paper. Remove only clearcoat and colorcoat, featheredge areas with 320 grit paper.

NOTE: DO NOT REMOVE SPRAY PRIMER OR E-COAT.

5. Blow off the area to remove loose dust or debris.

6. Wipe the sanded surface with wax or grease remover.

^ BASF product # 901 Prekleano or equivalent

7. Tack off area.

8. Mix and apply one coat of epoxy primer for adhesion and let dry per manufacturer's label instruction (20 - 30 minutes).

^ BASF product # DE 15, PA16, PR80 or equivalent

NOTE: DO NOT SAND THE NEWLY PRIMED AREAS.

9. Mix and apply two coats of the appropriate colored primer surface sealer.

^ BASF product # DP 21, Solo Color 1:1, then 2 parts of mixture 1 part DH 60, 30% PR80 or equivalent.

10. Mix and apply 2 coats or until hiding of basecoat per manufacturer's label instructions. Apply first coat to repair area only. Apply second coat over entire area. Allow a minimum of 15 minutes flash time before applying the clearcoat.

^ BASF # Diamont Basecoat Color and Diamont Reducer 1:1 or equivalent.

11. Mix and apply 2 coats of urethane clearcoat per manufacturer's label instructions.

^ BASF product # DC90 Diamond Clear, LH50 Diamond Hardener 2:1 or equivalent.

12. Polish if necessary.

13. Clean and detail the vehicle and return it to the customer.

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 106000

Power Seat Motor: Locations

Beneath Front Seat Assemblies

APPLICATION CHART	
VEHICLE	PART NUMBER
Ranger w/Premium Bucket Seat And R.H. 60/40 Split Bench Seat Ranger/Explorer w/High Back Bucket Seat And R.H. 60/40 Split Bench Seat	F47Z-1061018-A
F-150/350 Super Cab w/High Back Bucket Seat Bronco 150 w/High Back Bucket Seat	F4TZ-1861018-B
Bronco 150 w/Bucket Seat	F4TZ-9861018-A
Aerostar w/Bucket Seat	F4TZ-9861019-A

Seat Back Frame: Customer Interest Passenger Seat Back - Rattles When Unoccupied

Article No. 94-14-10

07/13/94

^ SEAT - "RATTLE" - PASSENGER FRONT SEAT BACK RATTLES WHEN UNOCCUPIED

^ NOISE - "RATTLE" - PASSENGER FRONT SEAT BACK RATTLES WHEN UNOCCUPIED

LIGHT TRUCK: 1990-93 AEROSTAR, BRONCO, F-150-350 SERIES, RANGER 1991-93 EXPLORER

ISSUE: When the front passenger seat is unoccupied, the seat back may rattle due to a round pivot bushing that could allow for premature wear and looseness.

ACTION: Replace the passenger front seat back frame assembly with a new frame that has a redesigned pivot bushing.

Prior to removal, verify that the seat back is causing the concern. Obtain the proper seat back frame assembly. Refer to Application Chart in this TSB.

REMOVAL PROCEDURE

1. Remove the complete front seat assembly, including the restraint "slide bar" (if so equipped) from the vehicle. Refer to Section 01-1OA or 01-10B of the appropriate Service Manual.

2. Remove inboard pivot cover (one push pin).

3. Remove outboard side shield (2 screws).

4. Remove tip-slide adjuster rod (if so equipped).

5. Remove front seat center arm rest and link (if so equipped).

6. Remove front seat back assembly from seat cushion assembly (two (2) seat back latch upper retaining bolts and one (1) seat back frame to seat cushion pivot bolt).

7. Remove seat trim cover.

8. Remove seat back recliner latch assembly.

9. Remove seat back pad and lumbar support adjuster (if so equipped).

10. Discard old seat back frame.

INSTALLATION

1. Install seat back latch to new frame.

2. Install seat back pad to new frame.

3. Install lumbar support adjuster (if so equipped).

4. Position trimmed seat back frame assembly to seat cushion assembly and install two (2) bolts required to retain seat back latch to new frame.

NOTE:

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

5. Install seat back frame to seat cushion frame pivot bolt.

NOTE:

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

6. Install the center arm rest and link (if so equipped) to the seat back assembly.

NOTE:

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

7. Install the tip-slide adjuster rod.

8. Install the inboard pivot cover to seat.

9. Install the outboard side shield to seat.

10. Install complete seat assembly (including "slide bar") in vehicle.

NOTE

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

11. Verify proper operation of all seat functions.

12. Verify concern has been corrected.

PART NUMBER PART NAME CLASS

F47Z-1061018-A Seat Back Frame Assembly C

F4TZ-1861018-B Seat Back Frame Assembly C

F4TZ-9861018-A Seat Back Frame Assembly C

F4TZ-9861019-A Seat Back Frame Assembly C

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-93 Models And Basic Warranty For All Other Models

OPERATION DESCRIPTION TIME

941410A Replace Passenger Seat 0.7 Hr.

Back Frame Assembly - Ranger, Explorer

941410B Replace Passenger Seat 1.0 Hr.

Back Frame Assembly - Aerostar

941410C Replace Passenger Seat 0.8 Hr.

Back Frame Assembly - F-Series, Bronco

DEALER CODING

BASIC PART NO. CONDITION CODE

7061018 33

OASIS CODES: 101000, 702300

APPLICATION CHART	
VEHICLE	PART NUMBER
Ranger w/Premium Bucket Seat And R.H. 60/40 Split Bench Seat Ranger/Explorer w/High Back Bucket Seat And R.H. 60/40 Split Bench Seat	F47Z-1061018-A
F-150/350 Super Cab w/High Back Bucket Seat Bronco 150 w/High Back Bucket Seat	F4TZ-1861018-B
Bronco 150 w/Bucket Seat	F41Z-9861018-A
Aerostar w/Bucket Seat	F4TZ-9861019-A

Seat Back Frame: All Technical Service Bulletins Passenger Seat Back - Rattles When Unoccupied

Article No. 94-14-10

07/13/94

^ SEAT - "RATTLE" - PASSENGER FRONT SEAT BACK RATTLES WHEN UNOCCUPIED

^ NOISE - "RATTLE" - PASSENGER FRONT SEAT BACK RATTLES WHEN UNOCCUPIED

LIGHT TRUCK: 1990-93 AEROSTAR, BRONCO, F-150-350 SERIES, RANGER 1991-93 EXPLORER

ISSUE: When the front passenger seat is unoccupied, the seat back may rattle due to a round pivot bushing that could allow for premature wear and looseness.

ACTION: Replace the passenger front seat back frame assembly with a new frame that has a redesigned pivot bushing.

Prior to removal, verify that the seat back is causing the concern. Obtain the proper seat back frame assembly. Refer to Application Chart in this TSB.

REMOVAL PROCEDURE

1. Remove the complete front seat assembly, including the restraint "slide bar" (if so equipped) from the vehicle. Refer to Section 01-1OA or 01-10B of the appropriate Service Manual.

2. Remove inboard pivot cover (one push pin).

3. Remove outboard side shield (2 screws).

4. Remove tip-slide adjuster rod (if so equipped).

5. Remove front seat center arm rest and link (if so equipped).

6. Remove front seat back assembly from seat cushion assembly (two (2) seat back latch upper retaining bolts and one (1) seat back frame to seat cushion pivot bolt).

7. Remove seat trim cover.

8. Remove seat back recliner latch assembly.

9. Remove seat back pad and lumbar support adjuster (if so equipped).

10. Discard old seat back frame.

INSTALLATION

1. Install seat back latch to new frame.

2. Install seat back pad to new frame.

3. Install lumbar support adjuster (if so equipped).

4. Position trimmed seat back frame assembly to seat cushion assembly and install two (2) bolts required to retain seat back latch to new frame.

NOTE:

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

5. Install seat back frame to seat cushion frame pivot bolt.

NOTE:

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

6. Install the center arm rest and link (if so equipped) to the seat back assembly.

NOTE:

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

7. Install the tip-slide adjuster rod.

8. Install the inboard pivot cover to seat.

9. Install the outboard side shield to seat.

10. Install complete seat assembly (including "slide bar") in vehicle.

NOTE

BE SURE TO TORQUE THE BOLTS TO THE PROPER SPECIFICATIONS. REFER TO THE APPROPRIATE SERVICE MANUAL.

11. Verify proper operation of all seat functions.

12. Verify concern has been corrected.

PART NUMBER PART NAME CLASS

F47Z-1061018-A Seat Back Frame Assembly C

F4TZ-1861018-B Seat Back Frame Assembly C

F4TZ-9861018-A Seat Back Frame Assembly C

F4TZ-9861019-A Seat Back Frame Assembly C

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-93 Models And Basic Warranty For All Other Models

OPERATION DESCRIPTION TIME

941410A Replace Passenger Seat 0.7 Hr.

Back Frame Assembly - Ranger, Explorer

941410B Replace Passenger Seat 1.0 Hr.

Back Frame Assembly - Aerostar

941410C Replace Passenger Seat 0.8 Hr.

Back Frame Assembly - F-Series, Bronco

DEALER CODING

BASIC PART NO. CONDITION CODE

7061018 33

OASIS CODES: 101000, 702300

Seat Cover: Technical Service Bulletins Seat Leather - Cleaning Procedure Tips

Article No. 98-17-1

09/01/98

SEAT - LEATHER CLEANING PROCEDURE - SERVICE TIP

FORD: 1984-94 TEMPO 1984-97 THUNDERBIRD 1984-98 CROWN VICTORIA, ESCORT, MUSTANG 1986-98 TAURUS 1989-97 PROBE 1994-97 ASPIRE 1995-98 CONTOUR

LINCOLN-MERCURY: 1984-94 TOPAZ 1984-97 COUGAR 1984-98 GRAND MARQUIS, TRACER 1984-99 TOWN CAR 1986-98 SABLE 1993-98 MARK VIII 1995-98 MYSTIQUE 1995-99 CONTINENTAL 1999 COUGAR

LIGHT TRUCK: 1983-98 RANGER 1984-96 BRONCO 1984-97 F-250 HD 1984-98 ECONOLINE, F-150, F-250 LD 1986-97 AEROSTAR 1991-98 EXPLORER 1993-98 VILLAGER 1996-98 WINDSTAR 1997-98 EXPEDITION, MOUNTAINEER 1998 NAVIGATOR 1999 SUPER DUTY F SERIES

This TSB article is being republished in its entirety to include the latest level parts and to include a revised Service Procedure.

ISSUE

The following TSB contains information regarding the cleaning of interior leather seats and trim. Improper cleaning procedures may damage the leather. If seats are not cleaned on a regular basis (every 4-6 weeks), normal wear and tear can cause excessive soiling.

ACTION

Ford Motor Company has developed a new kit (Deluxe Leather Care Kit - F8AZ-19G253-AA) to clean soiled seats without damaging the top coat of the leather. The kit contains a leather and vinyl cleaner along with a specially formulated sponge.

Refer to the text for cleaning leather seats and trim.

The Deluxe Leather Care Kit has been tested and approved for use on all Ford and Lincoln/Mercury leather and vinyl seating surfaces, and if used as directed, should be used for service repairs. Many household cleaners and sponges are too harsh to be used on leather and may actually cause permanent damage to the surface.

Use this material on leather and vinyl seats that:

^ show excessive soiling

^ have been stained with coffee, lipstick, etc.

Refer to the instructions included in the kit for specific application procedures.

After cleaning surface with cleaner and sponge, wipe area with water and a cotton cloth.

NOTE

AVOID EXCESSIVE APPLICATION OF CLEANER ALONG STITCHING.

PART NUMBER PART NAME

F8AZ-19G253-AA Deluxe Leather Care Kit

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 97-14-2

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 101000, 107000, 190000

Old Service Part Number	New Service Part Number
F6TZ-15702-AA E7DZ-15702-A	1U5Z-15702-AA 1U5Z-15702-AA

PART NUMBER	PART NAME
1U5Z-15702-AA	27 degree Mechanical Hood Lamp Switch

Underhood Lamp Switch: Technical Service Bulletins Hood Lamp Switch - Revised

Article No. 01-21-6

10/29/01

ELECTRICAL - REVISED MECHANICAL HOOD LAMP SWITCH TO REPLACE OLD STYLE MERCURY HOOD LAMP SWITCH

FORD: 1987-1995 TAURUS 1988-1991 CROWN VICTORIA 1989 THUNDERBIRD 1989-1996 MUSTANG 1994-1996 THUNDERBIRD 1990 BRONCO II 1990-1996 RANGER 1991-1996 BRONCO 1994-2001 EXPLORER 1997-2001 F-150 2000-2001 EXCURSION 2002 EXPEDITION

LINCOLN: 1989-1994 CONTINENTAL 1990-1992 MARK VII 1990-1996 TOWN CAR 1993-1995 MARK VIII 2002 NAVIGATOR

MERCURY: 1987-1995 SABLE 1988-1991 GRAND MARQUIS 1989 COUGAR 1994-1996 COUGAR 1997-2001 MOUNTAINEER

ISSUE

This article is to provide information on replacement hood lamp switches. The 27 degree Mercury style hood switches will no longer be available. Replacement 27 degree Mechanical switches will be available as a service replacement.

ACTION

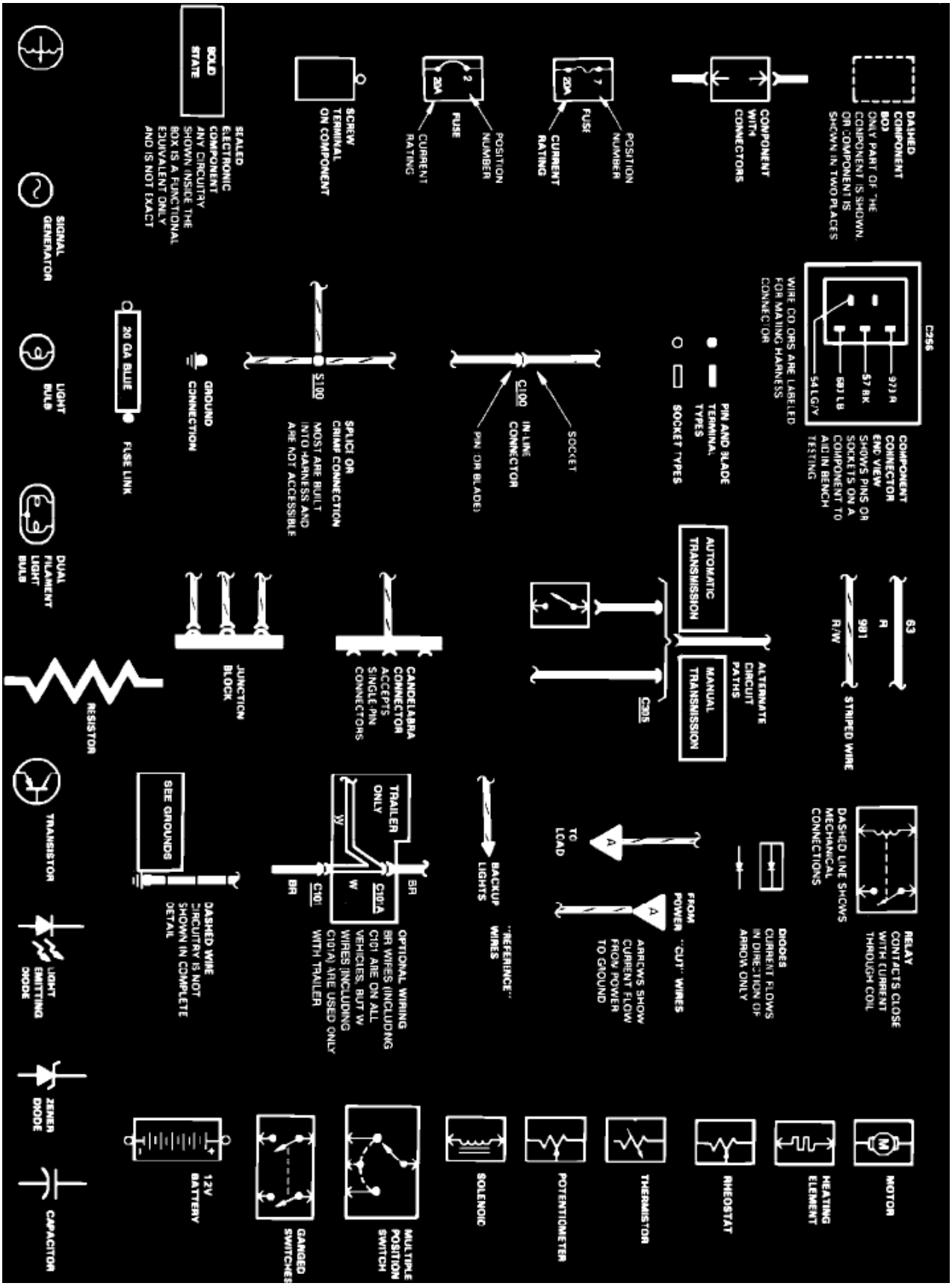
For vehicles requiring hood lamp switch replacement, replace the 27 degree Mercury switch with new 27 degree Mechanical switch. Replace hood lamp switch per the appropriate model year Workshop Manual as needed.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

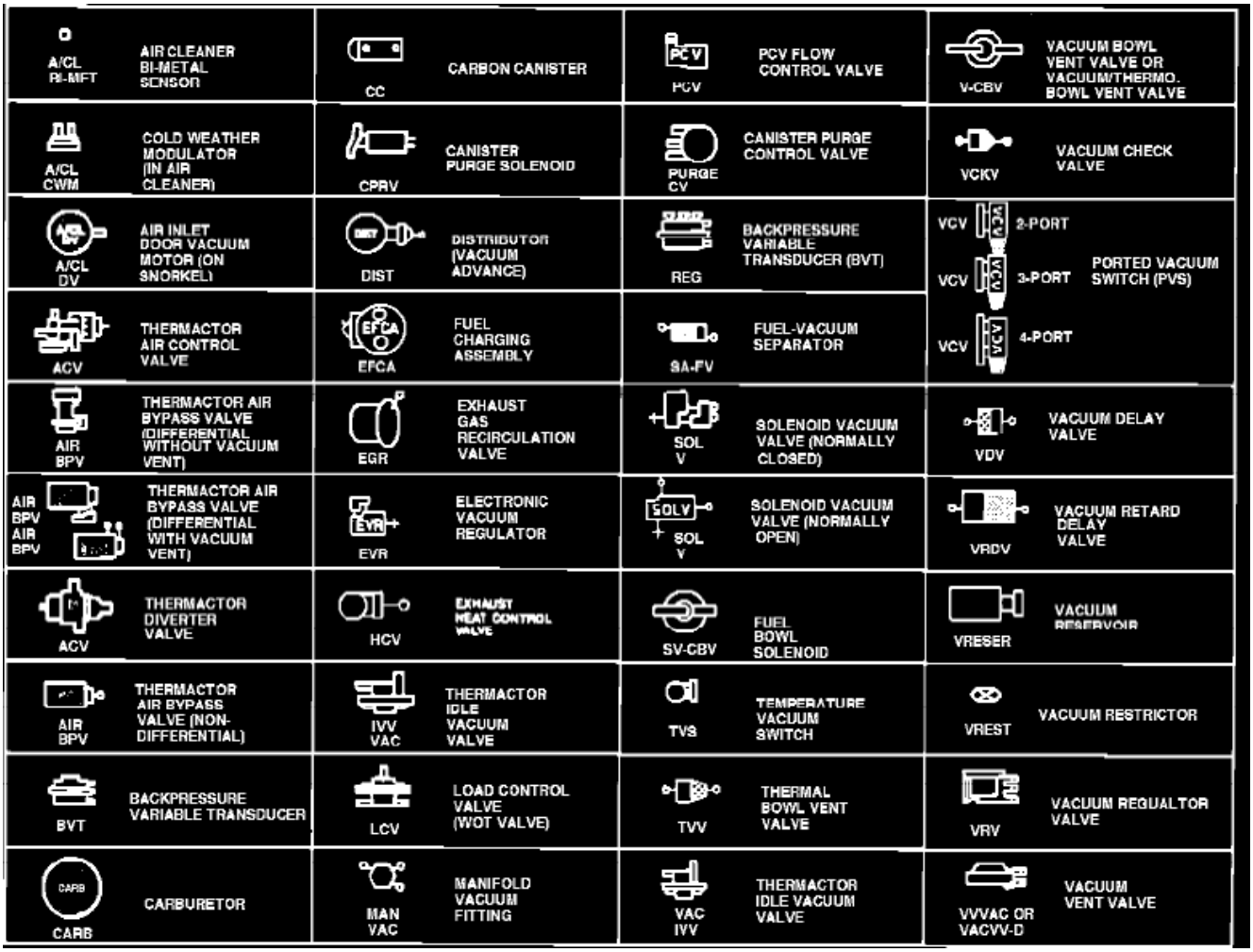
OASIS CODES: 201000, 201200

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Sensors and Switches - Body and Frame > Power Door Lock Switch > Component Information > Diagrams > Diagram Information and Instructions

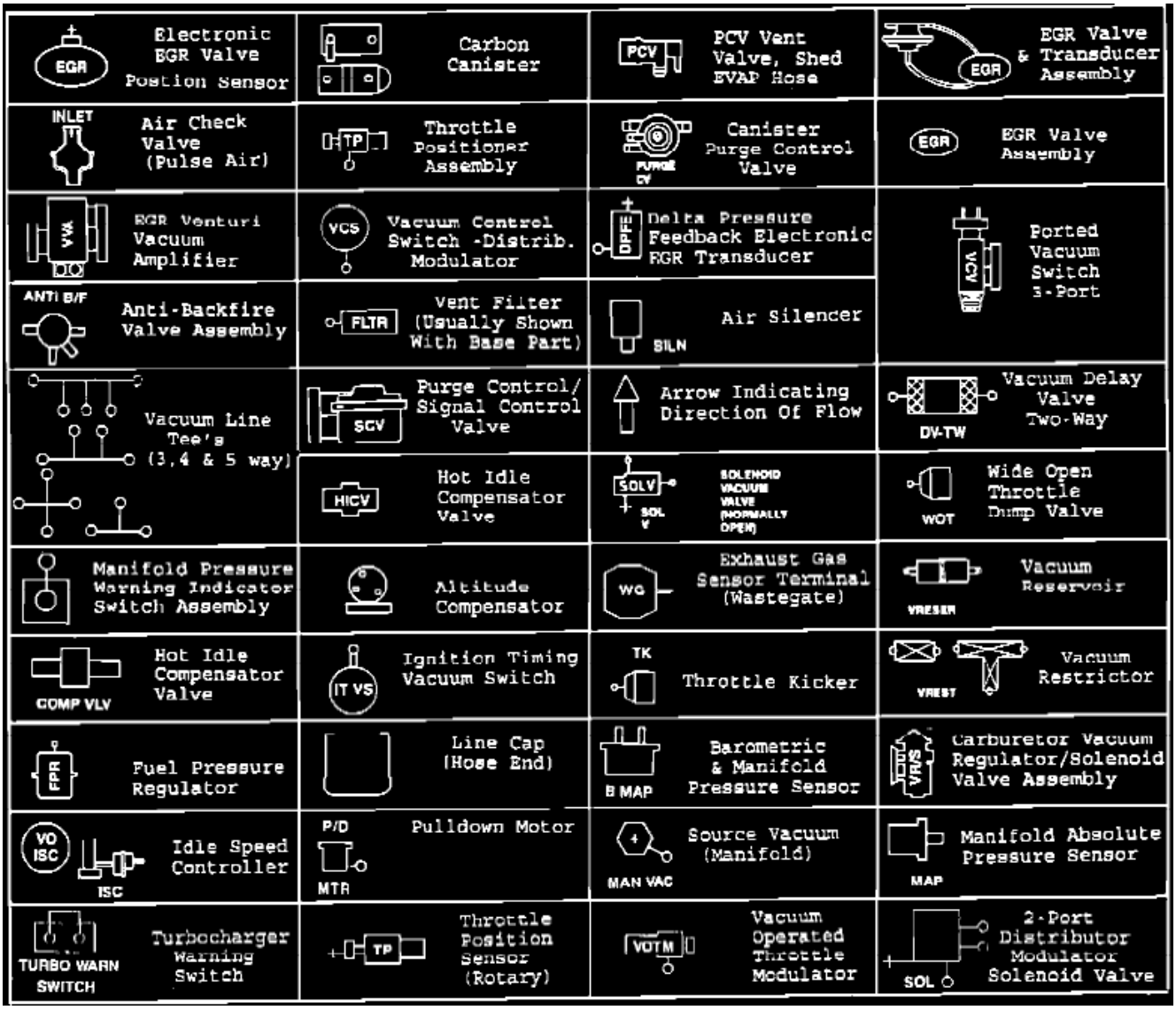


Power Door Lock Switch: Diagram Information and Instructions

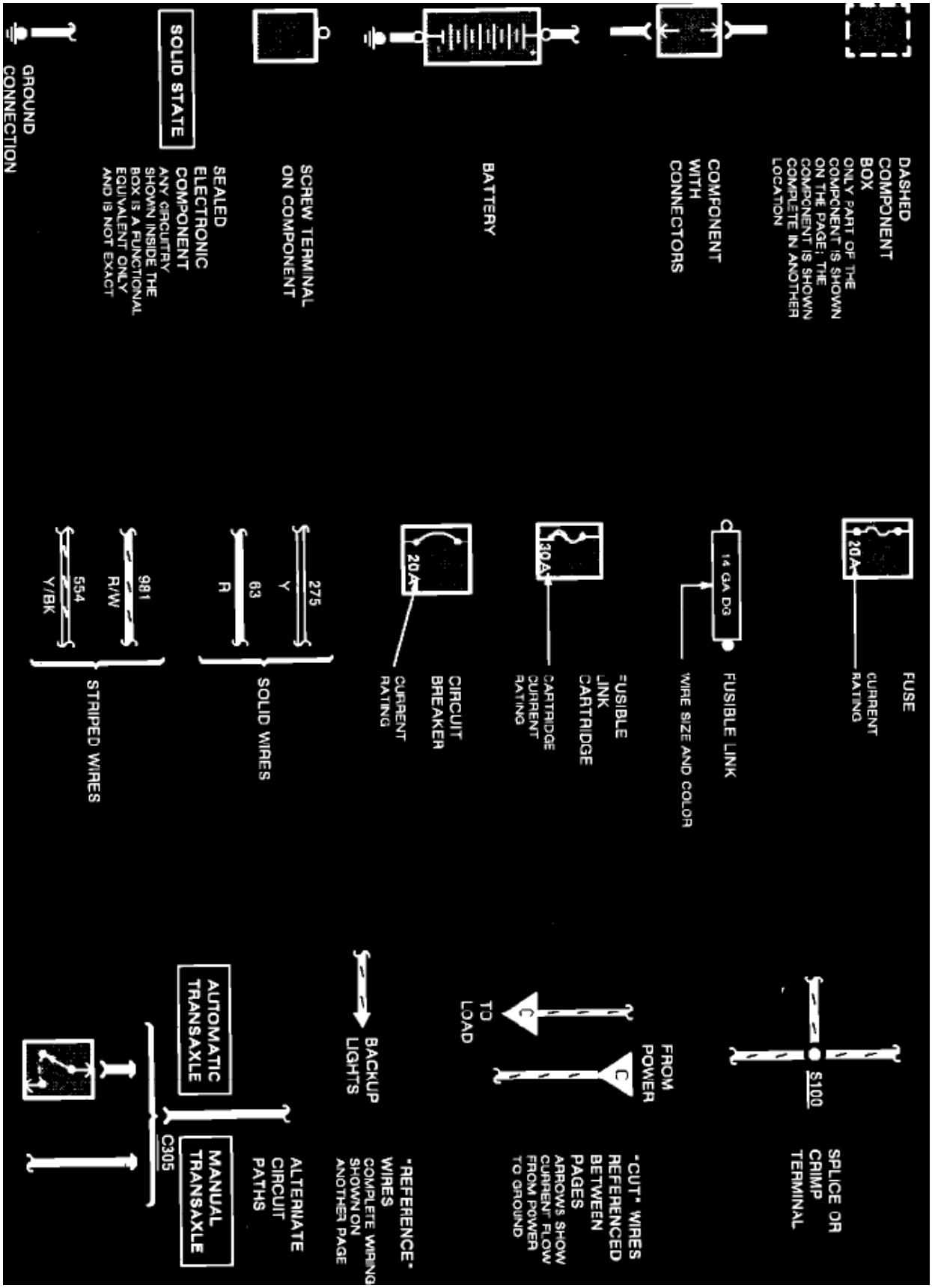
Symbol Identification



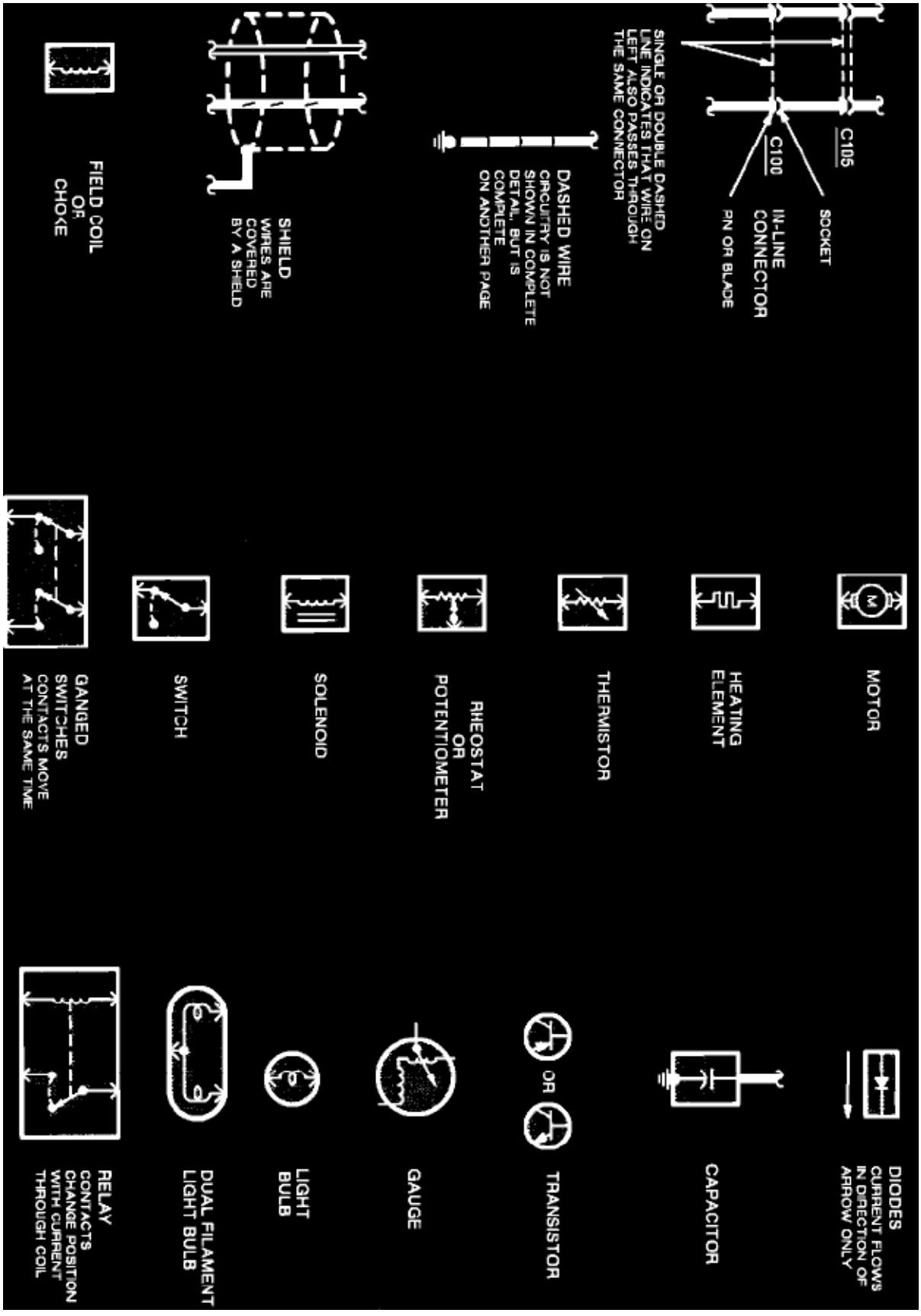
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

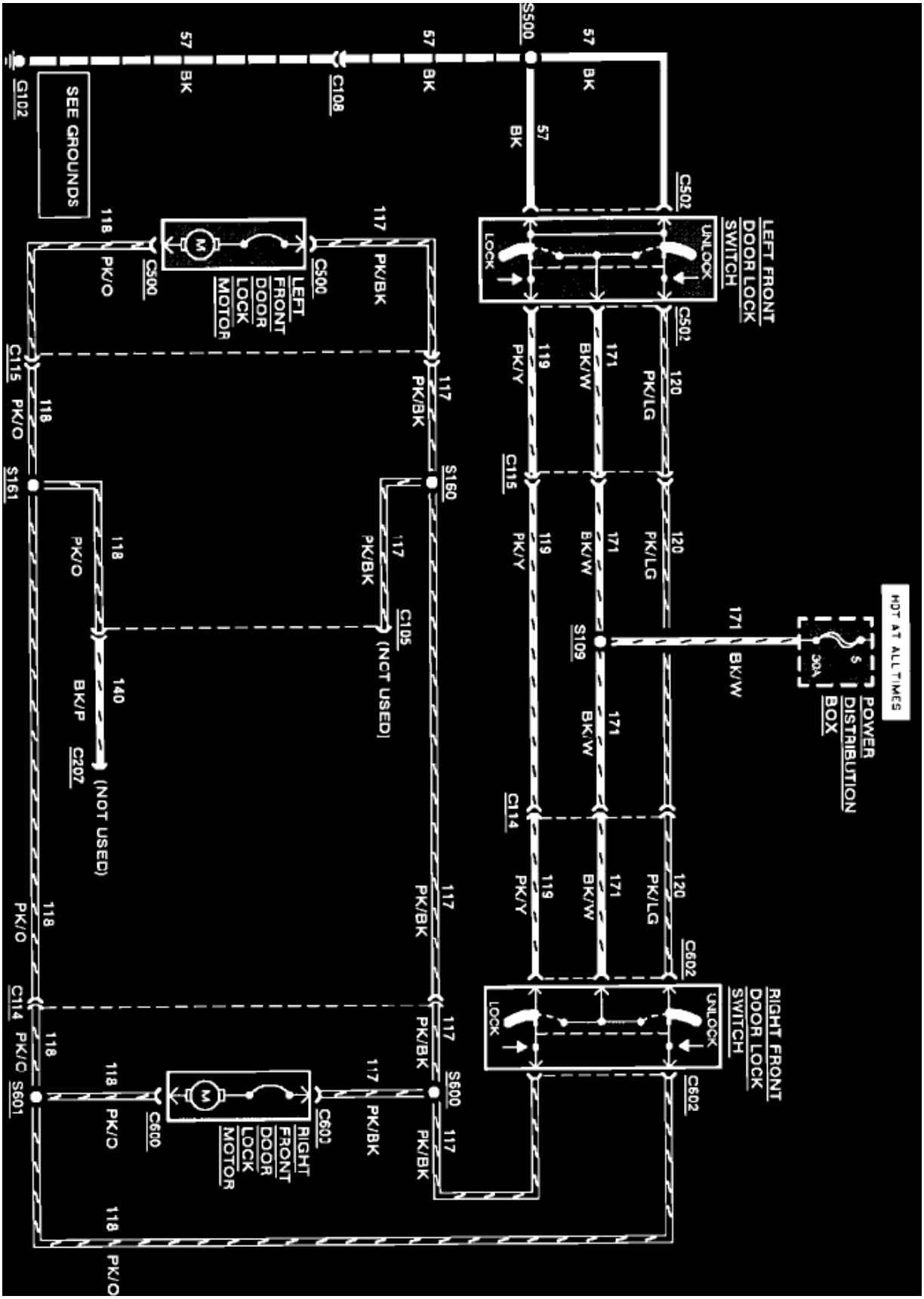
T: Tan

V: Violet

W: White

Y: Yellow

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Body and Frame > Sensors and Switches - Body and Frame > Power Door Lock Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 6988



Power Door Locks

Brake Switch (Cruise Control): Testing and Inspection

Perform this test only when brake application will not disconnect the speed control system.

1. Check operation of stop lamps by applying approximately 6 lbs. of pressure to brake pedal. If more than 6 lbs. is required, check brake pedal actuation and stop lamp switch.

2. If stop lamps do not function properly, check bulbs, circuit fuse or stop lamp switch.

3. If stop lamps function properly, check for battery voltage at 6-way connector using white wire w/purple stripe.

4. Depress brake pedal until stop lamps are illuminated. Check voltage at red wire w/black stripe on E-Series models, or the light green wire on Bronco and F-Series and Ranger, Bronco II, Explorer and Aerostar. The difference between the two voltage readings must not exceed 1.5 volts. If voltage is greater, a high resistance exists in the circuit and must be and corrected.

Clutch Switch: Service and Repair

1. Remove bracket mounting screw(s).
2. Disconnect electrical connector and remove switch and bracket assembly.
3. Remove switch from bracket.
4. Reverse procedure to install.

Cruise Control Brush Assembly: Service and Repair

1. Remove steering wheel pad attaching screws from behind steering wheel.

2. While pulling pad away from steering wheel, disconnect horn and speed control wire connectors and remove pad.

3. Remove retaining nuts securing the speed control switches and trim plate retainer to the steering wheel pad.

4. Disconnect wiring connector on rear of steering wheel pad assembly, then remove switch and trim retainer assembly.

5. Remove speed control switches by snapping out of plastic retainer.

6. To remove the ground brush, remove steering wheel for access.

7. Snap the ground brush assembly out of the turn signal switch.

8. Reverse procedure to install.

Cruise Control Module: Customer Interest Radio - AM Band Noise With Speed Control ON

Article No. 91-8-21

04/17/91

RADIO - NOISE WHILE IN AM MODE WHEN SPEED CONTROL IS ON

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: Radio static on weak to moderate strength AM radio stations only when both the radio and speed control are on, may be caused by the speed control module.

ACTION: Replace the speed control module with a new speed control module when vehicles exhibit this concern.

PART NUMBER PART NAME CLASS

F0TZ-9D843-A Module Speed Control B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

910821A Replace Speed Control 0.2 Hr.

Module

DEALER CODING

BASIC PART NO. CONDITION CODE

9D843 53

OASIS CODES: 207000

Cruise Control Module: All Technical Service Bulletins Radio - AM Band Noise With Speed Control ON

Article No. 91-8-21

04/17/91

RADIO - NOISE WHILE IN AM MODE WHEN SPEED CONTROL IS ON

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: Radio static on weak to moderate strength AM radio stations only when both the radio and speed control are on, may be caused by the speed control module.

ACTION: Replace the speed control module with a new speed control module when vehicles exhibit this concern.

PART NUMBER PART NAME CLASS

F0TZ-9D843-A Module Speed Control B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

910821A Replace Speed Control 0.2 Hr.

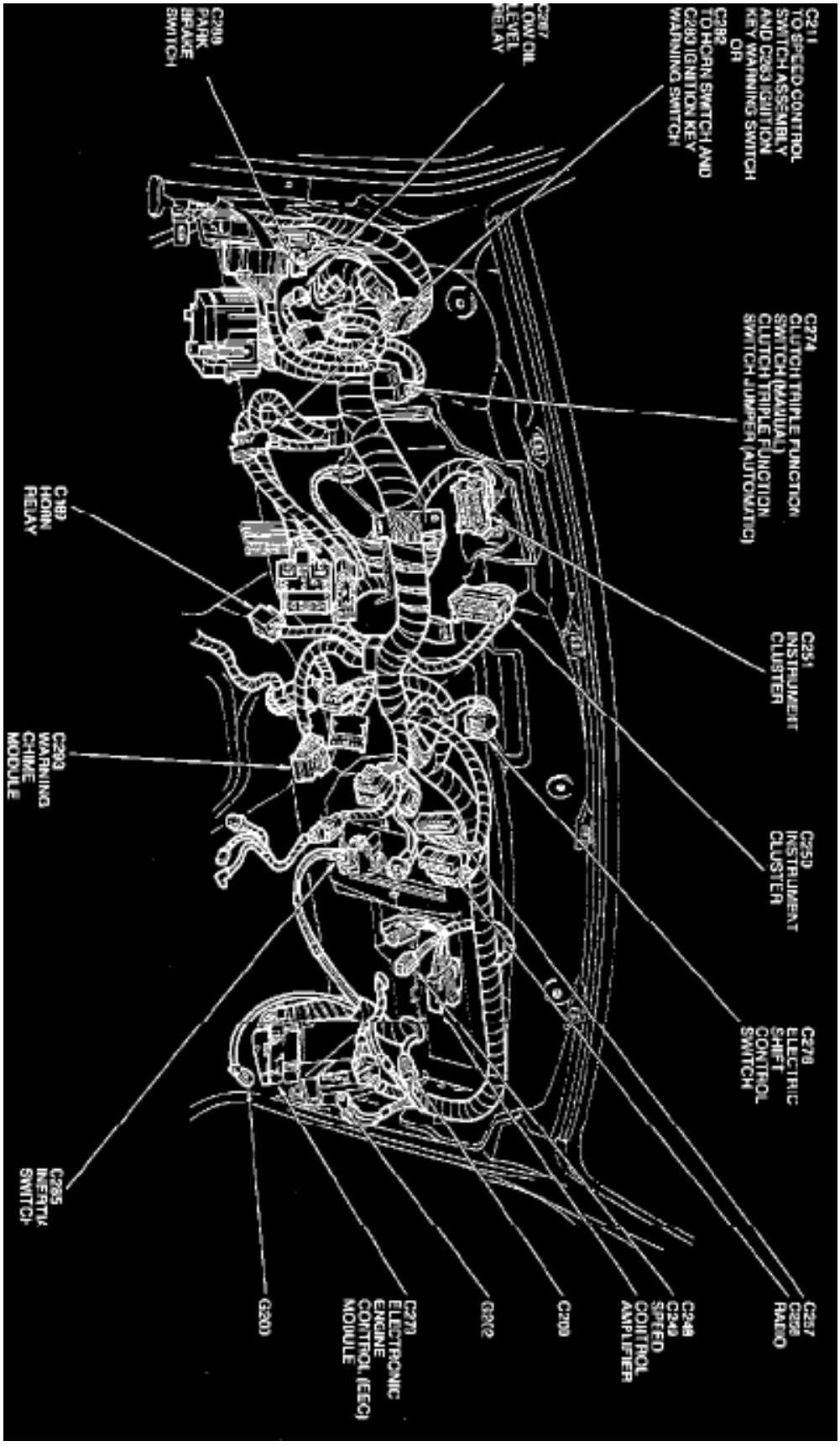
Module

DEALER CODING

BASIC PART NO. CONDITION CODE

9D843 53

OASIS CODES: 207000


C211
TO SPEED CONTROL SWITCH ASSEMBLY AND C263 IGNITION KEY WARNING SWITCH
OR
C282
TO HORN SWITCH AND C263 IGNITION KEY WARNING SWITCH
C274
CLUTCH TRIPLE FUNCTION SWITCH (MANUAL)
CLUTCH TRIPLE FUNCTION SWITCH JUMPER (AUTOMATIC)
C289
PARK BRAKE SWITCH
C287
TOW CHL LEVEL RELAY
C189
HORN RELAY
C251
INSTRUMENT CLUSTER
C293
WARNING CHIME MODULE
C250
INSTRUMENT CLUSTER
C278
ELECTRIC SHIFT CONTROL SWITCH
C265
INERTIA SWITCH
G200
C277
ELECTRONIC ENGINE CONTROL (EEC) MODULE
G202
C209
C248
C249
SPEED CONTROL AMPLIFIER
C257
C256
RADIO

Cruise Control Module: Locations

I/P Components

Behind RH Side Of I/P, Near Glove Box

Cruise Control Module: Testing and Inspection

For amplifier test, substitute with a known good amplifier.

Cruise Control Servo: Testing and Inspection

1. Disconnect 8 way connector from amplifier.

2. On 1988 models, connect an ohmmeter between orange wire w/yellow hash and gray wire w/black hash at the connector. A resistance of 40-125 ohms should be obtained.

3. On 1989-92 models, connect an ohmmeter between orange wire w/yellow hash and gray wire w/black hash at the connector. A resistance of 40-70 ohms should be obtained.

4.

On 1988 models, connect an ohmmeter between the leads of orange wire w/yellow hash and white wire w/pink hash and check for a reading of 60-90 ohms.

5. On 1989-92 models, connect an ohmmeter between the leads of orange wire w/yellow hash and white wire w/pink hash and check for a reading of 100-150 ohms.

6. On all models, disconnect servo from amplifier, then start engine. Connect orange wire w/yellow hash of servo to battery positive post, then connect white wire w/pink hash to ground and momentarily touch gray wire w/black hash to ground. Servo throttle actuator should pull in and engine RPM should increase. Throttle should hold in position or slowly release. When white wire w/pink hash is removed from ground, servo should release.

7. Replace servo if servo fails to function as described. Amplifier may need replacement if orange wire w/yellow hash is shorted to either white-pink hash lead or gray-black hash lead.

Cruise Control Servo: Service and Repair

1. Raise hood, then disconnect wiring harness connector at servo assembly. On some models, it may be necessary to disconnect servo assembly at the amplifier under the dash and carefully pull harness and connector through dash panel opening.

2. Disconnect ball chain at carburetor or adjuster from accelerator cable (as equipped), then remove vacuum hose from servo assembly.

3. Remove servo assembly retaining pins and nuts, then the servo assembly from mounting bracket.

4. Reverse procedure to install.

Cruise Control Servo Cable: Adjustments

1. Remove cable retaining clip, then disengage throttle positioner.

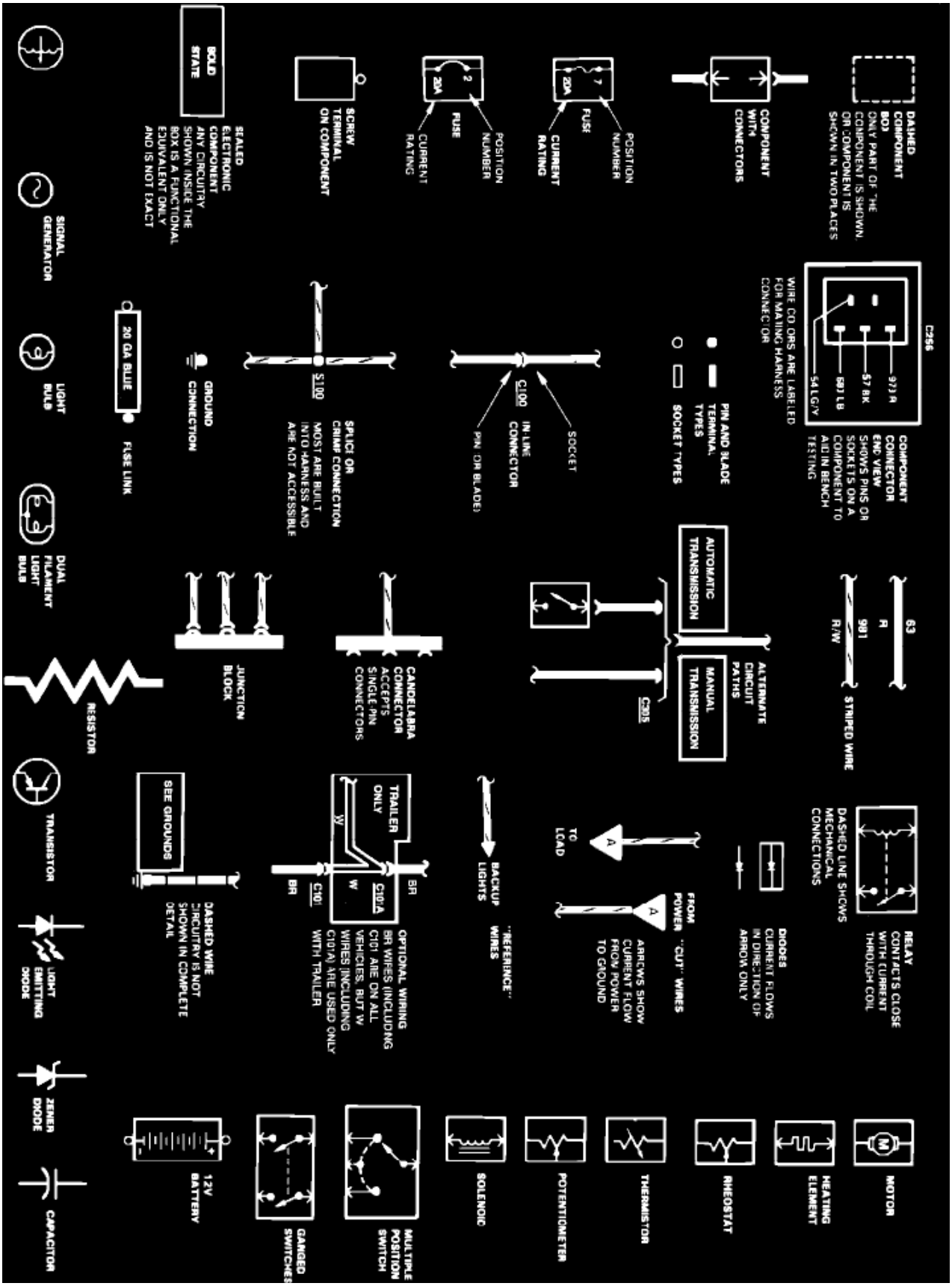
2. Set throttle to hot idle position.

3. Pull on actuator cable to take up all slack, then while holding cable in this position, reinstall cable retaining clip.

Cruise Control Servo Cable: Service and Repair

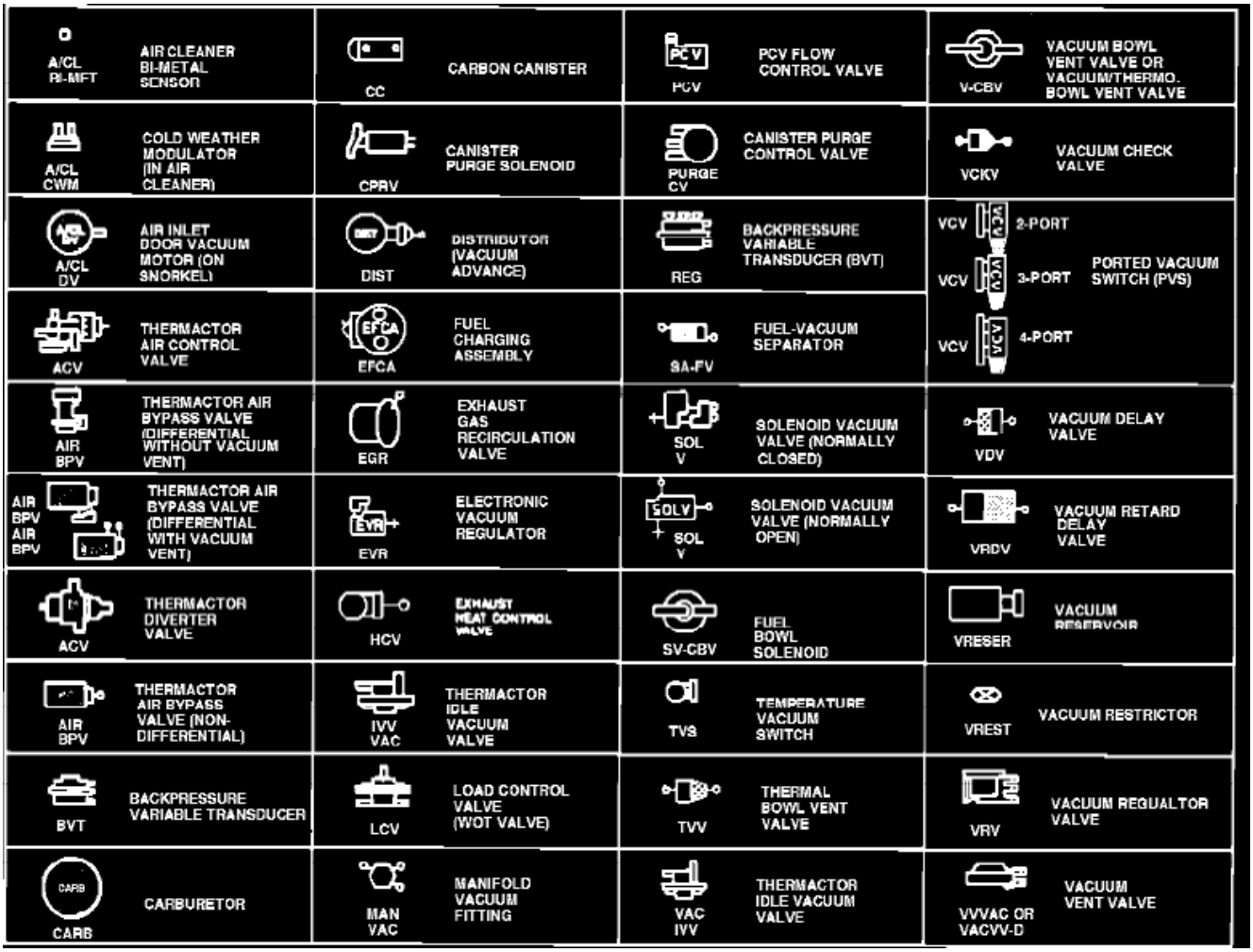
1. Remove servo assembly, then discard cable.
2. Attach new actuator cable to servo assembly.
3. Install servo assembly.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Cruise Control > Cruise Control Switch > Component Information > Diagrams > Diagram Information and Instructions

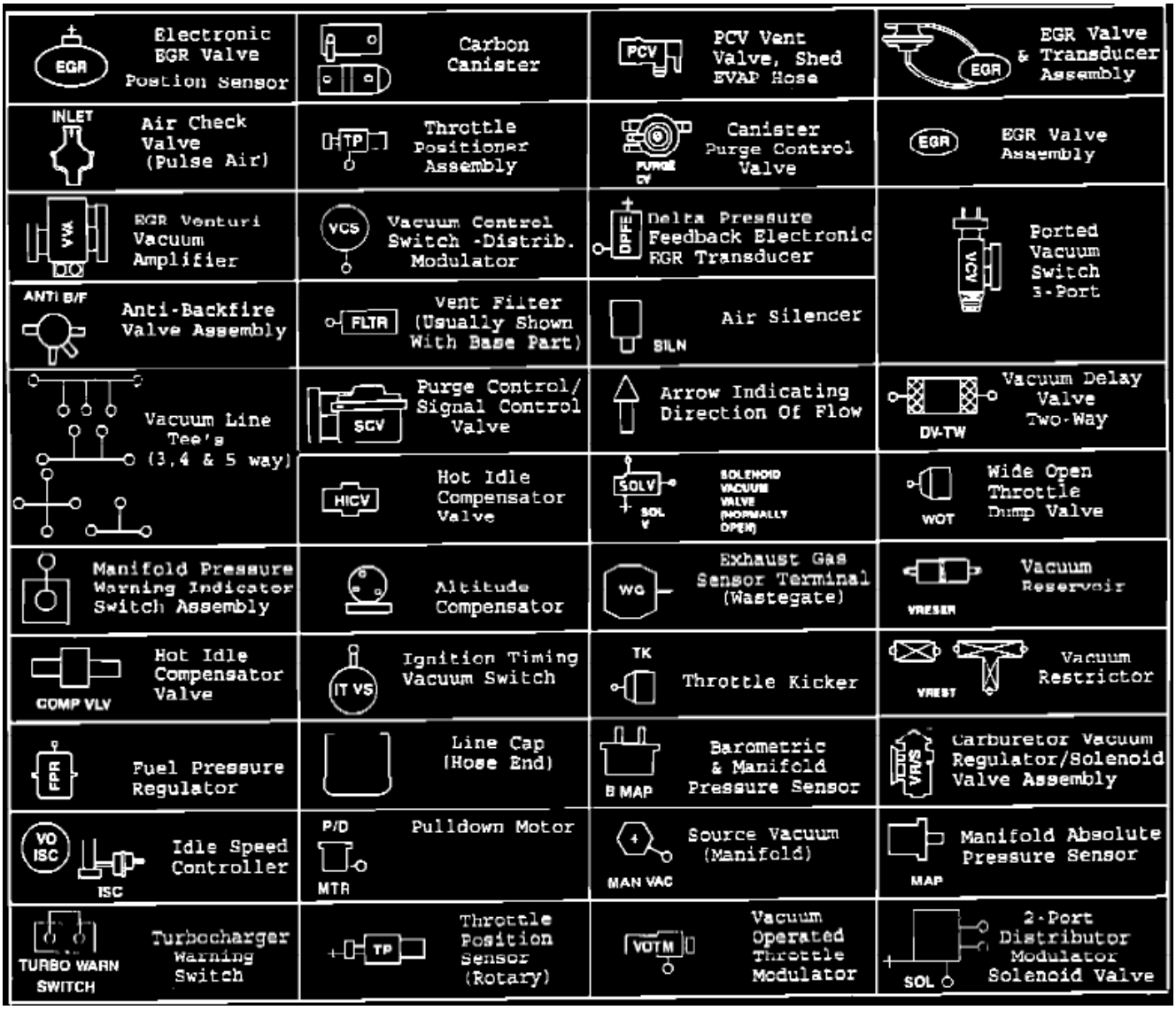


Cruise Control Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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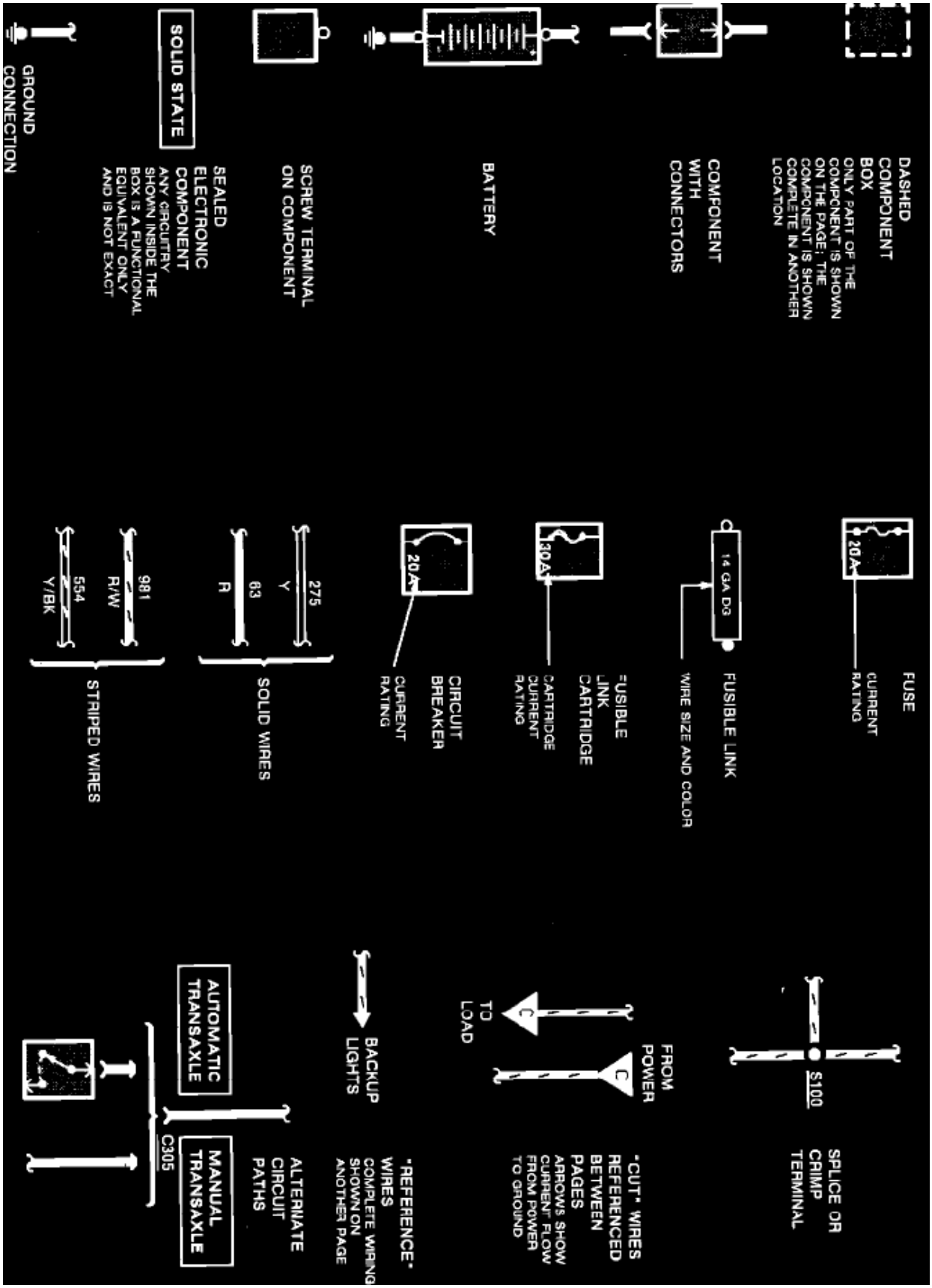
DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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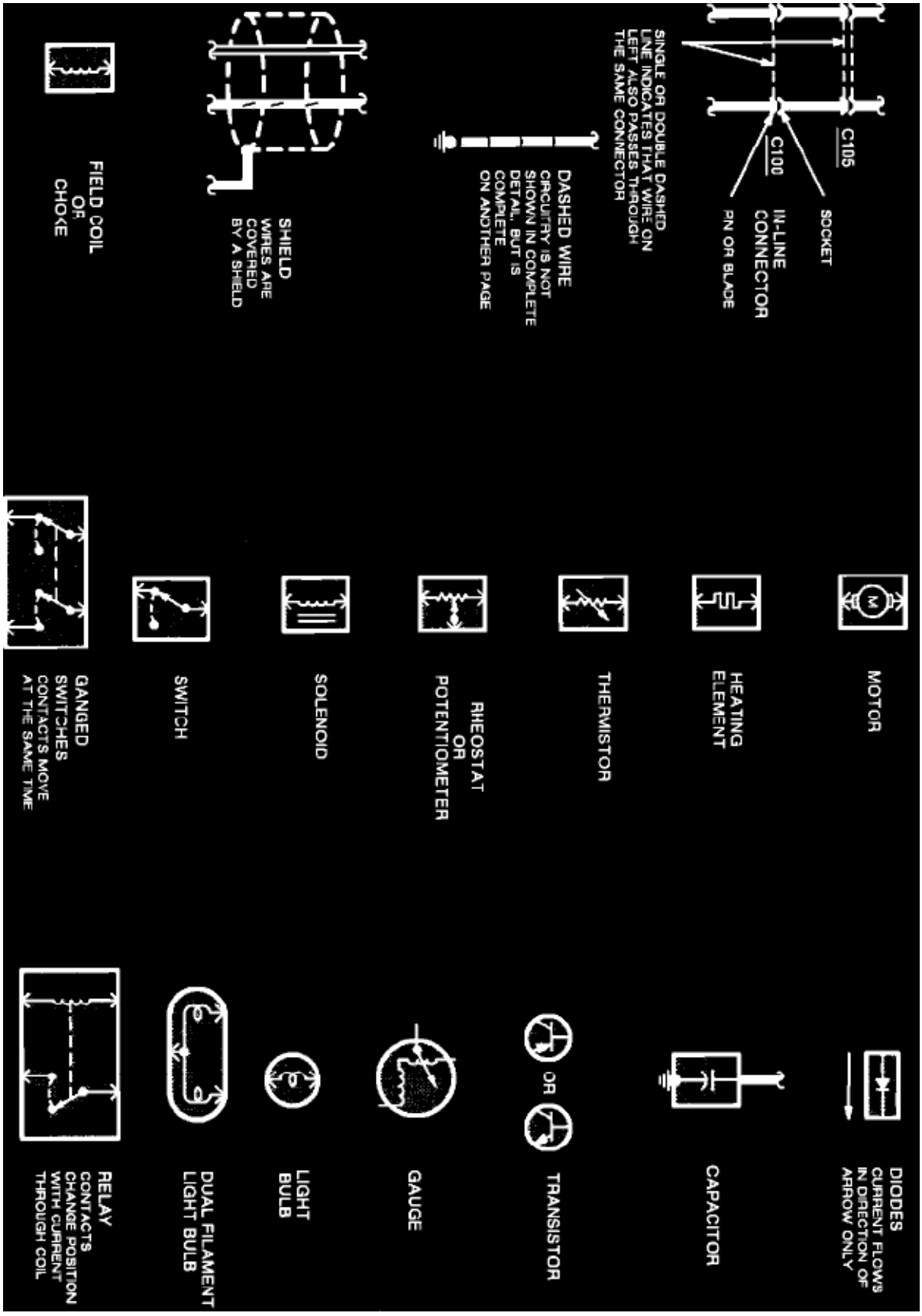
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

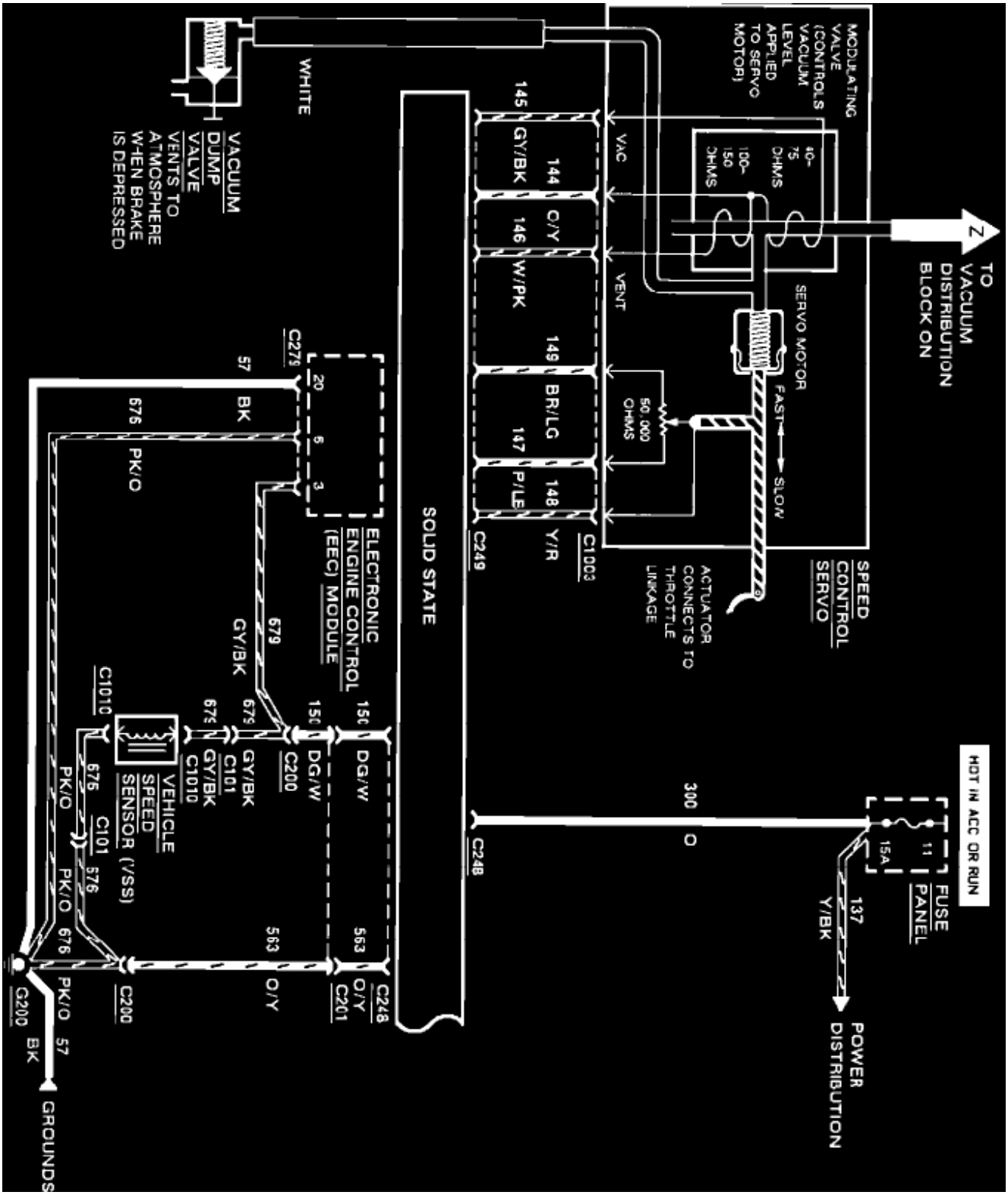
P: Purple

T: Tan

V: Violet

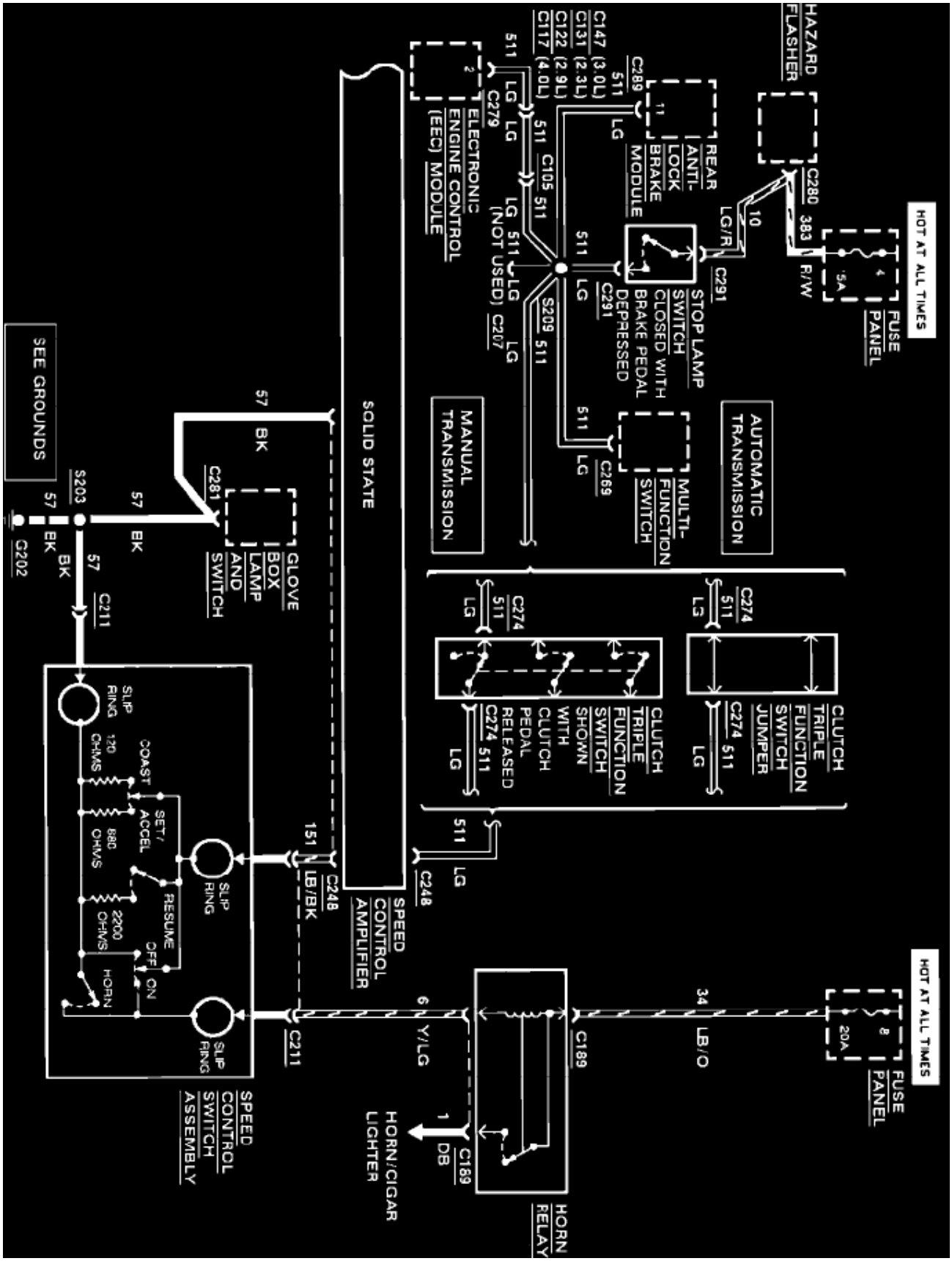
W: White

Y: Yellow



Cruise Control Switch: Electrical Diagrams

Cruise Control


HOT AT ALL TIMES
FUSE PANEL
4
5A
HAZARD FLASHER
C280
383
R/W
10
LG/R
C291
STOP LAMP SWITCH
CLOSED WITH BRAKE PEDAL DEPRESSED
C291
REAR ANTI-LOCK BRAKE MODULE
11
C289
511
LG
C147 (3.0L)
C131 (2.3L)
C122 (2.9L)
C117 (4.0L)
511
LG
LG
C279
2
ELECTRONIC ENGINE CONTROL (EEC) MODULE
511
C105
511
LG
511
(NOT USED)
LG
C207
S209
511
511
LG
C269
MULTI-FUNCTION SWITCH
AUTOMATIC TRANSMISSION
MANUAL TRANSMISSION
SOLID STATE
SEE GROUNDS
57
BK
C281
GLOVE BOX LAMP AND SWITCH
57
EK
S203
57
EK
G202
57
BK
C211
C274
511
LG
CLUTCH TRIPLE FUNCTION SWITCH JUMPER
C274
511
LG
CLUTCH TRIPLE FUNCTION SWITCH SHOWN WITH CLUTCH PEDAL RELEASED
C274
511
LG
511
LG
C248
151
LB/BK
C248
SPEED CONTROL AMPLIFIER
SLIP RING
120 OHMS
COAST
SET/ ACCEL
RESUME
880 OHMS
2200 OHMS
OFF
ON
HORN
SLIP RING
SLIP RING
C211
SPEED CONTROL SWITCH ASSEMBLY
HOT AT ALL TIMES
FUSE PANEL
8
20A
34
LB/O
C189
6
Y/LG
1
C169
DB
HORN/CIGAR LIGHTER
HORN RELAY

Cruise Control

Cruise Control Switch: Testing and Inspection

1. Apply brake pedal and ensure brake lights operate. If found satisfactory, proceed to step 2. If found unsatisfactory, check stop lamps circuit.

2. Press horn pad to sound horn. If found satisfactory, proceed to step 3. If found unsatisfactory, check horn circuit.

3. Locate 6-pin connector at speed control amplifier.

4. With ignition Off and 6-pin connector still connected to amplifier, connect an ohmmeter between black wire and ground on Ranger, Bronco II, Explorer and Aerostar with mechanical cluster or black-white wire on Aerostar with electronic cluster.

5. Check resistance to ground to ensure amplifier is grounded. If amplifier is not grounded, repair and retest. If amplifier is properly grounded, turn ignition to On position while making the following voltage checks: a.

Check circuit 296 (white/purple wire) on Aerostar models or circuit 302 (dark blue wire) on Bronco II, Explorer and Ranger models. If 12 volts are present, proceed to step b. If not present, check speed control fuse and 296 circuit wire continuity.

b. Apply brake pedal and check circuit 511 (light green wire) for 12 volts on Ranger, Bronco II and Explorer or circuit 810 (red/light green wire) on Aerostar. If 12 volts is not present, check continuity between stop lamp switch and amplifier and repair as necessary. If there is continuity, replace amplifier.

c. Check circuit 151 (light blue/black wire) for approximately 7.8 volts. If 7.8 volts is not present with amplifier properly grounded and 12 volts at circuit 296 white/purple wire on Aerostar models or 302 dark blue wire on Bronco II, Explorer and Ranger models, verified, check for On button sticking. If 12 volts is present or a short circuit to ground on circuit 151 (light blue/black wire) between amplifier and steering column brush assembly. If zero volts is present and both the On button and 151 wire are functioning properly, replace amplifier and repeat test. If 7.8 volts is present, proceed to step 6.

6. Check following voltages between circuit 151 (light blue/black wire) and amplifier ground while rotating the steering wheel with horn pad switch depressed making the following checks: a.

No button pressed, 7.8 volts.

b. On, 12.0 volts.

c. Off, 0.0 volts.

d. Resume, 6.5 volts.

e. Accel, 4.5 volts.

f. Coast, 1.5 volts.

7. If values are incorrect or fluctuate, proceed to Step 8. If values are correct, horn pad switches are operating properly. Proceed to step 17.

8. With ignition Off, disconnect the 6-pin connector from amplifier, then check following resistances between circuit 151 (light blue/black wire) and amplifier ground with horn pad switch depressed while rotating steering wheel. Ohmmeter readings should as follows with switch positions as indicated: a.

Off, 0--1 ohm.

b. Accel, 646-714 ohms,

c. Coast, 114-126 ohms.

d. Resume, 2090-2310 ohms.

9. If values are incorrect or fluctuate, proceed to step 10. If values are correct, replace amplifier and repeat step 4.

10. On models except 1992 Aerostar, remove steering wheel horn pad attaching screws in back cover, then disconnect electrical connectors from wheel.

11. On 1992 Aerostar, disable airbag system as outlined in MAINTENANCE PROCEDURES Remove airbag module, then disconnect clockspring contact electrical connector at upper center area of steering wheel.

12. On all models, connect suitable ohmmeter between circuit 151 (yellow/light blue wire) and circuit 6 (dark/blue wire) on horn pad on all models, except 1992 Aerostar or black wire connector on 1992 Aerostar models. Depress On switch and check for a reading of 0-1 ohms.

12. If reading is not correct, replace switch assembly.

13. Pull steering wheel, then check for continuity of circuit 151 (light blue/black wire) and circuit 57 (black wire) between amplifier 6-pin connector and brush assembly on models except 1992 Aerostar or clockspring on 1992 Aerostar models.

14. If there is no continuity, check for continuity between 3-pin brush assembly wiring connector and brushes or clockspring at steering wheel, then between mating 3-pin connector and amplifier 6-pin connector. Repair or replace brush or clockspring assembly as necessary.

15. If there is continuity for both circuits, clean brush assembly and slip rings in a suitable solvent and lubricate with suitable lubricant.

16. Install wheel and horn pad and repeat step 4.

17. Connect a suitable ohmmeter between circuit 150 (green/white wire) and speed sensor ground circuit 563 (orange/yellow wire) on Ranger, Bronco II and Explorer or 397 (black/white wire) on Aerostar.

18. If resistance is not between 180-250 ohms, check continuity between 6-pin connector at amplifier and 2-pin speed sensor connector at transmission and repair as necessary.

19. If resistance is correct, the speed sensor wiring is functioning properly. Not all speed sensor problems can be identified by a resistance check. Replacement with a known good sensor may be required.

Cruise Control Switch: Service and Repair

1. Remove steering wheel pad attaching screws from behind steering wheel.

2. While pulling pad away from steering wheel, disconnect horn and speed control wire connectors and remove pad.

3. Remove retaining nuts securing the speed control switches and trim plate retainer to the steering wheel pad.

4. Disconnect wiring connector on rear of steering wheel pad assembly, then remove switch and trim retainer assembly.

5. Remove speed control switches by snapping out of plastic retainer.

6. To remove the ground brush, remove steering wheel for access.

7. Snap the ground brush assembly out of the turn signal switch.

8. Reverse procedure to install.

Cruise Control Vacuum Vent Solenoid: Testing and Inspection

1. Disconnect vacuum hose from the servo that leads to the dump valve.

2. Connect a hand vacuum pump to the hose, and draw vacuum. If vacuum cannot be obtained, the hose or dump valve is leaking, and should be replaced.

3. Step on brake pedal. The vacuum should be released. If not, adjust or replace the dump valve. 2.5 inches of Hg is minimum vacuum for normal servo operation. The vacuum source is a hose attached to a 5/16 inch engine vacuum fitting port on all except diesel. On diesel engines, the vacuum source is the vacuum reservoir VAC port.

Cruise Control Vacuum Vent Solenoid: Adjustments

1. Firmly hold brake pedal in the release position.

2. Push in dump valve until valve bottoms against brake pedal pad.

3. On 1989-91 models, dump valve housing must clear white plastic pad on brake pedal by .050-.10 inch with brake pedal pulled to rear most position.

Cruise Control Vacuum Vent Solenoid: Service and Repair

1. Remove vacuum hose from valve and remove bracket mounting screw.
2. Remove valve and bracket assembly.
3. Remove valve from the bracket.
4. Reverse procedure to install.

Cruise Control Module: Customer Interest Radio - AM Band Noise With Speed Control ON

Article No. 91-8-21

04/17/91

RADIO - NOISE WHILE IN AM MODE WHEN SPEED CONTROL IS ON

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: Radio static on weak to moderate strength AM radio stations only when both the radio and speed control are on, may be caused by the speed control module.

ACTION: Replace the speed control module with a new speed control module when vehicles exhibit this concern.

PART NUMBER PART NAME CLASS

F0TZ-9D843-A Module Speed Control B

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Basic Warranty Coverage OPERATION DESCRIPTION

TIME

910821A Replace Speed Control 0.2 Hr.

Module

DEALER CODING

BASIC PART NO. CONDITION CODE

9D843 53

OASIS CODES: 207000

Cruise Control Module: All Technical Service Bulletins Radio - AM Band Noise With Speed Control ON

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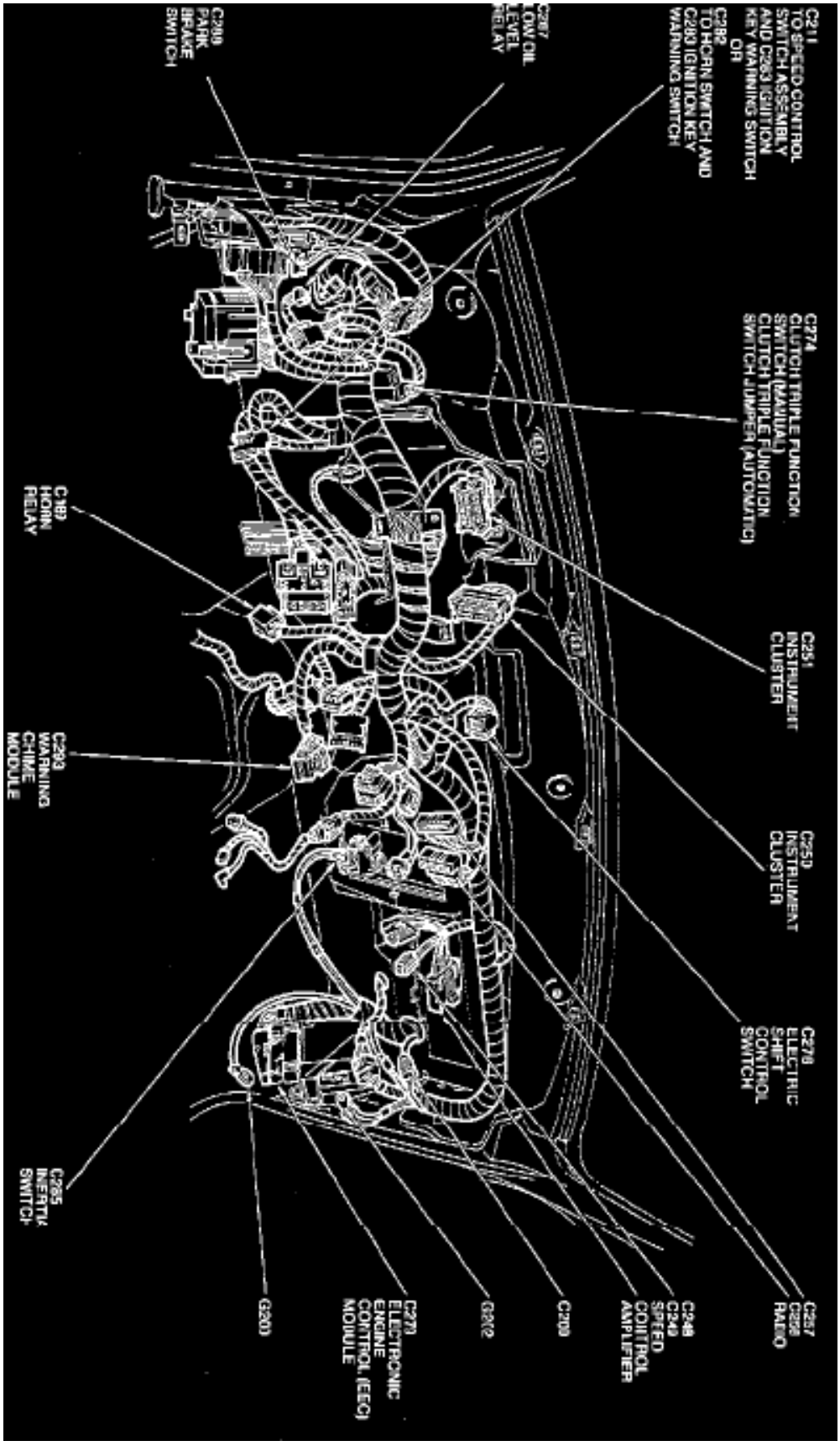
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Cruise Control Module: Locations

I/P Components

Behind RH Side Of I/P, Near Glove Box

Cruise Control Module: Testing and Inspection

For amplifier test, substitute with a known good amplifier.

Brake Switch (Cruise Control): Testing and Inspection

Perform this test only when brake application will not disconnect the speed control system.

1. Check operation of stop lamps by applying approximately 6 lbs. of pressure to brake pedal. If more than 6 lbs. is required, check brake pedal actuation and stop lamp switch.

2. If stop lamps do not function properly, check bulbs, circuit fuse or stop lamp switch.

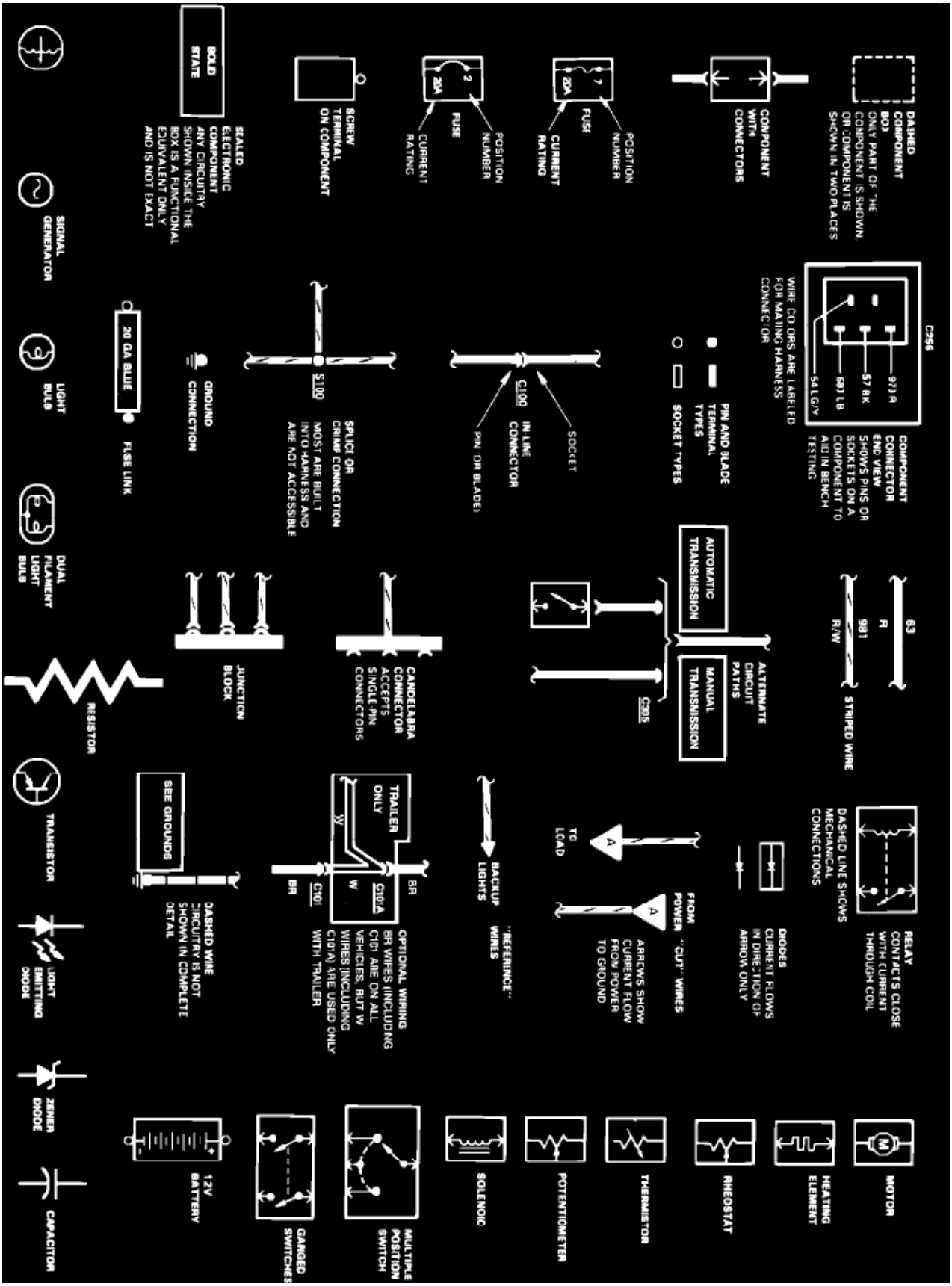
3. If stop lamps function properly, check for battery voltage at 6-way connector using white wire w/purple stripe.

4. Depress brake pedal until stop lamps are illuminated. Check voltage at red wire w/black stripe on E-Series models, or the light green wire on Bronco and F-Series and Ranger, Bronco II, Explorer and Aerostar. The difference between the two voltage readings must not exceed 1.5 volts. If voltage is greater, a high resistance exists in the circuit and must be and corrected.

Clutch Switch: Service and Repair

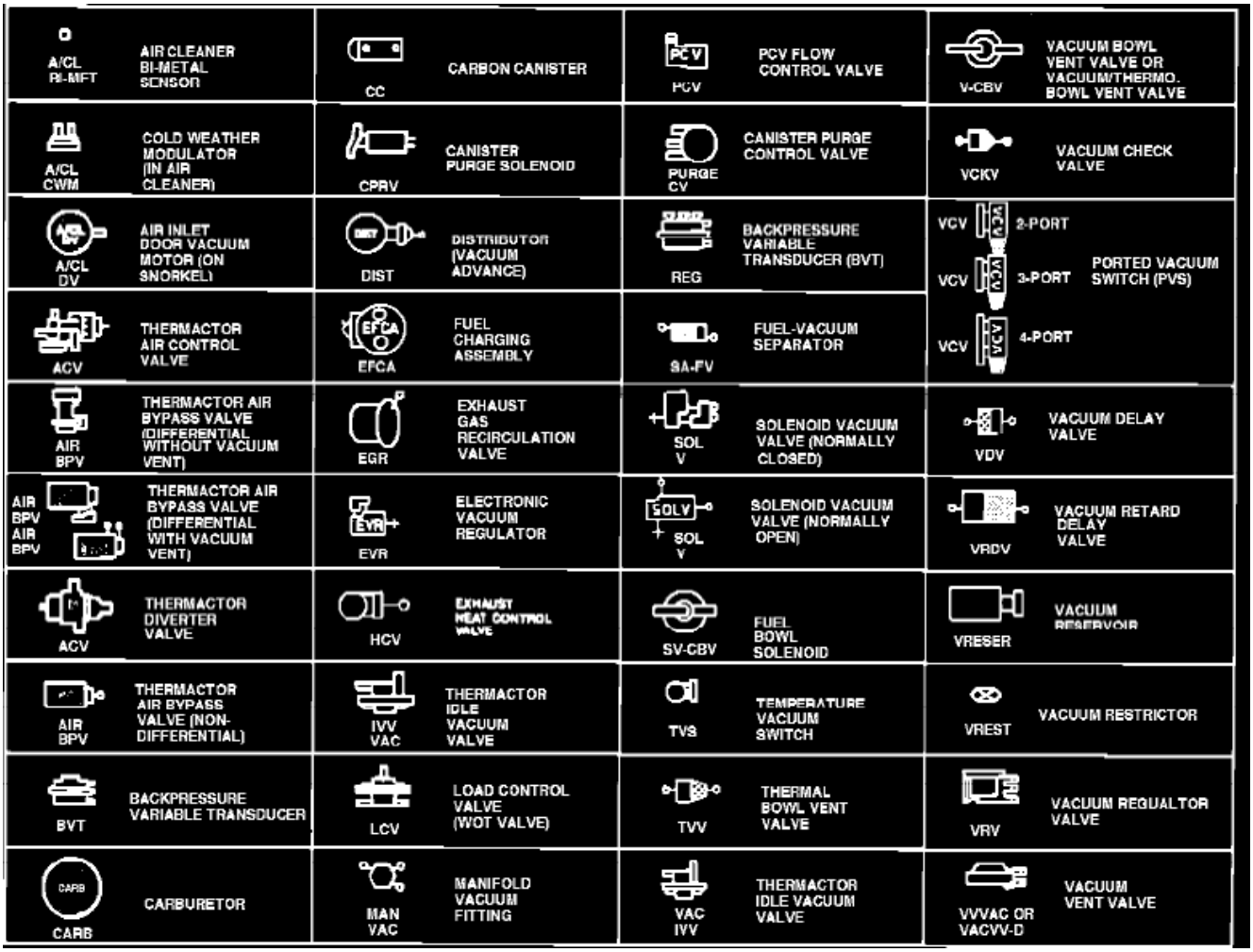
1. Remove bracket mounting screw(s).
2. Disconnect electrical connector and remove switch and bracket assembly.
3. Remove switch from bracket.
4. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Cruise Control > Sensors and Switches - Cruise Control > Cruise Control Switch > Component Information > Diagrams > Diagram Information and Instructions

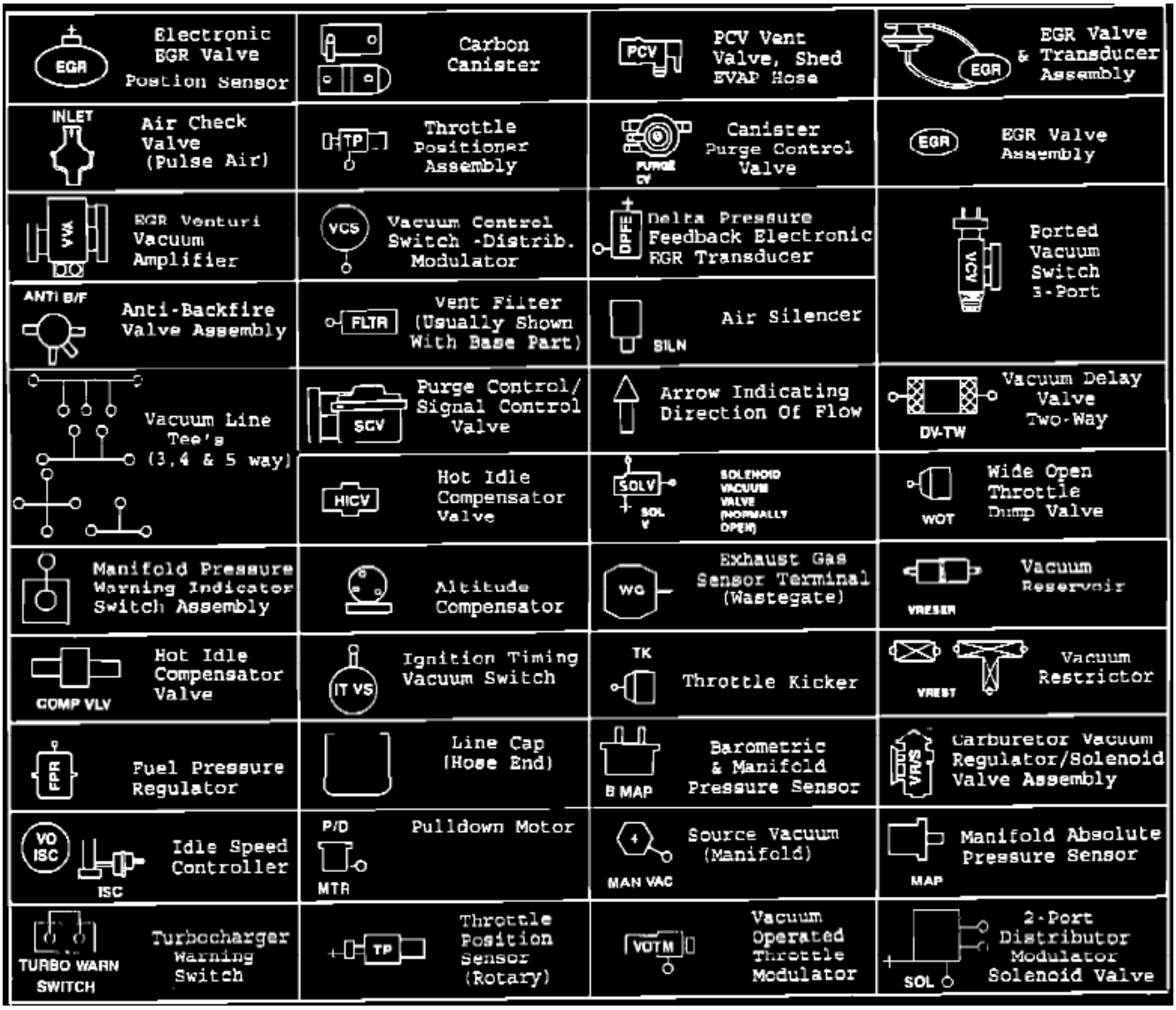


Cruise Control Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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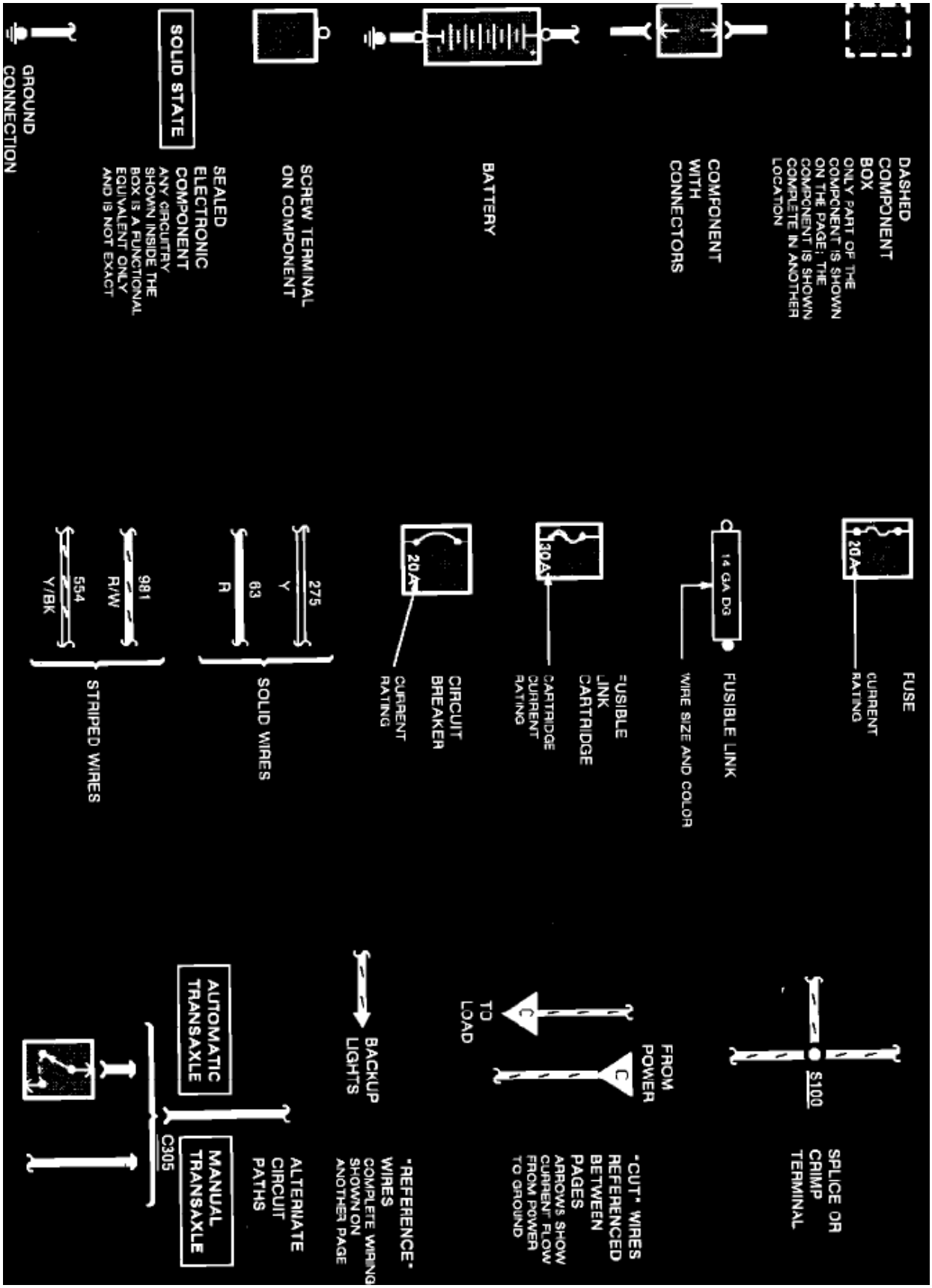
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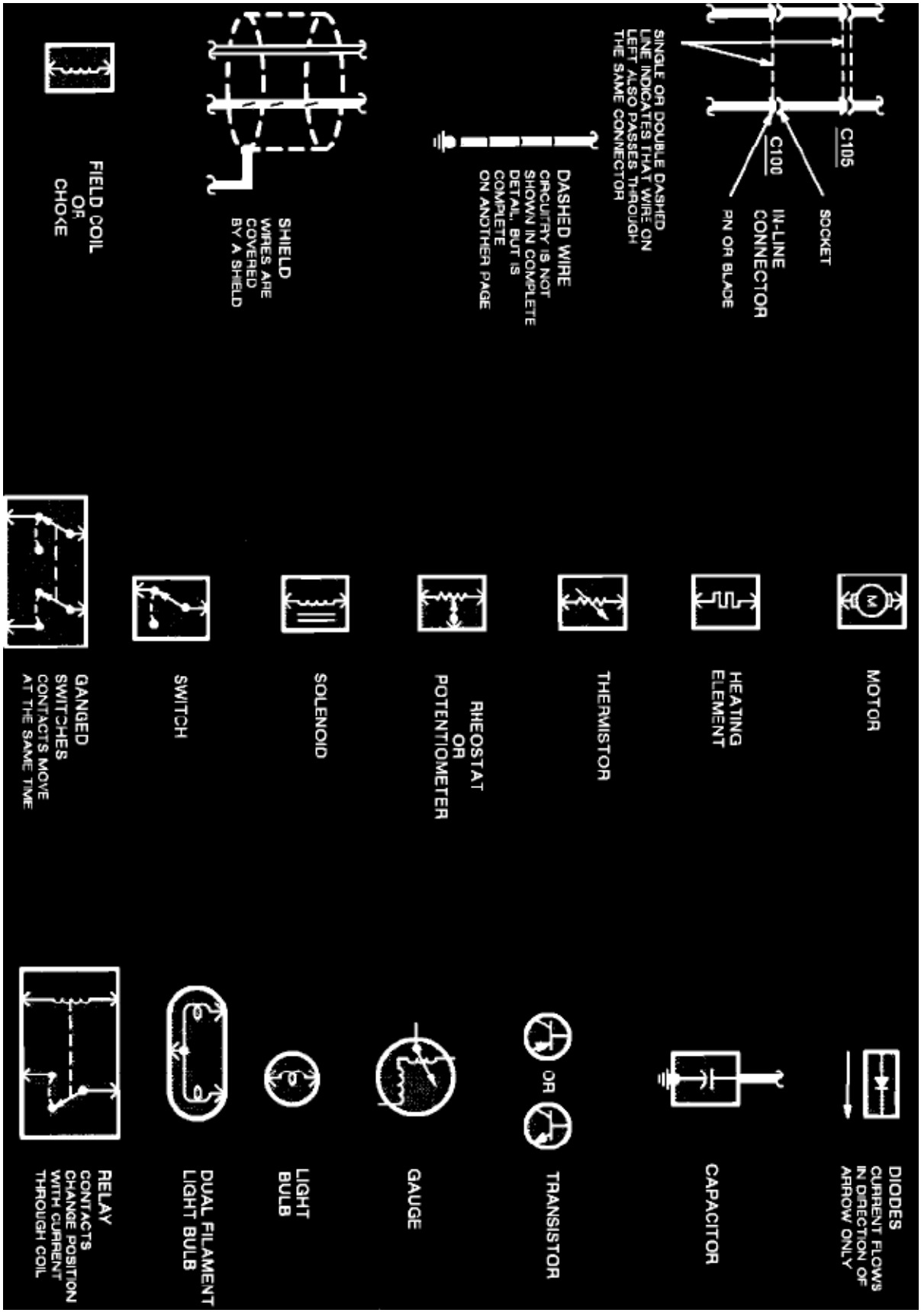
Electrical Symbols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Electrical Symbols

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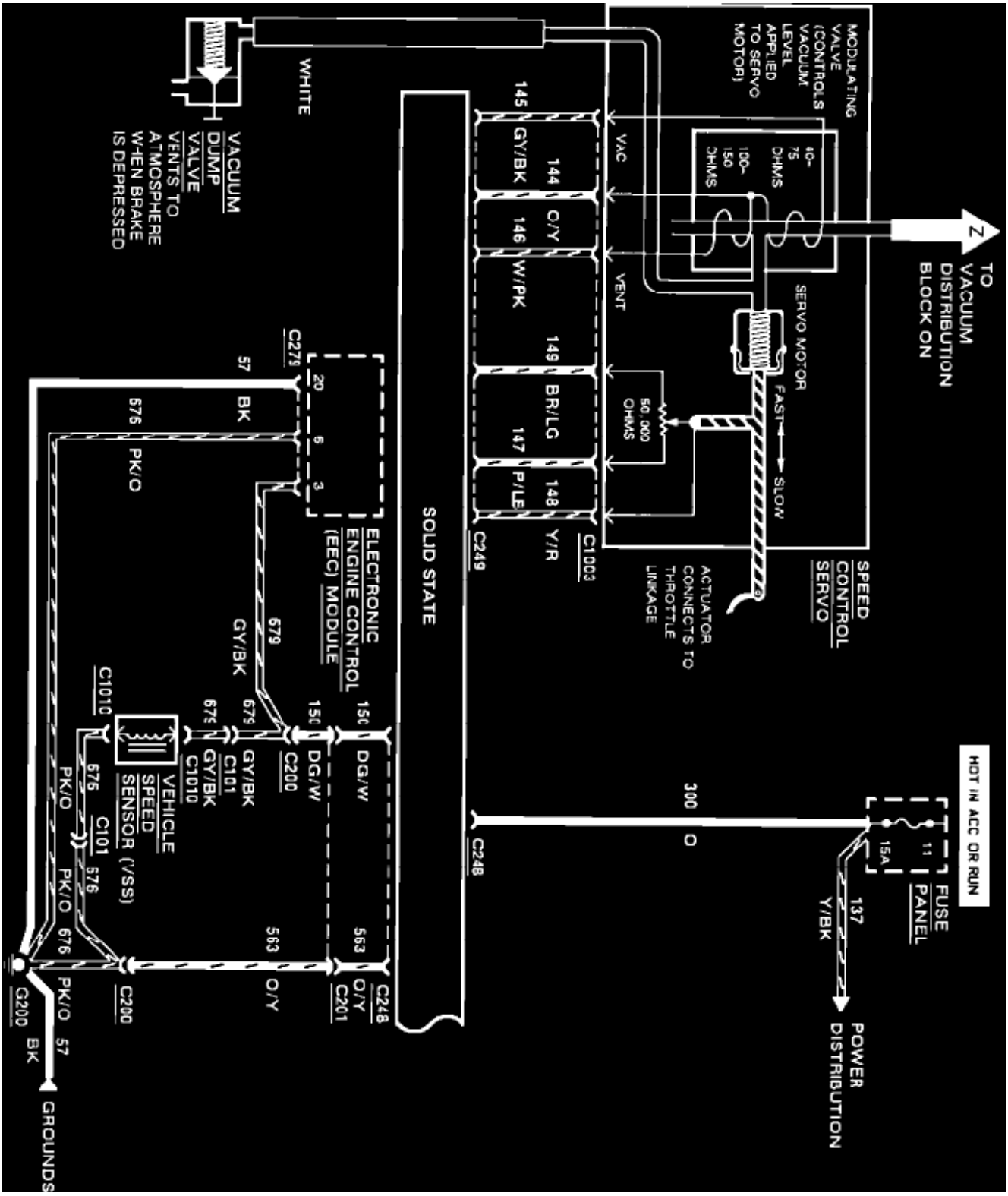
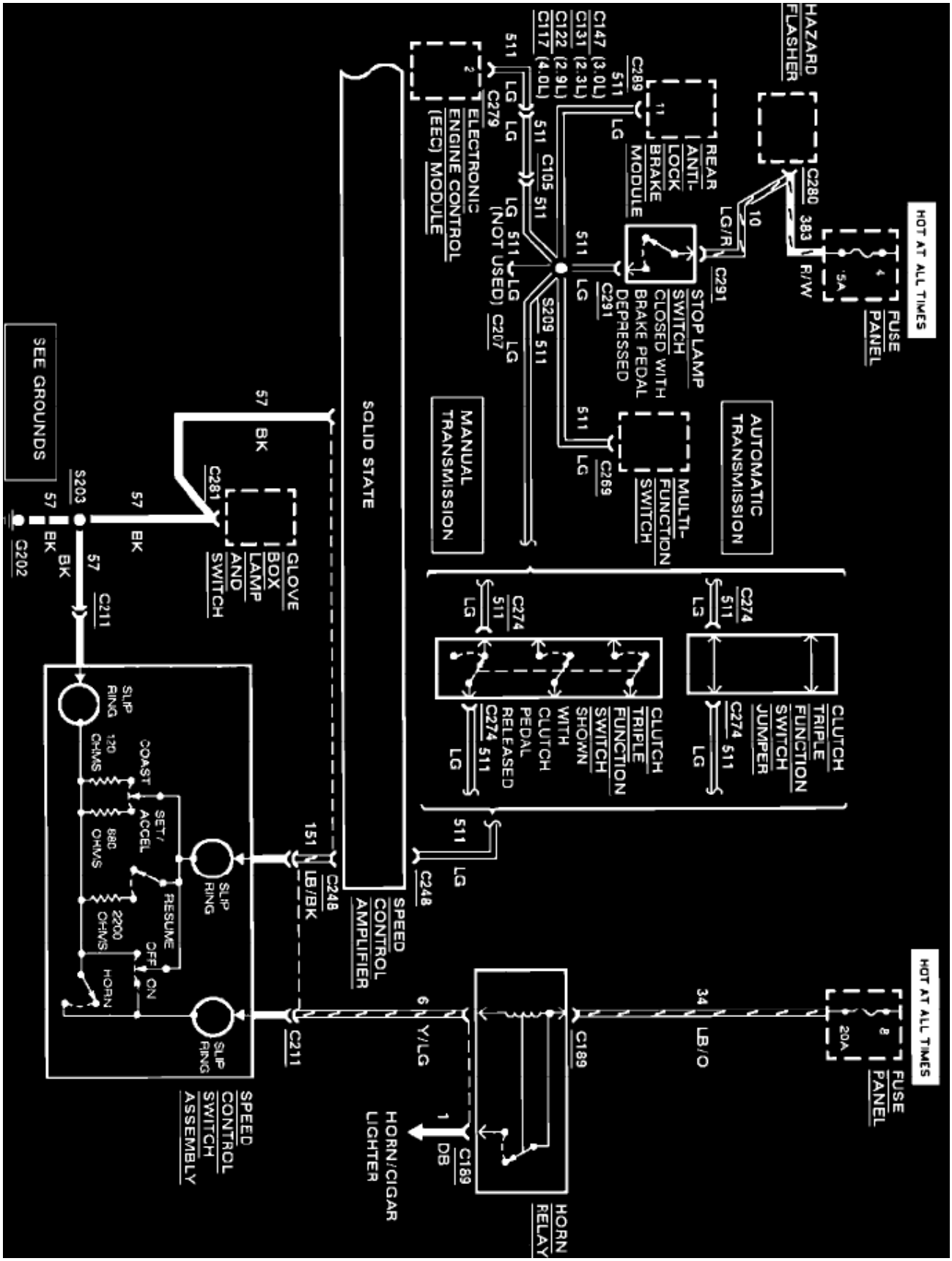


Cruise Control Switch: Electrical Diagrams

Cruise Control

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Cruise Control > Sensors and Switches - Cruise Control > Cruise Control Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 7073



Cruise Control

Cruise Control Switch: Testing and Inspection

1. Apply brake pedal and ensure brake lights operate. If found satisfactory, proceed to step 2. If found unsatisfactory, check stop lamps circuit.

2. Press horn pad to sound horn. If found satisfactory, proceed to step 3. If found unsatisfactory, check horn circuit.

3. Locate 6-pin connector at speed control amplifier.

4. With ignition Off and 6-pin connector still connected to amplifier, connect an ohmmeter between black wire and ground on Ranger, Bronco II, Explorer and Aerostar with mechanical cluster or black-white wire on Aerostar with electronic cluster.

5. Check resistance to ground to ensure amplifier is grounded. If amplifier is not grounded, repair and retest. If amplifier is properly grounded, turn ignition to On position while making the following voltage checks: a.

Check circuit 296 (white/purple wire) on Aerostar models or circuit 302 (dark blue wire) on Bronco II, Explorer and Ranger models. If 12 volts are present, proceed to step b. If not present, check speed control fuse and 296 circuit wire continuity.

b. Apply brake pedal and check circuit 511 (light green wire) for 12 volts on Ranger, Bronco II and Explorer or circuit 810 (red/light green wire) on Aerostar. If 12 volts is not present, check continuity between stop lamp switch and amplifier and repair as necessary. If there is continuity, replace amplifier.

c. Check circuit 151 (light blue/black wire) for approximately 7.8 volts. If 7.8 volts is not present with amplifier properly grounded and 12 volts at circuit 296 white/purple wire on Aerostar models or 302 dark blue wire on Bronco II, Explorer and Ranger models, verified, check for On button sticking. If 12 volts is present or a short circuit to ground on circuit 151 (light blue/black wire) between amplifier and steering column brush assembly. If zero volts is present and both the On button and 151 wire are functioning properly, replace amplifier and repeat test. If 7.8 volts is present, proceed to step 6.

6. Check following voltages between circuit 151 (light blue/black wire) and amplifier ground while rotating the steering wheel with horn pad switch depressed making the following checks: a.

No button pressed, 7.8 volts.

b. On, 12.0 volts.

c. Off, 0.0 volts.

d. Resume, 6.5 volts.

e. Accel, 4.5 volts.

f. Coast, 1.5 volts.

7. If values are incorrect or fluctuate, proceed to Step 8. If values are correct, horn pad switches are operating properly. Proceed to step 17.

8. With ignition Off, disconnect the 6-pin connector from amplifier, then check following resistances between circuit 151 (light blue/black wire) and amplifier ground with horn pad switch depressed while rotating steering wheel. Ohmmeter readings should as follows with switch positions as indicated: a.

Off, 0--1 ohm.

b. Accel, 646-714 ohms,

c. Coast, 114-126 ohms.

d. Resume, 2090-2310 ohms.

9. If values are incorrect or fluctuate, proceed to step 10. If values are correct, replace amplifier and repeat step 4.

10. On models except 1992 Aerostar, remove steering wheel horn pad attaching screws in back cover, then disconnect electrical connectors from wheel.

11. On 1992 Aerostar, disable airbag system as outlined in MAINTENANCE PROCEDURES Remove airbag module, then disconnect clockspring contact electrical connector at upper center area of steering wheel.

12. On all models, connect suitable ohmmeter between circuit 151 (yellow/light blue wire) and circuit 6 (dark/blue wire) on horn pad on all models, except 1992 Aerostar or black wire connector on 1992 Aerostar models. Depress On switch and check for a reading of 0-1 ohms.

12. If reading is not correct, replace switch assembly.

13. Pull steering wheel, then check for continuity of circuit 151 (light blue/black wire) and circuit 57 (black wire) between amplifier 6-pin connector and brush assembly on models except 1992 Aerostar or clockspring on 1992 Aerostar models.

14. If there is no continuity, check for continuity between 3-pin brush assembly wiring connector and brushes or clockspring at steering wheel, then between mating 3-pin connector and amplifier 6-pin connector. Repair or replace brush or clockspring assembly as necessary.

15. If there is continuity for both circuits, clean brush assembly and slip rings in a suitable solvent and lubricate with suitable lubricant.

16. Install wheel and horn pad and repeat step 4.

17. Connect a suitable ohmmeter between circuit 150 (green/white wire) and speed sensor ground circuit 563 (orange/yellow wire) on Ranger, Bronco II and Explorer or 397 (black/white wire) on Aerostar.

18. If resistance is not between 180-250 ohms, check continuity between 6-pin connector at amplifier and 2-pin speed sensor connector at transmission and repair as necessary.

19. If resistance is correct, the speed sensor wiring is functioning properly. Not all speed sensor problems can be identified by a resistance check. Replacement with a known good sensor may be required.

Cruise Control Switch: Service and Repair

1. Remove steering wheel pad attaching screws from behind steering wheel.

2. While pulling pad away from steering wheel, disconnect horn and speed control wire connectors and remove pad.

3. Remove retaining nuts securing the speed control switches and trim plate retainer to the steering wheel pad.

4. Disconnect wiring connector on rear of steering wheel pad assembly, then remove switch and trim retainer assembly.

5. Remove speed control switches by snapping out of plastic retainer.

6. To remove the ground brush, remove steering wheel for access.

7. Snap the ground brush assembly out of the turn signal switch.

8. Reverse procedure to install.

Vehicle Speed Sensor/Transducer - Cruise Control: Testing and Inspection

1. Disconnect speed sensor connector, then connect an ohmmeter between dark green/white and black wires.

2. A reading of 180-250 ohms should be obtained. A reading of 0 ohms indicates a shorted coil and an infinity reading indicates an open coil.

3. Replace sensor if a proper reading has not been obtained.

Vehicle Speed Sensor/Transducer - Cruise Control: Testing and Inspection

1. Disconnect speed sensor connector, then connect an ohmmeter between dark green/white and black wires.

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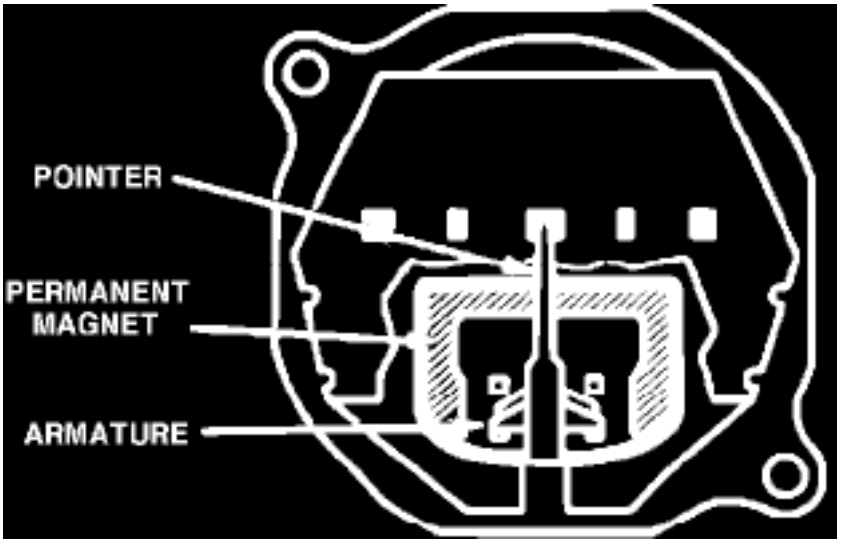


Ammeter Gauge: Description and Operation

The ammeter is an instrument used to indicate current flow into and out of the battery. When electrical accessories in the vehicle draw more current than the alternator can supply, current flows from the battery and the ammeter indicates a discharge (-) condition. When electrical loads of the vehicle are less than alternator output, current is available to charge the battery, and the ammeter indicates a charge (+) condition. If battery is fully charged, the voltage regulator reduces alternator output to meet only immediate vehicle electrical loads. When this happens, ammeter reads zero.

CONVENTIONAL AMMETER

Fig. 1 Conventional Type Ammeter

A conventional ammeter must be connected between battery and alternator in order to indicate current flow. This type ammeter, Fig. 1, consists of a frame to which a permanent magnet is attached. The frame also supports an armature and pointer assembly. Current in this system flows from the alternator through the ammeter, then to the battery or from the battery through the ammeter into the vehicle electrical system, depending on vehicle operating conditions. When no current flows through the ammeter, the magnet holds the pointer armature so that the pointer stands at the center of the dial. When current passes in either direction through the ammeter, the resulting magnetic field attracts the armature away from the effect of the permanent magnet, thus giving a reading proportional to the strength of the current flowing.

SHUNT TYPE AMMETER

The shunt type ammeter is actually a specifically calibrated voltmeter. It is connected to read voltage drop across a resistance wire (shunt) between the battery and alternator. The shunt is located either in the vehicle wiring or within the ammeter itself. When voltage is higher at the alternator end of the shunt, the meter indicates a charge (+) condition. When voltage is higher at the battery end of the shunt, the meter indicates a discharge (-) condition. When voltage is equal at both ends of the shunt, the meter reads zero.

Ammeter Gauge: Testing and Inspection

CONVENTIONAL AMMETER

When the ammeter apparently fails to register correctly, there may be trouble in the wiring which connects the ammeter to the alternator and battery or in the alternator or battery itself. To check the connections, first tighten the two terminal posts on the back of the ammeter. Then, following each wire from the ammeter, tighten all connections on the ignition switch, battery and alternator. Chafed, burned or broken insulation can be found by following each ammeter wire from end to end. All wires with chafed, burned or broken insulation should be repaired or replaced. After this is done, and all connections are tightened, connect the battery cable and turn on the ignition switch. The needle should point slightly to the discharge (-) side. Start the engine and run slightly above idling speed. The needle should move slowly to the charge side (+). If the pointer does not move as indicated, the ammeter is out of order and should be replaced.

SHUNT TYPE AMMETER

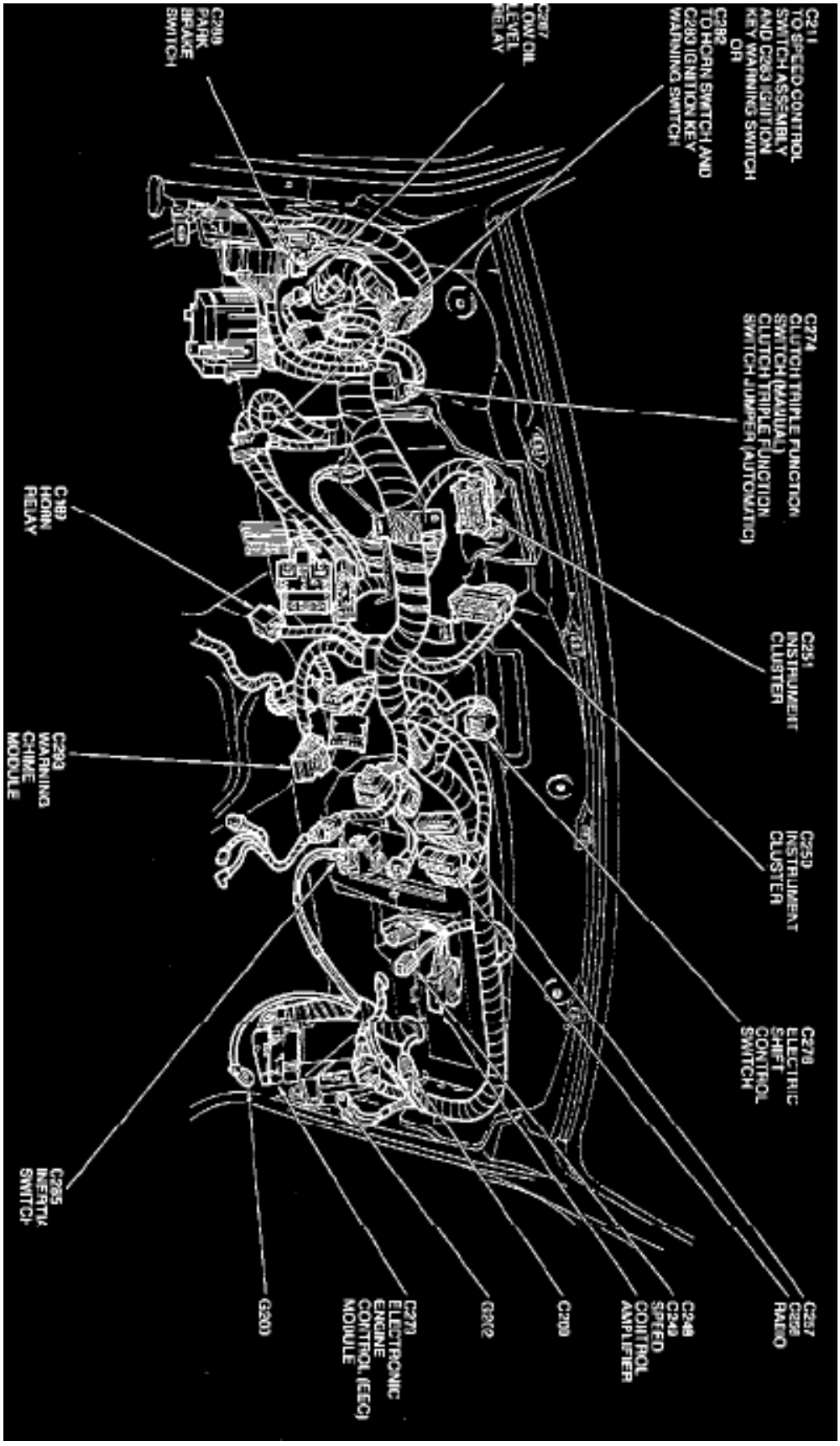
Ammeter accuracy can be determined by comparing reading with an ammeter of known accuracy.

1. With engine stopped and ignition switch in RUN position, switch on headlamps and heater fan. Meter should indicate a discharge (-) condition.

2. If ammeter pointer does not move, check ammeter terminals for proper connection and check for open circuit in wiring harness. If connections and wiring harness are satisfactory, ammeter is defective.

3. If ammeter indicates a charge (+) condition, wiring harness connections are reversed at ammeter.

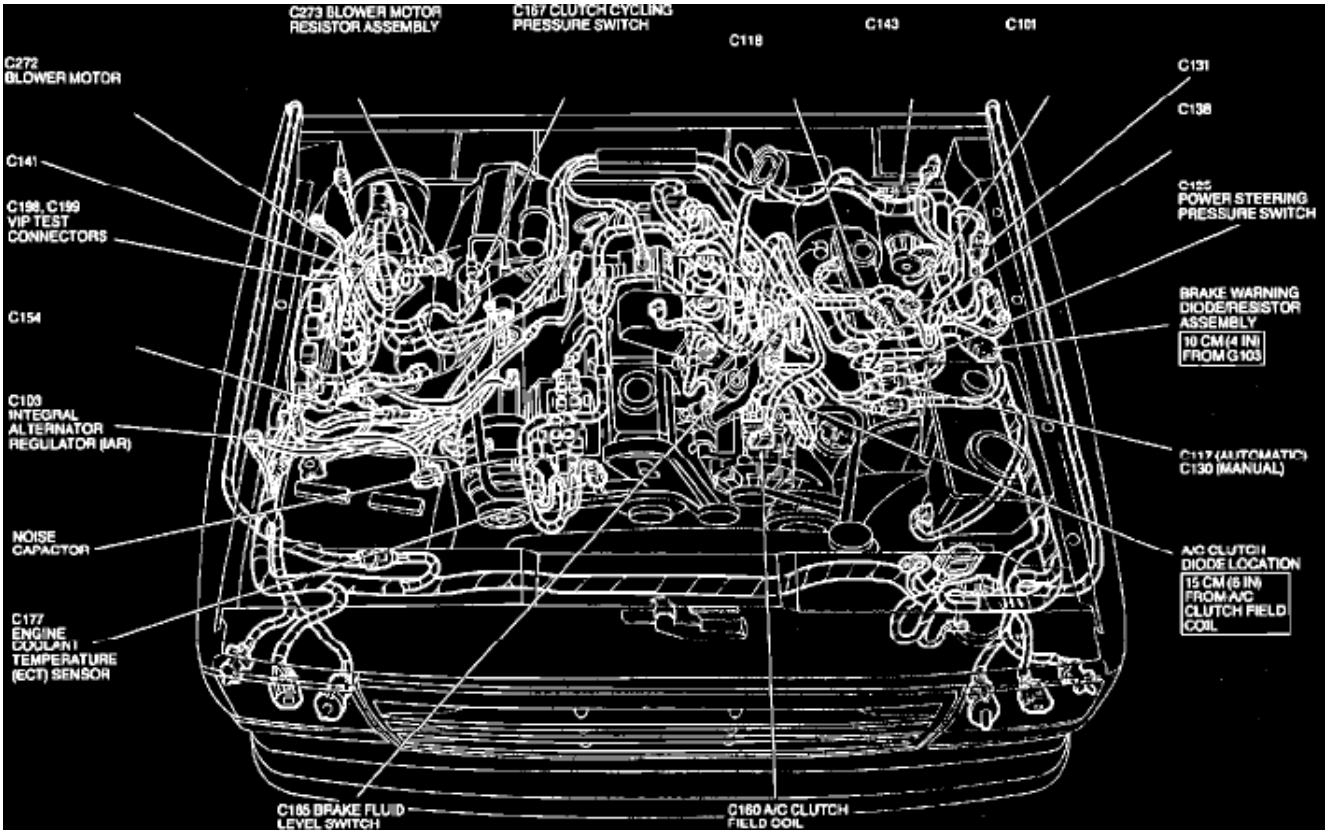
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Audible Warning Device Control Module > Component Information > Locations



Audible Warning Device Control Module: Locations

I/P Components

Behind Center Of I/P, Below Ashtray Assembly



Brake Warning Indicator: Locations

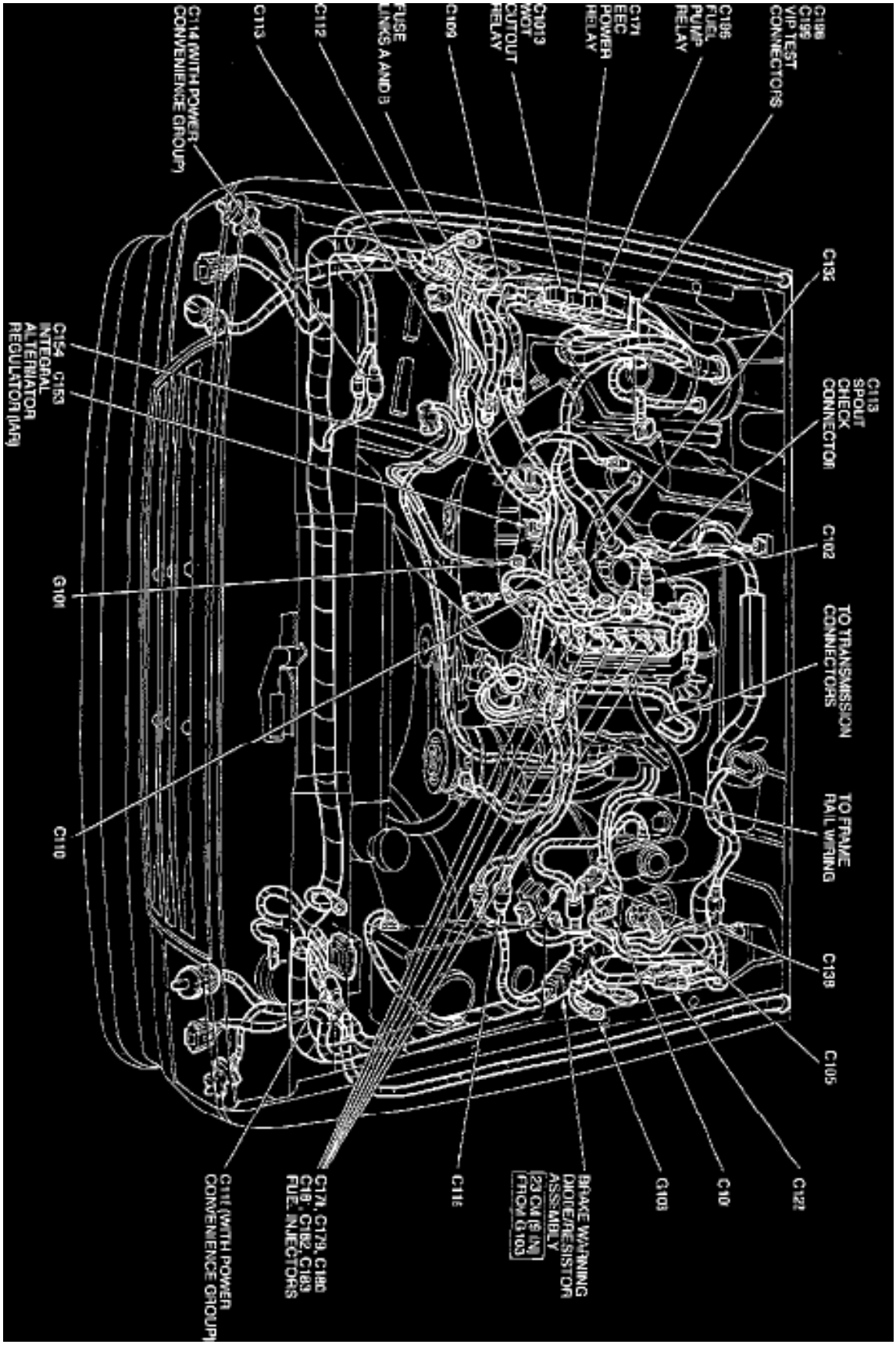
BRAKE INDICATOR RESISTOR/DIODE ASSEMBLY

Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

Applicable to: 2.3L/4-140

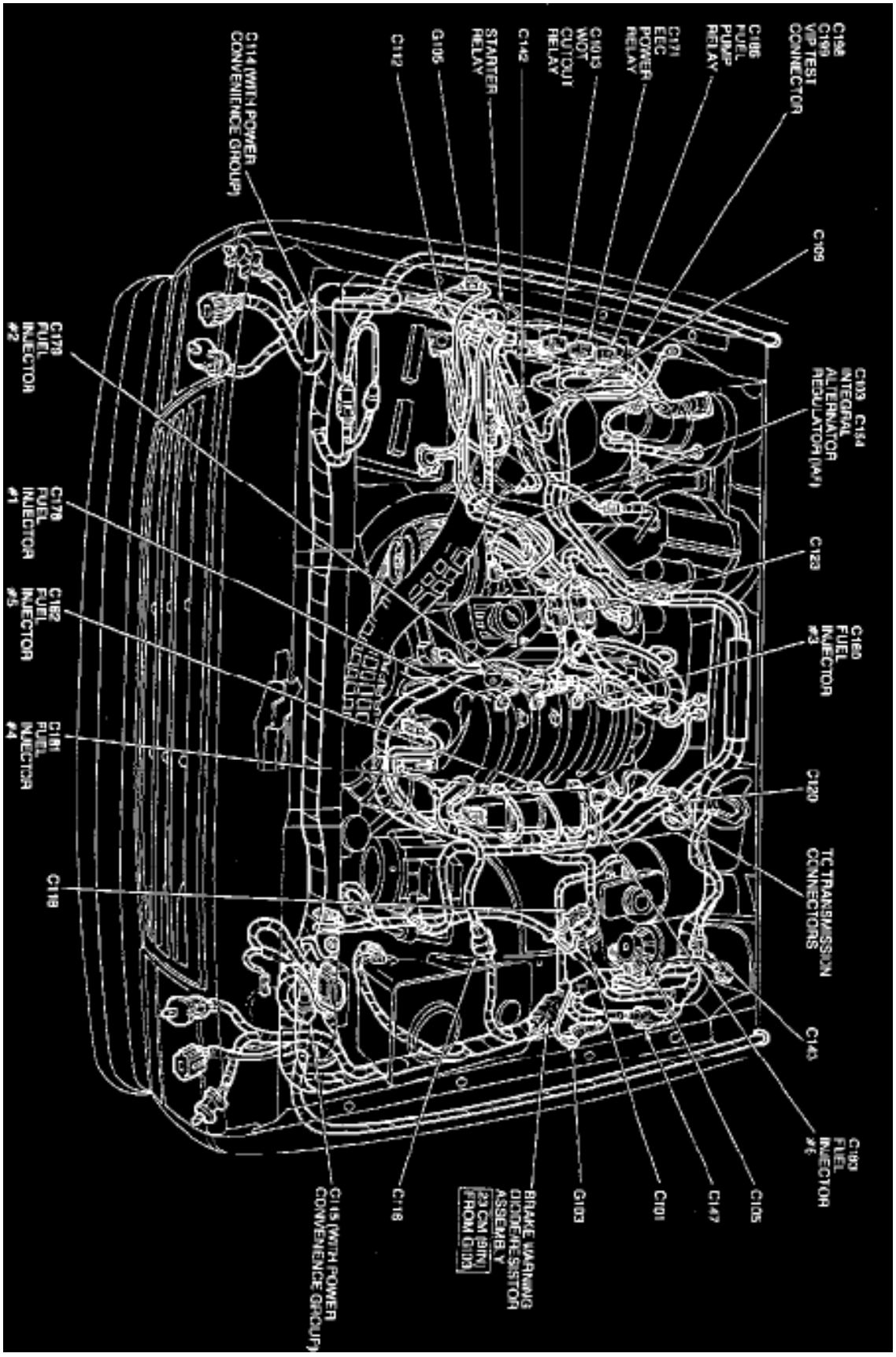
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Brake Warning Indicator > Component Information > Locations > Page 7093



Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

Applicable to: 2.9L/V6-179

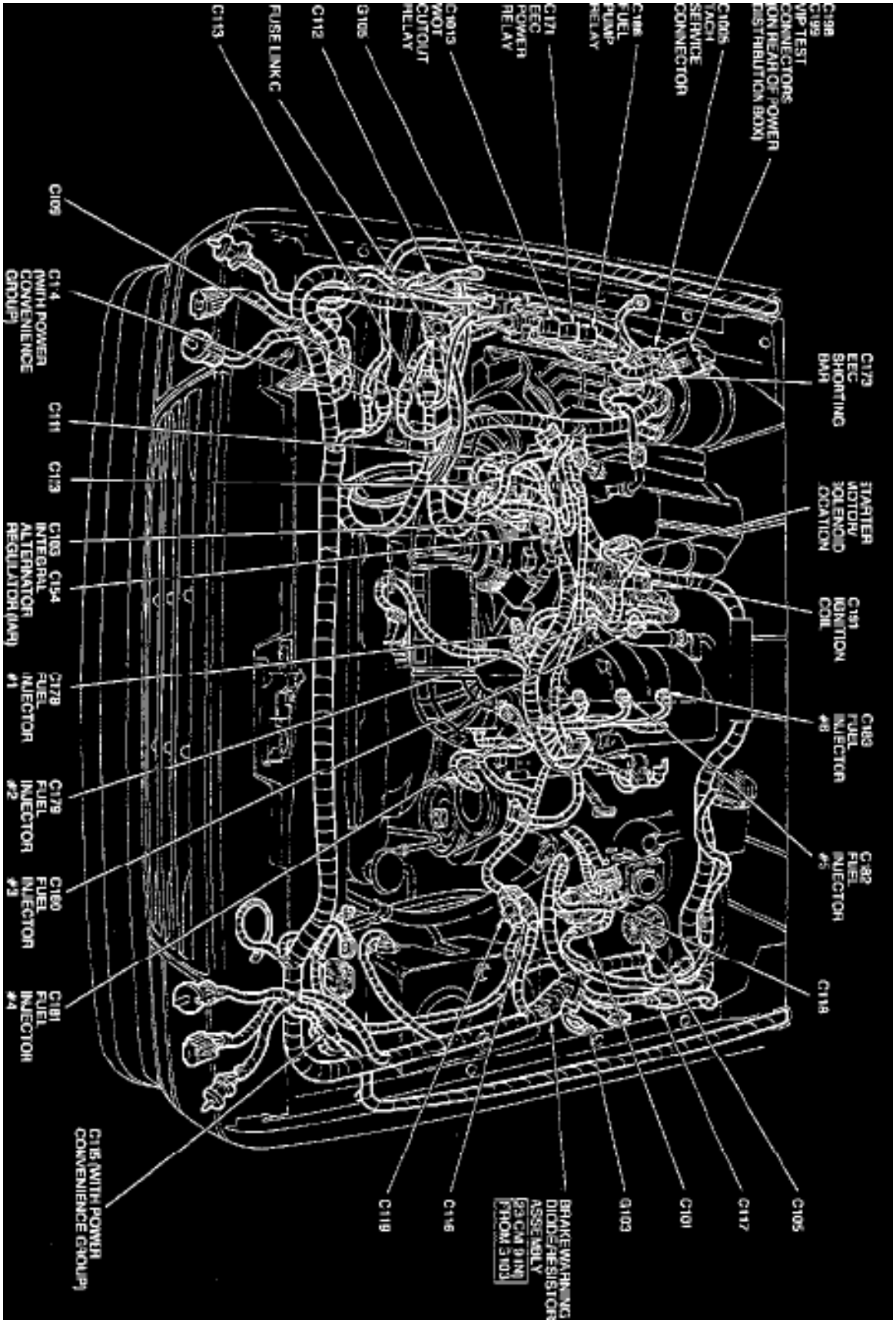

C158
C199
VIP TEST
CONNECTOR
C186
FUEL
PUMP
RELAY
C171
EEC
POWER
RELAY
C1013
WOT
CUTOUT
RELAY
C142
STARTER
RELAY
G105
C112
C114 (WITH POWER
CONVENIENCE GROUP)
C109
C103 C154
INTEGRAL
ALTERNATOR
REGULATOR (IAR)
C123
C160
FUEL
INJECTOR
#3
C120
TC TRANSMISSION
CONNECTORS
C145
C193
FUEL
INJECTOR
#6
C178
FUEL
INJECTOR
#1
C179
FUEL
INJECTOR
#2
C182
FUEL
INJECTOR
#5
C181
FUEL
INJECTOR
#4
C118
C105
C147
C101
G103
C118
BRAKE WARNING
DIODE/RESISTOR
ASSEMBLY
23 CM (9IN)
FROM G103
C115 (WITH POWER
CONVENIENCE GROUP)

Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

Applicable to: 3.0L/V6-181

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Brake Warning Indicator > Component Information > Locations > Page 7095

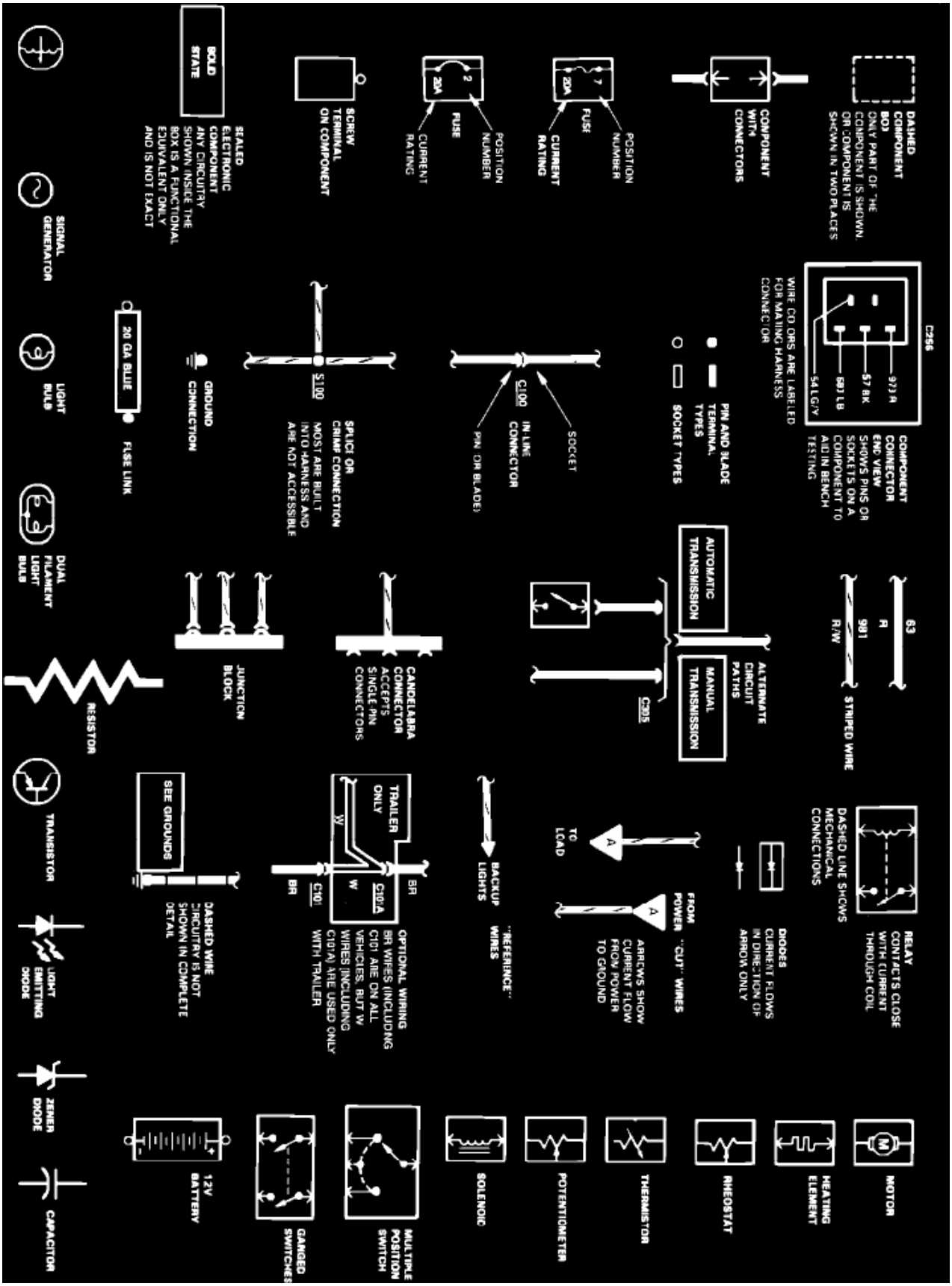


Engine Compartment Components.

LH Side Of Engine Compartment, Above Wheelwell, Taped In Harness

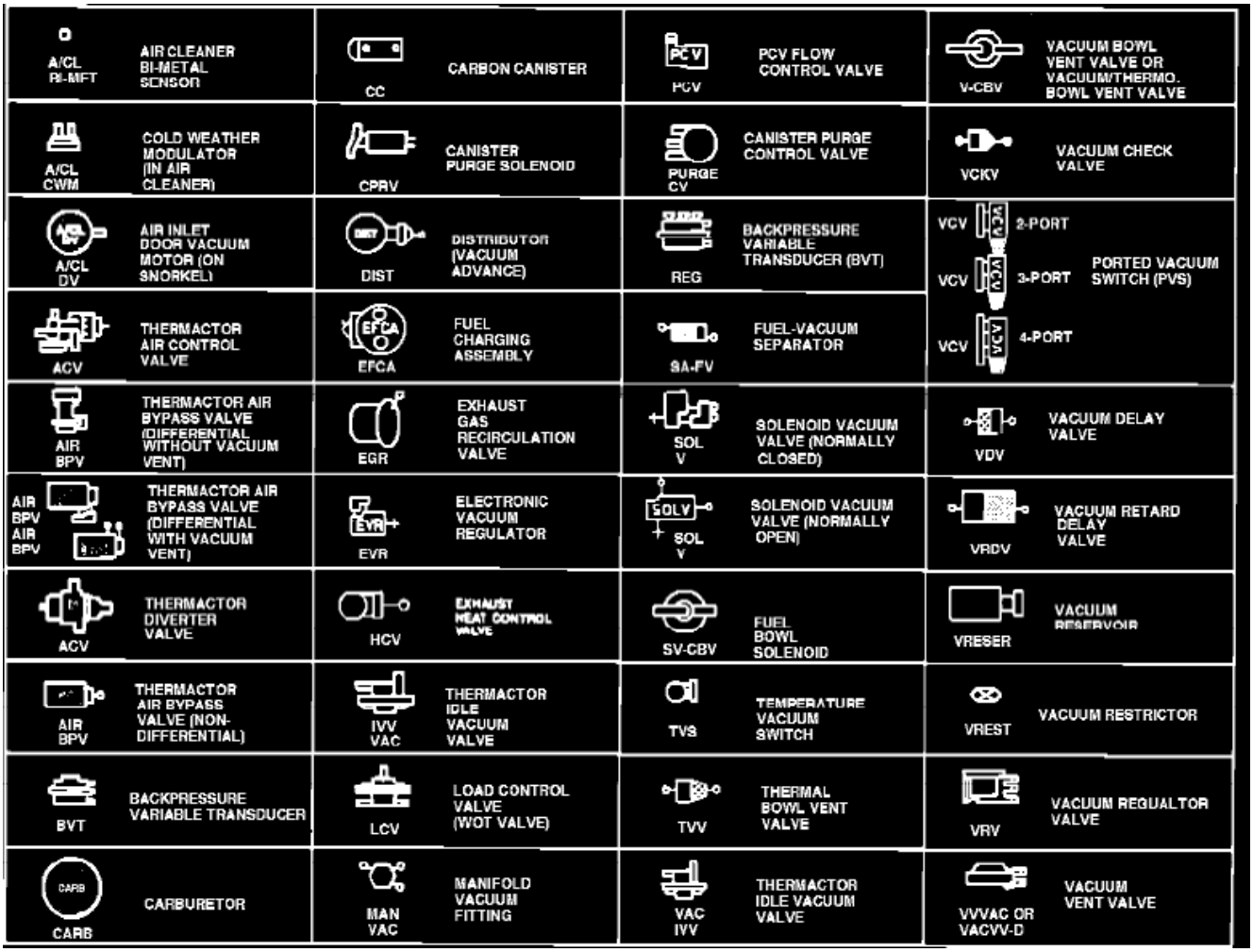
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Cigarette Lighter > Component Information > Diagrams > Diagram Information and Instructions

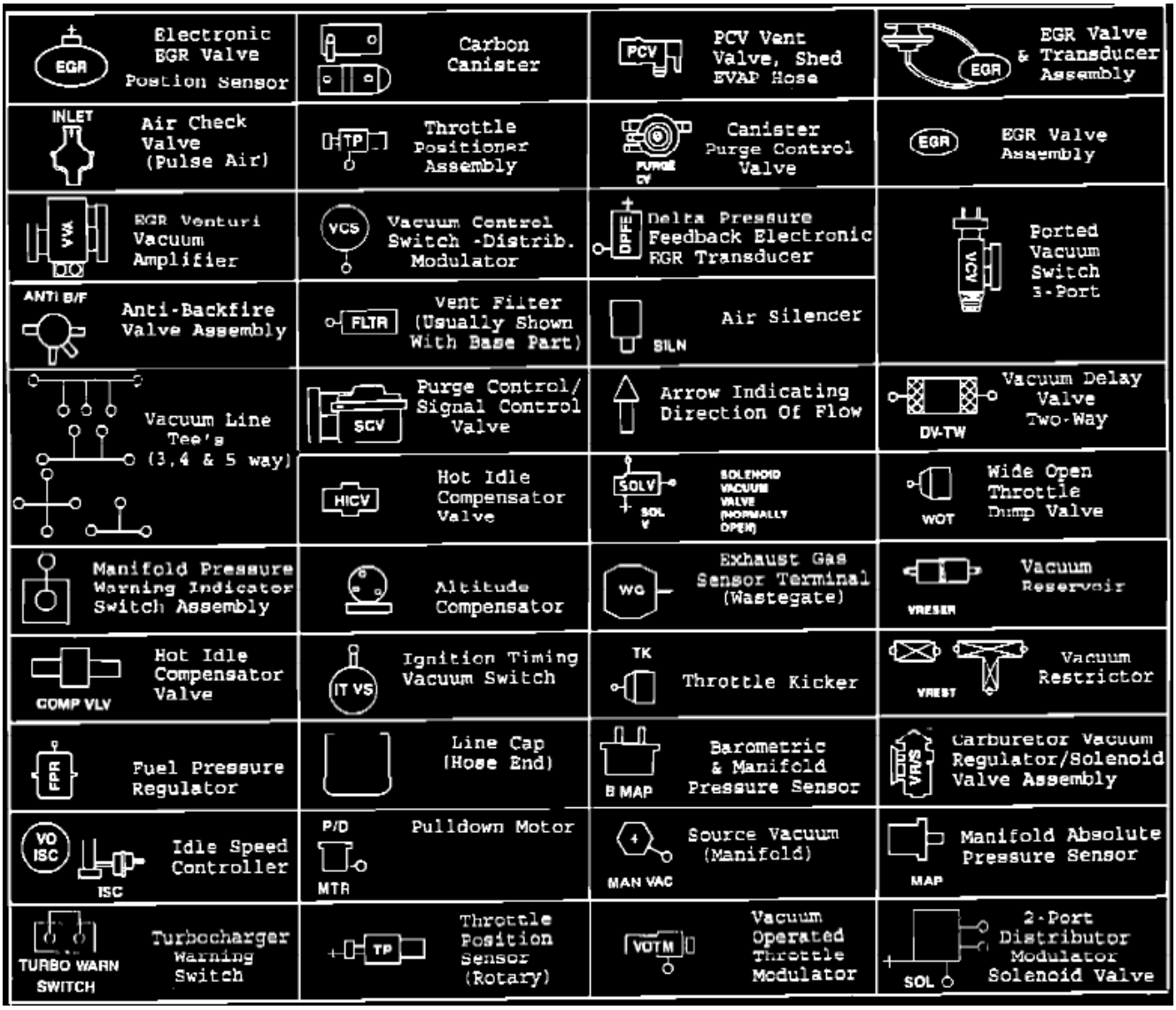


Cigarette Lighter: Diagram Information and Instructions

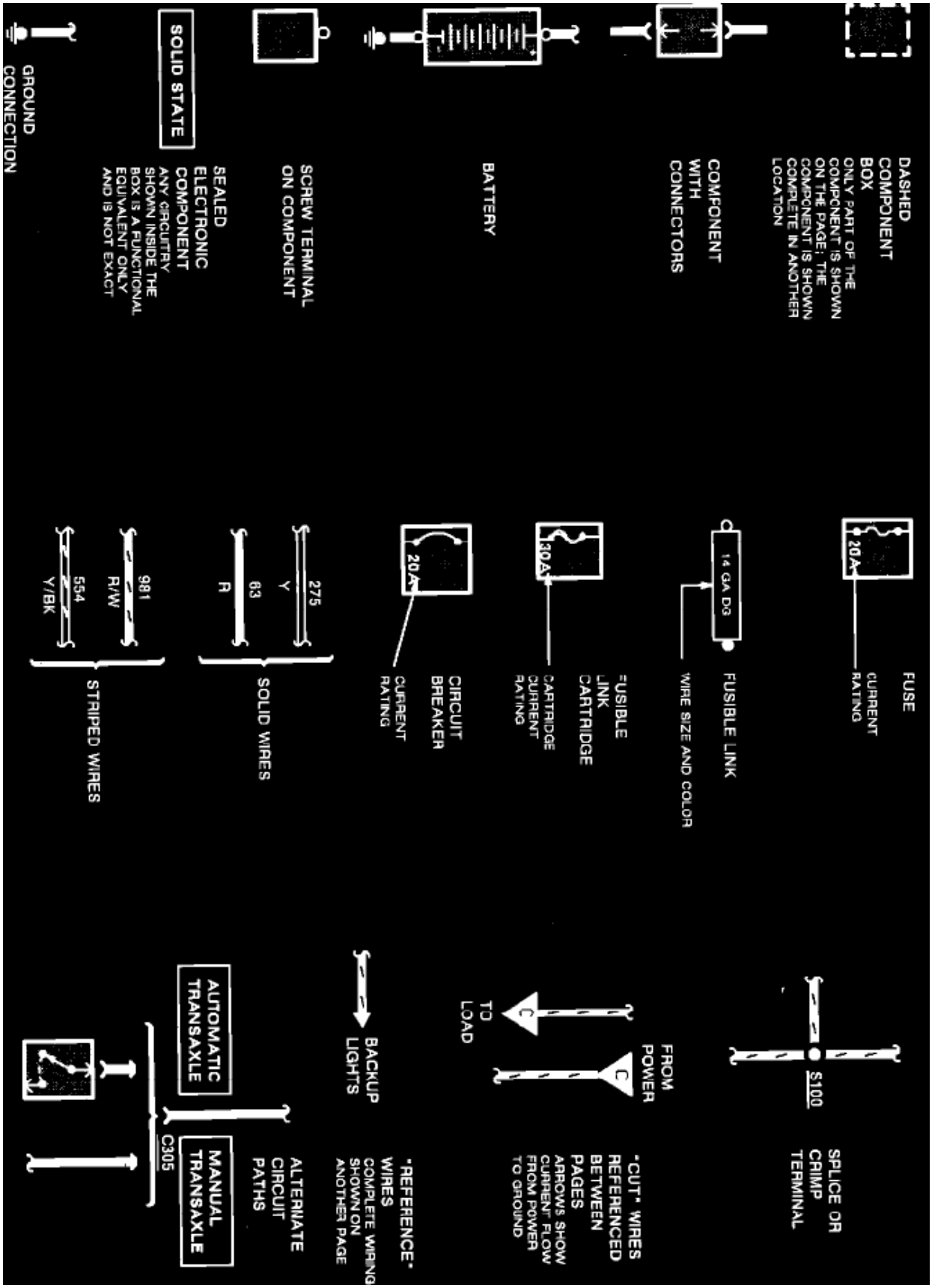
Symbol Identification



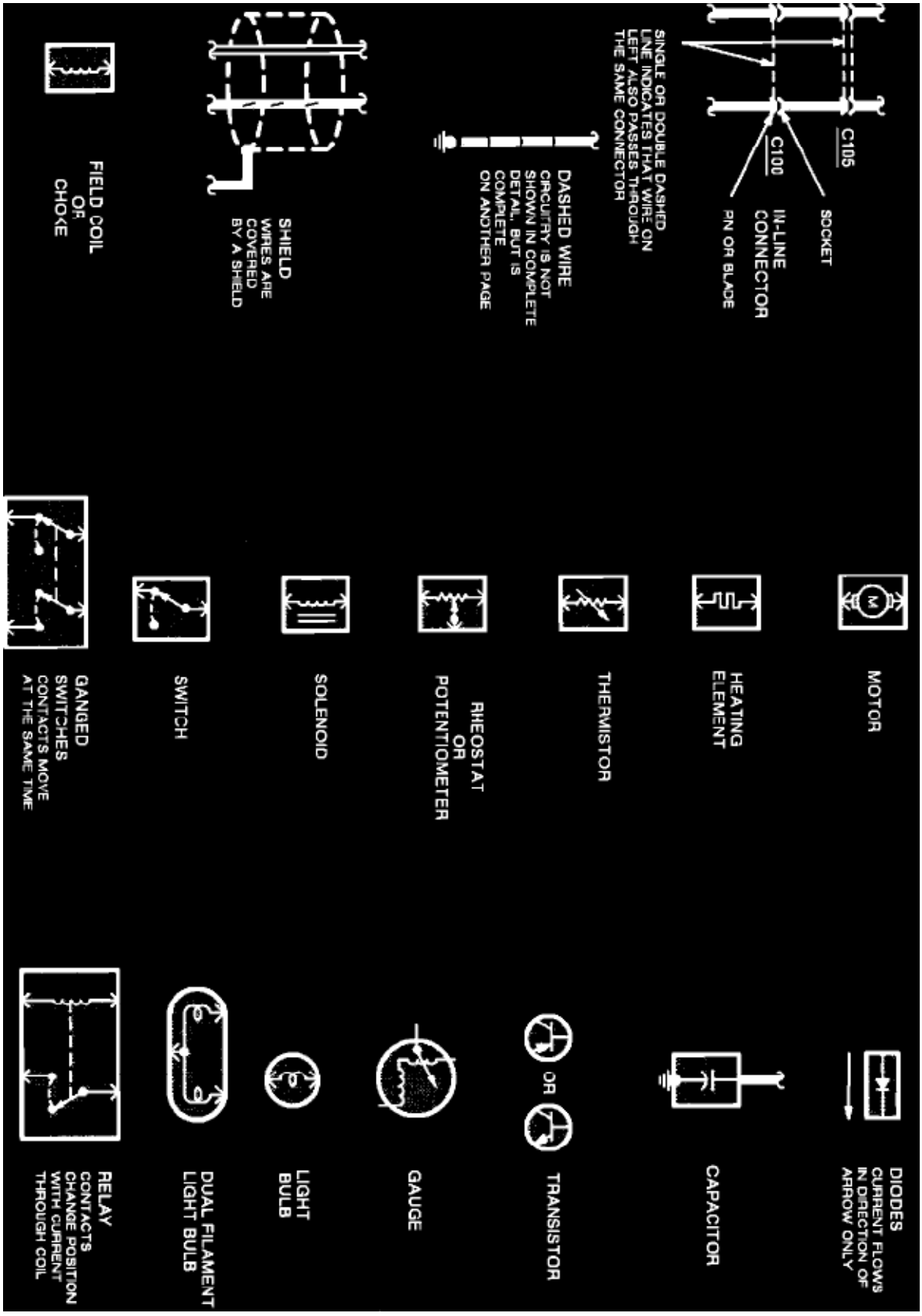
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
TO LOAD
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

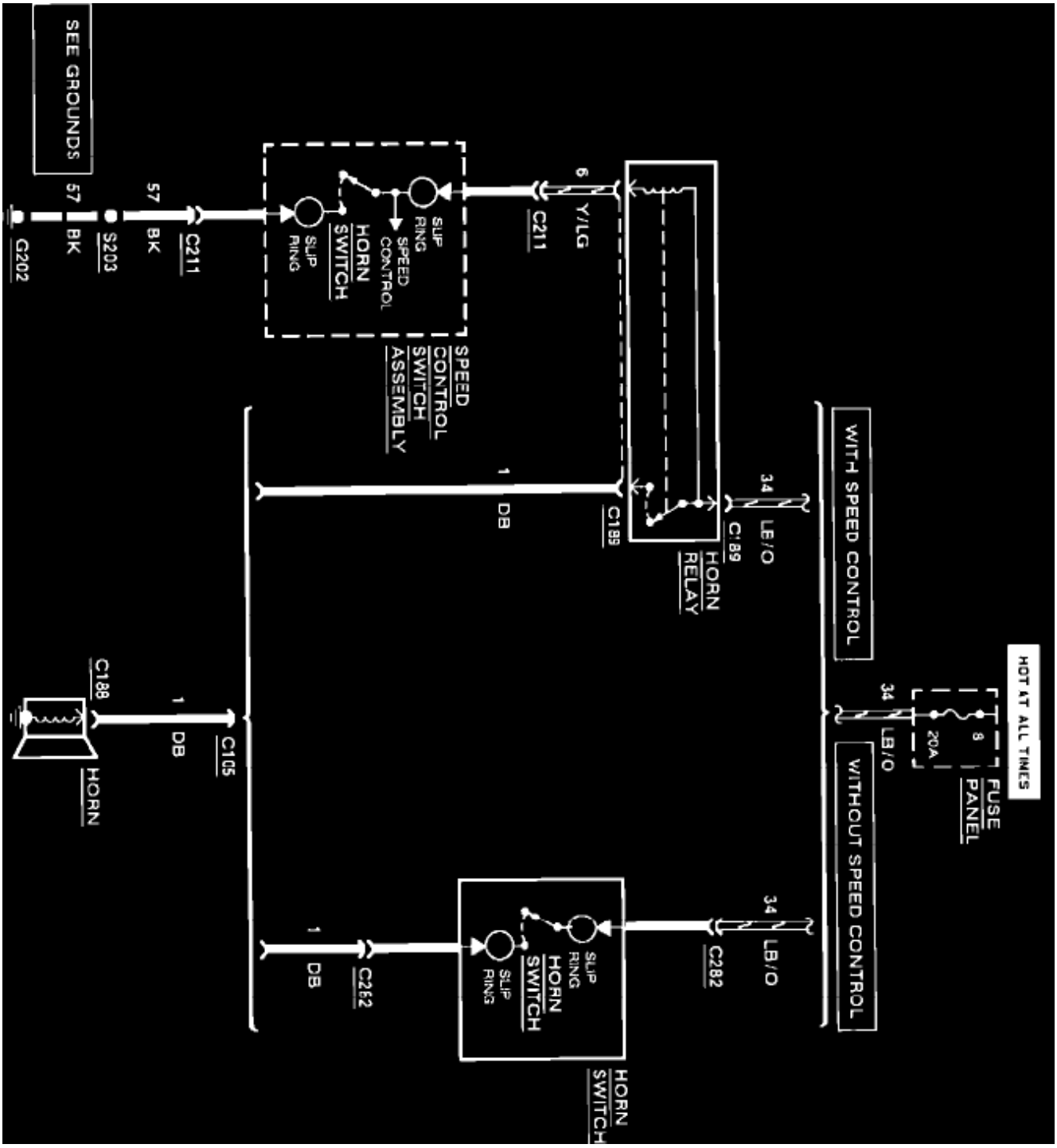
P: Purple

T: Tan

V: Violet

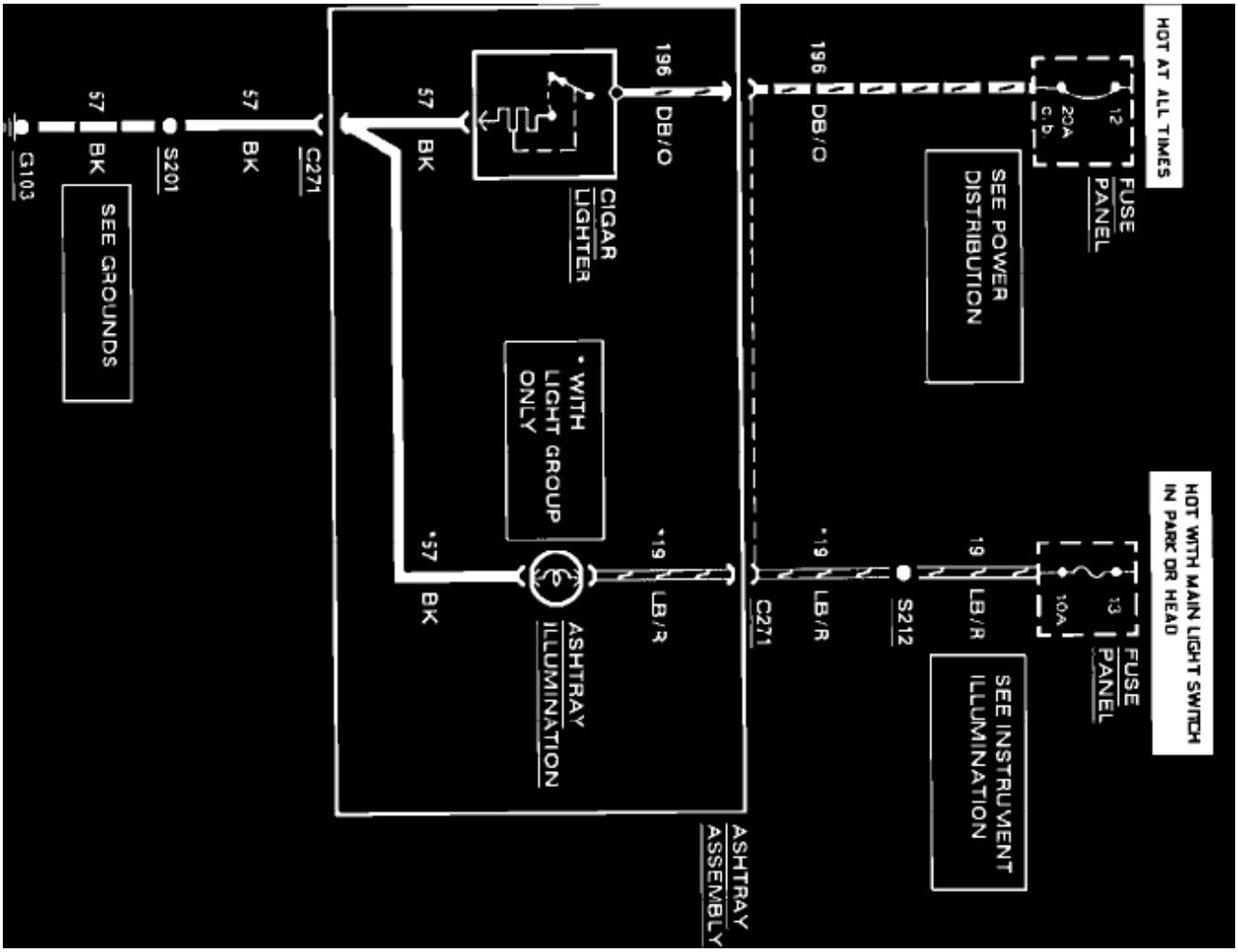
W: White

Y: Yellow



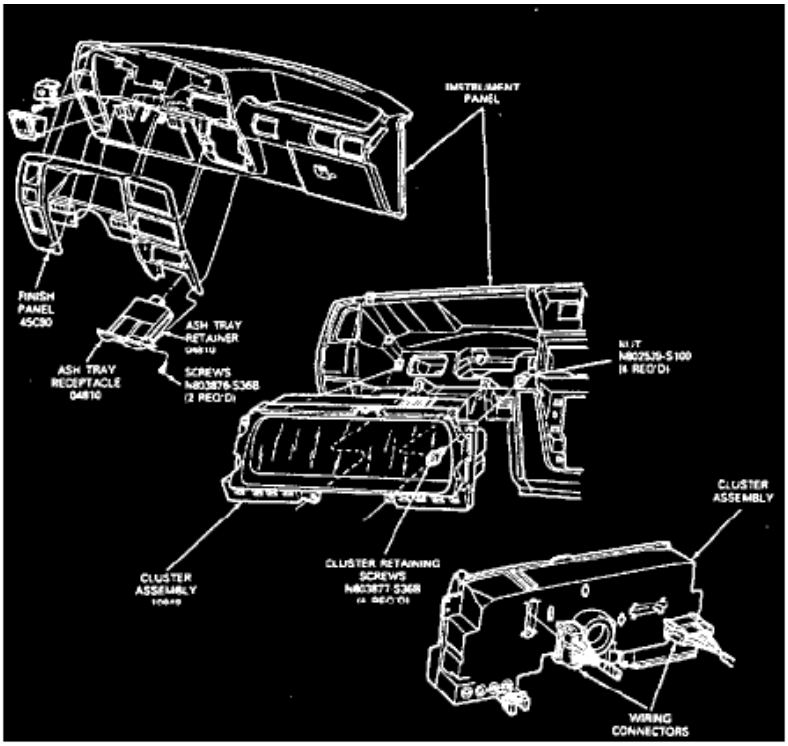
Cigarette Lighter: Electrical Diagrams

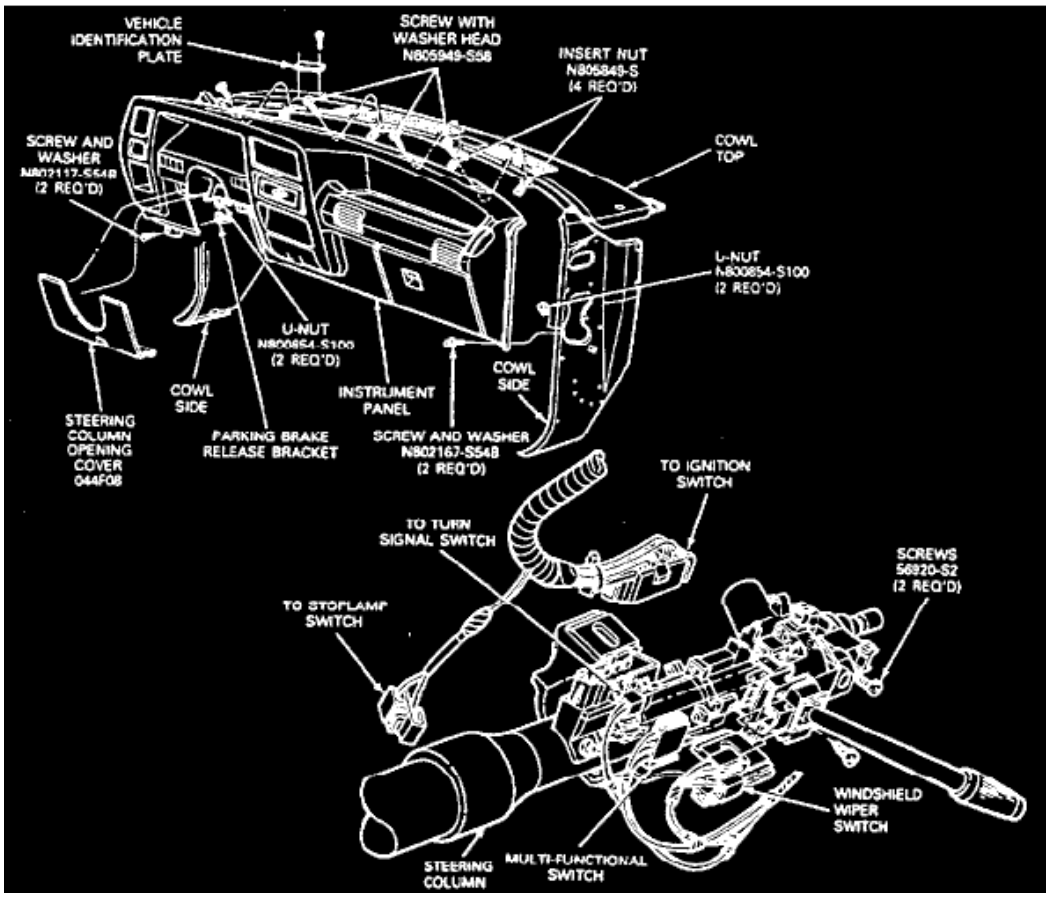
Horn/Cigar Lighter



Horn/Cigar Lighter

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Dashboard / Instrument Panel > Component Information > Service and Repair





Dashboard / Instrument Panel: Service and Repair

Fig 10. Exploded View Of Instrument Panel & Cluster, 1988-91 Bronco II, Explorer & Ranger.

Fig. 11 Exploded View Of Instrument Panel & Steering Coluum Connectors, 1988-91 Bronco II, Explorer & Ranger.

1. Disconnect negative battery cable. 2. Remove ashtray and retainer assembly, Fig. 10. 3. Remove cluster finish panel by unsnapping retainers.

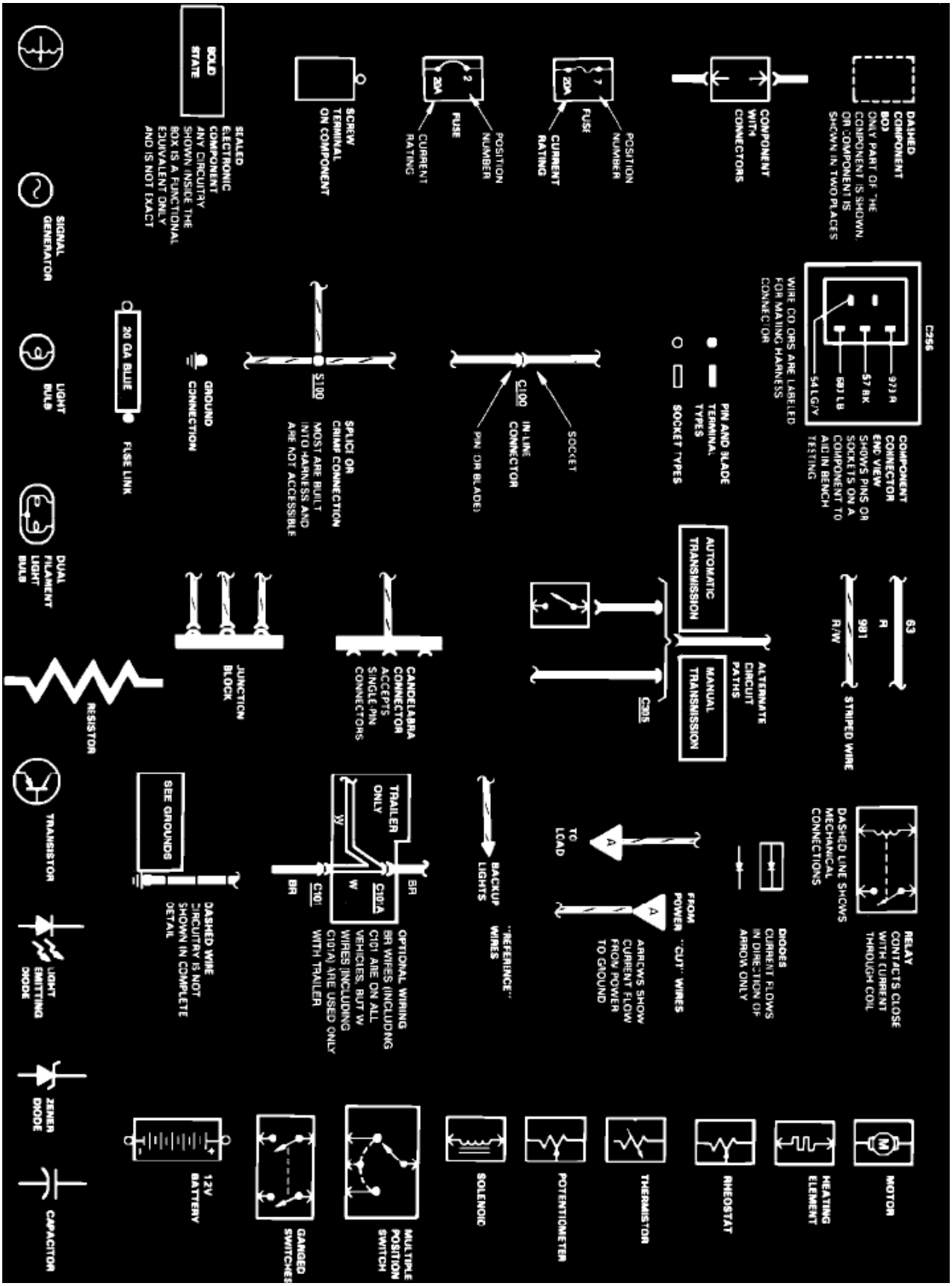
4. Remove cluster retaining screws Fig. 10. 5. Pull cluster rearward, then disconnect speedometer cable and electrical connectors. It may be necessary to disconnect the speedometer cable from

the transmission and wiring harness in the engine corn partment

6. Remove cluster. 7. Remove steering column opening cover, then remove the instrument panel to brake and clutch pedal support attaching screw. 8. Remove steering column upper and lower shrouds. 9. Disconnect wiring from steering column switches, Fig. 11.

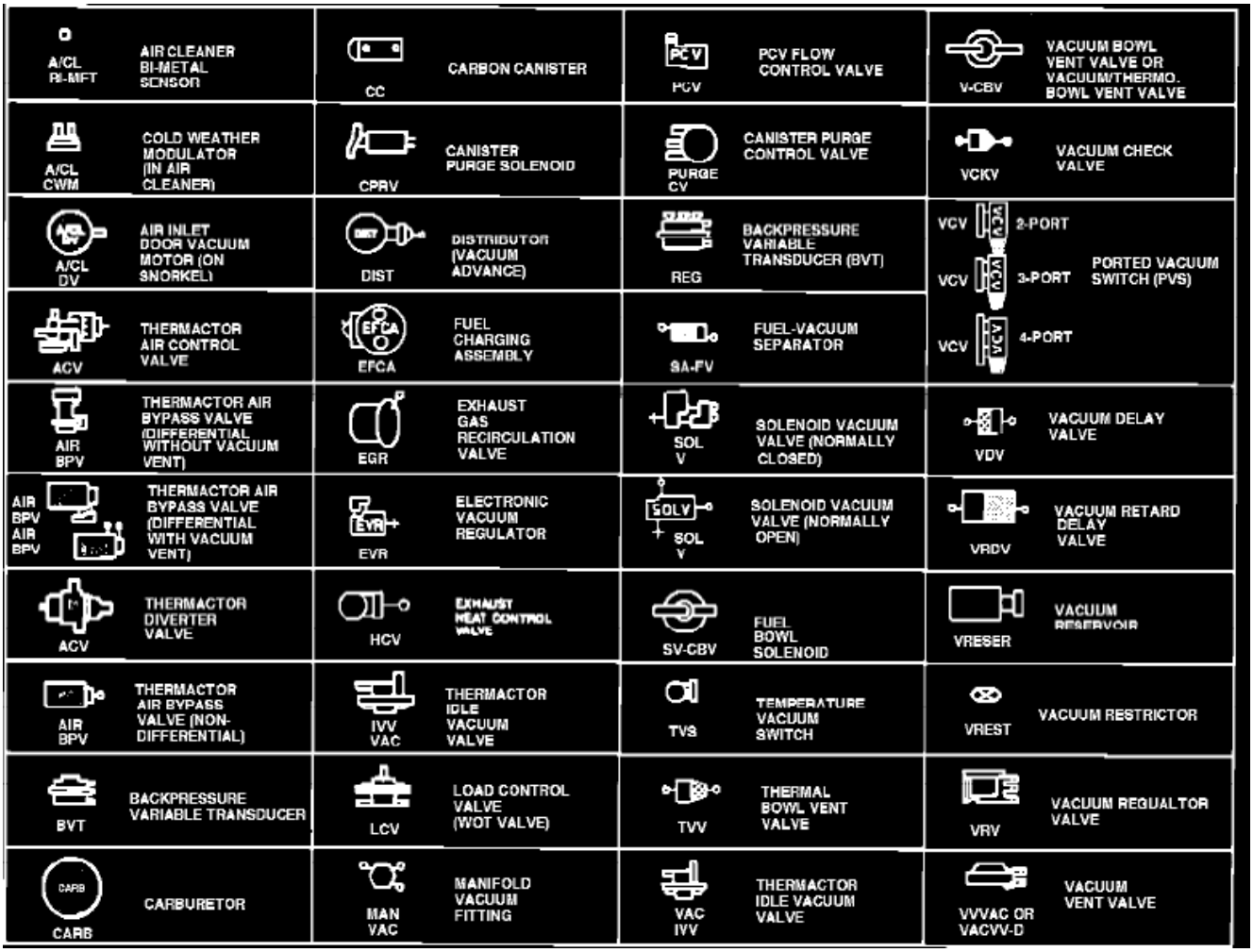
10. Remove righthand and lefthand cowl side trim covers, Fig. 11. 11. Remove righthand and lefthand lower corner instrument panel to cowl side retaining bolts. 12. Remove righthand lower insulator, if equipped. 13. Remove hood opening cable from instrument panel. 14. Remove screws retaining top of panel. 15. Support panel assembly, then disconnect wiring, vacuum lines, antenna, heater and A/C control cables. 16. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions

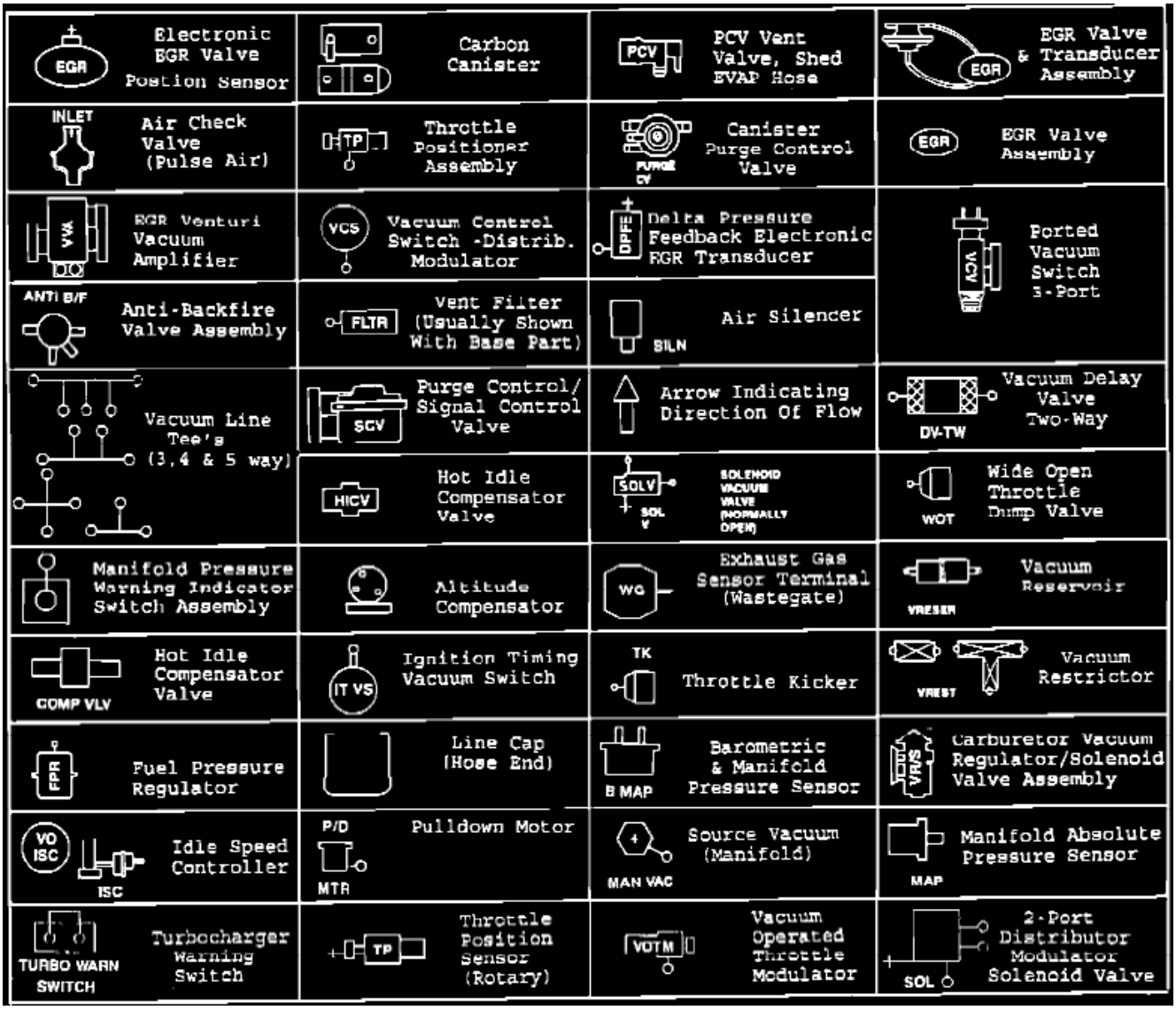


Driver/Vehicle Information Display: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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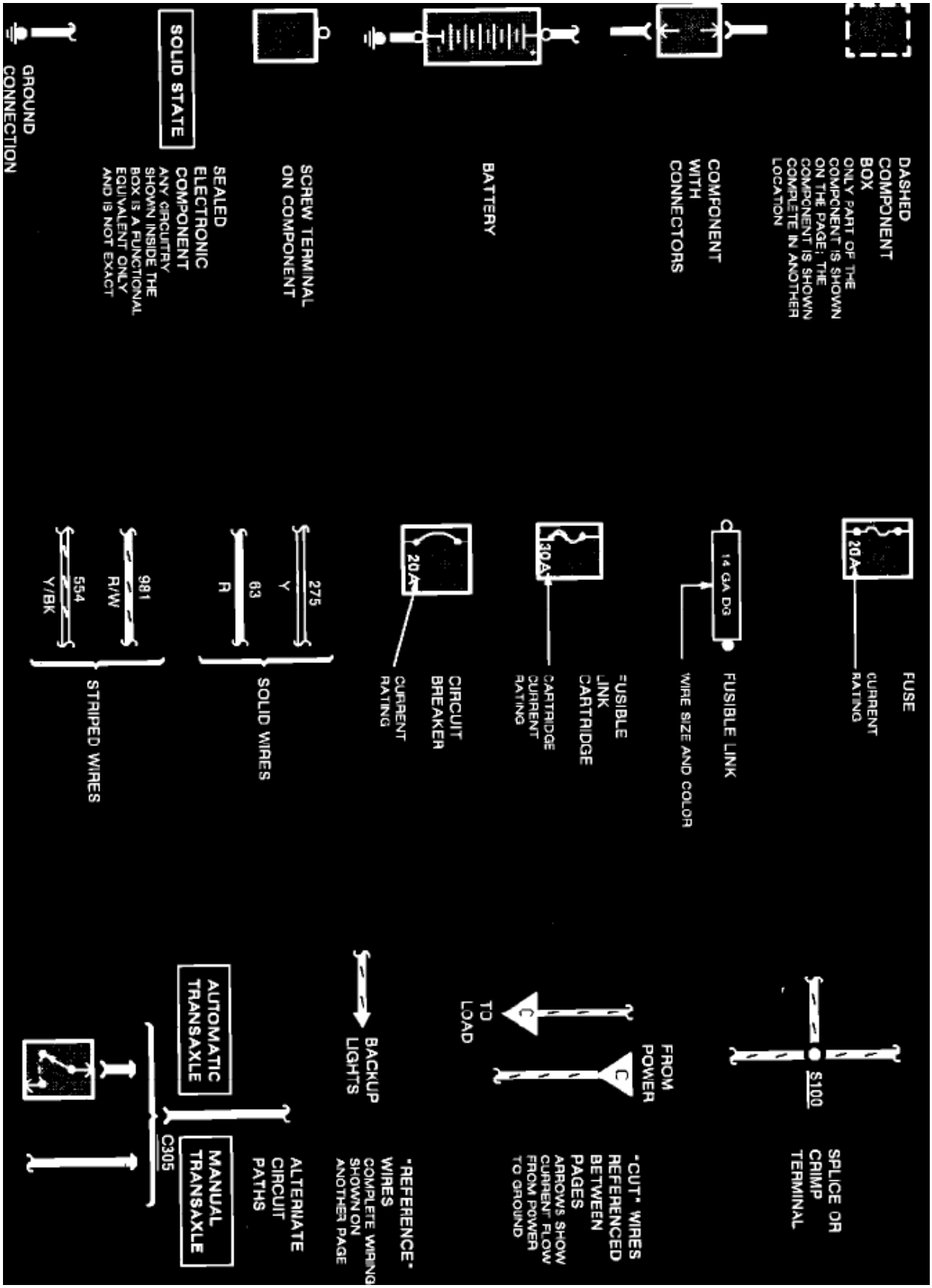
DASHED COMPONENT BOX
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COMPONENT WITH CONNECTORS
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SCREW TERMINAL ON COMPONENT
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CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
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Y
63
R
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981
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Y/BK
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"CUT" WIRES REFERENCED BETWEEN PAGES
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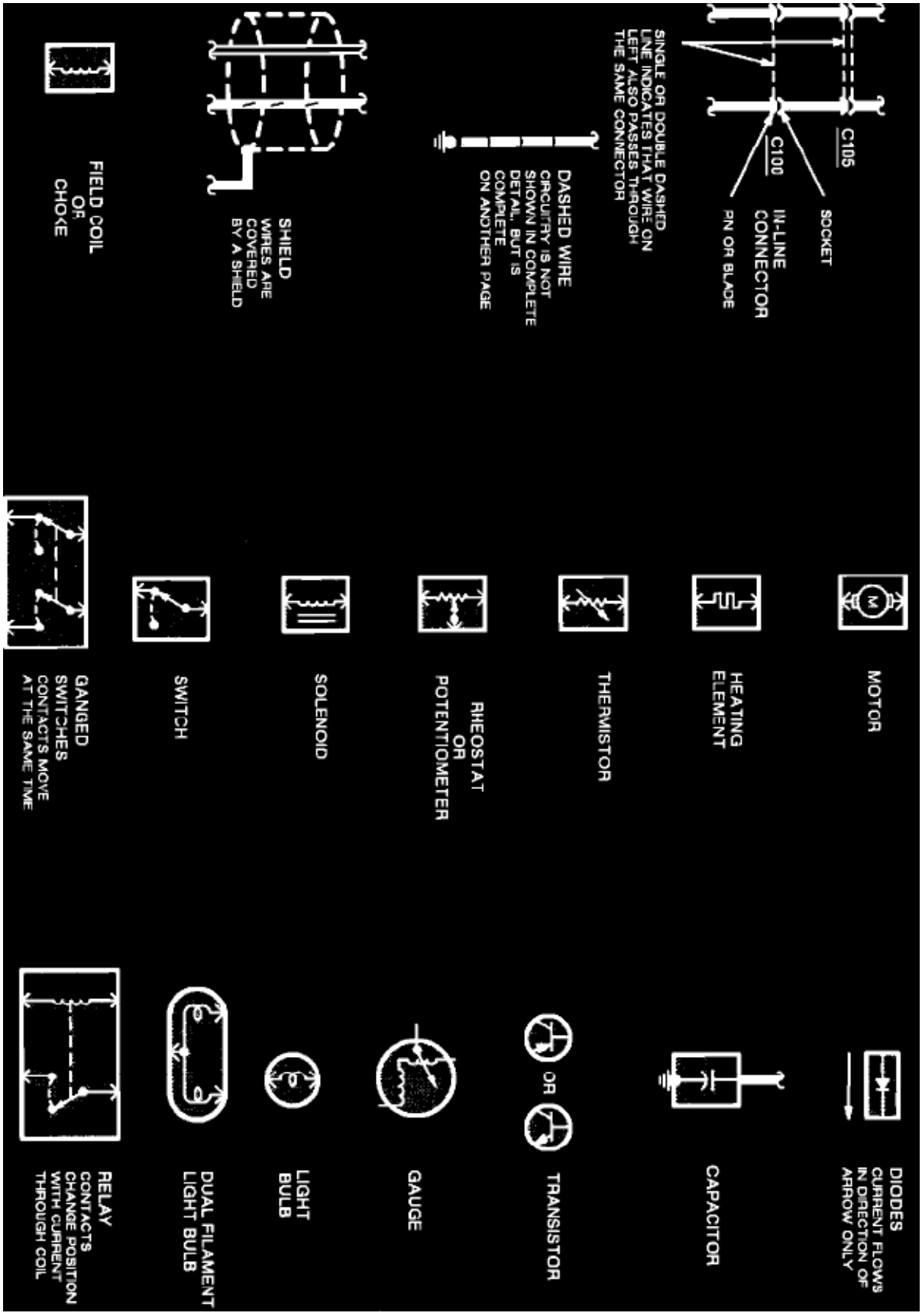
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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WIRES ARE COVERED BY A SHIELD
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THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
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CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

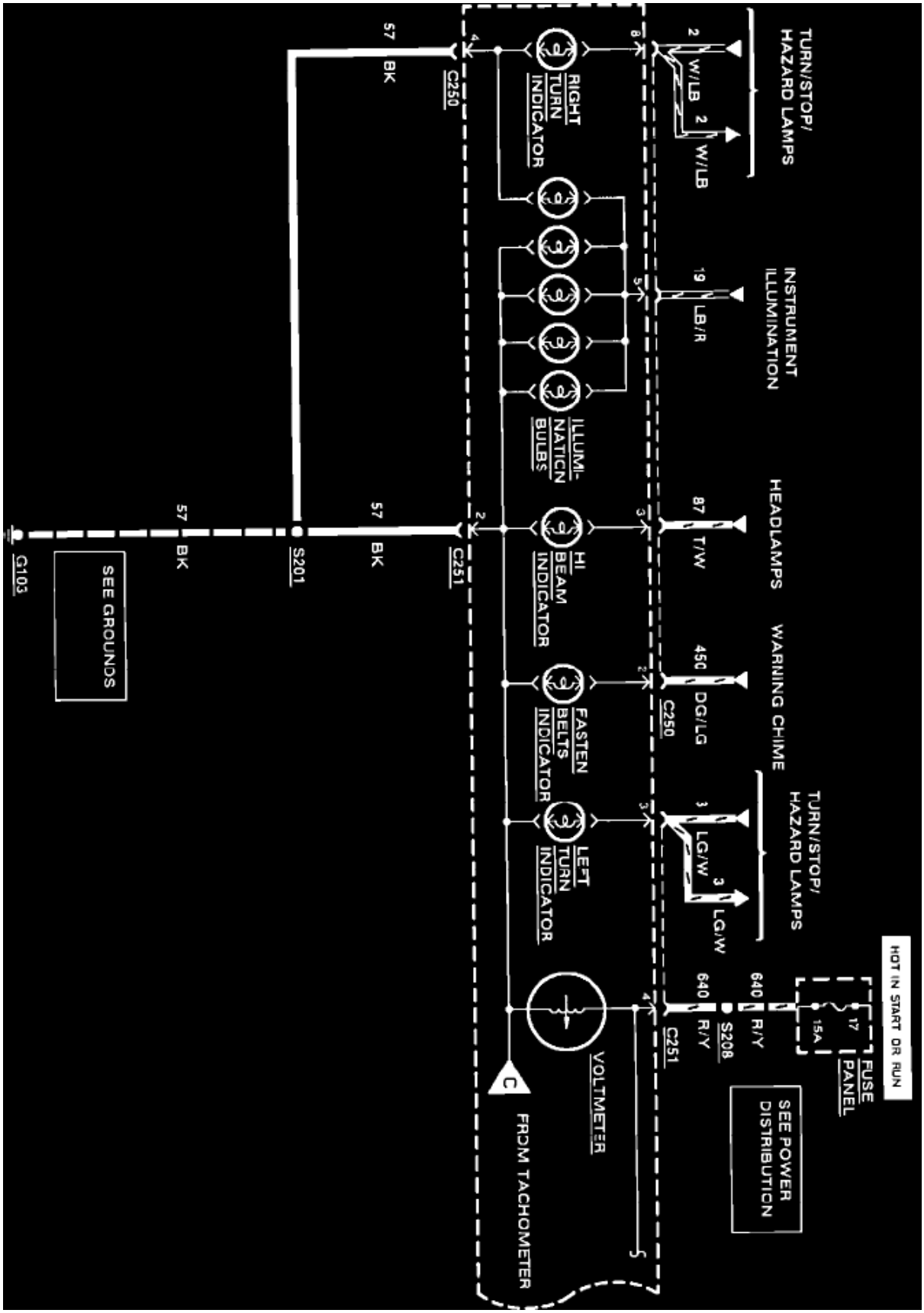
P: Purple

T: Tan

V: Violet

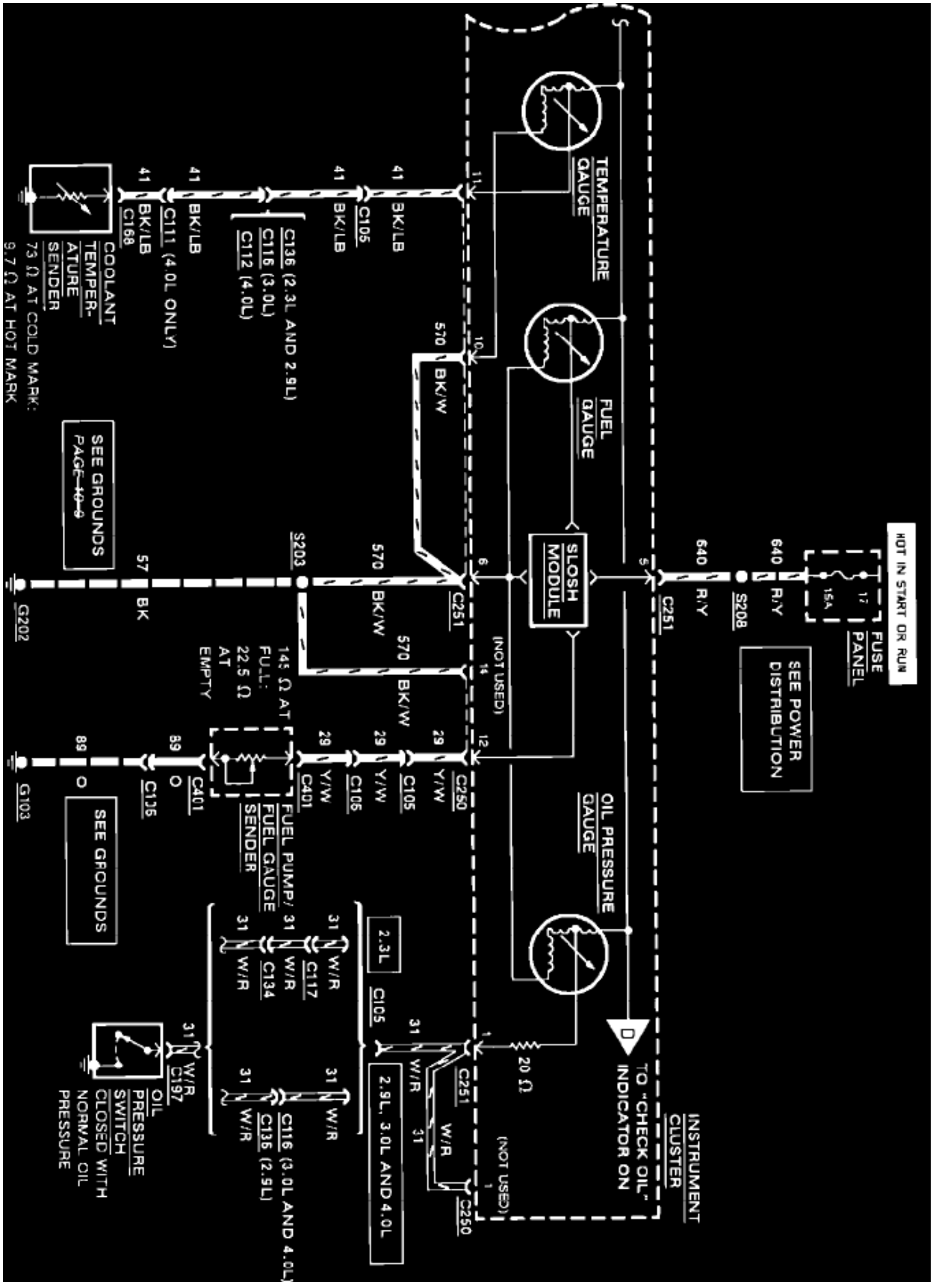
W: White

Y: Yellow

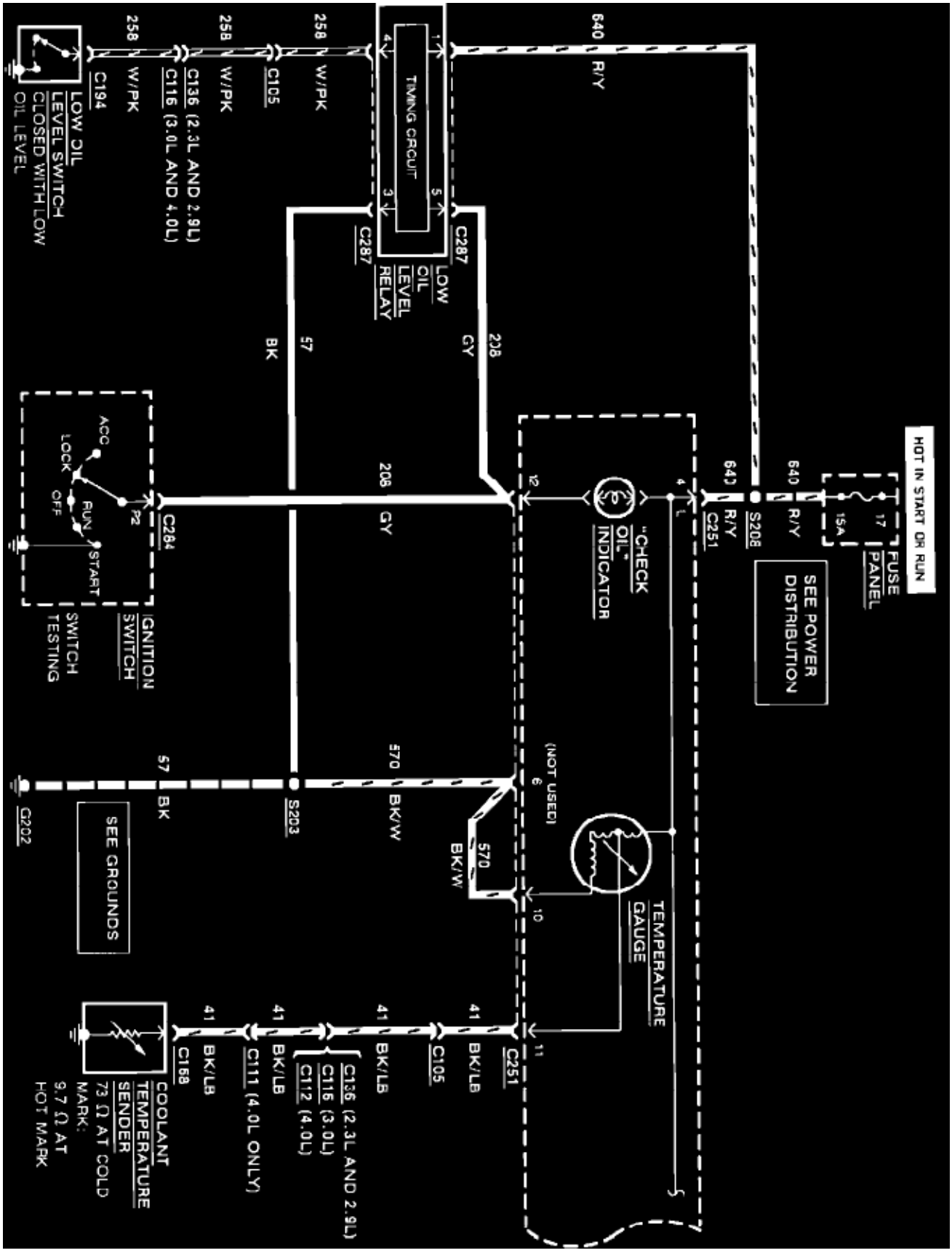

HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
TURN/STOP/ HAZARD LAMPS
640
R/Y
S208
C251
TURN/STOP/ HAZARD LAMPS
LG/W
3
LG/W
640
R/Y
C251
WARNING CHIME
DG/LG
450
C250
HEADLAMPS
T/W
87
INSTRUMENT ILLUMINATION
LB/R
19
TURN/STOP/ HAZARD LAMPS
W/LB
2
W/LB
2
RIGHT TURN INDICATOR
ILLUMI-NATION BULBS
HI BEAM INDICATOR
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
VOLTMETER
C
FROM TACHOMETER
57
BK
C250
57
BK
S201
57
BK
C251
G103
SEE GROUNDS

Driver/Vehicle Information Display: Electrical Diagrams

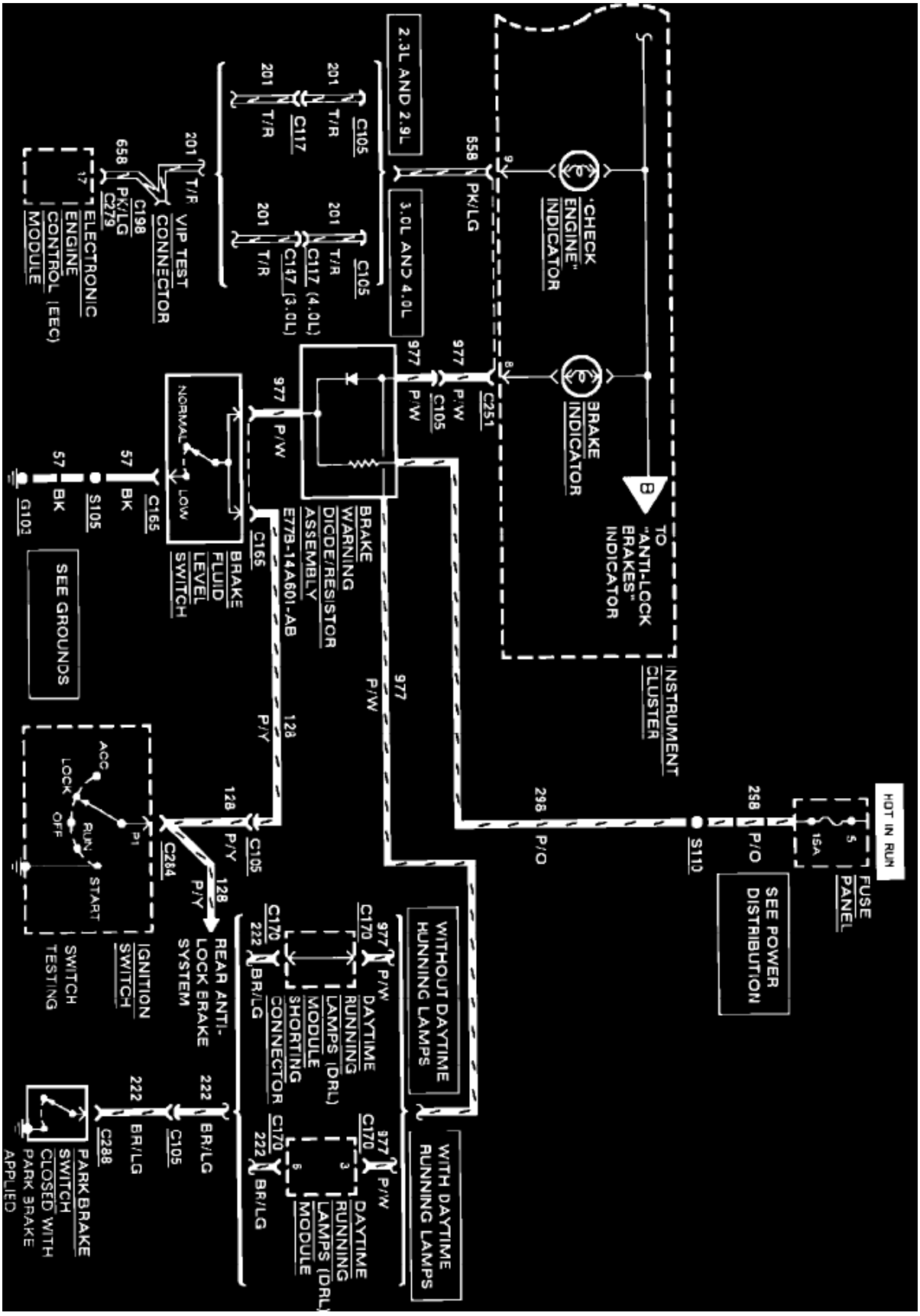
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
15A
640 R/Y
S208
SEE POWER DISTRIBUTION
640 R/Y
C251
TEMPERATURE GAUGE
FUEL GAUGE
SLOSH MODULE
OIL PRESSURE GAUGE
INSTRUMENT CLUSTER
TO "CHECK OIL" INDICATOR ON
20 Ω
(NOT USED)
C250
41 BK/LB
C105
C136 (2.3L AND 2.9L)
C116 (3.0L)
C112 (4.0L)
41 BK/LB
C111 (4.0L ONLY)
41 BK/LB
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD MARK;
9.7 Ω AT HOT MARK
570 BK/W
570 BK/W
570 BK/W
(NOT USED)
S203
57 BK
G202
SEE GROUNDS
PAGE 10-9
14.5 Ω AT FULL; 22.5 Ω AT EMPTY
89 O
C401
C136
G103
SEE GROUNDS
FUEL PUMP/ FUEL GAUGE SENDER
29 Y/W
C401
29 Y/W
C105
29 Y/W
C250
2.3L
C105
2.9L, 3.0L AND 4.0L
31 W/R
C117
31 W/R
C134
31 W/R
C197
OIL PRESSURE SWITCH
CLOSED WITH NORMAL OIL PRESSURE
31 W/R
C116 (3.0L AND 4.0L)
C135 (2.5L)
31 W/R
C251
31 W/R
C250
(NOT USED)

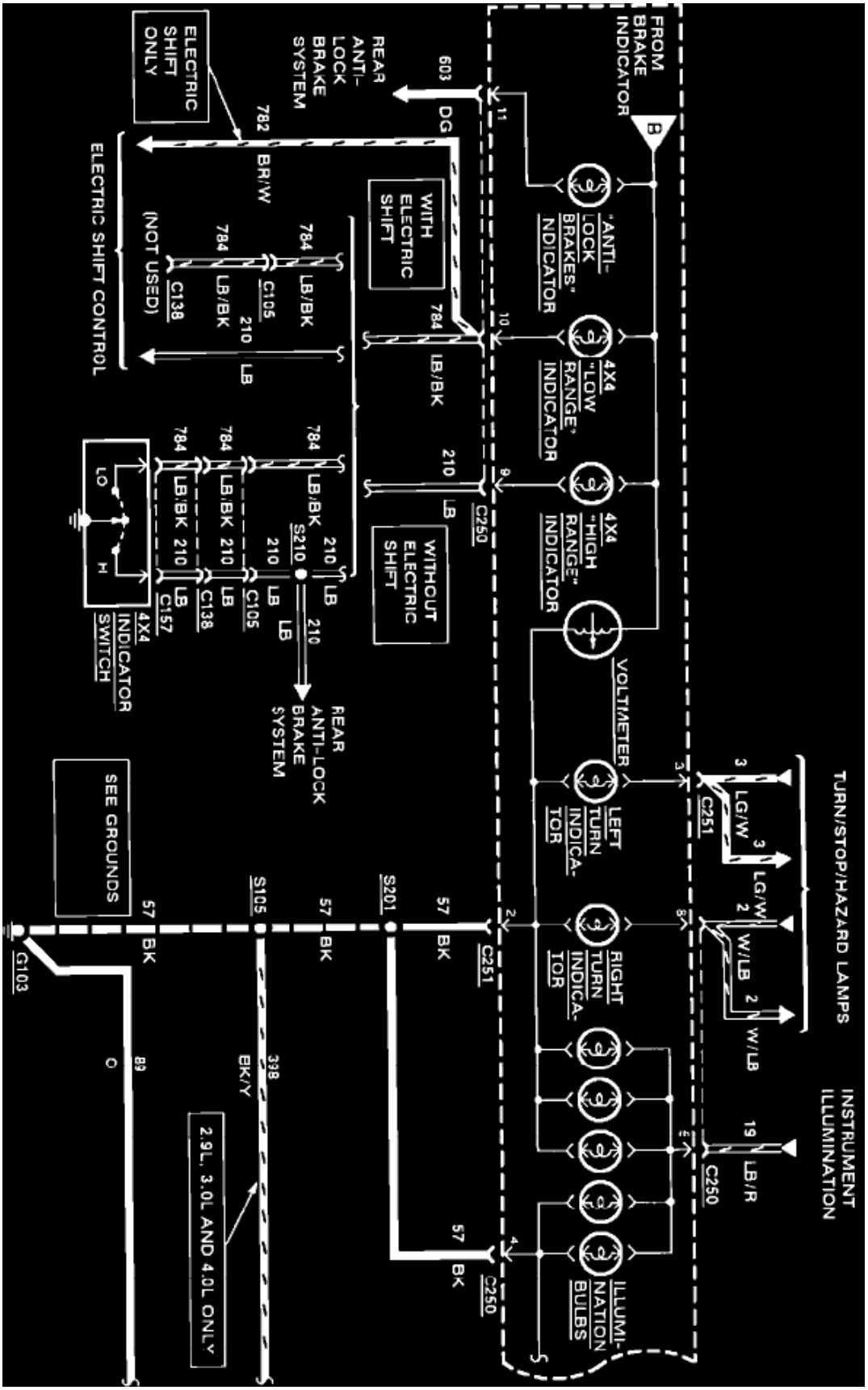
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
C251
SEE POWER DISTRIBUTION
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
(NOT USED)
LOW OIL LEVEL SWITCH CLOSED WITH LOW OIL LEVEL
C194
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C105
258
W/PK
238
GY
57
BK
208
570
BK/W
C284
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
P2
SWITCH TESTING
S203
G202
SEE GROUNDS
41
BK/LB
C112 (4.0L)
C111 (4.0L ONLY)
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD
MARK:
9.7 Ω AT HOT MARK

Instrument Panel (Standard)

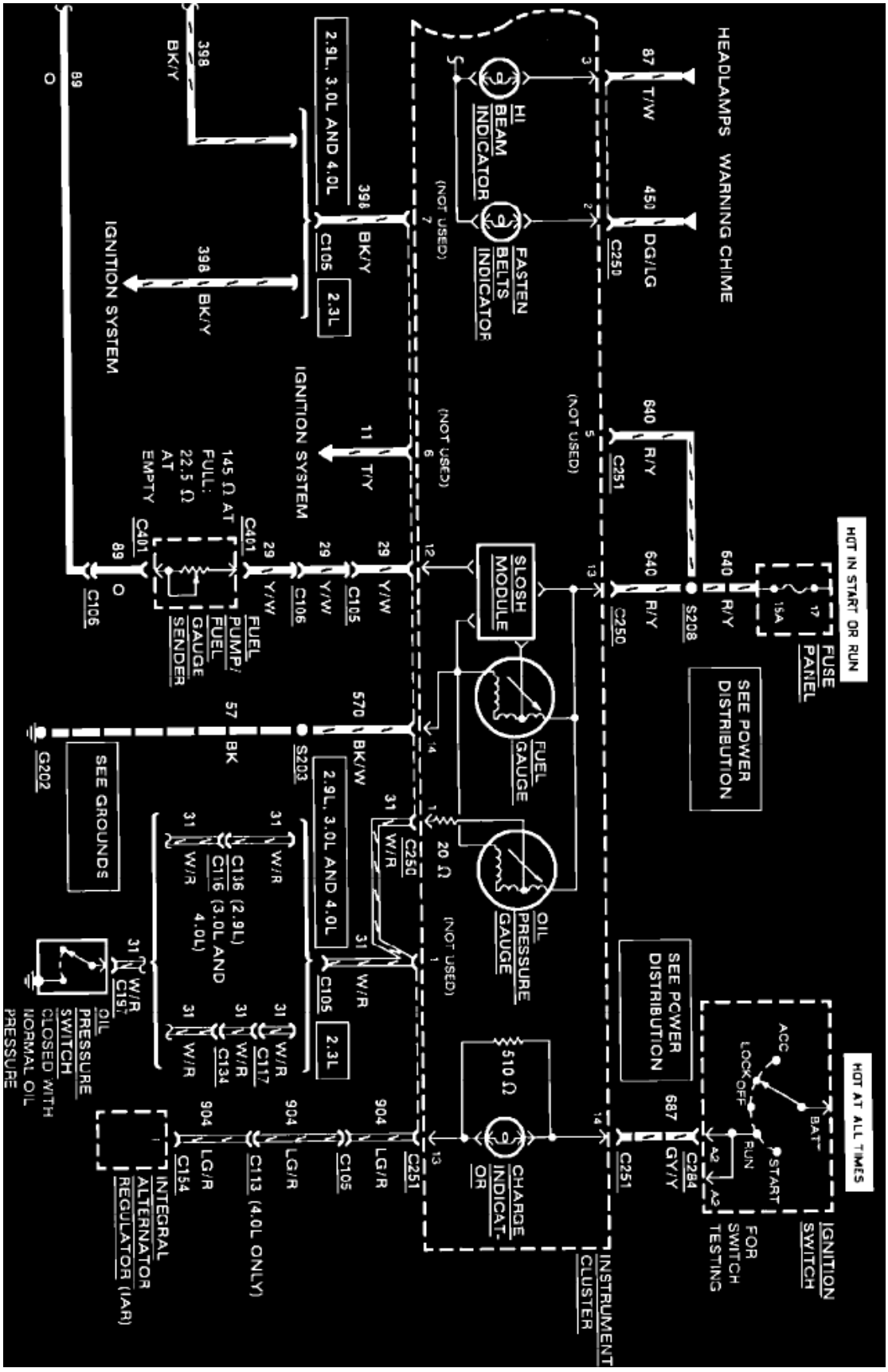

HOT IN RUN
FUSE PANEL
5
15A
SEE POWER DISTRIBUTION
258 P/O
298 P/O
S110
INSTRUMENT CLUSTER
TO "ANTI-LOCK BRAKES" INDICATOR
BRAKE INDICATOR
"CHECK ENGINE" INDICATOR
2.3L AND 2.9L
3.0L AND 4.0L
658 PK/LG
977 P/W
C251
C105
C117
C117 (4.0L)
C147 (3.0L)
201 T/R
201 T/F
VIP TEST CONNECTOR
C198
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
BRAKE FLUID LEVEL SWITCH
NORMAL
LOW
C165
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
RUN
START
OFF
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
222 BR/LG
C170
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE
SHORTING CONNECTOR
C288
PARK BRAKE SWITCH
CLOSED WITH PARK BRAKE APPLIED

Instrument Panel (Standard)

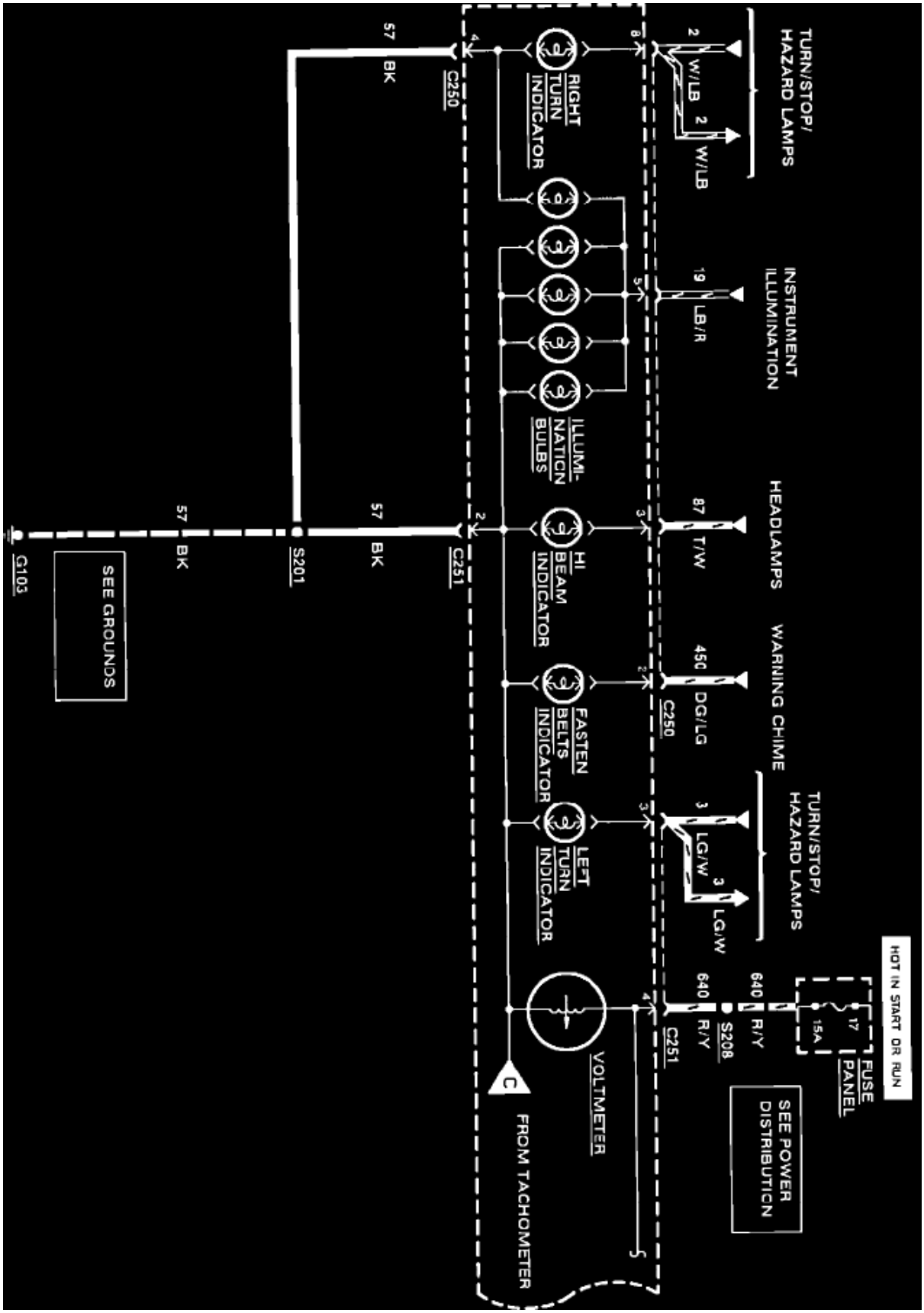

TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C105
C138
C157
C250
C251
S105
S201
S210
G103
LG/W
W/LB
LB/R
LB/BK
BR/W
BK/Y
DG
BK
O

Instrument Panel (Standard)

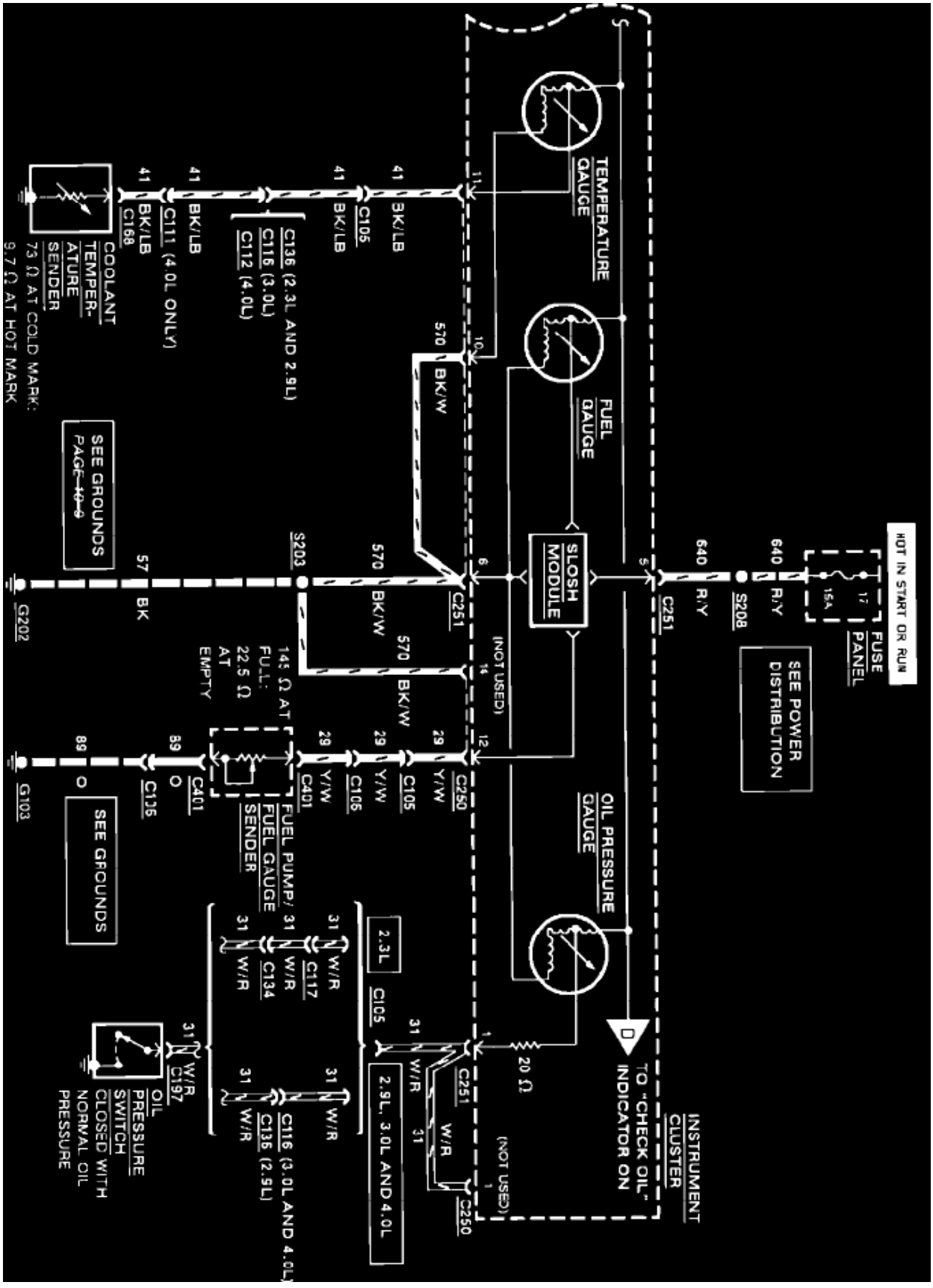
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 7125



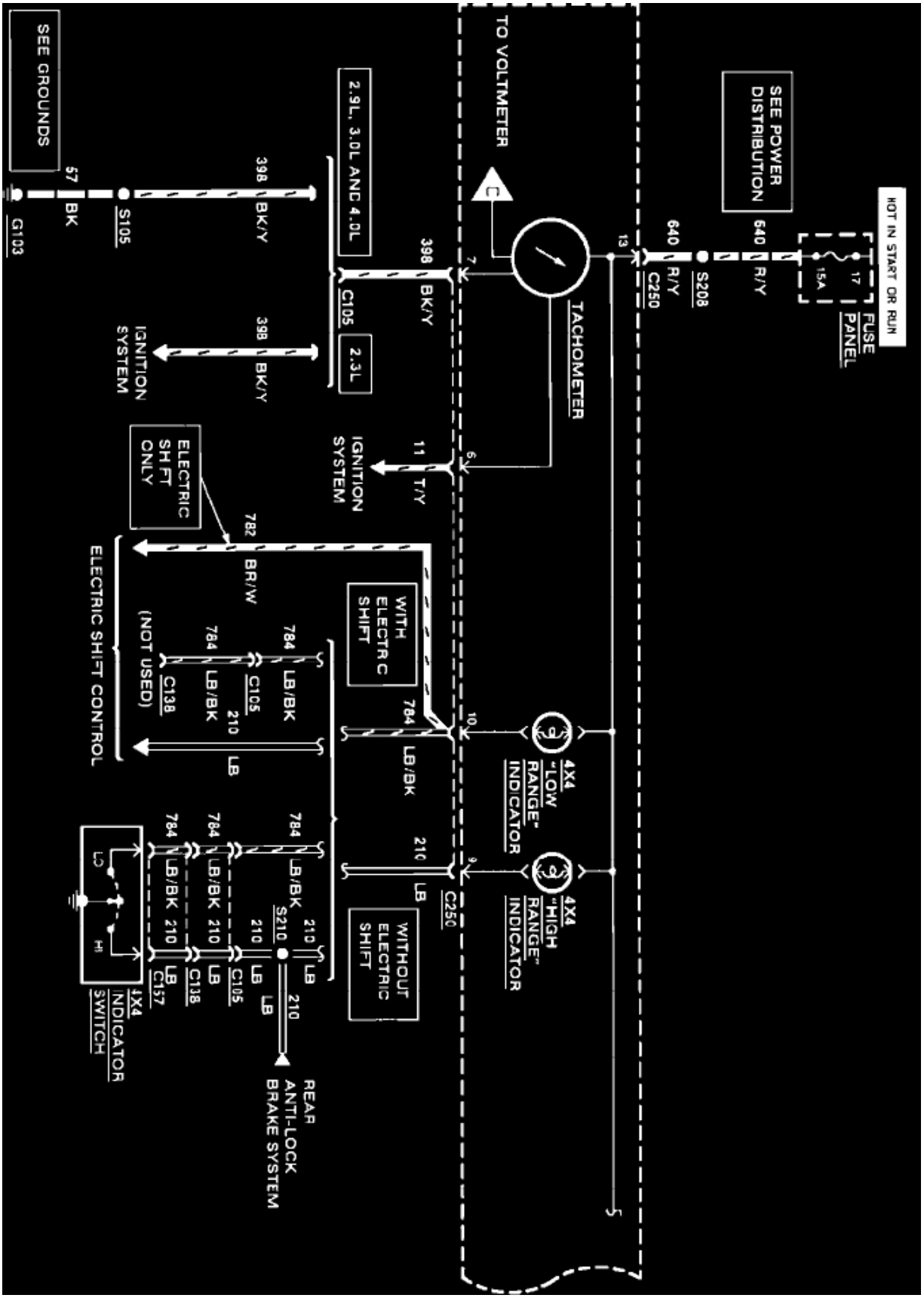
Instrument Panel (Standard)


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640
R/Y
S208
C251
TURN/STOP/ HAZARD LAMPS
W/LB
2
INSTRUMENT ILLUMINATION
LB/R
19
HEADLAMPS
T/W
87
WARNING CHIME
DG/LG
450
C250
TURN/STOP/ HAZARD LAMPS
LG/W
3
VOLTMETER
FROM TACHOMETER
C
RIGHT TURN INDICATOR
ILLUMI-NATION BULBS
HI BEAM INDICATOR
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
BK
57
S201
G103
SEE GROUNDS

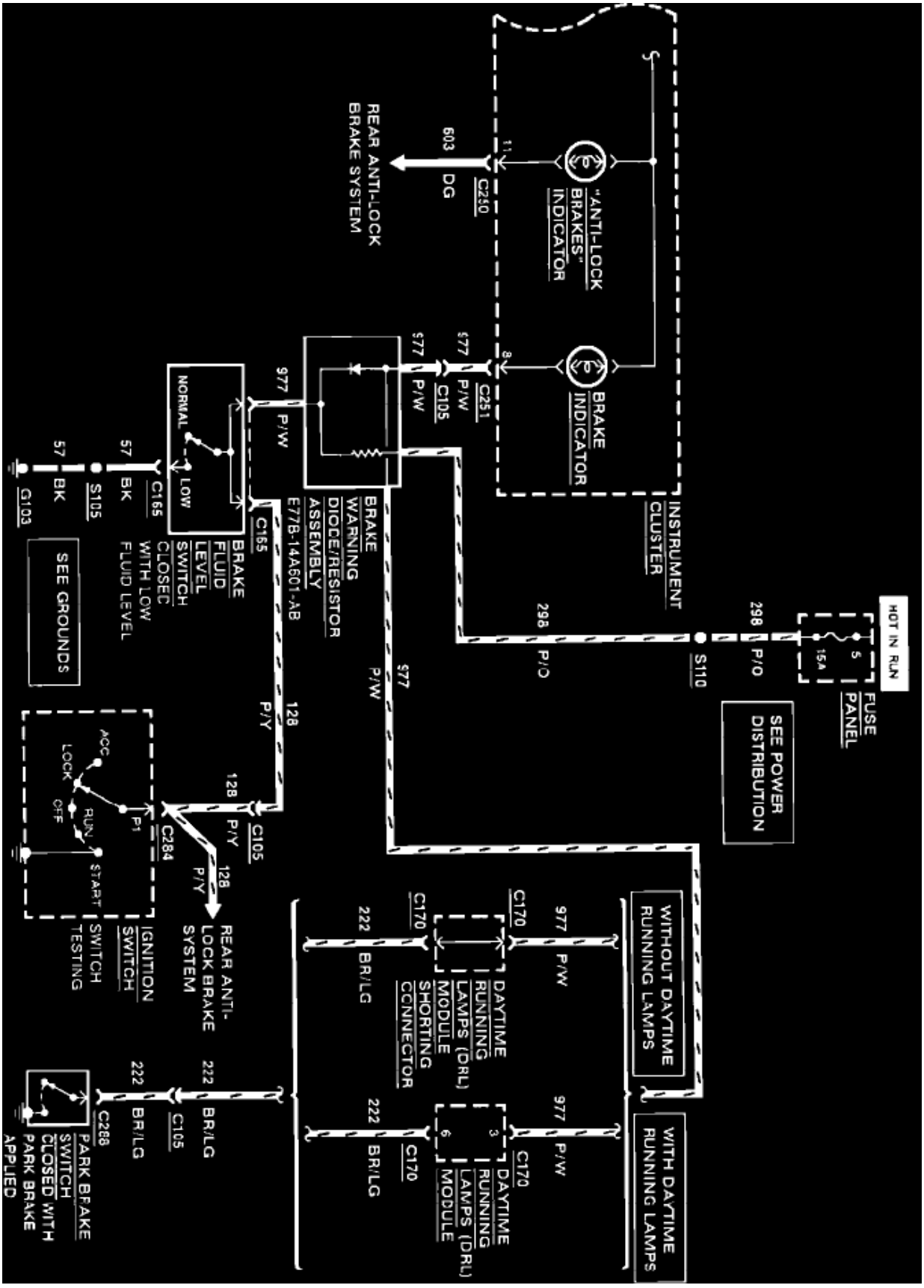
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
15A
640 R/Y
S208
SEE POWER DISTRIBUTION
640 R/Y
C251
TEMPERATURE GAUGE
FUEL GAUGE
SLOSH MODULE
OIL PRESSURE GAUGE
INSTRUMENT CLUSTER
TO "CHECK OIL" INDICATOR ON
20 Ω
(NOT USED)
C250
41 BK/LB
C105
C136 (2.3L AND 2.9L)
C116 (3.0L)
C112 (4.0L)
41 BK/LB
C111 (4.0L ONLY)
41 BK/LB
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD MARK;
9.7 Ω AT HOT MARK
570 BK/W
570 BK/W
570 BK/W
(NOT USED)
S203
SEE GROUNDS
PAGE 10-9
57 BK
G202
C251
C250
29 Y/W
C105
29 Y/W
C401
89 O
C136
89 O
G103
SEE GROUNDS
FUEL PUMP/ FUEL GAUGE SENDER
145 Ω AT FULL; 22.5 Ω AT EMPTY
C401
2.3L
C105
2.9L, 3.0L AND 4.0L
31 W/R
C117
31 W/R
C134
31 W/R
C116 (3.0L AND 4.0L)
C135 (2.5L)
31 W/R
C197
OIL PRESSURE SWITCH
CLOSED WITH NORMAL OIL PRESSURE

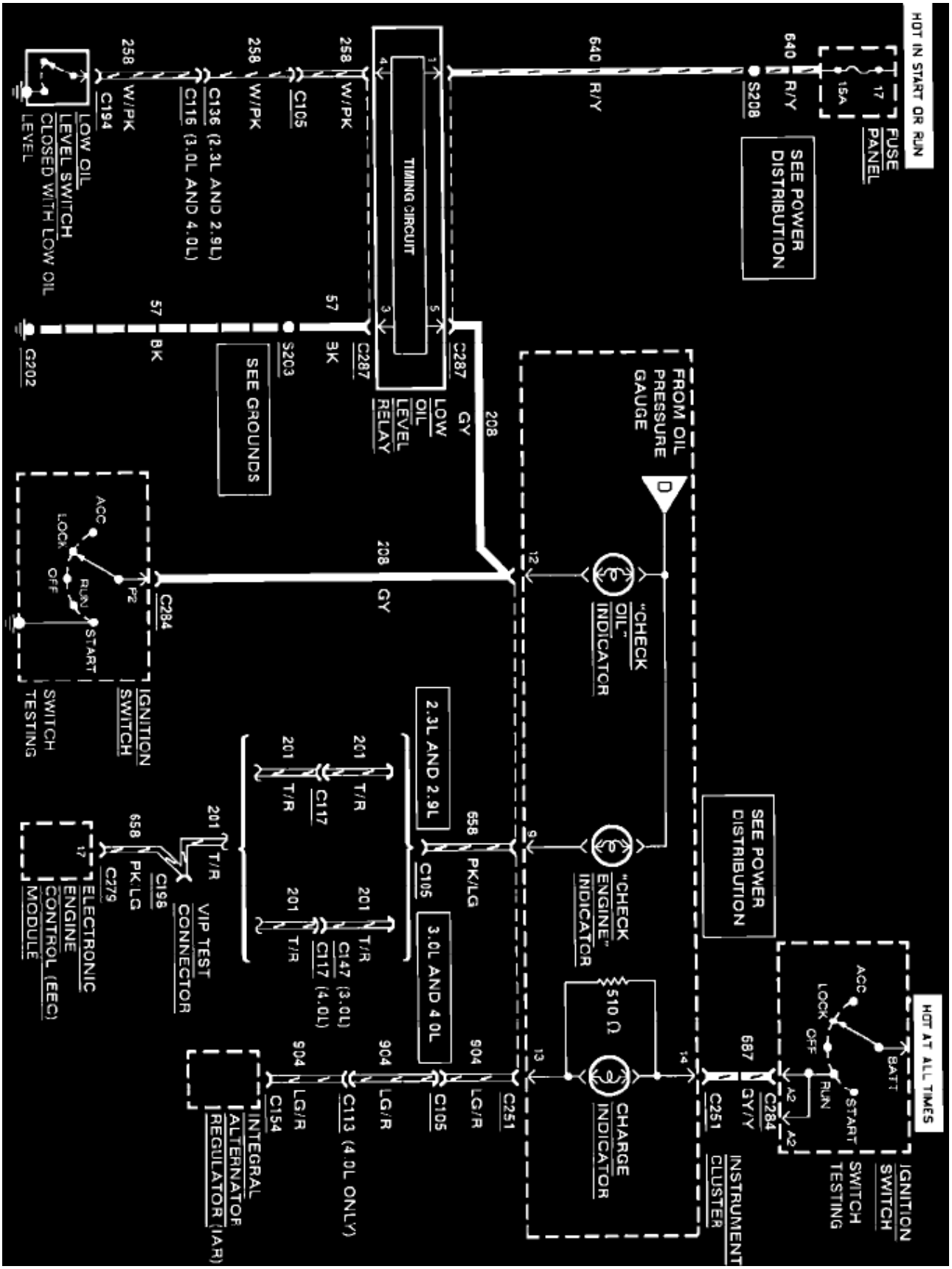
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640
R/Y
S208
C250
13
TO VOLTMETER
TACHOMETER
C
7
398
BK/Y
2.9L, 3.0L AND 4.0L
C105
2.3L
IGNITION SYSTEM
11
T/Y
6
SEE GROUNDS
57
BK
G103
S105
ELECTRIC SHIFT ONLY
782
BR/W
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
784
LB/BK
C138
210
LB
10
9
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
C250
S210
C105
C138
C157
4X4 INDICATOR SWITCH
LO
HI
REAR ANTI-LOCK BRAKE SYSTEM

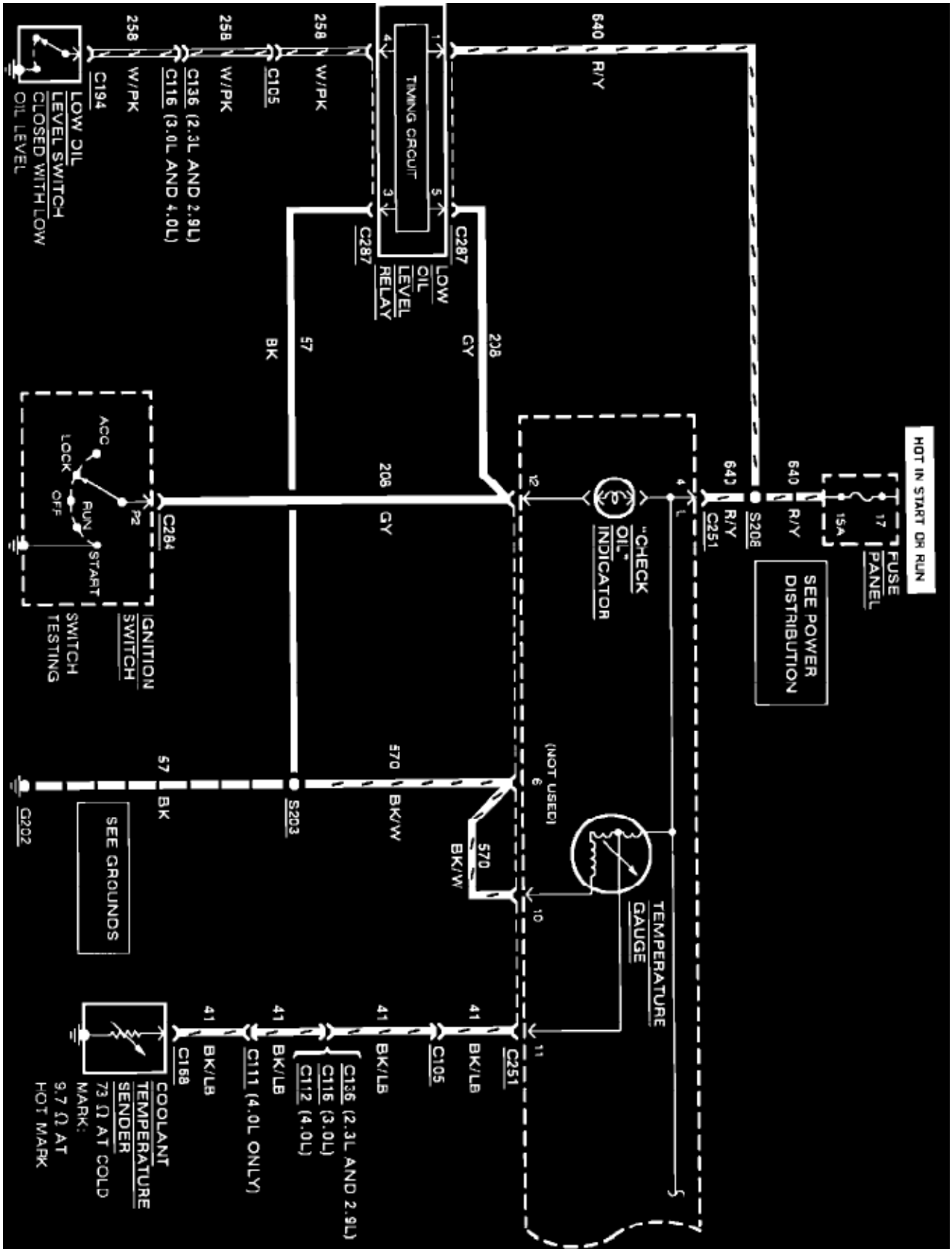
Instrument Panel (Sport)


HOT IN RUN
FUSE PANEL
5
15A
298 P/O
SEE POWER DISTRIBUTION
S110
INSTRUMENT CLUSTER
"ANTI-LOCK BRAKES" INDICATOR
BRAKE INDICATOR
603 DG
C250
11
REAR ANTI-LOCK BRAKE SYSTEM
577 P/W
C251
8
C105
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
977 P/W
C165
BRAKE FLUID LEVEL SWITCH CLOSED WITH LOW FLUID LEVEL
NORMAL
LOW
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
OFF
RUN
START
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
C170
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
222 BR/LG
DAYTIME RUNNING LAMPS (DRL) MODULE
PARK BRAKE SWITCH CLOSED WITH PARK BRAKE APPLIED
C268

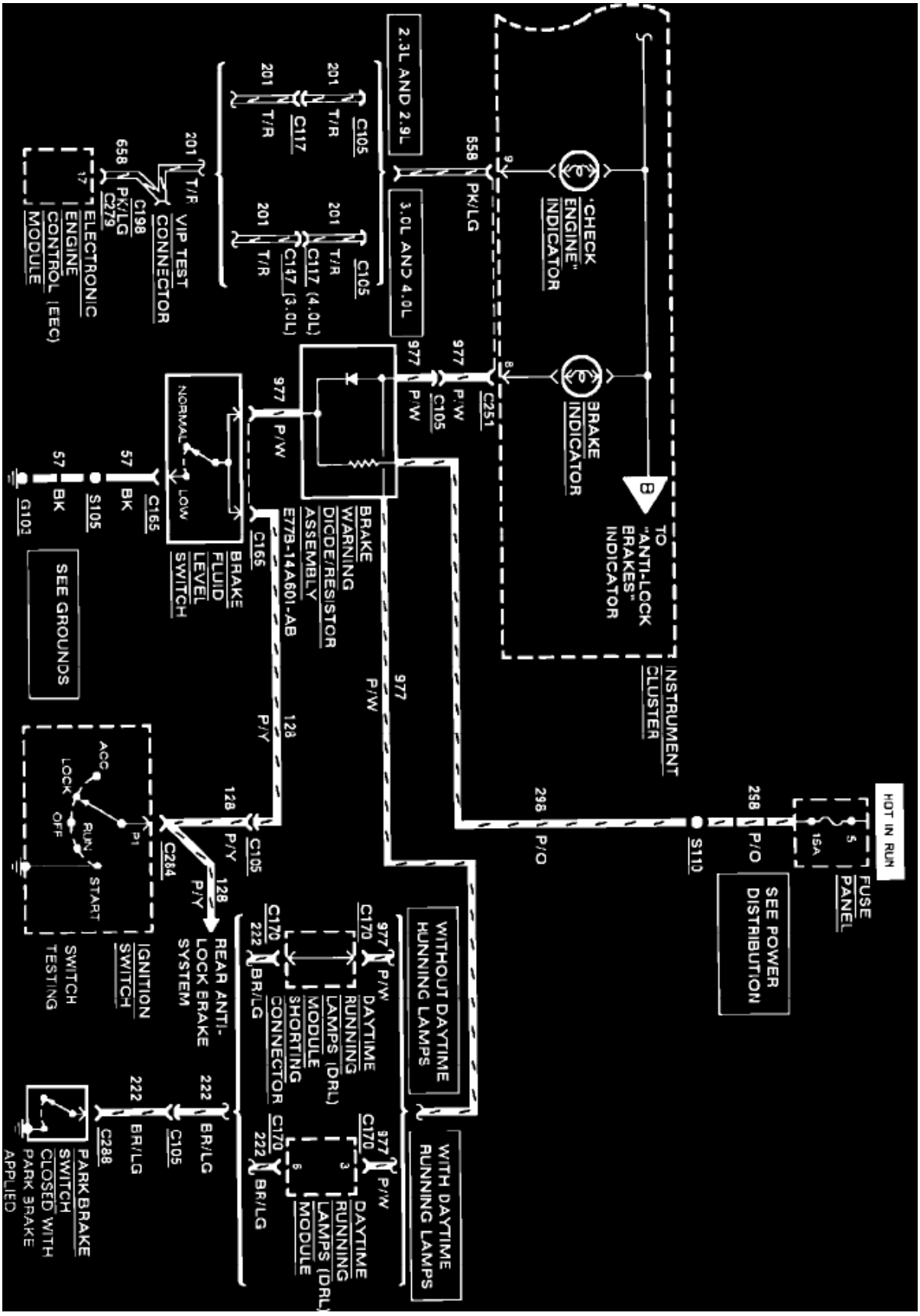
Instrument Panel (Sport)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
TIMING CIRCUIT
LOW OIL LEVEL SWITCH CLOSED WITH LOW OIL LEVEL
C194
W/PK
258
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C105
C287
LOW OIL LEVEL RELAY
57
BK
G202
S203
SEE GROUNDS
208
GY
FROM OIL PRESSURE GAUGE
"CHECK OIL" INDICATOR
"CHECK ENGINE" INDICATOR
510 Ω
CHARGE INDICATOR
SEE POWER DISTRIBUTION
INSTRUMENT CLUSTER
C251
GY/Y
687
C284
IGNITION SWITCH
SWITCH TESTING
ACC
LOCK
OFF
RUN
START
BATT
A2
P2
2.3L AND 2.9L
3.0L AND 4.0L
C117
C147 (3.0L)
C117 (4.0L)
C113 (4.0L ONLY)
T/R
201
PK/LG
658
LG/R
904
VIP TEST CONNECTOR
C196
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
C154
INTEGRAL ALTERNATOR REGULATOR (IAR)

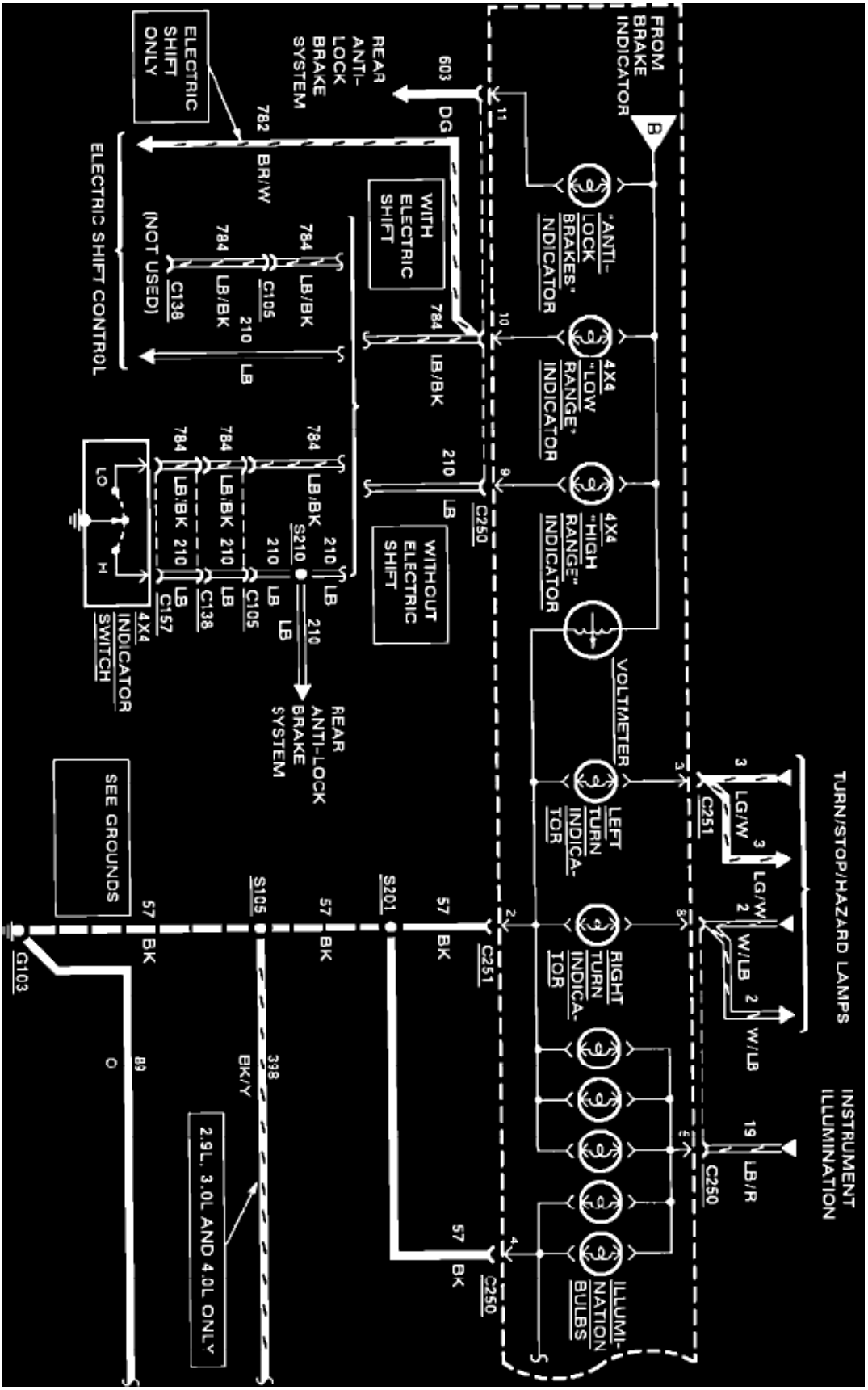
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
C251
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
(NOT USED)
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
238
GY
57
BK
208
570
BK/W
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
258
W/PK
C284
ACC
LOCK
RUN
START
OFF
IGNITION SWITCH
SWITCH TESTING
S203
G202
SEE GROUNDS
41
BK/LB
C112 (4.0L)
C111 (4.0L ONLY)
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD
MARK:
9.7 Ω AT HOT MARK

Instrument Panel (Standard)

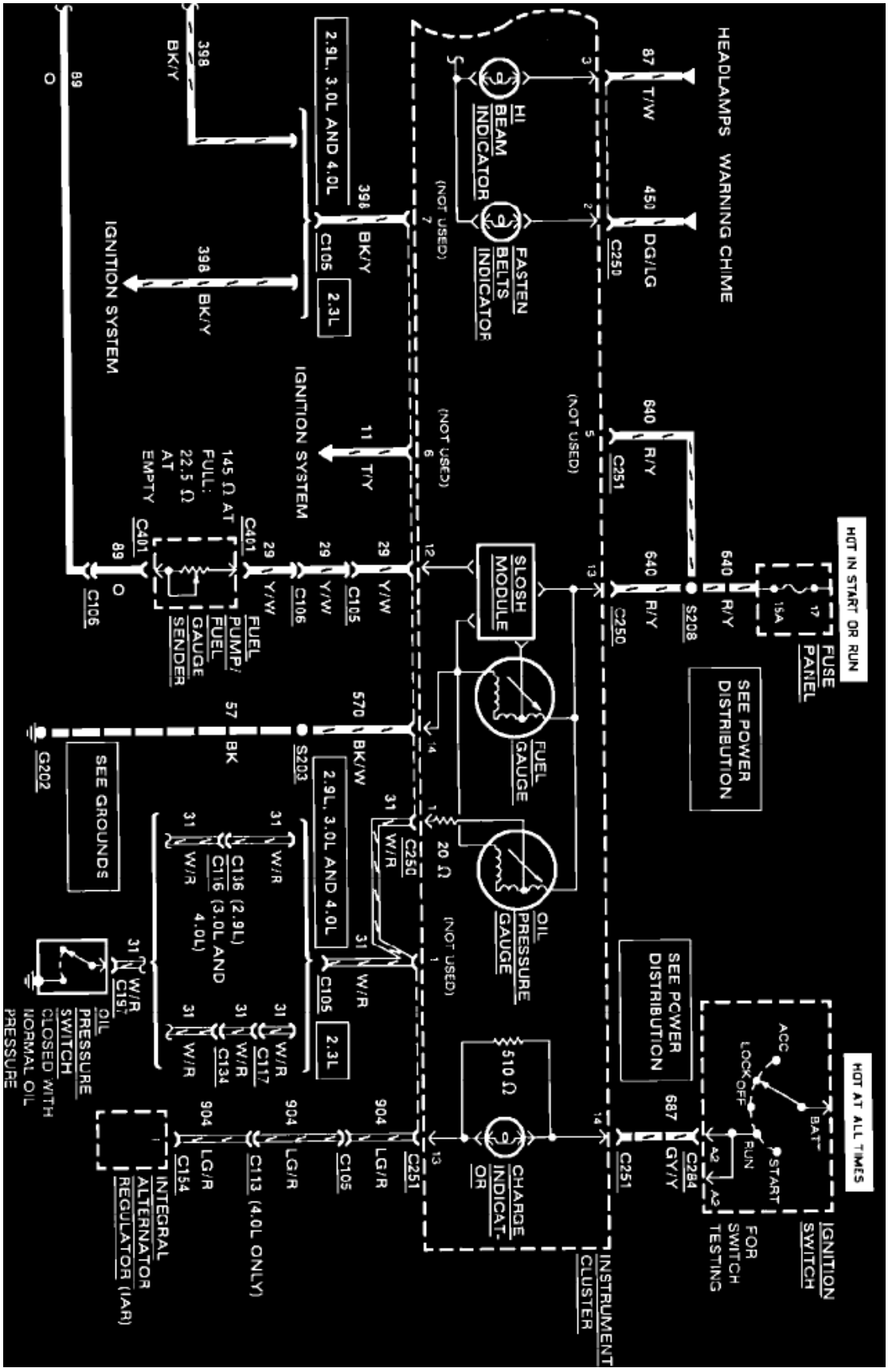

HOT IN RUN
FUSE PANEL
5
15A
SEE POWER DISTRIBUTION
258 P/O
298 P/O
S110
INSTRUMENT CLUSTER
"CHECK ENGINE" INDICATOR
BRAKE INDICATOR
TO "ANTI-LOCK BRAKES" INDICATOR
2.3L AND 2.9L
3.0L AND 4.0L
658 PK/LG
977 P/W
C251
C105
C117
C117 (4.0L)
C147 (3.0L)
201 T/R
201 T/F
VIP TEST CONNECTOR
C198
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
BRAKE FLUID LEVEL SWITCH
NORMAL
LOW
C165
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
RUN
START
OFF
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
C170
222 BR/LG
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE
SHORTING CONNECTOR
C288
PARK BRAKE SWITCH
CLOSED WITH PARK BRAKE APPLIED

Instrument Panel (Standard)

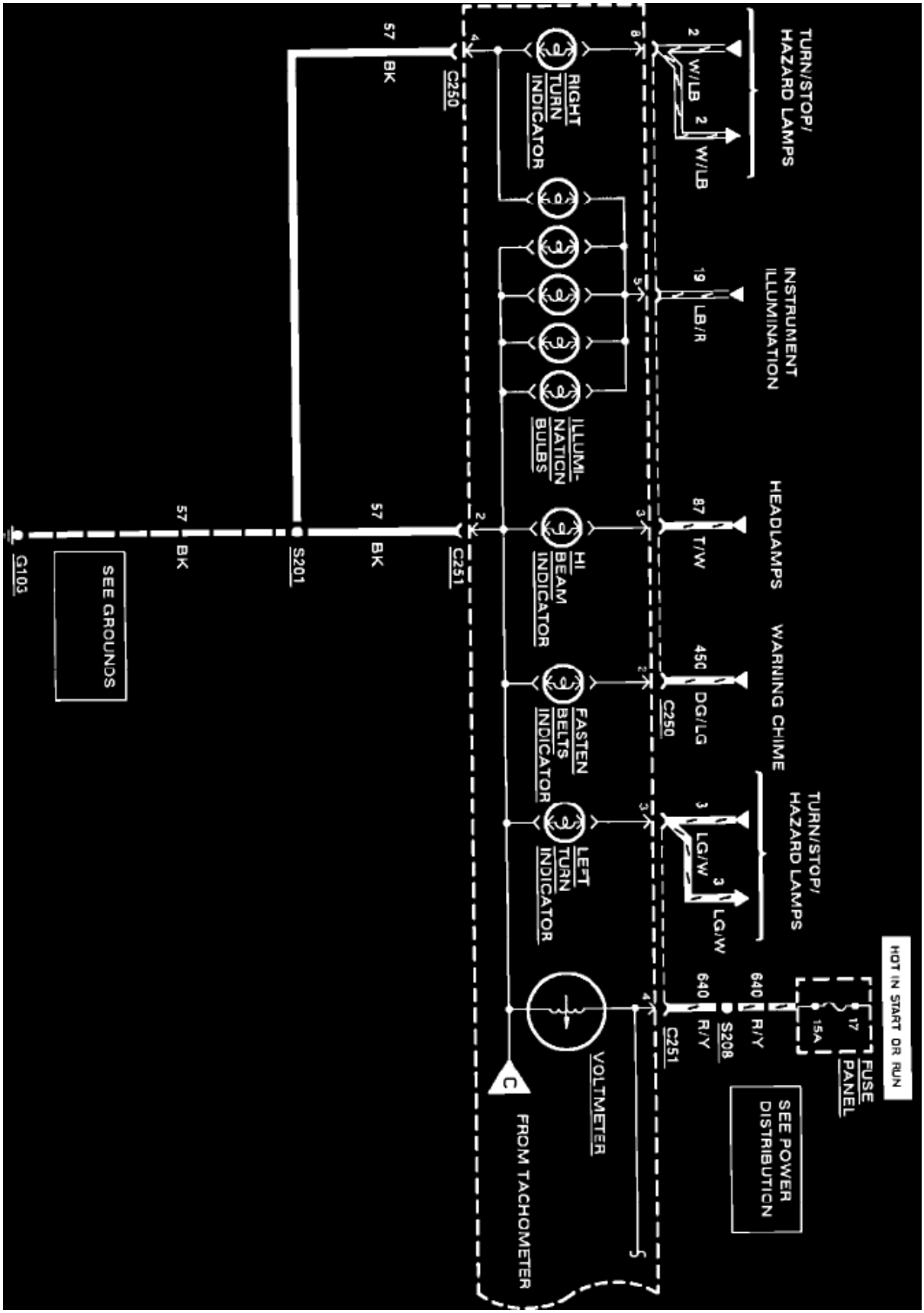

TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C251
C250
C105
C138
C157
S210
S201
S105
G103
LG/W
W/LB
LB/R
LB/BK
BR/W
DG
BK
BK/Y
O
LO
H

Instrument Panel (Standard)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 7134

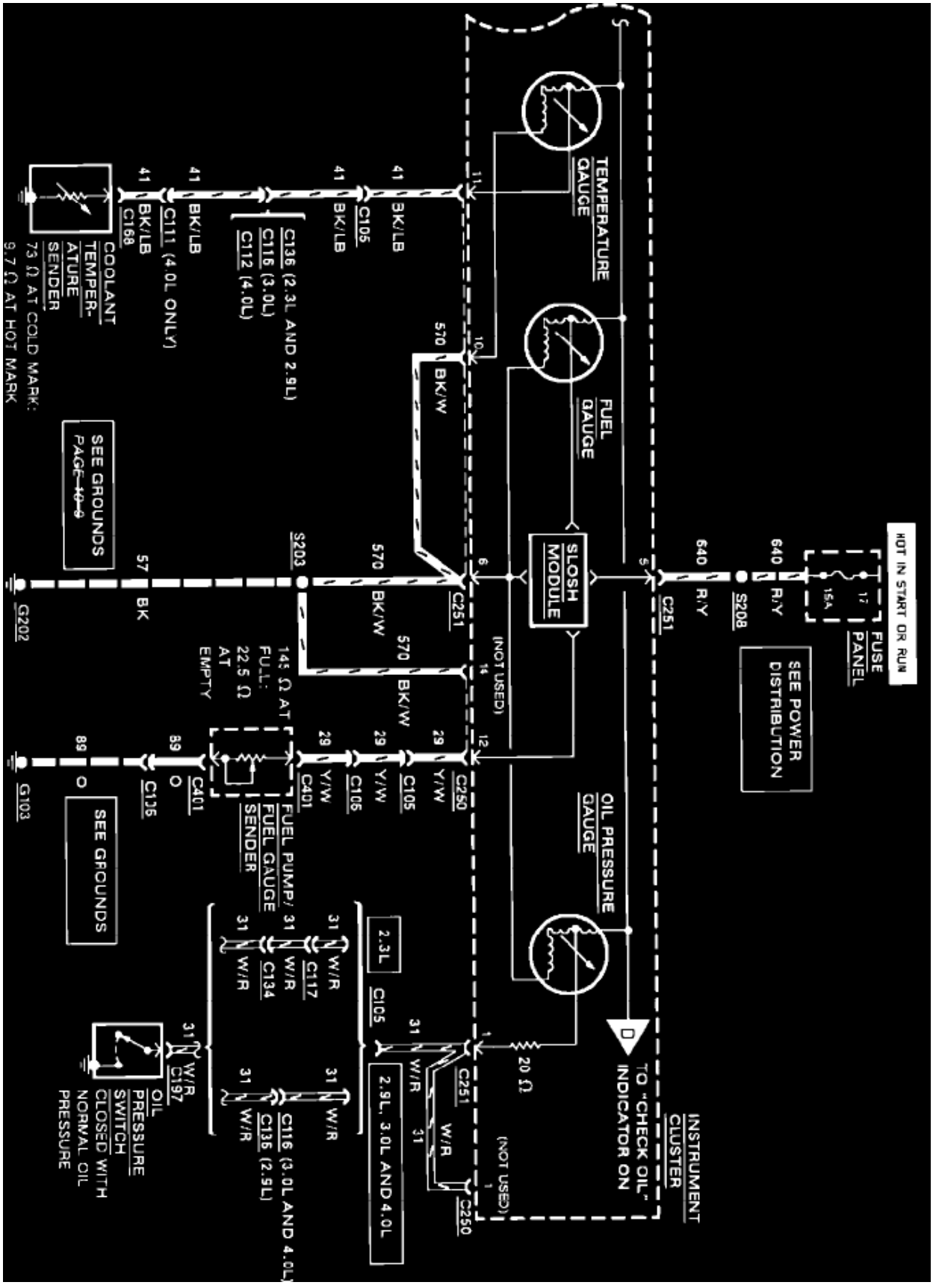


Instrument Panel (Standard)

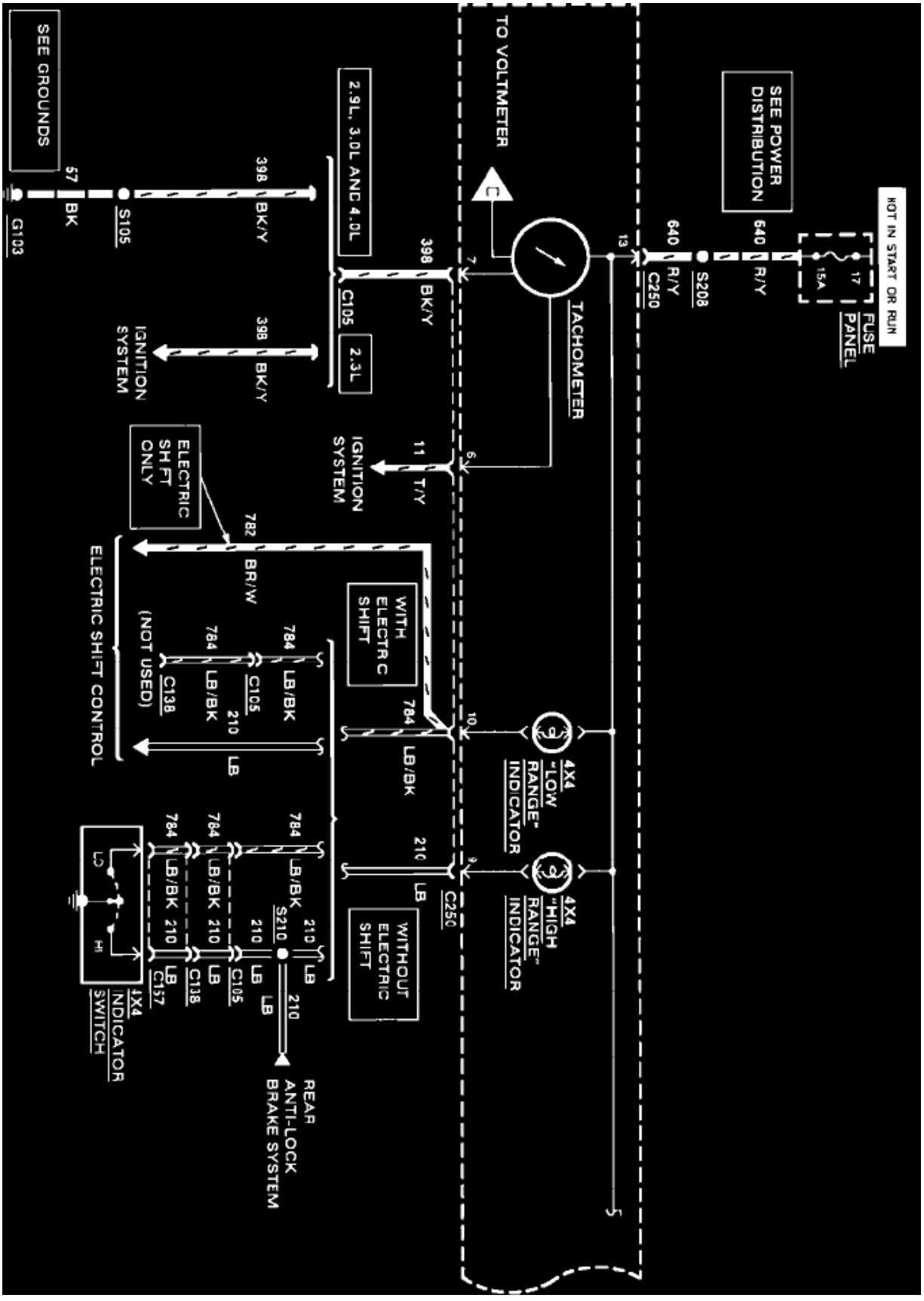

HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
C251
SEE POWER DISTRIBUTION
TURN/STOP/ HAZARD LAMPS
W/LB
INSTRUMENT ILLUMINATION
LB/R
HEADLAMPS
T/W
WARNING CHIME
DG/LG
C250
LG/W
RIGHT TURN INDICATOR
ILLUMI-NATION BULBS
HI BEAM INDICATOR
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
VOLTMETER
FROM TACHOMETER
57
BK
S201
G103
SEE GROUNDS

Instrument Panel (Sport)

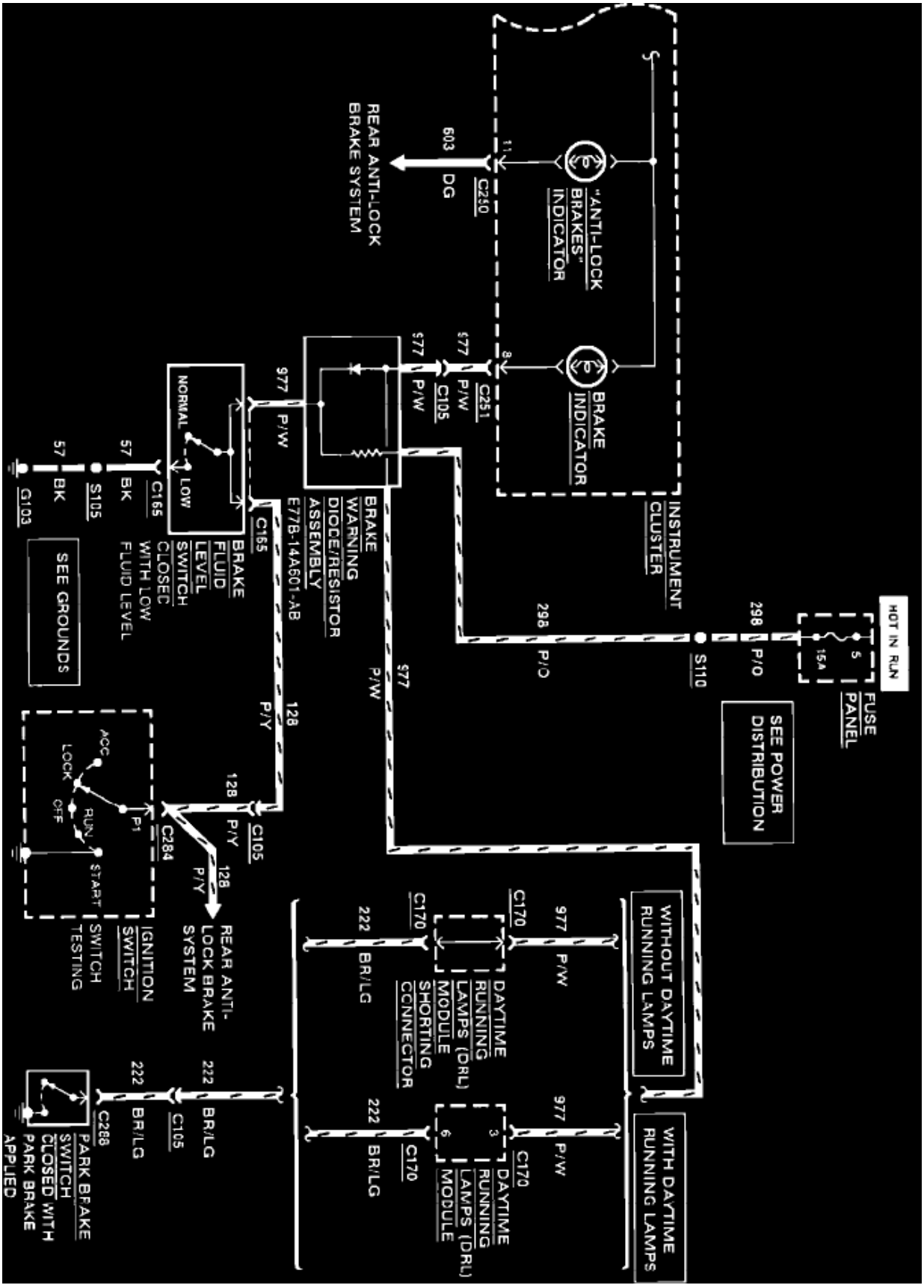
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 7136



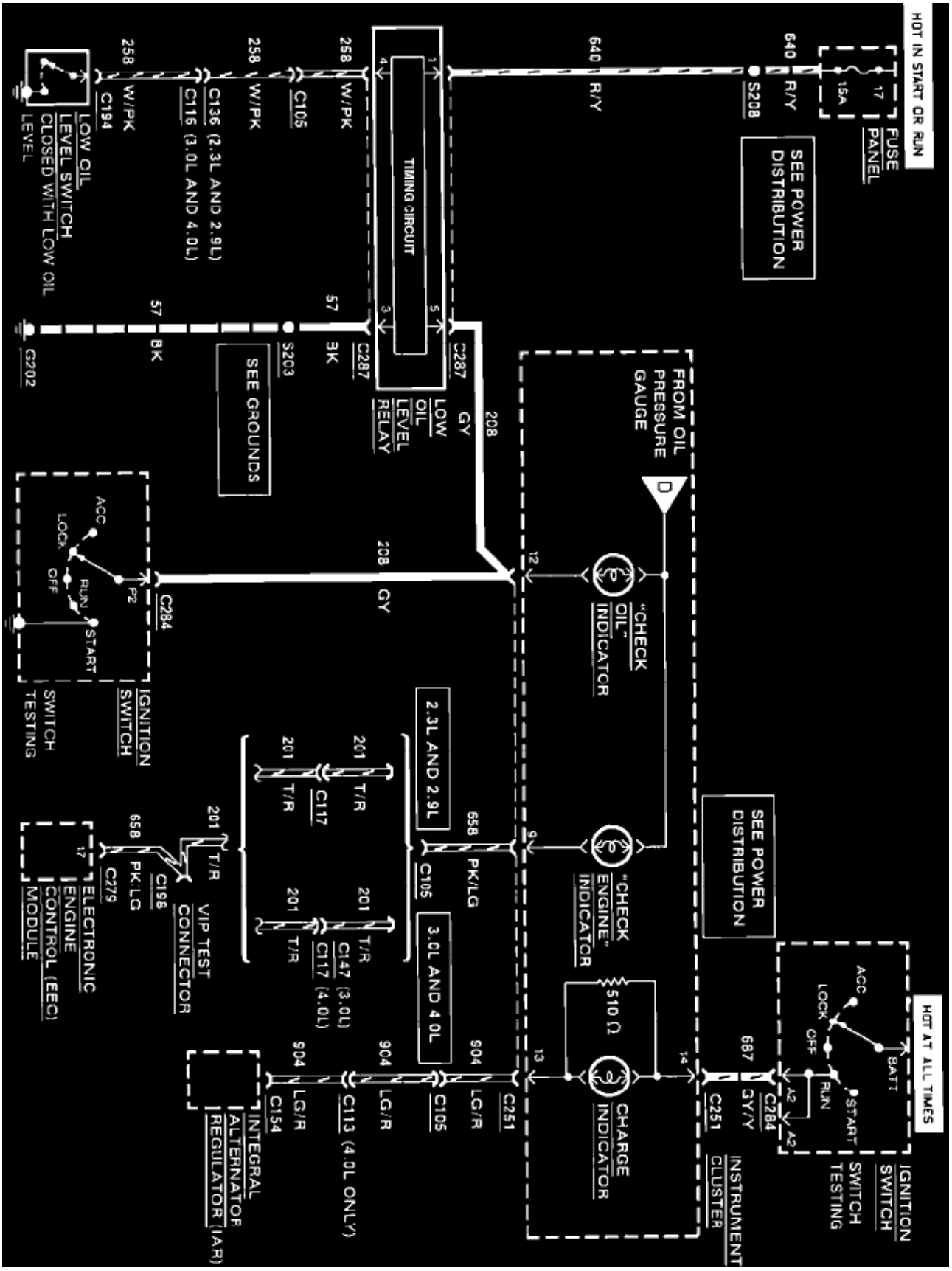
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640
R/Y
S208
C250
13
TO VOLTMETER
TACHOMETER
C
7
398
BK/Y
2.9L, 3.0L AND 4.0L
C105
2.3L
IGNITION SYSTEM
11
T/Y
6
SEE GROUNDS
57
BK
G103
S105
ELECTRIC SHIFT ONLY
782
BR/W
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
784
LB/BK
C138
210
LB
10
9
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
C250
S210
C105
C138
C157
4X4 INDICATOR SWITCH
LO
HI
REAR ANTI-LOCK BRAKE SYSTEM

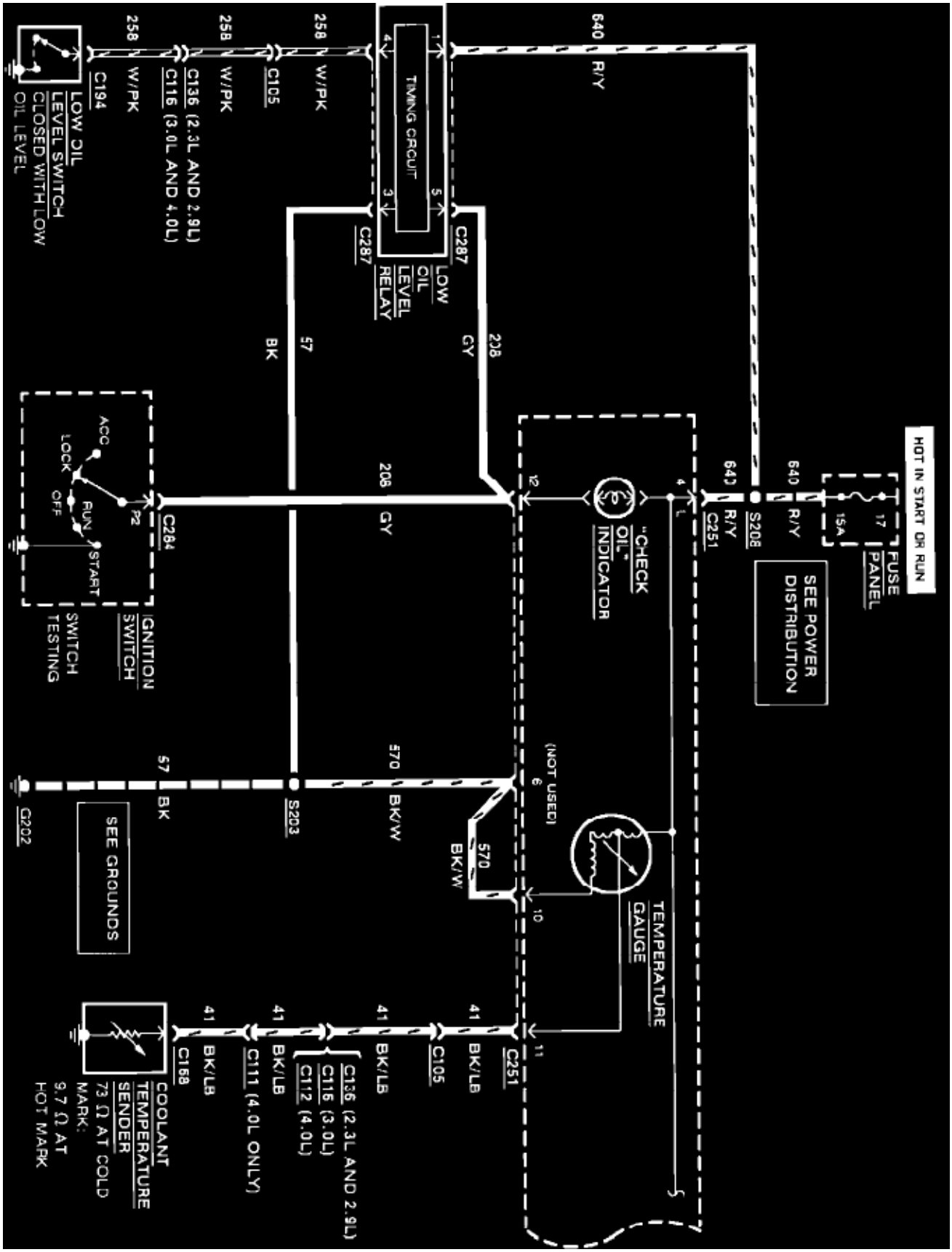
Instrument Panel (Sport)


HOT IN RUN
FUSE PANEL
5
15A
298 P/O
SEE POWER DISTRIBUTION
S110
INSTRUMENT CLUSTER
"ANTI-LOCK BRAKES" INDICATOR
BRAKE INDICATOR
603 DG
C250
11
REAR ANTI-LOCK BRAKE SYSTEM
577 P/W
C251
8
C105
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
977 P/W
C165
BRAKE FLUID LEVEL SWITCH CLOSED WITH LOW FLUID LEVEL
NORMAL
LOW
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
ACC
LOCK
OFF
RUN
START
P1
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
C170
222 BR/LG
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
DAYTIME RUNNING LAMPS (DRL) MODULE
PARK BRAKE SWITCH CLOSED WITH PARK BRAKE APPLIED
C268

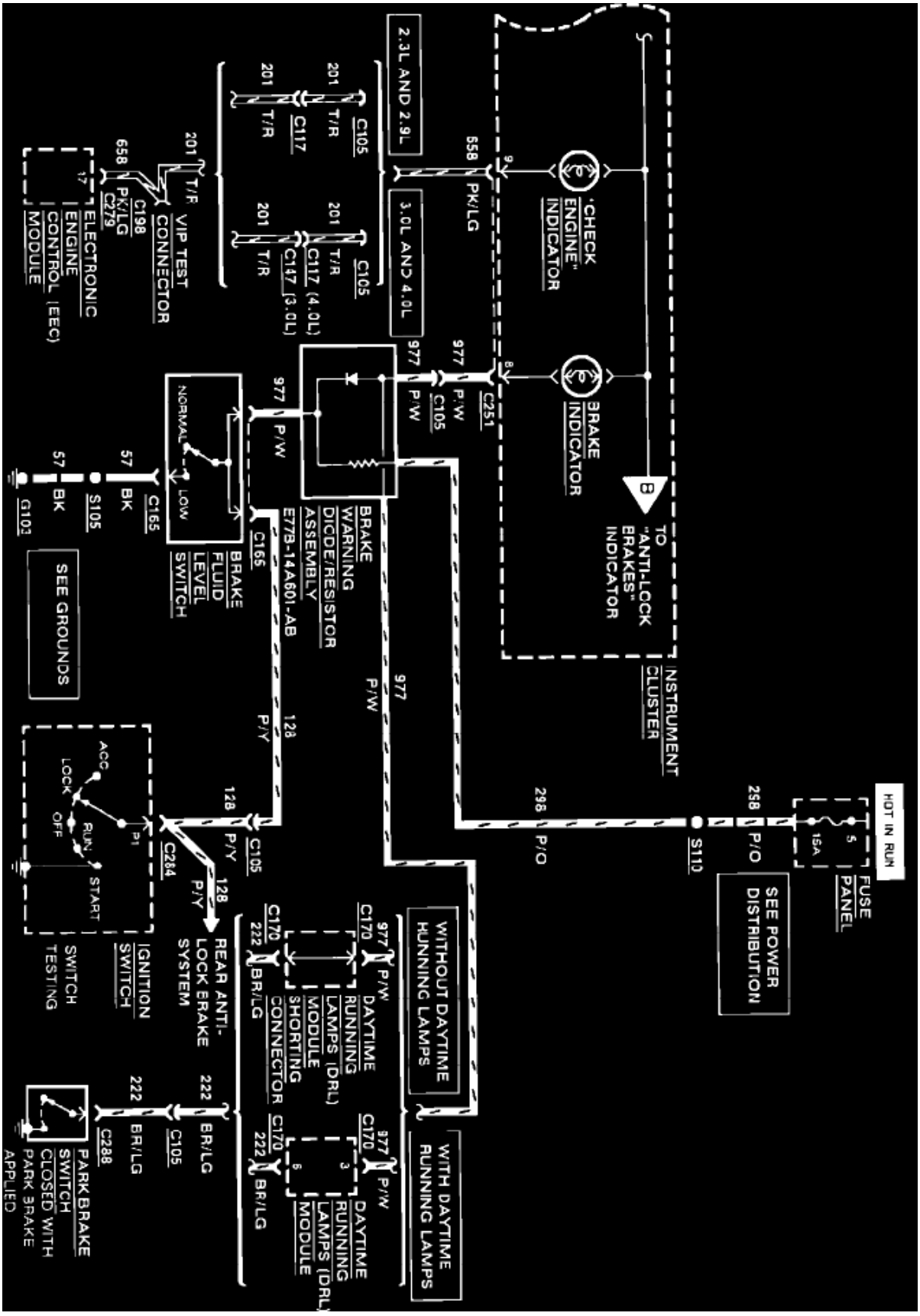
Instrument Panel (Sport)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
IGNITION SWITCH
BATT
ACC
LOCK
OFF
RUN
START
A2
C284
GY/Y
687
C251
INSTRUMENT CLUSTER
SWITCH TESTING
TIMING CIRCUIT
1
2
3
4
5
C287
LOW OIL LEVEL RELAY
258
W/PK
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
57
BK
G202
S203
SEE GROUNDS
208
GY
FROM OIL PRESSURE GAUGE
D
"CHECK OIL" INDICATOR
12
"CHECK ENGINE" INDICATOR
9
510 Ω
CHARGE INDICATOR
13
14
P2
C284
IGNITION SWITCH
SWITCH TESTING
2.3L AND 2.9L
3.0L AND 4.0L
658
PK/LG
201
T/R
C117
C147 (3.0L)
C117 (4.0L)
C198
VIP TEST CONNECTOR
C279
ELECTRONIC ENGINE CONTROL (EEC) MODULE
904
LG/R
C113 (4.0L ONLY)
C154
INTEGRAL ALTERNATOR REGULATOR (IAR)

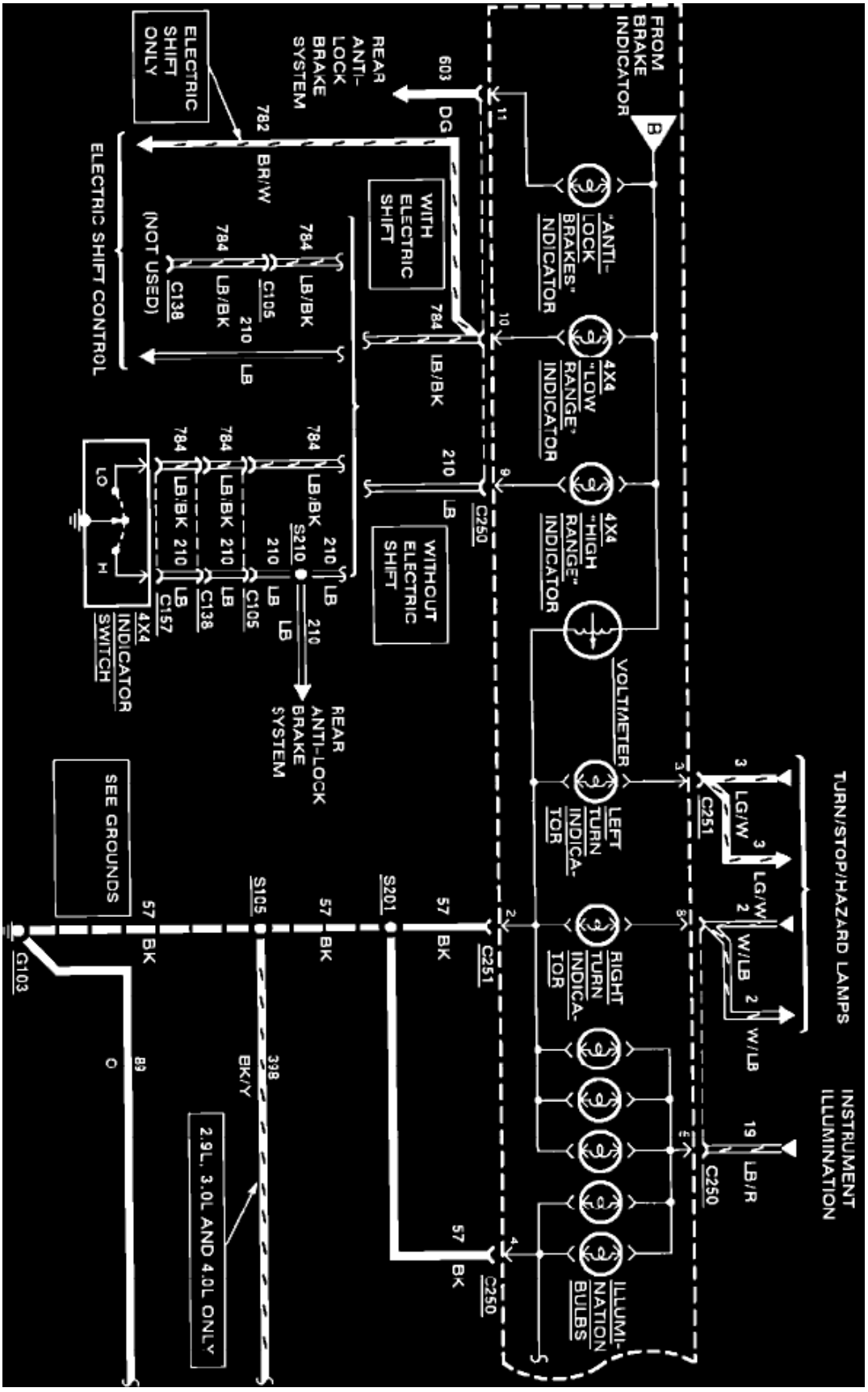
Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
C251
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
(NOT USED)
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
238
GY
57
BK
208
570
BK/W
258
W/PK
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
C284
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
SWITCH TESTING
S203
G202
SEE GROUNDS
41
BK/LB
C112 (4.0L)
C111 (4.0L ONLY)
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD
MARK:
9.7 Ω AT HOT MARK

Instrument Panel (Standard)

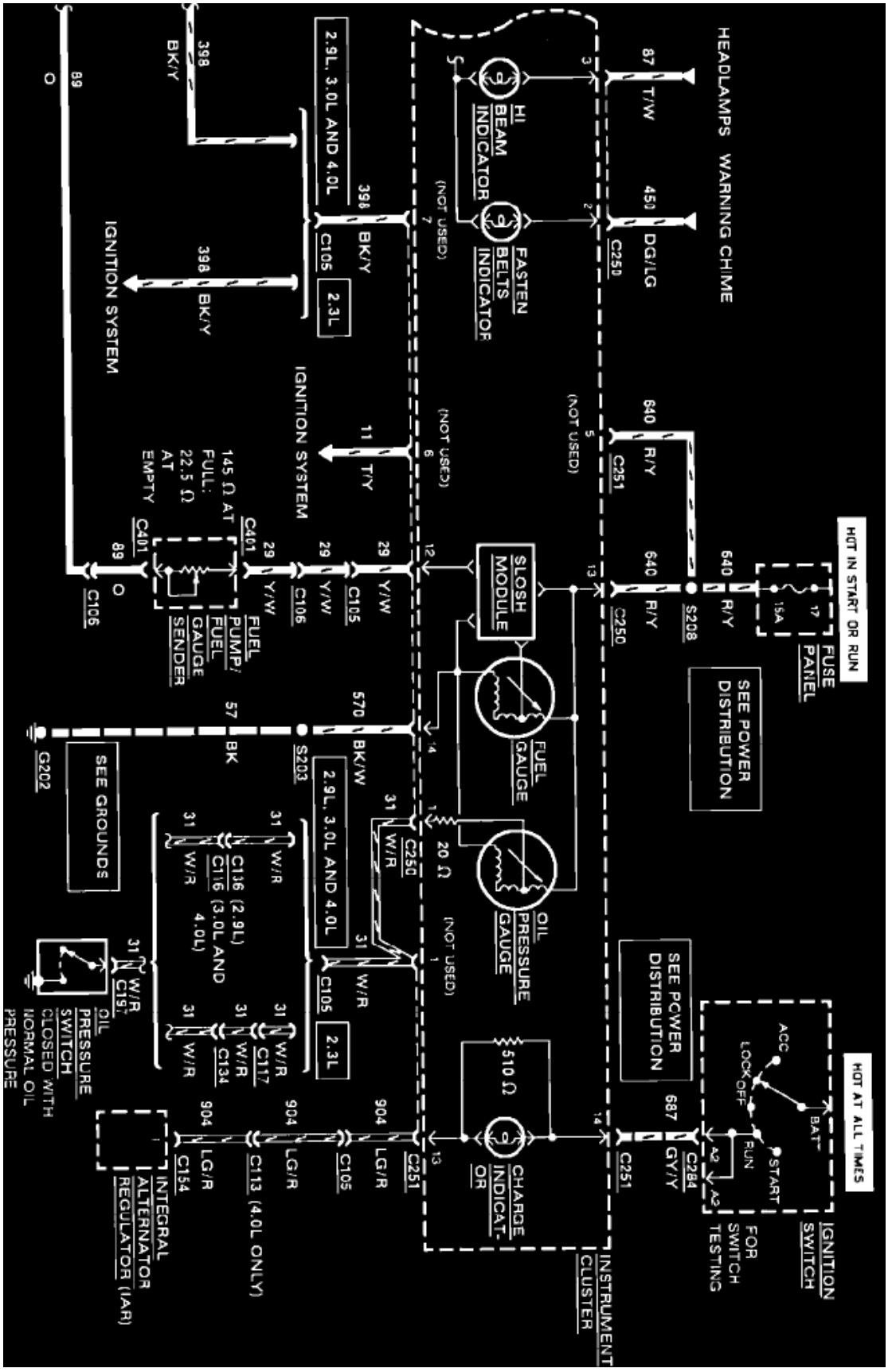

HOT IN RUN
FUSE PANEL
5
15A
SEE POWER DISTRIBUTION
298 P/O
S110
INSTRUMENT CLUSTER
TO "ANTI-LOCK BRAKES" INDICATOR
BRAKE INDICATOR
"CHECK ENGINE" INDICATOR
2.3L AND 2.9L
3.0L AND 4.0L
C105
C117
C117 (4.0L)
C147 (3.0L)
201 T/R
658 PK/LG
C198
C279
VIP TEST CONNECTOR
ELECTRONIC ENGINE CONTROL (EEC) MODULE
977 P/W
C251
BRAKE WARNING DIODE/RESISTOR ASSEMBLY
E77B-14A601-AB
BRAKE FLUID LEVEL SWITCH
NORMAL
LOW
C165
57 BK
S105
G103
SEE GROUNDS
128 P/Y
C284
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
C170
222 BR/LG
DAYTIME RUNNING LAMPS (DRL) MODULE
SHORTING CONNECTOR
PARK BRAKE SWITCH
CLOSED WITH PARK BRAKE APPLIED

Instrument Panel (Standard)

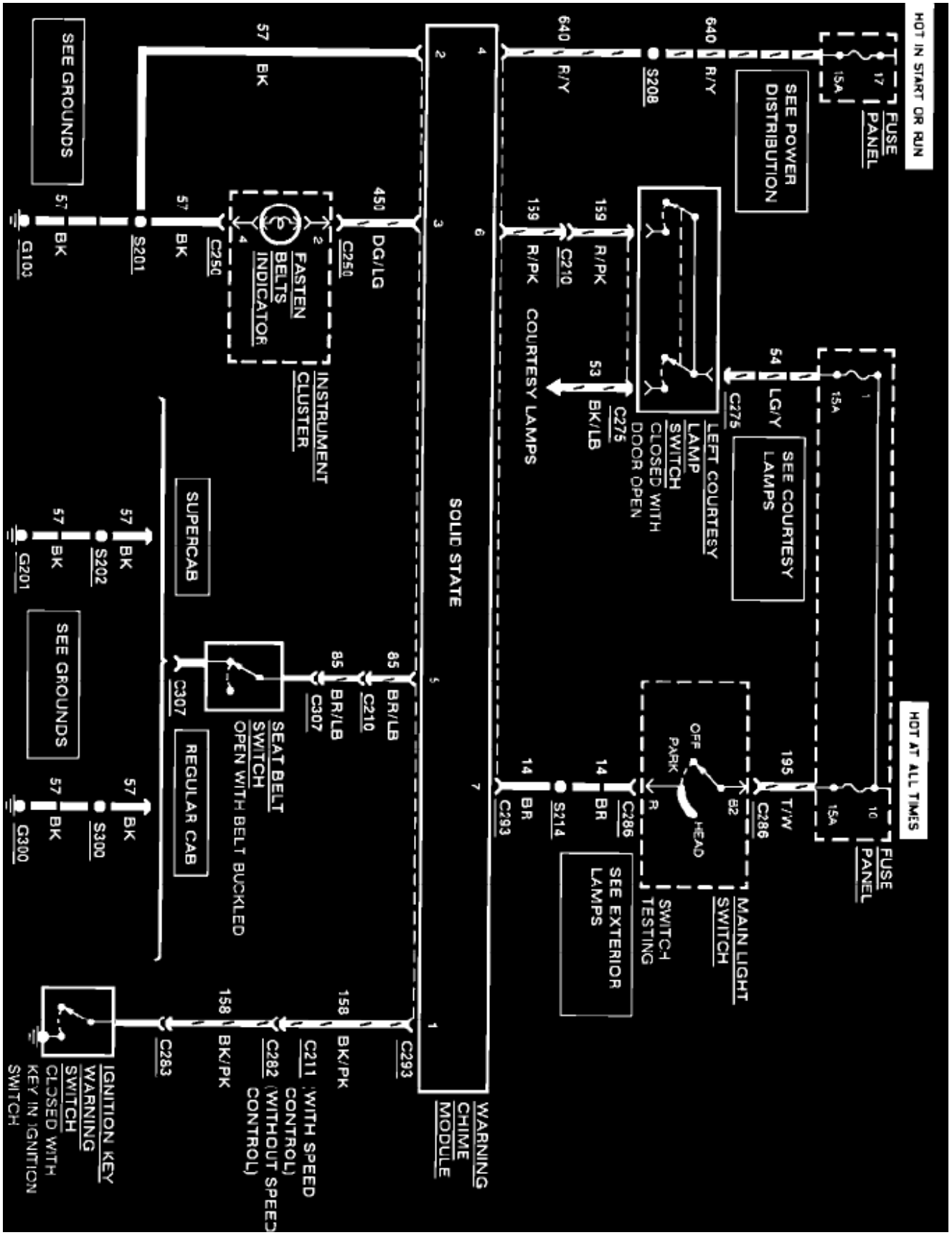

TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C105
C138
C157
C250
C251
S105
S201
S210
G103
LG/W
W/LB
LB/R
LB/BK
BR/W
BK/Y
DG
BK
O

Instrument Panel (Standard)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Driver/Vehicle Information Display > Component Information > Diagrams > Diagram Information and Instructions > Page 7143



Instrument Panel (Standard)


HOT IN START OR RUN
HOT AT ALL TIMES
FUSE PANEL
17
15A
10
15A
SEE POWER DISTRIBUTION
SEE COURTESY LAMPS
640 R/Y
S208
54 LG/Y
C275
LEFT COURTESY LAMP SWITCH CLOSED WITH DOOR OPEN
53 BK/LB
159 R/PK
C210
COURTESY LAMPS
195 T/W
C286
B2
MAIN LIGHT SWITCH
OFF
PARK
HEAD
R
14 BR
S214
C286
C293
SEE EXTERIOR LAMPS
SWITCH TESTING
SOLID STATE
WARNING CHIME MODULE
450 DG/LG
C250
FASTEN BELTS INDICATOR
INSTRUMENT CLUSTER
57 BK
S201
G103
SEE GROUNDS
SUPERCAB
REGULAR CAB
85 BR/LB
C307
SEAT BELT SWITCH OPEN WITH BELT BUCKLED
S202
G201
S300
G300
158 BK/PK
C211 (WITH SPEED CONTROL)
C282 (WITHOUT SPEED CONTROL)
C283
IGNITION KEY WARNING SWITCH CLOSED WITH KEY IN IGNITION SWITCH

Warning Chime

Fuel Gauge: Description and Operation

BI-METAL FUEL INDICATOR

This fuel level indicating system consists of a sending unit attached to the fuel reservoir and a fuel gauge mounted on the instrument panel. The bi-metal fuel indicator gauge pointer is attached to a wire-wound bimetal strip which, when heated by the flow of electrical current controlled by the sender unit, produces the appropriate indication. The bi-metal fuel indicator is used with a Instrument Voltage Regulator (IVR), which controls and maintains an average pulsating voltage of 5 volts at the indicator. The fuel sender consists of a variable resistor, controlled by the action of an attached float in the fuel tank. The variable resistor consists of a screened resistive material on a ceramic substrate, which produces a resistance value. On models except Aerostar, Bronco II, Explorer and Ranger, resistance should be 10 ohms (full tank) and 70 ohms (empty tank). On Aerostar, Bronco II, Explorer and Ranger, resistance should be 145 ohms (full tank) and 22.5 ohms (empty tank).

MAGNETIC FUEL INDICATOR

This fuel level indicating system consists of a sending unit attached to the fuel reservoir and a fuel gauge mounted on the instrument panel. The magnetic fuel indicator gauge creates a polarity in the wire windings which, depending on the resistance at the sender, controls the degree of pointer rotation. This gauge operates on battery voltage. The fuel sender consists of a variable resistor, controlled by the action of an attached float in the fuel tank.

CONDITION	POSSIBLE SOURCE	ACTION
Fuel gauge shows empty at all levels of fill.	1. Loose or dirty wiring connections or short to ground in wiring.	1. Check wiring connectors and sender terminals. Repair, clean, or tighten as needed.
	2. Leaking sender float.	2. Replace sender.
	3. Missing sender float.	3. Install float. Ensure float is securely retained on sender arm.
	4. Open circuit in sender.	4. Test for correct resistance values and replace if needed.
	5. Sender arm movement obstructed.	5. INSPECT tank and sender for cause REPLACE faulty component
Fuel gauge will not read full when tank is full.	1. Wrong sender installed.	1. Check part number. Install correct part.
	2. Sender arm movement obstructed. (Float rod bent)	2. INSPECT tank and sender for cause REPLACE faulty component.
	3. Leaking float.	3. Install new sender.
	4. Sender or gauge calibration.	4. Test for correct resistance valve and replace if needed.
	5. Fuel tank not filling to rated capacity.	5. Check fuel tank fill vent for kinks or obstructions. Correct as required and fill tank to verify proper capacity.

Fig. 7 Troubleshooting Chart

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	VERIFY CONDITION		
• Verify condition.		Gauge pointer does not move ▶	GO to **A2**.
		Gauge pointer moves ▶	GO to **B1**.
A2	CHECK OTHER GAUGES		
• Check power to cluster. With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test lamp to verify voltage at B+ terminal of cluster connector.		Other gauges and warning lamps operate properly; voltage present at cluster ▶	GO to **B1**.
		Other gauges and warning lamps do not operate properly; no voltage present at cluster ▶	REPAIR power to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TEST BOX CHECK		
• Place ignition switch in the OFF position. • Insert Instrument Gauge System Tester, Rotunda 021-00055 in sender circuit. Disconnect circuit 14405 connector under instrument panel and connect tester to cluster side of connector. Set tester to the 22 ohm position. • Place ignition in the ON position. • Wait 60 seconds. • Read fuel gauge.		Gauge reads 1/8-3/8 or 5/8-7/8 ▶	REPLACE fuel gauge.
		Gauge reads 3/8-5/8 ▶	REPLACE anti-slosh module.
		Gauge reads E ▶	GO to **B2**.
		Pointer pegged past FULL ▶	REPLACE anti-slosh module.
		Pointer does not move ▶	REPLACE fuel gauge.
B2	TEST BOX CHECK		
• Place ignition switch in the OFF position. • Insert Instrument Gauge System Tester, Rotunda 021-00055 in sender circuit. Disconnect circuit 14405 connector under instrument panel and connect tester to cluster side of connector. Set tester to the 145 ohm position. • Wait 60 seconds. • Read fuel gauge.		Gauge reads FULL ▶	GO to **B3**.
		Gauge reads less than 7/8 ▶	REPLACE fuel gauge.

B3	SENDER WIRING CHECK		
• Check sender circuit wiring for shorts or open with ohmmeter.		Circuit OK ▶	GO to **C1**.
		Circuit Not OK ▶	SERVICE wiring.

Fuel Gauge: Pinpoint Tests

Fig. 4 Troubleshooting Chart

Fig. 5 Troubleshooting Chart

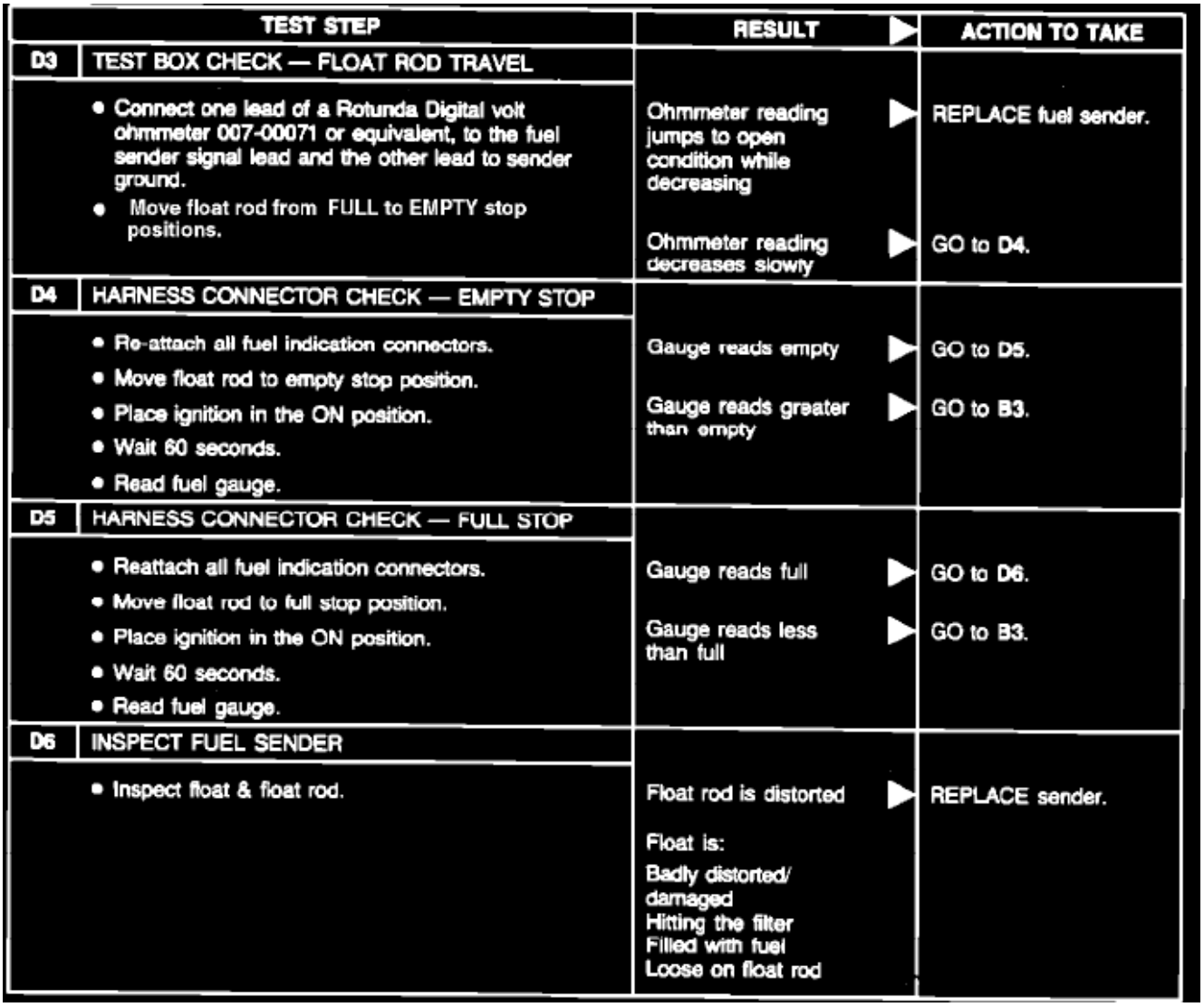
Fig. 5 Troubleshooting Chart

TEST STEP		RESULT	ACTION TO TAKE
C1	TANK INSPECTION • Inspect fuel tank for distortion or damage.	Damaged ▶ Not damaged ▶	REPLACE fuel tank. GO to D1.
D1	TEST BOX CHECK — EMPTY STOP • Connect one lead of a Rotunda Digital volt ohmmeter 007-00001 or equivalent, to the fuel sender signal lead and the other lead to sender ground. • When the float rod is against the empty stop (closest to fuel filter).	Digital volt ohmmeter read 14-18Ω ▶ Digital volt ohmmeter reads less than 14Ω or greater than 18Ω ▶	GO to D2. REPLACE fuel sender.
D2	TEST BOX CHECK — FULL STOP • Connect one lead of a Rotunda Digital volt ohmmeter 007-00071 or equivalent, to the fuel sender signal lead and the other lead to sender ground. • When the float rod is against the full stop.	Digital volt ohmmeter read 155-165Ω ▶ Digital volt ohmmeter reads less than 155Ω or greater than 165Ω. ▶	GO to D3. REPLACE fuel sender.

TEST STEP		RESULT	ACTION TO TAKE
C1	TANK INSPECTION • Inspect fuel tank for distortion or damage.	Damaged ▶ Not damaged ▶	REPLACE fuel tank. GO to D1.
D1	TEST BOX CHECK — EMPTY STOP • Connect one lead of a Rotunda Digital volt ohmmeter 007-00001 or equivalent, to the fuel sender signal lead and the other lead to sender ground. • When the float rod is against the empty stop (closest to fuel filter).	Digital volt ohmmeter read 14-18Ω ▶ Digital volt ohmmeter reads less than 14Ω or greater than 18Ω ▶	GO to D2. REPLACE fuel sender.
D2	TEST BOX CHECK — FULL STOP • Connect one lead of a Rotunda Digital volt ohmmeter 007-00071 or equivalent, to the fuel sender signal lead and the other lead to sender ground. • When the float rod is against the full stop.	Digital volt ohmmeter read 155-165Ω ▶ Digital volt ohmmeter reads less than 155Ω or greater than 165Ω. ▶	GO to D3. REPLACE fuel sender.

Fig. 6 Troubleshooting Chart

Fig. 6 Troubleshooting Chart



TEST STEP		RESULT	ACTION TO TAKE
D3	TEST BOX CHECK — FLOAT ROD TRAVEL		
• Connect one lead of a Rotunda Digital volt ohmmeter 007-00071 or equivalent, to the fuel sender signal lead and the other lead to sender ground. • Move float rod from FULL to EMPTY stop positions.		Ohmmeter reading jumps to open condition while decreasing	REPLACE fuel sender.
		Ohmmeter reading decreases slowly	GO to D4.
D4	HARNESS CONNECTOR CHECK — EMPTY STOP		
• Re-attach all fuel indication connectors. • Move float rod to empty stop position. • Place ignition in the ON position. • Wait 60 seconds. • Read fuel gauge.		Gauge reads empty	GO to D5.
		Gauge reads greater than empty	GO to B3.
D5	HARNESS CONNECTOR CHECK — FULL STOP		
• Reattach all fuel indication connectors. • Move float rod to full stop position. • Place ignition in the ON position. • Wait 60 seconds. • Read fuel gauge.		Gauge reads full	GO to D6.
		Gauge reads less than full	GO to B3.
D6	INSPECT FUEL SENDER		
• Inspect float & float rod.		Float rod is distorted	REPLACE sender.
		Float is: Badly distorted/ damaged Hitting the filter Filled with fuel Loose on float rod	

Fig. 6 Troubleshooting Chart

Fuel Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

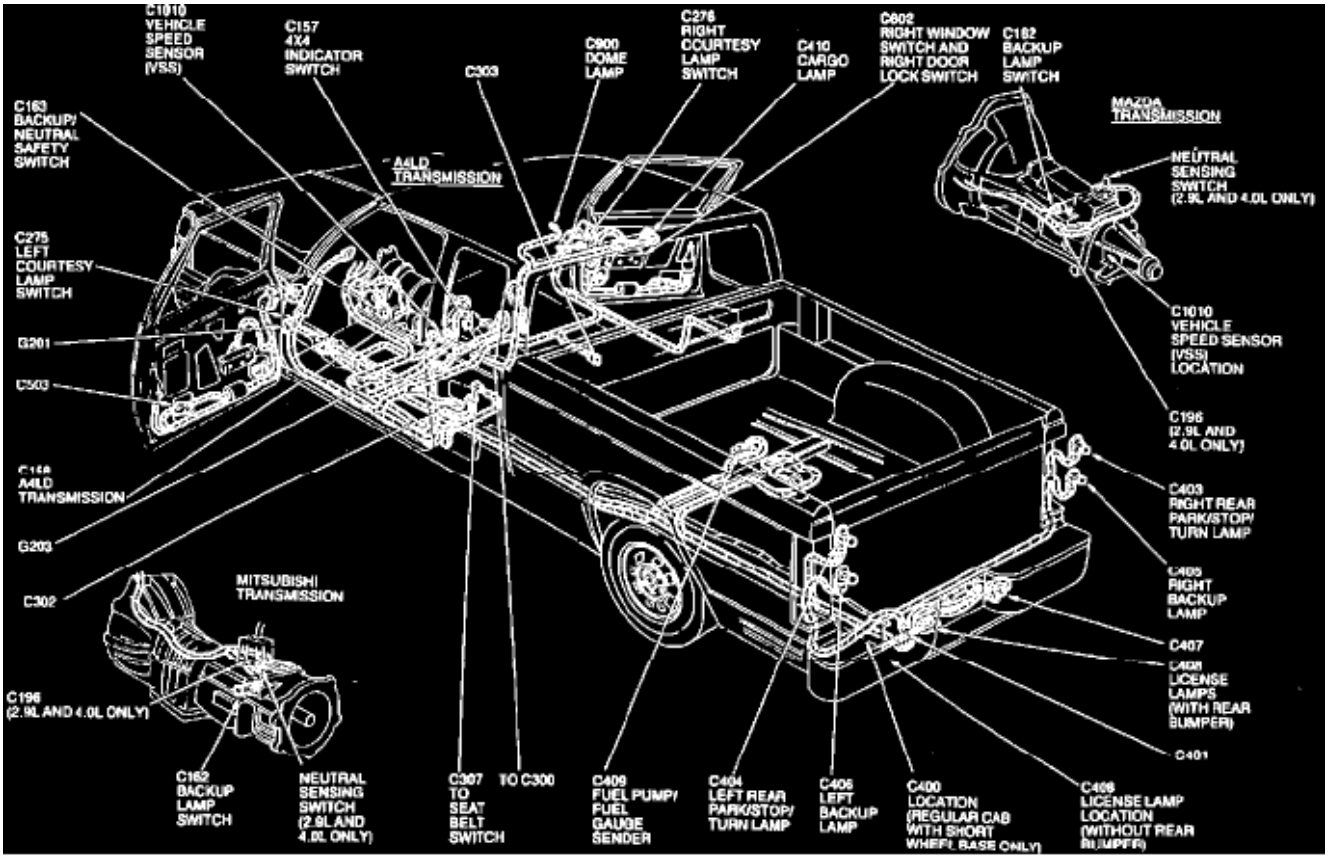
3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.



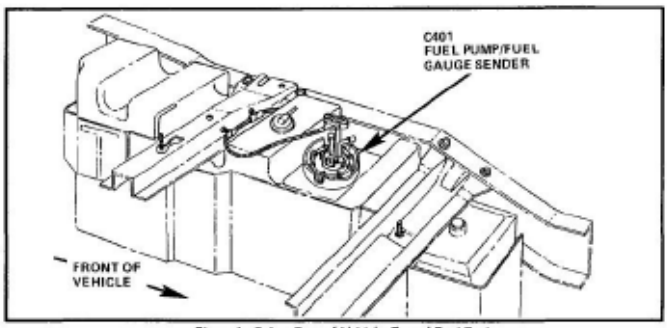


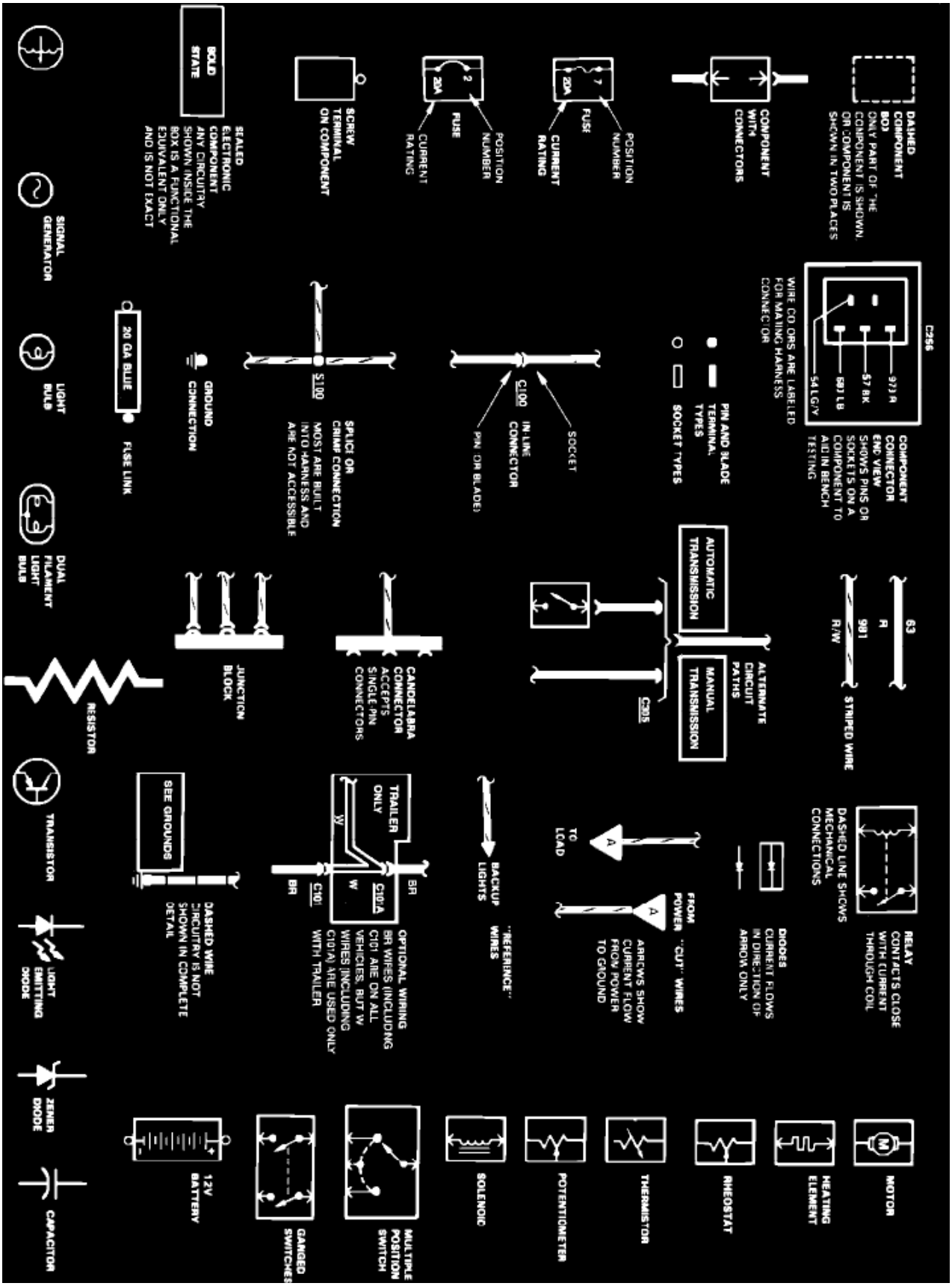
Figure 1 - Below Rear of Vehicle, Top of Fuel Tank

Fuel Gauge Sender: Locations

Body Components

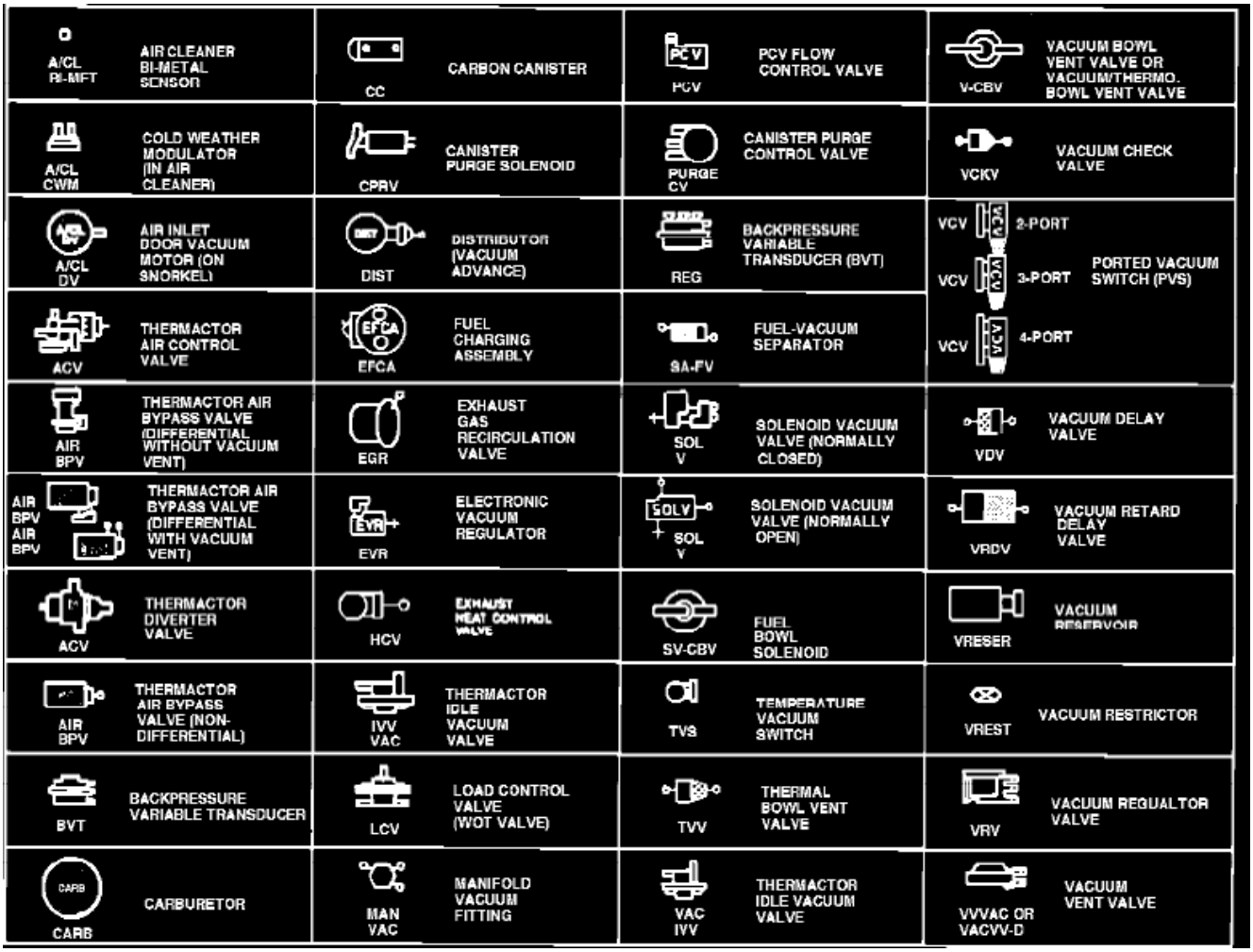
Below Rear Of Vehicle, Top Center Of Fuel Tank

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Instrument Cluster / Carrier > Instrument Panel Circuit Board > Component Information > Diagrams > Diagram Information and Instructions

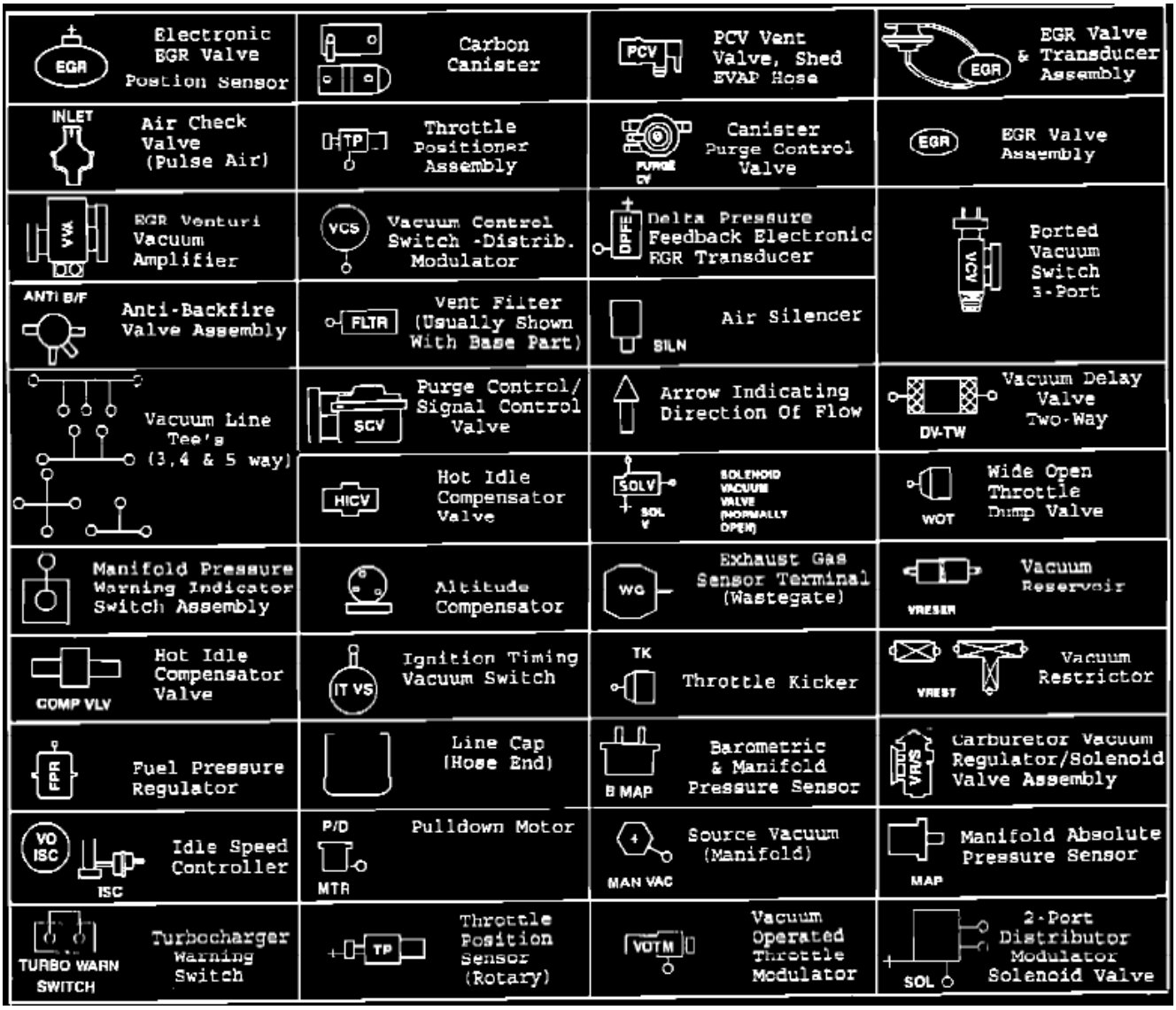


Instrument Panel Circuit Board: Diagram Information and Instructions

Symbol Identification



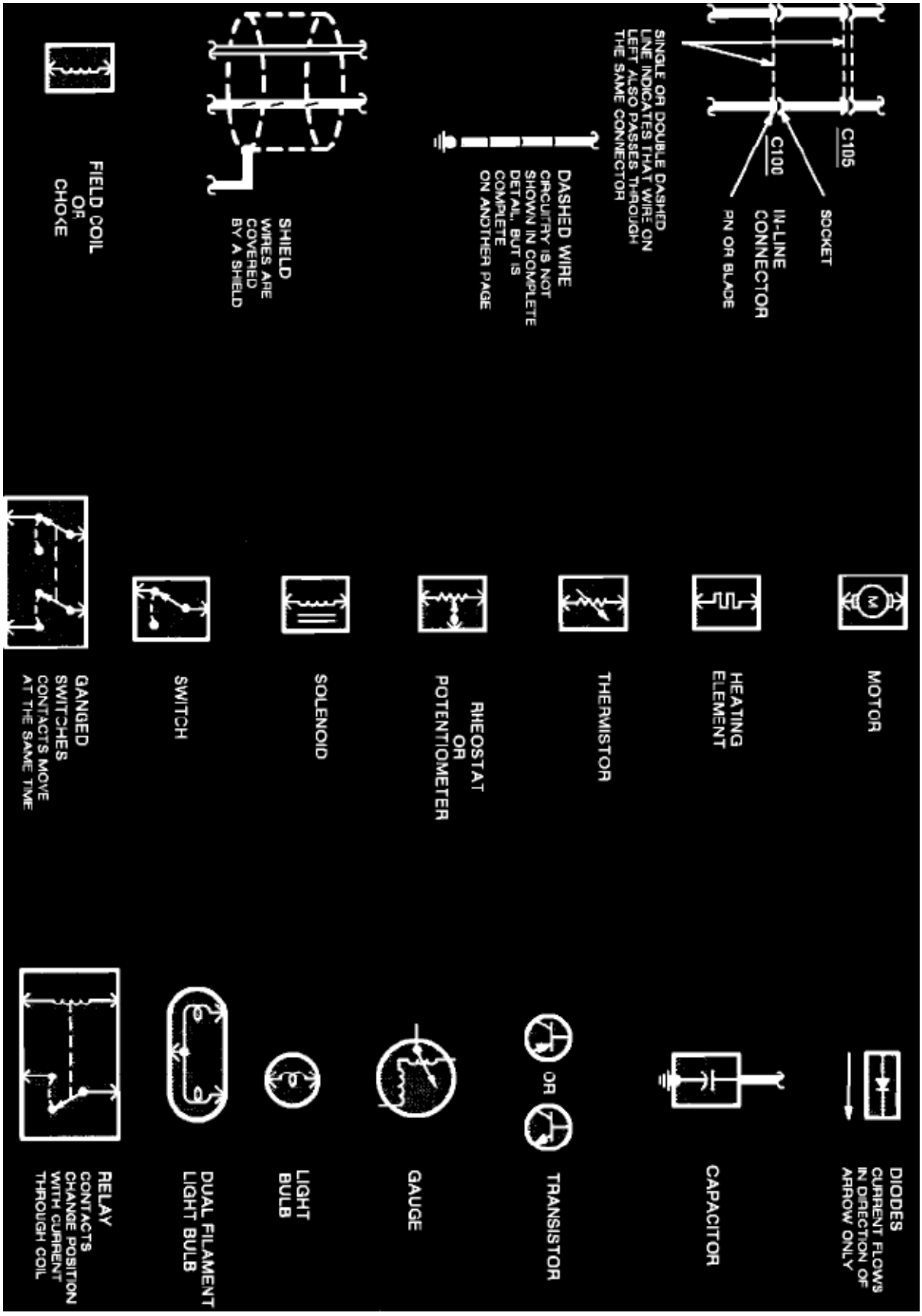
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

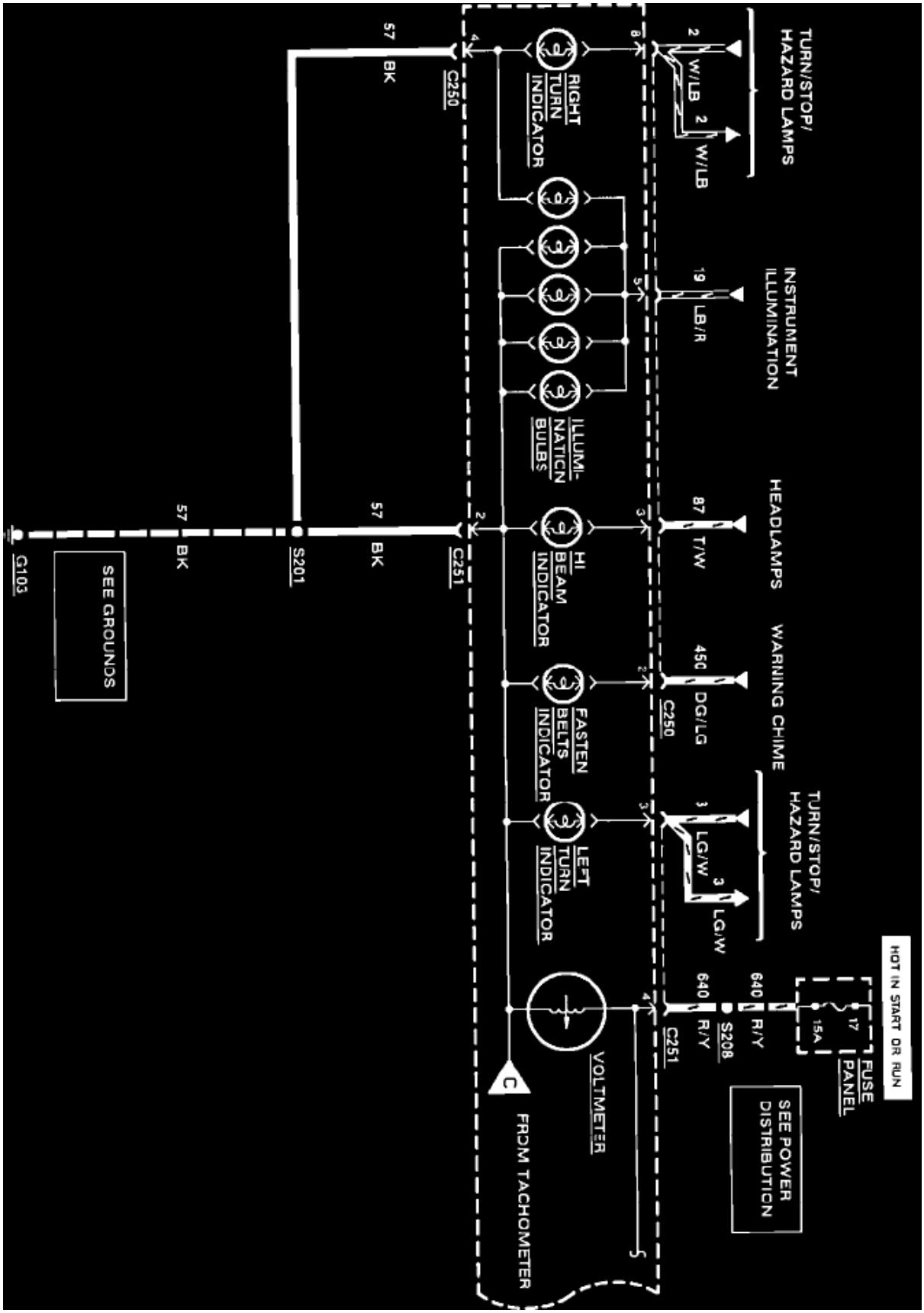
P: Purple

T: Tan

V: Violet

W: White

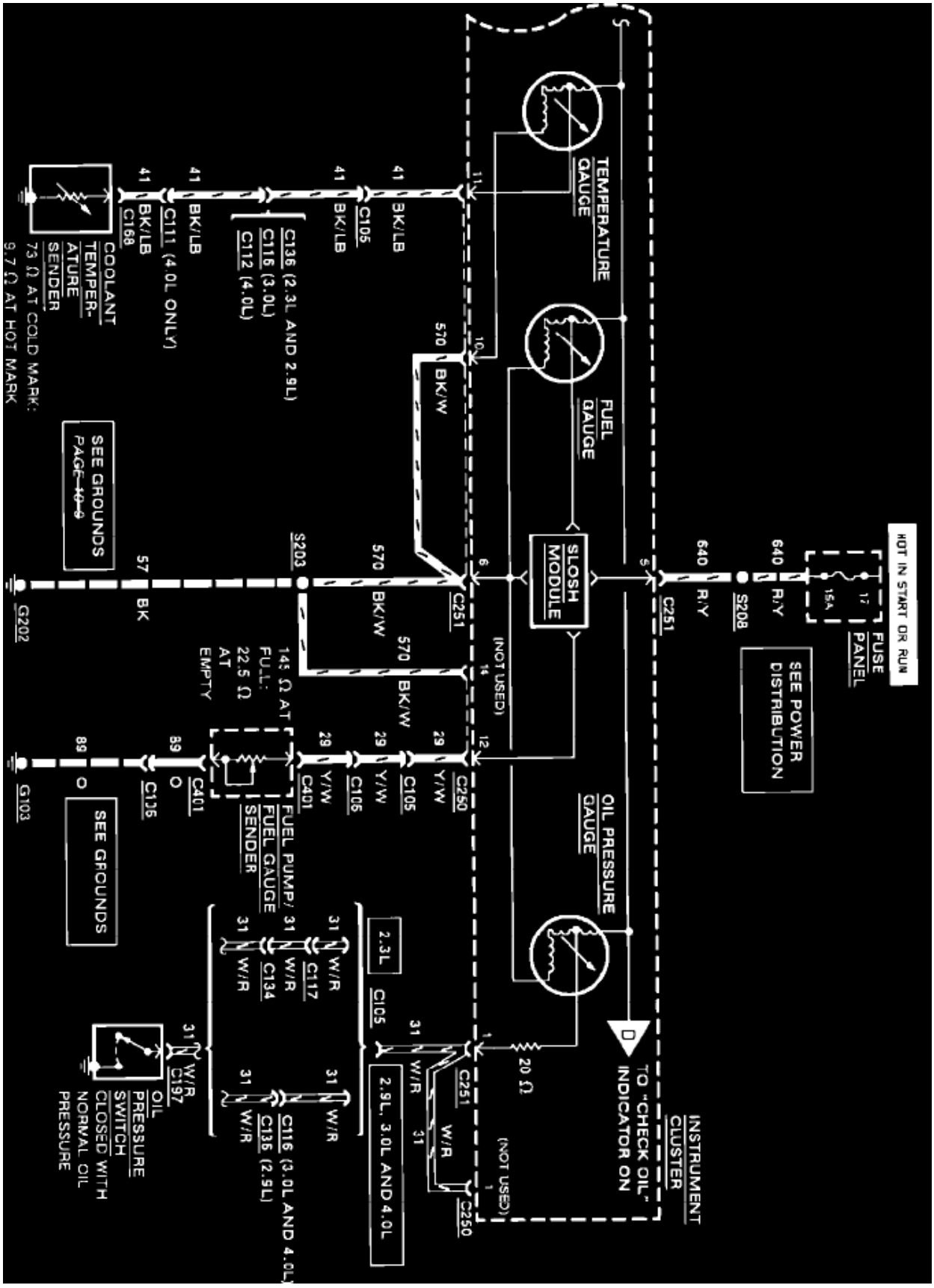
Y: Yellow


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
TURN/STOP/ HAZARD LAMPS
640
R/Y
S208
C251
TURN/STOP/ HAZARD LAMPS
LG/W
3
LG/W
640
R/Y
WARNING CHIME
HEADLAMPS
INSTRUMENT ILLUMINATION
450
DG/LG
C250
87
T/W
19
LB/R
2
W/LB
2
W/LB
VOLTMETER
C
FROM TACHOMETER
FASTEN BELTS INDICATOR
LEFT TURN INDICATOR
HI BEAM INDICATOR
ILLUMI-NATION BULBS
RIGHT TURN INDICATOR
57
BK
C250
57
BK
S201
57
BK
C251
G103
SEE GROUNDS

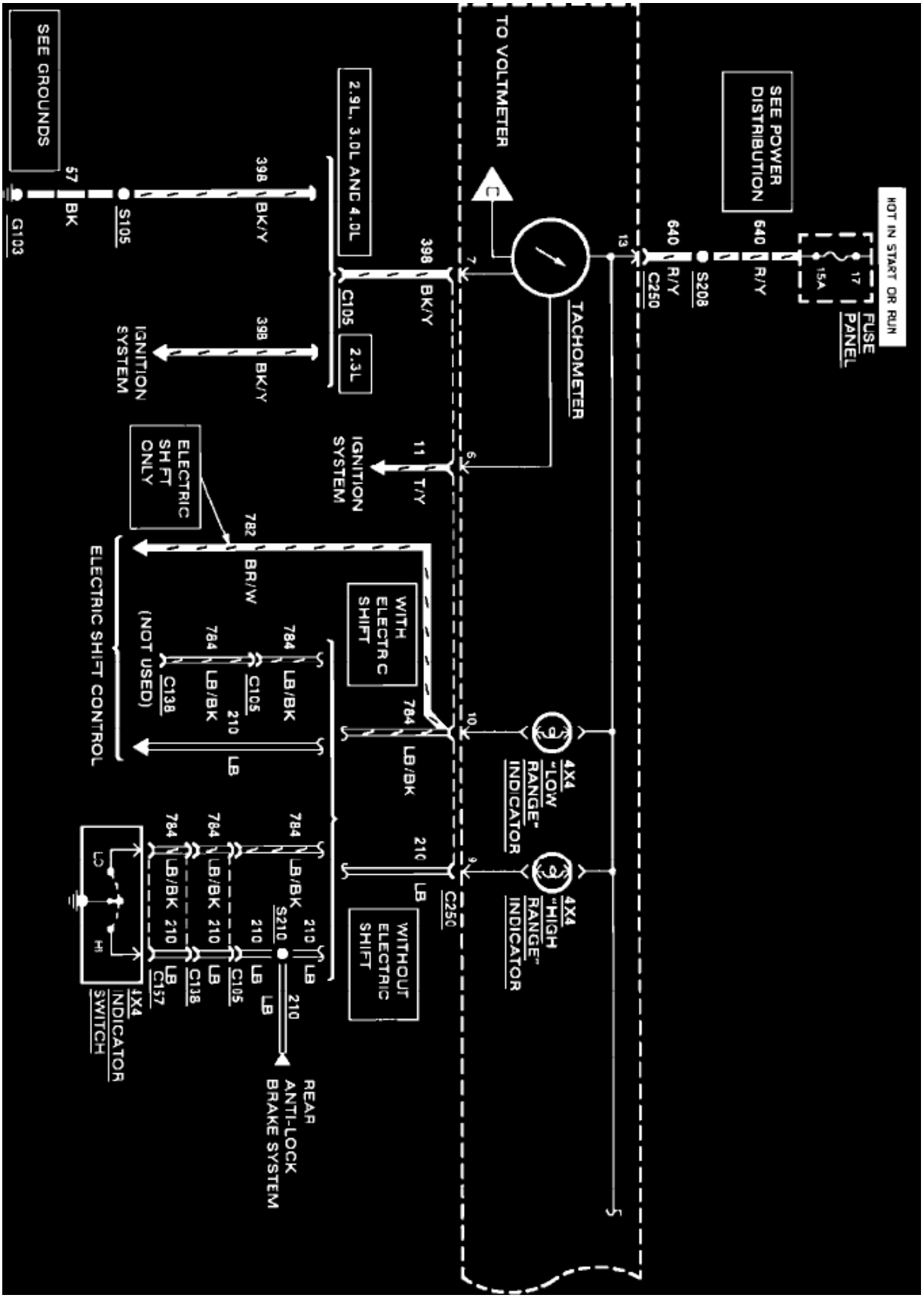
Instrument Panel Circuit Board: Electrical Diagrams

Instrument Panel (Sport)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Instrument Cluster / Carrier > Instrument Panel Circuit Board > Component Information > Diagrams > Diagram Information and Instructions > Page 7168

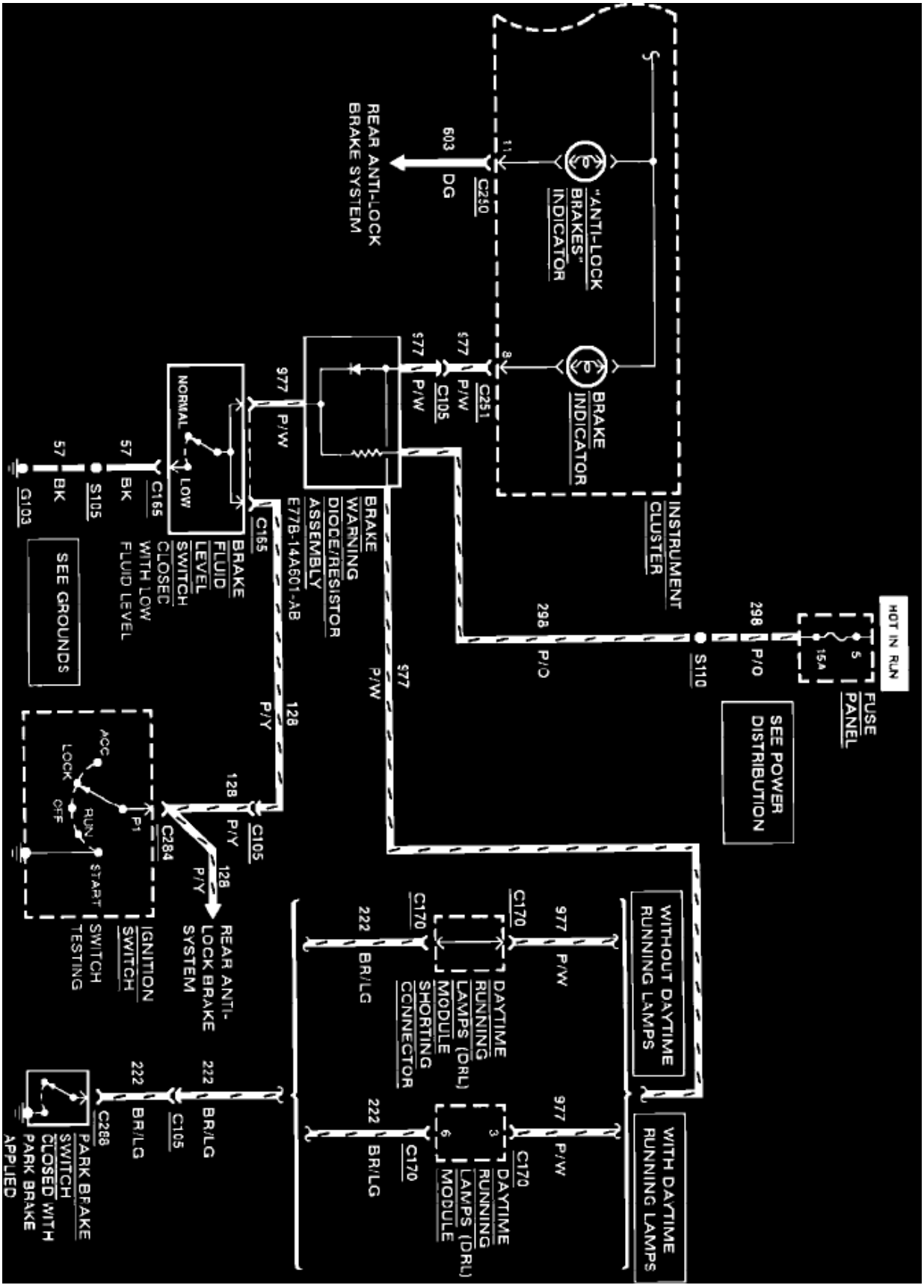


Instrument Panel (Sport)


HOT IN START OR RUN
FUSE PANEL
17
15A
SEE POWER DISTRIBUTION
640 R/Y
S208
640 R/Y
C250
13
TO VOLTMETER
C
TACHOMETER
7
398 BK/Y
C105
2.3L
2.9L, 3.0L AND 4.0L
398 BK/Y
IGNITION SYSTEM
398 BK/Y
IGNITION SYSTEM
11 T/Y
6
SEE GROUNDS
57 BK
G103
S105
ELECTRIC SHIFT ONLY
782 BR/W
ELECTRIC SHIFT CONTROL
784 LB/BK
C105
210 LB
(NOT USED)
C138
784 LB/BK
WITH ELECTRIC SHIFT
784 LB/BK
10
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
210 LB
9
C250
WITHOUT ELECTRIC SHIFT
784 LB/BK
784 LB/BK
784 LB/BK
210
S210
210 LB
210 LB
LB
LB
C105
LB
C138
LB
C157
4X4 INDICATOR SWITCH
LO
HI
210 LB
REAR ANTI-LOCK BRAKE SYSTEM

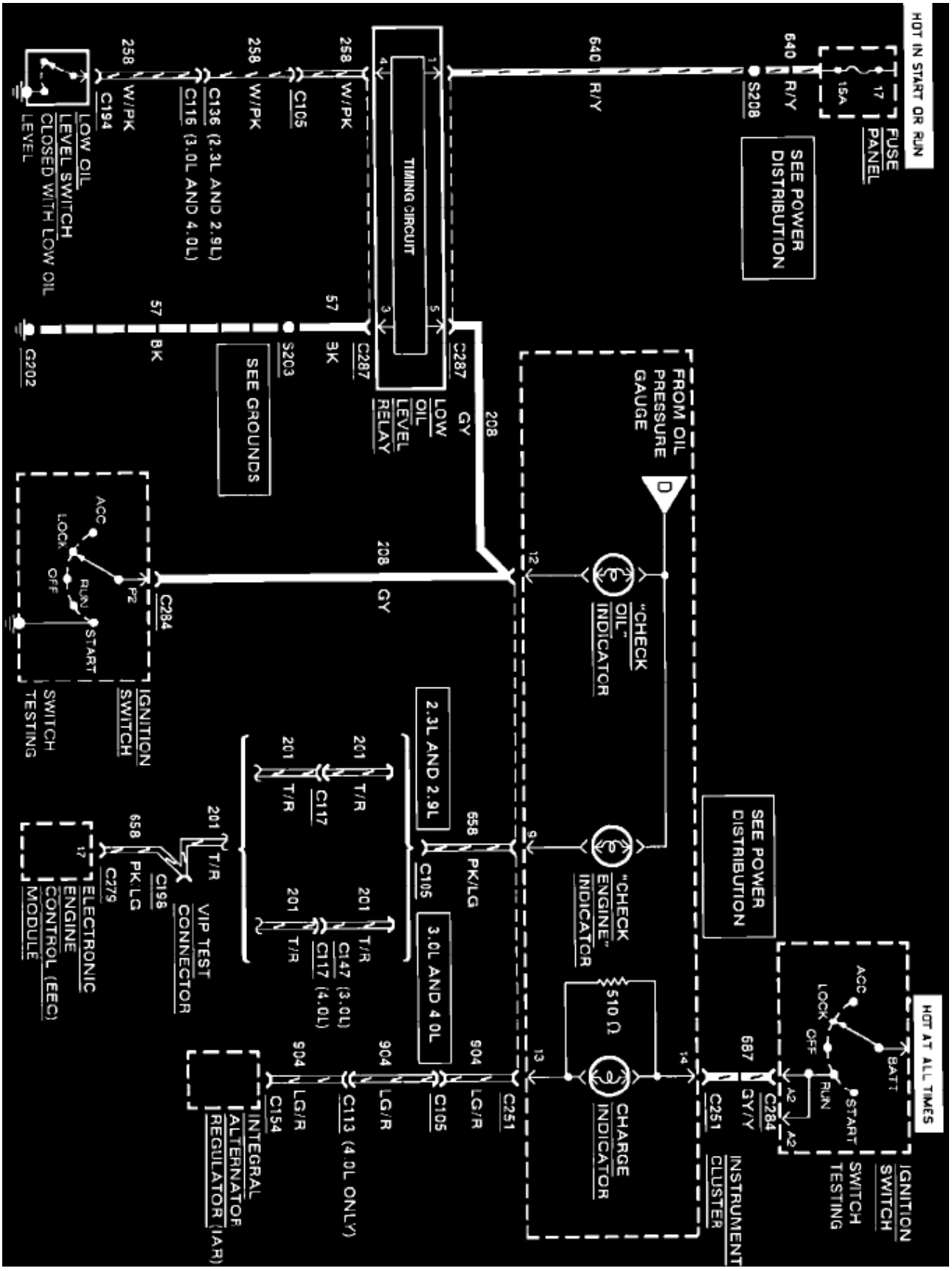
Instrument Panel (Sport)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Instrument Cluster / Carrier > Instrument Panel Circuit Board > Component Information > Diagrams > Diagram Information and Instructions > Page 7170

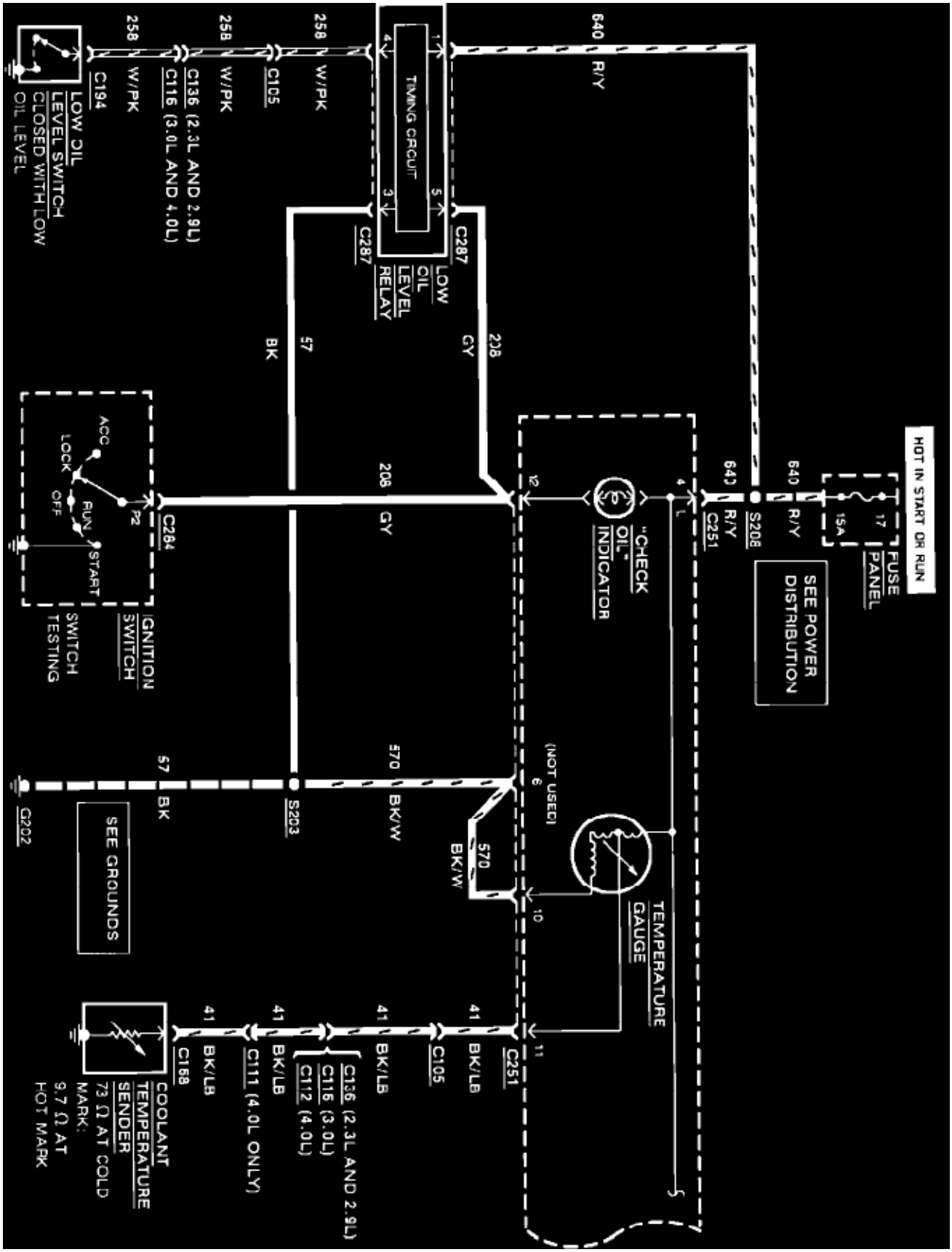


Instrument Panel (Sport)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Instrument Cluster / Carrier > Instrument Panel Circuit Board > Component Information > Diagrams > Diagram Information and Instructions > Page 7171

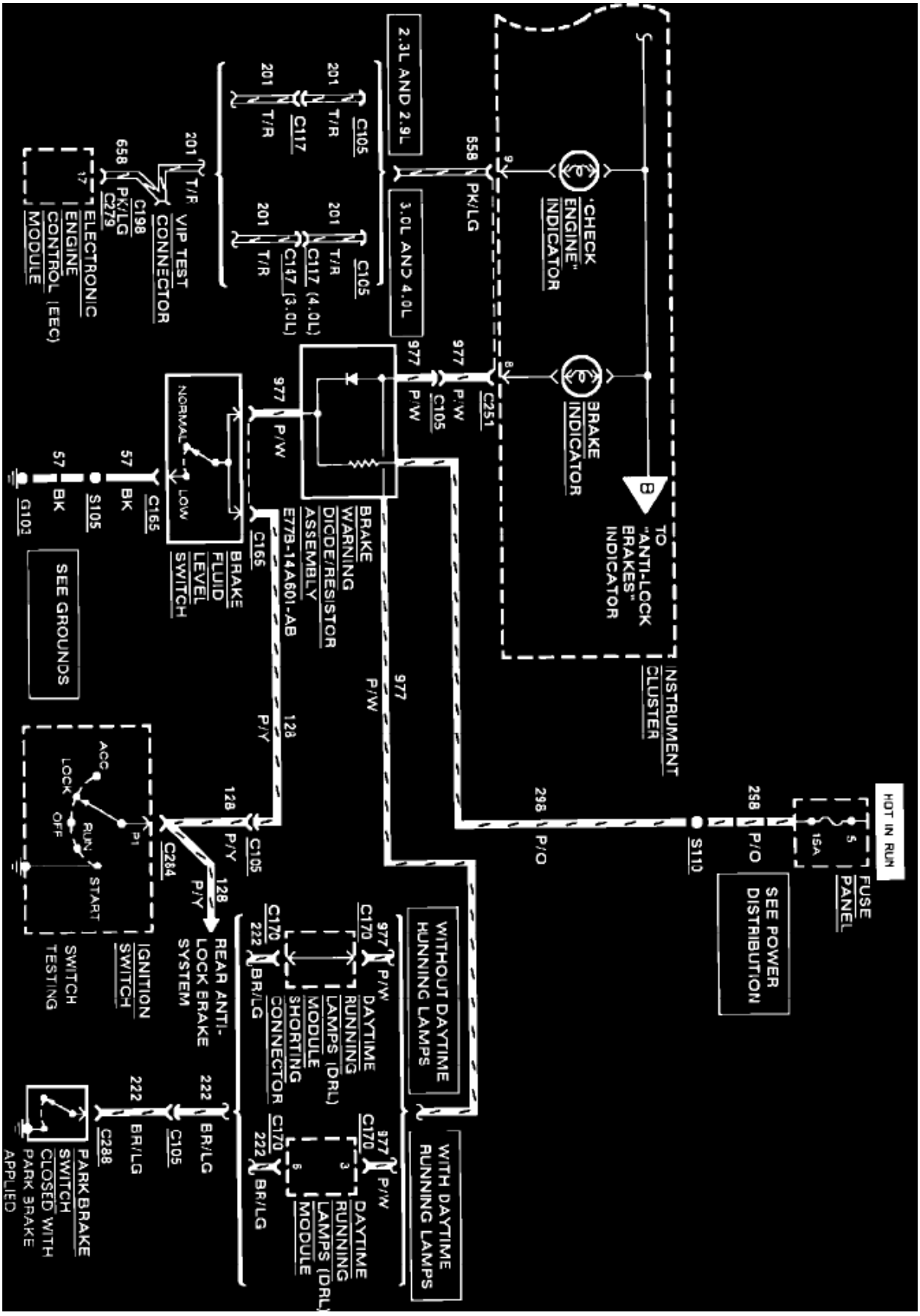


Instrument Panel (Sport)

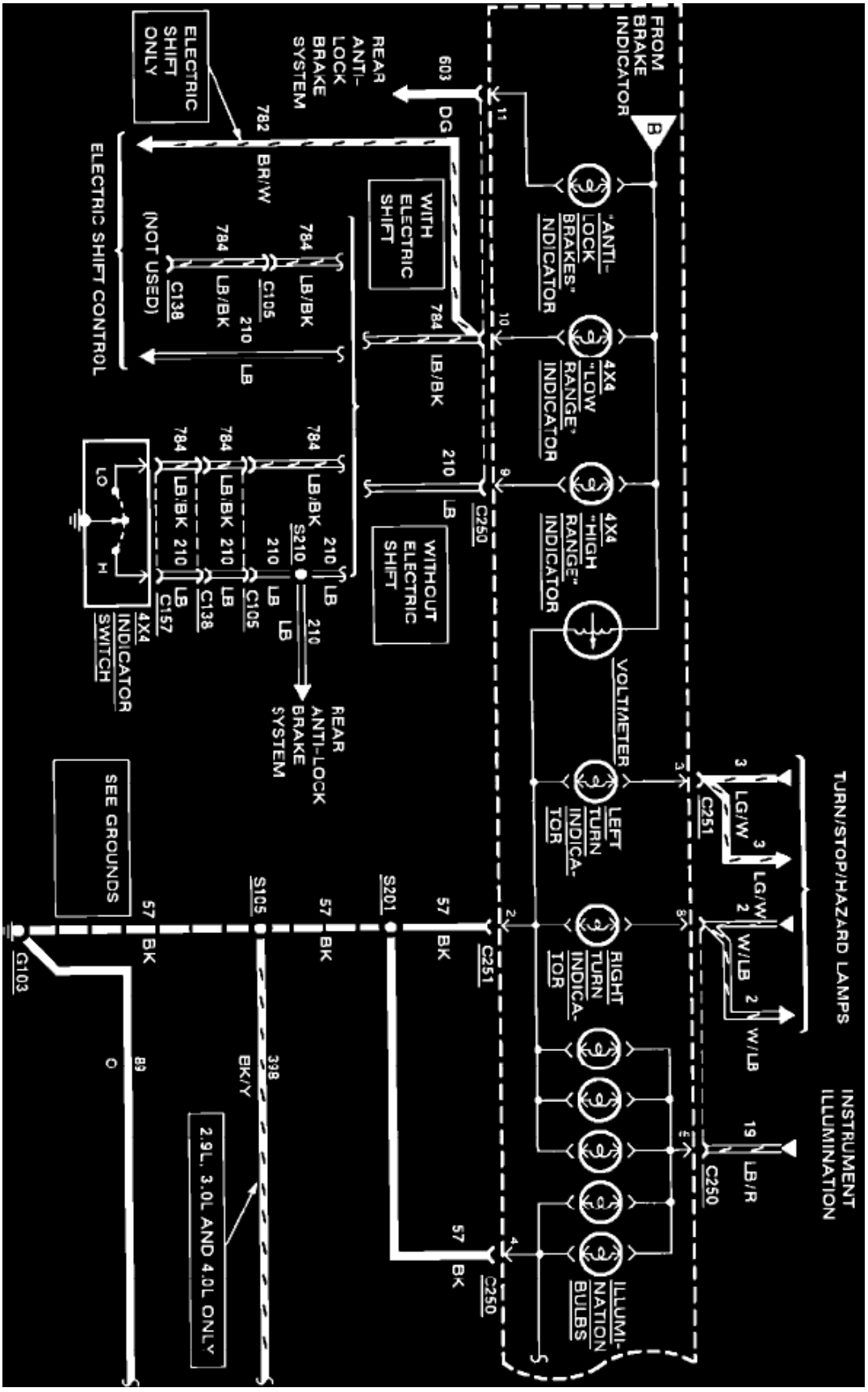

HOT IN START OR RUN
FUSE PANEL
17
15A
640
R/Y
S208
SEE POWER DISTRIBUTION
C251
"CHECK OIL" INDICATOR
TEMPERATURE GAUGE
(NOT USED)
TIMING CIRCUIT
LOW OIL LEVEL RELAY
C287
238
GY
57
BK
208
570
BK/W
IGNITION SWITCH
ACC
LOCK
RUN
START
OFF
P2
C284
SWITCH TESTING
SEE GROUNDS
G202
S203
C105
C136 (2.3L AND 2.9L)
C116 (3.0L AND 4.0L)
C194
258
W/PK
LOW OIL LEVEL SWITCH
CLOSED WITH LOW OIL LEVEL
C112 (4.0L)
C111 (4.0L ONLY)
BK/LB
41
C168
COOLANT TEMPERATURE SENDER
73 Ω AT COLD
MARK:
9.7 Ω AT HOT MARK

Instrument Panel (Standard)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Instrument Cluster / Carrier > Instrument Panel Circuit Board > Component Information > Diagrams > Diagram Information and Instructions > Page 7173

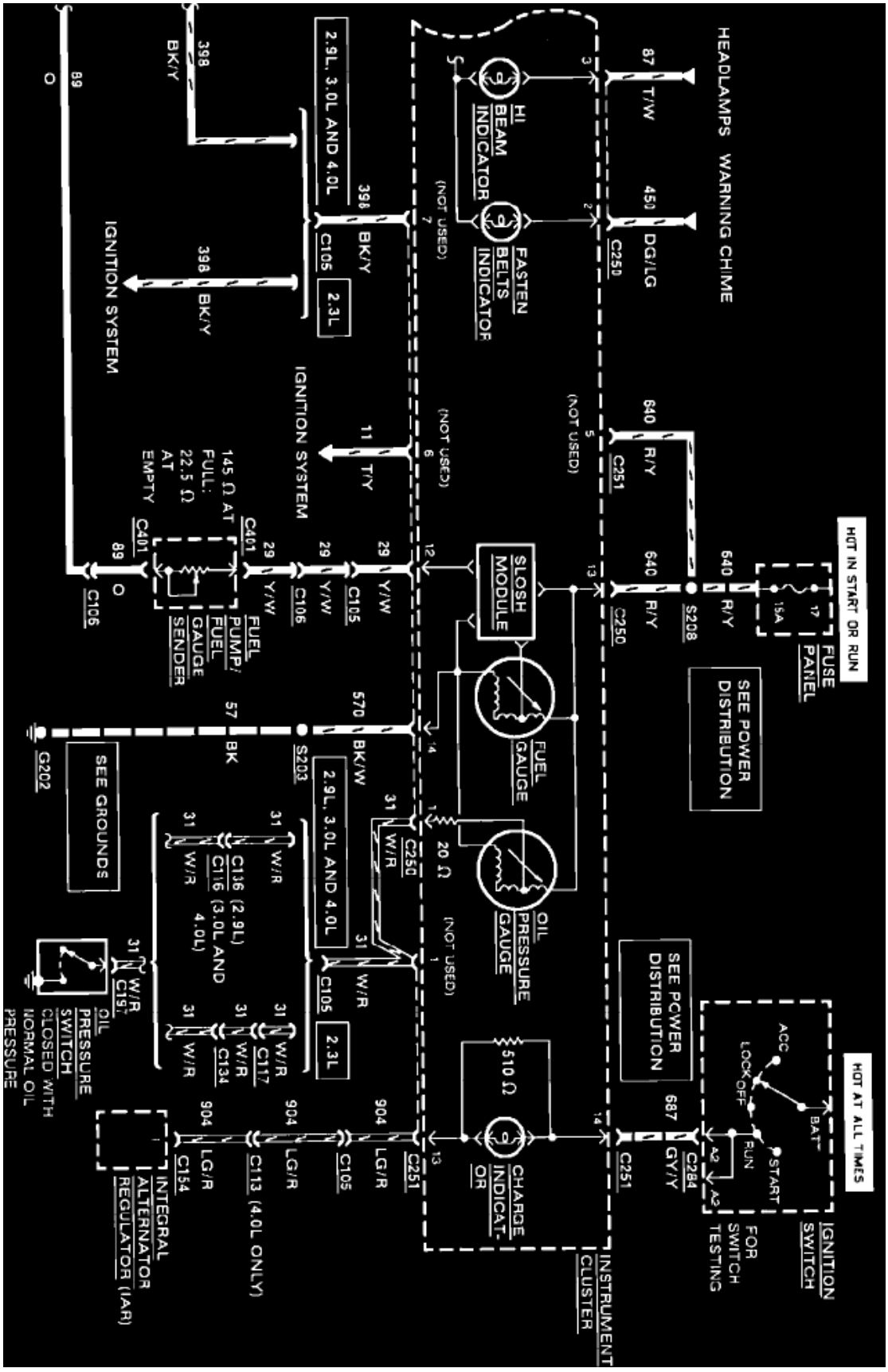


Instrument Panel (Standard)


TURN/STOP/HAZARD LAMPS
INSTRUMENT ILLUMINATION
FROM BRAKE INDICATOR
"ANTI-LOCK BRAKES" INDICATOR
4X4 "LOW RANGE" INDICATOR
4X4 "HIGH RANGE" INDICATOR
VOLTIMETER
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
ILLUMINATION BULBS
REAR ANTI-LOCK BRAKE SYSTEM
ELECTRIC SHIFT ONLY
ELECTRIC SHIFT CONTROL
WITH ELECTRIC SHIFT
WITHOUT ELECTRIC SHIFT
(NOT USED)
4X4 INDICATOR SWITCH
SEE GROUNDS
2.9L, 3.0L AND 4.0L ONLY
C251
C250
C105
C138
C157
S210
S201
S105
G103
LG/W
W/LB
LB/R
LB/BK
BR/W
DG
BK
BK/Y
LB
O

Instrument Panel (Standard)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Instrument Cluster / Carrier > Instrument Panel Circuit Board > Component Information > Diagrams > Diagram Information and Instructions > Page 7175



Instrument Panel (Standard)

Malfunction Indicator Lamp: Technical Service Bulletins Connector, DIS Ignition Revised

ARTICLE NO. 95-10-2

05/22/95

^ IGNITION CONTROL MODULE (ICM) - REVISED CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEMS (DIS) ONLY

^ LAMP - "MALFUNCTION INDICATOR LAMP" (MIL) ILLUNINATED - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION CLIP AND SEAL - DISTRIBUTORLESS IGNITION SYSTEM (DIS) ONLY

^ WIRING - REVISED IGNITION CONTROL MODULE (ICM) CONNECTOR RETENTION - DUSTRUBUTORLESS IGNITION SYSTEM (DIS) ONLY

FORD: 1991-94 ESCORT 1992-94 CROWN VICTORIA 1993-94 TAURUS 1994 MUSTANG, THUNDERBIRD

LINCOLN-MERCURY: 1990-94 TOWN CAR 1991-94 TRACER 1992-94 GRAND MARQUIS 1993-94 MARK VIII 1994 COUGAR

LIGHT TRUCK: 1990-94 AEROSTAR, RANGER 1991-94 EXPLORER

ISSUE: Some vehicles may have a disconnect of the Ignition Control Module (ICM) connector or moisture buildup within the connector. This can cause hard to start/no start, rough idle, or "check engine light" illumination concerns. The improved gasket and connector retainer that are currently used in production are now available for service of prior model distributorless ignition systems.

ACTION: Install new Connector Sleeve Retainer Clip and a current production seal (gasket). The clip assembles in between the connector beams and the ICM which will prevent accidental disconnects. The new seal is a "solid silicone" gasket that provides improved resistance to moisture entry into the connector. Refer to the ICM Connector Harness Wire Service kit (F5CZ-14A411-AA) for service details (I.S. 6621).

AFFECTED ENGINES

^ Escort/Tracer - 1.9L

^ Crown Victoria/Grand Marquis/Town Car/Mark VIII- 4.6L

^ Taurus Flex Fuel, California - 3.0L

^ Mustang - 3.8L

^ Thunderbird/Cougar - 3.8L SC, 3.8L California only, and 4.6L

^ Aerostar/Explorer/Ranger - 4.0L

The Ignition Control Module (ICM) Connector

Harness Wire Service Kit (F5CZ-14A411-AA) contains the following components:

^ One (1) Gasket - Wire Seal

^ One (1) Retainer - Wire Connector Sleeve (Clip)

^ One (1) Instruction Sheet (I.S. 6621)

PART NUMBER PART NAME

F5CZ-14A411-AA ICM Connector Harness Wire Service Kit

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Years, Basic Or Emissions

Warranty Coverage For All Others

OPERATION DESCRIPTION TIME

951002A Install kit 0.3 Hr.

DEALER CODING

CONDITION

BASIC PART NO. CODE

12A581 94

12A581 H2

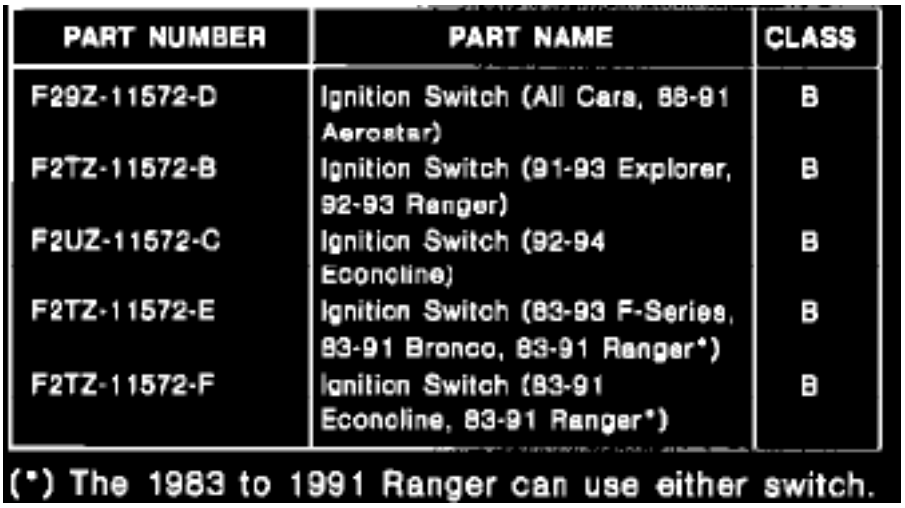
OASIS CODES: 203000, 206000, 602300, 603300, 608400, 698298

Malfunction Indicator Lamp: Locations

The Malfunction Indicator Light (MIL) is located on the instrument cluster. The MIL will show CHECK ENGINE when illuminated.

Malfunction Indicator Lamp: Description and Operation

The Malfunction Indicator Light (MIL) is mounted in the dash and reads CHECK ENGINE or SERVICE SOON. The MIL will ILLUMINATE when the engine is operating in Failure Mode Effects Management (FMEM). The light will stay ON as long as there is a fault in the system. The MIL can also be used to retrieve fault codes from the Electronic Engine Control (EEC) system when the self test mode is entered.



PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: Customer Interest Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

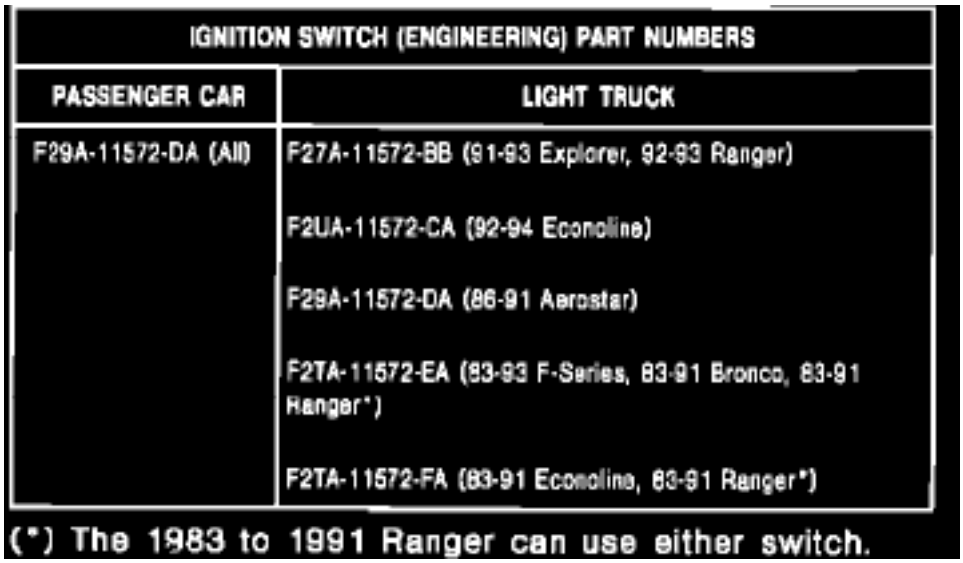
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger) F2UA-11572-CA (92-94 Econoline) F29A-11572-DA (86-91 Aerostar) F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*) F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

OASIS CODES: 201000, 201100, 206000

PART NUMBER	PART NAME	CLASS
F29Z-11572-D	Ignition Switch (All Cars, 88-91 Aerostar)	B
F2TZ-11572-B	Ignition Switch (91-93 Explorer, 92-93 Ranger)	B
F2UZ-11572-C	Ignition Switch (92-94 Econoline)	B
F2TZ-11572-E	Ignition Switch (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)	B
F2TZ-11572-F	Ignition Switch (83-91 Econoline, 83-91 Ranger*)	B

(*) The 1983 to 1991 Ranger can use either switch.

Oil Level Warning Indicator: All Technical Service Bulletins Instrument Cluster Warning Lights - Dimly Lit

Article No. 93-24-10

11/24/93

^ LAMP - MALFUNCTION OF FOUR PIN LOW OIL LEVEL RELAY - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

^ LAMPS - INSTRUMENT CLUSTER WARNING LIGHTS DIMLY LIT - VEHICLES BUILT AFTER 8/1/92 OR 1983-1993 VEHICLES THAT HAVE HAD SERVICE REPLACEMENT IGNITION SWITCHES AFTER 8/1/92

FORD: 1983 FAIRMONT 1983-89 CROWN VICTORIA, ESCORT 1983-93 MUSTANG, THUNDERBIRD 1983-94 PROBE 1984-86 LTD 1984-94 TEMPO

LINCOLN-MERCURY: 1983 LN7, ZEPHYR 1983-87 CONTINENTAL, LYNX 1983-89 GRAND MARQUIS, TOWN CAR 1983-93 COUGAR 1984-86 CAPRI, MARQUIS 1984-94 TOPAZ

LIGHT TRUCK: 1983-91 BRONCO 1983-93 ECONOLINE, F-150-350 SERIES, RANGER 1986-91 AEROSTAR 1991-93 EXPLORER

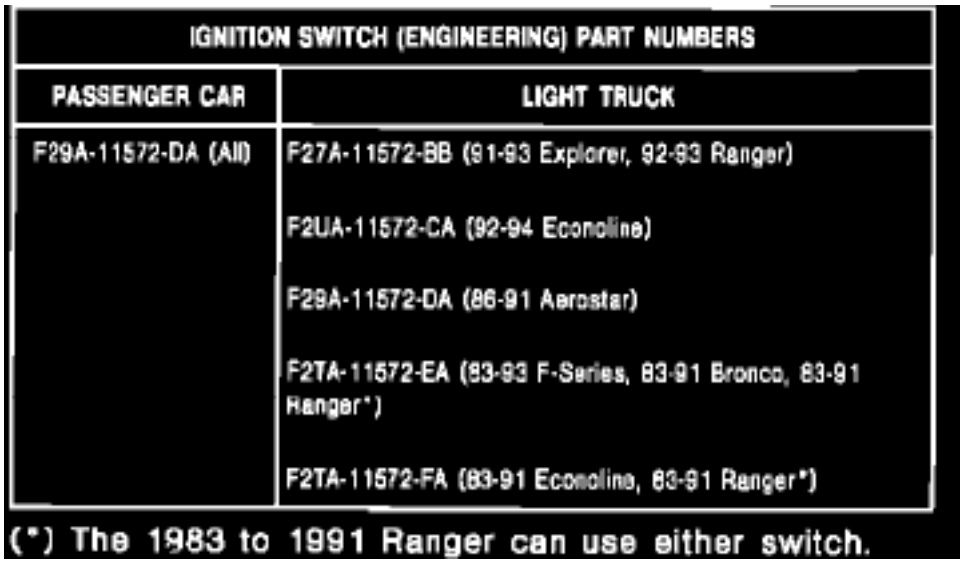
ISSUE: The instrument cluster warning light(s) may be dimly lit or there may be a malfunction of the four pin low oil relay on vehicles so equipped. This could be due to the ignition switch.

ACTION:

If the vehicle displays the subject symptoms and meets the following conditions, replace the ignition switch. Refer to the appropriate Car or Light Truck Service Manual (Section 13-04 for 1983-1990 Cars, Section 11-04 for 1991-1993 Cars and Section 13-05 for 1983-1990 Light Trucks, Section 11-05 for 1991-1993 Light Trucks) for removal and installation procedures. Refer to the Parts Block in this article for correct parts usage.

CONDITIONS

^ The vehicle has 14401 wiring attached to the P2 terminal of the ignition switch. Refer to the wiring schematic and/or Electrical And Vacuum Troubleshooting Manual (EVTM) for the concern vehicle.



IGNITION SWITCH (ENGINEERING) PART NUMBERS	
PASSENGER CAR	LIGHT TRUCK
F29A-11572-DA (All)	F27A-11572-BB (91-93 Explorer, 92-93 Ranger)
	F2UA-11572-CA (92-94 Econoline)
	F29A-11572-DA (86-91 Aerostar)
	F2TA-11572-EA (83-93 F-Series, 83-91 Bronco, 83-91 Ranger*)
	F2TA-11572-FA (83-91 Econoline, 83-91 Ranger*)

(*) The 1983 to 1991 Ranger can use either switch.

^ The vehicle is equipped with one of the ignition switches identified in the Ignition Switch Part Number Chart.

NOTE: THE SERVICE PART NUMBERS FOR THE REPLACEMENT IGNITION SWITCHES WILL HAVE THE SAME PART NUMBERS AS THOSE REPLACED. THE NEW SWITCH HAS BEEN IMPROVED TO CORRECT THE SUBJECT ISSUE.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under The Provisions Of The Bumper To Bumper For 1992/93 Models, Basic Warranty Coverage For All Other Models Except Lincolns. Major Component Warranty Coverage For Lincolns

OPERATION DESCRIPTION TIME

932410A Replace Ignition Switch - 0.5 Hr.

All Light and Compact Trucks

DEALER CODING

BASIC PART NO. CONDITION CODE

11572 X1

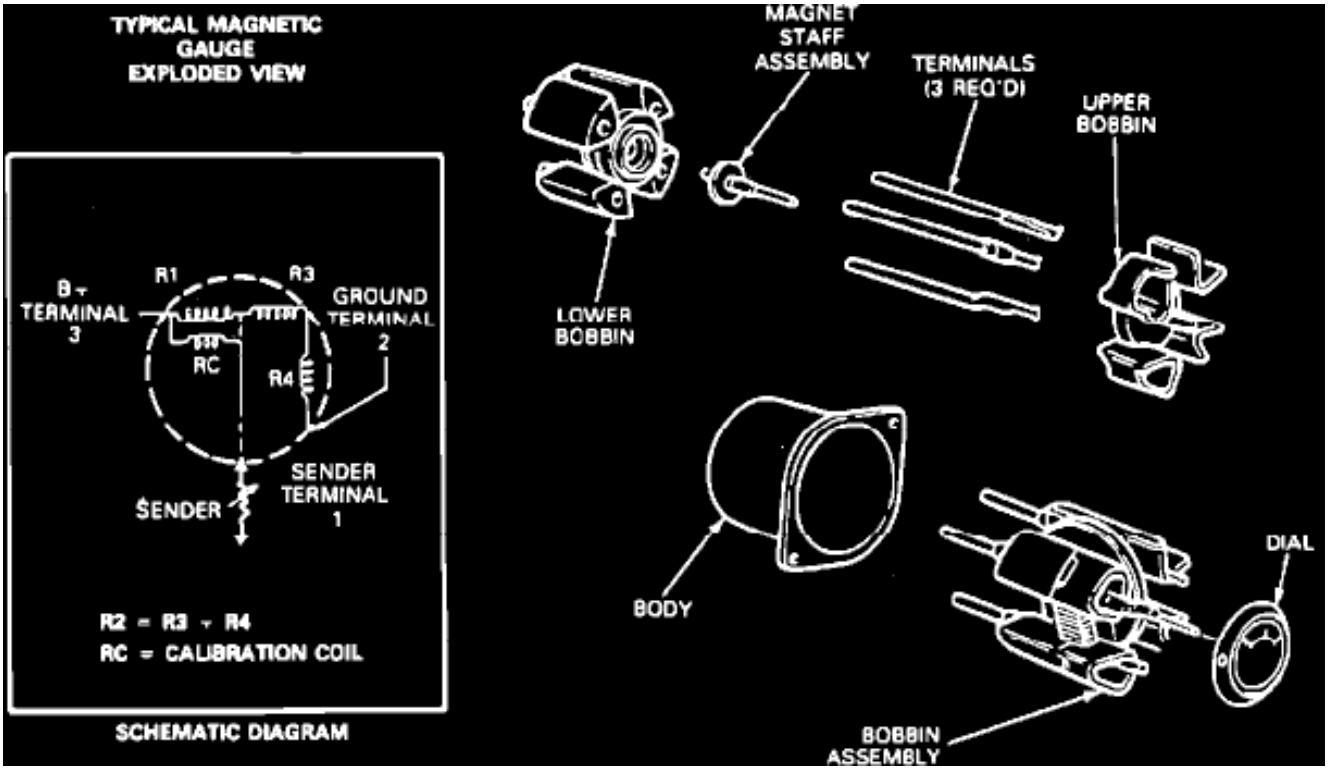
OASIS CODES: 201000, 201100, 206000

Oil Level Warning Indicator: Description and Operation

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

Oil Level Warning Indicator: Testing and Inspection

With oil level at FULL mark on oil dipstick and engine oil warm to assure that oil drains properly from oil sensor, turn ignition on and start engine. Warning lamp should come on briefly in Start for bulb test, then go out. Turn engine off. Drain 2 quarts of oil from engine. Wait approximately 5 minutes, then restart engine. Warning lamp should come on and stay on. If warning lamp does not come on check fuse, low oil level relay, low oil level sensor and lamp.



Oil Pressure Gauge: Description and Operation

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

This oil pressure indicating system incorporates an instrument voltage regulator, electrical oil pressure gauge and a sending unit which are connected in series. The sending unit consists of a diaphragm, contact and a variable resistor. As oil pressure increases or decreases, the diaphragm actuates the contact on the variable resistor, which in turn controls current flow to the gauge. When oil pressure is low, resistance of the variable resistor is high, which restricts current flow to the gauge, indicating low oil pressure. As oil pressure increases, resistance of the variable resistor is lowered, permitting increased current flow to the gauge, which increases the gauge reading.

MAGNETIC GAUGE SYSTEM

Fig. 8 Magnetic Guage

The magnetic gauge movement consists of three primary coils, one of which is wound at a 90° angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet which is attached to a shaft and pointer rotates to align to this primary field resulting in pointer position. The bobbin/coil assembly is pressed into a metal housing which is attached to the instrument cluster Fig. 8. These gauges require no adjustments, calibrations or maintenance. This gauge system does not use an IVR.

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	TEMPERATURE OR OIL GAUGE INOPERATIVE		
	• Check complaint.	Gauge pointer does not move ▶	GO to Step A2.
		Gauge pointer moves ▶	GO to Step B1.

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	VERIFY POWER TO CLUSTER		
	• With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test light to verify voltage at B+ terminal of cluster connector.	Other gauges and warning lamps operate correctly: voltage present at cluster ▶	GO to Step B1.
		Other gauges and warning lamps do not operate correctly: no voltage present at cluster ▶	SERVICE wiring to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TESTING SENDER CIRCUIT AT LOW		
	• Insert test box in sender circuit. Disconnect connector at sender and connect test box to cluster side of connector. Set box to LOW (73 ohms).	Temperature gauge reads around the C band ▶	GO to Step B2.
		Oil reads at or below L band ▶	GO to Step B3
		Pointer does not move ▶	GO to Step B4.
B2	TESTING TEMPERATURE SENDER CIRCUIT AT HIGH		
	• TEMPERATURE GAUGE • Set test box to HIGH (9.7 ohms).	Temperature gauge reads around the H grad ▶	REPLACE sender.
		Temperature gauge does not read around the H grad ▶	GO to Step B4.
B3	TESTING ON CABLE SENDER CIRCUIT AT HIGH		
	• OIL GAUGE • Set test box to 0 ohms (short circuit).	Oil gauge reads MID SCALE or slightly above ▶	REPLACE switch.
		Oil gauge does not read MID SCALE or slightly above ▶	GO to Step B4.
B4	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flexible circuit for shorts or open with ohmmeter.	Wiring and flex circuit OK ▶	REPLACE gauge. GO to A1.
		Wiring shorted or open. Flex circuit damaged ▶	REPAIR wiring / flex circuit. GO to A1.

Oil Pressure Gauge: Pinpoint Tests

Fig. 11 Troubleshooting Chart

Fig. 11 Troubleshooting Chart

Fig. 12 Troubleshooting Chart

Oil Pressure Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

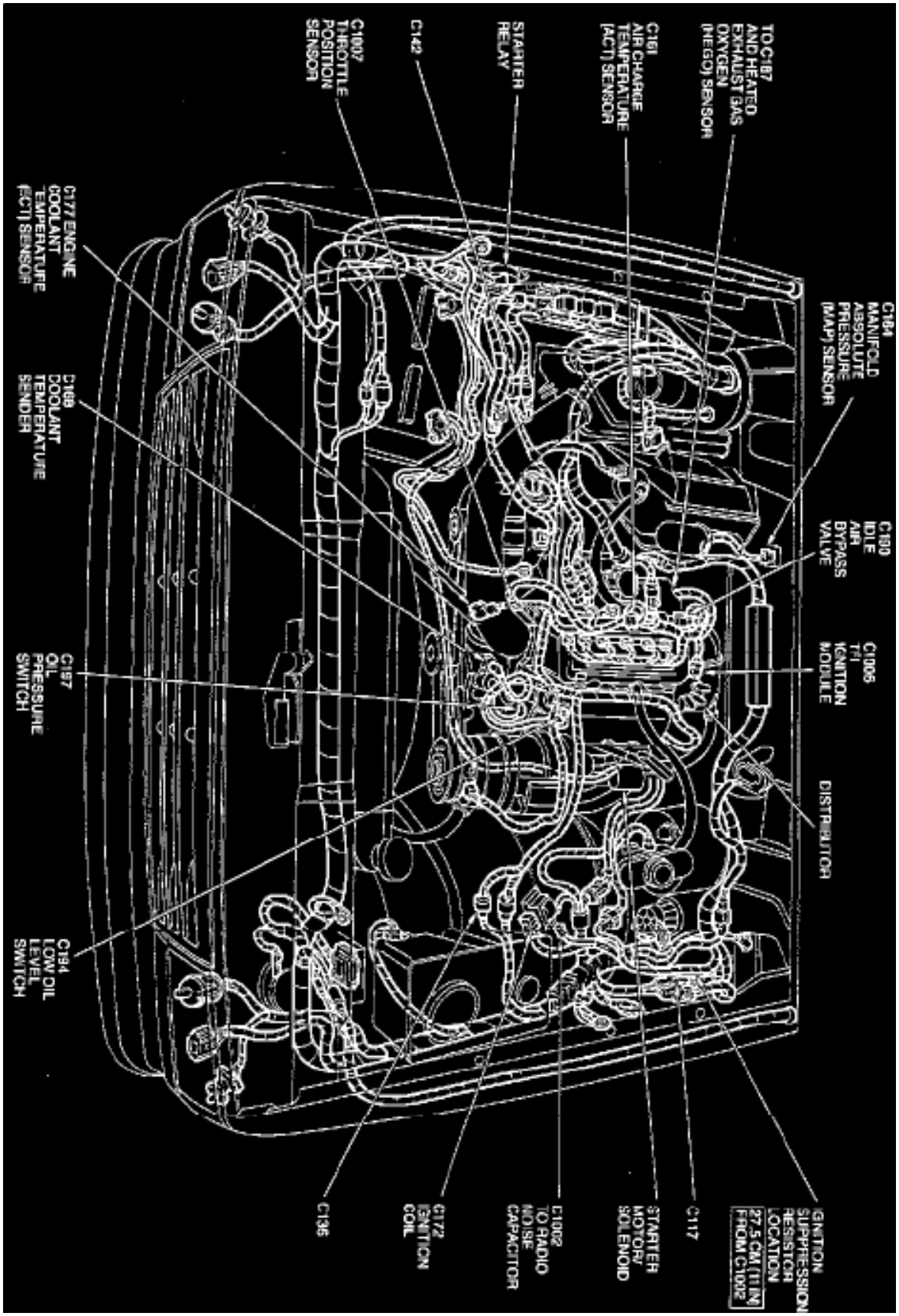
1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Oil Pressure Gauge: Tools and Equipment

Tester tool No. 021-00055 or equivalent should be used to diagnose these type gauges, following manufacturer's instructions.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Oil Pressure Switch <--> [Oil Pressure Sender] > Component Information > Locations



Oil Pressure Switch: Locations

Engine Compartment Components.

Lower LH Rear Of Engine

Applicable to: 2.9L/V6-179

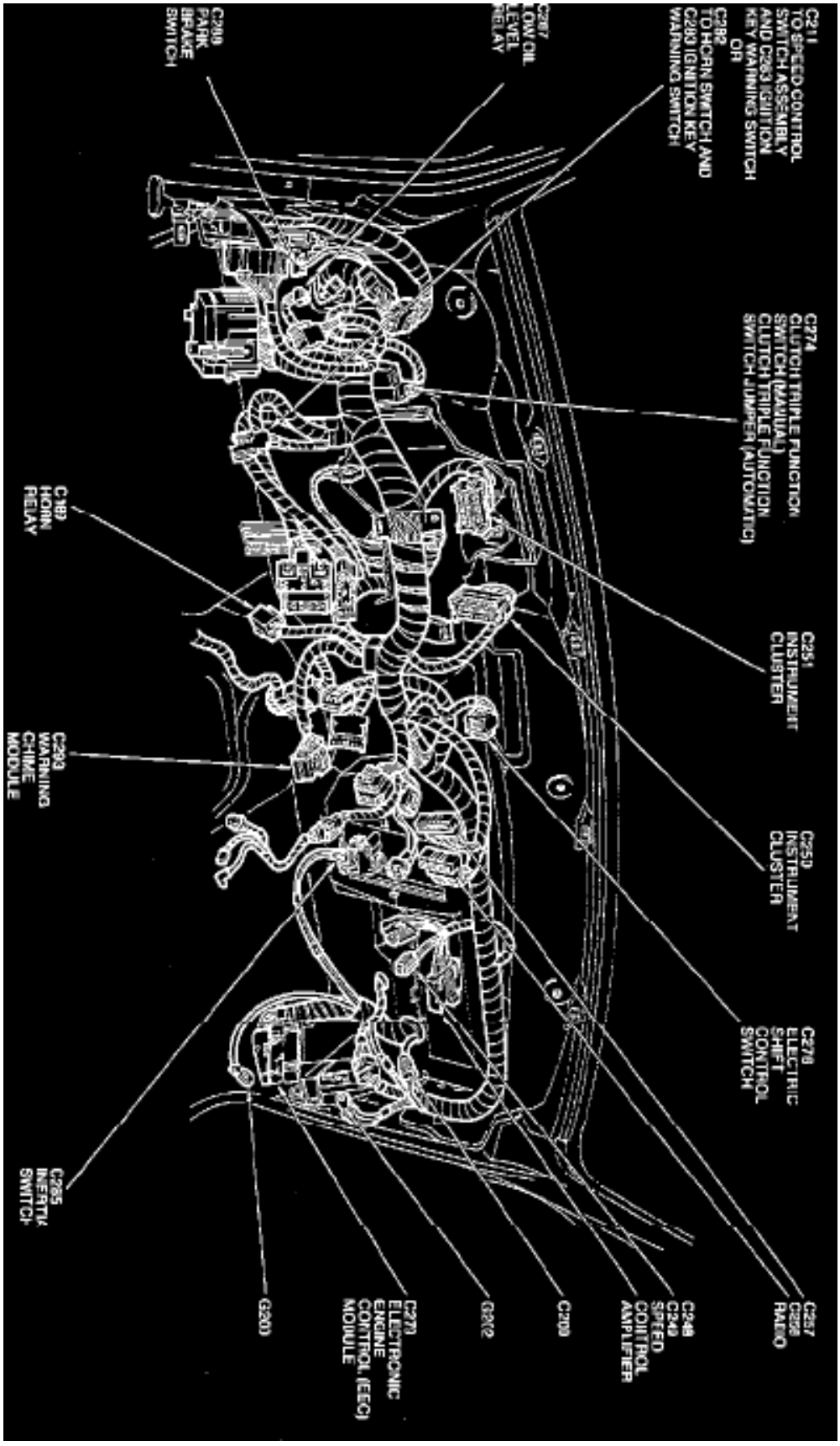
Oil Pressure Warning Lamp/Indicator: Description and Operation

Many trucks utilize a warning light on the instrument panel in place of the conventional dash indicating gauge to warn the driver when the oil pressure is dangerously low. The warning light is wired in series with the ignition switch and the engine unit--which is an oil pressure switch. The oil pressure switch contains a diaphragm and a set of contacts. When the ignition switch is turned on, the warning light circuit is energized and the circuit is completed through the closed contacts in the pressure switch. When the engine is started, build-up of oil pressure compresses the diaphragm, opening the contacts, thereby breaking the circuit and putting out the light.

Oil Pressure Warning Lamp/Indicator: Testing and Inspection

The oil pressure warning light should go on when the ignition is turned on. If it does not light, disconnect the wire from the engine unit and ground the wire to the frame or cylinder block. Then if the warning light still does not go on with the ignition switch on, replace the bulb. If the warning light goes on when the wire is grounded to the frame or cylinder block, the engine unit should be checked for being loose or poorly grounded. If the unit is found to be tight and properly grounded, it should be removed and a new one installed. (The presence of sealing compound on the threads of the engine unit will cause a poor ground). If the warning light remains lit when it normally should be out, replace the engine unit before proceeding further to determine the cause for a low pressure indication. The warning light will sometimes light up or flicker when engine is idling, even though oil pressure is adequate. However, light should go out when engine speed is increased.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Parking Brake Warning Switch > Component Information > Locations

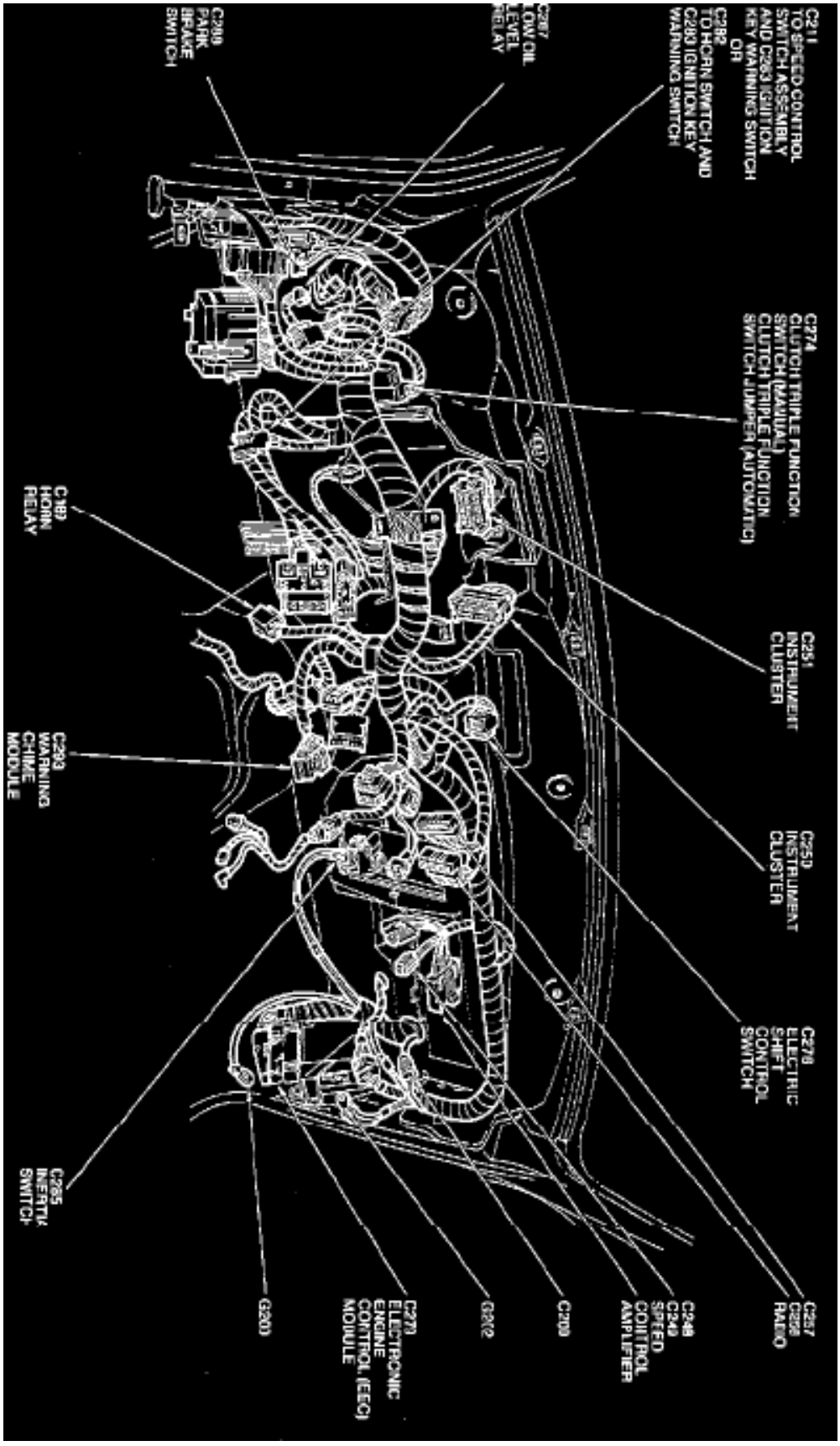


Parking Brake Warning Switch: Locations

I/P Components

Below LH Side Of I/P, On Park Brake Assembly

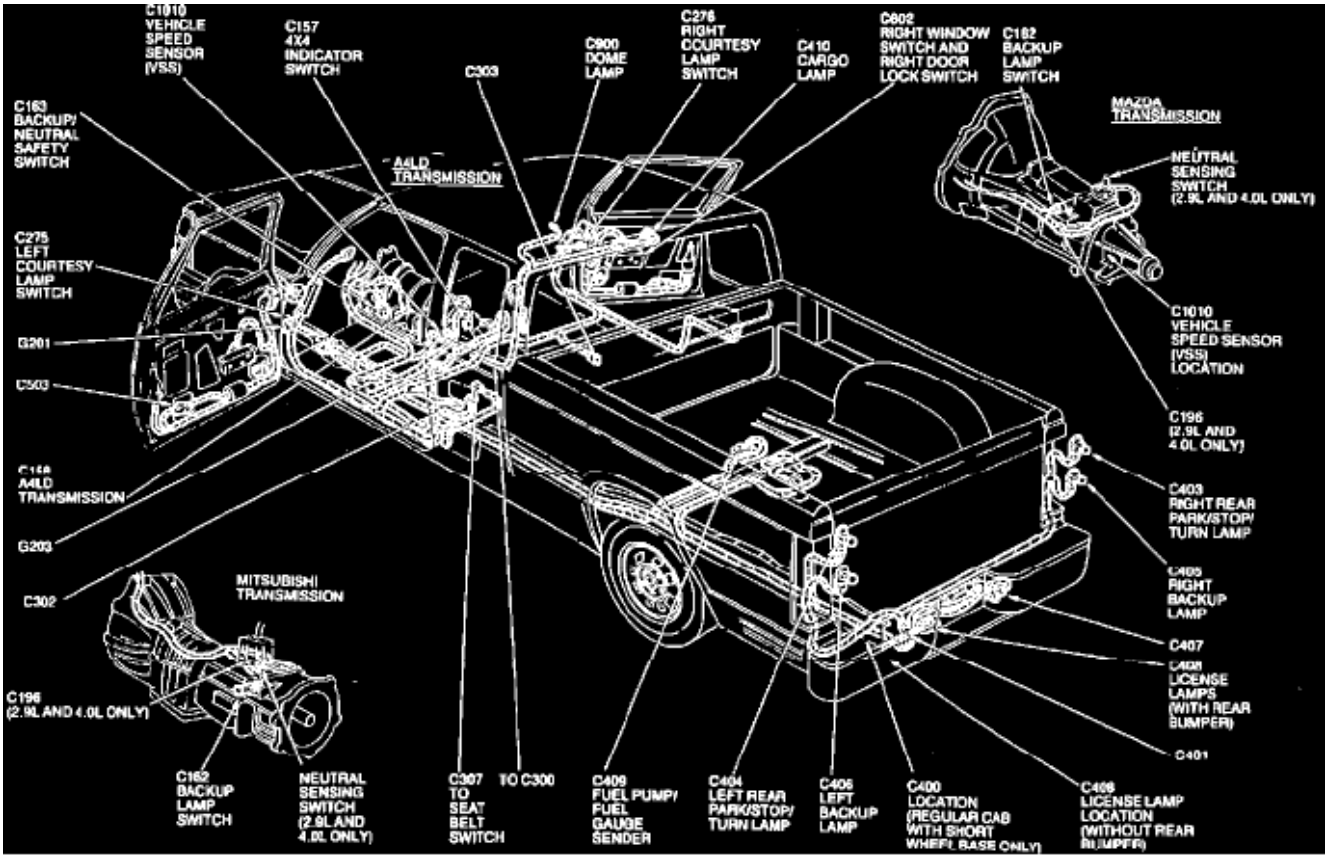
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Relays and Modules - Instrument Panel > Audible Warning Device Control Module > Component Information > Locations



Audible Warning Device Control Module: Locations

I/P Components

Behind Center Of I/P, Below Ashtray Assembly



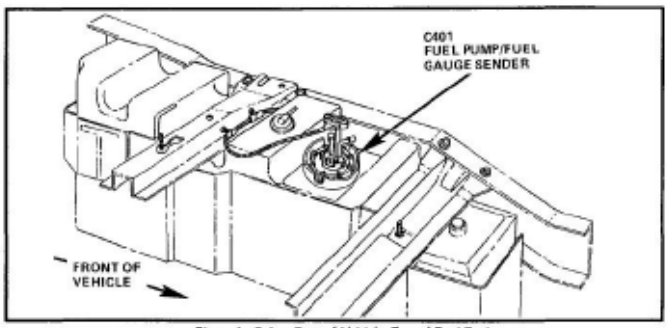


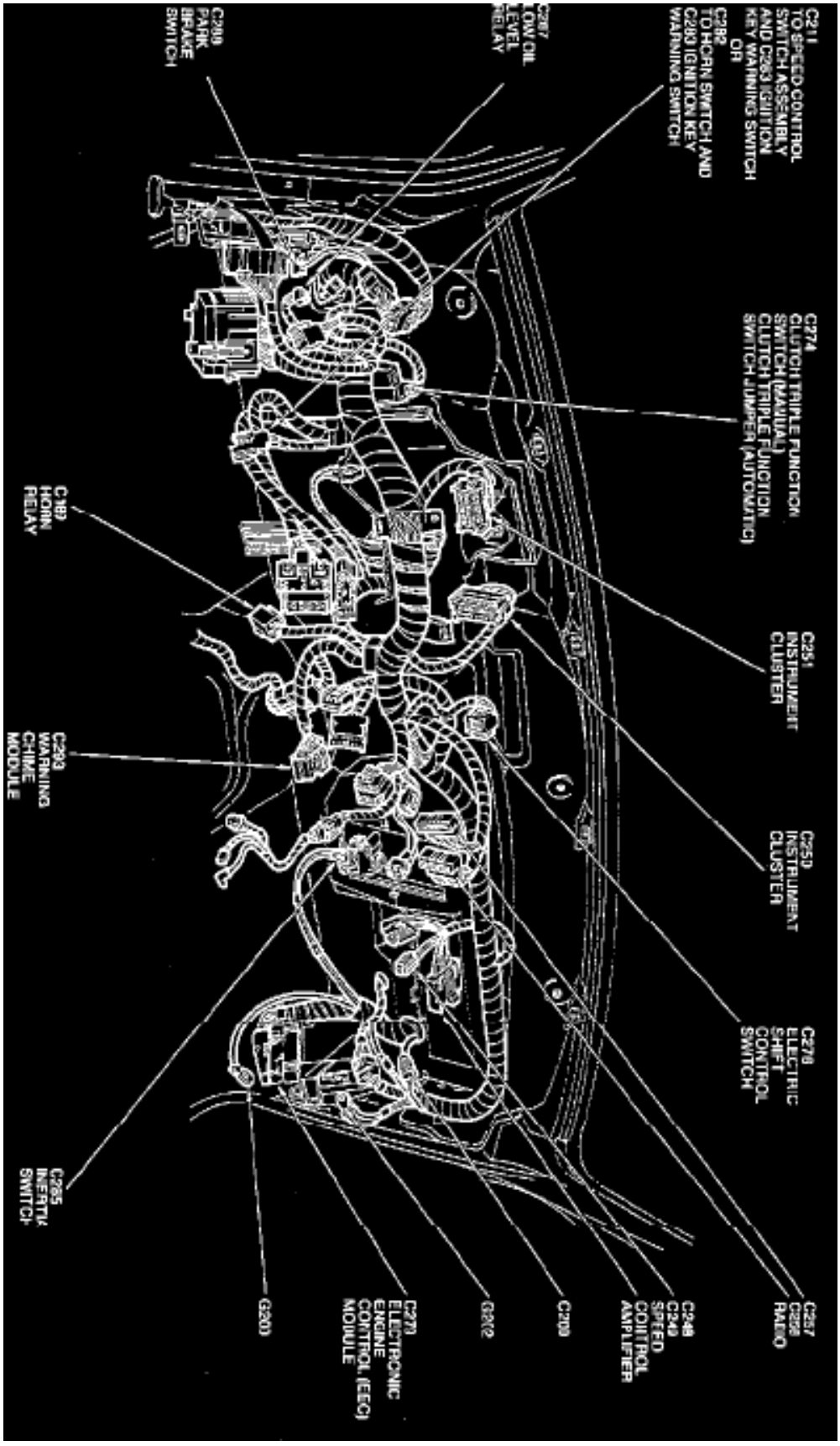
Figure 1 - Below Rear of Vehicle, Top of Fuel Tank

Fuel Gauge Sender: Locations

Body Components

Below Rear Of Vehicle, Top Center Of Fuel Tank

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Instrument Panel, Gauges and Warning Indicators > Sensors and Switches - Instrument Panel > Parking Brake Warning Switch > Component Information > Locations



Parking Brake Warning Switch: Locations

I/P Components

Below LH Side Of I/P, On Park Brake Assembly

Speedometer Cable: Testing and Inspection

Most cables are broken due to lack of lubrication, or a sharp bend or kink in the housing. A cable might break because of the speedometer head mechanism binds. In such cases, the speedometer head should be repaired or replaced before a new cable or housing is installed. A ``jumpy'' pointer condition, together with a scraping noise, is due, in most instances, to a dry or kinked speedometer cable. The kinked cable rubs on the housing and winds up, slowing down the pointer. The cable then unwinds and the pointer ``jumps.'' To check for kinks, remove the cable, lay it on a flat surface and twist one end with the fingers. If it turns over smoothly the cable is not kinked. But if part of the cable flops over as it is twisted, the cable is kinked and should be replaced.

Speedometer Cable: Service and Repair Speedometer Cable Lubrication

The speedometer cable should be lubricated with special cable lubricant. Fill the ferrule on the upper end of the housing with the cable lubricant. Insert the cable in the housing, starting at the upper end. Turn the cable around carefully while feeding it into the housing. Repeat filling the ferrule except for the last six inches of cable. Too much lubricant at this point may cause the lubricant to work into the speedometer head.

Speedometer Cable: Service and Repair Speedometer Cable Replacement

During installation, if the cable sticks when inserted into the housing and will not go through, the housing is damaged inside or kinked. Be sure to check the housing from one end to the other. Straighten any sharp bends by relocating clamps or elbows. Replace housing if it is badly kinked or broken. Position cable and housing so that they lead into the head as straight as possible. Check new cable for kinks before installing it. Use wide, sweeping, gradual curves where the cable comes out of the transmission and connects to the head so the cable will not be damaged during installation. Arrange the housing so it does not lean against the engine because heat from the engine may dry out the lubricant. If inspection indicates that the cable and housing are in good condition, yet pointer action is erratic, check the speedometer head for possible binding. The speedometer drive pinion should also be checked. If the pinion is dry or its teeth are stripped, the speedometer may not register properly.

Speedometer Head: Customer Interest Speedometer - Indicates High Speed When Cold

Article No. 92-12-9

DATE: 06-03-92

SPEEDOMETER-MECHANICAL (ANALOG)-INDICATES HIGH SPEED AT LOW AMBIENT TEMPERATURES (ABOUT 20 DEGREES F OR -7 DEGREES C OR BELOW)- VEHICLES BUILT AFTER 4/1/90

FORD: 1990-92 ESCORT, MUSTANG, TAURUS, TEMPO

LINCOLN-MERCURY: 1990-92 SABLE, TOPAZ, TRACER

LIGHT TRUCK: 1990-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES 1990-92 RANGER 1991-92 EXPLORER

ISSUE: Mechanical speedometers may indicate higher than actual vehicle speed at low ambient temperatures (about 20~ F or -7~ C or below). This occurs because of insufficient lubrication at lower temperatures. The speedometer will indicate speed correctly after the vehicle warms up.

SPEEDOMETER ASSEMBLY - PARTS BLOCK/APPLICATION CHART - CARS

VEHICLE APPLICATION	DESCRIPTION	PART NUMBER	CLASS
1990-91 Escort 1991 Tracer	85 MPH, U.S.	FOCZ-17255-A	B
	120 MPH, U.S.	FOCZ-17255-C	BG
	140 KMH, Export	FOCZ-17255-B	ZC
	200 KMH, Export	FOCZ-17255-D	ZC
1992 Escort and Tracer	85 MPH, U.S.	F2CZ-17255-C	A
	120 MPH, U.S.	F2CZ-17255-D	B
	140 KMH, Export	FOCZ-17255-B	ZC
	200 KMH, Export	FOCZ-17255-D	ZC
1990-91 Tempo and Topaz	85 MPH, U.S., W/O Trip Odo.	E83Z-17255-A	B
	85 MPH, U.S., Trip Odo.	E83Z-17255-B	B
	200 KMH, Can., W/O Trip Odo.	E93Z-17255-A	F
	200 KMH, Can., Trip Odo.	E93Z-17255-B	F
1992 Tempo and Topaz	85 MPH, U.S., W/O Trip Odo.	F23Z-17255-A	B
	85 MPH, U.S., Trip Odo.	F23Z-17255-C	B
	120 MPH, U.S., Trip Odo.	F26Z-17255-A	B
	200 KMH, Can., W/O Trip Odo.	F23Z-17255-B	ZC
	200 KMH, Can., Trip Odo.	F23Z-17255-D	ZC
1990-92 Mustang	85 MPH, U.S.	FOZZ-17255-B	B
	140 MPH, U.S.	FOZZ-17255-C	CL
	200 KMH, Can.	FOZZ-17255-A	ZC
	230 KMH, Can.	FOZZ-17255-D	ZC
1990-91 Mustang	160 MPH, U.S., Police	FOZV-17282-AA	CL
1990-92 Mustang	230 KMH, Can., Police	FOZV-17282-BA	(1)
1992 Mustang	160 MPH, U.S., Police	F2ZV-17282-AA	(2)
1990-91 Taurus and Sable	85 MPH, U.S.	FODZ-17255-A	B
	140 MPH, U.S., Taurus SHO	FO4Y-17255-A	B
	140 MPH, U.S., Taurus Police	FODZ-17255-C	C
	200 KMH, Can.	FODZ-17255-B	ZC
	220 KMH, Can., Taurus SHO	FO4Y-17255-B	ZC
	220 KMH, Can., Taurus Police	FODZ-17255-D	ZC
1992 Taurus and Sable	85 MPH, U.S.	F2DZ-17255-B	B
	140 MPH, U.S., Taurus SHO	F24Y-17255-A	B
	140 MPH, U.S., Taurus Police	F2DZ-17255-A	B
	200 KMH, Can.	F2DZ-17255-D	ZC
	220 KMH, Can., Taurus SHO	F24Y-17255-B	ZC
	220 KMH, Can., Taurus Police	F2DZ-17255-C	ZC

SPEEDOMETER ASSEMBLY - PARTS BLOCK/APPLICATION CHART - LIGHT TRUCKS

VEHICLE APPLICATION	DESCRIPTION	PART NUMBER	CLASS
1990-91 Aerostar	85 MPH, U.S.	E89Z-17255-A	B
	200 KMH, Can.	E89Z-17255-B	ZC
	200 KMH, Can., Motorhome	E89Z-17255-B	ZC
1990-91 Ranger, 1991 Explorer	85 MPH, U.S.	E9TZ-17255-F	B
	160 KMH, Can.	E9TZ-17255-G	ZC
1992 Ranger and Explorer	85 MPH, U.S.	E9TZ-17255-F	B
	160 KMH, Can.	E9TZ-17255-G	ZC
1990-91 Econoline	85 MPH, U.S.	FOUZ-17255-C	B
	160 KMH, Can.	FOUZ-17255-B	ZC
1990-91 F-Series and Bronco	85 MPH, U.S., W/O Trip Odo.*	FOTZ-17255-A	B
	85 MPH, U.S., W/O Trip Odo.**	F1TZ-17255-C	B
	85 MPH, U.S., Trip Odo.	FOTZ-17255-B	B
	160 KMH, Can., W/O Trip Odo.*	FOTZ-17255-C	ZC
	160 KMH, Can., Trip Odo,	FOTZ-17255-D	ZC

(*) Vehicles Built Before 11/1/90

(**) Vehicles Built After 11/1/90

(1) Dealer Special Order, To be set up by Canada as class ZC when first order is received at Bramalea.

(2) Dealer Special Order, To be set up as class CL when first order is received at NPDC.

ACTION: Replace the speedometer head with a service speedometer assembly. Speedometer part numbers are identified in the Parts Block/Application Chart. Refer to the appropriate Service Manual for removal and installation details.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Model

Years

OPERATION DESCRIPTION TIME

921209A Replace Speedometer 0.8 Hr.

Assy. - Escort/Tracer

921209B Replace Speedometer 1.2 Hrs.

Assy. - Taurus/Sable

921209C Replace Speedometer 1. 1 Hrs.

Assy. - Tempo/Topaz

921209D Replace Speedometer 1.2 Hrs.

Assy. - Mustang

921209E Replace Speedometer 0.7 Hr.

Assy. - Econoline

921209F Replace Speedometer 0.8 Hr.

Assy. - Aerostar/Fl5O-350/Bronco

921209G Replace Speedometer 0.8 Hr.

Assy. - Ranger

921209H Replace Speedometer 0.8 Hr.

Assy. - Explorer

DEALER CODING BASIC PART NO. CONDITION CODE

17255 51

OASIS CODES: 204000, 204200

Speedometer Head: All Technical Service Bulletins Speedometer - Indicates High Speed When Cold

Article No. 92-12-9

DATE: 06-03-92

SPEEDOMETER-MECHANICAL (ANALOG)-INDICATES HIGH SPEED AT LOW AMBIENT TEMPERATURES (ABOUT 20 DEGREES F OR -7 DEGREES C OR BELOW)- VEHICLES BUILT AFTER 4/1/90

FORD: 1990-92 ESCORT, MUSTANG, TAURUS, TEMPO

LINCOLN-MERCURY: 1990-92 SABLE, TOPAZ, TRACER

LIGHT TRUCK: 1990-91 AEROSTAR, BRONCO, ECONOLINE, F-150-350 SERIES 1990-92 RANGER 1991-92 EXPLORER

ISSUE: Mechanical speedometers may indicate higher than actual vehicle speed at low ambient temperatures (about 20~ F or -7~ C or below). This occurs because of insufficient lubrication at lower temperatures. The speedometer will indicate speed correctly after the vehicle warms up.

SPEEDOMETER ASSEMBLY - PARTS BLOCK/APPLICATION CHART - CARS

VEHICLE APPLICATION	DESCRIPTION	PART NUMBER	CLASS
1990-91 Escort 1991 Tracer	85 MPH, U.S.	FOCZ-17255-A	B
	120 MPH, U.S.	FOCZ-17255-C	BG
	140 KMH, Export	FOCZ-17255-B	ZC
	200 KMH, Export	FOCZ-17255-D	ZC
1992 Escort and Tracer	85 MPH, U.S.	F2CZ-17255-C	A
	120 MPH, U.S.	F2CZ-17255-D	B
	140 KMH, Export	FOCZ-17255-B	ZC
	200 KMH, Export	FOCZ-17255-D	ZC
1990-91 Tempo and Topaz	85 MPH, U.S., W/O Trip Odo.	E83Z-17255-A	B
	85 MPH, U.S., Trip Odo.	E83Z-17255-B	B
	200 KMH, Can., W/O Trip Odo.	E93Z-17255-A	F
	200 KMH, Can., Trip Odo.	E93Z-17255-B	F
1992 Tempo and Topaz	85 MPH, U.S., W/O Trip Odo.	F23Z-17255-A	B
	85 MPH, U.S., Trip Odo.	F23Z-17255-C	B
	120 MPH, U.S., Trip Odo.	F26Z-17255-A	B
	200 KMH, Can., W/O Trip Odo.	F23Z-17255-B	ZC
	200 KMH, Can., Trip Odo.	F23Z-17255-D	ZC
1990-92 Mustang	85 MPH, U.S.	FOZZ-17255-B	B
	140 MPH, U.S.	FOZZ-17255-C	CL
	200 KMH, Can.	FOZZ-17255-A	ZC
	230 KMH, Can.	FOZZ-17255-D	ZC
1990-91 Mustang	160 MPH, U.S., Police	FOZV-17282-AA	CL
1990-92 Mustang	230 KMH, Can., Police	FOZV-17282-BA	(1)
1992 Mustang	160 MPH, U.S., Police	F2ZV-17282-AA	(2)
1990-91 Taurus and Sable	85 MPH, U.S.	FODZ-17255-A	B
	140 MPH, U.S., Taurus SHO	FO4Y-17255-A	B
	140 MPH, U.S., Taurus Police	FODZ-17255-C	C
	200 KMH, Can.	FODZ-17255-B	ZC
	220 KMH, Can., Taurus SHO	FO4Y-17255-B	ZC
	220 KMH, Can., Taurus Police	FODZ-17255-D	ZC
1992 Taurus and Sable	85 MPH, U.S.	F2DZ-17255-B	B
	140 MPH, U.S., Taurus SHO	F24Y-17255-A	B
	140 MPH, U.S., Taurus Police	F2DZ-17255-A	B
	200 KMH, Can.	F2DZ-17255-D	ZC
	220 KMH, Can., Taurus SHO	F24Y-17255-B	ZC
	220 KMH, Can., Taurus Police	F2DZ-17255-C	ZC

SPEEDOMETER ASSEMBLY - PARTS BLOCK/APPLICATION CHART - LIGHT TRUCKS

VEHICLE APPLICATION	DESCRIPTION	PART NUMBER	CLASS
1990-91 Aerostar	85 MPH, U.S.	E89Z-17255-A	B
	200 KMH, Can.	E89Z-17255-B	ZC
	200 KMH, Can., Motorhome	E89Z-17255-B	ZC
1990-91 Ranger, 1991 Explorer	85 MPH, U.S.	E9TZ-17255-F	B
	160 KMH, Can.	E9TZ-17255-G	ZC
1992 Ranger and Explorer	85 MPH, U.S.	E9TZ-17255-F	B
	160 KMH, Can.	E9TZ-17255-G	ZC
1990-91 Econoline	85 MPH, U.S.	FOUZ-17255-C	B
	160 KMH, Can.	FOUZ-17255-B	ZC
1990-91 F-Series and Bronco	85 MPH, U.S., W/O Trip Odo.*	FOTZ-17255-A	B
	85 MPH, U.S., W/O Trip Odo.**	F1TZ-17255-C	B
	85 MPH, U.S., Trip Odo.	FOTZ-17255-B	B
	160 KMH, Can., W/O Trip Odo.*	FOTZ-17255-C	ZC
	160 KMH, Can., Trip Odo,	FOTZ-17255-D	ZC

(*) Vehicles Built Before 11/1/90

(**) Vehicles Built After 11/1/90

(1) Dealer Special Order, To be set up by Canada as class ZC when first order is received at Bramalea.

(2) Dealer Special Order, To be set up as class CL when first order is received at NPDC.

ACTION: Replace the speedometer head with a service speedometer assembly. Speedometer part numbers are identified in the Parts Block/Application Chart. Refer to the appropriate Service Manual for removal and installation details.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: Eligible Under Bumper To Bumper Warranty Coverage For 1992 Models And Basic Warranty Coverage For All Other Model

Years

OPERATION DESCRIPTION TIME

921209A Replace Speedometer 0.8 Hr.

Assy. - Escort/Tracer

921209B Replace Speedometer 1.2 Hrs.

Assy. - Taurus/Sable

921209C Replace Speedometer 1. 1 Hrs.

Assy. - Tempo/Topaz

921209D Replace Speedometer 1.2 Hrs.

Assy. - Mustang

921209E Replace Speedometer 0.7 Hr.

Assy. - Econoline

921209F Replace Speedometer 0.8 Hr.

Assy. - Aerostar/Fl5O-350/Bronco

921209G Replace Speedometer 0.8 Hr.

Assy. - Ranger

921209H Replace Speedometer 0.8 Hr.

Assy. - Explorer

DEALER CODING BASIC PART NO. CONDITION CODE

17255 51

OASIS CODES: 204000, 204200

Mass Air Flow (MAF) Sensor: All Technical Service Bulletins Engine - Lean Driveability Symptoms

Article No. 98-23-10

11/23/98

MASS AIR FLOW (MAF) - SENSOR CONTAMINATION - SERVICE TIP

FORD: 1990-97 THUNDERBIRD 1990-99 MUSTANG, TAURUS SHO 1991-99 CROWN VICTORIA, ESCORT, TAURUS 1992-94 TEMPO 1993-97 PROBE 1995-99 CONTOUR

LINCOLN-MERCURY: 1990-97 COUGAR 1991-99 CONTINENTAL, GRAND MARQUIS, SABLE, TOWN CAR, TRACER 1992-94 TOPAZ 1993-98 MARK VIII 1995-99 MYSTIQUE

LIGHT TRUCK: 1990 BRONCO II 1990-97 AEROSTAR 1990-99 RANGER 1991-99 EXPLORER 1994-96 BRONCO 1994-97 F SUPER DUTY, F-250 HD 1994-99 ECONOLINE, F-150, F-250 LD, F-350 1995-99 WINDSTAR 1997-99 EXPEDITION, MOUNTAINEER 1998-99 NAVIGATOR 1999 F-250 HD, SUPER DUTY F SERIES

ISSUE This TSB article is a diagnostic procedure to address vehicles that exhibit lean driveability symptoms and may or may not have any Diagnostic Trouble Codes (DTCs) stored in memory.

ACTION Follow the diagnostic procedures described in the following Service Tip. The revised diagnostic procedure is a more accurate means of diagnosing the symptoms.

SERVICE TIP

MASS AIR FLOW (MAF) DISCUSSION

MAF sensors can get contaminated from a variety of sources: dirt, oil, silicon, spider webs, potting compound from the sensor itself, etc. When a MAF sensor gets contaminated, it skews the transfer function such that the sensor over-estimates air flow at idle (causes the fuel system to go rich) and under-estimates air flow at high air flows (causes fuel system to go lean). This means Long Term Fuel Trims will learn lean (negative) corrections at idle and learn rich (positive) corrections at higher air flows.

If vehicle is driven at Wide Open Throttle (WOT) or high loads, the fuel system normally goes open loop rich to provide maximum power. If the MAF sensor is contaminated, the fuel system will actually be lean because of under-estimated air flow. During open loop fuel operation, the vehicle applies Long Term Fuel Trim corrections that have been learned during closed loop operation. These corrections are often lean corrections learned at lower air flows. This combination of under-estimated air flow and lean fuel trim corrections can result in spark knock/detonation and lack of power concerns at WOT and high loads.

One of the indicators for diagnosing this condition is barometric pressure. Barometric pressure (BARO) is inferred by the Powertrain Control Module (PCM) software at part throttle and WOT (there is no actual BARO sensor on MAF-equipped vehicles, except for the 3.8L Supercharged engine). At high air flows, a contaminated MAF sensor will under-estimate air flow coming into the engine, hence the PCM infers that the vehicle is operating at a higher altitude. The BARO reading is stored in Keep Alive Memory (KAM) after it is updated. Other indicators are Long Term Fuel Trim and MAF

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE			
Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

voltage at idle.

NOTE

THE FOLLOWING PROCEDURE MAY ALSO BE USED TO DIAGNOSE VEHICLES THAT DO NOT HAVE FUEL SYSTEM/HO2S SENSOR DTCS.

Symptoms

^ Lack of Power

^ Spark Knock/Detonation

^ Buck/Jerk

^ Hesitation/Surge on Acceleration

^ Malfunction Indicator Lamp (MIL) Illuminated -

DTCs P0171, P0172, P0174, P0175 may be stored in memory

OBDII DTCs

^ P0171, P0174 (Fuel system lean, Bank 1 or 2)

^ P0172, P0175, (Fuel system rich, Bank 1 or 2)

^ P1130, P1131, P1132, (HO2S11 lack of switching, Bank 1)

^ P1150, P1151, P1152, (HO2S21 lack of switching, Bank 2)

OBDI DTCs

^ 181, 189 (Fuel system lean, Bank 1 or 2)

^ 179, 188 (Fuel system rich, Bank 1 or 2)

^ 171, 172, 173 (HO2S11 lack of switching, Bank 1)

^ 175, 176, 177 (HO2S21 lack of switching, Bank 2)

^ 184, 185 (MAF higher/lower than expected)

^ 186, 187 (Injector pulse width higher/lower than expected)

NOTE:

DO NOT DISCONNECT THE BATTERY. IT WILL ERASE KEEP ALIVE MEMORY AND RESET LONG TERM FUEL TRIM AND BARO TO THEIR STARTING/BASE VALUES. THE BARO PARAMETER IDENTIFICATION DISPLAY (PID) IS USED FOR THIS DIAGNOSTIC PROCEDURE. ALL OBDII APPLICATIONS HAVE THIS PID AVAILABLE. THERE ARE SOME OBDI VEHICLES THAT DO NOT HAVE THE BARO PID, FOR THESE VEHICLES OMIT THE BARO CHECK AND REFER ONLY TO STEPS 2, 3, AND 4 IN THE DIAGNOSTIC PROCEDURE.

BAROMETRIC PRESSURE REFERENCE

Barometric Pressure (in. Hg.)	Barometric Pressure (kPa)	BARO/MAP PID (Hz)	Altitude above sea level (ft)
3.5	11.8	89.3	
5	16.9	92.8	
10	33.8	104.6	
15	50.7	117.0	14,000
20	67.5	129.6	10,000
21	70.9	132.5	9,000
22	74.3	135.4	8,000
23	77.7	138.3	7,000
24	81.1	141.1	6,000
25	84.4	144.0	5,000
26	87.8	146.9	4,000
27	91.2	149.8	3,000
28	94.6	152.8	2,000
29	97.9	155.8	1,000
30	101.3	158.9	0 (sea level)
31	104.7	162.0	
31.875	107.7	164.7	

1. Look at the BARO PID. Refer to the Barometric Pressure Reference Chart in this article. At sea level, BARO should read about 159 Hz (29.91 in. Hg). As a reference, Denver, Colorado at 1524 meters (5000 ft.) altitude should be about 144 Hz (24.88 in.Hg). Normal learned BARO variability is up to +/- 6 Hz (+/- 2 in. Hg.). If BARO indicates a higher altitude than you are not at (7 or more Hz lower than expected), you may have MAF contamination. If available, Service Bay Diagnostic System (SBDS) has a Manifold Absolute Pressure (MAP) sensor that can be used as a barometric pressure reference. Use "MAP/BARO" test under "Powertrain," "Testers and Meters." Ignore the hookup screen. Connect GP2 to the reference MAP on the following screen.

NOTE

REMEMBER THAT MOST WEATHER SERVICES REPORT A LOCAL BAROMETRIC PRESSURE THAT HAS BEEN CORRECTED TO SEA LEVEL. THE BARO PID, ON THE OTHER HAND, REPORTS THE ACTUAL BAROMETRIC PRESSURE FOR THE ALTITUDE THE VEHICLE IS BEING OPERATED IN. LOCAL WEATHER CONDITIONS (HIGH AND LOW PRESSURE AREAS) WILL CHANGE THE LOCAL BAROMETRIC PRESSURE BY SEVERAL INCHES OF MERCURY (+/- 3 Hz, +/- 1 in. Hg.).

NOTE

BARO IS UPDATED ONLY WHEN THE VEHICLE IS AT HIGH THROTTLE OPENINGS. THEREFORE, A VEHICLE WHICH IS DRIVEN DOWN FROM A HIGHER ALTITUDE MAY NOT HAVE HAD AN OPPORTUNITY TO UPDATE THE BARO VALUE IN KAM. IF YOU ARE NOT CONFIDENT THAT BARO HAS BEEN UPDATED, PERFORM THREE OR FOUR HEAVY, SUSTAINED ACCELERATIONS AT GREATER THAN HALF-THROTTLE TO ALLOW BARO TO UPDATE.

2. On a fully warmed up engine, look at Long Term Fuel Trim at idle, in Neutral, A/C off, (LONGFT1 and/or LONGFT2 PIDs). If it is more negative than -12%, the fuel system has learned lean corrections which may be due to the MAF sensor over-estimating air flow at idle. Note that both Banks 1 and 2 will exhibit negative corrections for 2-bank system. If only one bank of a 2-bank system has negative corrections, the MAF sensor is probably not contaminated.

3. On a fully warmed up engine, look at MAF voltage at idle, in Neutral, A/C off (MAF V PID). If it's 30% greater than the nominal MAF V voltage listed in the Powertrain Control/Emissions Diagnosis (PC/ED) Diagnostic Value Reference Charts for your vehicle, or greater than 1.1 volts as a rough guide, the MAF sensor is over-estimating air flow at idle.

4. If at least tow of the previous three steps are true, proceed to disconnect the MAF sensor connector. This puts the vehicle into Failure Mode and Effects Management (FMEM). In FMEM mode, air flow is inferred by using rpm and throttle position instead of reading the MAF sensor. (In addition, the BARO value is reset to a base/unlearned value.) If the lean driveability symptoms go away, the MAF sensor is probably contaminated and should be replaced. If the lean driveability symptoms do not go away, go to the PC/ED Service Manual for the appropriate diagnostics.

NOTE

DUE TO INCREASINGLY STRINGENT EMISSION/OBDII REQUIREMENTS, IT IS POSSIBLE FOR SOME VEHICLES WITH MAF SENSOR CONTAMINATION TO SET FUEL SYSTEM DTCs AND ILLUMINATE THE MIL WITH NO DRIVEABILITY CONCERNS. DISCONNECTING THE MAF ON THESE VEHICLES WILL, THEREFORE, PRODUCE NO IMPROVEMENTS IN DRIVEABILITY. IN THESE CASES, IF THE BARO, LONGFT1, LONGFT2, AND MAF V PIDs INDICATE THAT THE MAF IS CONTAMINATED, PROCEED TO REPLACE THE MAF SENSOR.

After replacing the MAF sensor, disconnect the vehicle battery (5 minutes, minimum to reset KAM, or on newer vehicles, use the "KAM Reset" feature on the New Generation Star (NGS) Tester and verify that the lean driveability symptoms are gone.

OTHER APPLICABLE ARTICLES:: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 206000, 610000, 610500, 610600, 610700, 611000, 611500, 612000, 612500, 614000, 614500, 614600, 698298

Speedometer Head: Description and Operation

Service repair procedures on the speedometer are not included as they require special tools and extreme care when making repairs and adjustment that only an experienced speedometer mechanic should attempt. The speedometer has two main parts, speedometer head and speedometer drive cable. When speedometer fails to indicate speed or mileage, cable or cable housing is probably broken. On vehicles equipped with speed control, there is a speed sensor attached to the transmission. This is used to sense the revolutions of the cable assembly and to regulate speed control.

Temperature Gauge: Customer Interest Temperature Gauge - Fluctuation/Inaccurate

Article No. 95-18-5

09/11/95

TEMPERATURE GAUGE - FLUCTUATING AND/OR INACCURATE HIGH READINGS

FORD: 1990-94 TAURUS, THUNDERBIRD 1991-93 TEMPO 1991-94 ESCORT

LINCOLN-MERCURY: 1990-94 COUGAR SABLE 1991-93 TOPAZ 1991-94 TRACER

LIGHT TRUCK: 1990-91 AEROSTAR 1990-94 RANGER 1991-94 EXPLORER

This TSB article is being republished in its entirety to correct model year application and revise the part descriptions.

ISSUE: Some vehicles may show temperature gauge fluctuations and/or inaccurate (high) readings (affected engines are 3.0L/4.0L Ranger. 4.0L Explore and 1.9L Escort/Tracer). The inaccurate (high) readings may result in a customer concern with the perception of engine overheating. This is caused by Gauge/Sender design characteristics which create a sensitive gauge indication.

ACTION: Replace the gauge and sender with a new Temperature Indication Service Kit. Refer to the following for Additional Concerns and Service Procedure for details.

ADDITIONAL CONCERNS

Please verify the following two (2) concerns before implementing the fix for the above concern.

1. Perform cooling system diagnosis per TSB 93-24-8.

2. Vehicles built from 1/1/93 to 4/1/93 may experience high temperature gauge indications which may have been due to the installation of improperly manufactured temperature sending units. The customer concern is that the gauge indication is beyond the letter "L" in the word "NORMAL". If this condition occurs, inspect the temperature sender for an "A3" stamped date code on the hex of the sending unit. If an "A3" unit is found, replace with "NON-A3" service stock.

3. 1993 Taurus/Sable 3.8L vehicles built 8/16/93 to 8/31/93 may have high temperature gauge readings caused by an incorrect temperature sending unit installed at the assembly plant. The incorrect temperature sending unit can be identified by a blue insulator around the terminal. The correct temperature sending unit has a green insulator. If a temperature sending unit with a blue insulator is found, replace it with an F1SZ-10884-A.

4. Explorer 4.0L vehicles with date code 2204 to 2274 should not be used. Any other date code outside this is acceptable even with an "A3" stamp.

NOTE:

DATE CODES ARE BASED ON THE JULIAN DATE CODE SYSTEM. THE LAST NUMBER DENOTES THE YEAR THAT THE PART WAS MANUFACTURED. FOR EXAMPLE, 2274 (1994 PART) AND 2275 (1995 PART). ANY 1995 PART MAY BE USED.

TEMPERATURE INDICATION SERVICE KIT PROCEDURE

NOTE:

THIS PROCEDURE IS PERFORMED AFTER THE ABOVE TWO (2) STEPS HAVE BEEN DONE.

The installation of the service kit will result in a pointer indicating in the approximate center of the "NORMAL" band while providing protection for a boil-over condition.

The service kit consists of:

PART NUMBER	PART NAME
F4CZ-10E922-A	Temperature Indication Kit - Base (Escort/Tracer 1.9L)
F4CZ-10E922-B	Temperature Indication Kit - With Tachometer (Escort/Tracer - 1.9L)
F43Z-10E922-A	Temperature Indication Kit - Base (Tempo/Topaz)
F46Z-10E922-A	Temperature Indication Kit - With Tachometer (Tempo/Topaz)
F4DZ-10E922-A	Temperature Indication Kit - Base (Taurus)
F44Z-10E922-A	Temperature Indication Kit - With Tachometer (Taurus/Sable)
F4SZ-10E922-A	Temperature Indication Kit - Base (Thunderbird/Cougar)
F4SZ-10E922-B	Temperature Indication Kit - With Tachometer (Thunderbird/Cougar)
F47Z-10E922-A	Temperature Indication Kit Without Tachometer (Ranger - 3.0L And 4.0L Engines)
F47Z-10E922-B	Temperature Indication Kit - With Tachometer (Explorer - 4.0L, Ranger - 3.0L And 4.0L Engines)
F49Z-10E922-A	Temperature Indication Kit (Aerostar)

^ Instructions

^ Temperature Gauge

^ Temperature Sender

The instructions will contain the following steps:

1. Remove BOTH existing temperature sender and temperature gauge from the vehicle.

NOTE:

REFER TO SECTION 13, CONVENTIONAL INSTRUMENT CLUSTER, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE GAUGE REMOVAL AND INSTALLATION INSTRUCTIONS. REFER TO SECTION 03-03, COOLING SYSTEM, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE SENDER REMOVAL AND INSTALLATION PROCEDURES.

2. Install BOTH service kit temperature sender and temperature gauge into the vehicle.

NOTE:

THE SERVICE KIT TEMPERATURE SENDER AND TEMPERATURE GAUGE MUST BE USED TOGETHER.

Parts Block

OTHER APPLICABLE ARTICLES: 93-24-8 SUPERSEDES: 95-15-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

951805A Replace Temperature 1.0 Hr.

Gauge And Sending Unit - Taurus/Sable, Tempo/Topaz, Thunderbird/Cougar, Explorer, Ranger, Aerostar (4X2)

951805B Replace Temperature 1.1 Hr.

Gauge And Sending Unit - Escort/Tracer

951805C Replace Temperature 1.2 Hrs.

Gauge And Sending Unit - Aerostar (4X4)

DEALER CODING

CONDITION

BASIC PART NO. CODE

10883 79

10884 79

OASIS CODES: 204000, 204200, 206000, 402000

Temperature Gauge: All Technical Service Bulletins Temperature Gauge - Fluctuation/Inaccurate

Article No. 95-18-5

09/11/95

TEMPERATURE GAUGE - FLUCTUATING AND/OR INACCURATE HIGH READINGS

FORD: 1990-94 TAURUS, THUNDERBIRD 1991-93 TEMPO 1991-94 ESCORT

LINCOLN-MERCURY: 1990-94 COUGAR SABLE 1991-93 TOPAZ 1991-94 TRACER

LIGHT TRUCK: 1990-91 AEROSTAR 1990-94 RANGER 1991-94 EXPLORER

This TSB article is being republished in its entirety to correct model year application and revise the part descriptions.

ISSUE: Some vehicles may show temperature gauge fluctuations and/or inaccurate (high) readings (affected engines are 3.0L/4.0L Ranger. 4.0L Explore and 1.9L Escort/Tracer). The inaccurate (high) readings may result in a customer concern with the perception of engine overheating. This is caused by Gauge/Sender design characteristics which create a sensitive gauge indication.

ACTION: Replace the gauge and sender with a new Temperature Indication Service Kit. Refer to the following for Additional Concerns and Service Procedure for details.

ADDITIONAL CONCERNS

Please verify the following two (2) concerns before implementing the fix for the above concern.

1. Perform cooling system diagnosis per TSB 93-24-8.

2. Vehicles built from 1/1/93 to 4/1/93 may experience high temperature gauge indications which may have been due to the installation of improperly manufactured temperature sending units. The customer concern is that the gauge indication is beyond the letter "L" in the word "NORMAL". If this condition occurs, inspect the temperature sender for an "A3" stamped date code on the hex of the sending unit. If an "A3" unit is found, replace with "NON-A3" service stock.

3. 1993 Taurus/Sable 3.8L vehicles built 8/16/93 to 8/31/93 may have high temperature gauge readings caused by an incorrect temperature sending unit installed at the assembly plant. The incorrect temperature sending unit can be identified by a blue insulator around the terminal. The correct temperature sending unit has a green insulator. If a temperature sending unit with a blue insulator is found, replace it with an F1SZ-10884-A.

4. Explorer 4.0L vehicles with date code 2204 to 2274 should not be used. Any other date code outside this is acceptable even with an "A3" stamp.

NOTE:

DATE CODES ARE BASED ON THE JULIAN DATE CODE SYSTEM. THE LAST NUMBER DENOTES THE YEAR THAT THE PART WAS MANUFACTURED. FOR EXAMPLE, 2274 (1994 PART) AND 2275 (1995 PART). ANY 1995 PART MAY BE USED.

TEMPERATURE INDICATION SERVICE KIT PROCEDURE

NOTE:

THIS PROCEDURE IS PERFORMED AFTER THE ABOVE TWO (2) STEPS HAVE BEEN DONE.

The installation of the service kit will result in a pointer indicating in the approximate center of the "NORMAL" band while providing protection for a boil-over condition.

The service kit consists of:

PART NUMBER	PART NAME
F4CZ-10E922-A	Temperature Indication Kit - Base (Escort/Tracer 1.9L)
F4CZ-10E922-B	Temperature Indication Kit - With Tachometer (Escort/Tracer - 1.9L)
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F46Z-10E922-A	Temperature Indication Kit - With Tachometer (Tempo/Topaz)
F4DZ-10E922-A	Temperature Indication Kit - Base (Taurus)
F44Z-10E922-A	Temperature Indication Kit - With Tachometer (Taurus/Sable)
F4SZ-10E922-A	Temperature Indication Kit - Base (Thunderbird/Cougar)
F4SZ-10E922-B	Temperature Indication Kit - With Tachometer (Thunderbird/Cougar)
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F47Z-10E922-B	Temperature Indication Kit - With Tachometer (Explorer - 4.0L, Ranger - 3.0L And 4.0L Engines)
F49Z-10E922-A	Temperature Indication Kit (Aerostar)

^ Instructions

^ Temperature Gauge

^ Temperature Sender

The instructions will contain the following steps:

1. Remove BOTH existing temperature sender and temperature gauge from the vehicle.

NOTE:

REFER TO SECTION 13, CONVENTIONAL INSTRUMENT CLUSTER, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE GAUGE REMOVAL AND INSTALLATION INSTRUCTIONS. REFER TO SECTION 03-03, COOLING SYSTEM, OF THE APPROPRIATE SERVICE MANUAL FOR TEMPERATURE SENDER REMOVAL AND INSTALLATION PROCEDURES.

2. Install BOTH service kit temperature sender and temperature gauge into the vehicle.

NOTE:

THE SERVICE KIT TEMPERATURE SENDER AND TEMPERATURE GAUGE MUST BE USED TOGETHER.

Parts Block

OTHER APPLICABLE ARTICLES: 93-24-8 SUPERSEDES: 95-15-3

WARRANTY STATUS: Eligible Under The Provisions Of Bumper To Bumper Warranty Coverage For 1992-94 Model Year Vehicles, Basic Warranty Coverage For All Other Model Year Vehicles

OPERATION DESCRIPTION TIME

951805A Replace Temperature 1.0 Hr.

Gauge And Sending Unit - Taurus/Sable, Tempo/Topaz, Thunderbird/Cougar, Explorer, Ranger, Aerostar (4X2)

951805B Replace Temperature 1.1 Hr.

Gauge And Sending Unit - Escort/Tracer

951805C Replace Temperature 1.2 Hrs.

Gauge And Sending Unit - Aerostar (4X4)

DEALER CODING

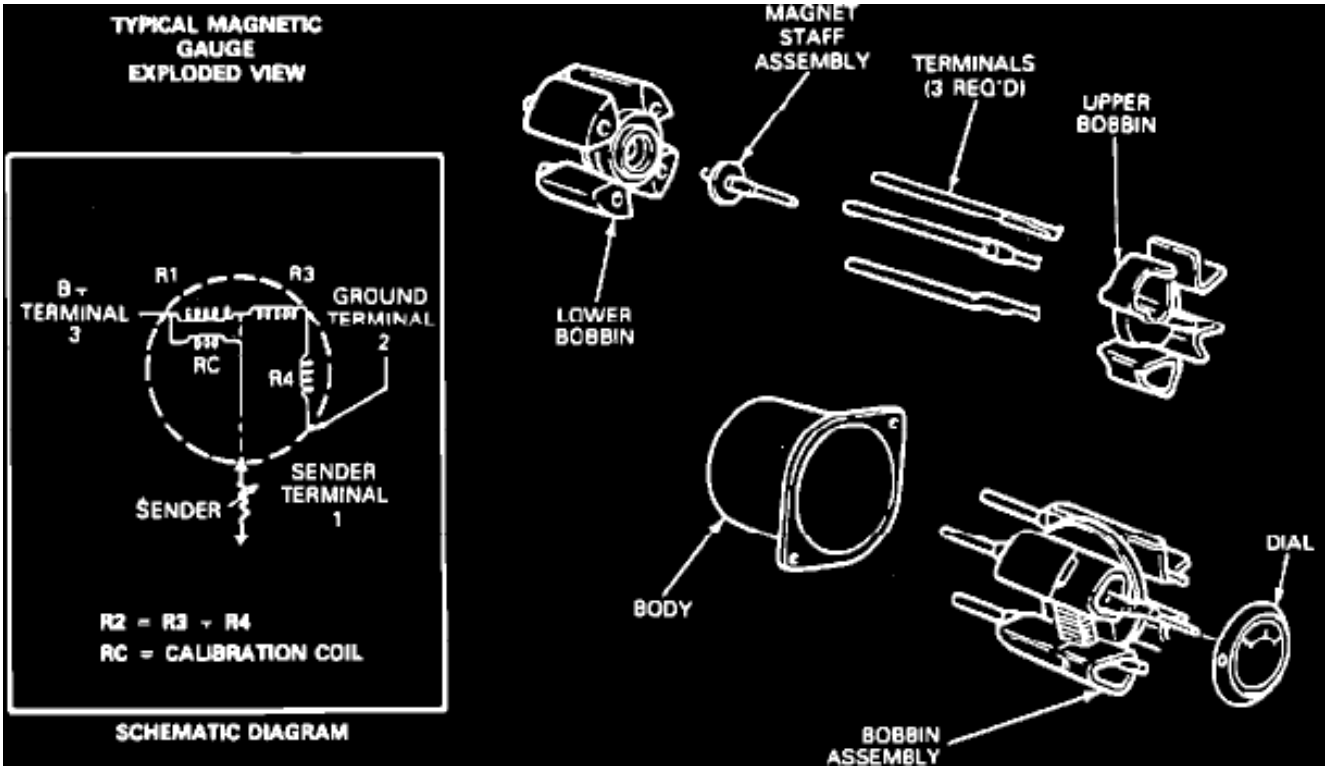
CONDITION

BASIC PART NO. CODE

10883 79

10884 79

OASIS CODES: 204000, 204200, 206000, 402000



Temperature Gauge: Description and Operation

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

This temperature indicating system consists of a sending unit, located on the cylinder head, electrical temperature gauge and an instrument voltage regulator. As engine temperature increases or decreases, the resistance of the sending unit changes, in turn controlling current flow to the gauge. When engine temperature is low, the resistance of the sending unit is high, restricting current flow to the gauge, in turn indicating low engine temperature. As engine temperature increases, the resistance of the ending unit decreases, permitting an increased current flow to the gauge, resulting in an increased temperature reading.

MAGNETIC GAUGE SYSTEM

Fig. 8 Magnetic Guage

The magnetic gauge movement consists of three primary coils, one of which is wound at a 90° angle to the other two. The coils form a magnetic field which varies in direction according to the variable resistance of the sender unit which is connected between two of them. A primary magnet which is attached to a shaft and pointer rotates and aligns to this primary field resulting in pointer position. The bobbin/coil assembly is pressed into a metal housing which is attached to the instrument cluster, Fig. 8. These gauges require no adjustments, calibrations or maintenance. This gauge system does not use an IVR.

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	TEMPERATURE OR OIL GAUGE INOPERATIVE		
	• Check complaint.	Gauge pointer does not move ▶	GO to Step A2.
		Gauge pointer moves ▶	GO to Step B1.

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	VERIFY POWER TO CLUSTER		
	• With ignition on, observe other gauges and warning lamps for proper operation. If necessary, use voltmeter or test light to verify voltage at B+ terminal of cluster connector.	Other gauges and warning lamps operate correctly: voltage present at cluster ▶	GO to Step B1.
		Other gauges and warning lamps do not operate correctly: no voltage present at cluster ▶	SERVICE wiring to cluster.

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	TESTING SENDER CIRCUIT AT LOW		
	• Insert test box in sender circuit. Disconnect connector at sender and connect test box to cluster side of connector. Set box to LOW (73 ohms).	Temperature gauge reads around the C band ▶	GO to Step B2.
		Oil reads at or below L band ▶	GO to Step B3
		Pointer does not move ▶	GO to Step B4.
B2	TESTING TEMPERATURE SENDER CIRCUIT AT HIGH		
	• TEMPERATURE GAUGE • Set test box to HIGH (9.7 ohms).	Temperature gauge reads around the H grad ▶	REPLACE sender.
		Temperature gauge does not read around the H grad ▶	GO to Step B4.
B3	TESTING ON CABLE SENDER CIRCUIT AT HIGH		
	• OIL GAUGE • Set test box to 0 ohms (short circuit).	Oil gauge reads MID SCALE or slightly above ▶	REPLACE switch.
		Oil gauge does not read MID SCALE or slightly above ▶	GO to Step B4.
B4	CHECK SENDER CIRCUIT WIRING		
	• Check sender circuit wiring and cluster flexible circuit for shorts or open with ohmmeter.	Wiring and flex circuit OK ▶	REPLACE gauge. GO to A1.
		Wiring shorted or open. Flex circuit damaged ▶	REPAIR wiring / flex circuit. GO to A1.

Temperature Gauge: Pinpoint Tests

Fig. 11 Troubleshooting Chart

Fig. 11 Troubleshooting Chart

Fig. 12 Troubleshooting Chart

Temperature Gauge: Component Tests and General Diagnostics

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Temperature Gauge: Tools and Equipment

Tester tool No. 021-00055 or equivalent should be used to diagnose these type gauges.

Temperature Sensor (Gauge): Technical Service Bulletins Temperature Gauge - Reads Low/Erratic

Article No. 95-13-2

07/03/95

^ GAUGE - TEMPERATURE-READS IN LOW RANGE - ERRATIC READINGS

^ SERVICE PARTS - RETURN OF OBSOLETE TEMPERATURE SENDERS

FORD: 1981-94 ESCORT 1981-95 MUSTANG, THUNDERBIRD 1983-95 CROWN VICTORIA 1984-94 TEMPO 1986-95 TAURUS

LINCOLN-MERCURY: 1981-92 TOWN CAR 1981-95 COUGAR 1983-95 GRAND MARQUIS 1984-92 MARK VII 1984-94 TOPAZ 1986-95 SABLE 1987-89 TRACER 1991-94 TRACER 1993-95 MARK VIII

LIGHT TRUCK: 1982-95 BRONCO 1983-95 RANGER 1986-94 AEROSTAR 1990-95 F-150-350 SERIES 1991-95 EXPLORER 1992-95 ECONOLINE 1995 WINDSTAR

ISSUE: Temperature Sender F1SZ-10884-A with a build date code prior to 2774 (277th day of 1994) should be purged from your inventory and returned to your facing PDC. These parts are being made obsolete because of an incorrect crimp during assembly. Installing these parts on a vehicle could result in early loss of temperature sender function.

ACTION: Remove and return the suspect parts from your dealership's inventory. The obsolete parts should be withdrawn from your inventory and returned to your facing PDC within 30 days of this TSB.

NOTE:

USE TSB ARTICLE 93-24-8 FOR DIAGNOSIS PROCEDURE IN DETERMINING IF LOW GAUGE READINGS COULD BE ASSOCIATED WITH A TEMPERATURE SENDER CONCERN.

1. Perform 100% sort of all stock on hand.

2. Suspect stock has a build date code prior to 2774. Usable stock will have a build date code of 2774 or later.

NOTE:

DATE CODES ARE LOCATED ON THE SIDE OF THE SENDER HEX.

3. Usable stock can be returned to your inventory and released for normal sales.

4. Return suspect part (F1SZ-10884-A) to your facing PDC using the least expensive transportation.

5. If claim is processed electronically via DOES II, use return code "GB"; otherwise, complete a separate paper claim form FPS-340 using return code "J".

6. In the Remarks Section, write "Returned per TSB 95-13-2".

LIMITS

^ The returns must be received within 30 days from the date of this TSB.

^ Returns are restricted to the subject parts.

^ The parts returned must have been purchased from FCSD in accordance with Policy and Procedure Bulletin 4000.

CREDIT

Credit for parts and prepaid freight costs will be issued.

Replacement stock is available for ordering

PART NUMBER PART NAME

F1SZ-10884-A Temperature Sender

OTHER APPLICABLE ARTICLES: 93-24-8

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 203000, 203200, 204000, 204200, 402000

Temperature Warning Lamp/Indicator: Description and Operation

A bimetal temperature switch located in the cylinder head controls operation of a temperature indicator light with a red lens. If engine cooling system is not functioning properly and coolant temperature exceeds a predetermined value, warning light will illuminate.

Temperature Warning Lamp/Indicator: Testing and Inspection

If the red light is not lit when engine is being cranked, check for a burned out bulb, open in light circuit, or a defective ignition switch. If red light is lit when engine is running, check wiring between light and switch for a ground, defective temperature switch, or overheated cooling system. As a test circuit to check whether the red bulb is functioning properly, a wire which is connected to the ground terminal of the ignition switch is tapped into its circuit. When the ignition is in ``Start'' (engine cranking) position, ground terminal is grounded inside the switch and the red bulb will be lit. When engine is started and the ignition switch is in the On position, test circuit is opened and bulb is then controlled by the temperature switch.

Volt Meter Gauge: Description and Operation

The voltmeter is a gauge which measures the electrical flow from the battery to indicate whether the battery output is within tolerances. The voltmeter reading can range from 13.5-14.0 volts under normal operating conditions. If an undercharge or overcharge condition is indicated for an extended period, the battery and charging system should be checked.

Volt Meter Gauge: Testing and Inspection Dash Gauge Test

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

1. Ensure voltage is present at fuse panel and cluster.

2. Install gauge tester tool No. 021-00055 or equivalent, following manufacturer's instructions. This tester can be used on the CVR or Magnetic Gauge systems.

Volt Meter Gauge: Testing and Inspection Voltmeter Gauge

CONSTANT VOLTAGE REGULATOR GAUGE SYSTEM (CVR)

1. Disconnect battery ground cable and remove gauge from vehicle.

2. Connect ohmmeter between gauge terminals and read coil winding resistance.

3. An upward movement of ohmmeter needle from 10 ohms to 14 ohms is normal, as test current of ohmmeter causes a temperature rise in gauge coil windings.

4. If ohmmeter reads below 10 ohms or above 14 ohms, gauge is defective.

MAGNETIC GAUGE SYSTEM

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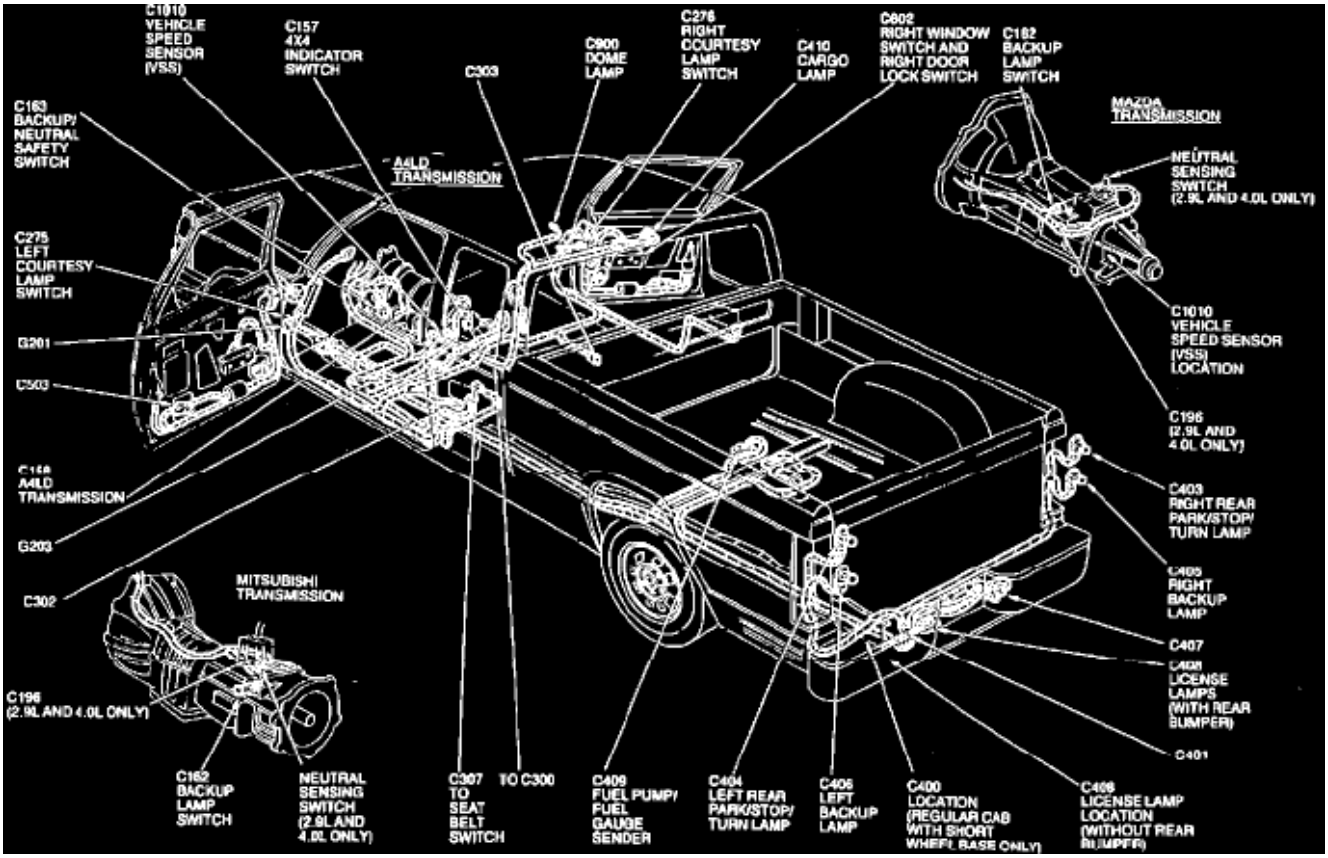
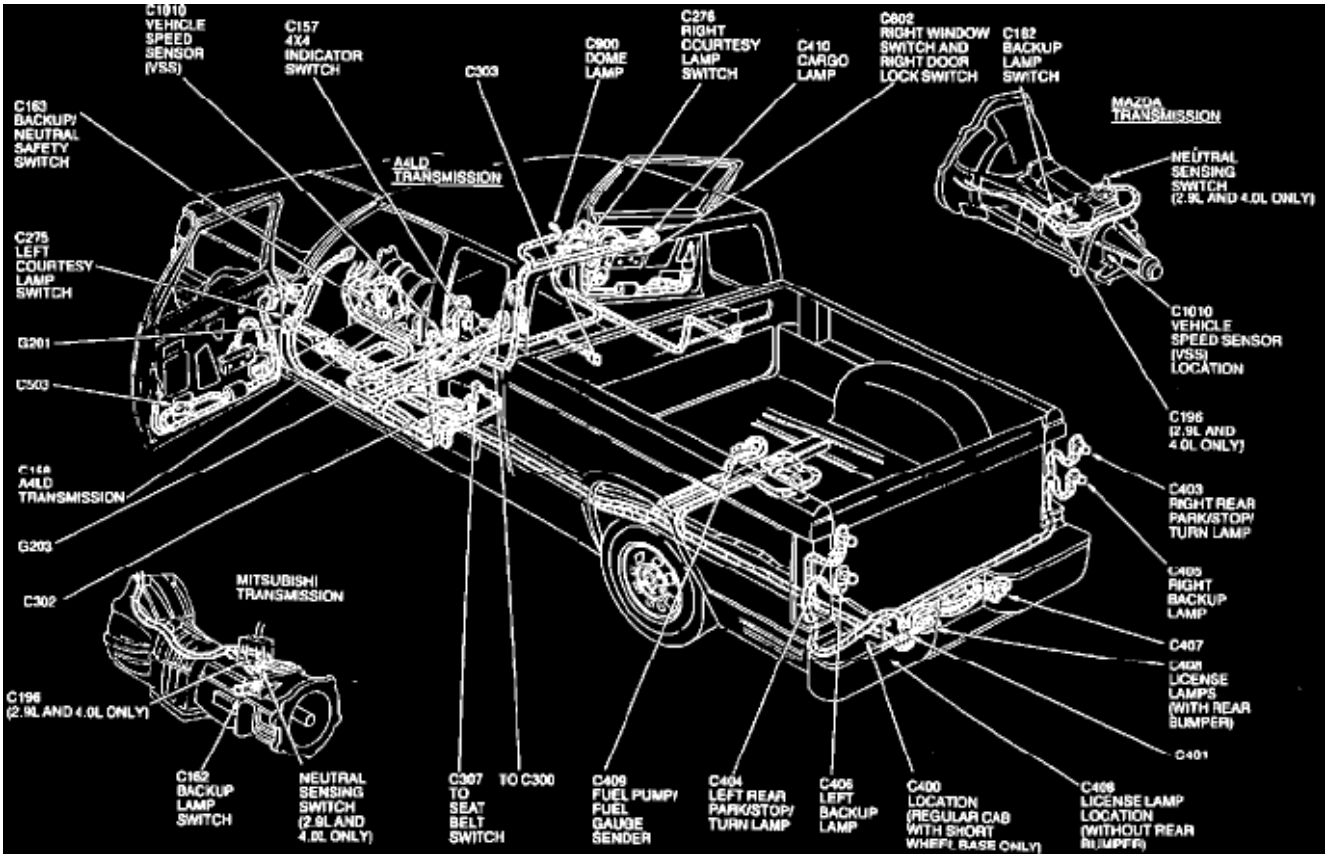


Backup Lamp Switch: Locations Back-Up Lamp/Neutral Safety Switch

Body Components

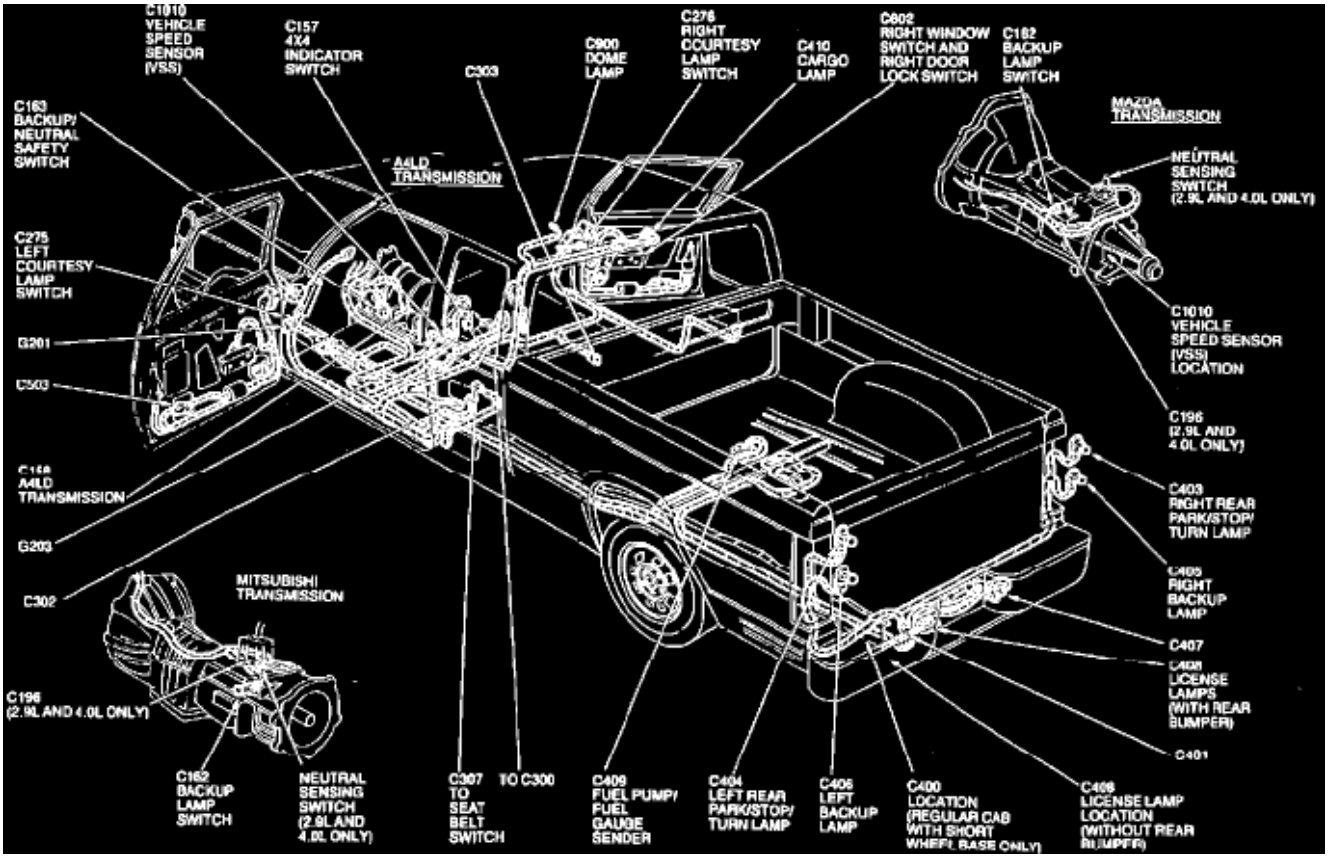
LH Side Of Transmission



Backup Lamp Switch: Locations Backup Lamp Switch (Mazda Transmission)

Body Components

Top LH Side Of Transmission

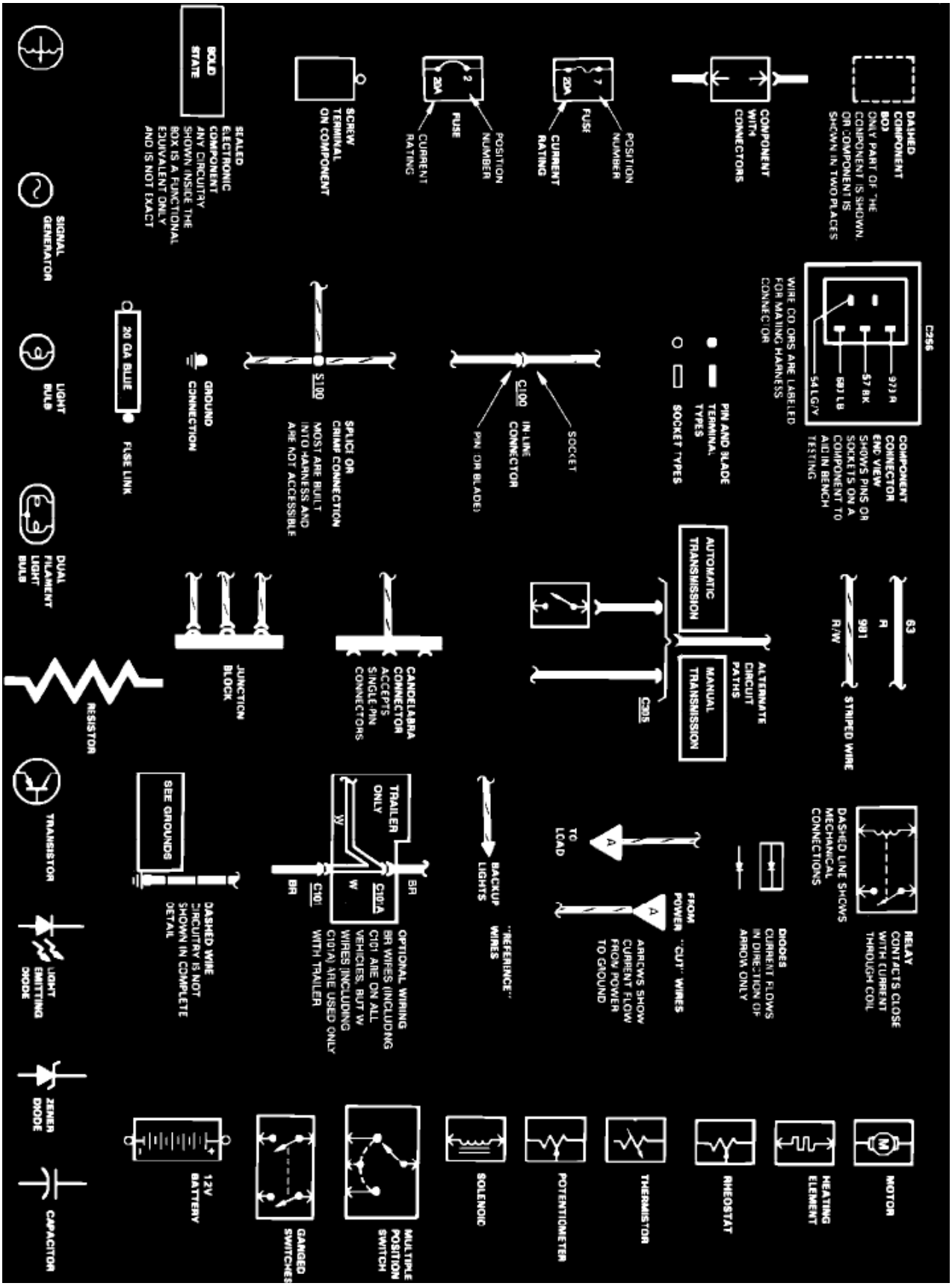


Backup Lamp Switch: Locations Backup Lamp Switch (Mitsubishi Transmission)

Body Components

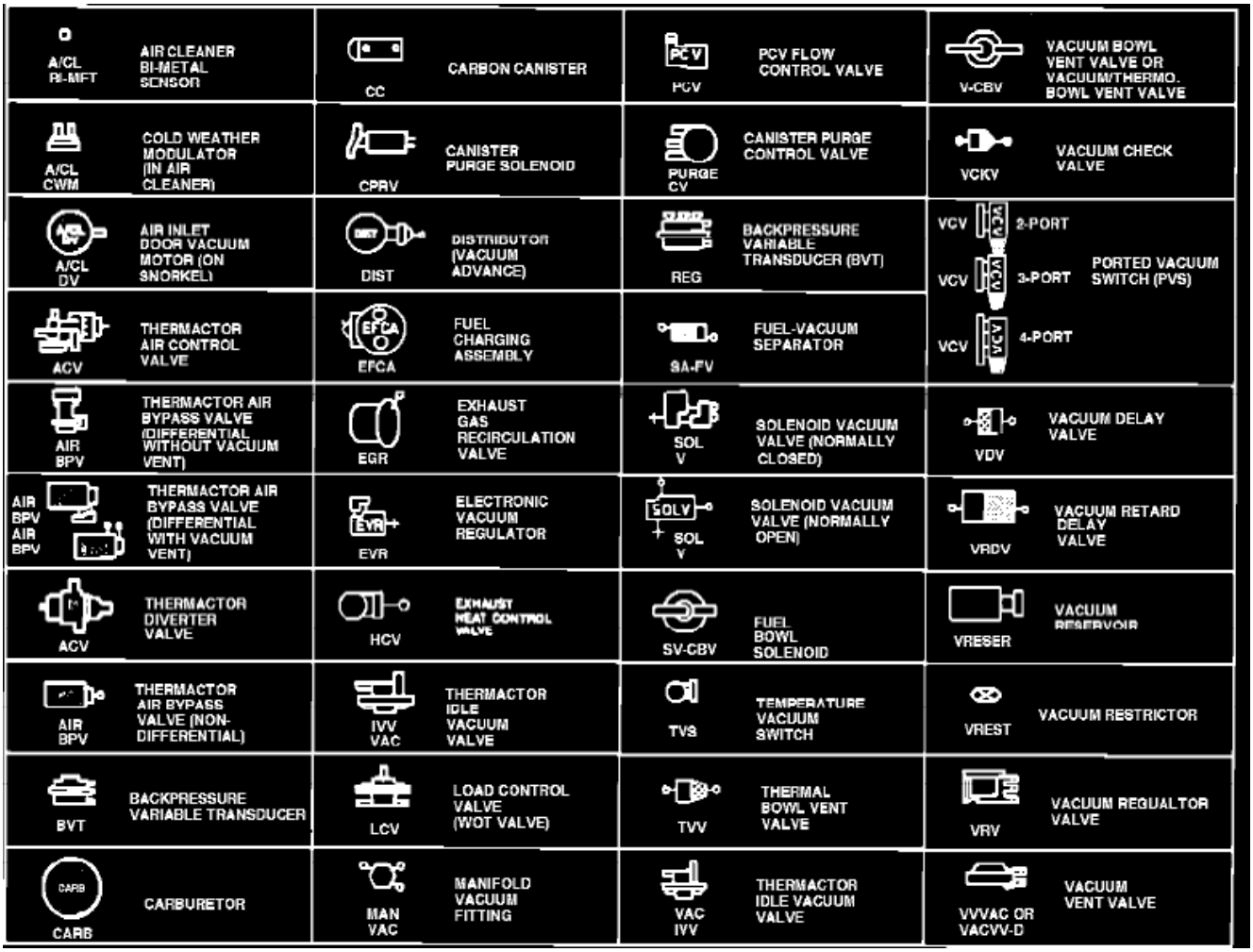
RH Side Of Transmission

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Brake Lamp > Component Information > Diagrams > Diagram Information and Instructions

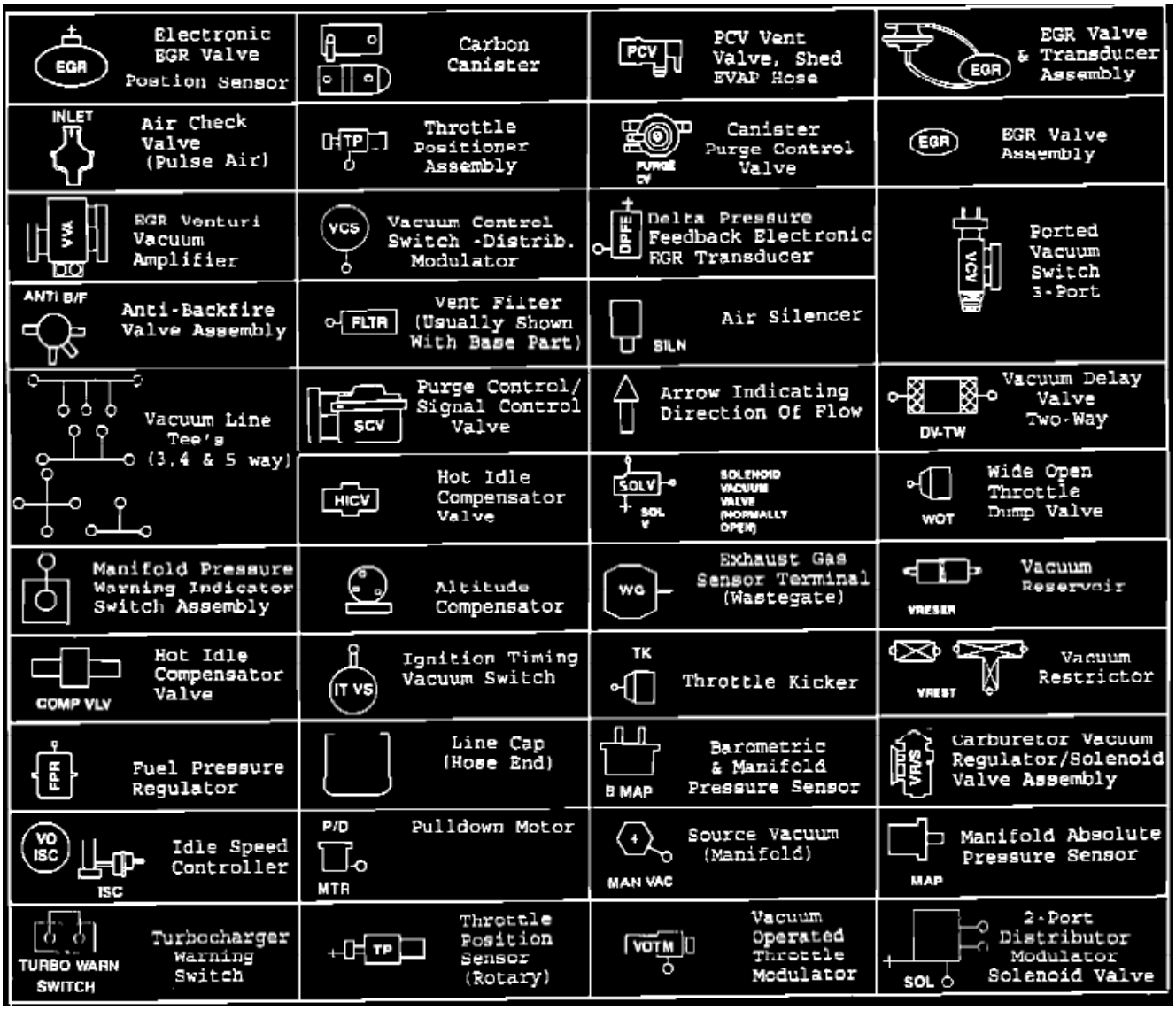


Brake Lamp: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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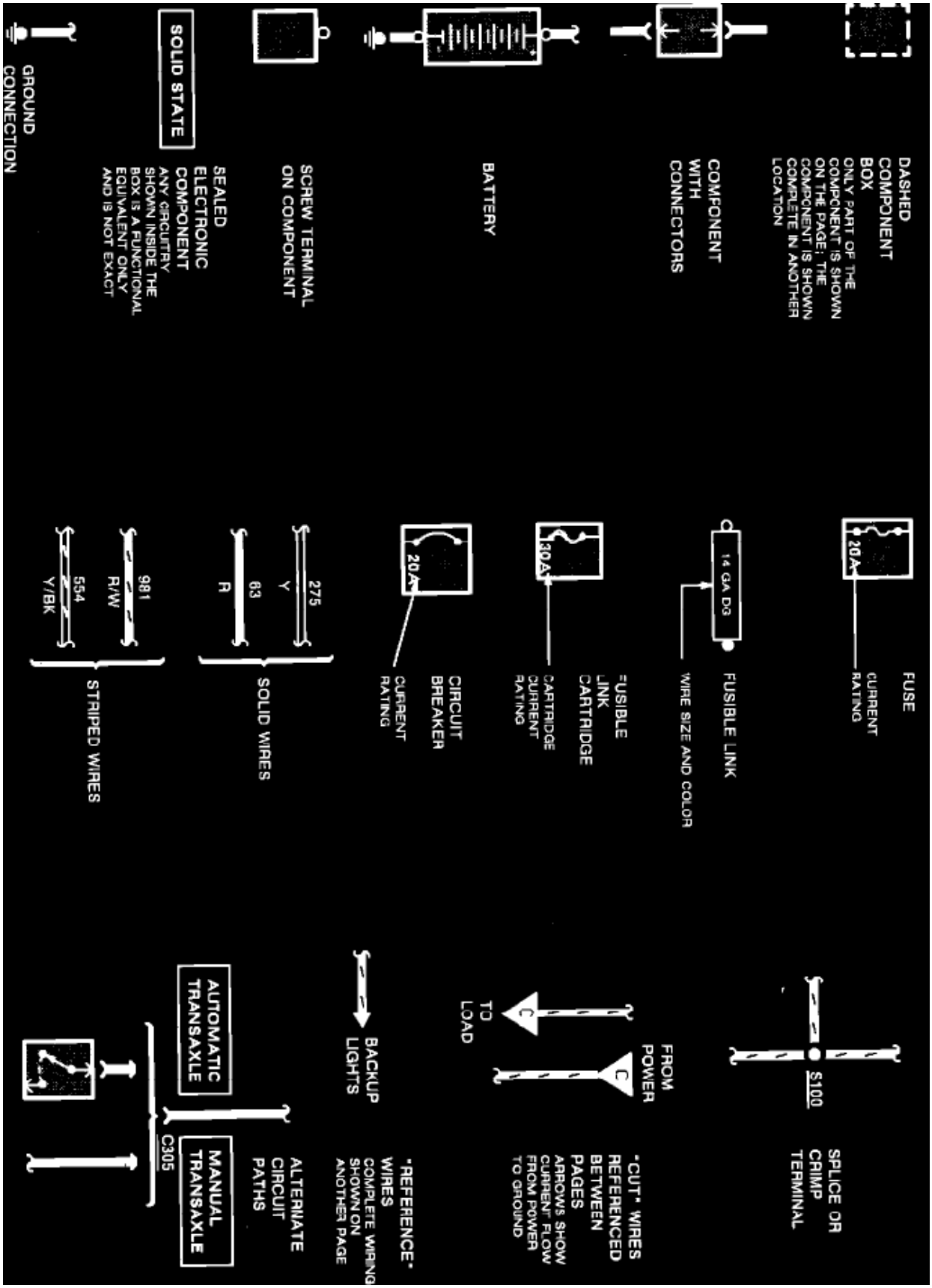
DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
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C
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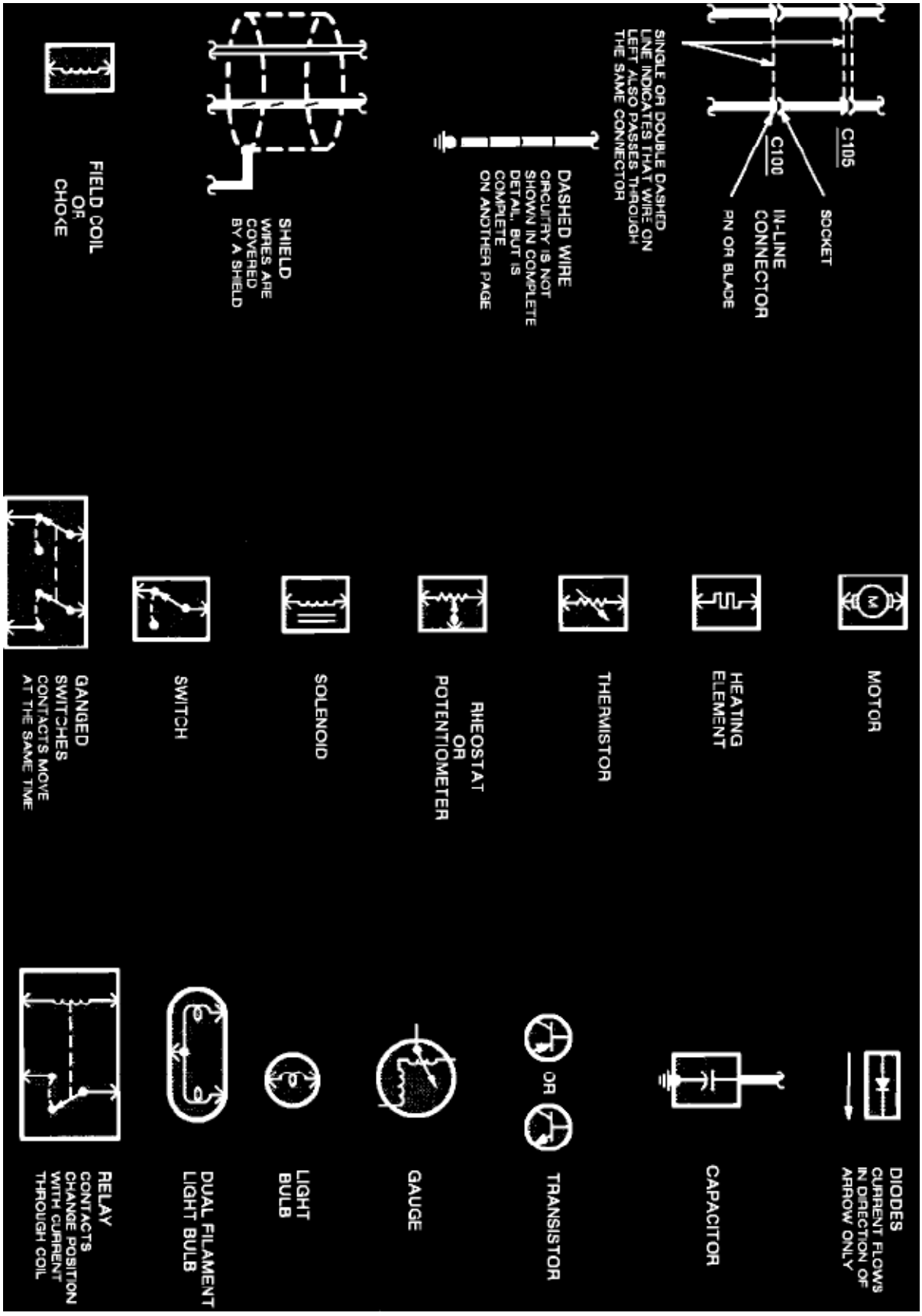
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
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OR
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DUAL FILAMENT LIGHT BULB
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CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

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PK: Pink R: Red

P: Purple

T: Tan

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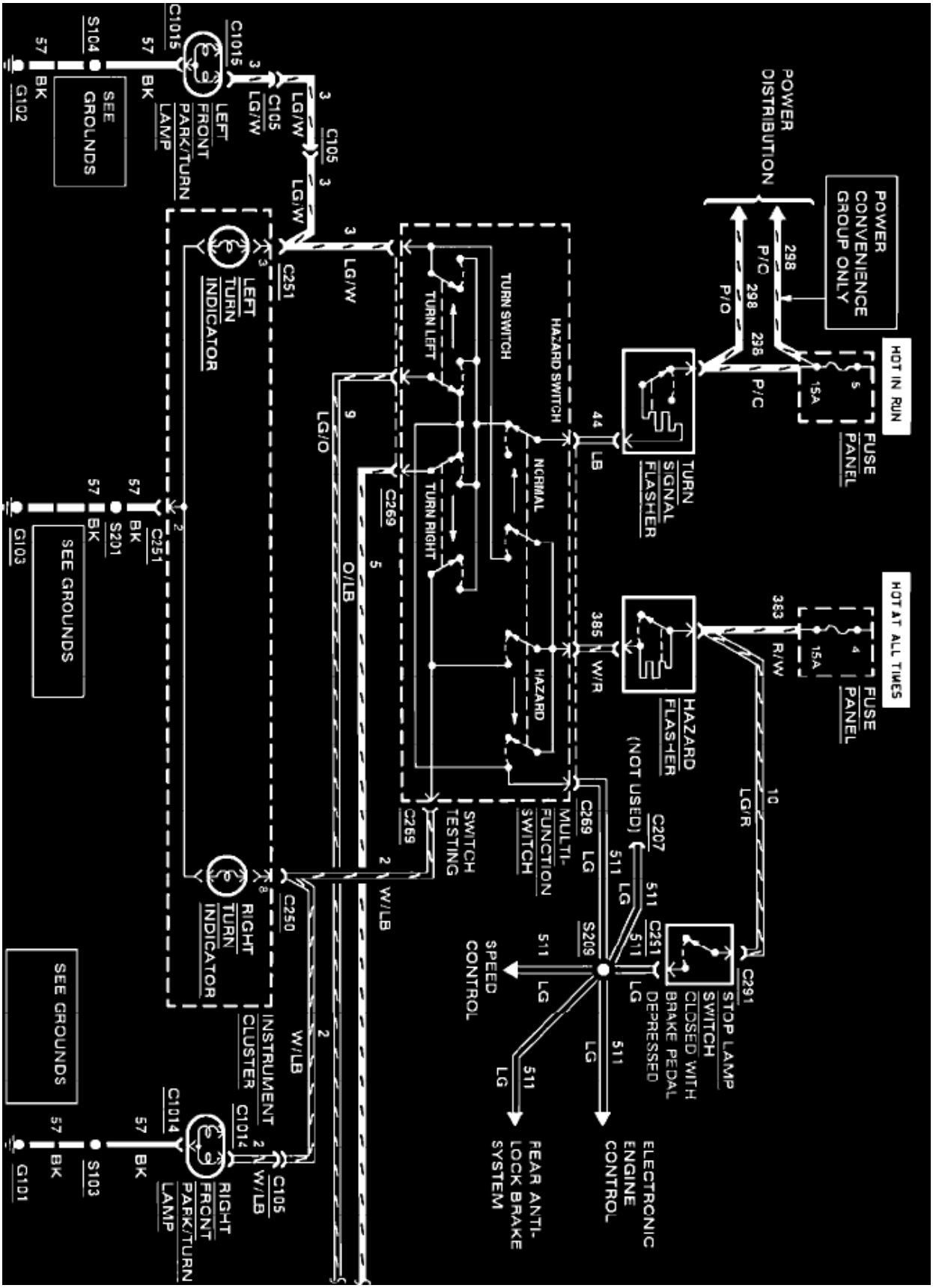
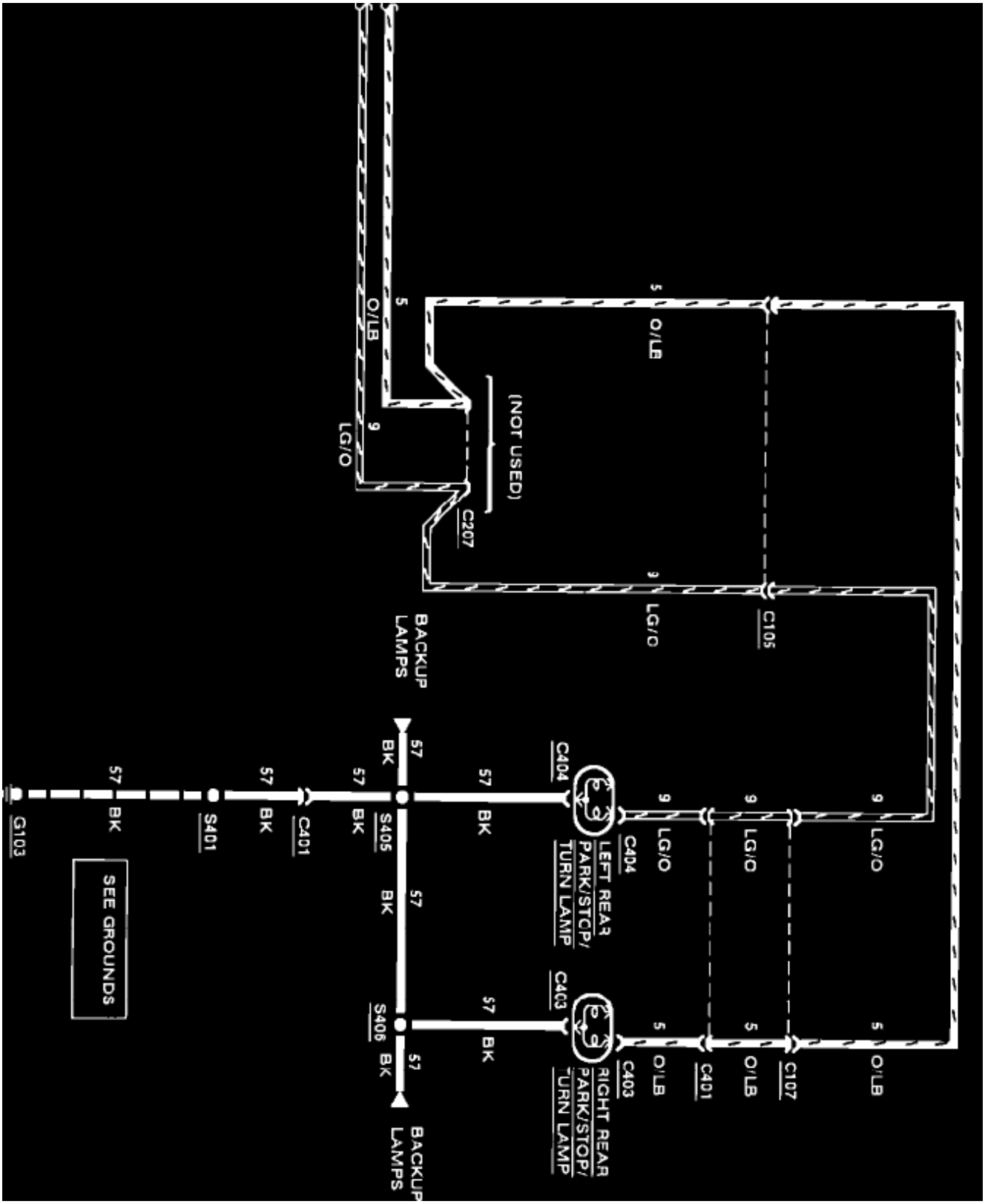
W: White

Y: Yellow


POWER DISTRIBUTION
POWER CONVENIENCE GROUP ONLY
HOT IN RUN
FUSE PANEL
HOT AT ALL TIMES
FUSE PANEL
TURN SIGNAL FLASHER
HAZARD FLASHER
(NOT USED)
STOP LAMP SWITCH
CLOSED WITH BRAKE PEDAL DEPRESSED
HAZARD SWITCH
TURN SWITCH
NORMAL
TURN LEFT
TURN RIGHT
HAZARD
MULTI-FUNCTION SWITCH
SWITCH TESTING
SPEED CONTROL
ELECTRONIC ENGINE CONTROL
REAR ANTI-LOCK BRAKE SYSTEM
INSTRUMENT CLUSTER
LEFT FRONT PARK/TURN LAMP
RIGHT FRONT PARK/TURN LAMP
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
SEE GROUNDS
SEE GRDLNDS
G102
G103
G101
S104
S201
S103
C1015
C105
C251
C269
C207
C291
C250
C1014
S209
298
P/C
P/O
15A
5
4
44
LB
363
R/W
385
W/R
10
LG/R
511
LG
9
LG/O
O/LB
2
W/LB
3
LG/W
57
BK

Brake Lamp: Electrical Diagrams

Turn/Stop/Hazard Lamps



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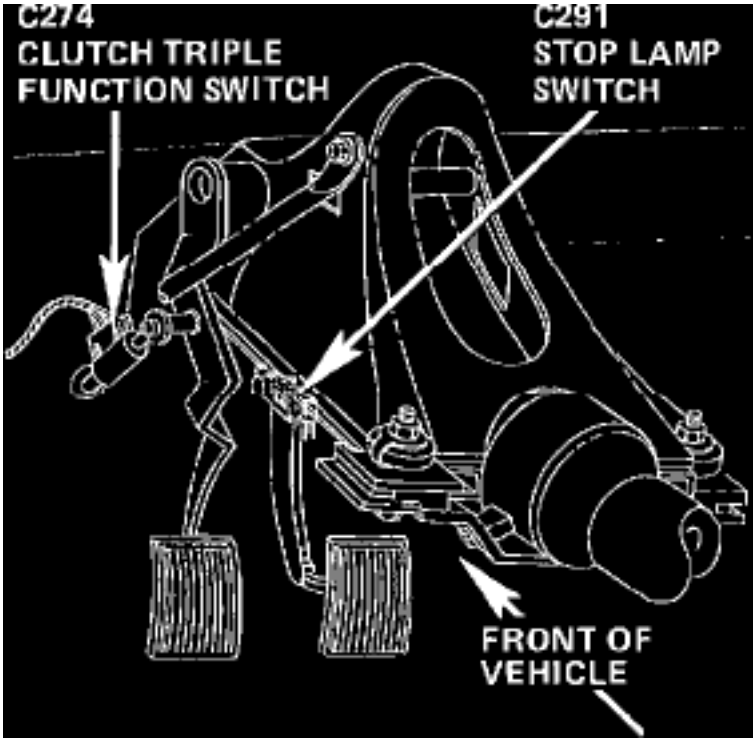
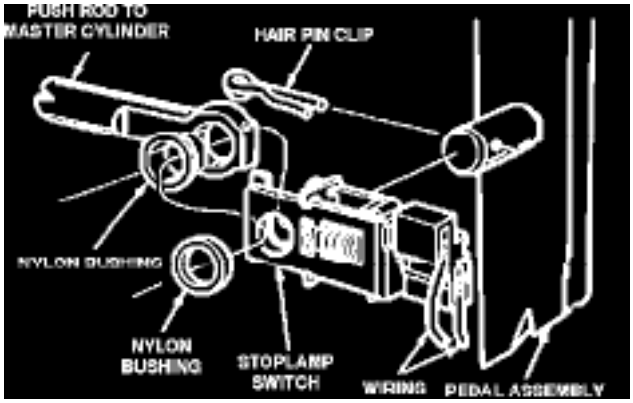


Brake And Clutch Switches

Brake Light Switch: Description and Operation

The Brake On Off (BOO) signal is sent by the brake switch when the brakes are APPLIED. The Engine Control Assembly (ECA) uses this signal to modify the operation of the torque converter clutch (if equipped), A/C compressor (if equipped), and idle speed during periods of decel and idle with the brakes APPLIED.



Brake Light Switch: Service and Repair

Fig. 12 Stop Light Switch Replacement

REMOVAL

1. Disconnect electrical connector from switch, Fig. 12.

2. Remove hairpin clip, then slide switch, pushrod, nylon washer and bushings away from pedal.

3. Remove washer, then the switch by sliding switch up or down.

INSTALLATION

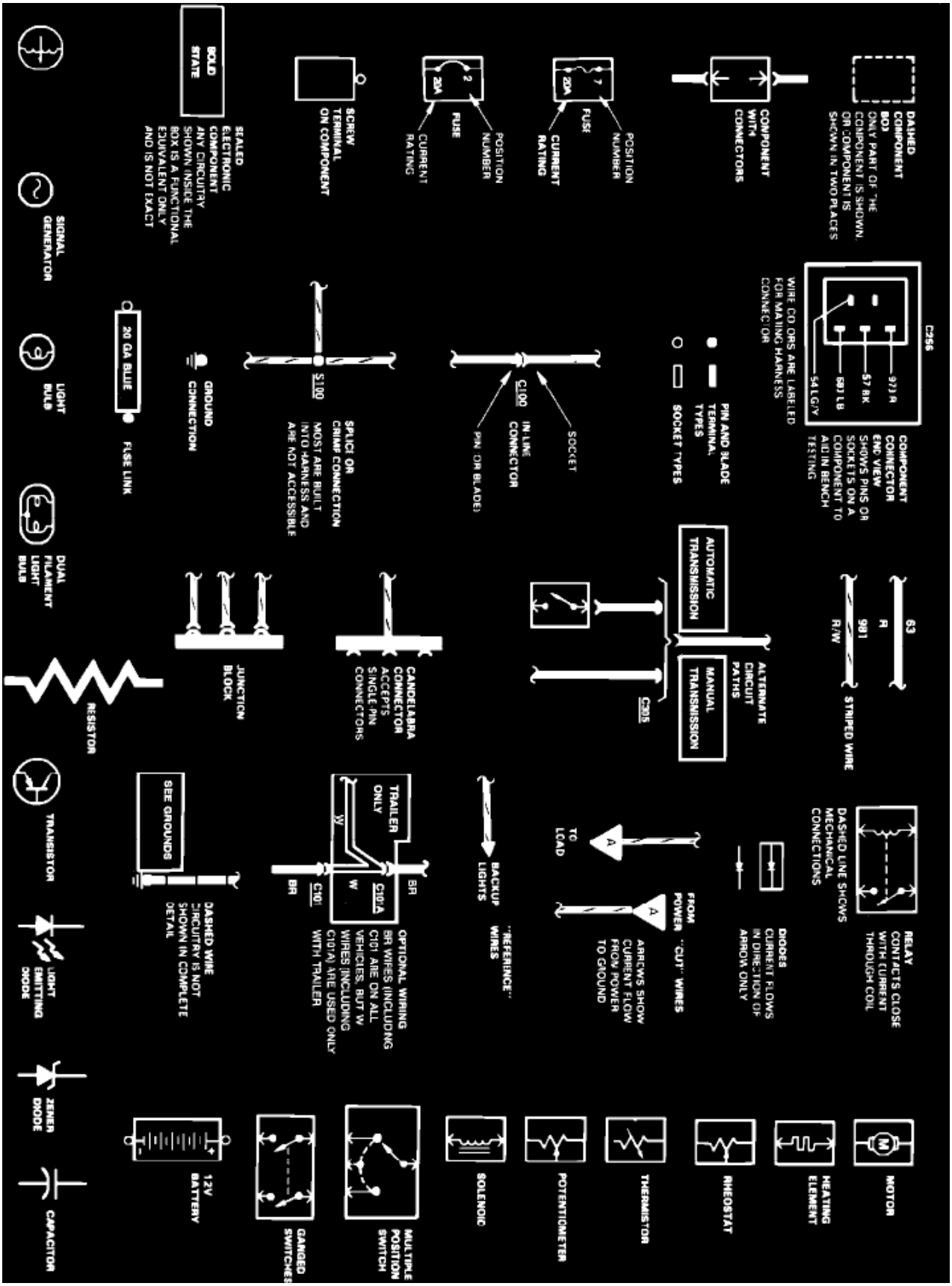
1. Position switch so that U-shaped side is nearest pedal and directly over or under pin.

2. Slide switch up or down, trapping vacuum booster input rod and bushing between switch side plates.

3. Push switch and push rod assembly toward brake pedal arm, then assemble plastic washer to pin and install hairpin clip to retain assembly.

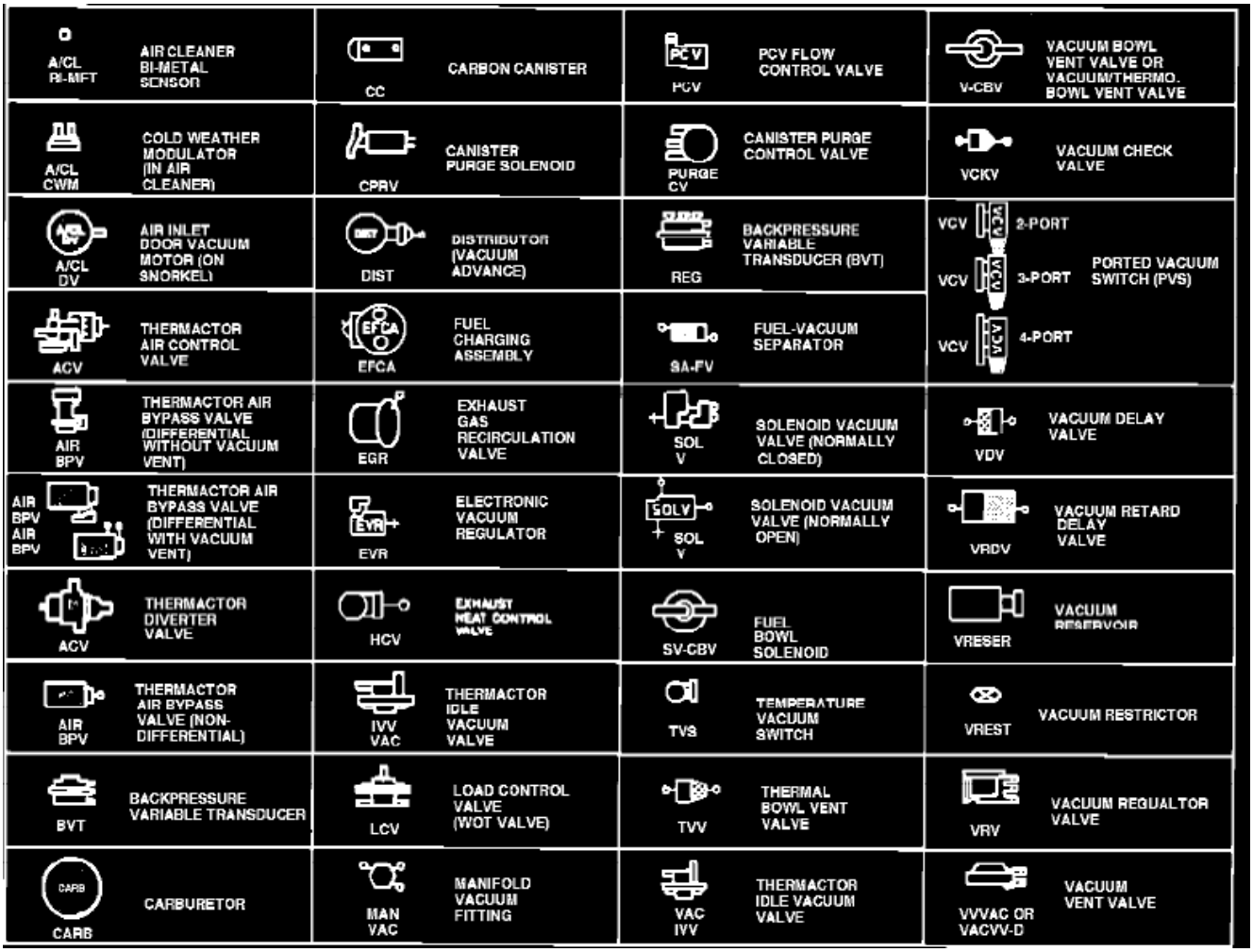
4. Connect electrical connector to switch, then check for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Courtesy Lamp > Component Information > Diagrams > Diagram Information and Instructions



Courtesy Lamp: Diagram Information and Instructions

Symbol Identification



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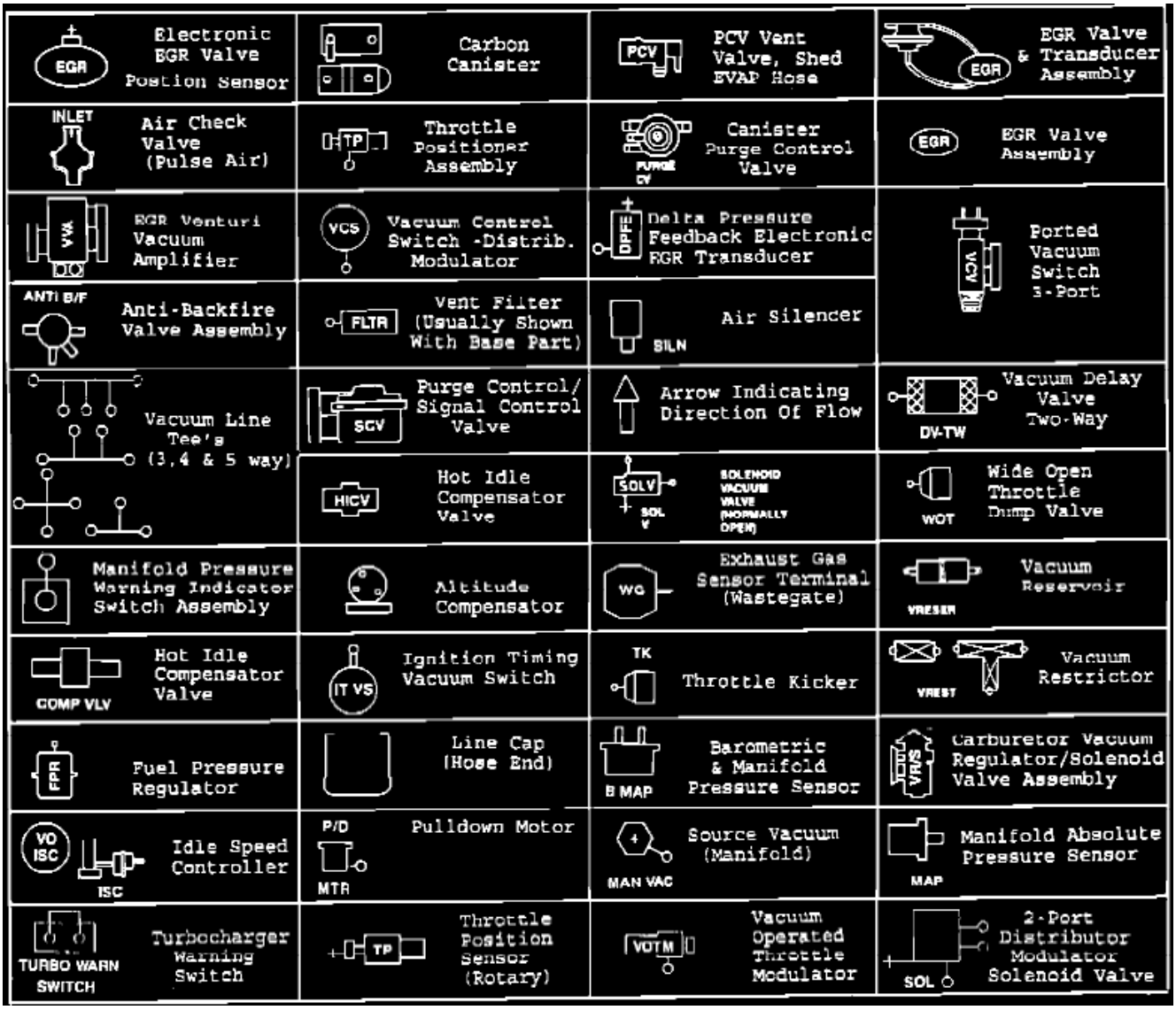

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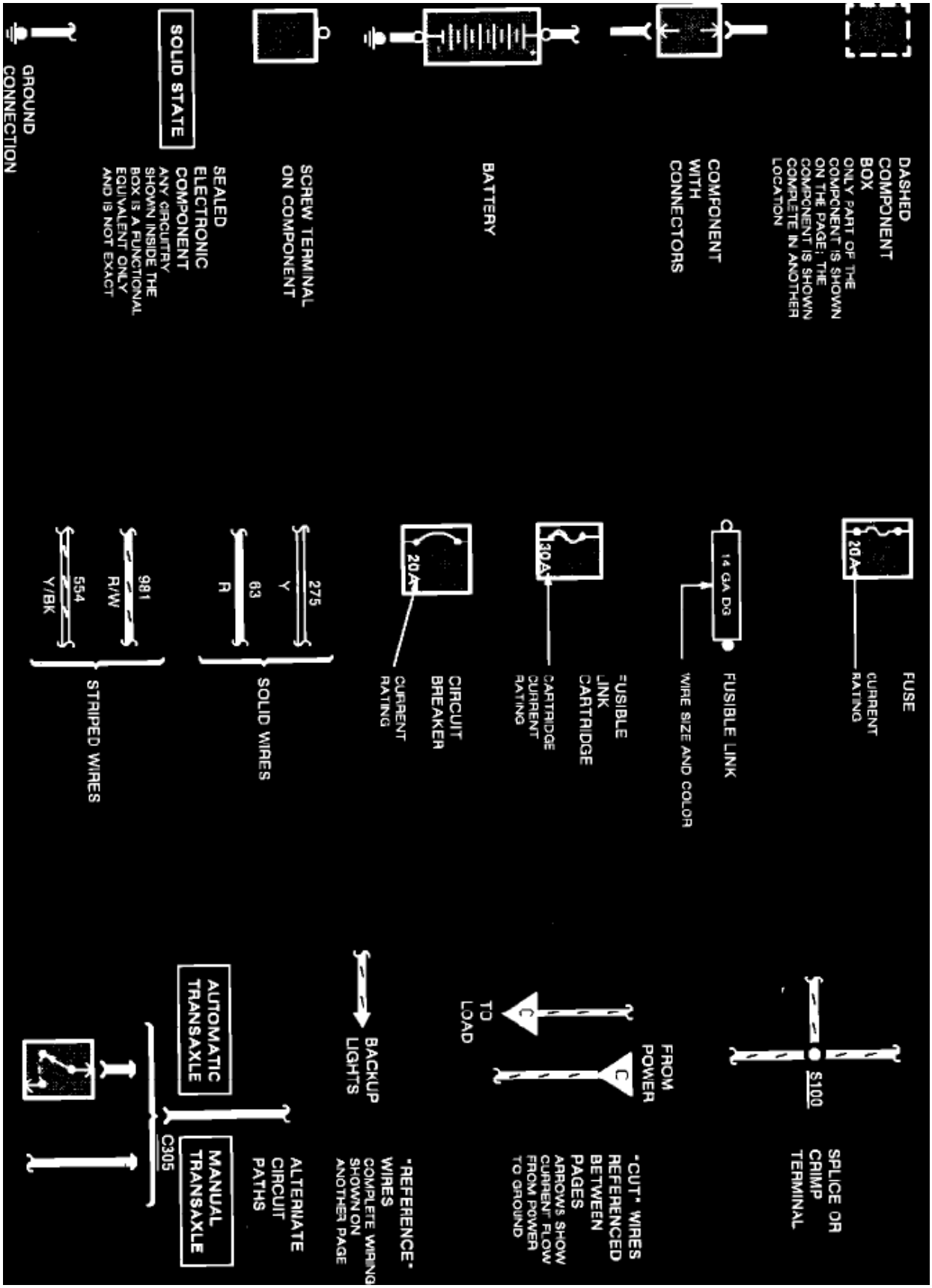
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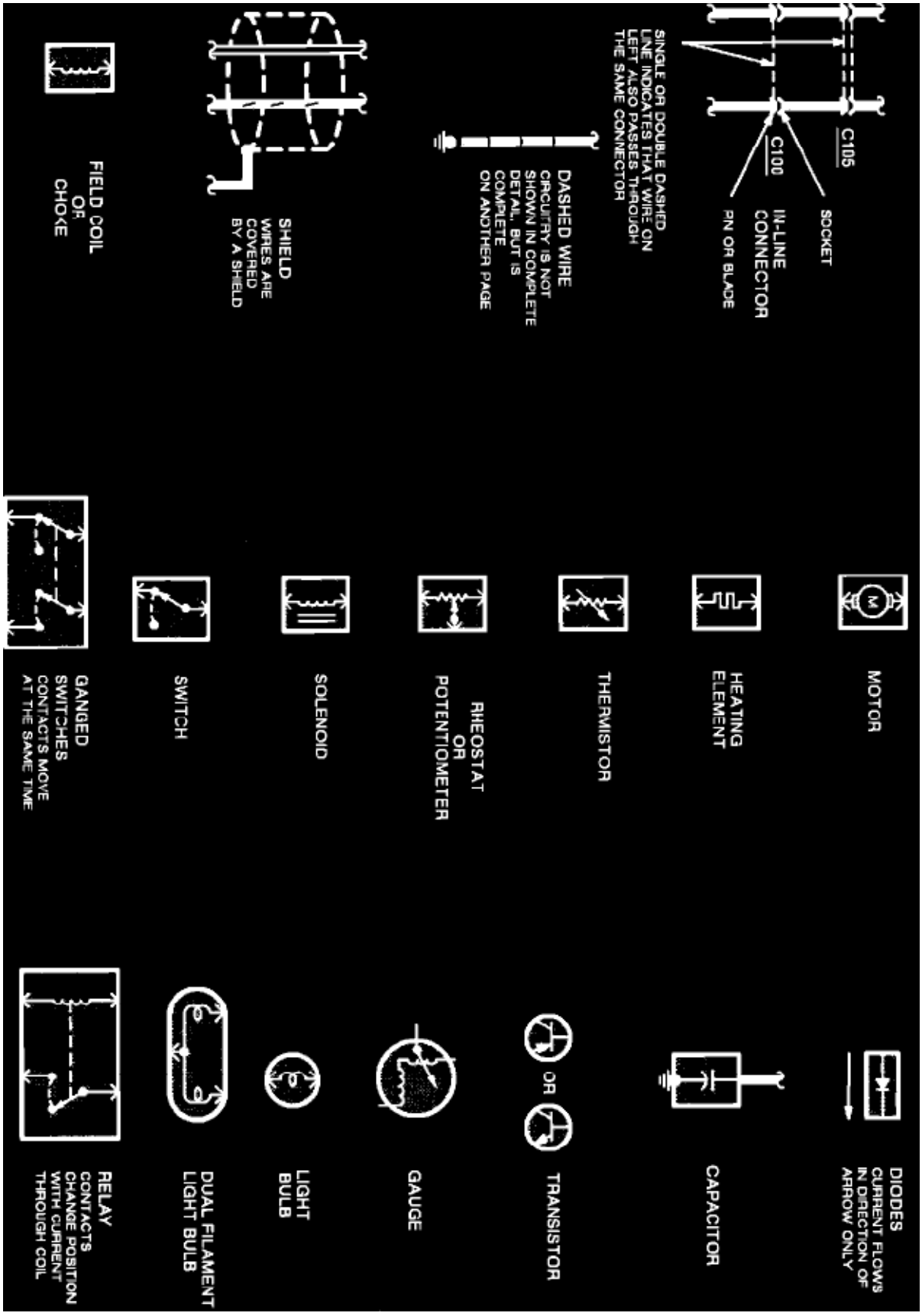
Electrical Symbols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THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
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Electrical Symbols

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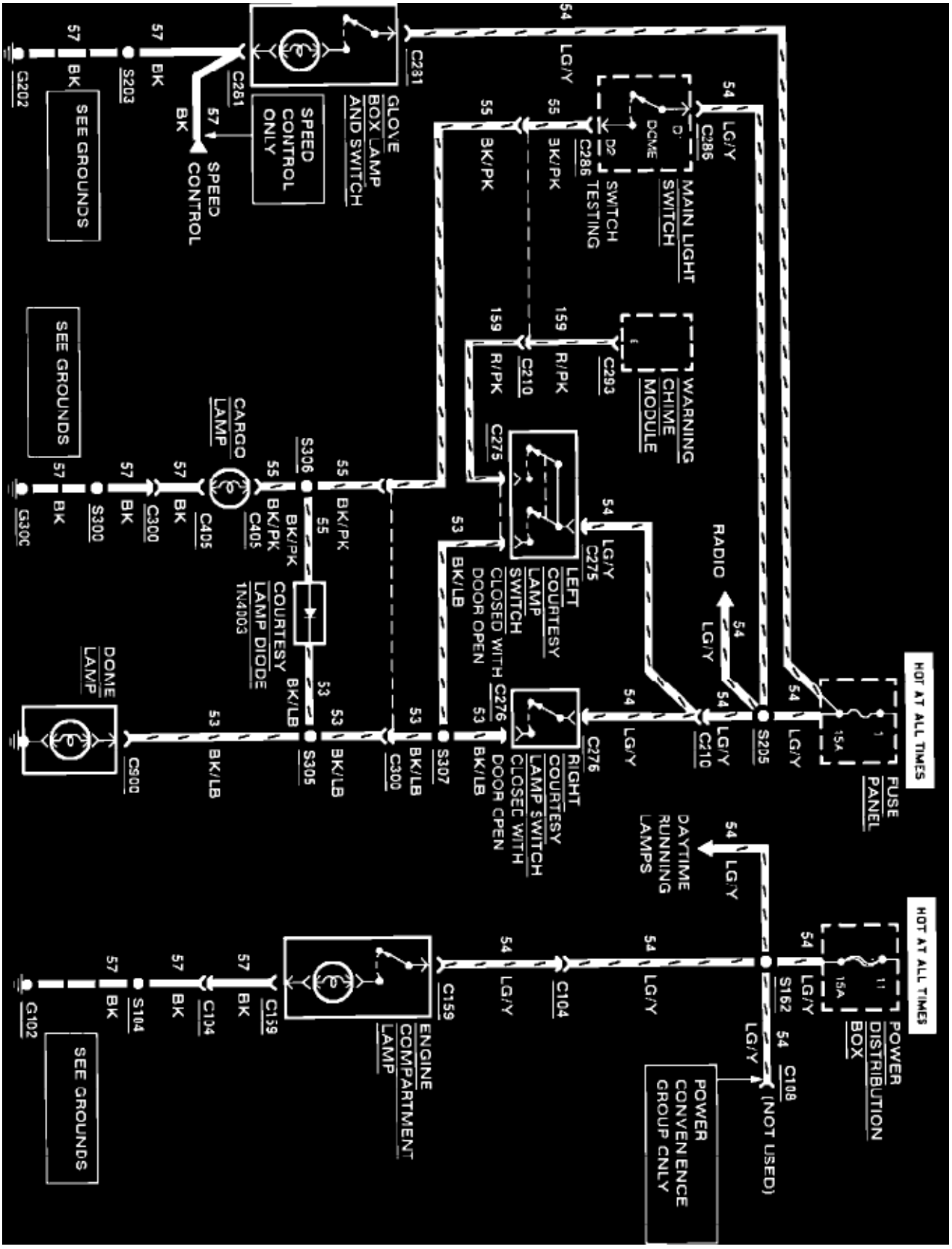
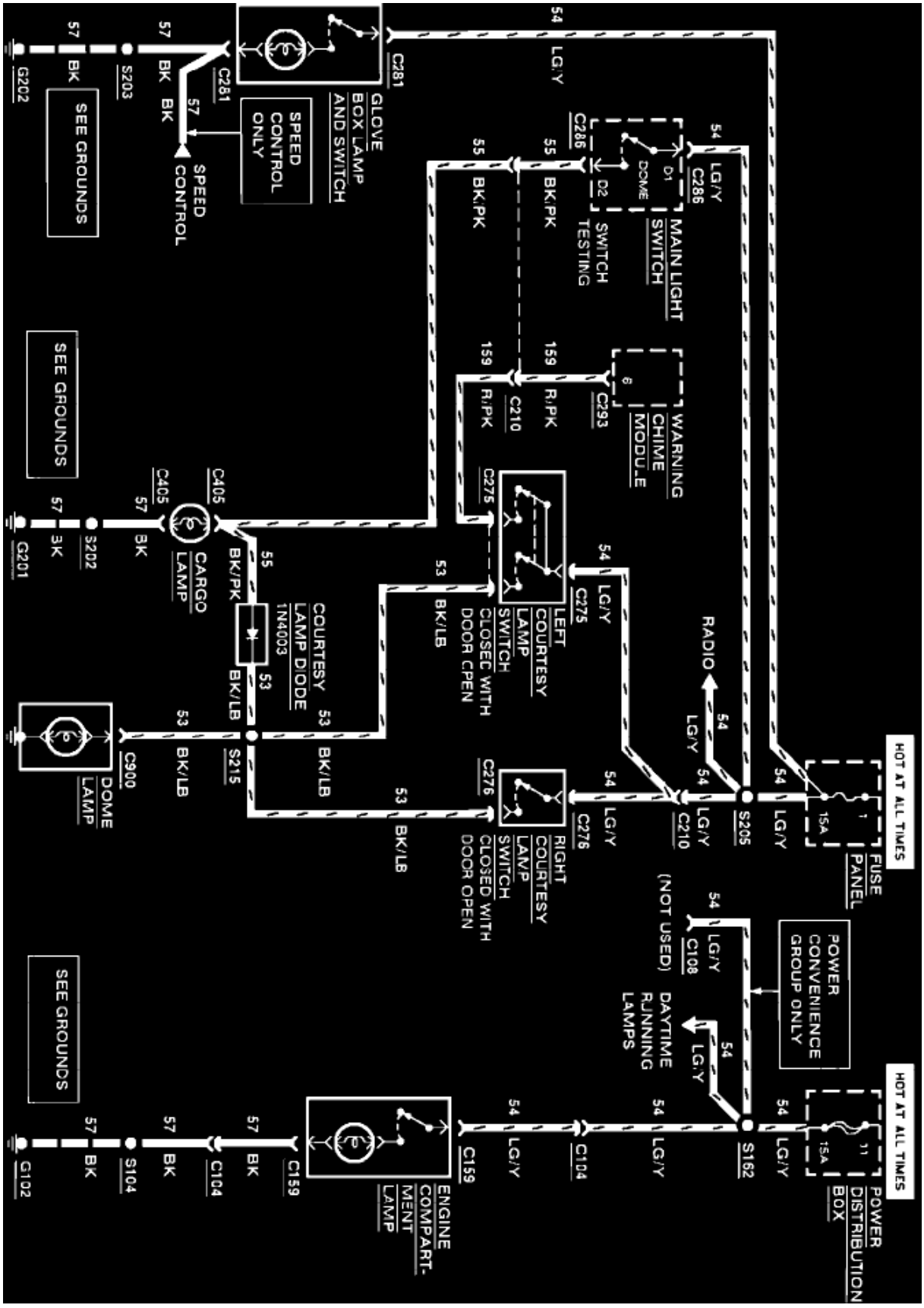

HOT AT ALL TIMES
FUSE PANEL
15A
POWER DISTRIBUTION BOX
HOT AT ALL TIMES
15A
S205
S162
C108
(NOT USED)
POWER CONVENIENCE GROUP CNLY
RADIO
DAYTIME RUNNING LAMPS
C210
C276
RIGHT COURTESY LAMP SWITCH
CLOSED WITH DOOR OPEN
BK/LB
C275
LEFT COURTESY LAMP SWITCH
CLOSED WITH DOOR OPEN
BK/LB
C293
WARNING CHIME MODULE
C286
MAIN LIGHT SWITCH
SWITCH TESTING
DCME
C231
GLOVE BOX LAMP AND SWITCH
SPEED CONTROL ONLY
SPEED CONTROL
S203
G202
SEE GROUNDS
S306
CARGO LAMP
C405
BK/PK
C405
COURTESY LAMP DIODE
1N4003
S305
C300
S307
C300
S300
G300
SEE GROUNDS
DOME LAMP
C900
C159
ENGINE COMPARTMENT LAMP
C104
S104
G102
SEE GROUNDS
LG/Y
BK/PK
R/PK
BK/LB
BK
54
55
159
53
57

Courtesy Lamp: Electrical Diagrams

Courtesy Lamps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C293
C210
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C276
C108
C405
C900
S205
S162
S203
S215
S202
S104
C159
C104
G202
G201
G102
54 LG/Y
55 BK/PK
159 R/PK
57 BK
53 BK/LB

Courtesy Lamps

Campaign - Running Light Module, Extended Coverage

92M78

OWNER NOTIFICATION PROGRAM

Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

Dealer Letter

Attachment I ^

Administrative Information

^ Refunds

Attachment II ^

Labor Allowances Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

^ Daytime Running Lamp Module Locations

Customer Notification Letter

Attachment I - Admin. and Refund Information

Administrative Information

OASIS OASIS will not contain this Owner Notification Program. Verify through OASIS if a vehicle, involved in this program, has any other outstanding Recalls or Programs. Complete all uncompleted Recall and Program service actions during a single visit by the owner.

Promptly Perform Program On: Affected vehicles with the program condition which are brought to your dealership.

Dealership Responsibilities Promptly perform this program service, if required, on all eligible vehicles. Promptly report to the "Customer Assistance Centre" at Oakville any instance in which an owner will not allow you to complete this program because of objections in scheduling or for any other reason. Advise the Company of any vehicle's ownership status change (refer Warranty and Policy Manual - Section 3.3).

Reimbursement For Program Completion And Claims Preparation Instructions Claim reimbursement through the Direct Warranty Entry (DWE) system using the RECALLS screen only (PF3 Recall Entry/Retrieval on the DWE Menu Screen). If the claim number contains more than six digits, enter only the last six digits.

NOTE:

Claim Form 1864 is no longer mailed to owners. Use a Form 6125-2, an authorized computer generated claim form or a Form 1864 as an internal repair order to support DWE Entry through the RECALLS screen. Ensure that only the RECALLS screen is used when inputting completion and reimbursement information.

Dealers without DWE capability must mail a completed Form 1864 (Company Claim Copy No. 2) to Warranty Claims Processing at Oakville for reimbursement. Forms submitted must show labor times, all parts used and their costs, the parts handling allowance, and be imprinted, dated and signed by authorized dealership personnel. All claims must show 92M78 in the Recall box.

Refunds Refund requests must be submitted on a separate claim from the program completion claim. Refund requests are governed by the following guidelines:

^

Refunds are provided only for dealer and/or owner-paid repairs directly related to this program (DRL module replacement only - parts and labor) and performed within the program coverage provision. The original copy of the paid repair order or parts invoices must be presented to any Ford or Mercury dealership.

^ Using the DWE Recall Screen, enter the following:

Administrative Allowance ..... 0.3 Hrs. Labor Code.....A Recall Code.....R92M78 Enter "REFUND INV # _____ " in the area on the claim designated for PARTS USED. Enter the owner refund amount as a "MISCELLANEOUS" cost. ^

Provide prompt refund to all eligible owners having proper documentation regardless of the source of the original service.

^ Retain the copy of the paid repair or parts invoice with a copy of the refund request in your service file for reference.

^ Dealers without DWE capability must mail their refund requests on a separate completed Form 1864 with the owner's original paid repair order or parts purchase receipt to Warranty Claims Processing. Enter the 0.3 Hrs. in Box A and "R92M78" in the Recall box of the Form. Include all amounts in the TOTAL CLAIM box.

Attachment II - Labor and Parts Information

Labour Allowance Replace DRL Module (Includes Verification of DRL System Function).

VEHICLE LINE LABOR TIME LABOR CODE

Thunderbird, Cougar, Tempo, Topaz, Escort, Mustang, 0.3 Hrs. B

Ranger, Explorer and Econoline.

Taurus, Sable and Medium/Heavy F-Series Cab 0.5 Hrs. B

All Other Involved Vehicles 0.4 Hrs. B

Parts Ordering Information DRL modules will not be direct shipped for this Program. Order required parts through your Servicing Parts Distribution Centre.

PART NUMBER VEHICLE APPLICATION

FOVY-15A272-A ^ 1991 Cougar

E9SZ-15A272-B ^ 1989-90 Cougar

^ 1989-91 Thunderbird

FODZ-15A272-B ^ 1990 Escort

^ 1990-91 Taurus/Sable, Tempo/Topaz, Mustang, Econoline,

^ Aerostar, Ranger, Bronco II, Bronco, F-Series Light Trucks

^ (150-250-350), F-Super Duty and Explorer

FOHZ-15A272-A ^ 1990-91 Medium/Heavy Trucks (with single headlights)

Attachment III - Tech. Instruct./Daytime Lamp Module Locations

Technical Instructions

Correction of wiring connections and/or replacement of burned out fuses and bulbs is not covered by this program.

Description of Daytime Running Light (DRL) System Operation

The DRL System is designed to turn the Hi beam headlights ON with a reduced light output, and without illuminating the high beam indicator lamp in the instrument panel when the following conditions are met: ^

The vehicle is running.

^ The parking brake is fully released.

^ The headlight switch is in OFF position.

NOTE:

If the vehicle is equipped with an automatic lighting system, the DRL System is active until the automatic system turns on the headlights.

DRL Module Removal and Installation Procedure (Refer to Daytime Running Light Module Location Table.) Refer to the Vehicle's 1990 or 1991 Shop Manual, Section 32 "Lighting System", for Removal and Installation instructions. Mutilate and scrap the removed DRL module.

NOTE:

For the 1989 Thunderbird and Cougar cars refer to the 1990 Model Year Shop Manual.

After Installing The Replacement DRL Module Verify DRL System Function As Follows Ensure the vehicle's road wheels are blocked to preclude inadvertent vehicle movement. ^

Manual transmission in NEUTRAL.

^ Automatic Transmission in PARK. (Neutral on Heavy Trucks with Allison automatic.)

1. Parking brake applied and headlight switch OFF, start engine.

^ The headlights (Hi or Lo beam) should not be illuminated.

2. Parking brake released and headlight switch OFF, engine running.

^ The high beams should be ON at reduced intensity.

NOTE:

A comparison check for full intensity can be made using flash-to-pass or by putting headlight switch ON and switching to high beams.

a. Turn on Park Lights.

The high beams should be ON at reduced intensity.

The high beam indicator should NOT be ON.

b. Turn on headlights (LOW BEAMS).

The low beams should be ON at full intensity. The high beams should be OFF. The high beam indicator should NOT be ON.

c. Turn on headlights (HIGH BEAMS).

The high beams should be ON at full intensity. The high beam indicator should be ON.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Daytime Running Light Module Locations

1989 MODEL YEAR (CARS/LIGHT TRUCKS) LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

1990-1991 MODEL YEAR LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

Tempo/Topaz Inside on the RH side radiator support, vertically mounted below radiator cap.

Ford Mustang Under the LH front fender apron, directly below the battery.

Taurus/Sable On the LH front fender apron, directly under the battery. (Remove LH side fender liner for access.)

Ford Escort (1190 MY Only) On the RH side of the radiator support.

Ranger/Bronco II/Explorer Inside on the LH side radiator support, at top near washer fluid reservoir.

F-Series Light Truck/Super Duty/Bronco Inside the LH radiator support below the horn assembly.

Aerostar Inside the LH front fender apron, behind the battery.

Econoline Inside the LH radiator support.

1990/91 MEDIUM/HEAVY TRUCK SERIES LOCATION

"F" (Cab and Cowl) Behind RH side instrument panel.

"C" Behind RH side instrument panel.

"CL" (Single Headlights) Behind instrument panel RH side.

"CF" (Cargo) Under hood beside windshield washer bottle.

"L" Inside engine compartment left side bulkhead.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Dealer Letter

To: All Ford of Canada Dealers

Attention: Dealer Principal, Service Manager, Parts Manager

Subject: Owner Notification Program 92M78 - Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

In OASIS NO

Listings NO

Return Removed Parts NO (Mutilate and Scrap). Program Coverage Available for 36 months or 60,000 kilometers, whichever occurs first, from original warranty start date or through July 31, 1992, whichever provides greatest coverage.

Refund Provisions YES

NOTE:

Please read and circulate this bulletin to your Service and Parts Personnel. They should become familiar with this program and be able to respond to owner inquiries.

Vehicles Affected

^ All 1989-90-91 Thunderbird and Cougar

^ All 1990 Escort

^ All 1990-91 Taurus, Sable, Tempo, Topaz, Mustang, Econoline, Aerostar, Bronco, F-Series Light Trucks, F-Super Duty, Ranger, Bronco II, Explorer and Medium/Heavy Trucks (except LL/LTL and CL with quad rectangular headlights)

Reason For This Program The Daytime Running Lights (DRL) control module may malfunction. A malfunctioning DRL module can result in Daytime Running Lights that dim, flicker or go off and in some instances may remain on after the ignition is turned OFF. Normal manual Lo and Hi beam headlight operation is not affected.

Service Action Replace the Daytime Running Light (DRL) module if the customer is experiencing any of the above described symptoms.

NOTE:

Replacement of headlight bulbs or sealed beams is not covered by this program.

Refunds If all or a portion of the repair covered by the program (DRL module replacement only - parts and labor) has been paid by the owner and/or the dealer, within program coverage provisions, both the owner and/or the dealer are eligible for a refund. Company Contacts: (Dealer use only)

CONCERN NATURE CONTACT ACTIVITY

Technical Technical Assistance Hotline for your Region

Claiming Procedures Warranty Claims Hotline for your Region

Owner Concerns Customer Assistance Centre Hotline for your Region

General Administrative Christine Murray - Recall Administrator

^ Telephone: (416) 845-2511 Ext. 1495

^ Facsimile: (416) 845-7069

Attachments

Attachment I ^

Administrative

^ Refunds

Attachment II ^

Labor Allowance Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

Owner Letter

Mailing Date

Mr. John Sample 123 Main Street Anywhere, Prov. ANA NAN Ford Motor Company of Canada, Limited (Ford) is providing an Extended Coverage Program, number "92M78", for the Daytime

Running Lights (DRL) control module. This Program provides extended coverage to owners of certain 1989 through 1991 Model Year cars and trucks. Our records show you own the 19xx (vehicle) with the serial number shown above your name and address.

Reason For This Program And Program Period: Ford is extending the coverage for the Daytime Running Lights module in your vehicle.

This extended coverage will be provided for 3 years or 60,000 kilometers, whichever occurs first, from your vehicle's Original Warranty Start Date, or until July 31, 1992, whichever gives you the

greater coverage.

Description Of DRL System Operation: The DRL System is designed to turn the Hi beam headlights ON with a reduced light output. This is accomplished when the following conditions are met: ^

the vehicle is running.

^ the parking brake is fully released.

^ the headlight switch is in OFF position.

Symptoms Of Abnormal DRL System Operation: Symptoms associated with an improperly operating DRL module, normally include reduced, flickering or no DRL illumination. In some instances, the DRL may remain on when the ignition is turned OFF. Normal Lo and Hi beam headlight operation is not affected.

No Cost Service: Should you encounter symptoms such as described above, contact your Ford or Mercury dealer. Your dealer will replace the DRL control module on your vehicle under the terms of this program at no cost to you.

NOTE:

Headlight bulb or sealed beam replacement is not covered by this program.

How Long Will It Take? The time needed for this service is less than one hour. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call Your Dealer: Call your dealer should your vehicle experience any of the above described conditions. Ask your dealer for a service appointment and if parts are in stock. Also ask your dealer to check the OASIS system for any other recalls or programs that may be required on your vehicle. If you have leased this vehicle to another person or organization, please immediately inform the lessee of the program. When you bring your vehicle in, show the dealer this letter. If you lose the letter your dealer will still do the work, free of charge.

Refunds: A full refund is available if you paid for the service covered by this Program (Daytime Running Light Control Module replacement only - parts and labor). Please give the original copy of your paid work-order or parts receipt to your dealer. Your dealer will arrange for the refund (which could take about one month).

Changed Name, Address, Or Sold The Vehicle? If you have changed your name or address, or have sold the vehicle, please fill out the enclosed prepaid postcard. Sign and date it, and mail the card to Ford. If you cannot get the service performed, contact the Ford "Customer Assistance Centre" at the address identified in the letterhead of this letter. Please identify your vehicle's serial number in any correspondence. We are taking this action as part of our efforts to ensure your long term satisfaction with the DRL feature in your vehicle. We hope this program will confirm your continued satisfaction with your Ford built vehicle.

Campaign - Running Light Module, Extended Coverage

92M78

OWNER NOTIFICATION PROGRAM

Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

Dealer Letter

Attachment I ^

Administrative Information

^ Refunds

Attachment II ^

Labor Allowances Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

^ Daytime Running Lamp Module Locations

Customer Notification Letter

Attachment I - Admin. and Refund Information

Administrative Information

OASIS OASIS will not contain this Owner Notification Program. Verify through OASIS if a vehicle, involved in this program, has any other outstanding Recalls or Programs. Complete all uncompleted Recall and Program service actions during a single visit by the owner.

Promptly Perform Program On: Affected vehicles with the program condition which are brought to your dealership.

Dealership Responsibilities Promptly perform this program service, if required, on all eligible vehicles. Promptly report to the "Customer Assistance Centre" at Oakville any instance in which an owner will not allow you to complete this program because of objections in scheduling or for any other reason. Advise the Company of any vehicle's ownership status change (refer Warranty and Policy Manual - Section 3.3).

Reimbursement For Program Completion And Claims Preparation Instructions Claim reimbursement through the Direct Warranty Entry (DWE) system using the RECALLS screen only (PF3 Recall Entry/Retrieval on the DWE Menu Screen). If the claim number contains more than six digits, enter only the last six digits.

NOTE:

Claim Form 1864 is no longer mailed to owners. Use a Form 6125-2, an authorized computer generated claim form or a Form 1864 as an internal repair order to support DWE Entry through the RECALLS screen. Ensure that only the RECALLS screen is used when inputting completion and reimbursement information.

Dealers without DWE capability must mail a completed Form 1864 (Company Claim Copy No. 2) to Warranty Claims Processing at Oakville for reimbursement. Forms submitted must show labor times, all parts used and their costs, the parts handling allowance, and be imprinted, dated and signed by authorized dealership personnel. All claims must show 92M78 in the Recall box.

Refunds Refund requests must be submitted on a separate claim from the program completion claim. Refund requests are governed by the following guidelines:

^

Refunds are provided only for dealer and/or owner-paid repairs directly related to this program (DRL module replacement only - parts and labor) and performed within the program coverage provision. The original copy of the paid repair order or parts invoices must be presented to any Ford or Mercury dealership.

^ Using the DWE Recall Screen, enter the following:

Administrative Allowance ..... 0.3 Hrs. Labor Code.....A Recall Code.....R92M78 Enter "REFUND INV # _____ " in the area on the claim designated for PARTS USED. Enter the owner refund amount as a "MISCELLANEOUS" cost. ^

Provide prompt refund to all eligible owners having proper documentation regardless of the source of the original service.

^ Retain the copy of the paid repair or parts invoice with a copy of the refund request in your service file for reference.

^ Dealers without DWE capability must mail their refund requests on a separate completed Form 1864 with the owner's original paid repair order or parts purchase receipt to Warranty Claims Processing. Enter the 0.3 Hrs. in Box A and "R92M78" in the Recall box of the Form. Include all amounts in the TOTAL CLAIM box.

Attachment II - Labor and Parts Information

Labour Allowance Replace DRL Module (Includes Verification of DRL System Function).

VEHICLE LINE LABOR TIME LABOR CODE

Thunderbird, Cougar, Tempo, Topaz, Escort, Mustang, 0.3 Hrs. B

Ranger, Explorer and Econoline.

Taurus, Sable and Medium/Heavy F-Series Cab 0.5 Hrs. B

All Other Involved Vehicles 0.4 Hrs. B

Parts Ordering Information DRL modules will not be direct shipped for this Program. Order required parts through your Servicing Parts Distribution Centre.

PART NUMBER VEHICLE APPLICATION

FOVY-15A272-A ^ 1991 Cougar

E9SZ-15A272-B ^ 1989-90 Cougar

^ 1989-91 Thunderbird

FODZ-15A272-B ^ 1990 Escort

^ 1990-91 Taurus/Sable, Tempo/Topaz, Mustang, Econoline,

^ Aerostar, Ranger, Bronco II, Bronco, F-Series Light Trucks

^ (150-250-350), F-Super Duty and Explorer

FOHZ-15A272-A ^ 1990-91 Medium/Heavy Trucks (with single headlights)

Attachment III - Tech. Instruct./Daytime Lamp Module Locations

Technical Instructions

Correction of wiring connections and/or replacement of burned out fuses and bulbs is not covered by this program.

Description of Daytime Running Light (DRL) System Operation

The DRL System is designed to turn the Hi beam headlights ON with a reduced light output, and without illuminating the high beam indicator lamp in the instrument panel when the following conditions are met: ^

The vehicle is running.

^ The parking brake is fully released.

^ The headlight switch is in OFF position.

NOTE:

If the vehicle is equipped with an automatic lighting system, the DRL System is active until the automatic system turns on the headlights.

DRL Module Removal and Installation Procedure (Refer to Daytime Running Light Module Location Table.) Refer to the Vehicle's 1990 or 1991 Shop Manual, Section 32 "Lighting System", for Removal and Installation instructions. Mutilate and scrap the removed DRL module.

NOTE:

For the 1989 Thunderbird and Cougar cars refer to the 1990 Model Year Shop Manual.

After Installing The Replacement DRL Module Verify DRL System Function As Follows Ensure the vehicle's road wheels are blocked to preclude inadvertent vehicle movement. ^

Manual transmission in NEUTRAL.

^ Automatic Transmission in PARK. (Neutral on Heavy Trucks with Allison automatic.)

1. Parking brake applied and headlight switch OFF, start engine.

^ The headlights (Hi or Lo beam) should not be illuminated.

2. Parking brake released and headlight switch OFF, engine running.

^ The high beams should be ON at reduced intensity.

NOTE:

A comparison check for full intensity can be made using flash-to-pass or by putting headlight switch ON and switching to high beams.

a. Turn on Park Lights.

The high beams should be ON at reduced intensity.

The high beam indicator should NOT be ON.

b. Turn on headlights (LOW BEAMS).

The low beams should be ON at full intensity. The high beams should be OFF. The high beam indicator should NOT be ON.

c. Turn on headlights (HIGH BEAMS).

The high beams should be ON at full intensity. The high beam indicator should be ON.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Daytime Running Light Module Locations

1989 MODEL YEAR (CARS/LIGHT TRUCKS) LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

1990-1991 MODEL YEAR LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

Tempo/Topaz Inside on the RH side radiator support, vertically mounted below radiator cap.

Ford Mustang Under the LH front fender apron, directly below the battery.

Taurus/Sable On the LH front fender apron, directly under the battery. (Remove LH side fender liner for access.)

Ford Escort (1190 MY Only) On the RH side of the radiator support.

Ranger/Bronco II/Explorer Inside on the LH side radiator support, at top near washer fluid reservoir.

F-Series Light Truck/Super Duty/Bronco Inside the LH radiator support below the horn assembly.

Aerostar Inside the LH front fender apron, behind the battery.

Econoline Inside the LH radiator support.

1990/91 MEDIUM/HEAVY TRUCK SERIES LOCATION

"F" (Cab and Cowl) Behind RH side instrument panel.

"C" Behind RH side instrument panel.

"CL" (Single Headlights) Behind instrument panel RH side.

"CF" (Cargo) Under hood beside windshield washer bottle.

"L" Inside engine compartment left side bulkhead.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Dealer Letter

To: All Ford of Canada Dealers

Attention: Dealer Principal, Service Manager, Parts Manager

Subject: Owner Notification Program 92M78 - Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

In OASIS NO

Listings NO

Return Removed Parts NO (Mutilate and Scrap). Program Coverage Available for 36 months or 60,000 kilometers, whichever occurs first, from original warranty start date or through July 31, 1992, whichever provides greatest coverage.

Refund Provisions YES

NOTE:

Please read and circulate this bulletin to your Service and Parts Personnel. They should become familiar with this program and be able to respond to owner inquiries.

Vehicles Affected

^ All 1989-90-91 Thunderbird and Cougar

^ All 1990 Escort

^ All 1990-91 Taurus, Sable, Tempo, Topaz, Mustang, Econoline, Aerostar, Bronco, F-Series Light Trucks, F-Super Duty, Ranger, Bronco II, Explorer and Medium/Heavy Trucks (except LL/LTL and CL with quad rectangular headlights)

Reason For This Program The Daytime Running Lights (DRL) control module may malfunction. A malfunctioning DRL module can result in Daytime Running Lights that dim, flicker or go off and in some instances may remain on after the ignition is turned OFF. Normal manual Lo and Hi beam headlight operation is not affected.

Service Action Replace the Daytime Running Light (DRL) module if the customer is experiencing any of the above described symptoms.

NOTE:

Replacement of headlight bulbs or sealed beams is not covered by this program.

Refunds If all or a portion of the repair covered by the program (DRL module replacement only - parts and labor) has been paid by the owner and/or the dealer, within program coverage provisions, both the owner and/or the dealer are eligible for a refund. Company Contacts: (Dealer use only)

CONCERN NATURE CONTACT ACTIVITY

Technical Technical Assistance Hotline for your Region

Claiming Procedures Warranty Claims Hotline for your Region

Owner Concerns Customer Assistance Centre Hotline for your Region

General Administrative Christine Murray - Recall Administrator

^ Telephone: (416) 845-2511 Ext. 1495

^ Facsimile: (416) 845-7069

Attachments

Attachment I ^

Administrative

^ Refunds

Attachment II ^

Labor Allowance Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

Owner Letter

Mailing Date

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Running Lights (DRL) control module. This Program provides extended coverage to owners of certain 1989 through 1991 Model Year cars and trucks. Our records show you own the 19xx (vehicle) with the serial number shown above your name and address.

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greater coverage.

Description Of DRL System Operation: The DRL System is designed to turn the Hi beam headlights ON with a reduced light output. This is accomplished when the following conditions are met: ^

the vehicle is running.

^ the parking brake is fully released.

^ the headlight switch is in OFF position.

Symptoms Of Abnormal DRL System Operation: Symptoms associated with an improperly operating DRL module, normally include reduced, flickering or no DRL illumination. In some instances, the DRL may remain on when the ignition is turned OFF. Normal Lo and Hi beam headlight operation is not affected.

No Cost Service: Should you encounter symptoms such as described above, contact your Ford or Mercury dealer. Your dealer will replace the DRL control module on your vehicle under the terms of this program at no cost to you.

NOTE:

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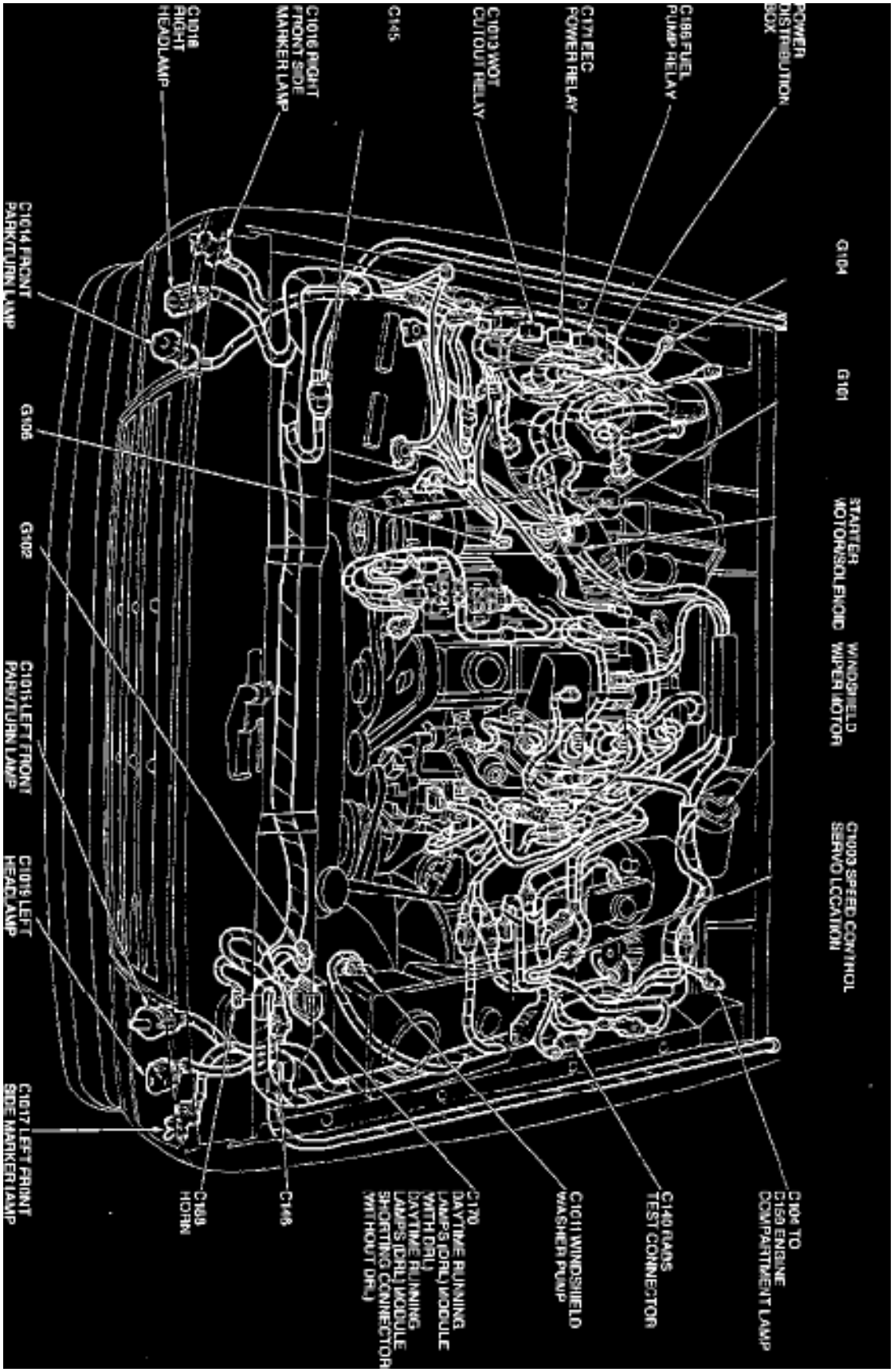
How Long Will It Take? The time needed for this service is less than one hour. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call Your Dealer: Call your dealer should your vehicle experience any of the above described conditions. Ask your dealer for a service appointment and if parts are in stock. Also ask your dealer to check the OASIS system for any other recalls or programs that may be required on your vehicle. If you have leased this vehicle to another person or organization, please immediately inform the lessee of the program. When you bring your vehicle in, show the dealer this letter. If you lose the letter your dealer will still do the work, free of charge.

Refunds: A full refund is available if you paid for the service covered by this Program (Daytime Running Light Control Module replacement only - parts and labor). Please give the original copy of your paid work-order or parts receipt to your dealer. Your dealer will arrange for the refund (which could take about one month).

Changed Name, Address, Or Sold The Vehicle? If you have changed your name or address, or have sold the vehicle, please fill out the enclosed prepaid postcard. Sign and date it, and mail the card to Ford. If you cannot get the service performed, contact the Ford "Customer Assistance Centre" at the address identified in the letterhead of this letter. Please identify your vehicle's serial number in any correspondence. We are taking this action as part of our efforts to ensure your long term satisfaction with the DRL feature in your vehicle. We hope this program will confirm your continued satisfaction with your Ford built vehicle.

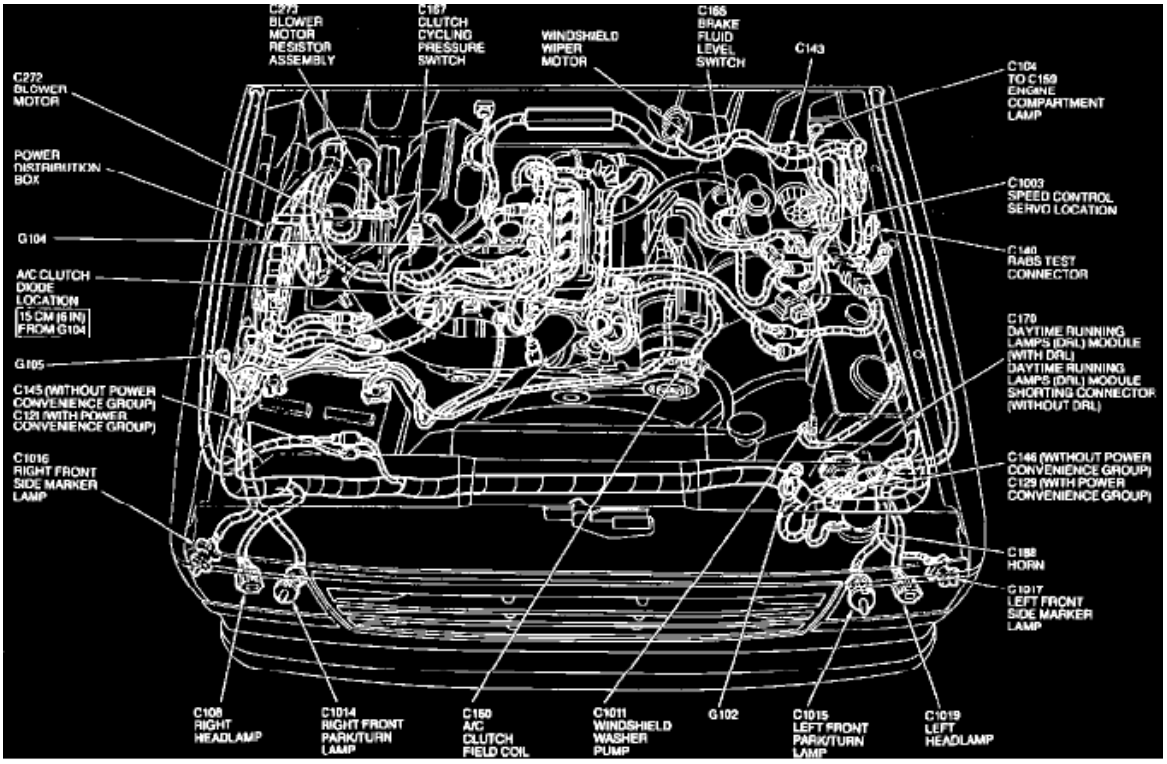

G104
G101
STARTER MOTOR/SOLENOID
WINDSHIELD WIPER MOTOR
C1003 SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C188 FUEL PUMP RELAY
C171 EEC POWER RELAY
C1013 WOT CUTOUT RELAY
C145
C1016 RIGHT FRONT SIDE MARKER LAMP
C1018 RIGHT HEADLAMP
C1014 FRONT PARK/TURN LAMP
G106
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP
C1017 LEFT FRONT SIDE MARKER LAMP
C169 HORN
C146
C170 DAYTIME RUNNING LAMPS (DRL) MODULE WITH DRL DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C1011 WINDSHIELD WASHER PUMP
C140 RAINS TEST CONNECTOR
C104 TO C150 ENGINE COMPARTMENT LAMP

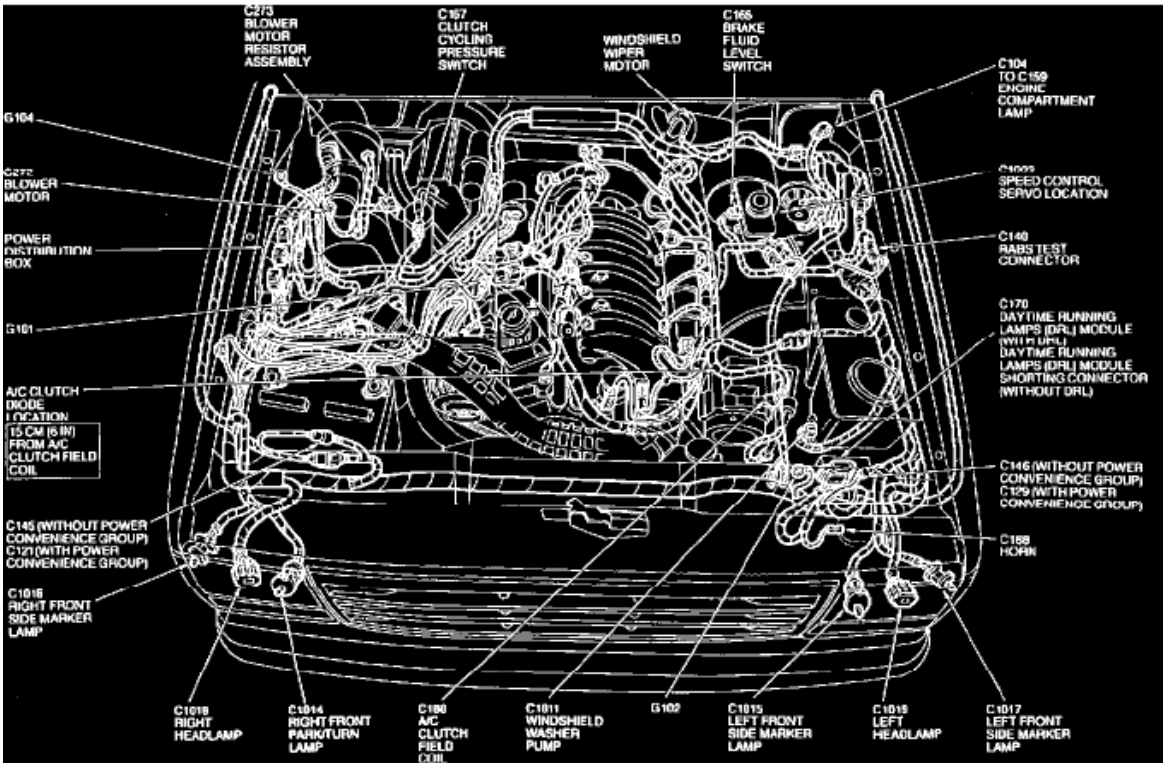
Daytime Running Lamp Control Unit: Locations

Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

Applicable to: 2.3L/4-140


C272
BLOWER
MOTOR
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C143
C272
BLOWER
MOTOR
C104
TO C159
ENGINE
COMPARTMENT
LAMP
POWER
DISTRIBUTION
BOX
C1003
SPEED CONTROL
SERVO LOCATION
G104
C140
RABS TEST
CONNECTOR
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM G104
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
G105
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C158
HORN
C1017
LEFT FRONT
SIDE MARKER
LAMP
C108
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
PARK/TURN
LAMP
C1019
LEFT
HEADLAMP


C273
BLOWER
MOTOR
RESISTOR
ASSEMBLY
C167
CLUTCH
CYCLING
PRESSURE
SWITCH
WINDSHIELD
WIPER
MOTOR
C165
BRAKE
FLUID
LEVEL
SWITCH
C104
TO C159
ENGINE
COMPARTMENT
LAMP
G104
C272
BLOWER
MOTOR
C1003
SPEED CONTROL
SERVO LOCATION
POWER
DISTRIBUTION
BOX
C140
RABS TEST
CONNECTOR
G101
C170
DAYTIME RUNNING
LAMPS (DRL) MODULE
(WITH DRL)
DAYTIME RUNNING
LAMPS (DRL) MODULE
SHORTING CONNECTOR
(WITHOUT DRL)
A/C CLUTCH
DIODE
LOCATION
15 CM (6 IN)
FROM A/C
CLUTCH FIELD
COIL
C146 (WITHOUT POWER
CONVENIENCE GROUP)
C129 (WITH POWER
CONVENIENCE GROUP)
C145 (WITHOUT POWER
CONVENIENCE GROUP)
C121 (WITH POWER
CONVENIENCE GROUP)
C158
HORN
C1016
RIGHT FRONT
SIDE MARKER
LAMP
C1018
RIGHT
HEADLAMP
C1014
RIGHT FRONT
PARK/TURN
LAMP
C150
A/C
CLUTCH
FIELD
COIL
C1011
WINDSHIELD
WASHER
PUMP
G102
C1015
LEFT FRONT
SIDE MARKER
LAMP
C1019
LEFT
HEADLAMP
C1017
LEFT FRONT
SIDE MARKER
LAMP

Engine Compartment Components.

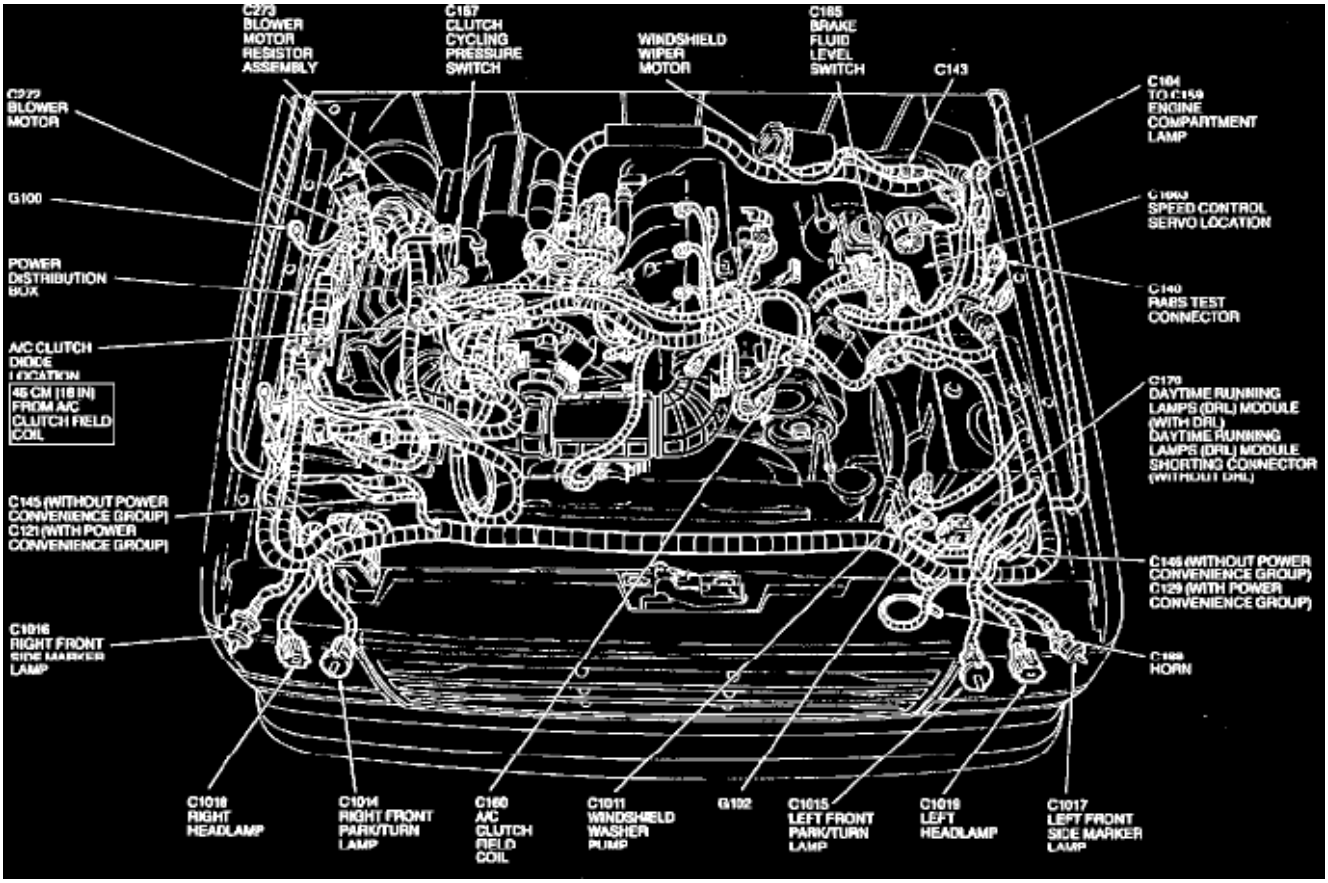
LH Side Of Upper Radiator Support, Near G102

Applicable to: 2.9L/V6-179

Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

Applicable to: 3.0L/V6-181

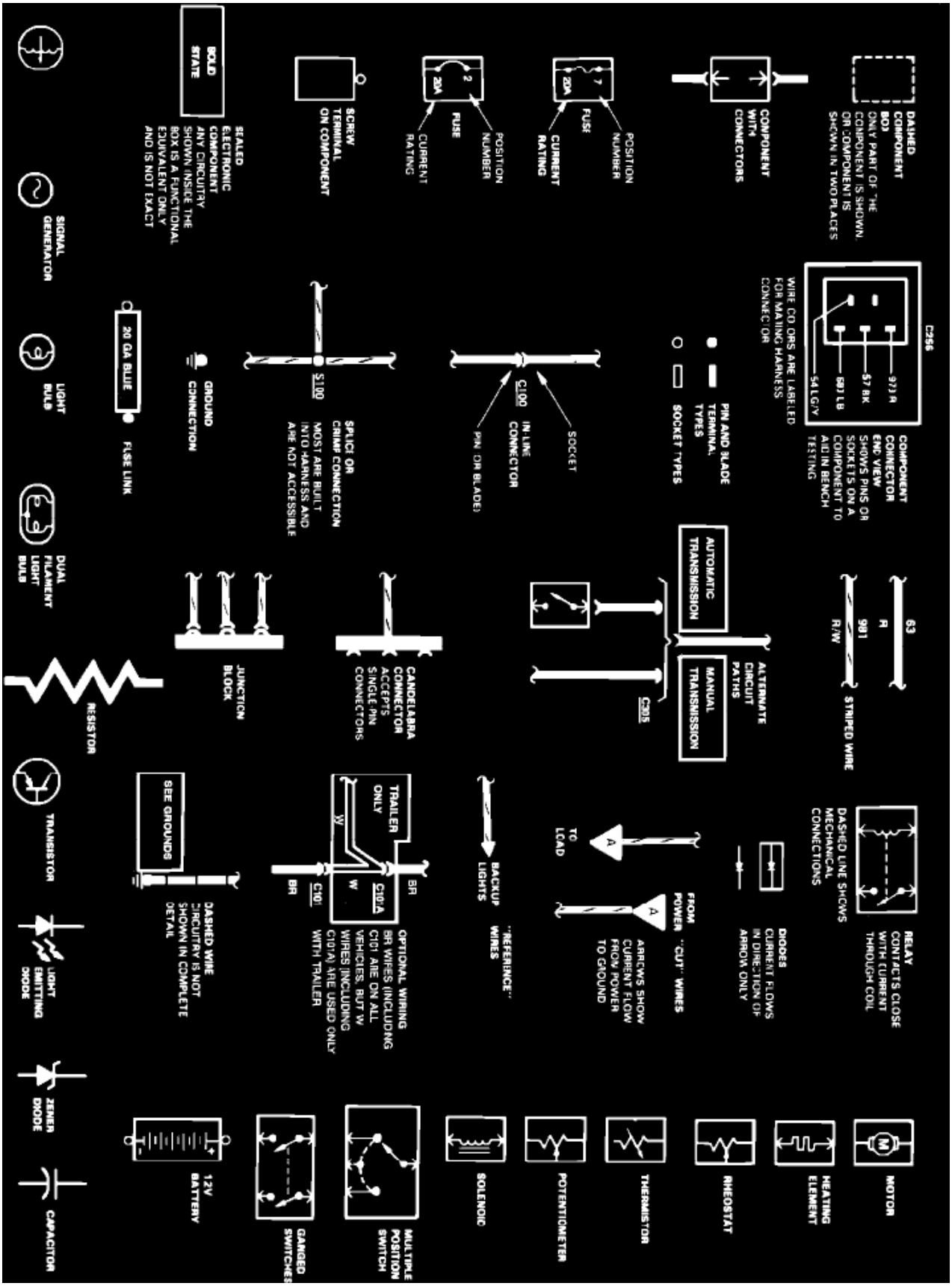


Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

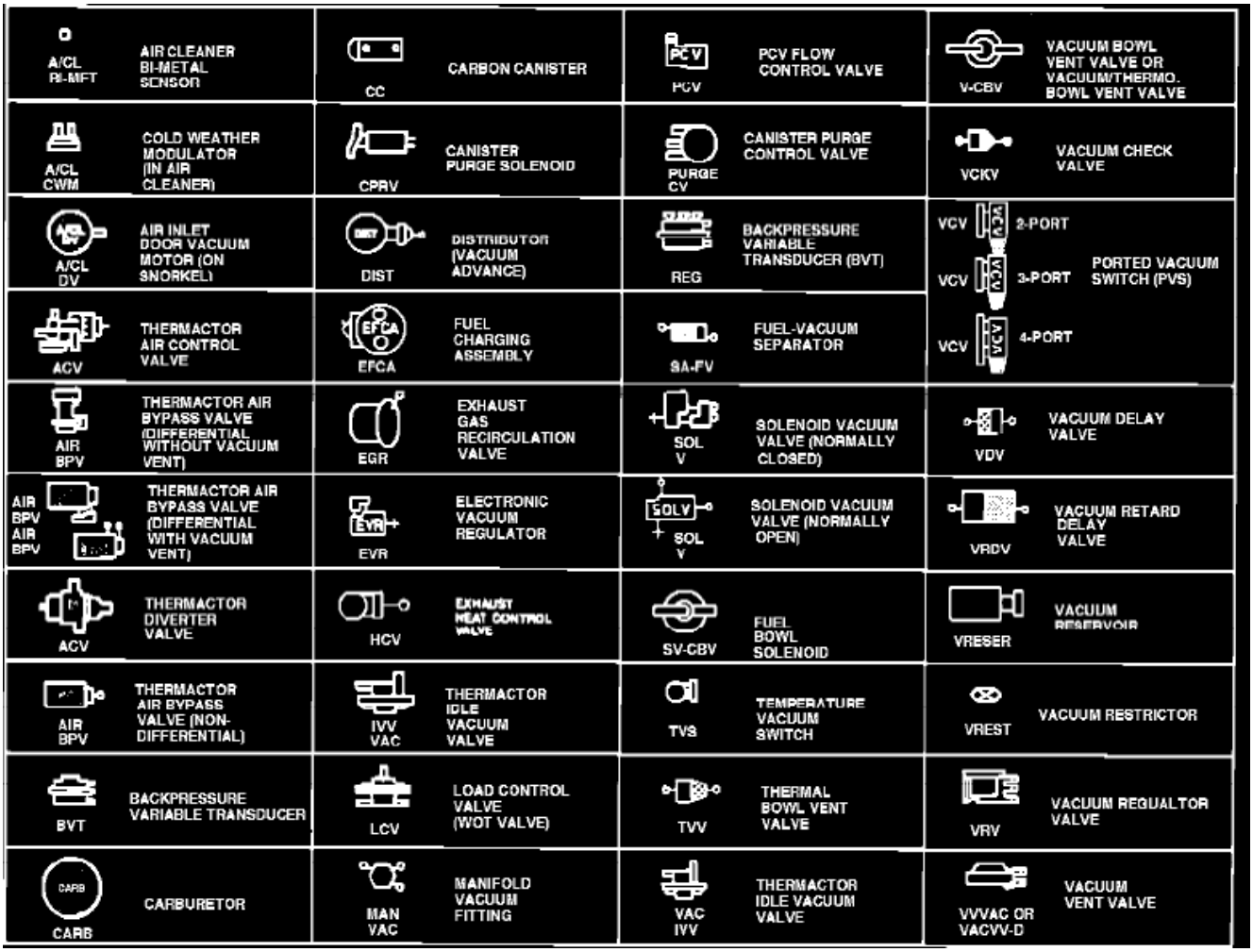
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Daytime Running Lamp > Daytime Running Lamp Control Unit > Component Information > Diagrams > Diagram Information and Instructions

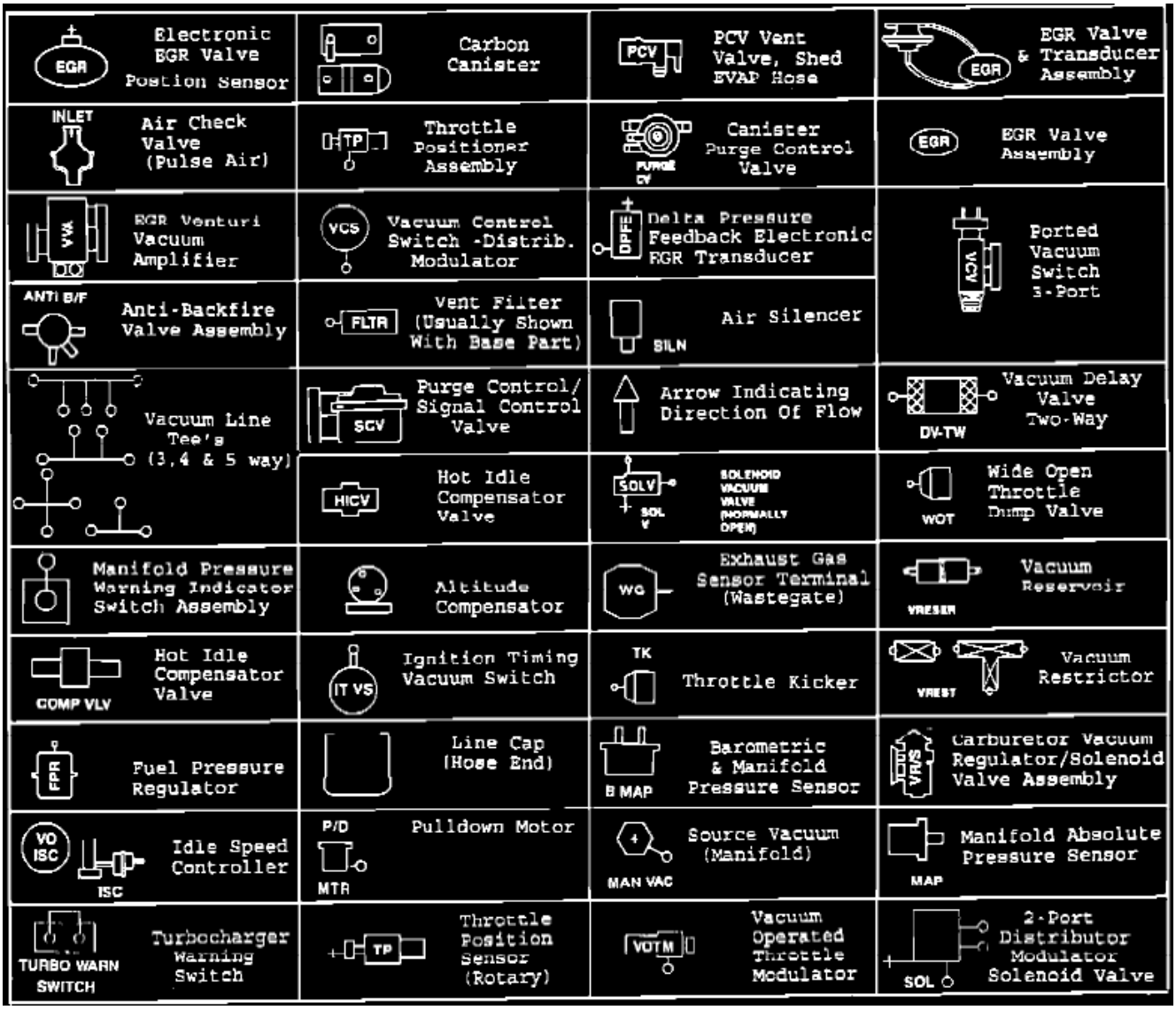


Daytime Running Lamp Control Unit: Diagram Information and Instructions

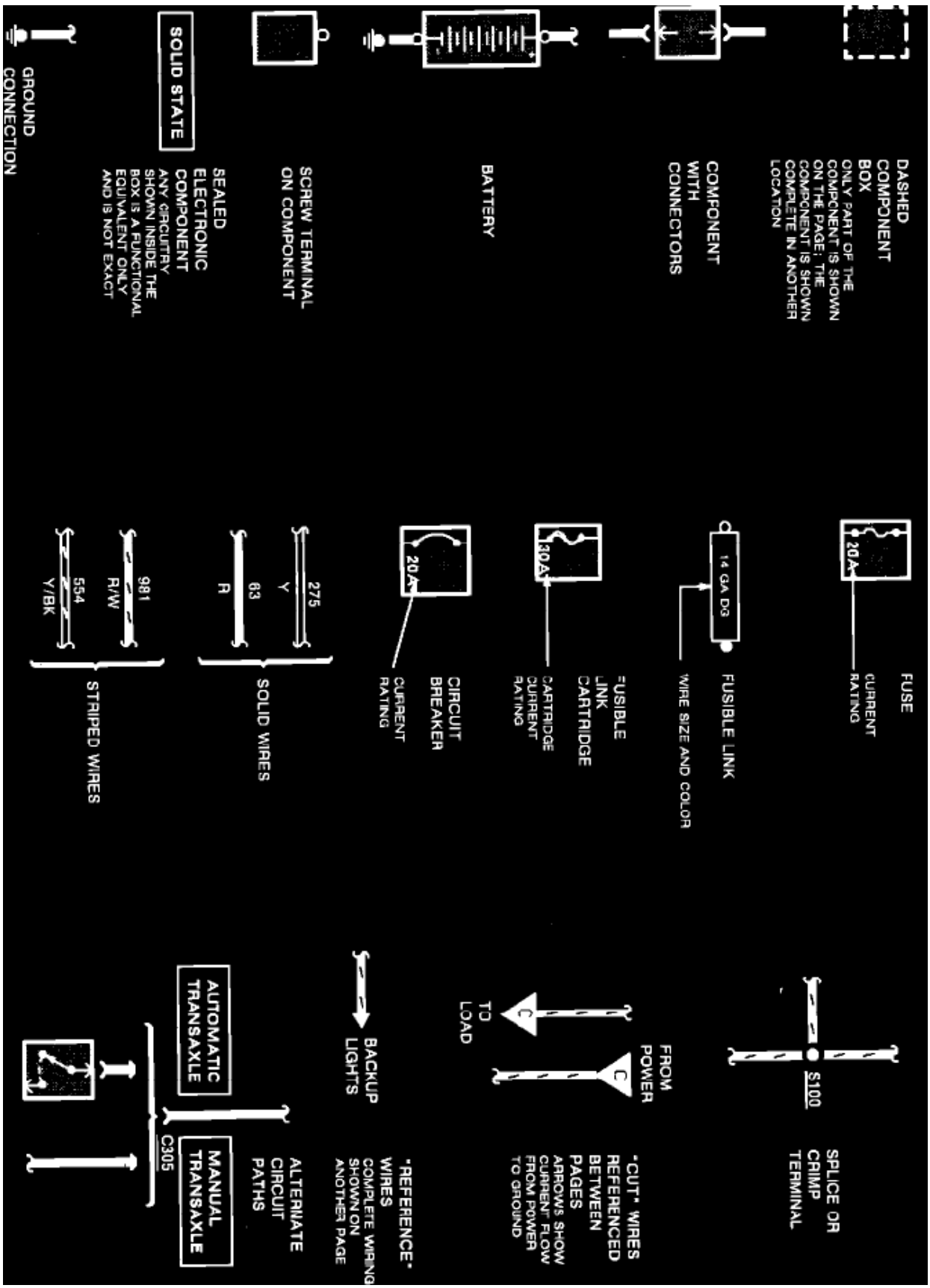
Symbol Identification



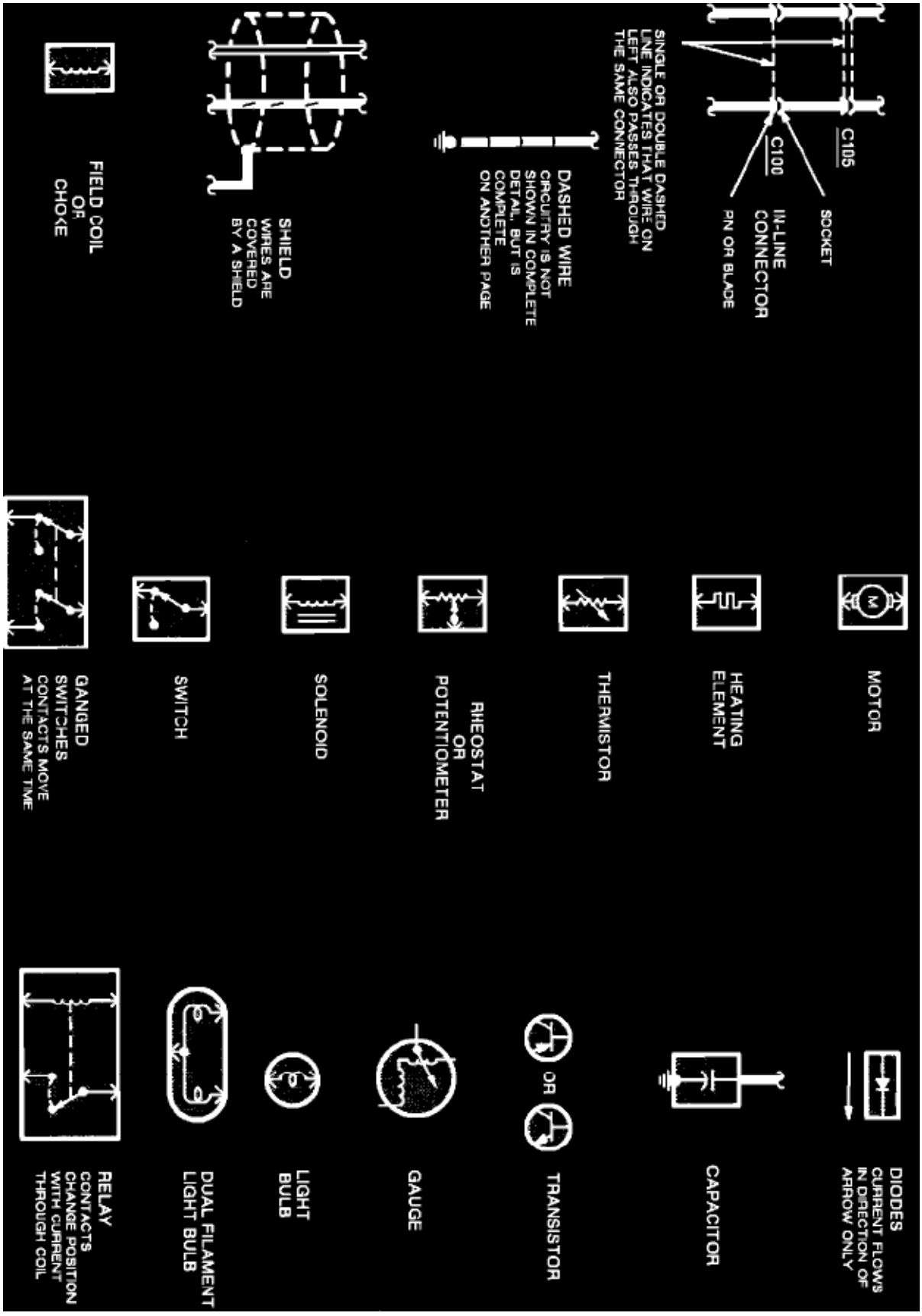
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
S100
SPLICE OR CRIMP TERMINAL
FROM POWER
C
TO LOAD
C
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

P: Purple

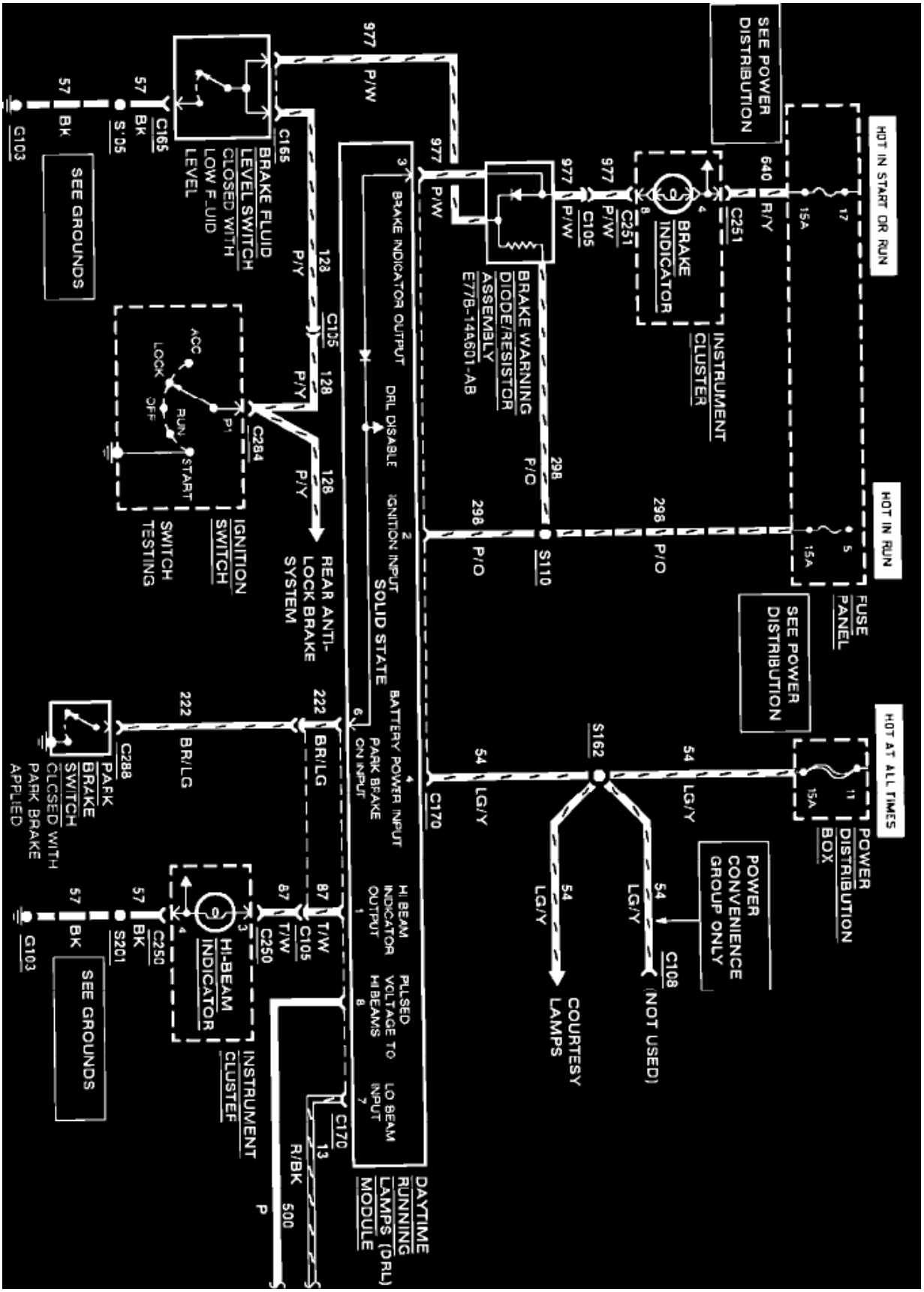
T: Tan

V: Violet

W: White

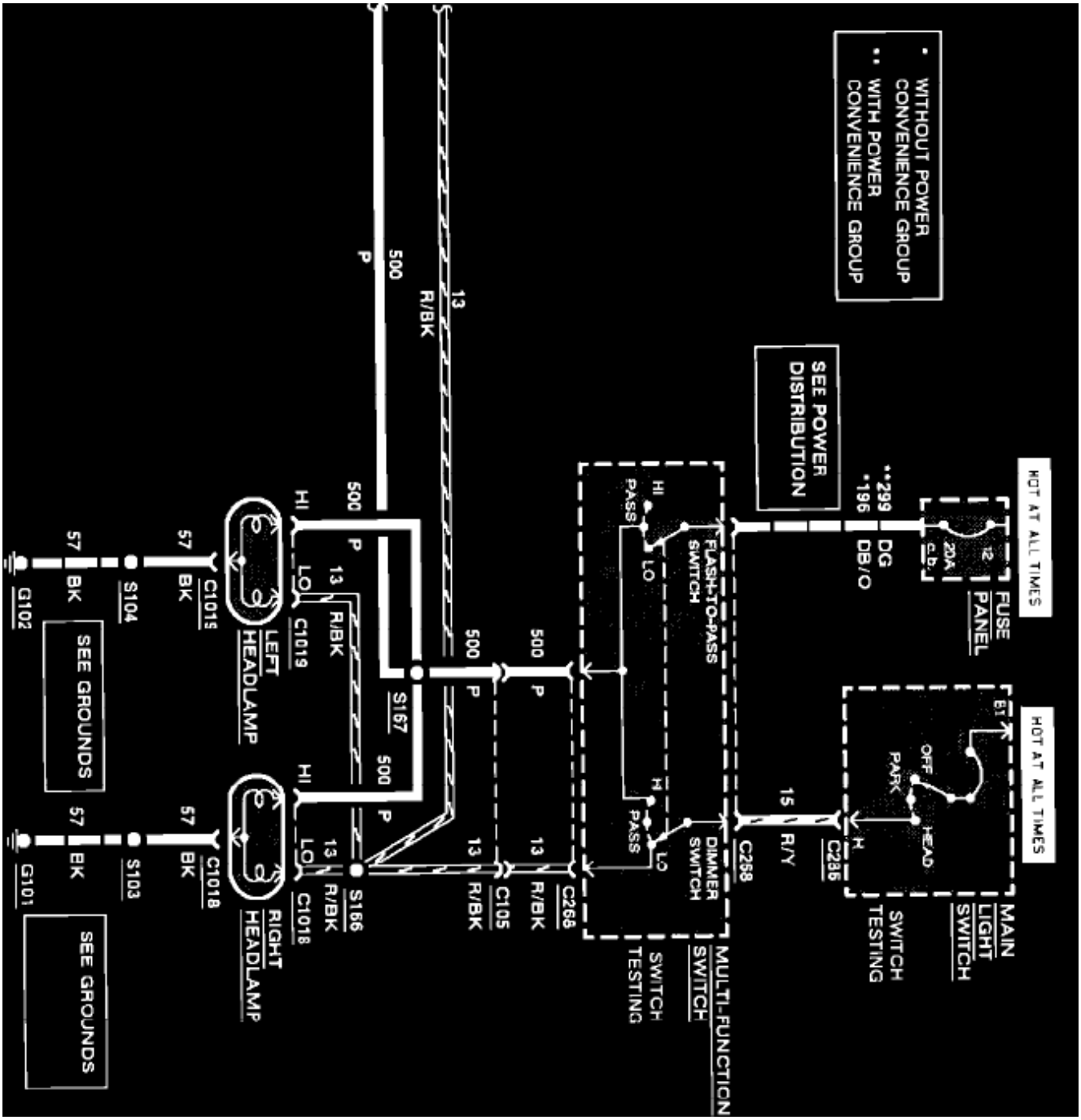
Y: Yellow

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Daytime Running Lamp > Daytime Running Lamp Control Unit > Component Information > Diagrams > Diagram Information and Instructions > Page 7372

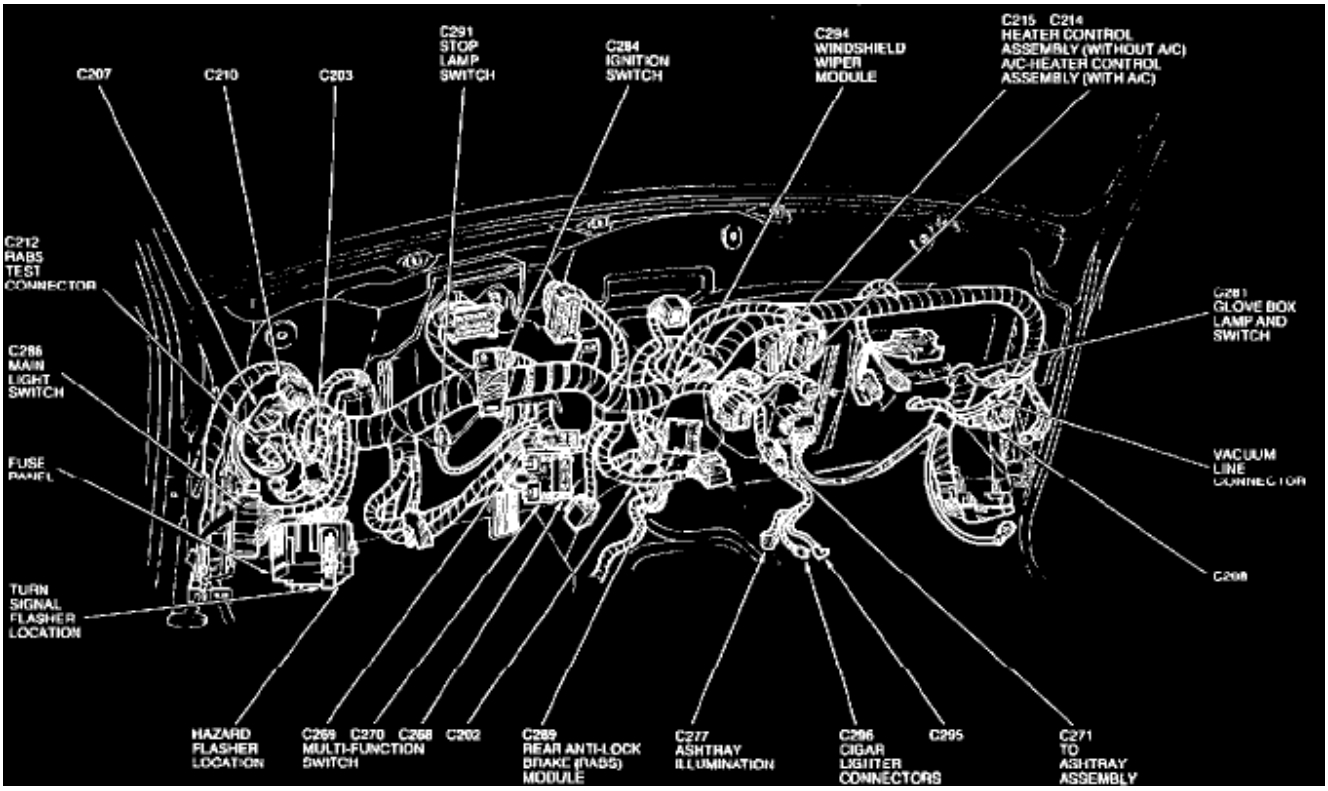


Daytime Running Lamp Control Unit: Electrical Diagrams

Daytime Running Lamps (Canada)



Daytime Running Lamps (Canada)

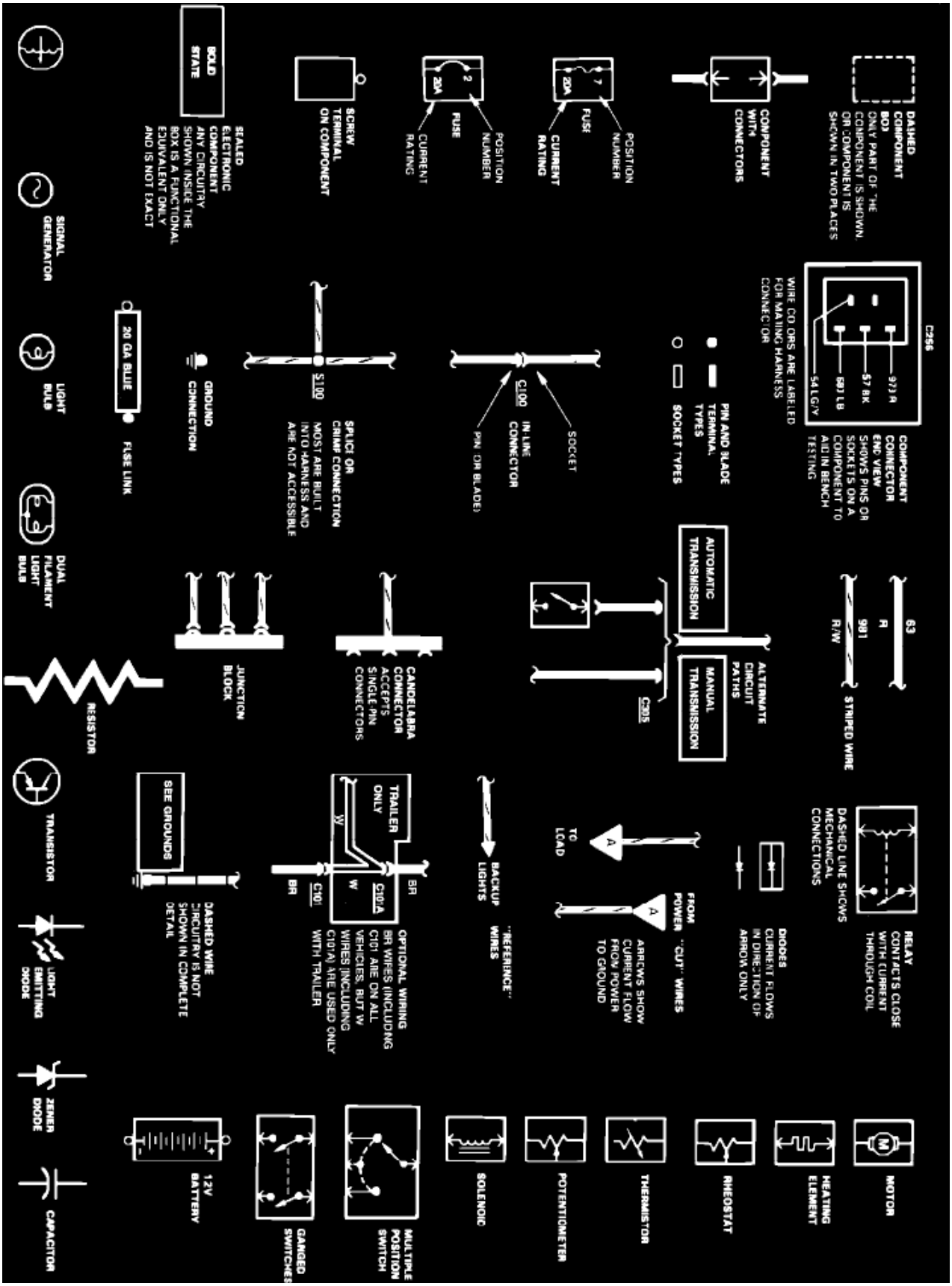


Hazard Warning Flasher: Locations

I/P Components

Behind LH Side Of I/P, Rear Of Fuse Panel, Below Turn Signal Flasher

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Hazard Warning Lamps > Hazard Warning Switch > Component Information > Diagrams > Diagram Information and Instructions



Hazard Warning Switch: Diagram Information and Instructions

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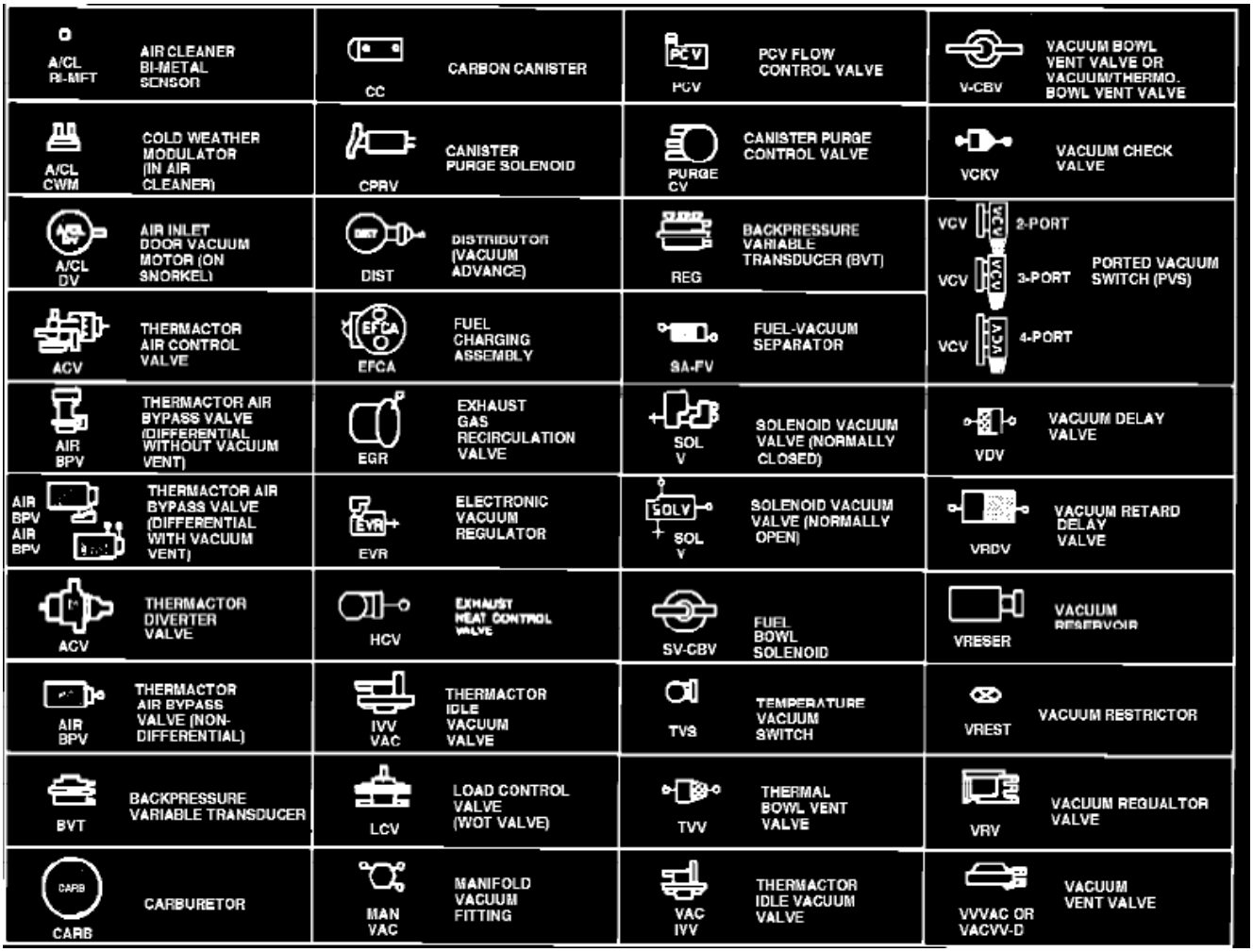
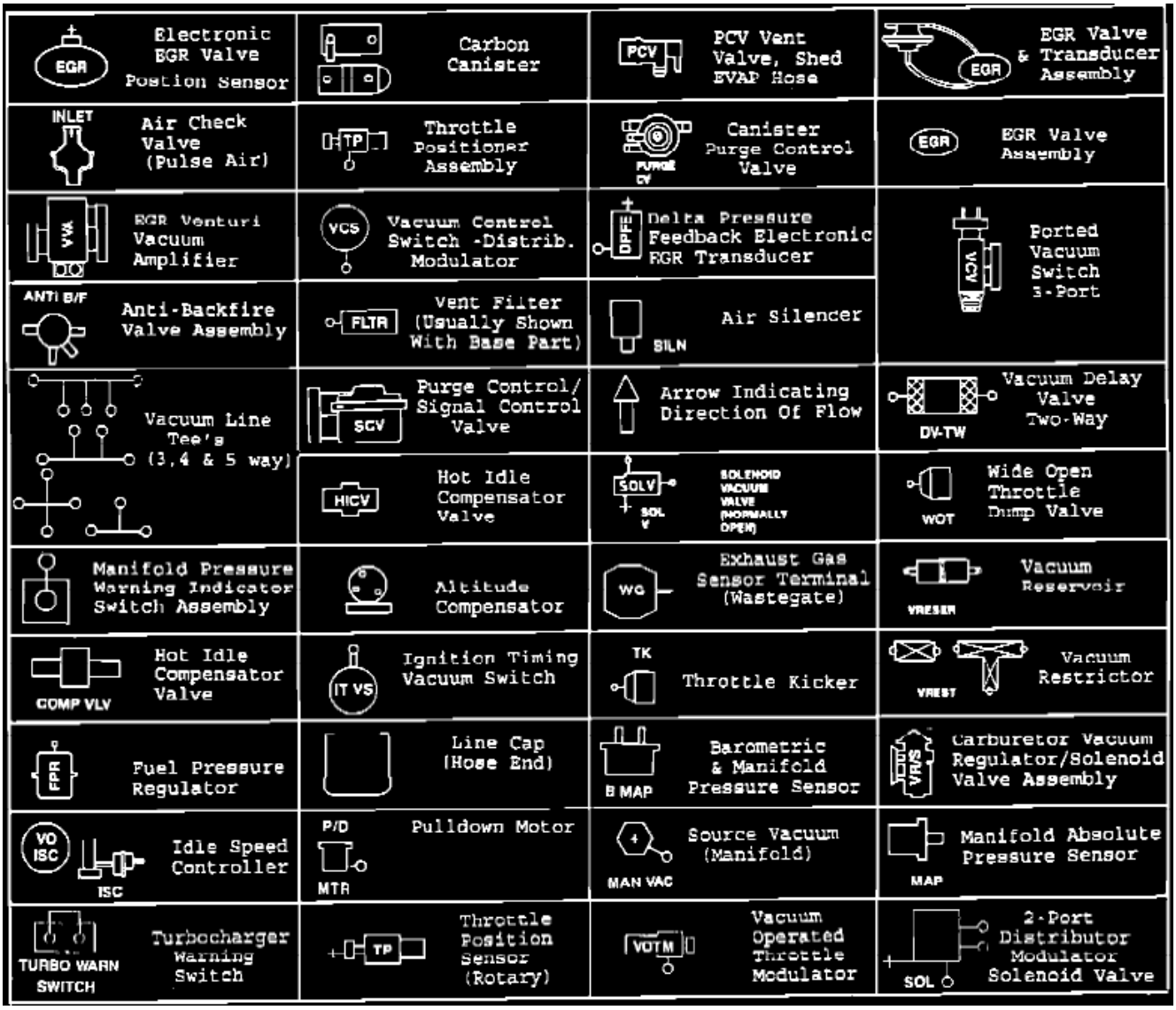


Vacuum And Vapor Hose Schematic Symbols



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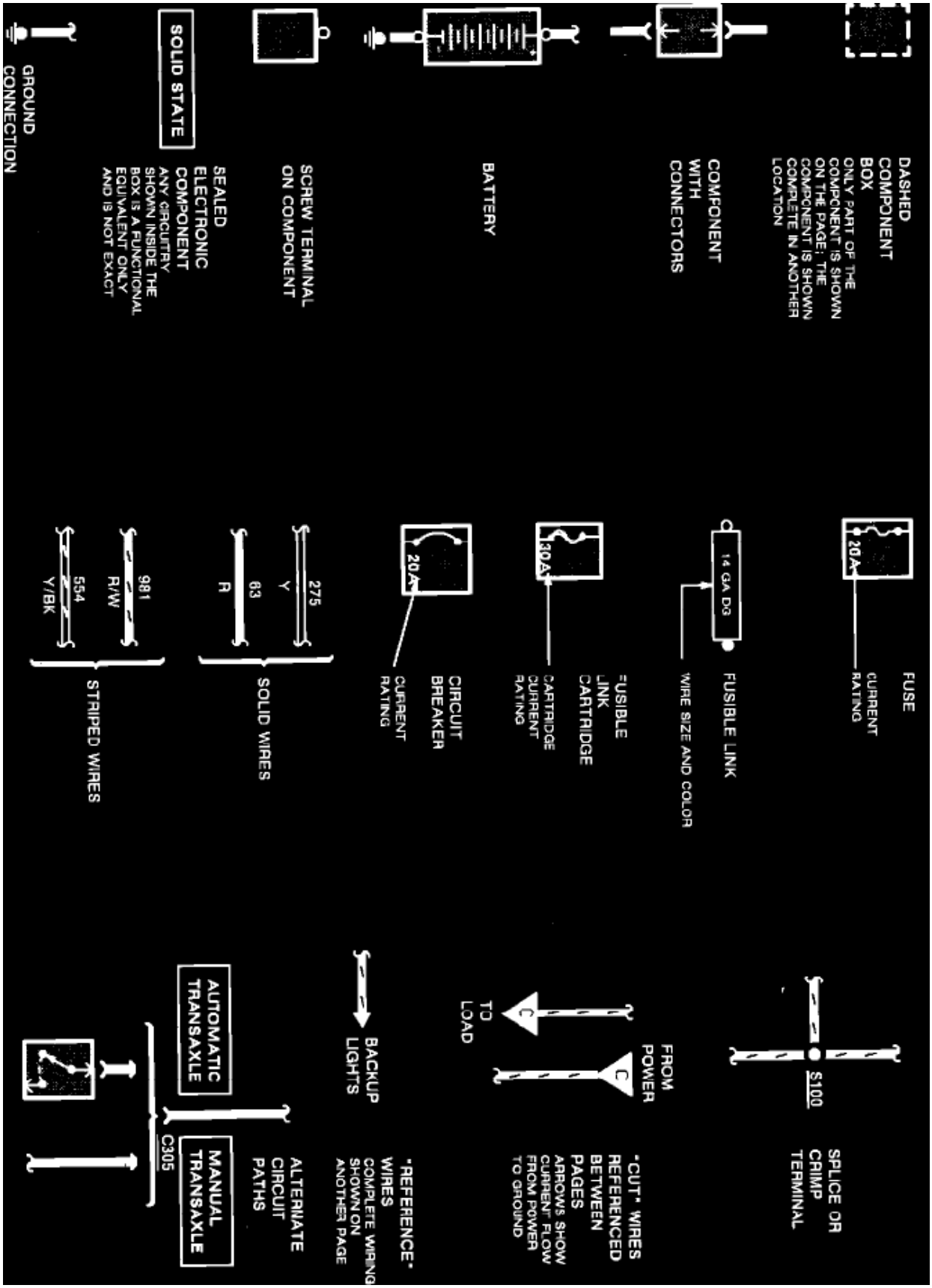
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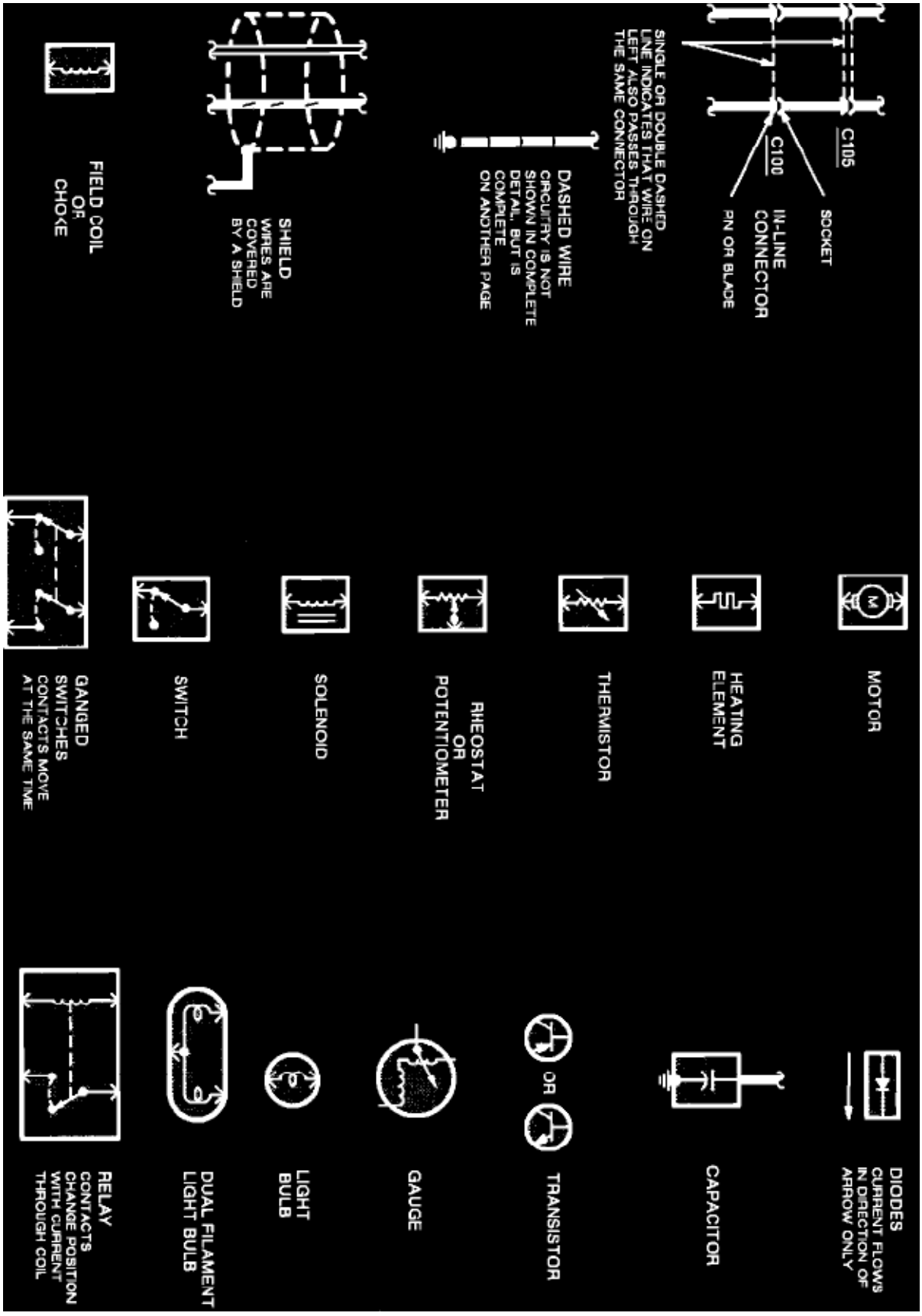
Electrical Symbols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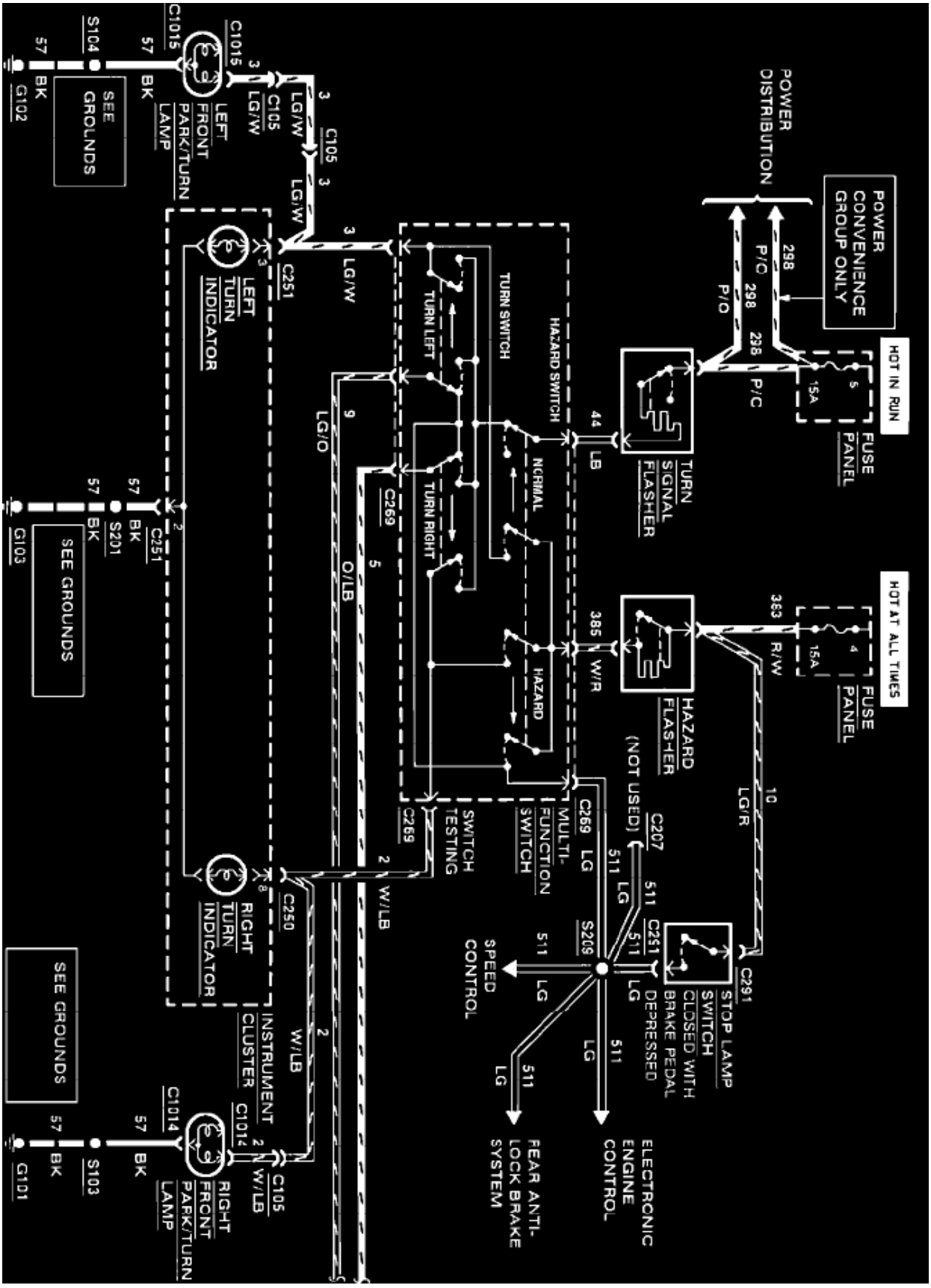
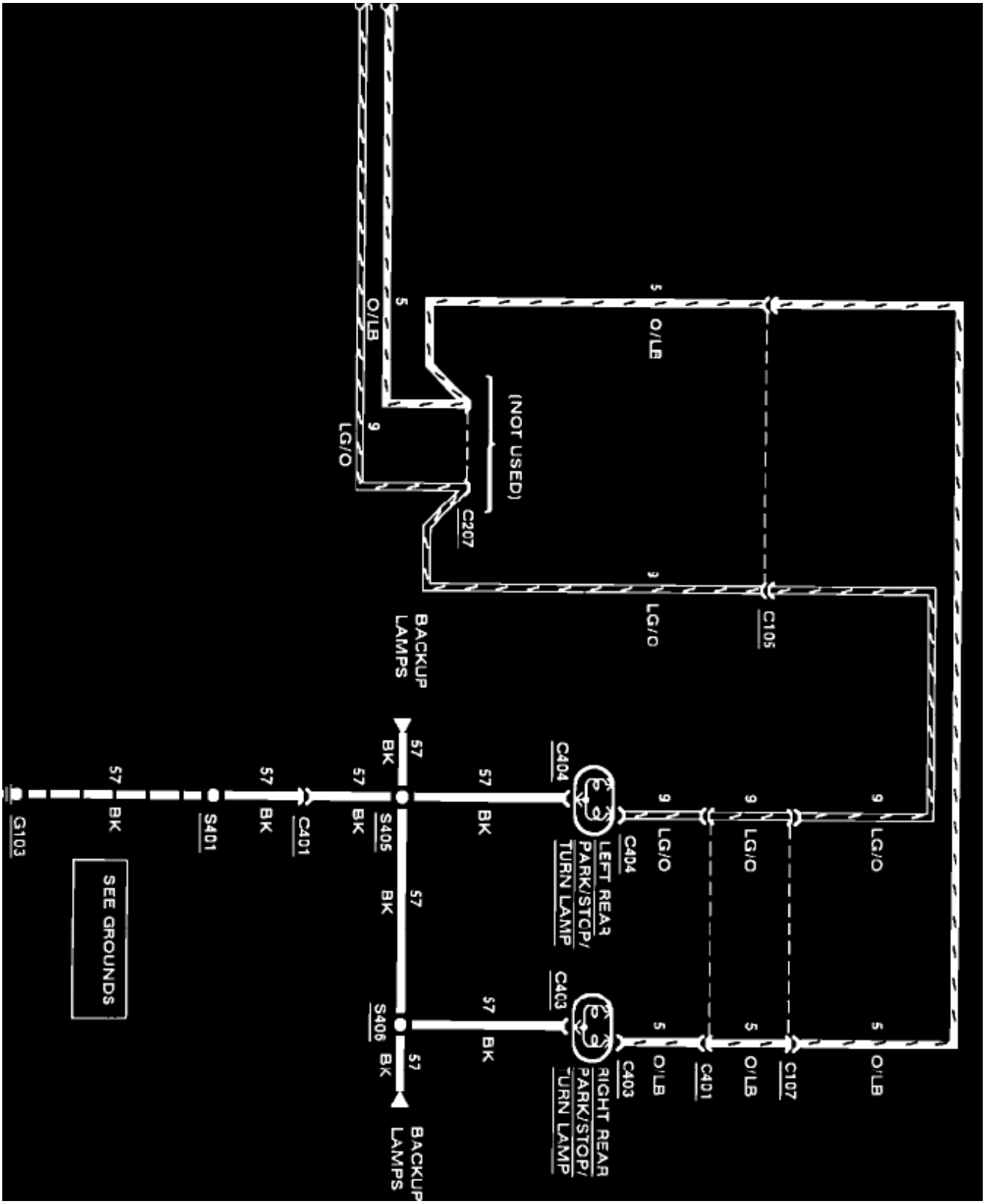
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Hazard Warning Lamps > Hazard Warning Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 7387



Hazard Warning Switch: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Hazard Warning Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

10. Check multi-function switch and steering column for proper operation.

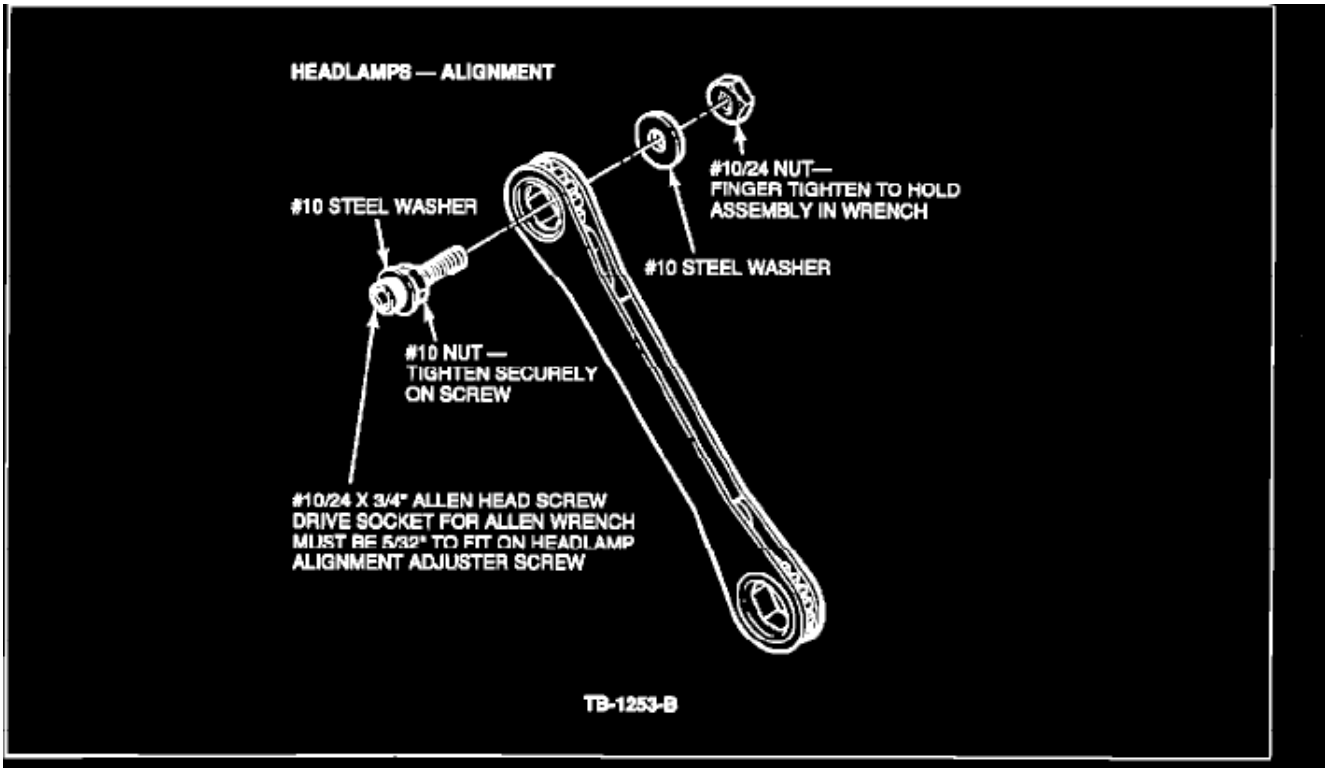


Figure 1

Headlamp Adjusting Screw: Technical Service Bulletins Headlamp - Horizontal Adjuster Difficult Access

Article No. 93-4-9

February 17, 1993

LAMP - HEADLAMP - HORIZONTAL ADJUSTER DIFFICULT TO ACCESS

LIGHT TRUCK: 1989-90 BRONCO II 1989-93 RANGER 1991-93 EXPLORER

This TSB article is being republished to include 1989-1993 Rangers and 1991-1993 Explorers.

ISSUE: The headlamp horizontal adjuster can be difficult to access because the clearance between the sheet metal and the adjuster is not large enough to allow the use of a regular socket and ratchet.

ACTION:

Assemble a headlamp horizontal adjuster specialized tool from locally obtained parts, Figure 1, to make headlamp adjustments easier. Use this tool with a ratcheting box wrench.

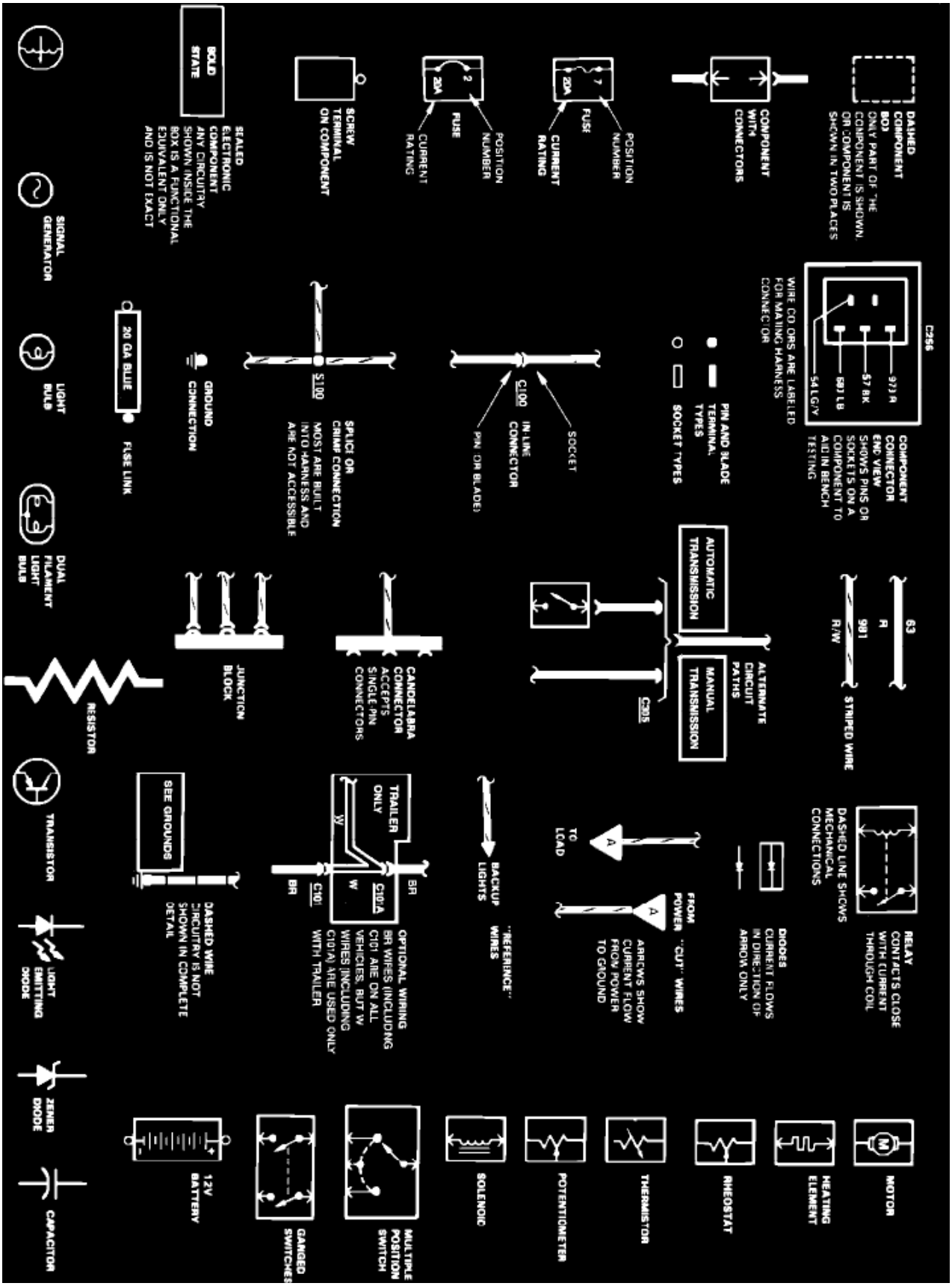
OTHER APPLICABLE ARTICLES: None

SUPERSEDES: 89-16-12

WARRANTY STATUS: INFORMATION ONLY

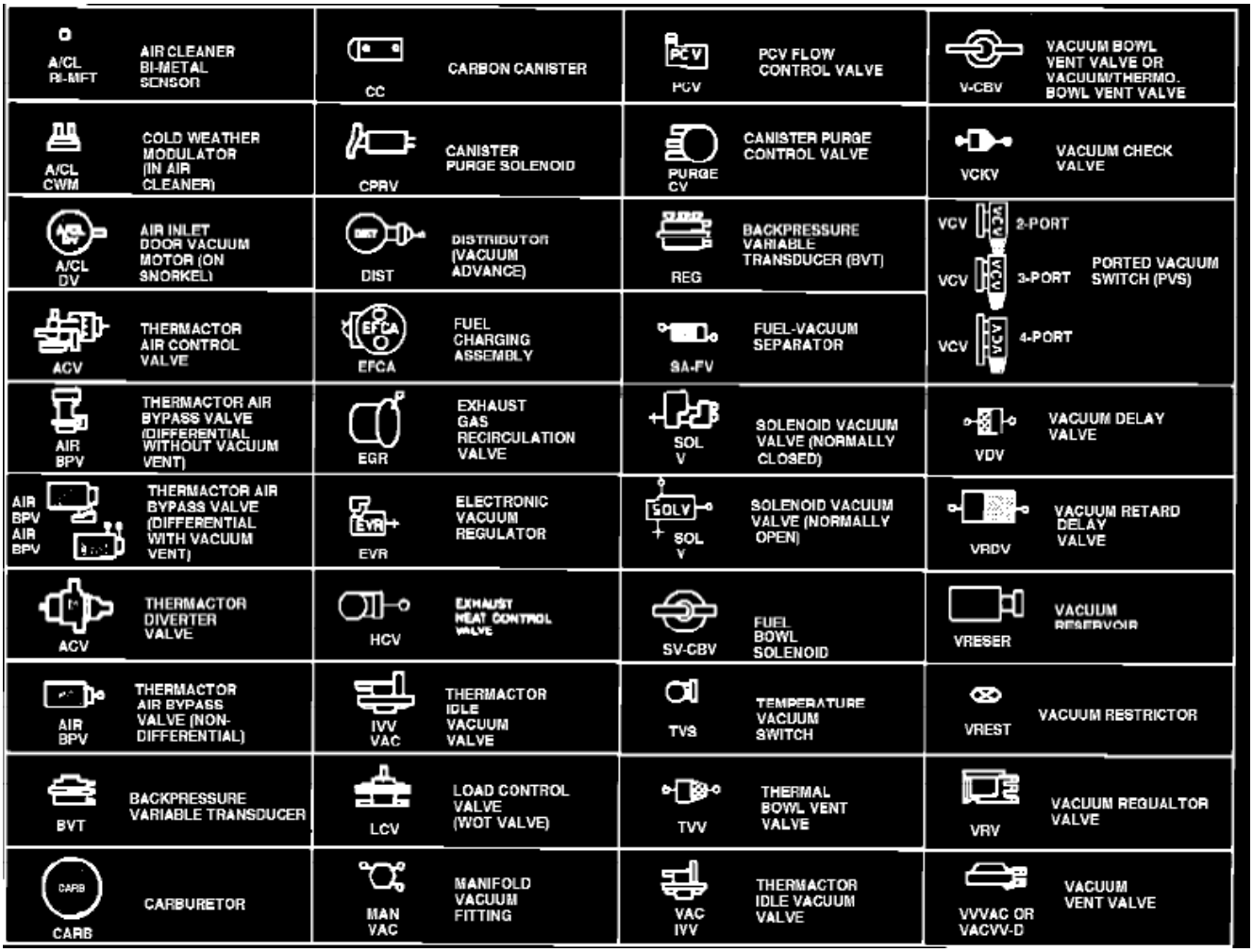
OASIS CODES: 2160, 2100

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Headlamp > Headlamp Control Module > Component Information > Diagrams > Diagram Information and Instructions



Headlamp Control Module: Diagram Information and Instructions

Symbol Identification



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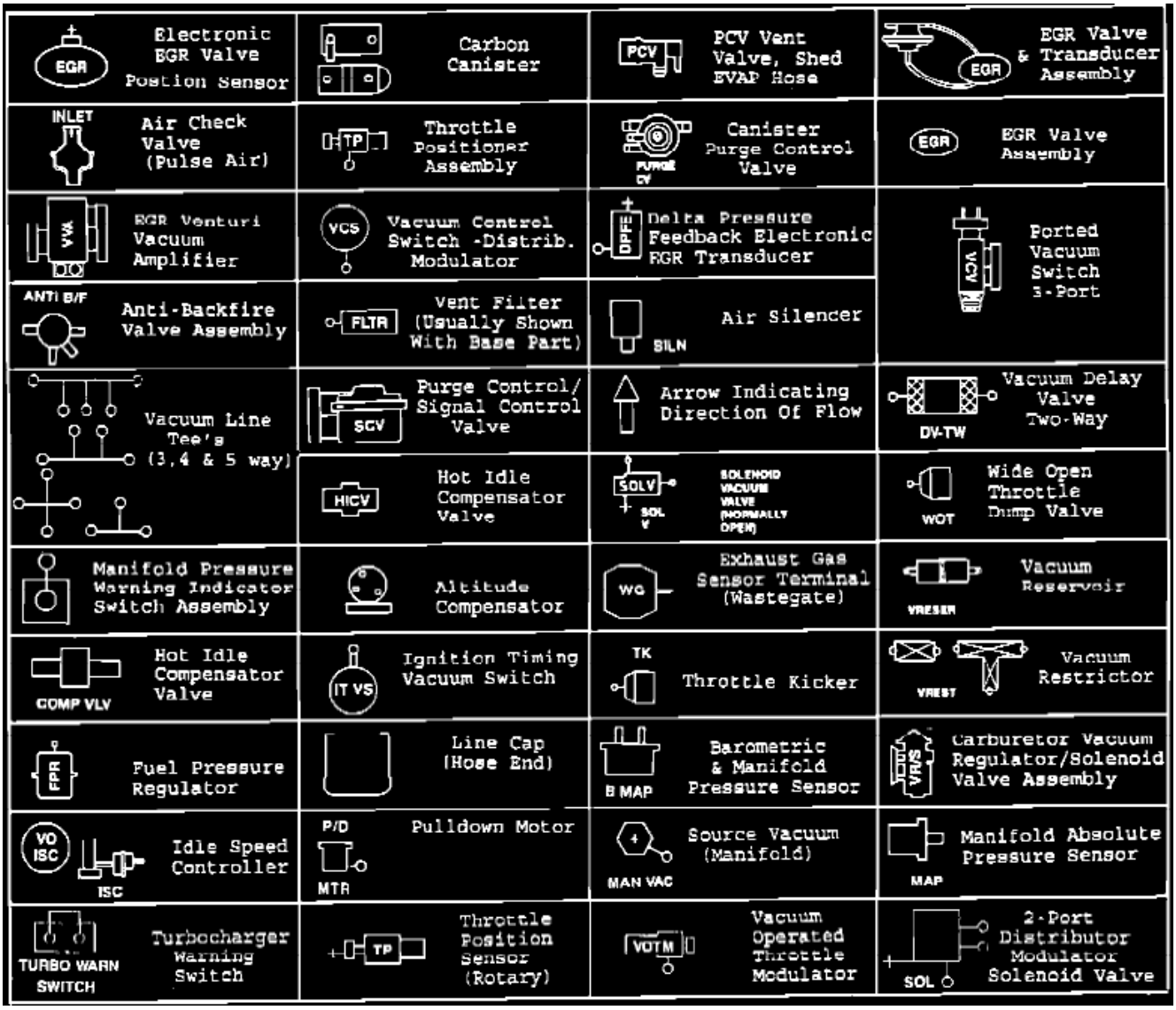

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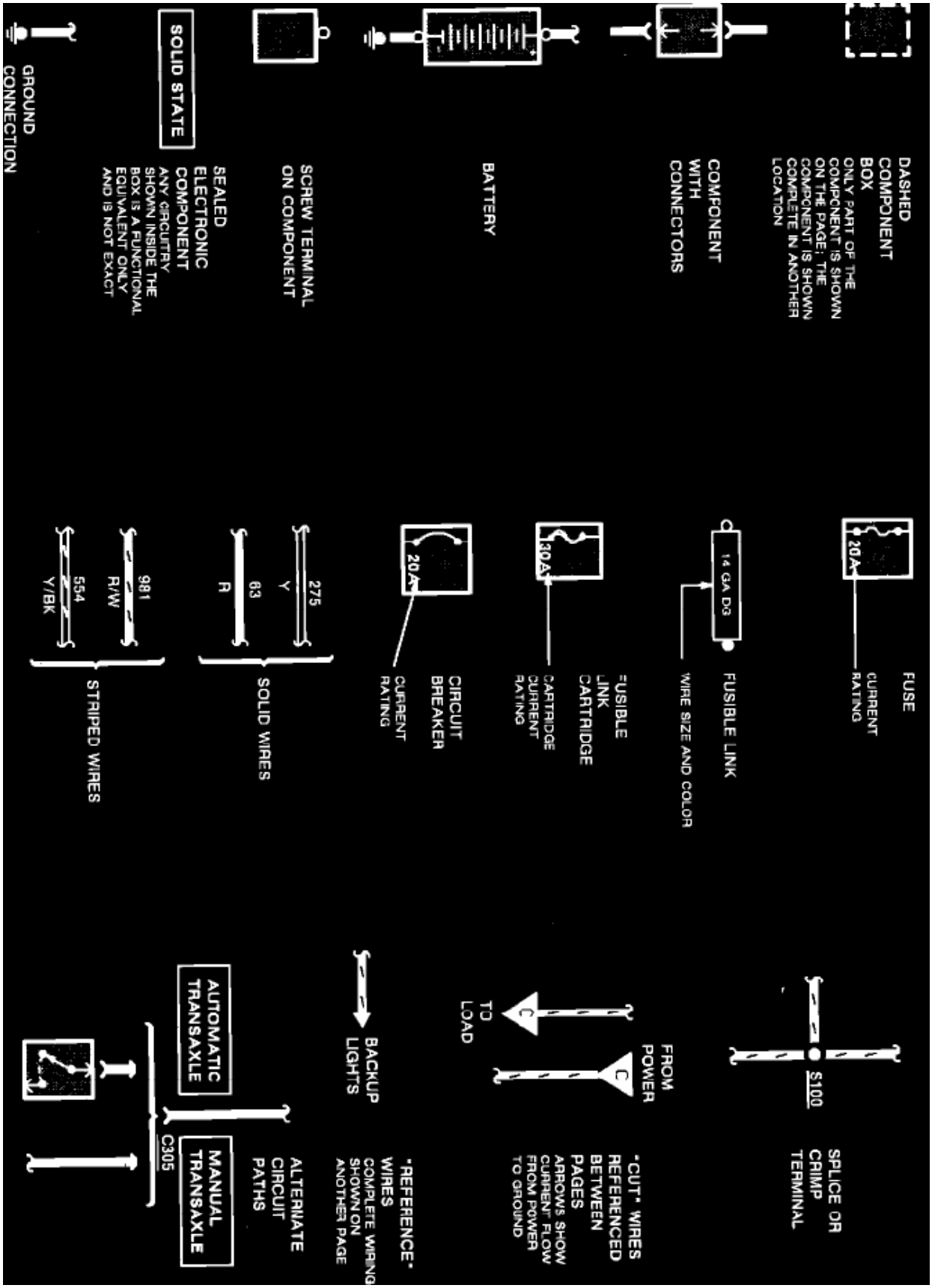
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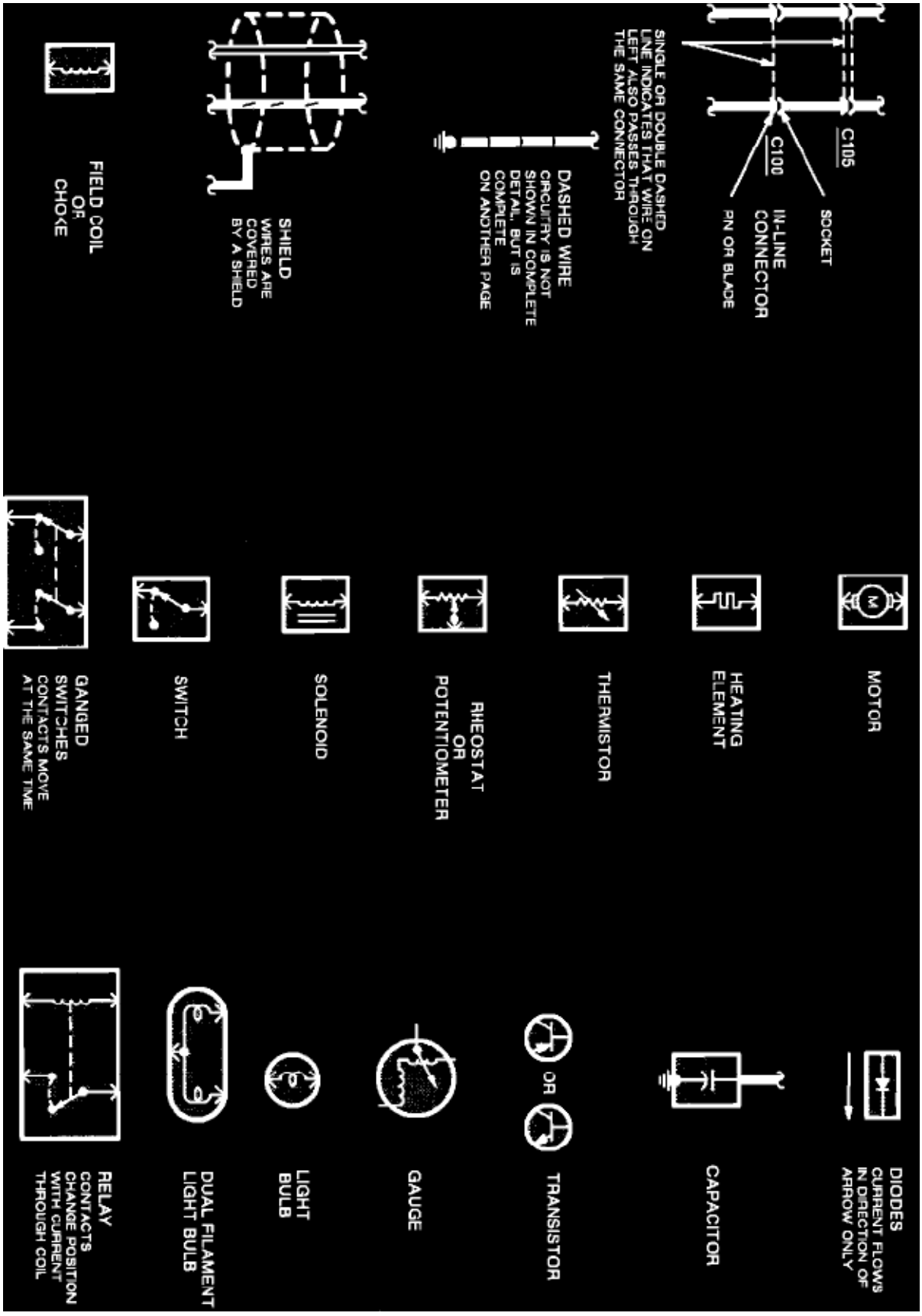
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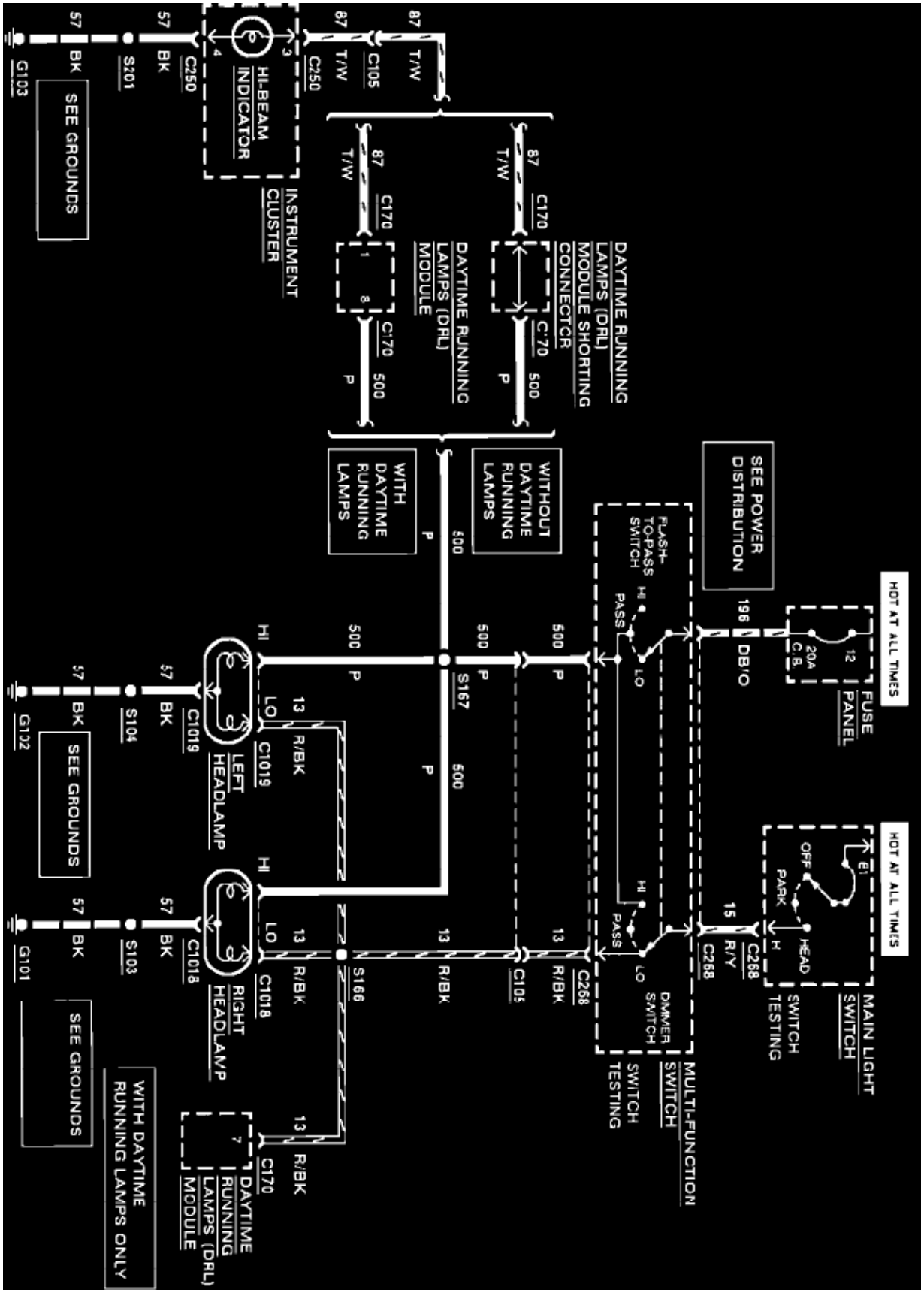
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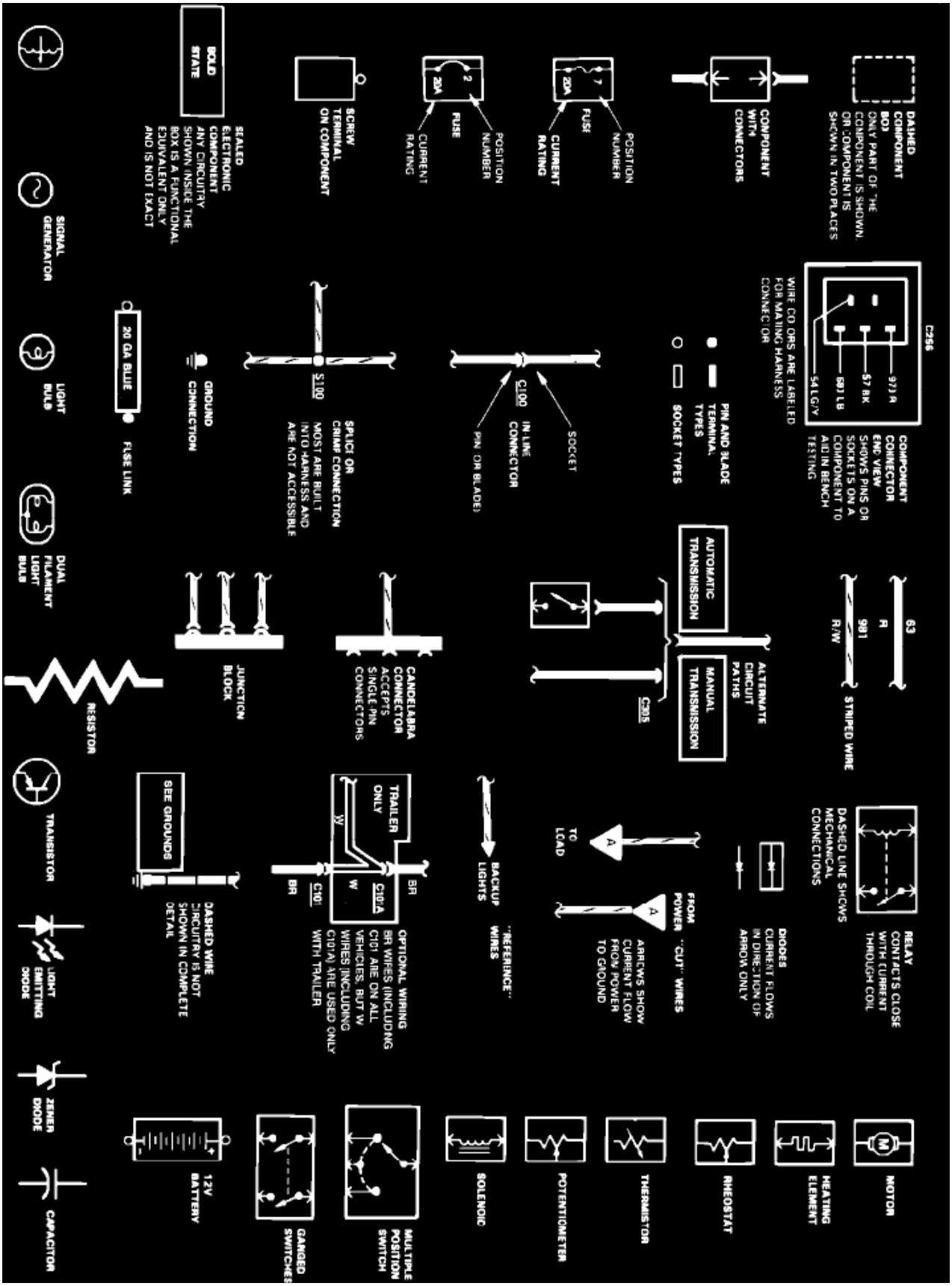
FUSE PANEL
12
20A C.B.
196
DB/O
SEE POWER DISTRIBUTION
HOT AT ALL TIMES
E1
OFF
PARK
HEAD
H
C268
R/Y
15
MAIN LIGHT SWITCH
SWITCH TESTING
MULTI-FUNCTION SWITCH
DIMMER SWITCH
SWITCH TESTING
FLASH-TO-PASS SWITCH
HI
PASS
LO
C268
R/BK
13
C105
S166
S167
500
P
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE CONNECTOR
C170
DAYTIME RUNNING LAMPS (DRL) MODULE
87
T/W
C105
C250
INSTRUMENT CLUSTER
HI-BEAM INDICATOR
S201
57
BK
G103
SEE GROUNDS
LEFT HEADLAMP
RIGHT HEADLAMP
C1019
C1018
S104
S103
G122
G101
WITH DAYTIME RUNNING LAMPS ONLY

Headlamps

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Headlamp > Headlamp Dimmer Switch > Component Information > Diagrams > Diagram Information and Instructions



Headlamp Dimmer Switch: Diagram Information and Instructions

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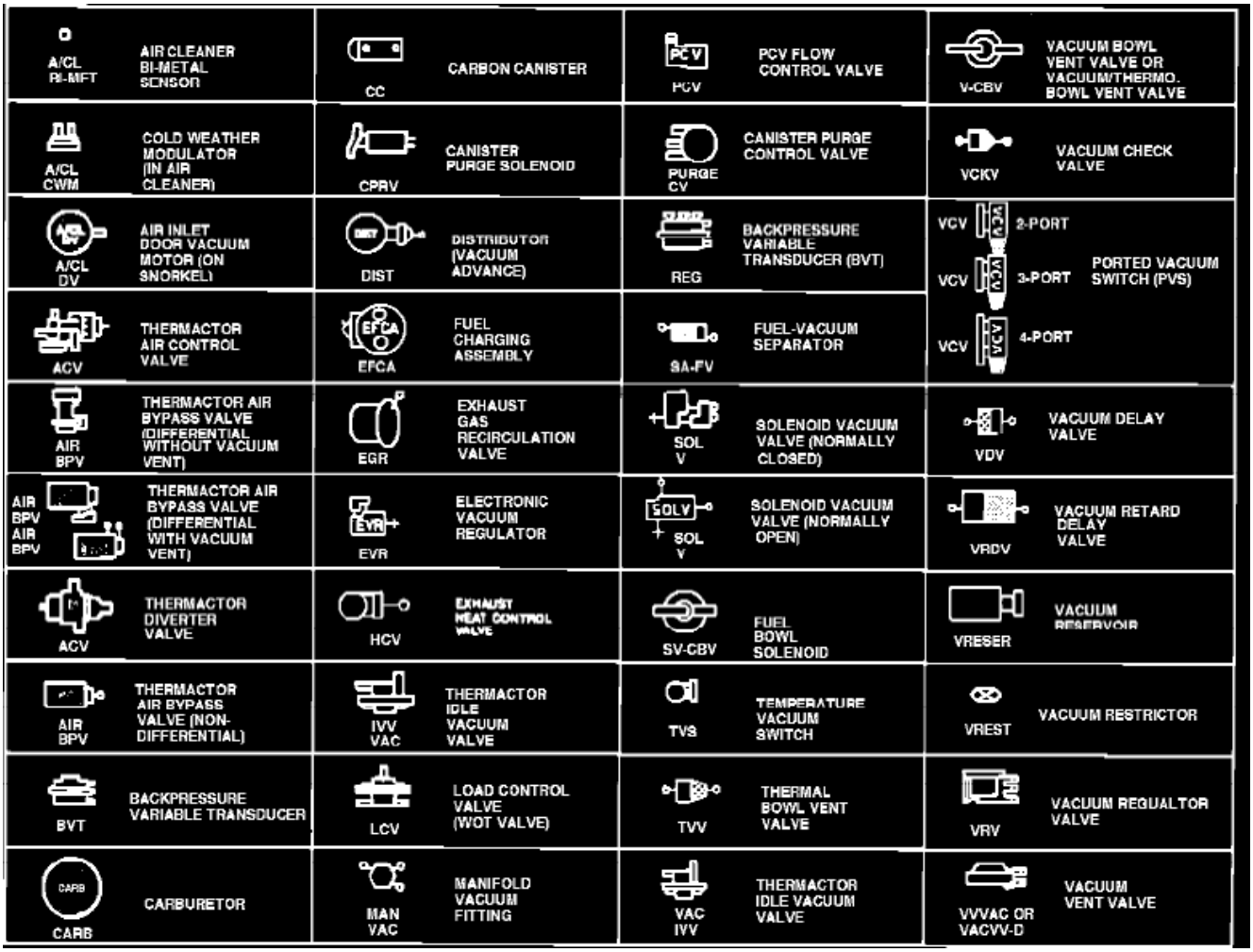

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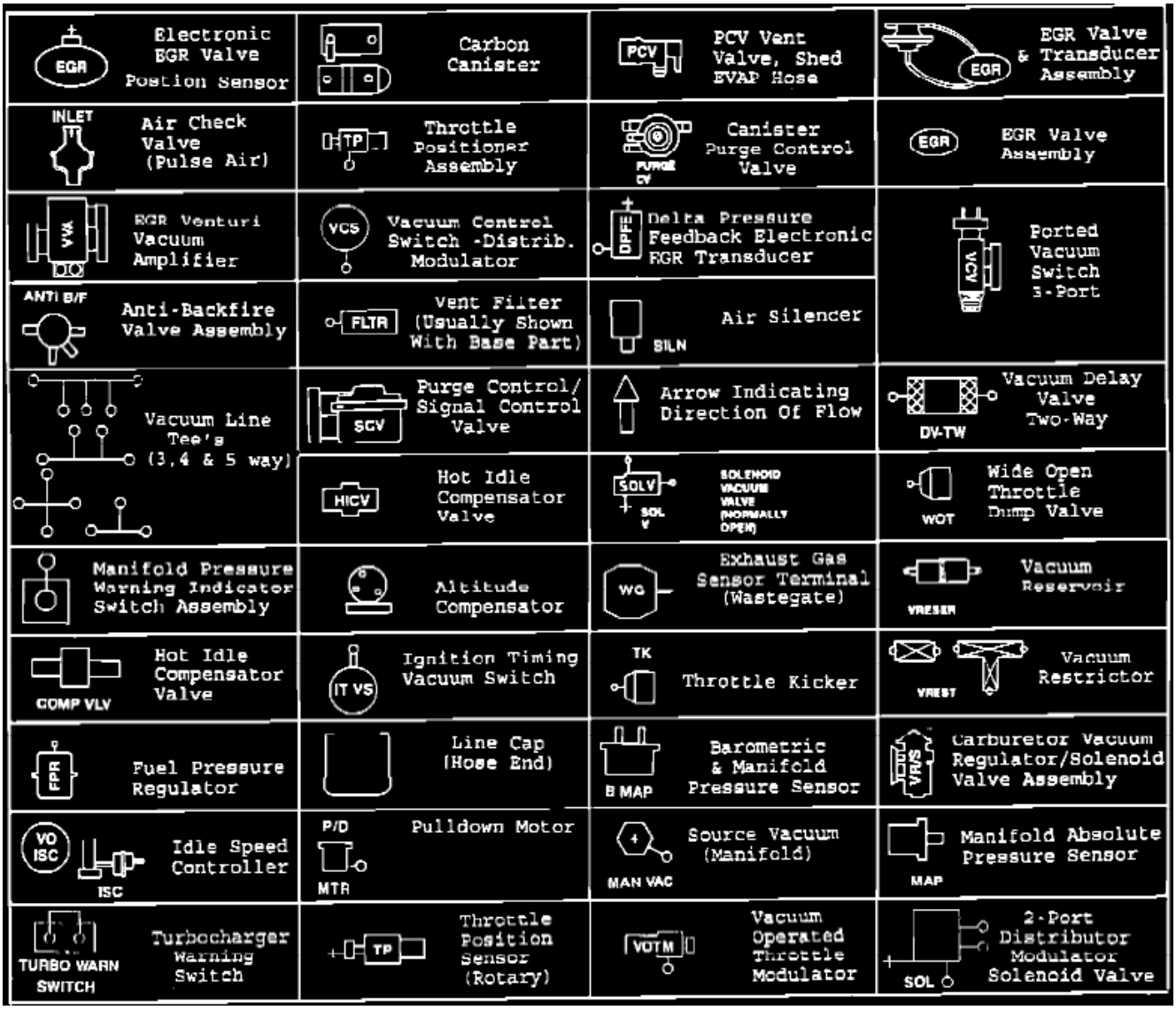

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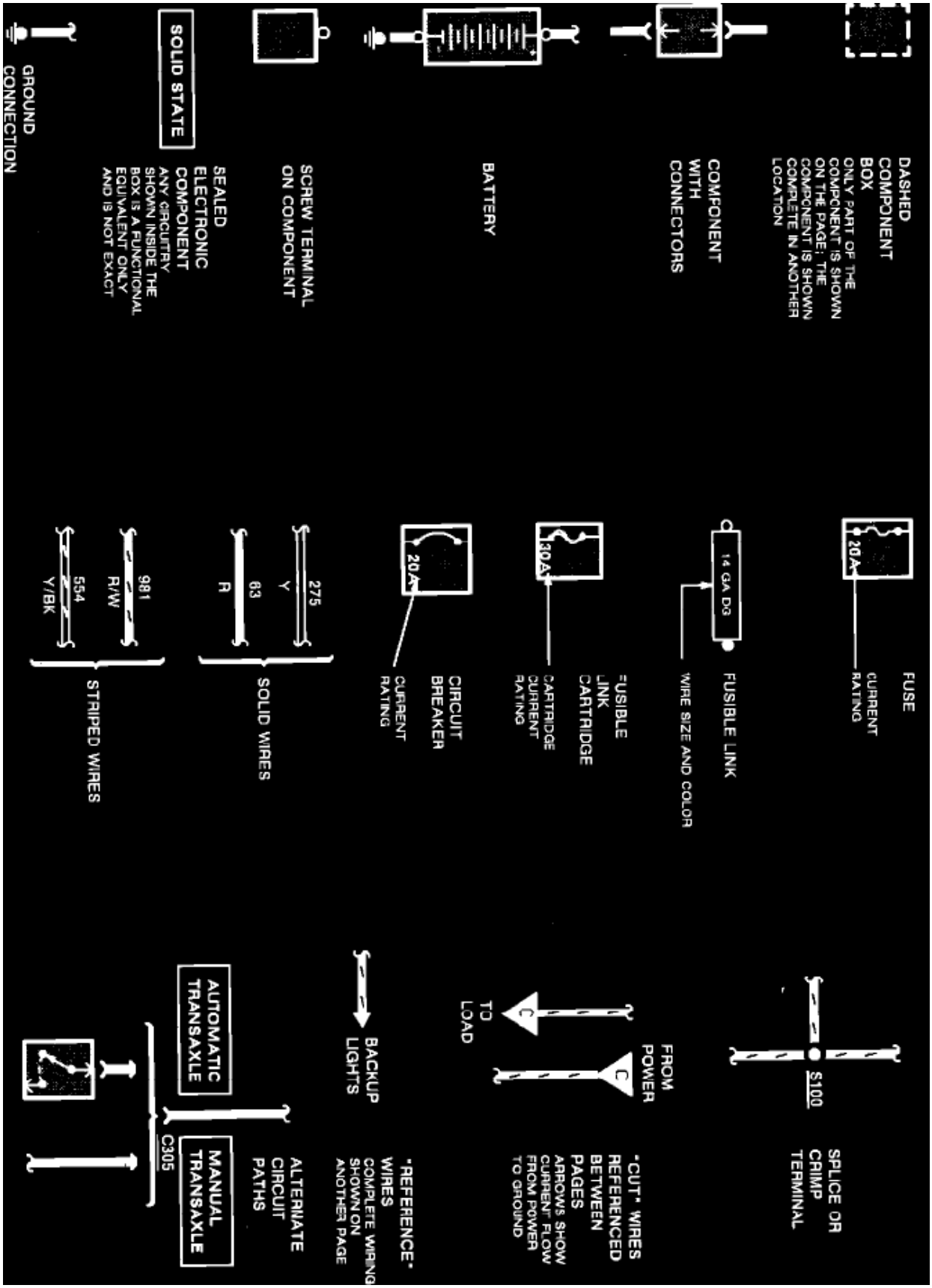
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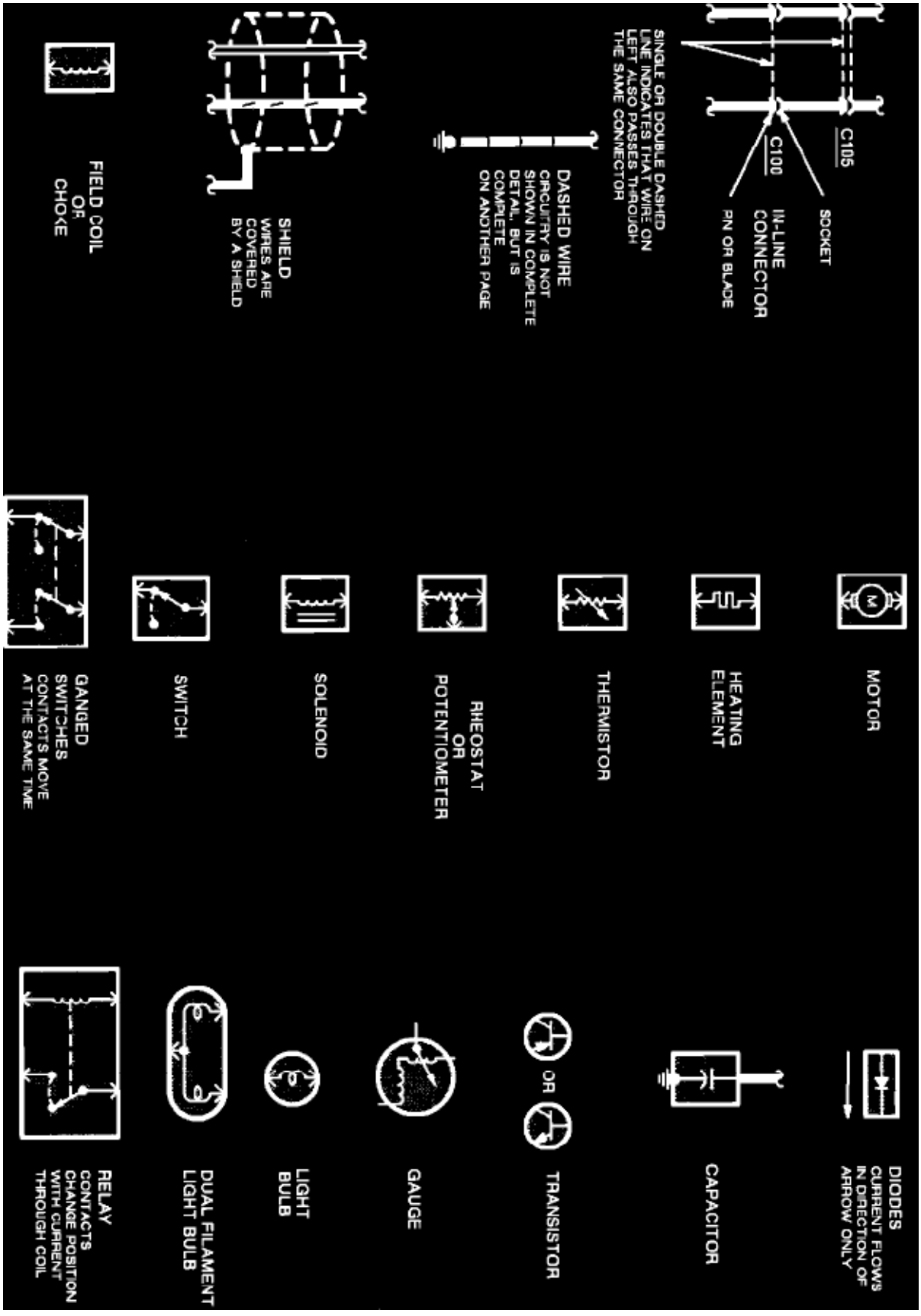
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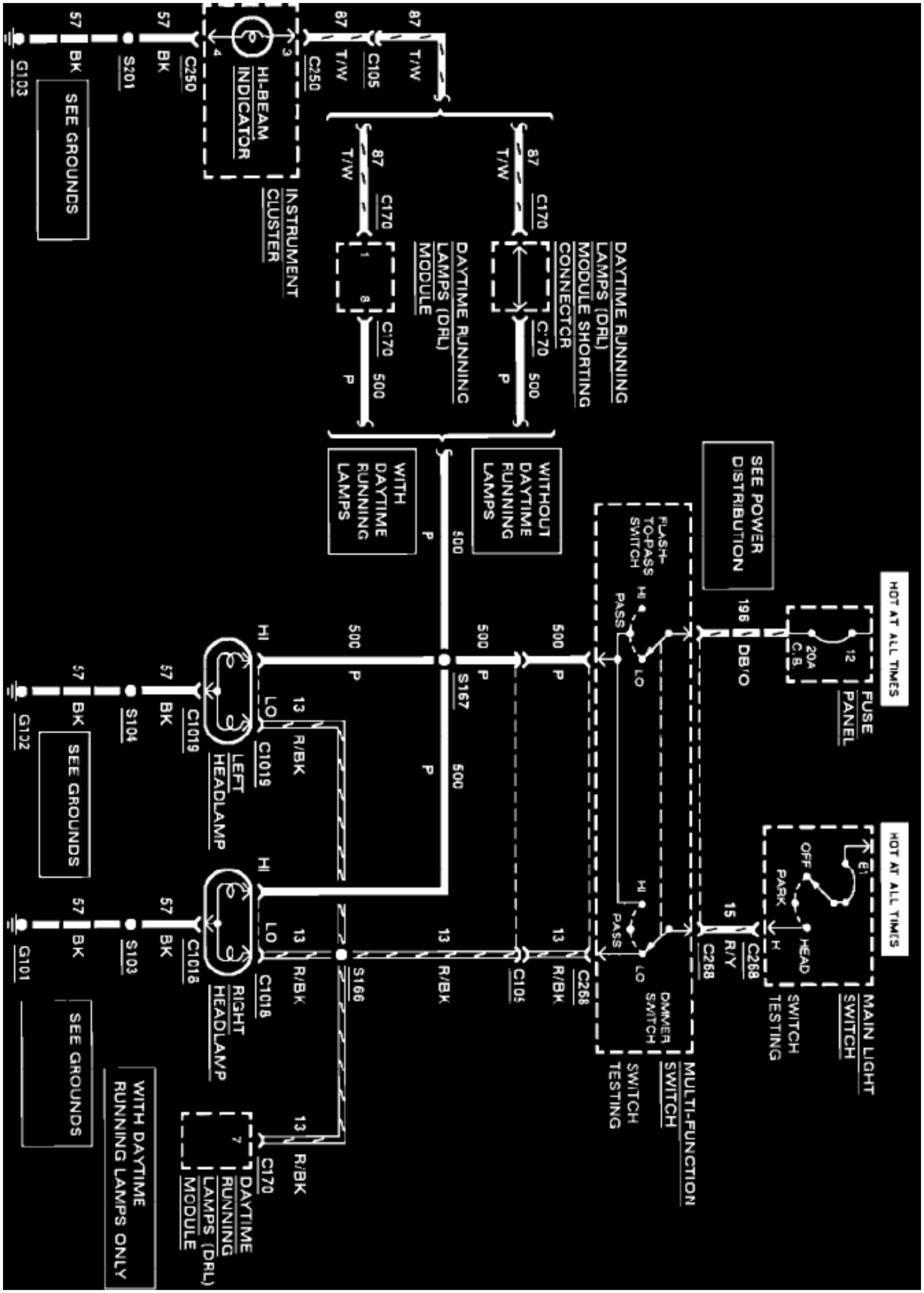
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57
BK
G103
G122
G101
SEE GROUNDS
WITH DAYTIME RUNNING LAMPS ONLY
DAYTIME RUNNING LAMPS (DRL) MODULE

Headlamps

Headlamp Dimmer Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

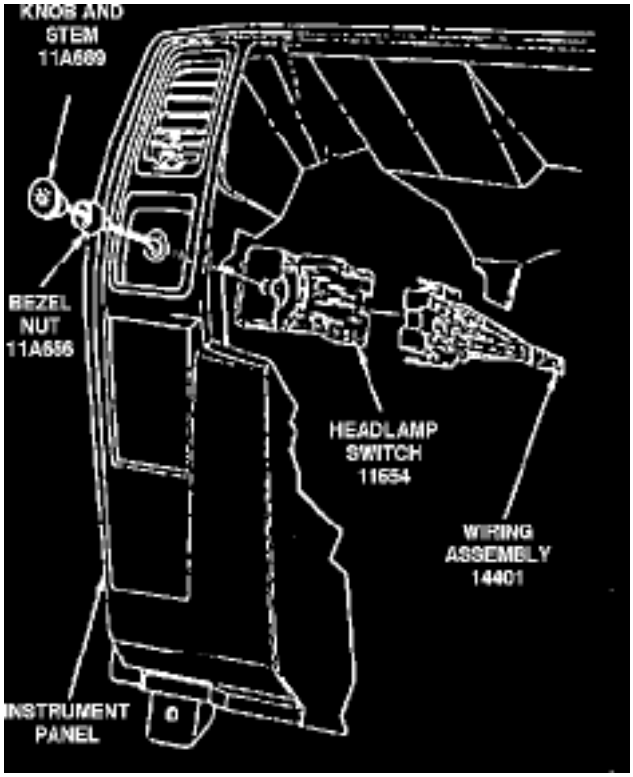
6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

10. Check multi-function switch and steering column for proper operation.



Headlamp Switch: Service and Repair

Fig. 11 Headlamp Switch Replacement.

1. Disconnect battery ground cable, remove ash tray assembly and two finish panel retaining screws, then the finish panel (snaps off).

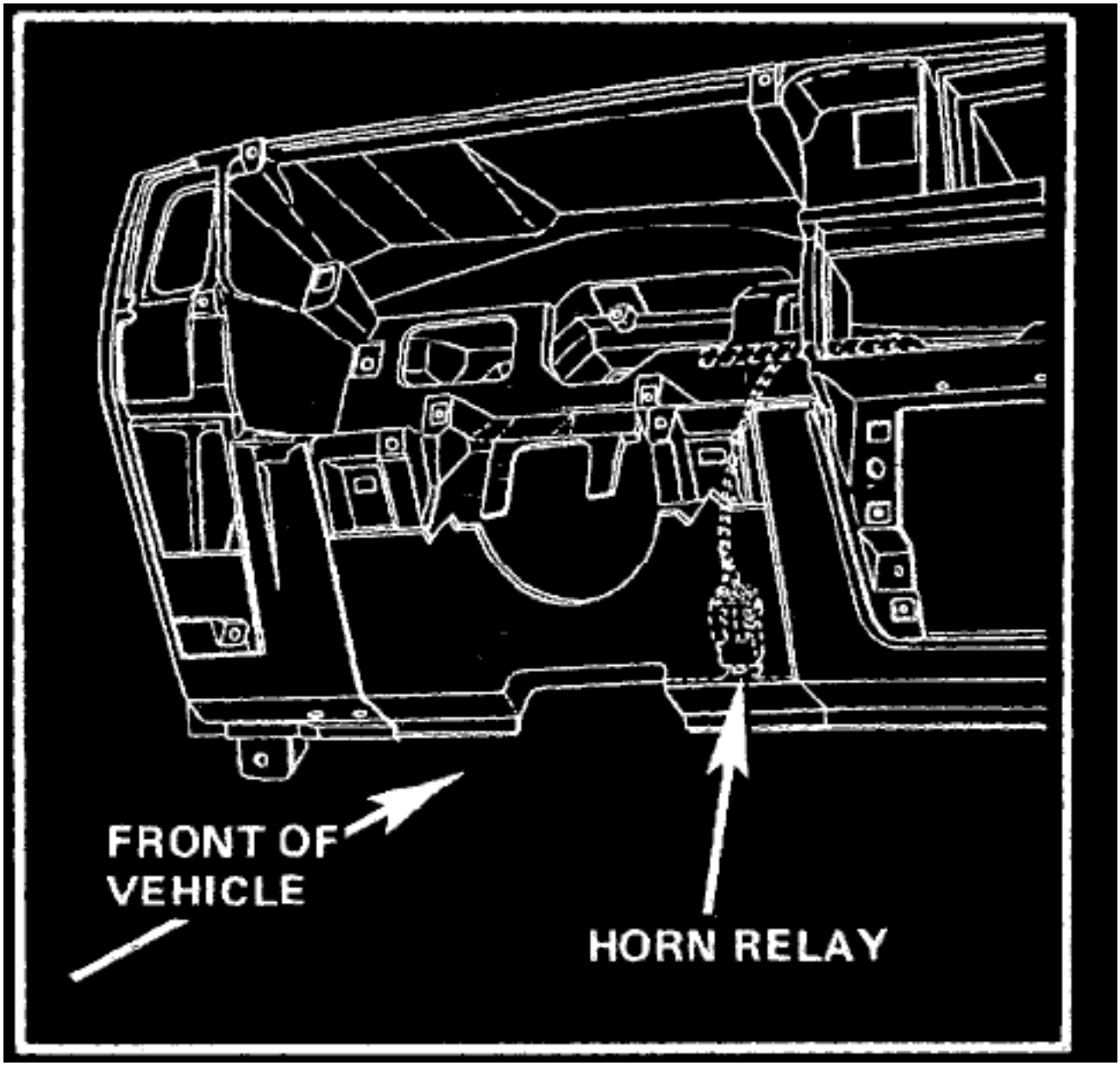
2. On Bronco II or Explorer models, remove rear window wash/wipe and heated backlit switch assembly (snaps out).

3. On Ranger models, remove storage bin (snaps out).

4. On all models, pull headlamp switch knob to ON position, then depress shaft release button on switch and remove knob and shaft assembly, Fig. 11.

5. Remove bezel nut, pull switch down through opening, disconnect electrical connector, then remove switch.

6. Reverse procedure to install.



Horn Relay: Locations

The horn relay is located behind the lower left side of the instrument panel, to the right of the steering column. It is attached to the speed control amplifier bracket. Vehicles not equipped with speed control do not use a horn relay.

Horn Relay: Testing and Inspection

Connectors should remain connected during following test.

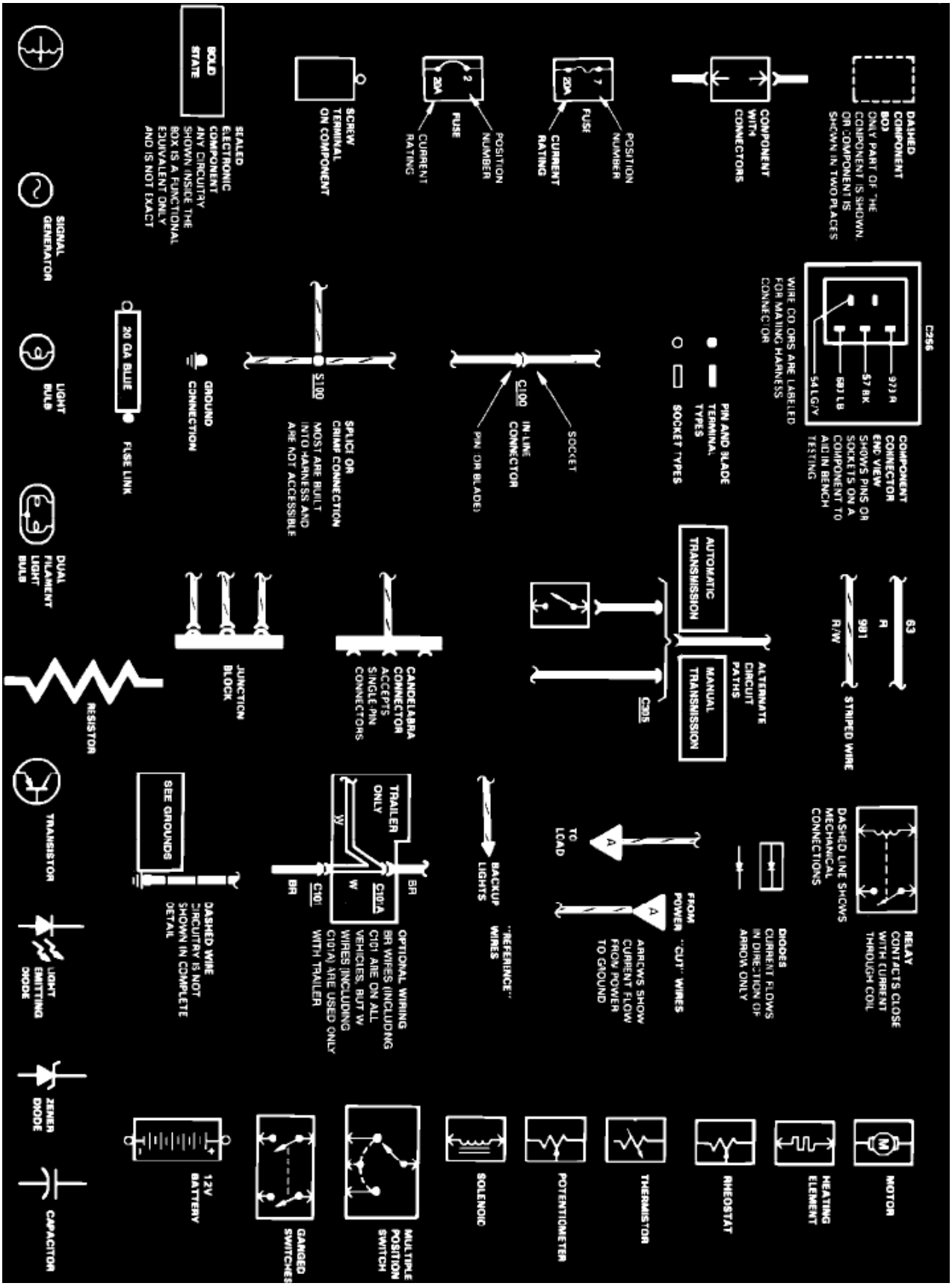
1. Measure voltage between circuit 460 (yellow/light blue) and ground. If 12 volts are not indicated, check fuse F20A and repair or replace as required.

2. If circuit 460 (yellow/light blue) is as indicated, depress horn switch. Voltage at circuit 460 (horn relay terminal No. 4) should drop to about zero volts and horn should sound. If horn does not sound and circuit 460 remains at 12 volts, proceed to step 3.

3. Check for 12 volts at circuit 6 (yellow/light green) at horn relay terminals No. 2, if voltage is not present, replace relay, then repeat step 2.

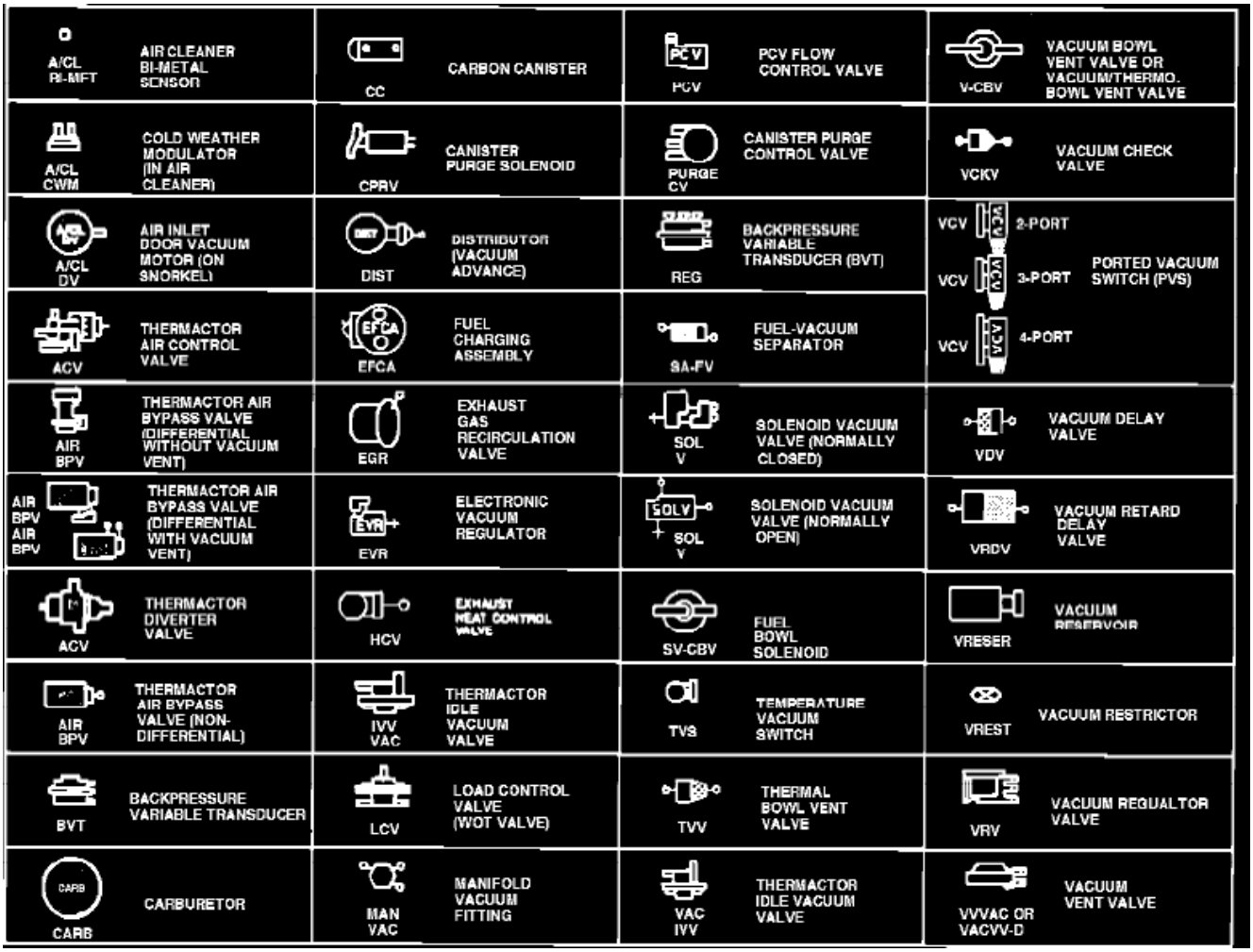
4. If 12 volts are indicated at horn relay terminal No. 2, connect terminal No. 2 to ground. If horn sounds replace horn pad or buttons. If horn does not sound, check for 12 volts at circuit 1 (dark blue) at horn relay terminal No. 3 with terminal No. 2 grounded. If voltage is not indicated, replace relay and repeat step 2. If voltage is indicated, check horn connectors and function.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Marker Lamp > Component Information > Diagrams > Diagram Information and Instructions

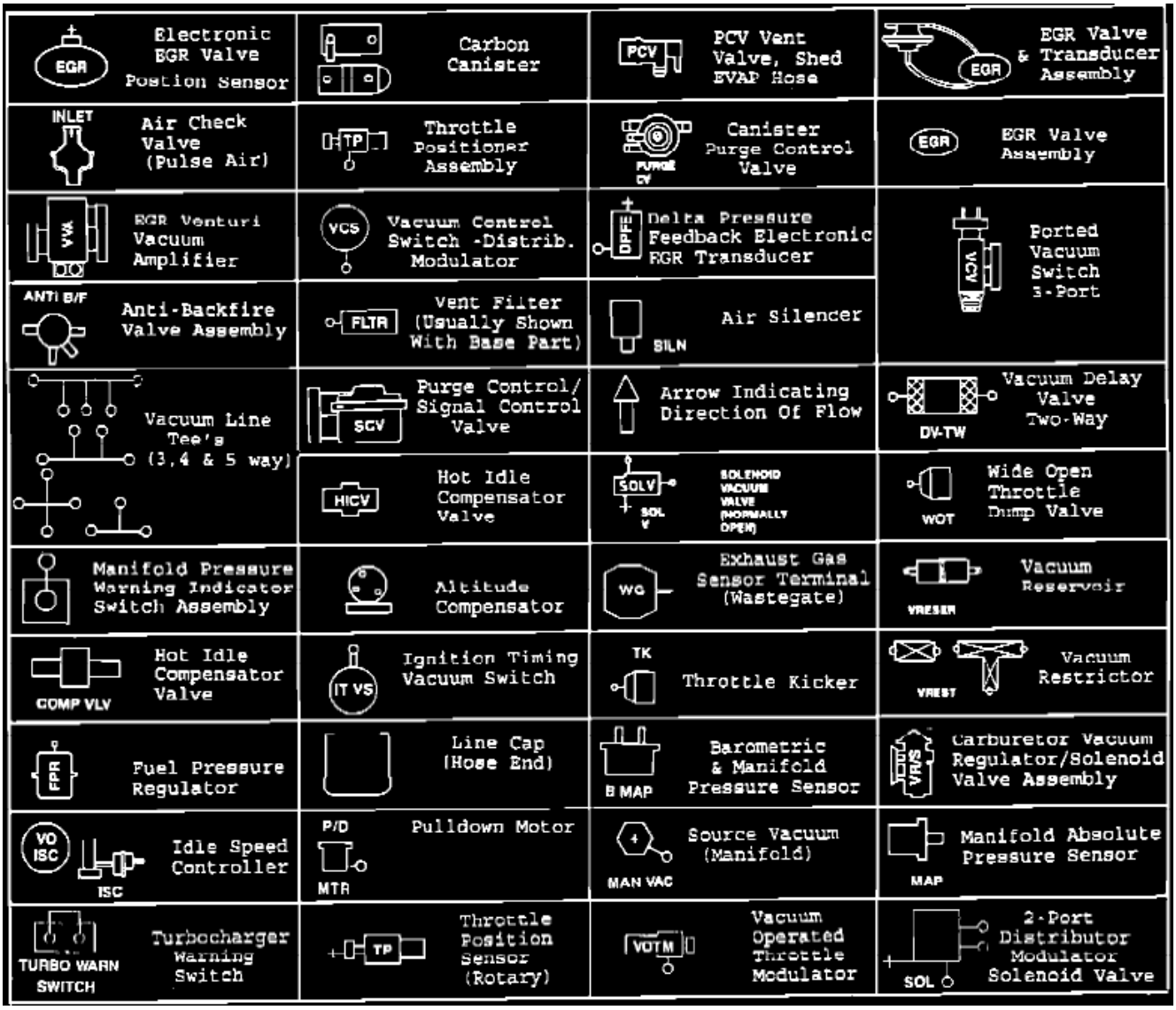


Marker Lamp: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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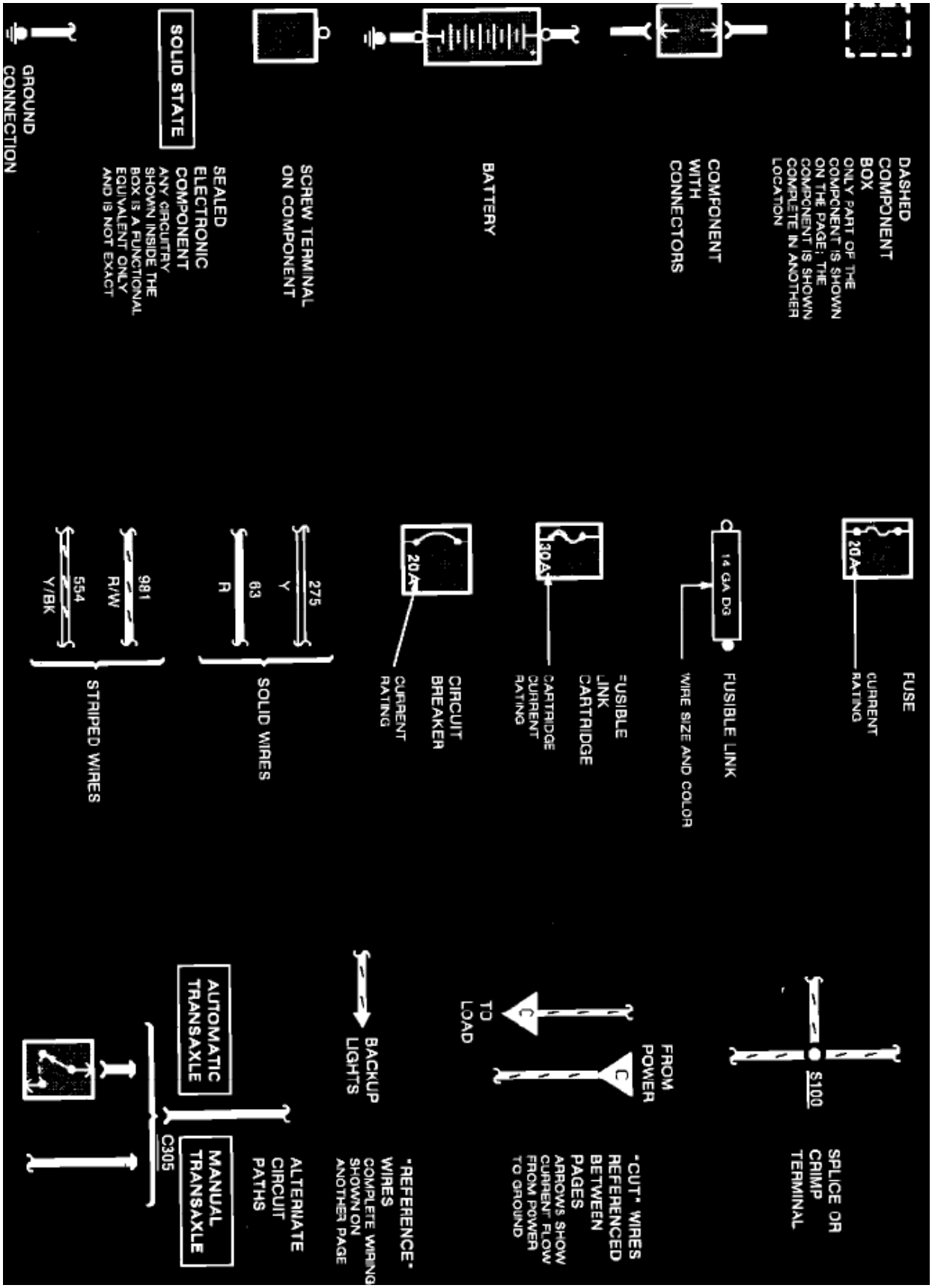
DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
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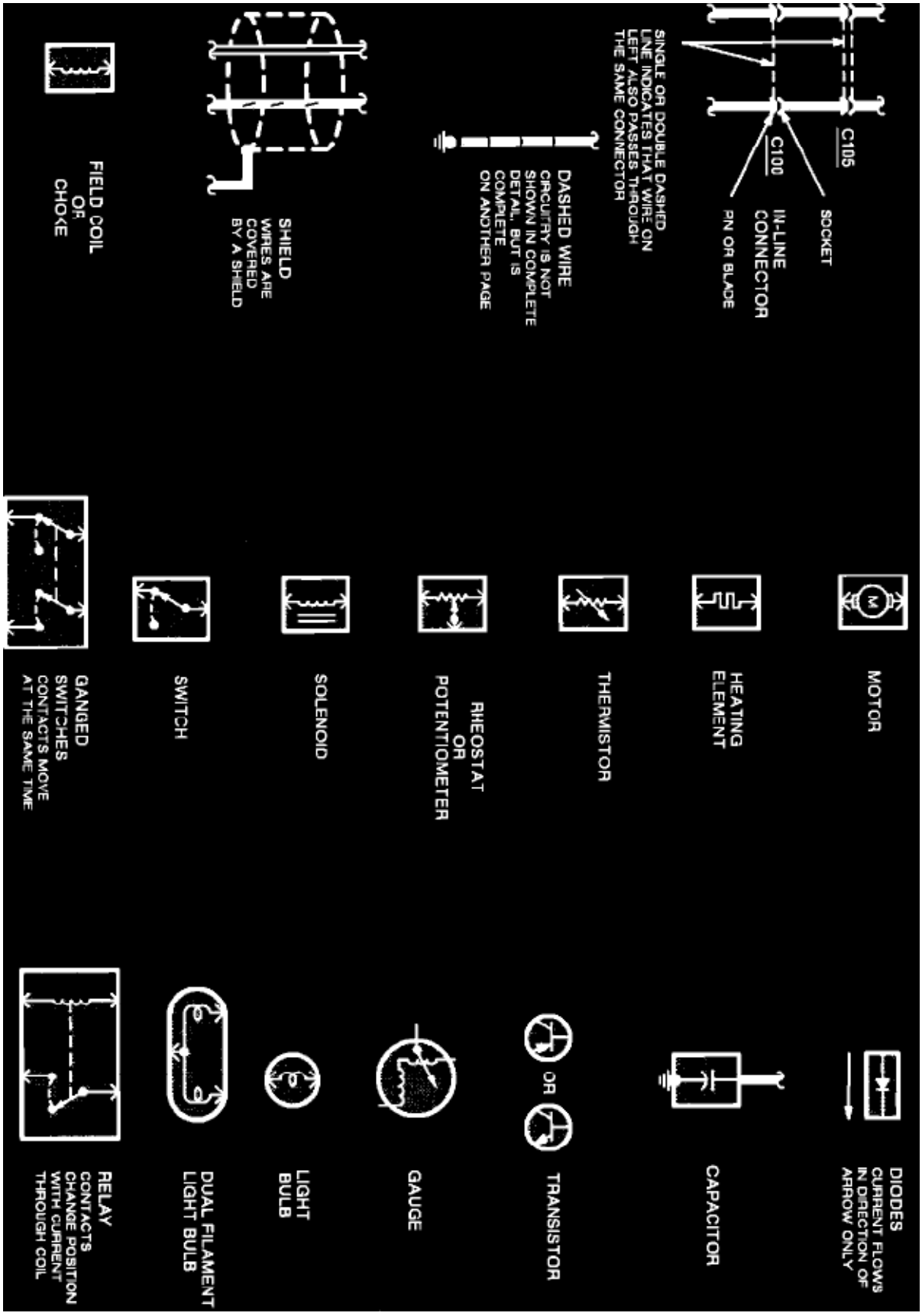
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
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OR
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CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

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PK: Pink R: Red

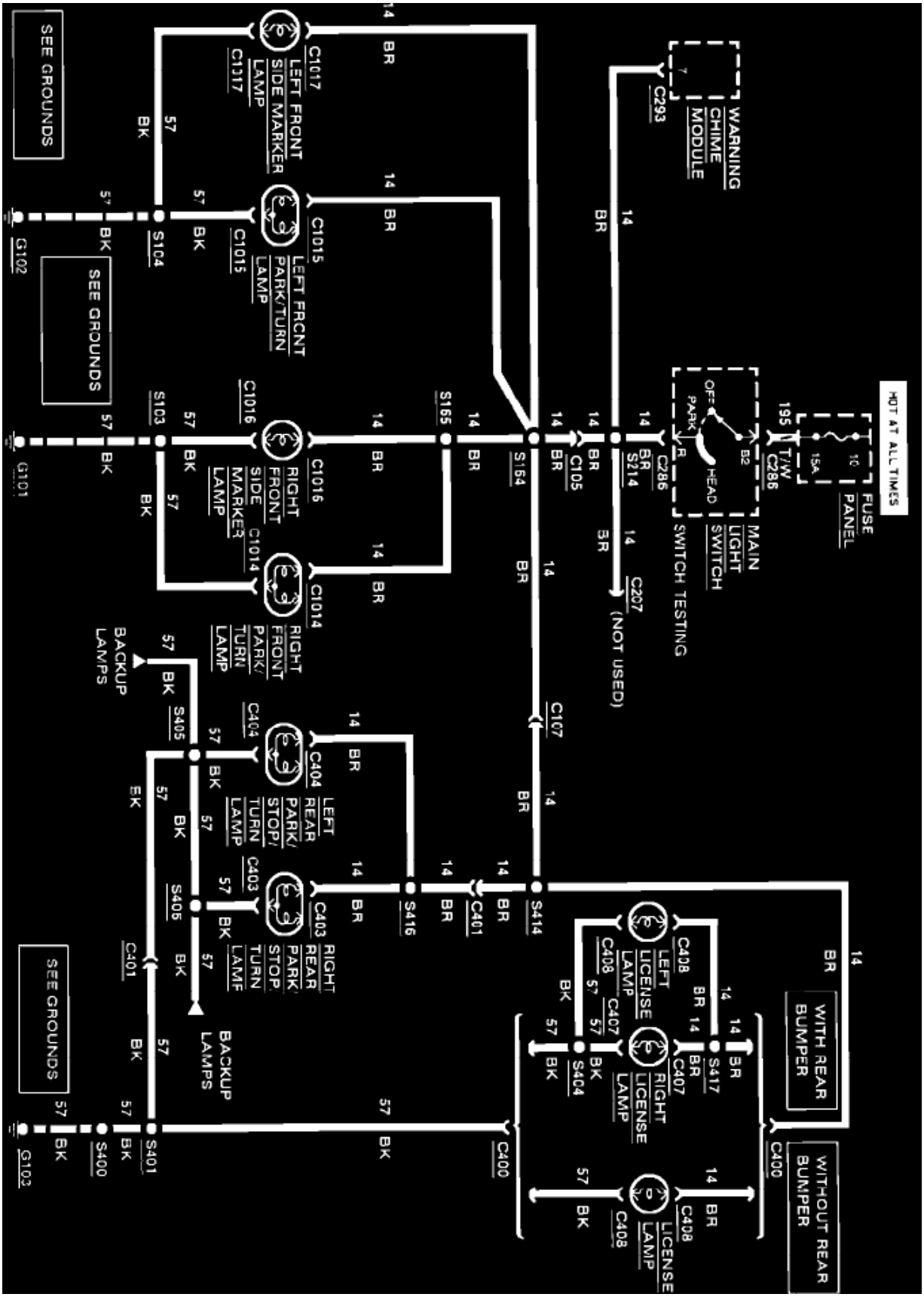
P: Purple

T: Tan

V: Violet

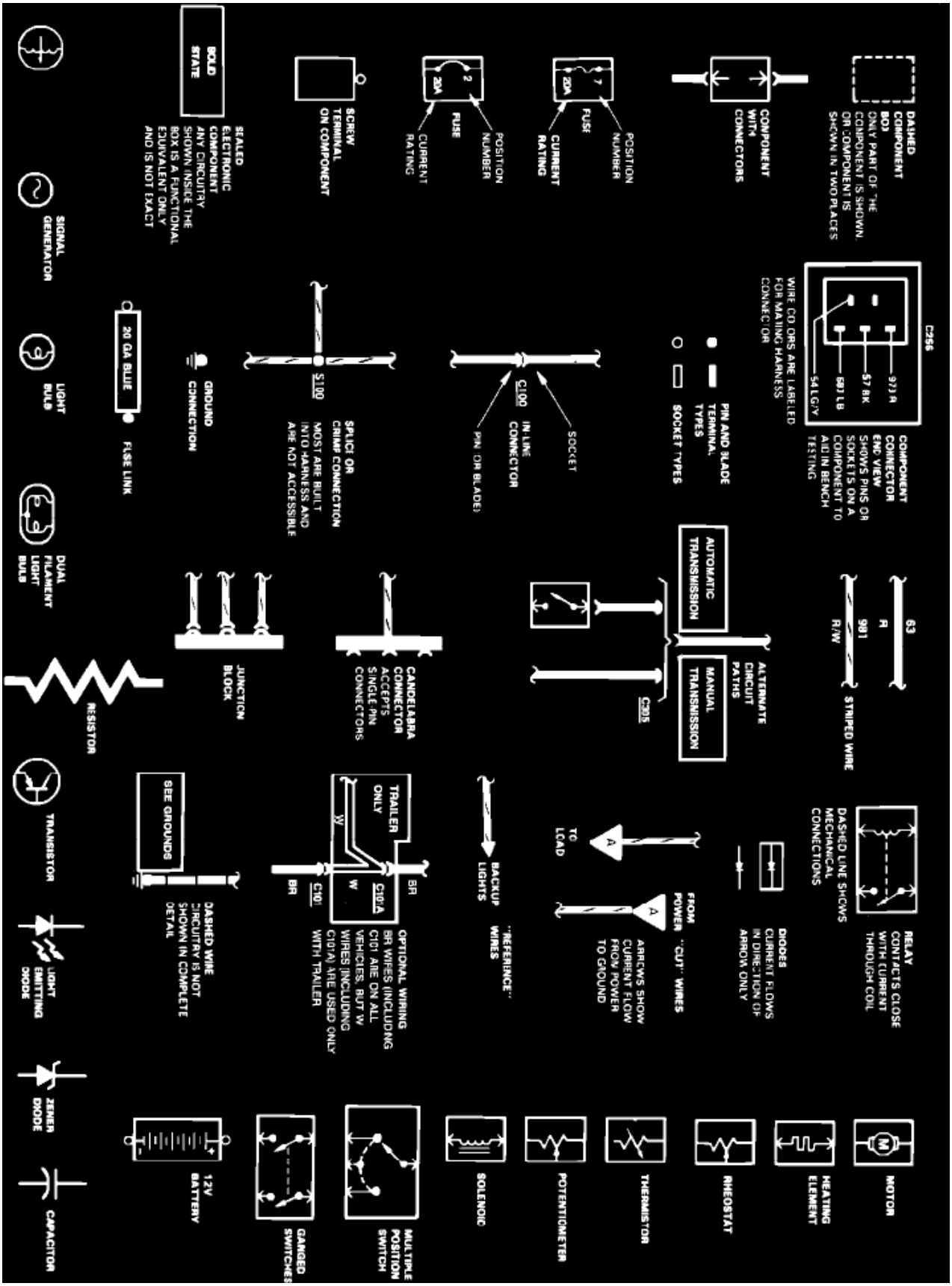
W: White

Y: Yellow


HOT AT ALL TIMES
FUSE PANEL
15A
195 T/W
C286
OFF
PARK
HEAD
B2
MAIN LIGHT SWITCH
SWITCH TESTING
WARNING CHIME MODULE
C293
S214
C207
(NOT USED)
S154
C105
C107
S165
C1017
LEFT FRONT SIDE MARKER LAMP
C1317
C1015
LEFT FRONT PARK/TURN LAMP
C1016
RIGHT FRONT SIDE MARKER LAMP
C1014
RIGHT FRONT PARK/ TURN LAMP
S104
S103
G102
G101
SEE GROUNDS
BACKUP LAMPS
C404
LEFT REAR PARK/ STOP/ TURN LAMP
C403
RIGHT REAR PARK/ STOP/ TURN LAMP
S405
S406
S416
C401
S414
C400
WITH REAR BUMPER
WITHOUT REAR BUMPER
S417
C407
C408
LEFT LICENSE LAMP
RIGHT LICENSE LAMP
S404
S401
S400
BR
BK
EK
14
57

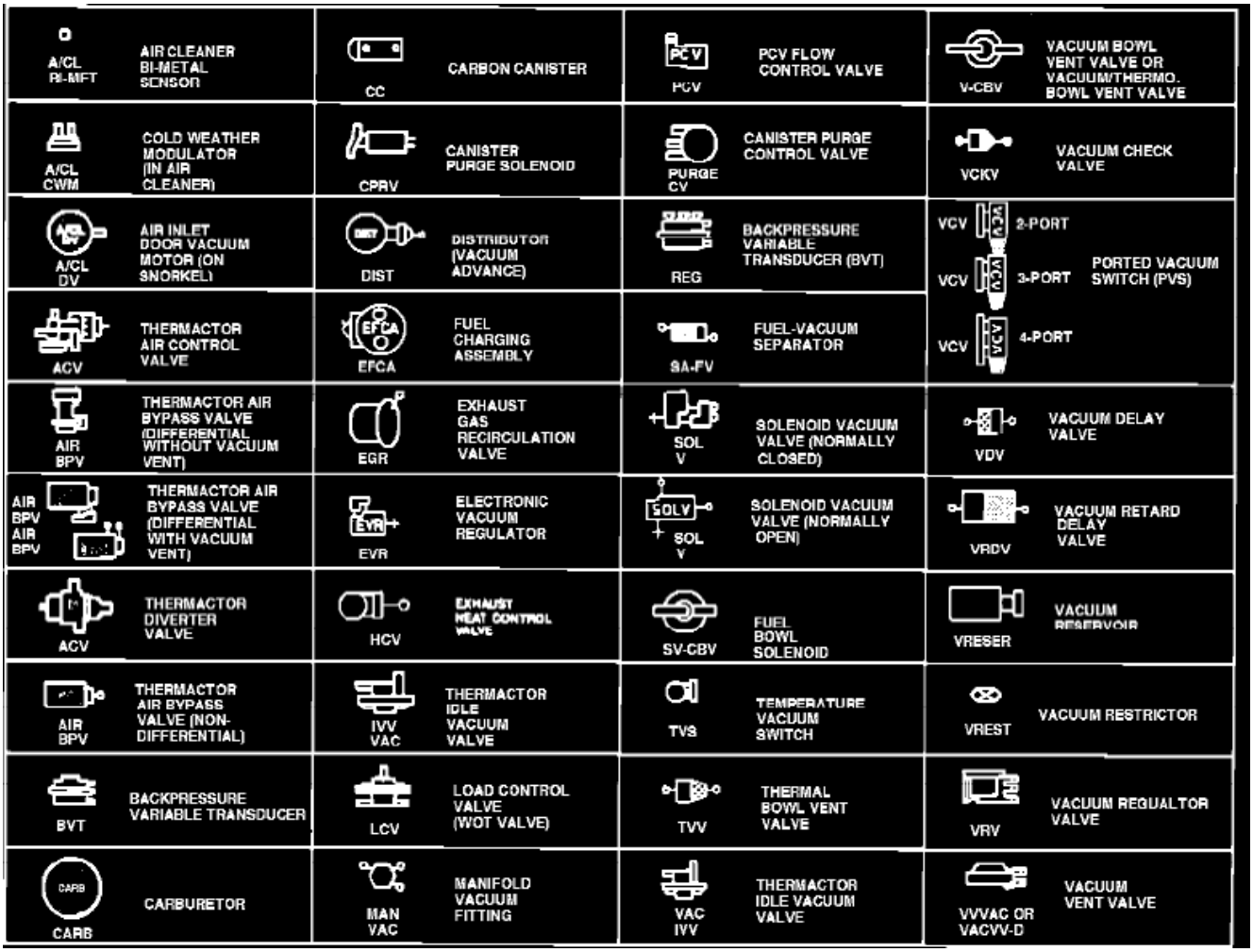
Exterior Lamps

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Parking Lamp > Component Information > Diagrams > Diagram Information and Instructions



Parking Lamp: Diagram Information and Instructions

Symbol Identification



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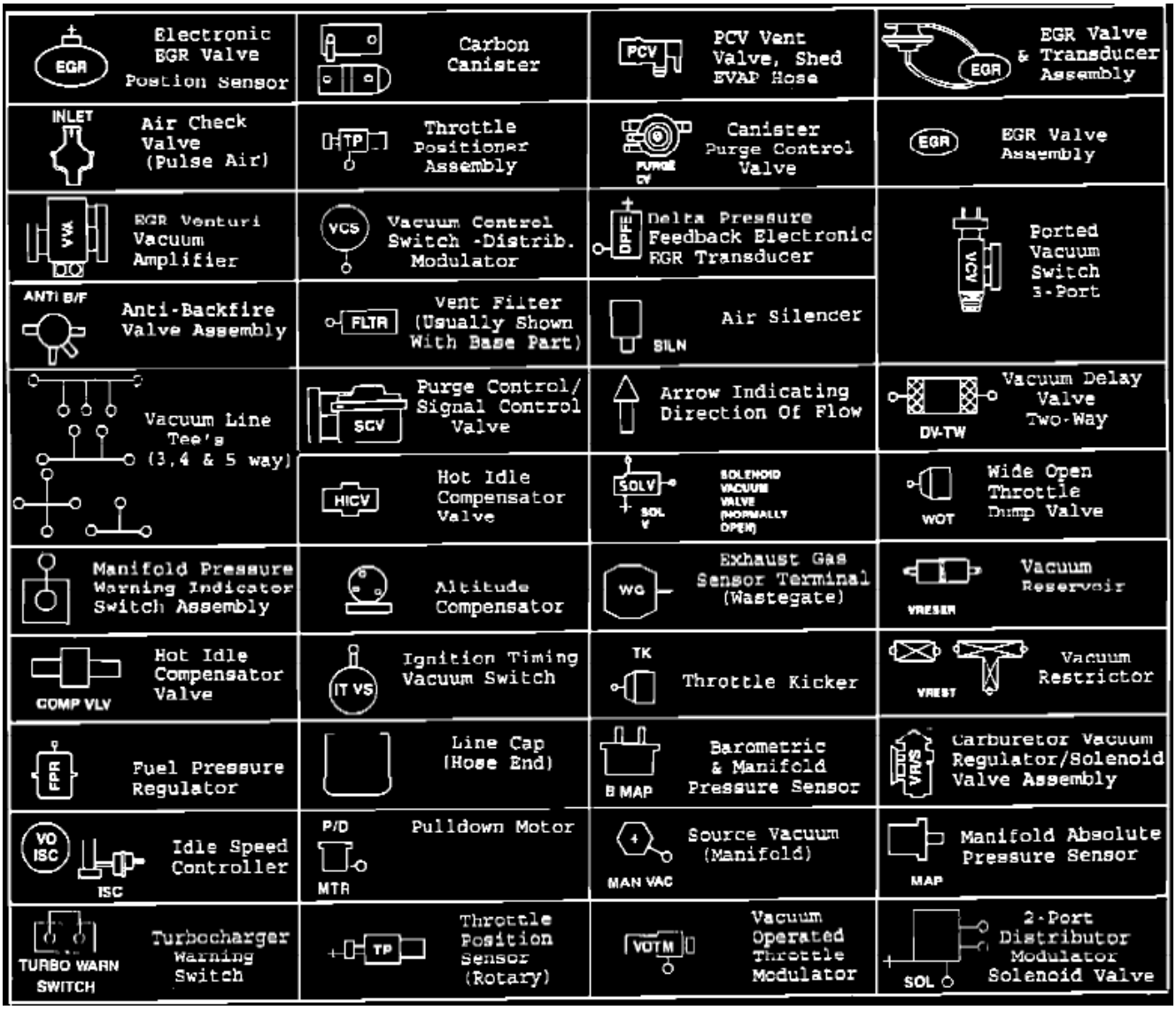

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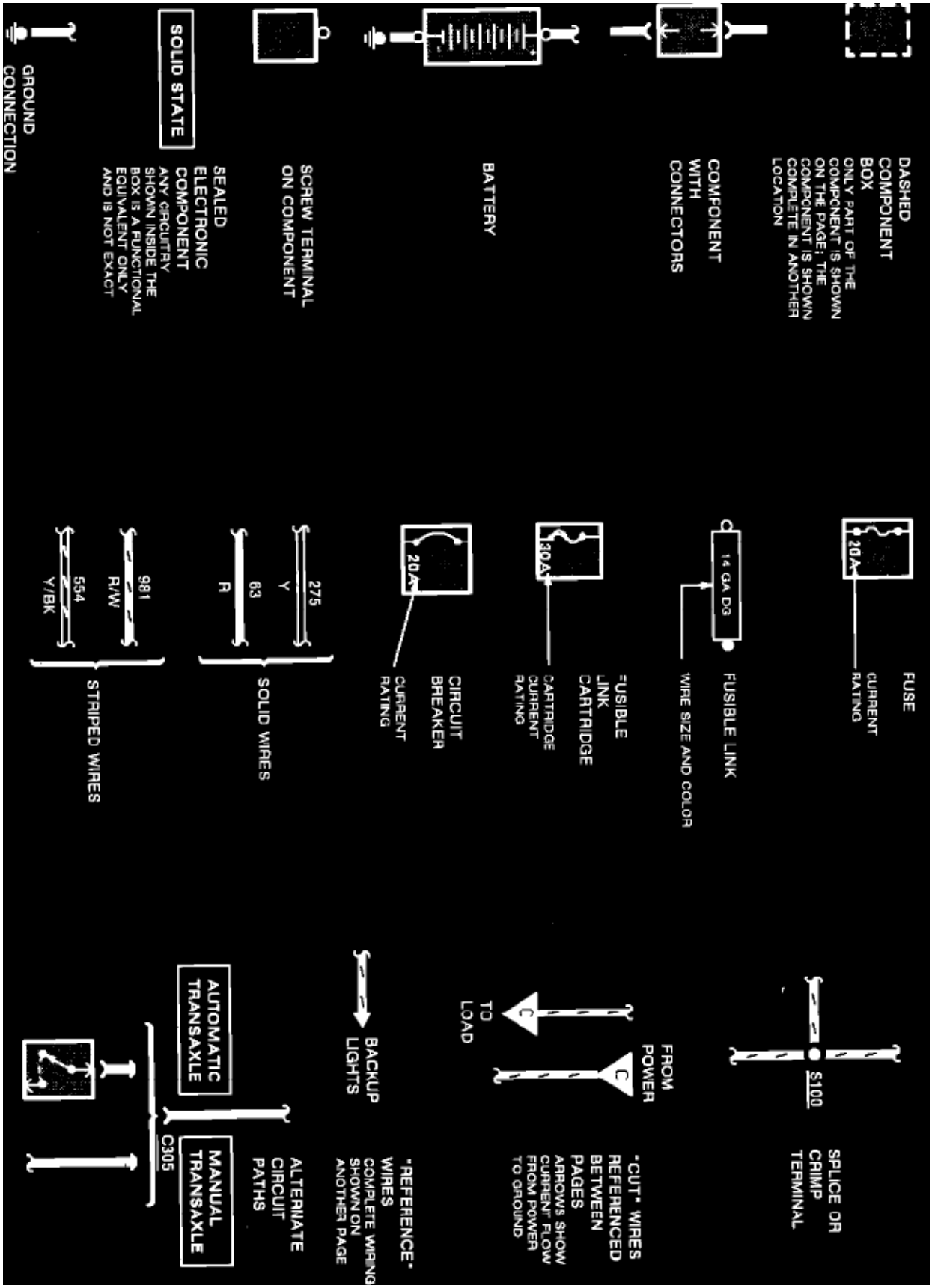
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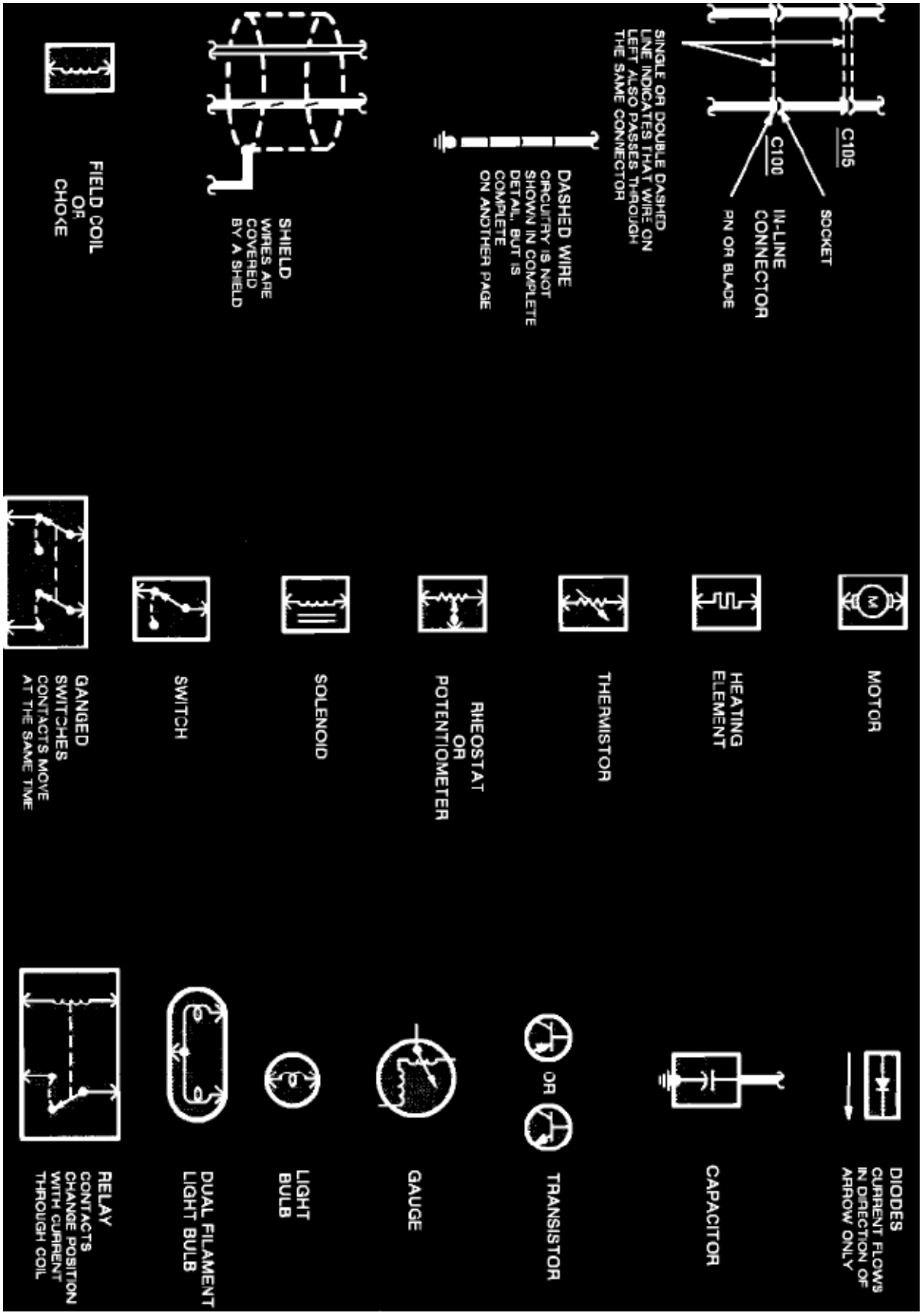
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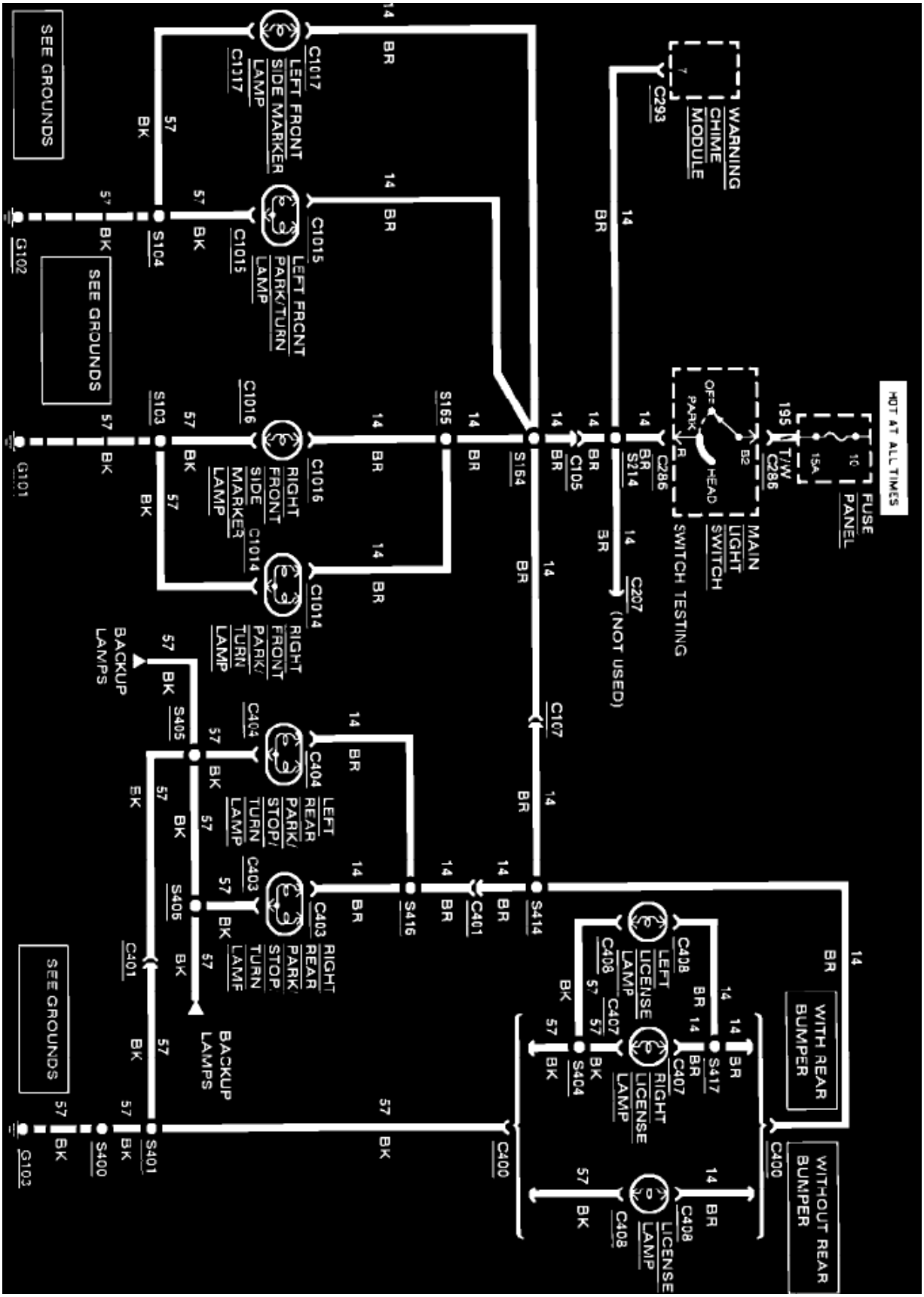
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S154
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C107
S165
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S406
S416
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S414
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C408
LEFT LICENSE LAMP
RIGHT LICENSE LAMP
C407
S404
S417
C400
S401
S400
BR
BK
EK
14
57

Exterior Lamps

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Relays and Modules - Lighting and Horns > Daytime Running Lamp Control Unit > Component Information > Technical Service Bulletins > Recalls for Daytime Running Lamp Control Unit: > 92M78 > Jan > 92 > Campaign - Running Light Module, Extended Coverage

Campaign - Running Light Module, Extended Coverage

92M78

OWNER NOTIFICATION PROGRAM

Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

Dealer Letter

Attachment I ^

Administrative Information

^ Refunds

Attachment II ^

Labor Allowances Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

^ Daytime Running Lamp Module Locations

Customer Notification Letter

Attachment I - Admin. and Refund Information

Administrative Information

OASIS OASIS will not contain this Owner Notification Program. Verify through OASIS if a vehicle, involved in this program, has any other outstanding Recalls or Programs. Complete all uncompleted Recall and Program service actions during a single visit by the owner.

Promptly Perform Program On: Affected vehicles with the program condition which are brought to your dealership.

Dealership Responsibilities Promptly perform this program service, if required, on all eligible vehicles. Promptly report to the "Customer Assistance Centre" at Oakville any instance in which an owner will not allow you to complete this program because of objections in scheduling or for any other reason. Advise the Company of any vehicle's ownership status change (refer Warranty and Policy Manual - Section 3.3).

Reimbursement For Program Completion And Claims Preparation Instructions Claim reimbursement through the Direct Warranty Entry (DWE) system using the RECALLS screen only (PF3 Recall Entry/Retrieval on the DWE Menu Screen). If the claim number contains more than six digits, enter only the last six digits.

NOTE:

Claim Form 1864 is no longer mailed to owners. Use a Form 6125-2, an authorized computer generated claim form or a Form 1864 as an internal repair order to support DWE Entry through the RECALLS screen. Ensure that only the RECALLS screen is used when inputting completion and reimbursement information.

Dealers without DWE capability must mail a completed Form 1864 (Company Claim Copy No. 2) to Warranty Claims Processing at Oakville for reimbursement. Forms submitted must show labor times, all parts used and their costs, the parts handling allowance, and be imprinted, dated and signed by authorized dealership personnel. All claims must show 92M78 in the Recall box.

Refunds Refund requests must be submitted on a separate claim from the program completion claim. Refund requests are governed by the following guidelines:

^

Refunds are provided only for dealer and/or owner-paid repairs directly related to this program (DRL module replacement only - parts and labor) and performed within the program coverage provision. The original copy of the paid repair order or parts invoices must be presented to any Ford or Mercury dealership.

^ Using the DWE Recall Screen, enter the following:

Administrative Allowance ..... 0.3 Hrs. Labor Code.....A Recall Code.....R92M78 Enter "REFUND INV # _____ " in the area on the claim designated for PARTS USED. Enter the owner refund amount as a "MISCELLANEOUS" cost. ^

Provide prompt refund to all eligible owners having proper documentation regardless of the source of the original service.

^ Retain the copy of the paid repair or parts invoice with a copy of the refund request in your service file for reference.

^ Dealers without DWE capability must mail their refund requests on a separate completed Form 1864 with the owner's original paid repair order or parts purchase receipt to Warranty Claims Processing. Enter the 0.3 Hrs. in Box A and "R92M78" in the Recall box of the Form. Include all amounts in the TOTAL CLAIM box.

Attachment II - Labor and Parts Information

Labour Allowance Replace DRL Module (Includes Verification of DRL System Function).

VEHICLE LINE LABOR TIME LABOR CODE

Thunderbird, Cougar, Tempo, Topaz, Escort, Mustang, 0.3 Hrs. B

Ranger, Explorer and Econoline.

Taurus, Sable and Medium/Heavy F-Series Cab 0.5 Hrs. B

All Other Involved Vehicles 0.4 Hrs. B

Parts Ordering Information DRL modules will not be direct shipped for this Program. Order required parts through your Servicing Parts Distribution Centre.

PART NUMBER VEHICLE APPLICATION

FOVY-15A272-A ^ 1991 Cougar

E9SZ-15A272-B ^ 1989-90 Cougar

^ 1989-91 Thunderbird

FODZ-15A272-B ^ 1990 Escort

^ 1990-91 Taurus/Sable, Tempo/Topaz, Mustang, Econoline,

^ Aerostar, Ranger, Bronco II, Bronco, F-Series Light Trucks

^ (150-250-350), F-Super Duty and Explorer

FOHZ-15A272-A ^ 1990-91 Medium/Heavy Trucks (with single headlights)

Attachment III - Tech. Instruct./Daytime Lamp Module Locations

Technical Instructions

Correction of wiring connections and/or replacement of burned out fuses and bulbs is not covered by this program.

Description of Daytime Running Light (DRL) System Operation

The DRL System is designed to turn the Hi beam headlights ON with a reduced light output, and without illuminating the high beam indicator lamp in the instrument panel when the following conditions are met: ^

The vehicle is running.

^ The parking brake is fully released.

^ The headlight switch is in OFF position.

NOTE:

If the vehicle is equipped with an automatic lighting system, the DRL System is active until the automatic system turns on the headlights.

DRL Module Removal and Installation Procedure (Refer to Daytime Running Light Module Location Table.) Refer to the Vehicle's 1990 or 1991 Shop Manual, Section 32 "Lighting System", for Removal and Installation instructions. Mutilate and scrap the removed DRL module.

NOTE:

For the 1989 Thunderbird and Cougar cars refer to the 1990 Model Year Shop Manual.

After Installing The Replacement DRL Module Verify DRL System Function As Follows Ensure the vehicle's road wheels are blocked to preclude inadvertent vehicle movement. ^

Manual transmission in NEUTRAL.

^ Automatic Transmission in PARK. (Neutral on Heavy Trucks with Allison automatic.)

1. Parking brake applied and headlight switch OFF, start engine.

^ The headlights (Hi or Lo beam) should not be illuminated.

2. Parking brake released and headlight switch OFF, engine running.

^ The high beams should be ON at reduced intensity.

NOTE:

A comparison check for full intensity can be made using flash-to-pass or by putting headlight switch ON and switching to high beams.

a. Turn on Park Lights.

The high beams should be ON at reduced intensity.

The high beam indicator should NOT be ON.

b. Turn on headlights (LOW BEAMS).

The low beams should be ON at full intensity. The high beams should be OFF. The high beam indicator should NOT be ON.

c. Turn on headlights (HIGH BEAMS).

The high beams should be ON at full intensity. The high beam indicator should be ON.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Daytime Running Light Module Locations

1989 MODEL YEAR (CARS/LIGHT TRUCKS) LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

1990-1991 MODEL YEAR LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

Tempo/Topaz Inside on the RH side radiator support, vertically mounted below radiator cap.

Ford Mustang Under the LH front fender apron, directly below the battery.

Taurus/Sable On the LH front fender apron, directly under the battery. (Remove LH side fender liner for access.)

Ford Escort (1190 MY Only) On the RH side of the radiator support.

Ranger/Bronco II/Explorer Inside on the LH side radiator support, at top near washer fluid reservoir.

F-Series Light Truck/Super Duty/Bronco Inside the LH radiator support below the horn assembly.

Aerostar Inside the LH front fender apron, behind the battery.

Econoline Inside the LH radiator support.

1990/91 MEDIUM/HEAVY TRUCK SERIES LOCATION

"F" (Cab and Cowl) Behind RH side instrument panel.

"C" Behind RH side instrument panel.

"CL" (Single Headlights) Behind instrument panel RH side.

"CF" (Cargo) Under hood beside windshield washer bottle.

"L" Inside engine compartment left side bulkhead.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Dealer Letter

To: All Ford of Canada Dealers

Attention: Dealer Principal, Service Manager, Parts Manager

Subject: Owner Notification Program 92M78 - Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

In OASIS NO

Listings NO

Return Removed Parts NO (Mutilate and Scrap). Program Coverage Available for 36 months or 60,000 kilometers, whichever occurs first, from original warranty start date or through July 31, 1992, whichever provides greatest coverage.

Refund Provisions YES

NOTE:

Please read and circulate this bulletin to your Service and Parts Personnel. They should become familiar with this program and be able to respond to owner inquiries.

Vehicles Affected

^ All 1989-90-91 Thunderbird and Cougar

^ All 1990 Escort

^ All 1990-91 Taurus, Sable, Tempo, Topaz, Mustang, Econoline, Aerostar, Bronco, F-Series Light Trucks, F-Super Duty, Ranger, Bronco II, Explorer and Medium/Heavy Trucks (except LL/LTL and CL with quad rectangular headlights)

Reason For This Program The Daytime Running Lights (DRL) control module may malfunction. A malfunctioning DRL module can result in Daytime Running Lights that dim, flicker or go off and in some instances may remain on after the ignition is turned OFF. Normal manual Lo and Hi beam headlight operation is not affected.

Service Action Replace the Daytime Running Light (DRL) module if the customer is experiencing any of the above described symptoms.

NOTE:

Replacement of headlight bulbs or sealed beams is not covered by this program.

Refunds If all or a portion of the repair covered by the program (DRL module replacement only - parts and labor) has been paid by the owner and/or the dealer, within program coverage provisions, both the owner and/or the dealer are eligible for a refund. Company Contacts: (Dealer use only)

CONCERN NATURE CONTACT ACTIVITY

Technical Technical Assistance Hotline for your Region

Claiming Procedures Warranty Claims Hotline for your Region

Owner Concerns Customer Assistance Centre Hotline for your Region

General Administrative Christine Murray - Recall Administrator

^ Telephone: (416) 845-2511 Ext. 1495

^ Facsimile: (416) 845-7069

Attachments

Attachment I ^

Administrative

^ Refunds

Attachment II ^

Labor Allowance Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

Owner Letter

Mailing Date

Mr. John Sample 123 Main Street Anywhere, Prov. ANA NAN Ford Motor Company of Canada, Limited (Ford) is providing an Extended Coverage Program, number "92M78", for the Daytime

Running Lights (DRL) control module. This Program provides extended coverage to owners of certain 1989 through 1991 Model Year cars and trucks. Our records show you own the 19xx (vehicle) with the serial number shown above your name and address.

Reason For This Program And Program Period: Ford is extending the coverage for the Daytime Running Lights module in your vehicle.

This extended coverage will be provided for 3 years or 60,000 kilometers, whichever occurs first, from your vehicle's Original Warranty Start Date, or until July 31, 1992, whichever gives you the

greater coverage.

Description Of DRL System Operation: The DRL System is designed to turn the Hi beam headlights ON with a reduced light output. This is accomplished when the following conditions are met: ^

the vehicle is running.

^ the parking brake is fully released.

^ the headlight switch is in OFF position.

Symptoms Of Abnormal DRL System Operation: Symptoms associated with an improperly operating DRL module, normally include reduced, flickering or no DRL illumination. In some instances, the DRL may remain on when the ignition is turned OFF. Normal Lo and Hi beam headlight operation is not affected.

No Cost Service: Should you encounter symptoms such as described above, contact your Ford or Mercury dealer. Your dealer will replace the DRL control module on your vehicle under the terms of this program at no cost to you.

NOTE:

Headlight bulb or sealed beam replacement is not covered by this program.

How Long Will It Take? The time needed for this service is less than one hour. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call Your Dealer: Call your dealer should your vehicle experience any of the above described conditions. Ask your dealer for a service appointment and if parts are in stock. Also ask your dealer to check the OASIS system for any other recalls or programs that may be required on your vehicle. If you have leased this vehicle to another person or organization, please immediately inform the lessee of the program. When you bring your vehicle in, show the dealer this letter. If you lose the letter your dealer will still do the work, free of charge.

Refunds: A full refund is available if you paid for the service covered by this Program (Daytime Running Light Control Module replacement only - parts and labor). Please give the original copy of your paid work-order or parts receipt to your dealer. Your dealer will arrange for the refund (which could take about one month).

Changed Name, Address, Or Sold The Vehicle? If you have changed your name or address, or have sold the vehicle, please fill out the enclosed prepaid postcard. Sign and date it, and mail the card to Ford. If you cannot get the service performed, contact the Ford "Customer Assistance Centre" at the address identified in the letterhead of this letter. Please identify your vehicle's serial number in any correspondence. We are taking this action as part of our efforts to ensure your long term satisfaction with the DRL feature in your vehicle. We hope this program will confirm your continued satisfaction with your Ford built vehicle.

Campaign - Running Light Module, Extended Coverage

92M78

OWNER NOTIFICATION PROGRAM

Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

Dealer Letter

Attachment I ^

Administrative Information

^ Refunds

Attachment II ^

Labor Allowances Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

^ Daytime Running Lamp Module Locations

Customer Notification Letter

Attachment I - Admin. and Refund Information

Administrative Information

OASIS OASIS will not contain this Owner Notification Program. Verify through OASIS if a vehicle, involved in this program, has any other outstanding Recalls or Programs. Complete all uncompleted Recall and Program service actions during a single visit by the owner.

Promptly Perform Program On: Affected vehicles with the program condition which are brought to your dealership.

Dealership Responsibilities Promptly perform this program service, if required, on all eligible vehicles. Promptly report to the "Customer Assistance Centre" at Oakville any instance in which an owner will not allow you to complete this program because of objections in scheduling or for any other reason. Advise the Company of any vehicle's ownership status change (refer Warranty and Policy Manual - Section 3.3).

Reimbursement For Program Completion And Claims Preparation Instructions Claim reimbursement through the Direct Warranty Entry (DWE) system using the RECALLS screen only (PF3 Recall Entry/Retrieval on the DWE Menu Screen). If the claim number contains more than six digits, enter only the last six digits.

NOTE:

Claim Form 1864 is no longer mailed to owners. Use a Form 6125-2, an authorized computer generated claim form or a Form 1864 as an internal repair order to support DWE Entry through the RECALLS screen. Ensure that only the RECALLS screen is used when inputting completion and reimbursement information.

Dealers without DWE capability must mail a completed Form 1864 (Company Claim Copy No. 2) to Warranty Claims Processing at Oakville for reimbursement. Forms submitted must show labor times, all parts used and their costs, the parts handling allowance, and be imprinted, dated and signed by authorized dealership personnel. All claims must show 92M78 in the Recall box.

Refunds Refund requests must be submitted on a separate claim from the program completion claim. Refund requests are governed by the following guidelines:

^

Refunds are provided only for dealer and/or owner-paid repairs directly related to this program (DRL module replacement only - parts and labor) and performed within the program coverage provision. The original copy of the paid repair order or parts invoices must be presented to any Ford or Mercury dealership.

^ Using the DWE Recall Screen, enter the following:

Administrative Allowance ..... 0.3 Hrs. Labor Code.....A Recall Code.....R92M78 Enter "REFUND INV # _____ " in the area on the claim designated for PARTS USED. Enter the owner refund amount as a "MISCELLANEOUS" cost. ^

Provide prompt refund to all eligible owners having proper documentation regardless of the source of the original service.

^ Retain the copy of the paid repair or parts invoice with a copy of the refund request in your service file for reference.

^ Dealers without DWE capability must mail their refund requests on a separate completed Form 1864 with the owner's original paid repair order or parts purchase receipt to Warranty Claims Processing. Enter the 0.3 Hrs. in Box A and "R92M78" in the Recall box of the Form. Include all amounts in the TOTAL CLAIM box.

Attachment II - Labor and Parts Information

Labour Allowance Replace DRL Module (Includes Verification of DRL System Function).

VEHICLE LINE LABOR TIME LABOR CODE

Thunderbird, Cougar, Tempo, Topaz, Escort, Mustang, 0.3 Hrs. B

Ranger, Explorer and Econoline.

Taurus, Sable and Medium/Heavy F-Series Cab 0.5 Hrs. B

All Other Involved Vehicles 0.4 Hrs. B

Parts Ordering Information DRL modules will not be direct shipped for this Program. Order required parts through your Servicing Parts Distribution Centre.

PART NUMBER VEHICLE APPLICATION

FOVY-15A272-A ^ 1991 Cougar

E9SZ-15A272-B ^ 1989-90 Cougar

^ 1989-91 Thunderbird

FODZ-15A272-B ^ 1990 Escort

^ 1990-91 Taurus/Sable, Tempo/Topaz, Mustang, Econoline,

^ Aerostar, Ranger, Bronco II, Bronco, F-Series Light Trucks

^ (150-250-350), F-Super Duty and Explorer

FOHZ-15A272-A ^ 1990-91 Medium/Heavy Trucks (with single headlights)

Attachment III - Tech. Instruct./Daytime Lamp Module Locations

Technical Instructions

Correction of wiring connections and/or replacement of burned out fuses and bulbs is not covered by this program.

Description of Daytime Running Light (DRL) System Operation

The DRL System is designed to turn the Hi beam headlights ON with a reduced light output, and without illuminating the high beam indicator lamp in the instrument panel when the following conditions are met: ^

The vehicle is running.

^ The parking brake is fully released.

^ The headlight switch is in OFF position.

NOTE:

If the vehicle is equipped with an automatic lighting system, the DRL System is active until the automatic system turns on the headlights.

DRL Module Removal and Installation Procedure (Refer to Daytime Running Light Module Location Table.) Refer to the Vehicle's 1990 or 1991 Shop Manual, Section 32 "Lighting System", for Removal and Installation instructions. Mutilate and scrap the removed DRL module.

NOTE:

For the 1989 Thunderbird and Cougar cars refer to the 1990 Model Year Shop Manual.

After Installing The Replacement DRL Module Verify DRL System Function As Follows Ensure the vehicle's road wheels are blocked to preclude inadvertent vehicle movement. ^

Manual transmission in NEUTRAL.

^ Automatic Transmission in PARK. (Neutral on Heavy Trucks with Allison automatic.)

1. Parking brake applied and headlight switch OFF, start engine.

^ The headlights (Hi or Lo beam) should not be illuminated.

2. Parking brake released and headlight switch OFF, engine running.

^ The high beams should be ON at reduced intensity.

NOTE:

A comparison check for full intensity can be made using flash-to-pass or by putting headlight switch ON and switching to high beams.

a. Turn on Park Lights.

The high beams should be ON at reduced intensity.

The high beam indicator should NOT be ON.

b. Turn on headlights (LOW BEAMS).

The low beams should be ON at full intensity. The high beams should be OFF. The high beam indicator should NOT be ON.

c. Turn on headlights (HIGH BEAMS).

The high beams should be ON at full intensity. The high beam indicator should be ON.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Daytime Running Light Module Locations

1989 MODEL YEAR (CARS/LIGHT TRUCKS) LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

1990-1991 MODEL YEAR LOCATION

Thunderbird/Cougar In front of driver's side radiator support, vertically mounted behind bumper.

Tempo/Topaz Inside on the RH side radiator support, vertically mounted below radiator cap.

Ford Mustang Under the LH front fender apron, directly below the battery.

Taurus/Sable On the LH front fender apron, directly under the battery. (Remove LH side fender liner for access.)

Ford Escort (1190 MY Only) On the RH side of the radiator support.

Ranger/Bronco II/Explorer Inside on the LH side radiator support, at top near washer fluid reservoir.

F-Series Light Truck/Super Duty/Bronco Inside the LH radiator support below the horn assembly.

Aerostar Inside the LH front fender apron, behind the battery.

Econoline Inside the LH radiator support.

1990/91 MEDIUM/HEAVY TRUCK SERIES LOCATION

"F" (Cab and Cowl) Behind RH side instrument panel.

"C" Behind RH side instrument panel.

"CL" (Single Headlights) Behind instrument panel RH side.

"CF" (Cargo) Under hood beside windshield washer bottle.

"L" Inside engine compartment left side bulkhead.

NOTE:

LL and LTL models use quad highlight systems and are not affected by this program.

Dealer Letter

To: All Ford of Canada Dealers

Attention: Dealer Principal, Service Manager, Parts Manager

Subject: Owner Notification Program 92M78 - Extended Coverage of Daytime Running Lights Module on Certain 1989-91 Vehicles

In OASIS NO

Listings NO

Return Removed Parts NO (Mutilate and Scrap). Program Coverage Available for 36 months or 60,000 kilometers, whichever occurs first, from original warranty start date or through July 31, 1992, whichever provides greatest coverage.

Refund Provisions YES

NOTE:

Please read and circulate this bulletin to your Service and Parts Personnel. They should become familiar with this program and be able to respond to owner inquiries.

Vehicles Affected

^ All 1989-90-91 Thunderbird and Cougar

^ All 1990 Escort

^ All 1990-91 Taurus, Sable, Tempo, Topaz, Mustang, Econoline, Aerostar, Bronco, F-Series Light Trucks, F-Super Duty, Ranger, Bronco II, Explorer and Medium/Heavy Trucks (except LL/LTL and CL with quad rectangular headlights)

Reason For This Program The Daytime Running Lights (DRL) control module may malfunction. A malfunctioning DRL module can result in Daytime Running Lights that dim, flicker or go off and in some instances may remain on after the ignition is turned OFF. Normal manual Lo and Hi beam headlight operation is not affected.

Service Action Replace the Daytime Running Light (DRL) module if the customer is experiencing any of the above described symptoms.

NOTE:

Replacement of headlight bulbs or sealed beams is not covered by this program.

Refunds If all or a portion of the repair covered by the program (DRL module replacement only - parts and labor) has been paid by the owner and/or the dealer, within program coverage provisions, both the owner and/or the dealer are eligible for a refund. Company Contacts: (Dealer use only)

CONCERN NATURE CONTACT ACTIVITY

Technical Technical Assistance Hotline for your Region

Claiming Procedures Warranty Claims Hotline for your Region

Owner Concerns Customer Assistance Centre Hotline for your Region

General Administrative Christine Murray - Recall Administrator

^ Telephone: (416) 845-2511 Ext. 1495

^ Facsimile: (416) 845-7069

Attachments

Attachment I ^

Administrative

^ Refunds

Attachment II ^

Labor Allowance Information

^ Parts Ordering Information

Attachment III ^

Technical Instructions

Owner Letter

Mailing Date

Mr. John Sample 123 Main Street Anywhere, Prov. ANA NAN Ford Motor Company of Canada, Limited (Ford) is providing an Extended Coverage Program, number "92M78", for the Daytime

Running Lights (DRL) control module. This Program provides extended coverage to owners of certain 1989 through 1991 Model Year cars and trucks. Our records show you own the 19xx (vehicle) with the serial number shown above your name and address.

Reason For This Program And Program Period: Ford is extending the coverage for the Daytime Running Lights module in your vehicle.

This extended coverage will be provided for 3 years or 60,000 kilometers, whichever occurs first, from your vehicle's Original Warranty Start Date, or until July 31, 1992, whichever gives you the

greater coverage.

Description Of DRL System Operation: The DRL System is designed to turn the Hi beam headlights ON with a reduced light output. This is accomplished when the following conditions are met: ^

the vehicle is running.

^ the parking brake is fully released.

^ the headlight switch is in OFF position.

Symptoms Of Abnormal DRL System Operation: Symptoms associated with an improperly operating DRL module, normally include reduced, flickering or no DRL illumination. In some instances, the DRL may remain on when the ignition is turned OFF. Normal Lo and Hi beam headlight operation is not affected.

No Cost Service: Should you encounter symptoms such as described above, contact your Ford or Mercury dealer. Your dealer will replace the DRL control module on your vehicle under the terms of this program at no cost to you.

NOTE:

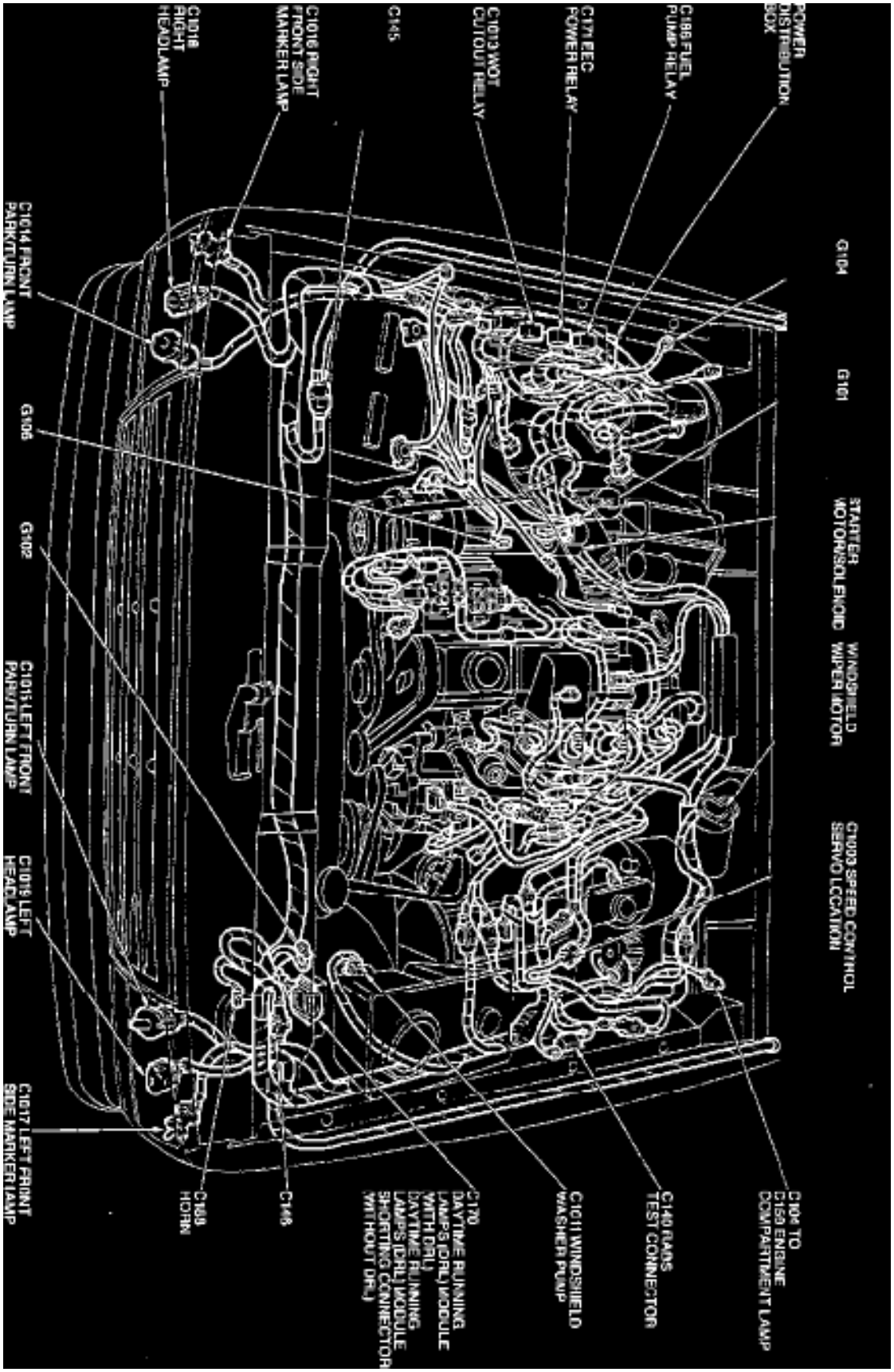
Headlight bulb or sealed beam replacement is not covered by this program.

How Long Will It Take? The time needed for this service is less than one hour. However, due to service scheduling times, your dealer may need your vehicle for one full working day.

Call Your Dealer: Call your dealer should your vehicle experience any of the above described conditions. Ask your dealer for a service appointment and if parts are in stock. Also ask your dealer to check the OASIS system for any other recalls or programs that may be required on your vehicle. If you have leased this vehicle to another person or organization, please immediately inform the lessee of the program. When you bring your vehicle in, show the dealer this letter. If you lose the letter your dealer will still do the work, free of charge.

Refunds: A full refund is available if you paid for the service covered by this Program (Daytime Running Light Control Module replacement only - parts and labor). Please give the original copy of your paid work-order or parts receipt to your dealer. Your dealer will arrange for the refund (which could take about one month).

Changed Name, Address, Or Sold The Vehicle? If you have changed your name or address, or have sold the vehicle, please fill out the enclosed prepaid postcard. Sign and date it, and mail the card to Ford. If you cannot get the service performed, contact the Ford "Customer Assistance Centre" at the address identified in the letterhead of this letter. Please identify your vehicle's serial number in any correspondence. We are taking this action as part of our efforts to ensure your long term satisfaction with the DRL feature in your vehicle. We hope this program will confirm your continued satisfaction with your Ford built vehicle.

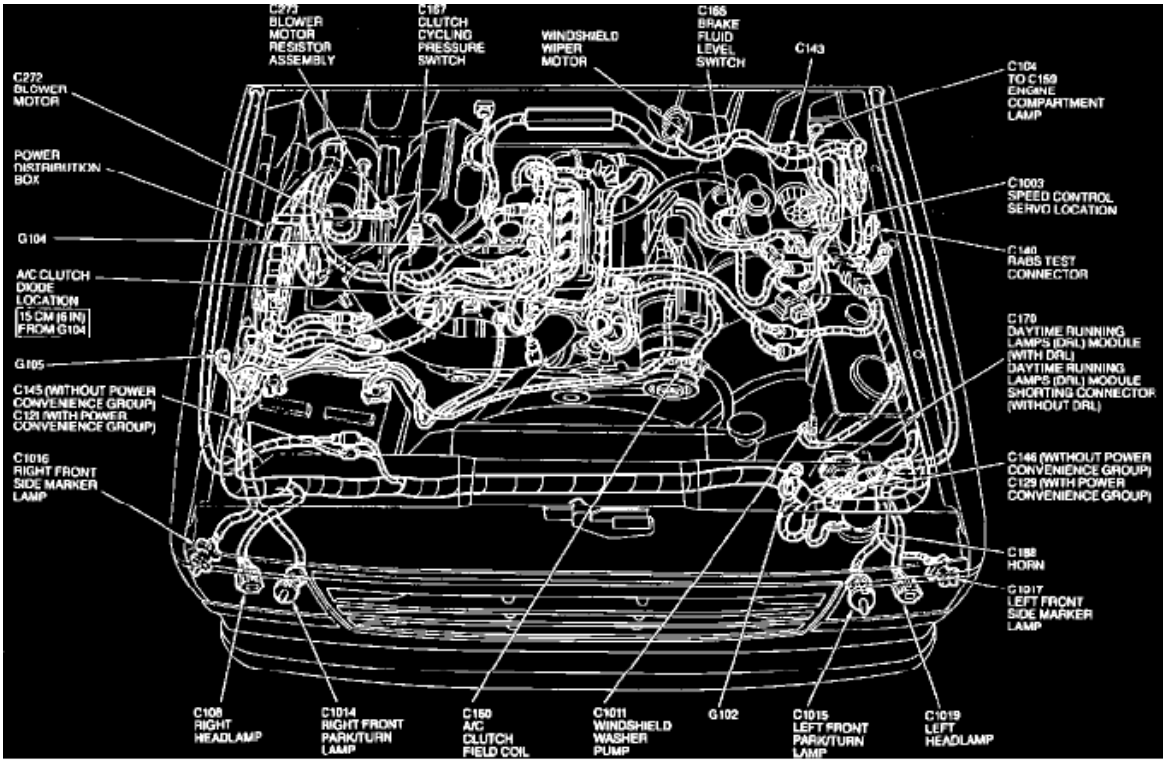

G104
G101
STARTER MOTOR/SOLENOID
WINDSHIELD WIPER MOTOR
C1003 SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C188 FUEL PUMP RELAY
C171 EEC POWER RELAY
C1013 WOT CUTOUT RELAY
C145
C1016 RIGHT FRONT SIDE MARKER LAMP
C1018 RIGHT HEADLAMP
C1014 FRONT PARK/TURN LAMP
G106
G102
C1015 LEFT FRONT PARK/TURN LAMP
C1019 LEFT HEADLAMP
C1017 LEFT FRONT SIDE MARKER LAMP
C169 HORN
C148
C170 DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL) DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
C1011 WINDSHIELD WASHER PUMP
C140 RAINS TEST CONNECTOR
C104 TO C150 ENGINE COMPARTMENT LAMP

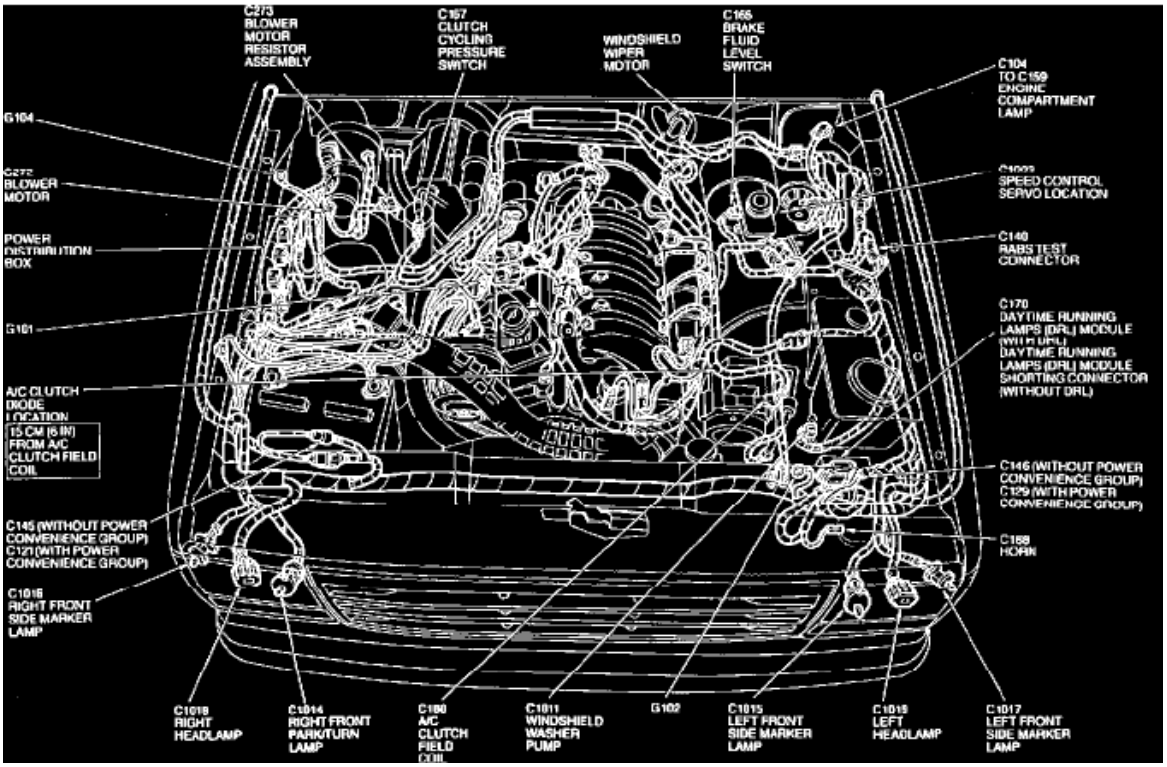
Daytime Running Lamp Control Unit: Locations

Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

Applicable to: 2.3L/4-140


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C167
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C143
C272
BLOWER MOTOR
C104
TO C159
ENGINE COMPARTMENT LAMP
POWER DISTRIBUTION BOX
C1003
SPEED CONTROL SERVO LOCATION
G104
C140
RABS TEST CONNECTOR
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM G104
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
G105
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C1016
RIGHT FRONT SIDE MARKER LAMP
C158
HORN
C1017
LEFT FRONT SIDE MARKER LAMP
C108
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT PARK/TURN LAMP
C1019
LEFT HEADLAMP


C273
BLOWER MOTOR RESISTOR ASSEMBLY
C167
CLUTCH CYCLING PRESSURE SWITCH
WINDSHIELD WIPER MOTOR
C165
BRAKE FLUID LEVEL SWITCH
C104
TO C159
ENGINE COMPARTMENT LAMP
G104
C272
BLOWER MOTOR
C1003
SPEED CONTROL SERVO LOCATION
POWER DISTRIBUTION BOX
C140
RABS TEST CONNECTOR
G101
C170
DAYTIME RUNNING LAMPS (DRL) MODULE (WITH DRL)
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR (WITHOUT DRL)
A/C CLUTCH DIODE LOCATION
15 CM (6 IN) FROM A/C CLUTCH FIELD COIL
C146 (WITHOUT POWER CONVENIENCE GROUP)
C129 (WITH POWER CONVENIENCE GROUP)
C145 (WITHOUT POWER CONVENIENCE GROUP)
C121 (WITH POWER CONVENIENCE GROUP)
C158
HORN
C1016
RIGHT FRONT SIDE MARKER LAMP
C1018
RIGHT HEADLAMP
C1014
RIGHT FRONT PARK/TURN LAMP
C160
A/C CLUTCH FIELD COIL
C1011
WINDSHIELD WASHER PUMP
G102
C1015
LEFT FRONT SIDE MARKER LAMP
C1019
LEFT HEADLAMP
C1017
LEFT FRONT SIDE MARKER LAMP

Engine Compartment Components.

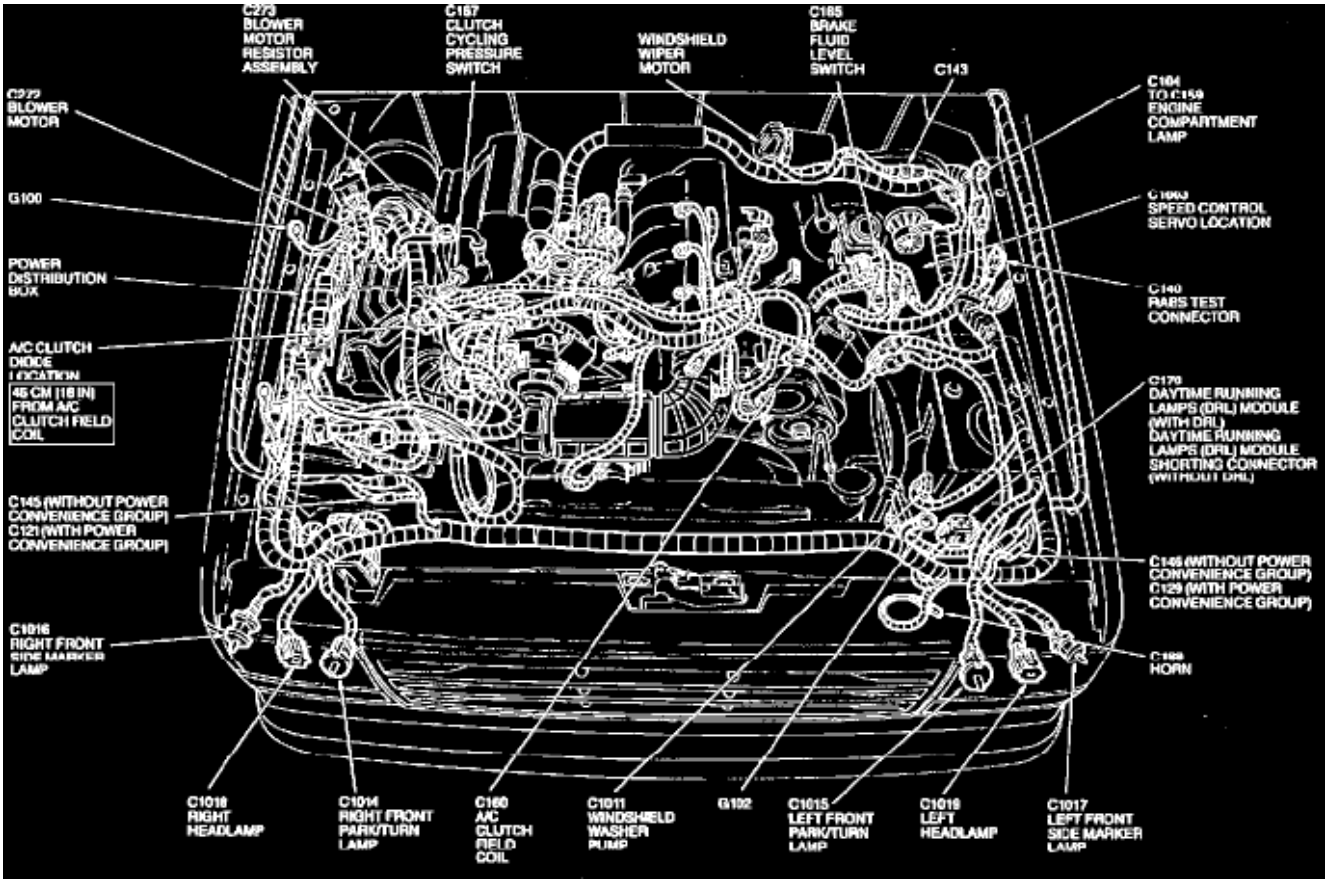
LH Side Of Upper Radiator Support, Near G102

Applicable to: 2.9L/V6-179

Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

Applicable to: 3.0L/V6-181

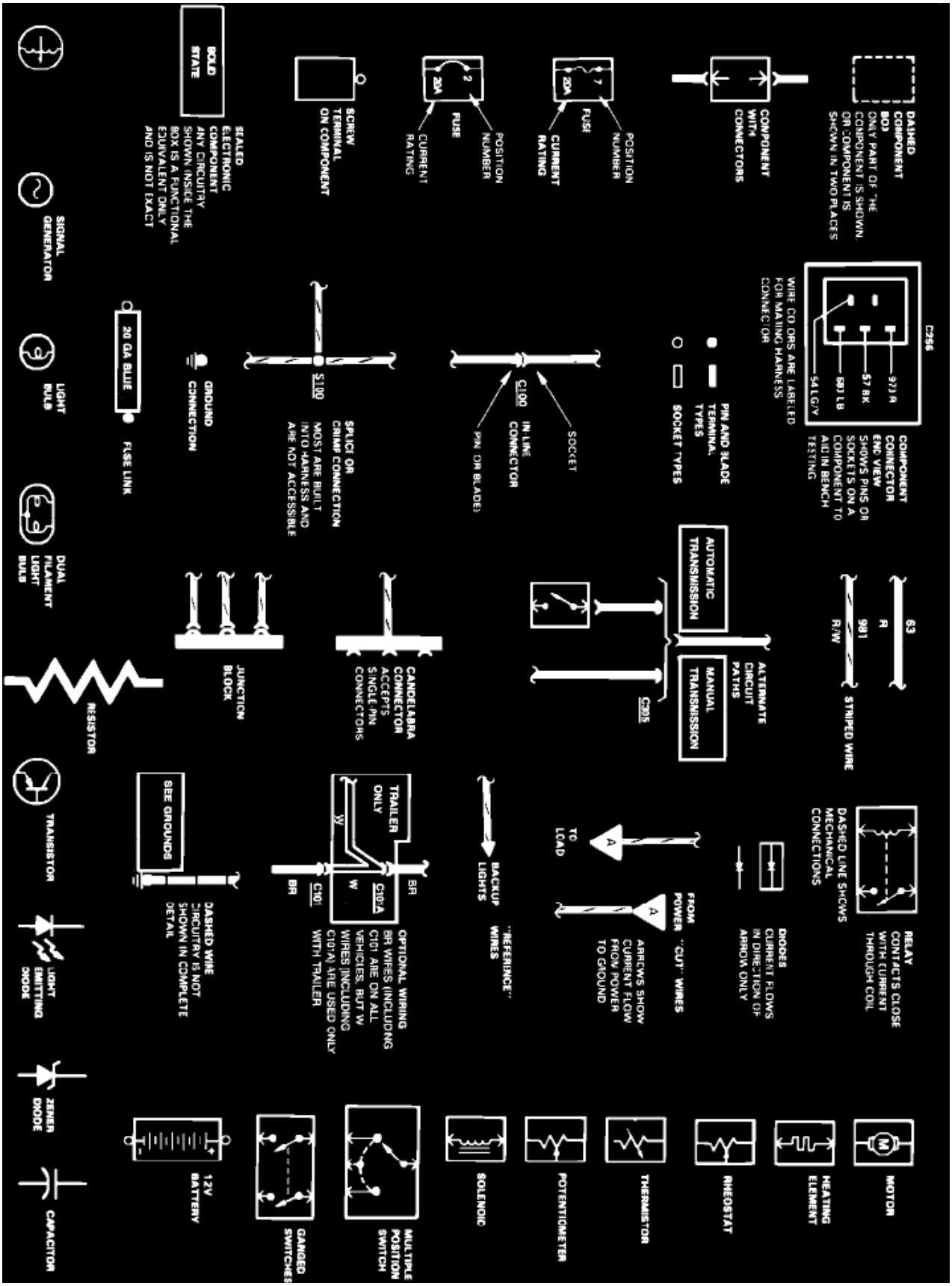


Engine Compartment Components.

LH Side Of Upper Radiator Support, Near G102

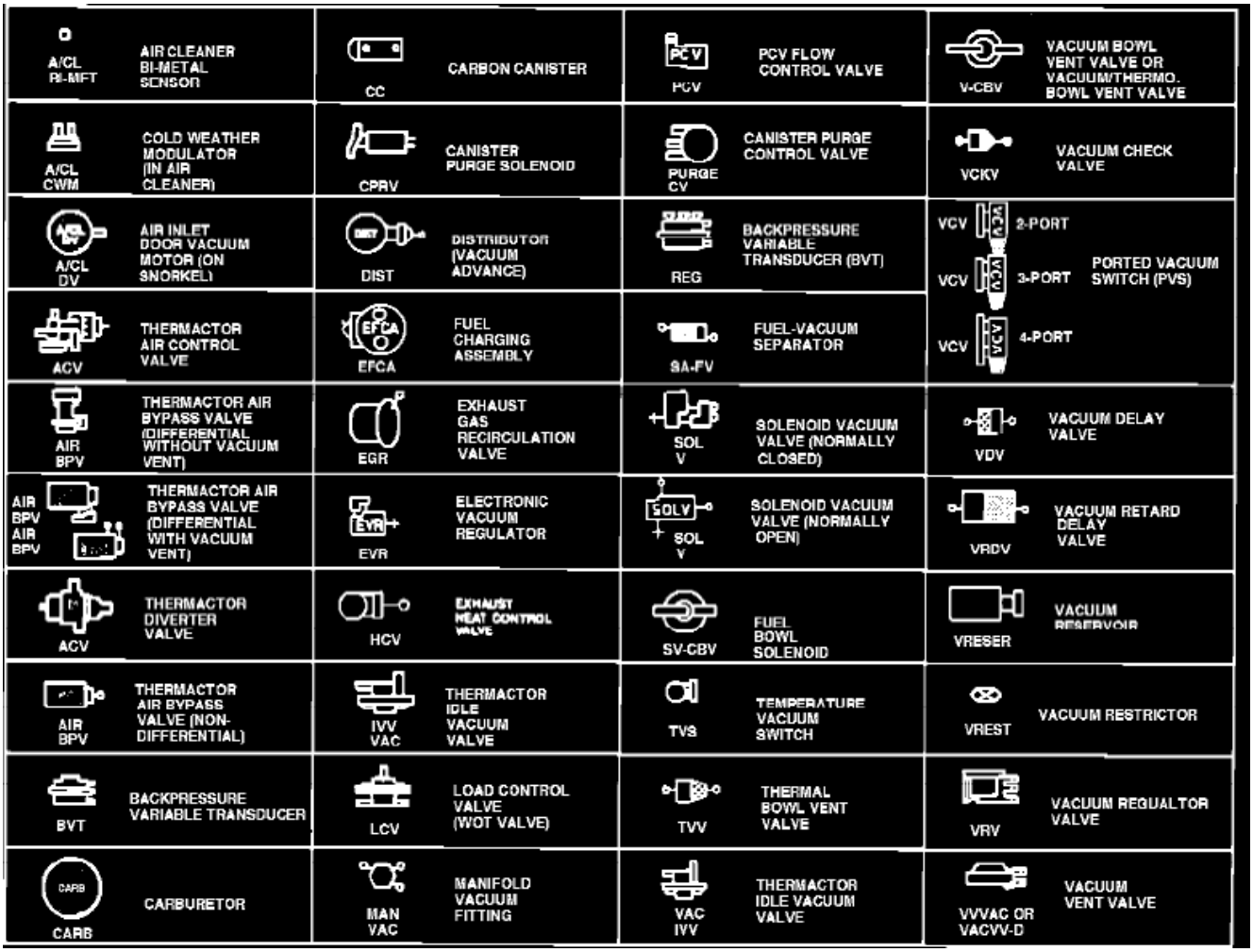
Applicable to: 4.0L/V6-244

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Relays and Modules - Lighting and Horns > Daytime Running Lamp Control Unit > Component Information > Diagrams > Diagram Information and Instructions

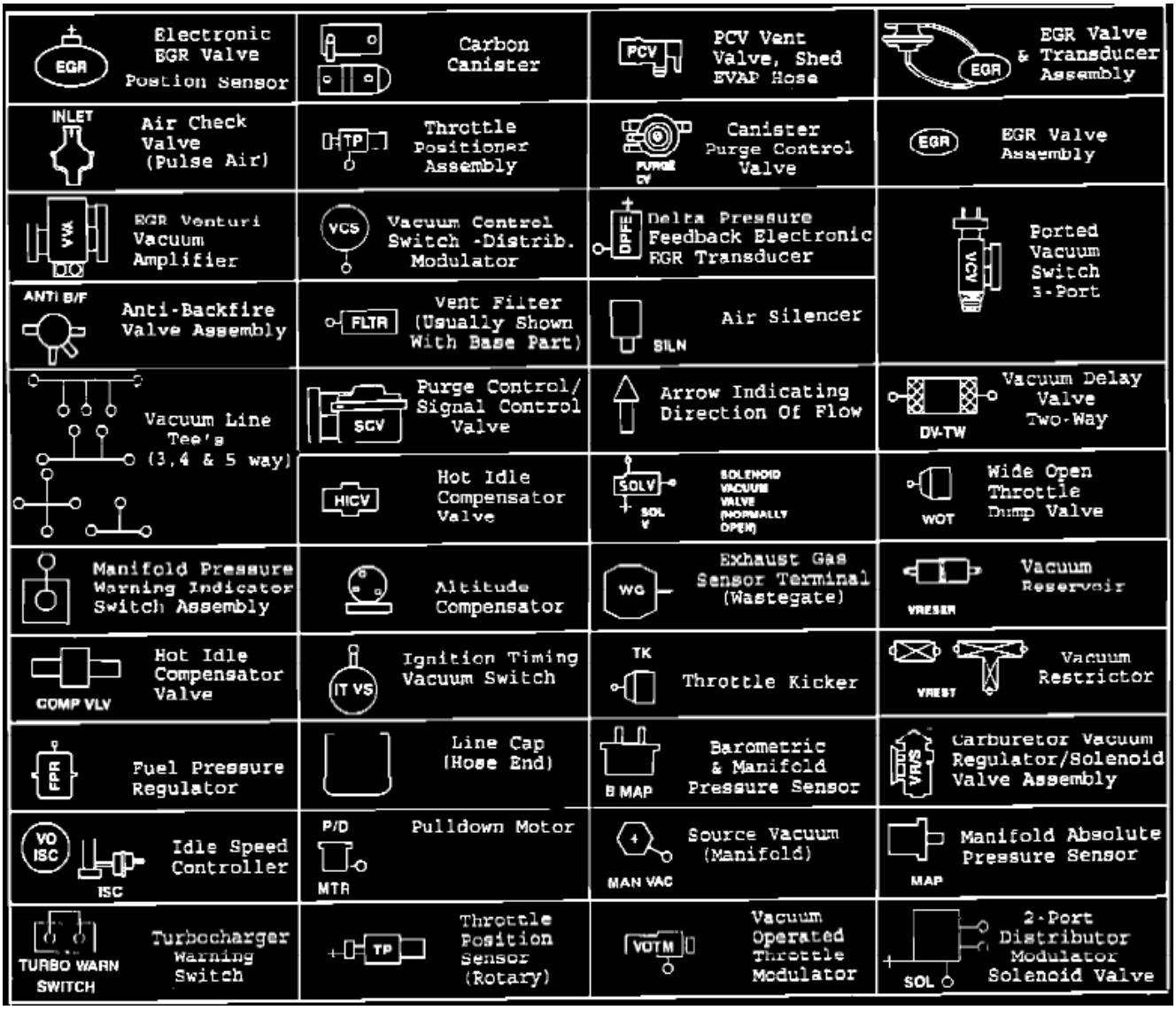


Daytime Running Lamp Control Unit: Diagram Information and Instructions

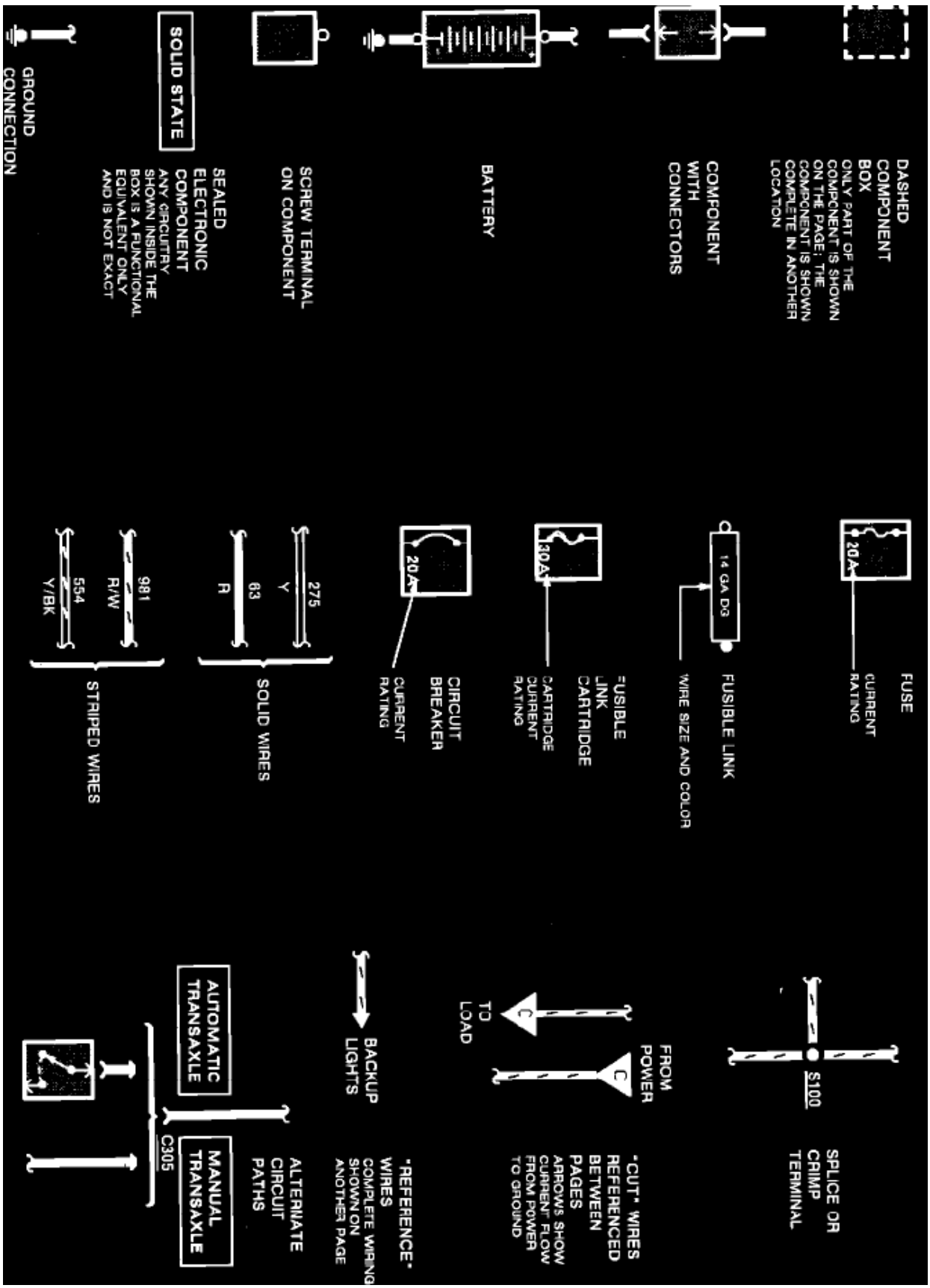
Symbol Identification



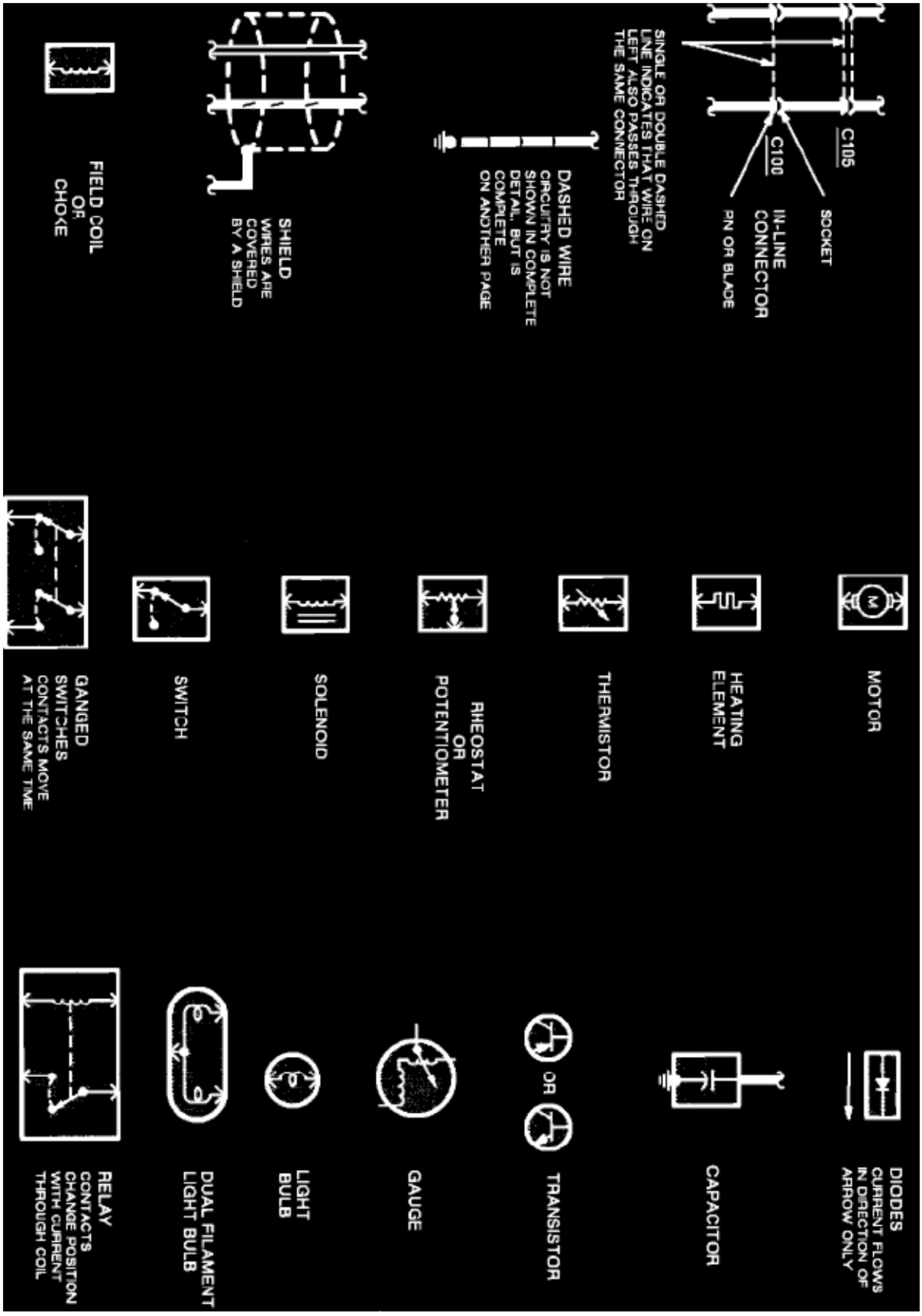
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
SOCKET
C100
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

O: Orange

PK: Pink R: Red

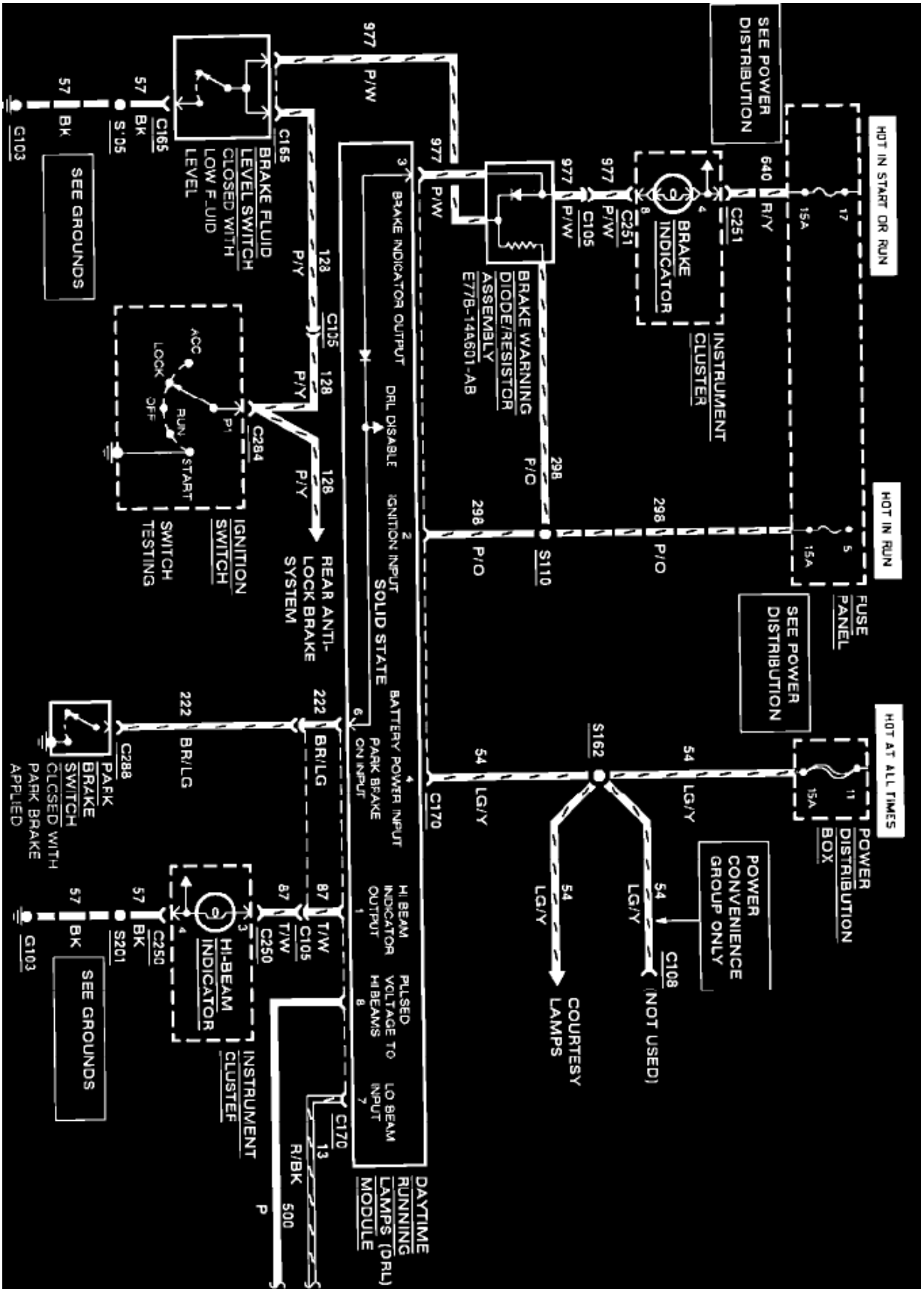
P: Purple

T: Tan

V: Violet

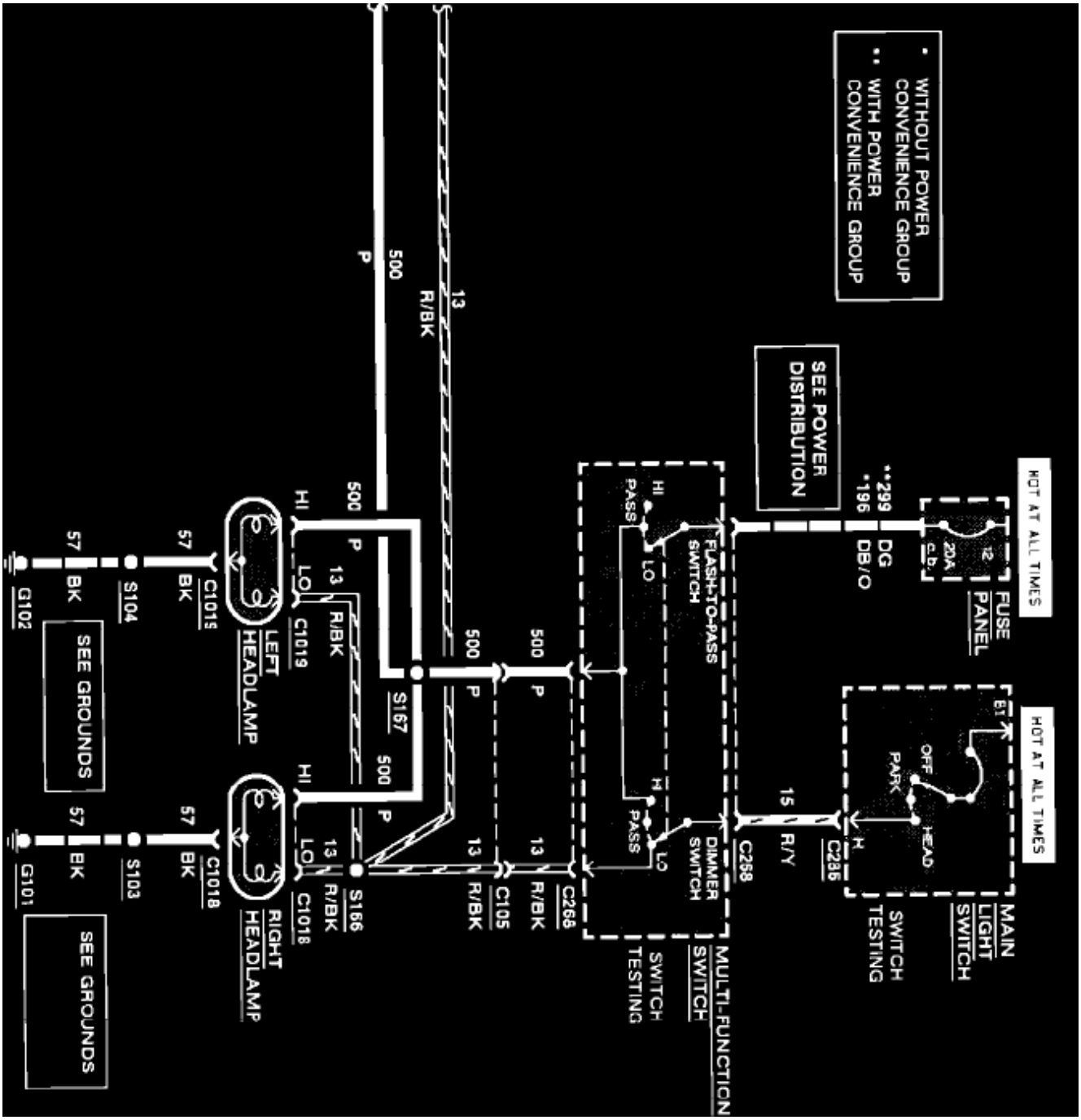
W: White

Y: Yellow


HOT IN START OR RUN
HOT IN RUN
HOT AT ALL TIMES
SEE POWER DISTRIBUTION
FUSE PANEL
POWER DISTRIBUTION BOX
BRAKE INDICATOR
INSTRUMENT CLUSTER
BRAKE WARNING DIODE/RESISTOR ASSEMBLY E77B-14A601-AB
BRAKE FLUID LEVEL SWITCH CLOSED WITH LOW FLUID LEVEL
SEE GROUNDS
IGNITION SWITCH
SWITCH TESTING
REAR ANTI-LOCK BRAKE SYSTEM
SOLID STATE
BRAKE INDICATOR OUTPUT
DRL DISABLE
IGNITION INPUT
BATTERY POWER INPUT
PARK BRAKE CKT INPUT
HI BEAM INDICATOR OUTPUT
PULSED VOLTAGE TO HI BEAMS
LO BEAM INPUT
PARK BRAKE SWITCH CLOSED WITH PARK BRAKE APPLIED
HI-BEAM INDICATOR
POWER CONVENIENCE GROUP ONLY
(NOT USED)
COURTESY LAMPS
DAYTIME RUNNING LAMPS (DRL) MODULE
ACC
LOCK
OFF
RUN
START
977 P/W
640 R/Y
298 P/O
54 LG/Y
222 BR/LG
87 T/W
128 P/Y
123 P/Y
57 BK
500 R/BK
P
C165
C105
C251
C284
C288
C250
C108
C170
S110
S162
S201
S'05
G103

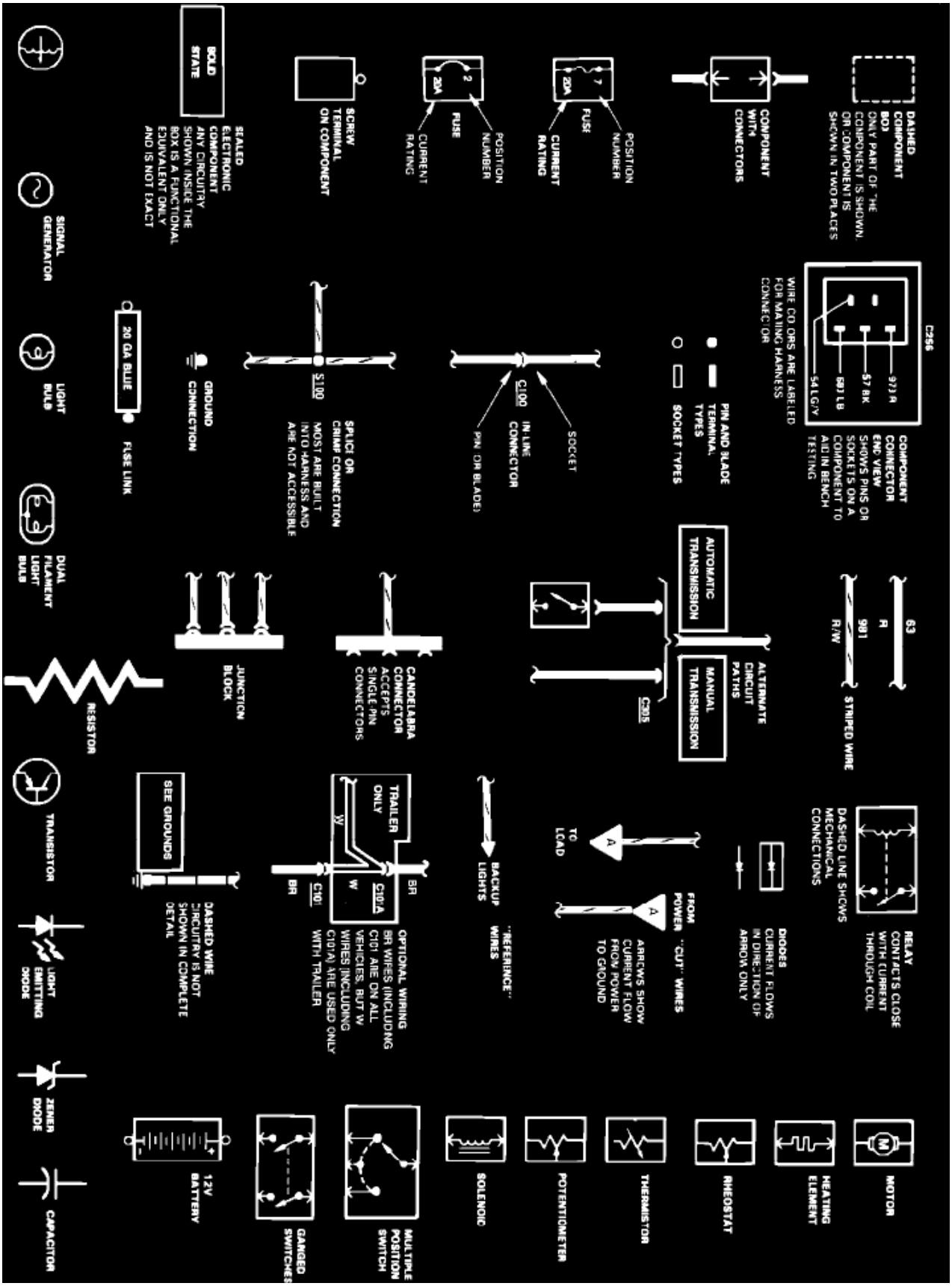
Daytime Running Lamp Control Unit: Electrical Diagrams

Daytime Running Lamps (Canada)



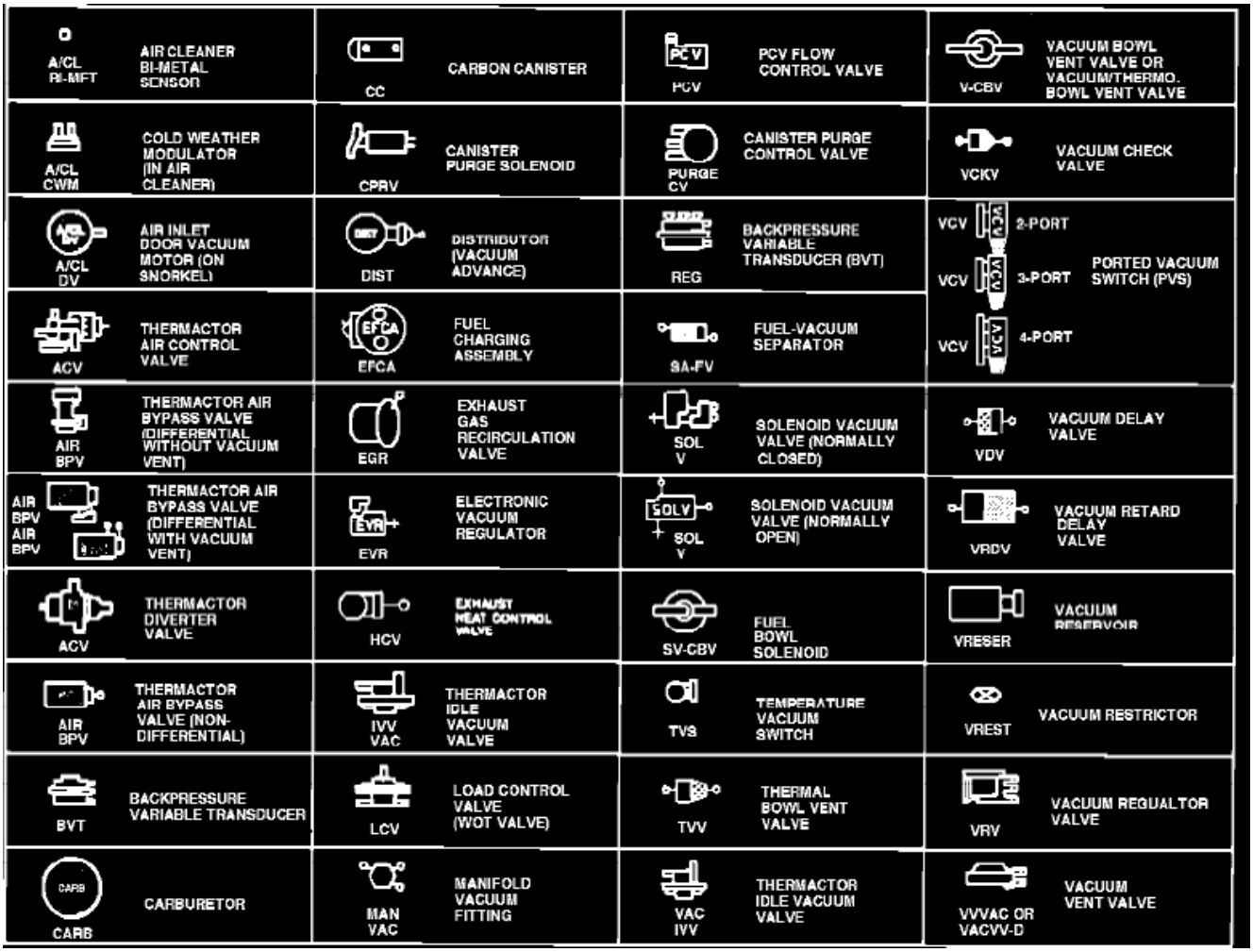
Daytime Running Lamps (Canada)

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Relays and Modules - Lighting and Horns > Headlamp Control Module > Component Information > Diagrams > Diagram Information and Instructions

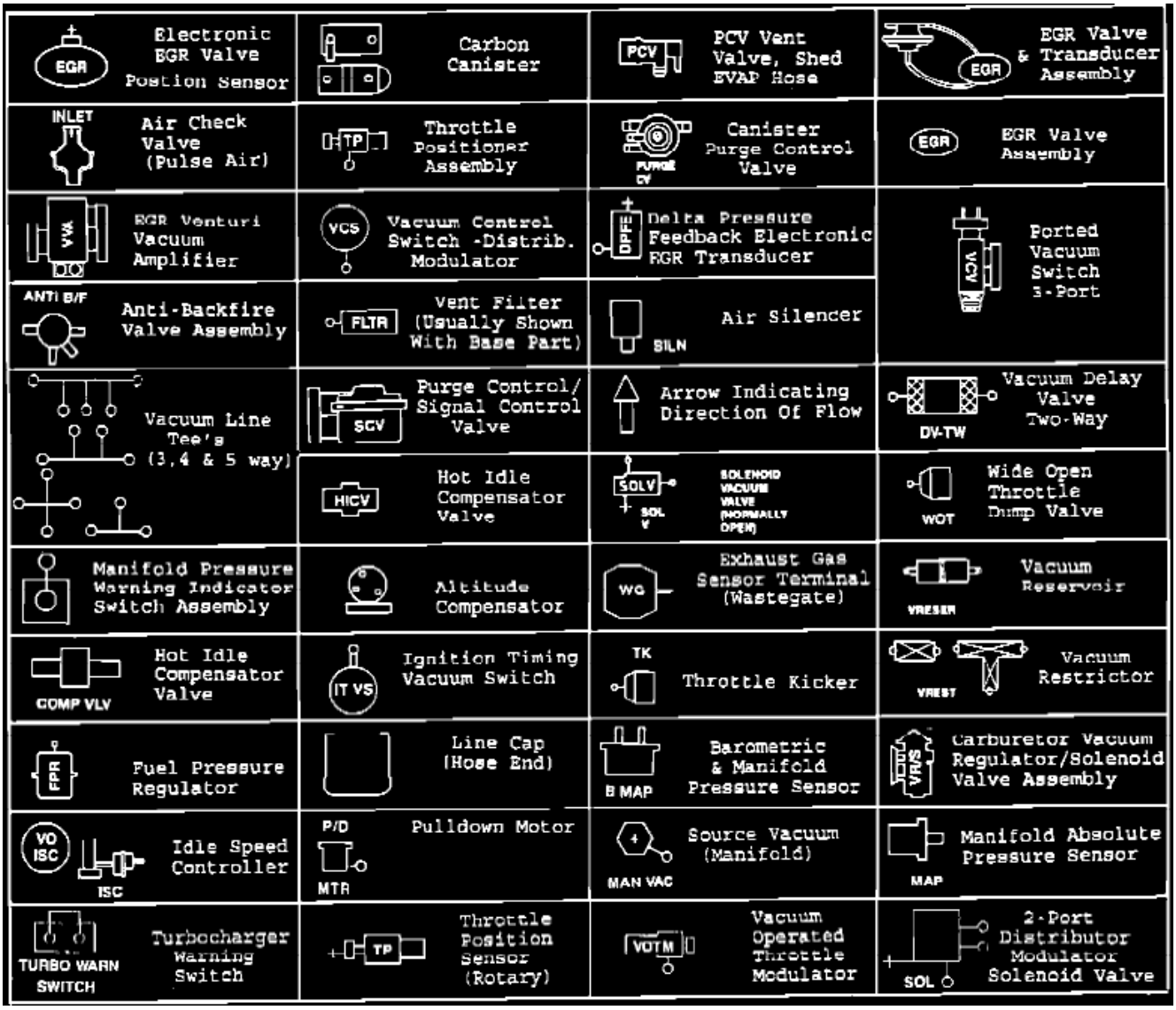


Headlamp Control Module: Diagram Information and Instructions

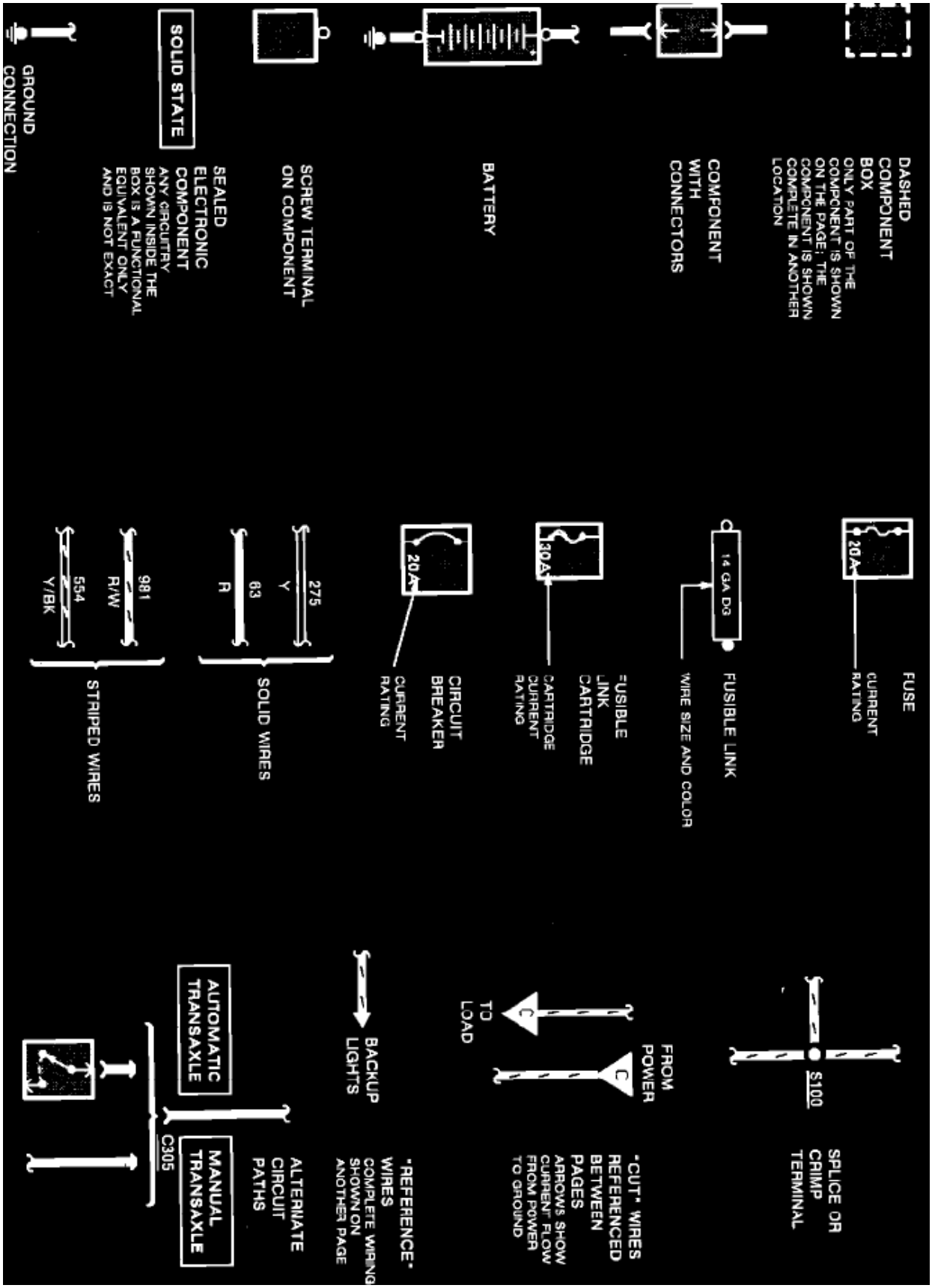
Symbol Identification



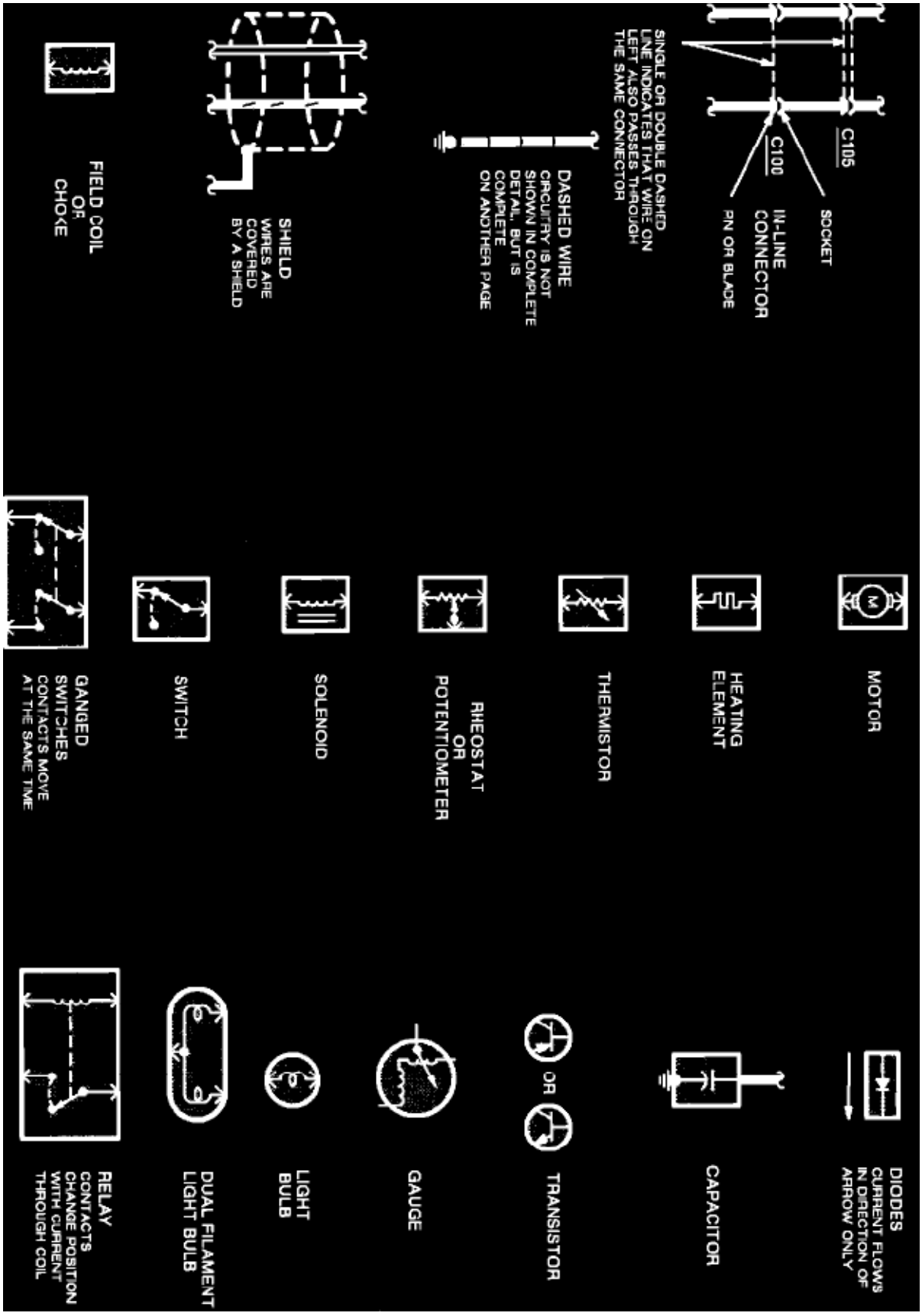
Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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OR
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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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T: Tan

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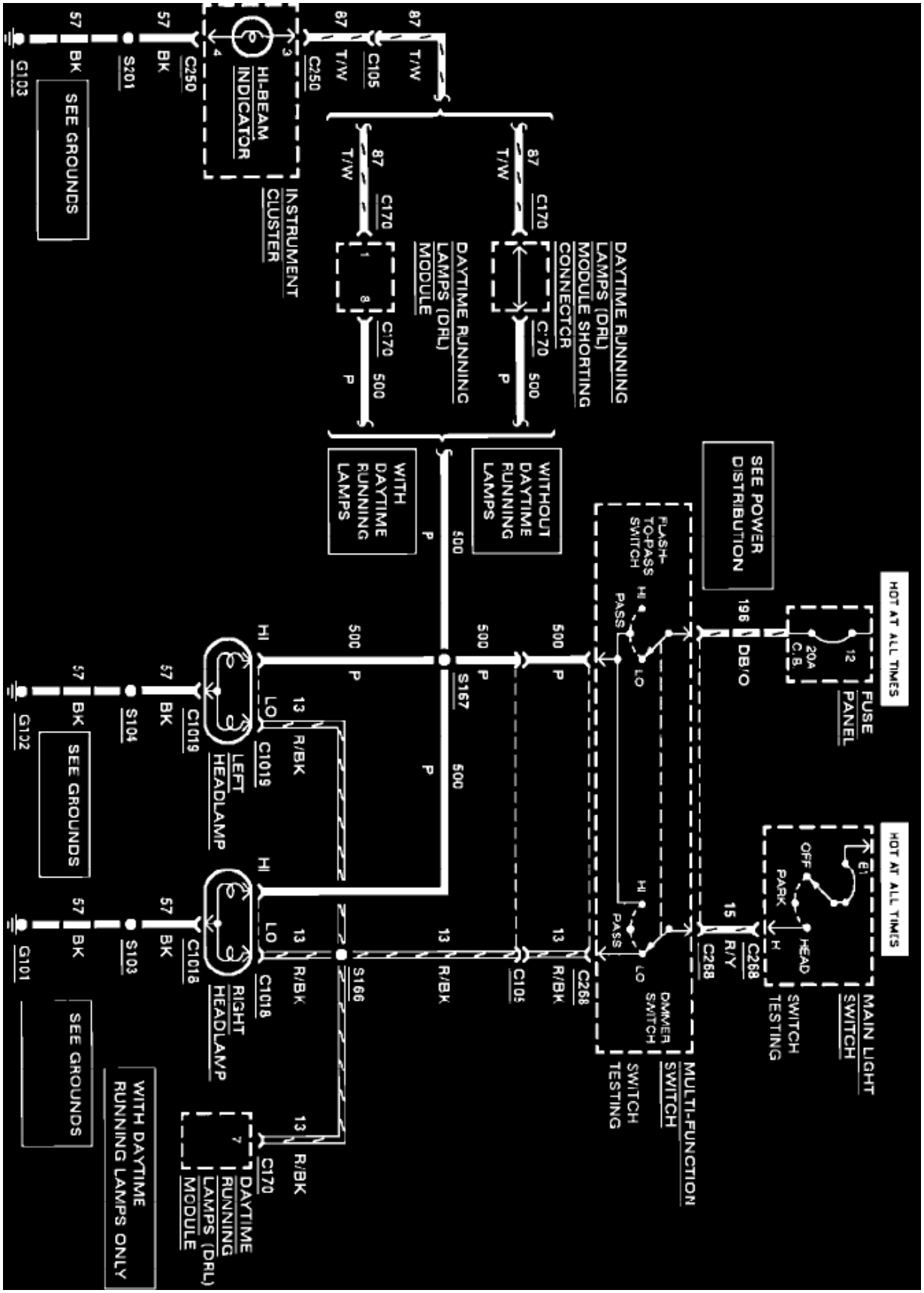
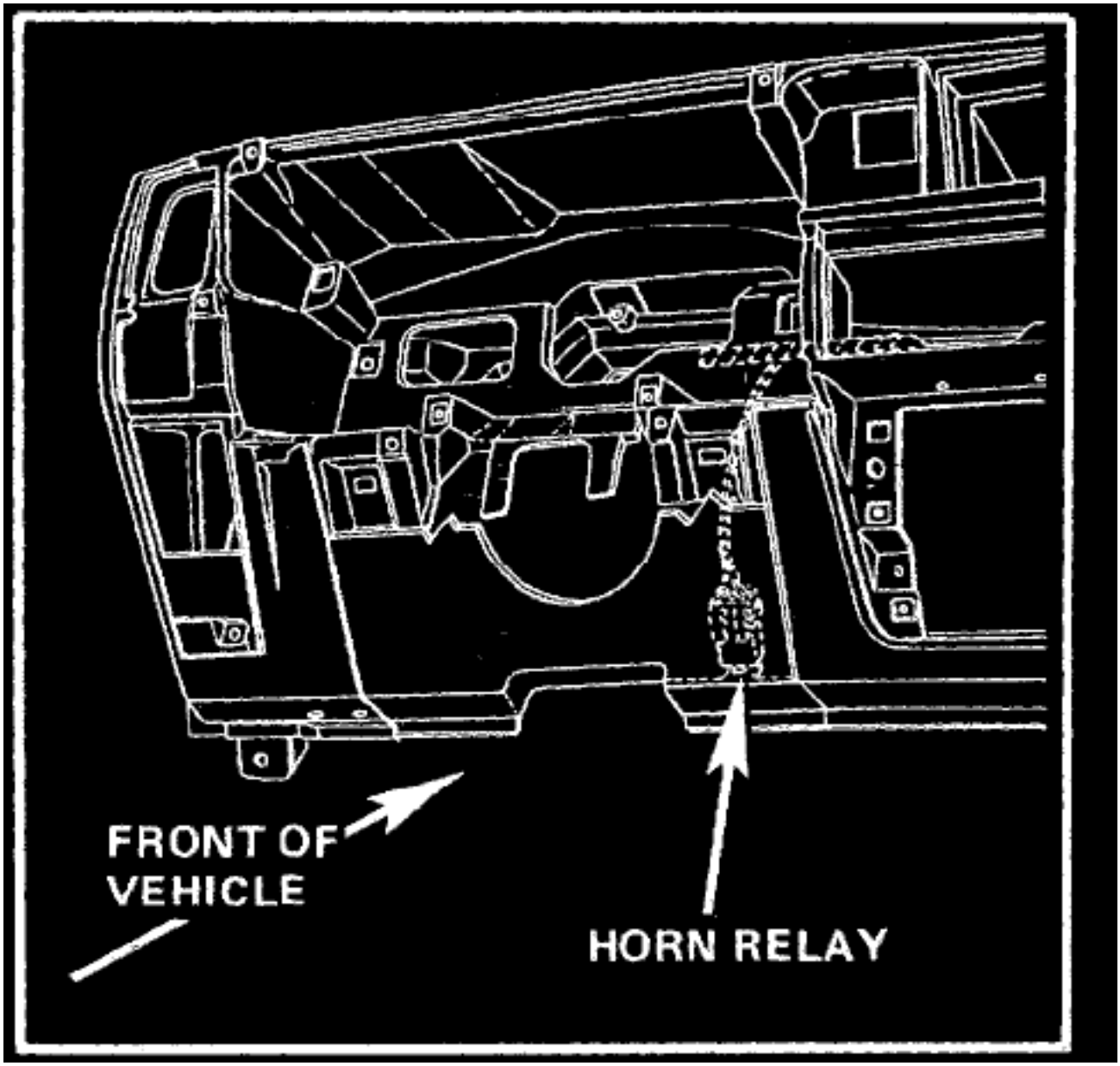

HOT AT ALL TIMES
FUSE PANEL
12
20A C.B.
196
DB/O
SEE POWER DISTRIBUTION
HOT AT ALL TIMES
E1
OFF
PARK
HEAD
H
C268
R/Y
15
MAIN LIGHT SWITCH
SWITCH TESTING
MULTI-FUNCTION SWITCH
DIMMER SWITCH
SWITCH TESTING
FLASH-TO-PASS SWITCH
HI
PASS
LO
C268
R/BK
13
C105
S166
S167
500
P
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
C170
87
T/W
DAYTIME RUNNING LAMPS (DRL) MODULE
WITHOUT DAYTIME RUNNING LAMPS
WITH DAYTIME RUNNING LAMPS
INSTRUMENT CLUSTER
HI-BEAM INDICATOR
C250
57
BK
S201
G103
SEE GROUNDS
LEFT HEADLAMP
RIGHT HEADLAMP
C1019
C1018
S104
S103
G122
G101
WITH DAYTIME RUNNING LAMPS ONLY

Headlamps



Horn Relay: Locations

The horn relay is located behind the lower left side of the instrument panel, to the right of the steering column. It is attached to the speed control amplifier bracket. Vehicles not equipped with speed control do not use a horn relay.

Horn Relay: Testing and Inspection

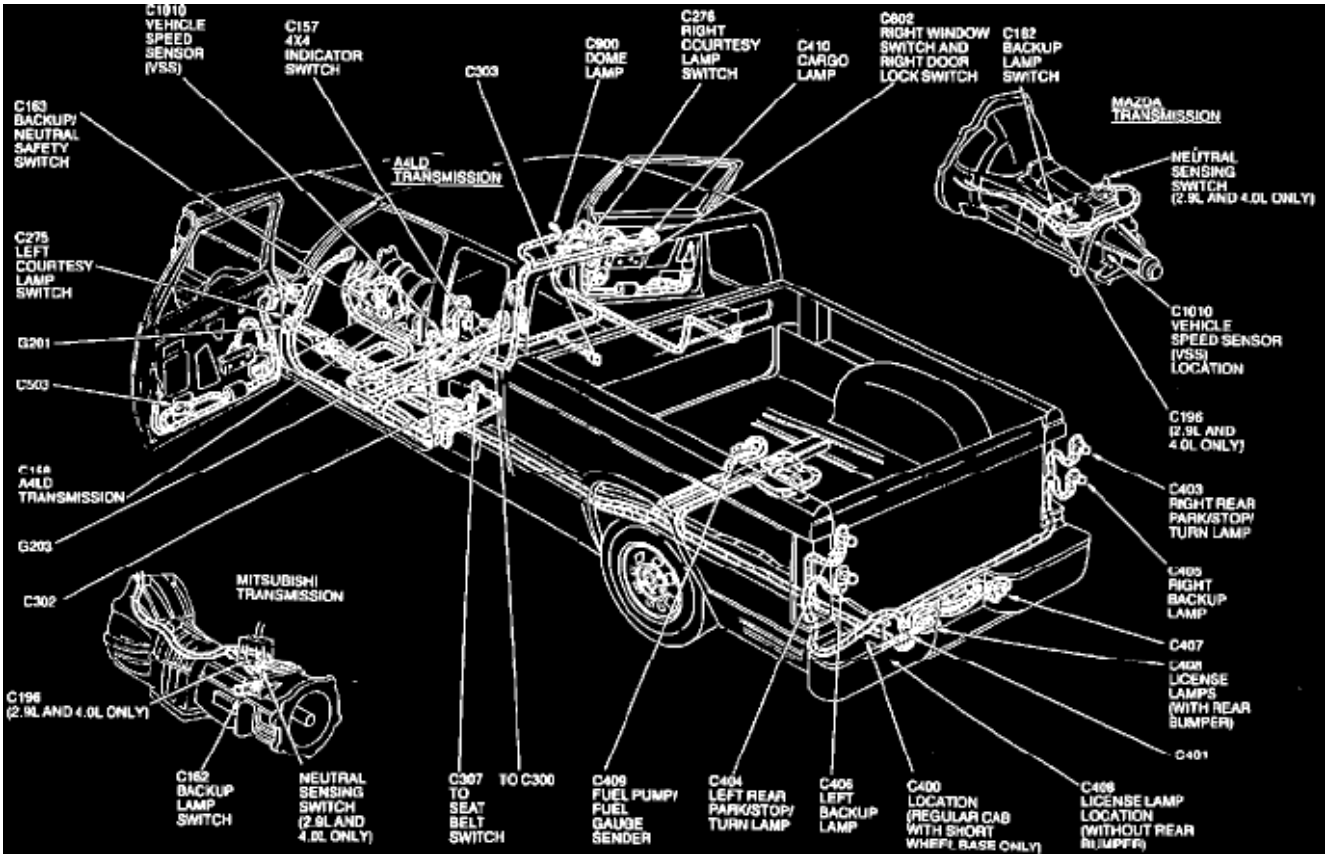
Connectors should remain connected during following test.

1. Measure voltage between circuit 460 (yellow/light blue) and ground. If 12 volts are not indicated, check fuse F20A and repair or replace as required.

2. If circuit 460 (yellow/light blue) is as indicated, depress horn switch. Voltage at circuit 460 (horn relay terminal No. 4) should drop to about zero volts and horn should sound. If horn does not sound and circuit 460 remains at 12 volts, proceed to step 3.

3. Check for 12 volts at circuit 6 (yellow/light green) at horn relay terminals No. 2, if voltage is not present, replace relay, then repeat step 2.

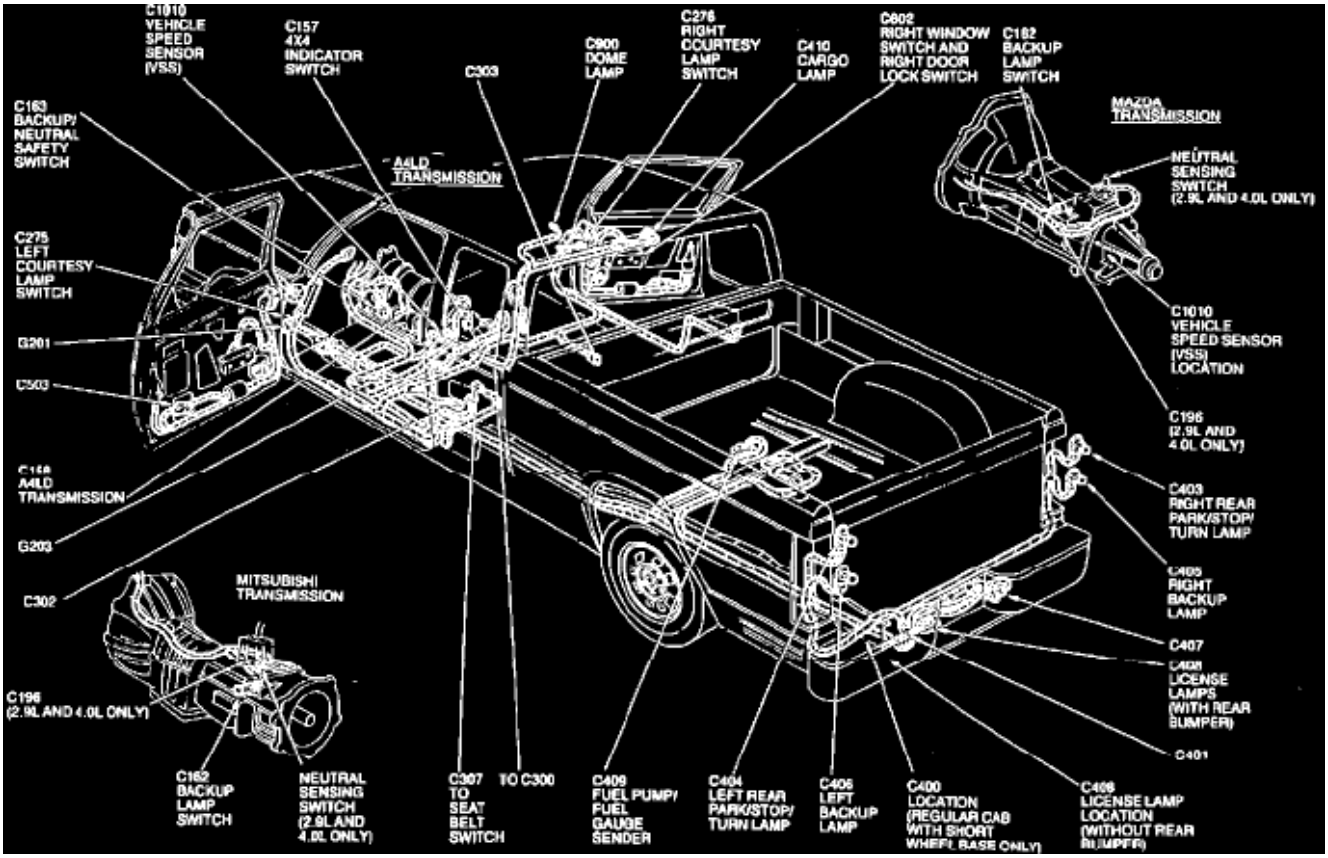
4. If 12 volts are indicated at horn relay terminal No. 2, connect terminal No. 2 to ground. If horn sounds replace horn pad or buttons. If horn does not sound, check for 12 volts at circuit 1 (dark blue) at horn relay terminal No. 3 with terminal No. 2 grounded. If voltage is not indicated, replace relay and repeat step 2. If voltage is indicated, check horn connectors and function.



Backup Lamp Switch: Locations Back-Up Lamp/Neutral Safety Switch

Body Components

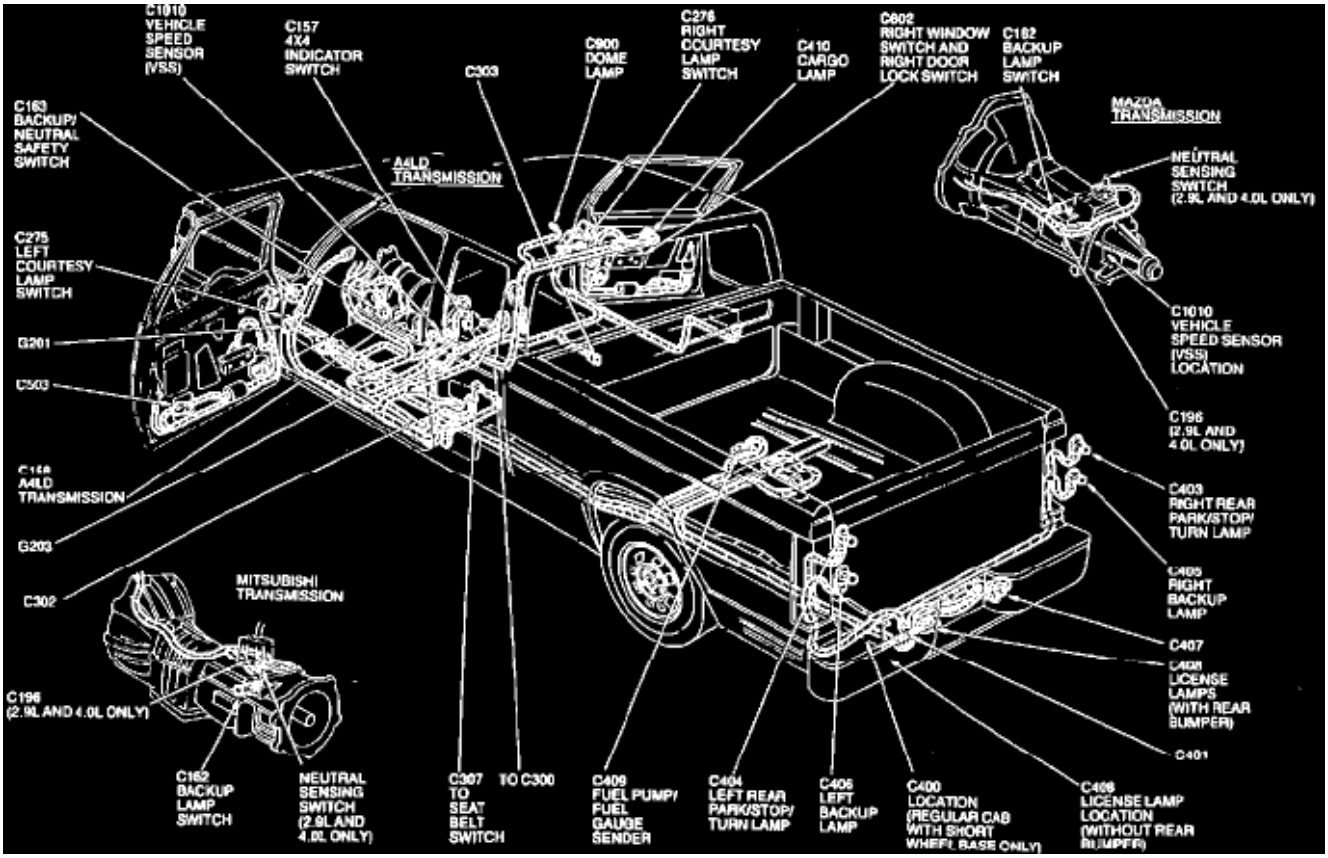
LH Side Of Transmission



Backup Lamp Switch: Locations Backup Lamp Switch (Mazda Transmission)

Body Components

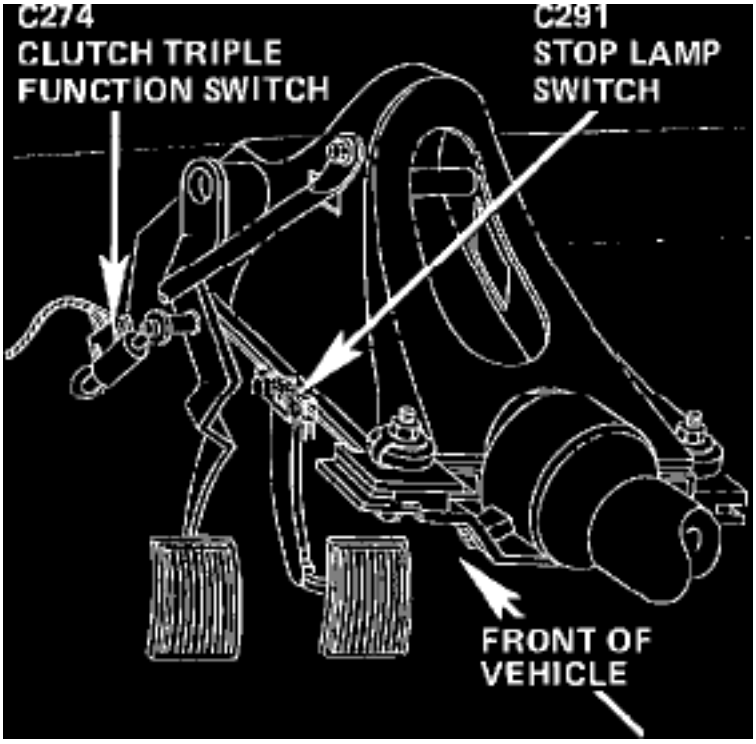
Top LH Side Of Transmission



Backup Lamp Switch: Locations Backup Lamp Switch (Mitsubishi Transmission)

Body Components

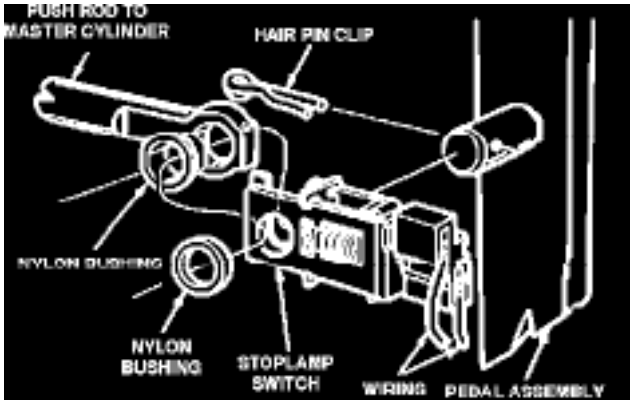
RH Side Of Transmission



Brake And Clutch Switches

Brake Light Switch: Description and Operation

The Brake On Off (BOO) signal is sent by the brake switch when the brakes are APPLIED. The Engine Control Assembly (ECA) uses this signal to modify the operation of the torque converter clutch (if equipped), A/C compressor (if equipped), and idle speed during periods of decel and idle with the brakes APPLIED.



Brake Light Switch: Service and Repair

Fig. 12 Stop Light Switch Replacement

REMOVAL

1. Disconnect electrical connector from switch, Fig. 12.

2. Remove hairpin clip, then slide switch, pushrod, nylon washer and bushings away from pedal.

3. Remove washer, then the switch by sliding switch up or down.

INSTALLATION

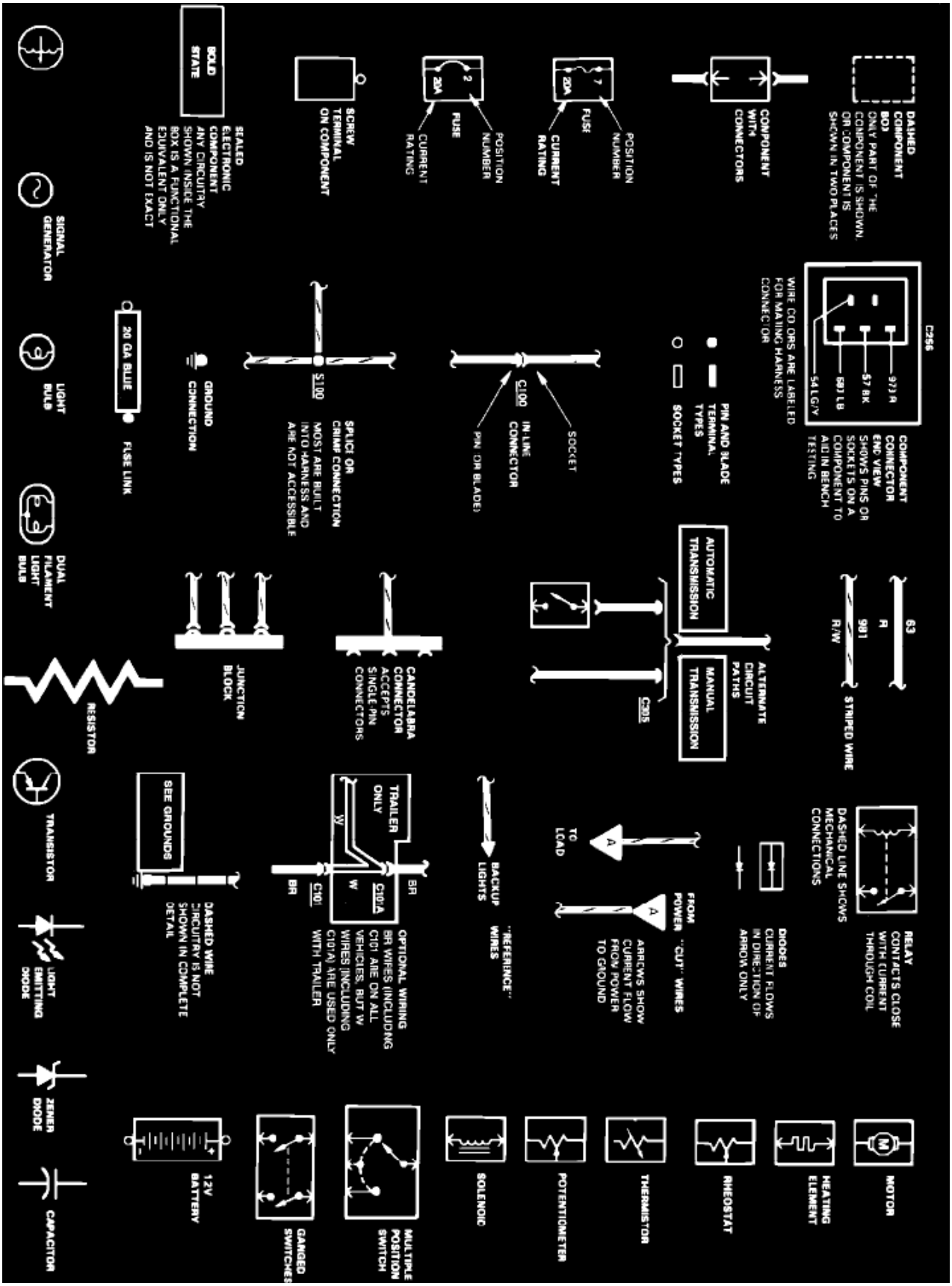
1. Position switch so that U-shaped side is nearest pedal and directly over or under pin.

2. Slide switch up or down, trapping vacuum booster input rod and bushing between switch side plates.

3. Push switch and push rod assembly toward brake pedal arm, then assemble plastic washer to pin and install hairpin clip to retain assembly.

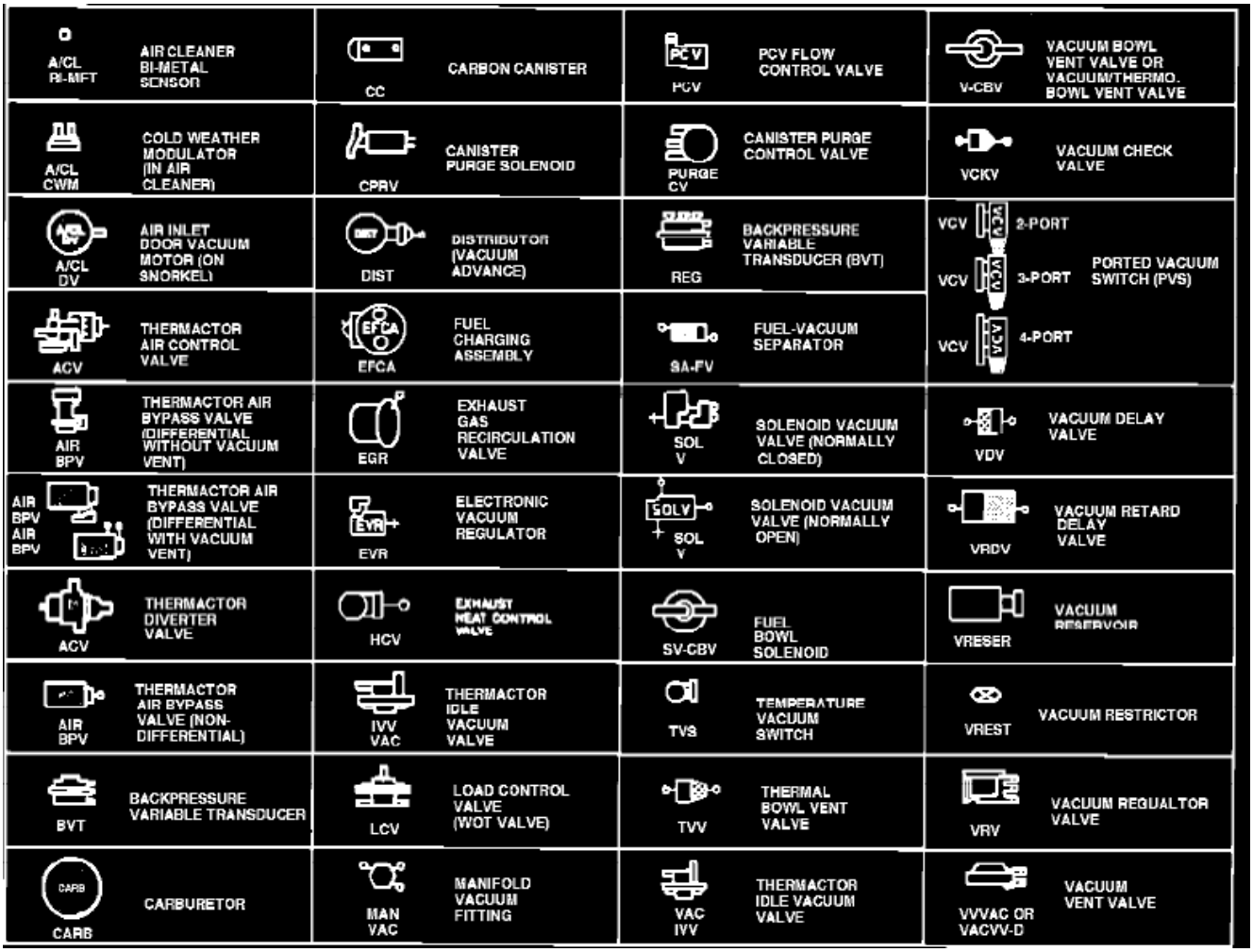
4. Connect electrical connector to switch, then check for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Sensors and Switches - Lighting and Horns > Hazard Warning Switch > Component Information > Diagrams > Diagram Information and Instructions

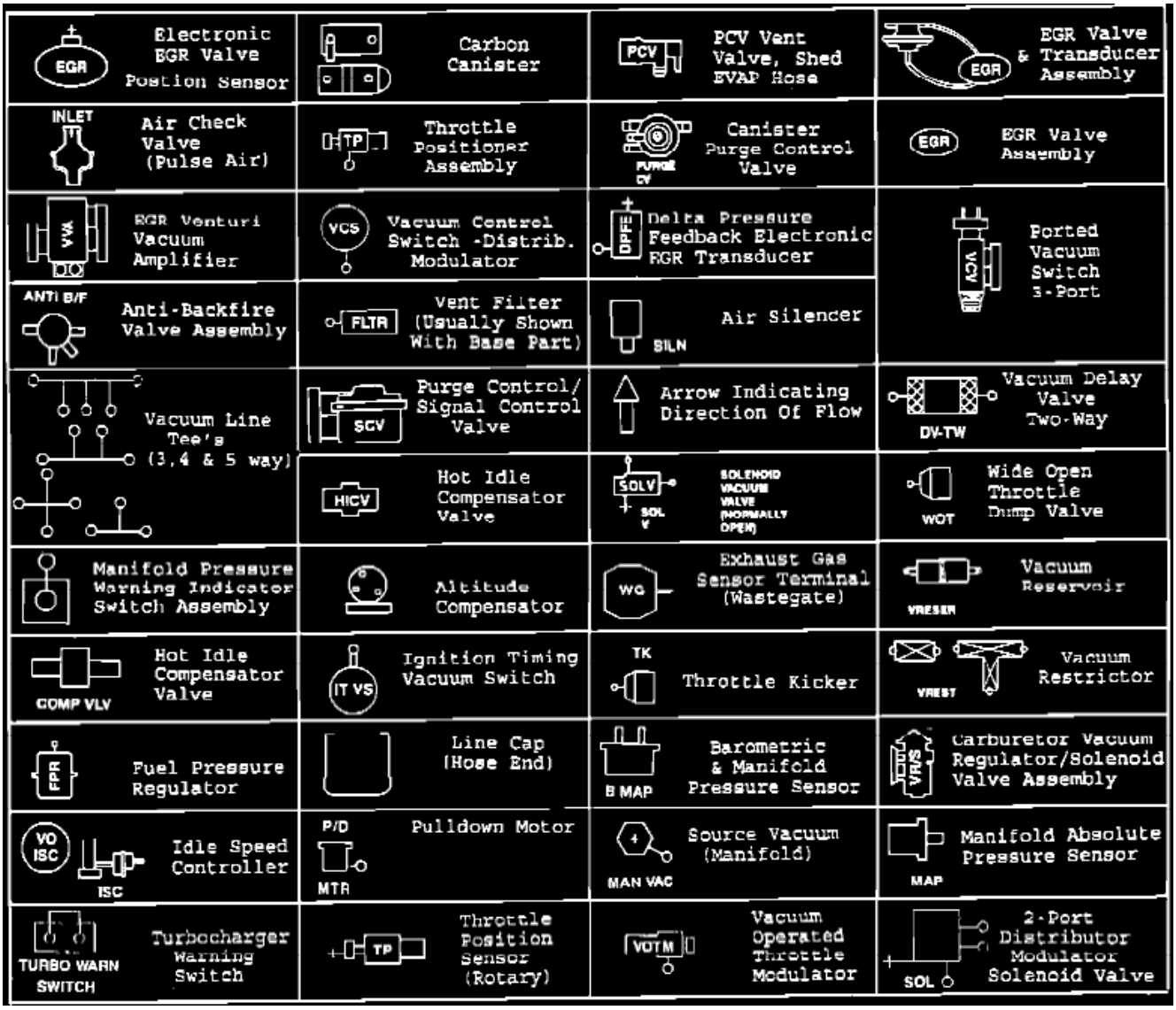


Hazard Warning Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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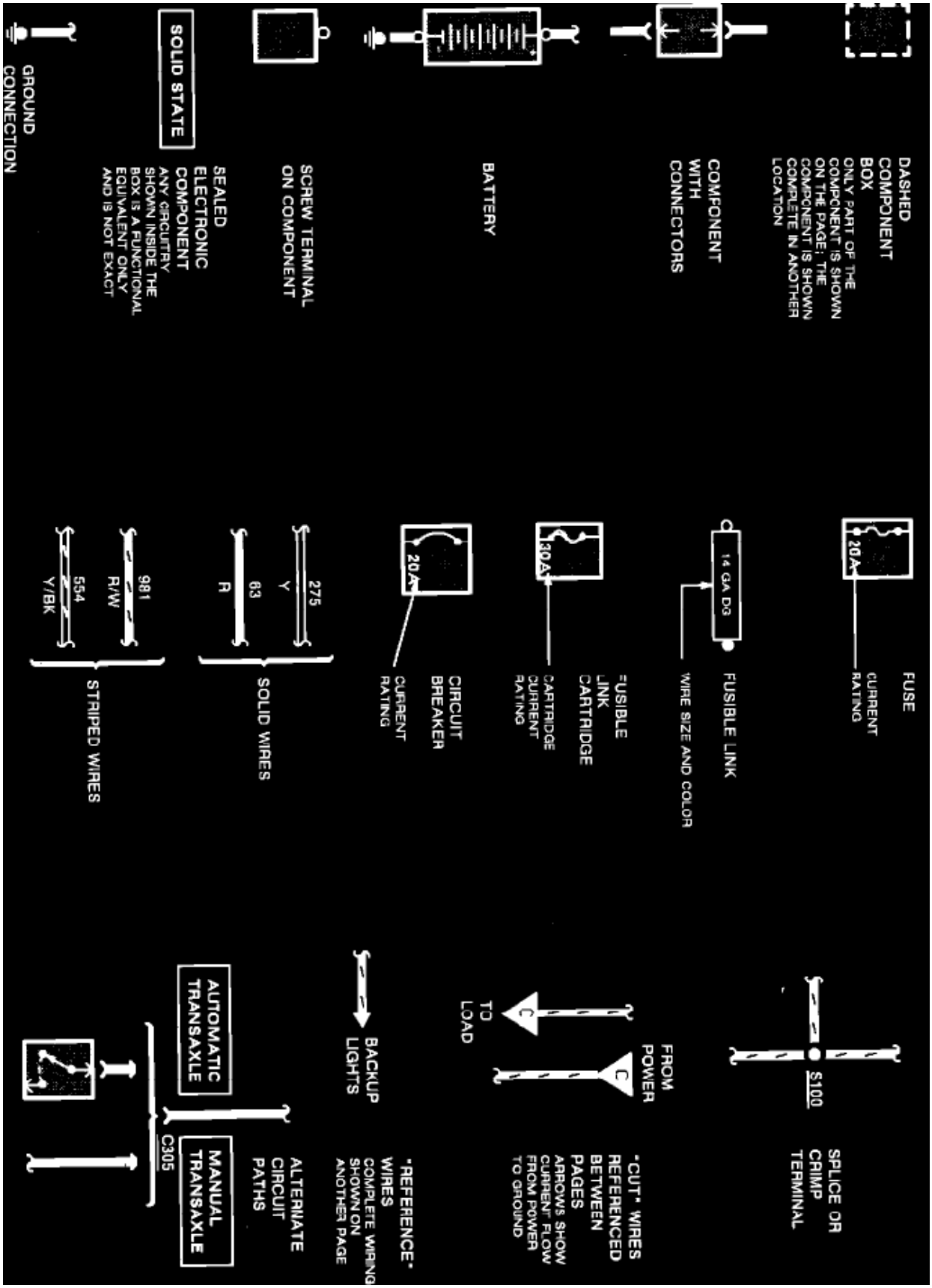
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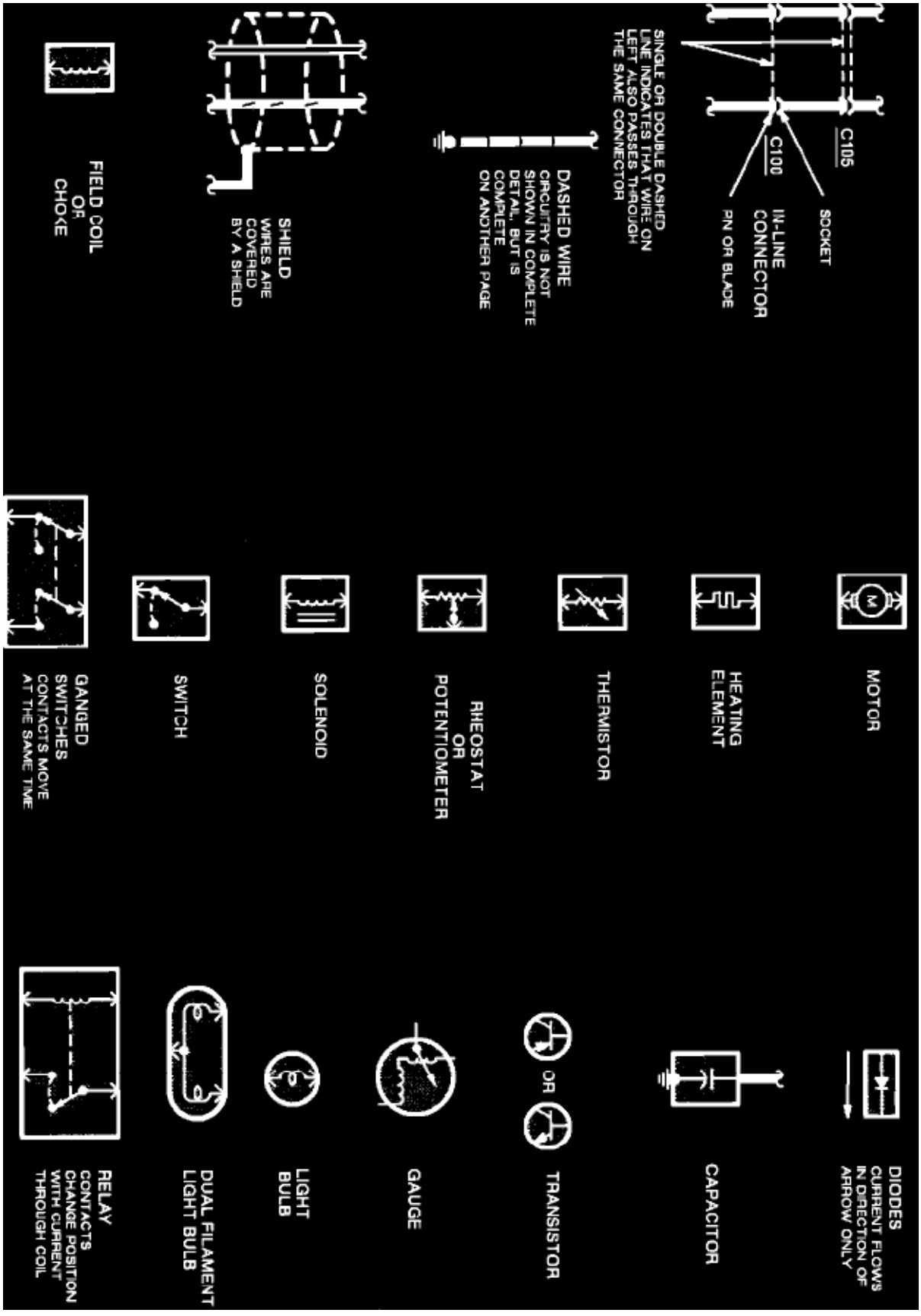
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

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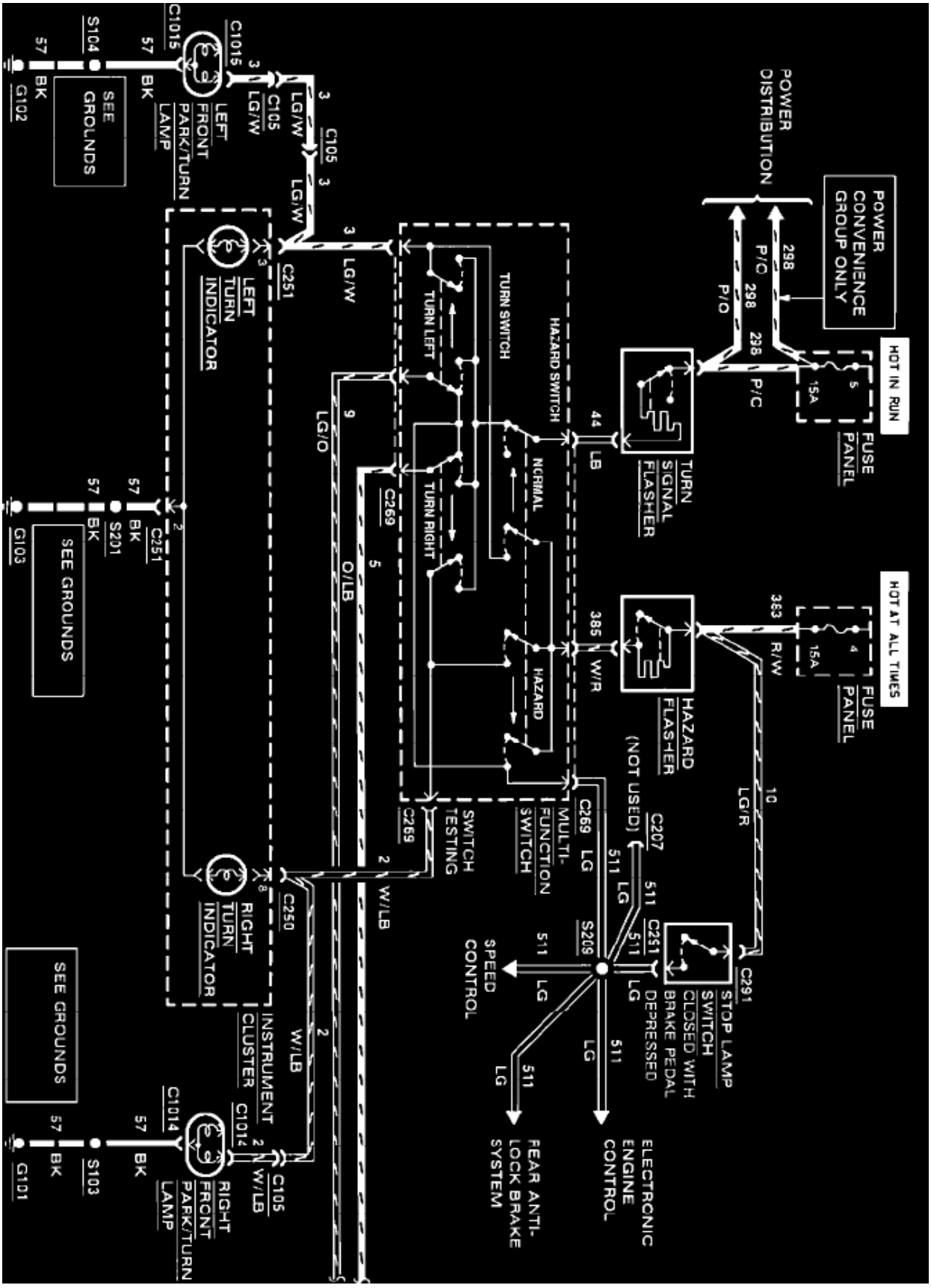
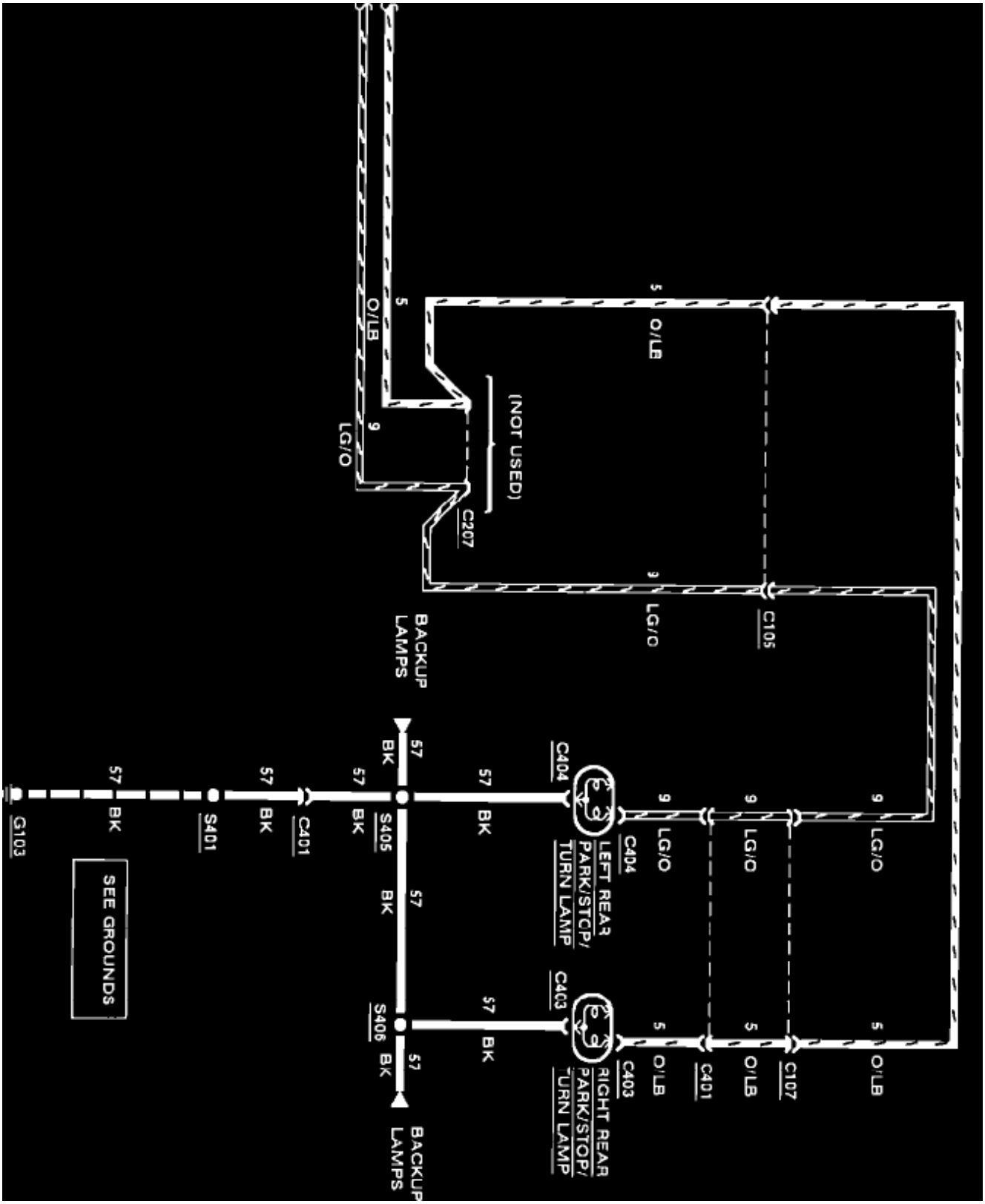
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Sensors and Switches - Lighting and Horns > Hazard Warning Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 7515



Hazard Warning Switch: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Hazard Warning Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

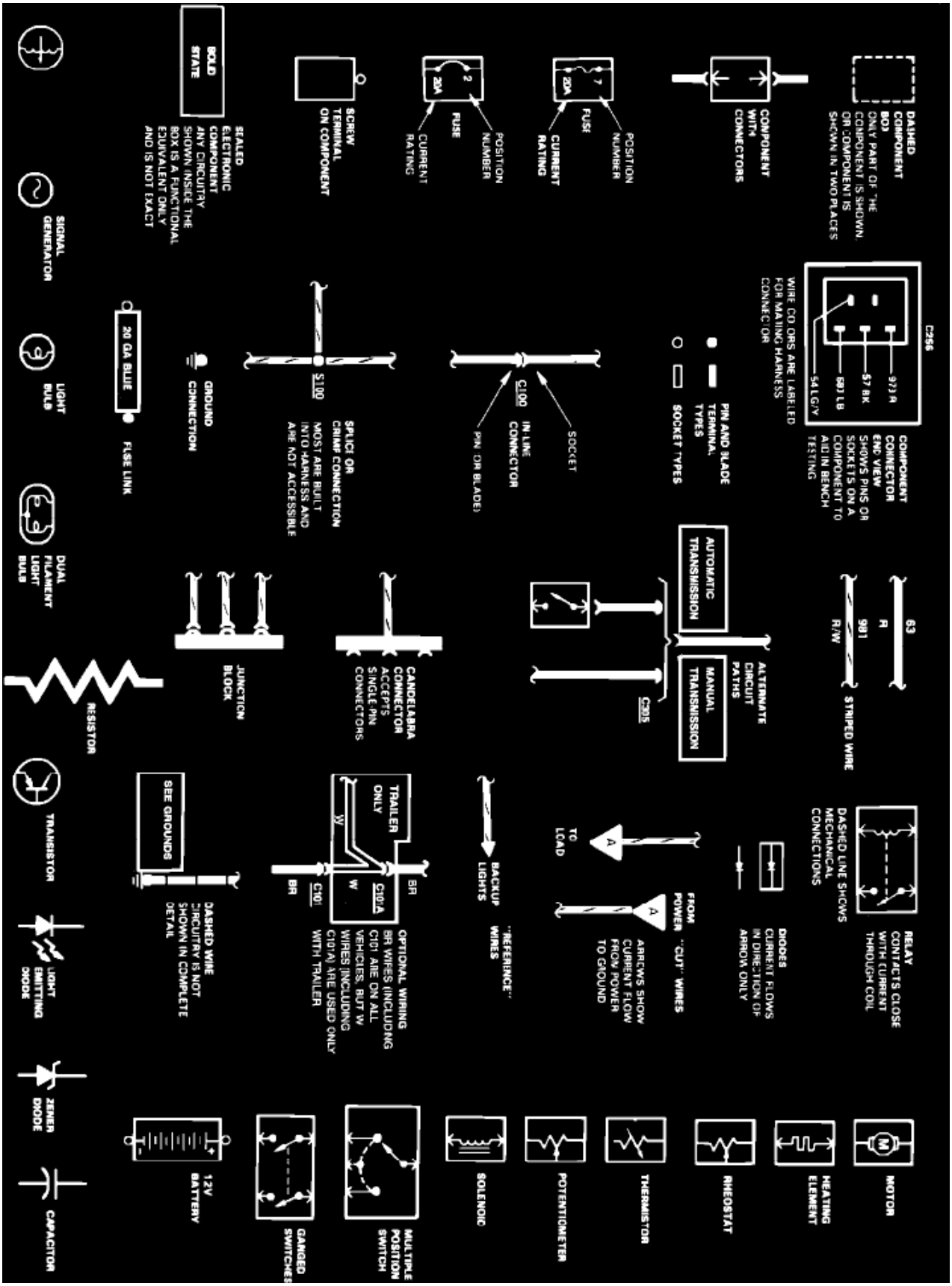
7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

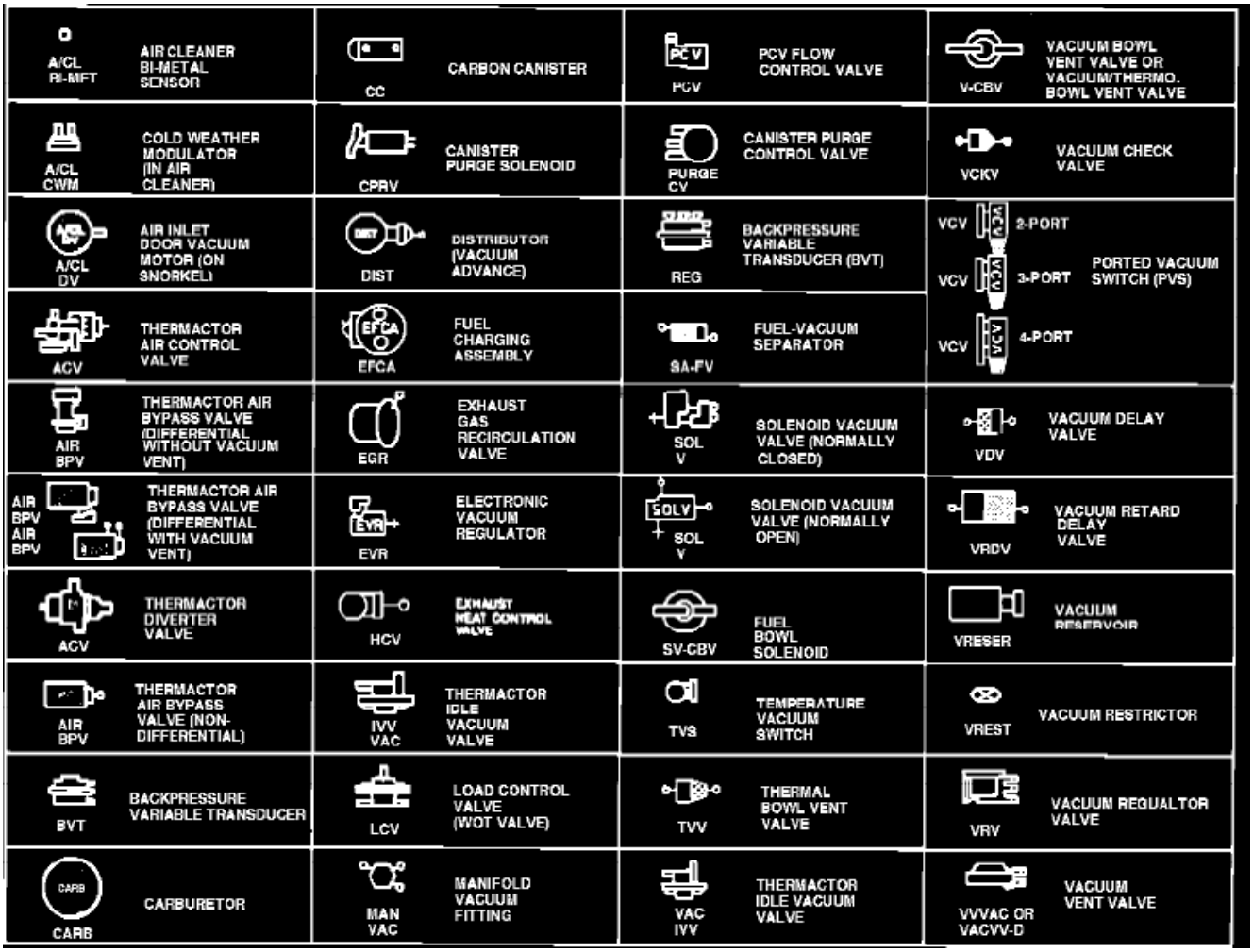
10. Check multi-function switch and steering column for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Sensors and Switches - Lighting and Horns > Headlamp Dimmer Switch > Component Information > Diagrams > Diagram Information and Instructions

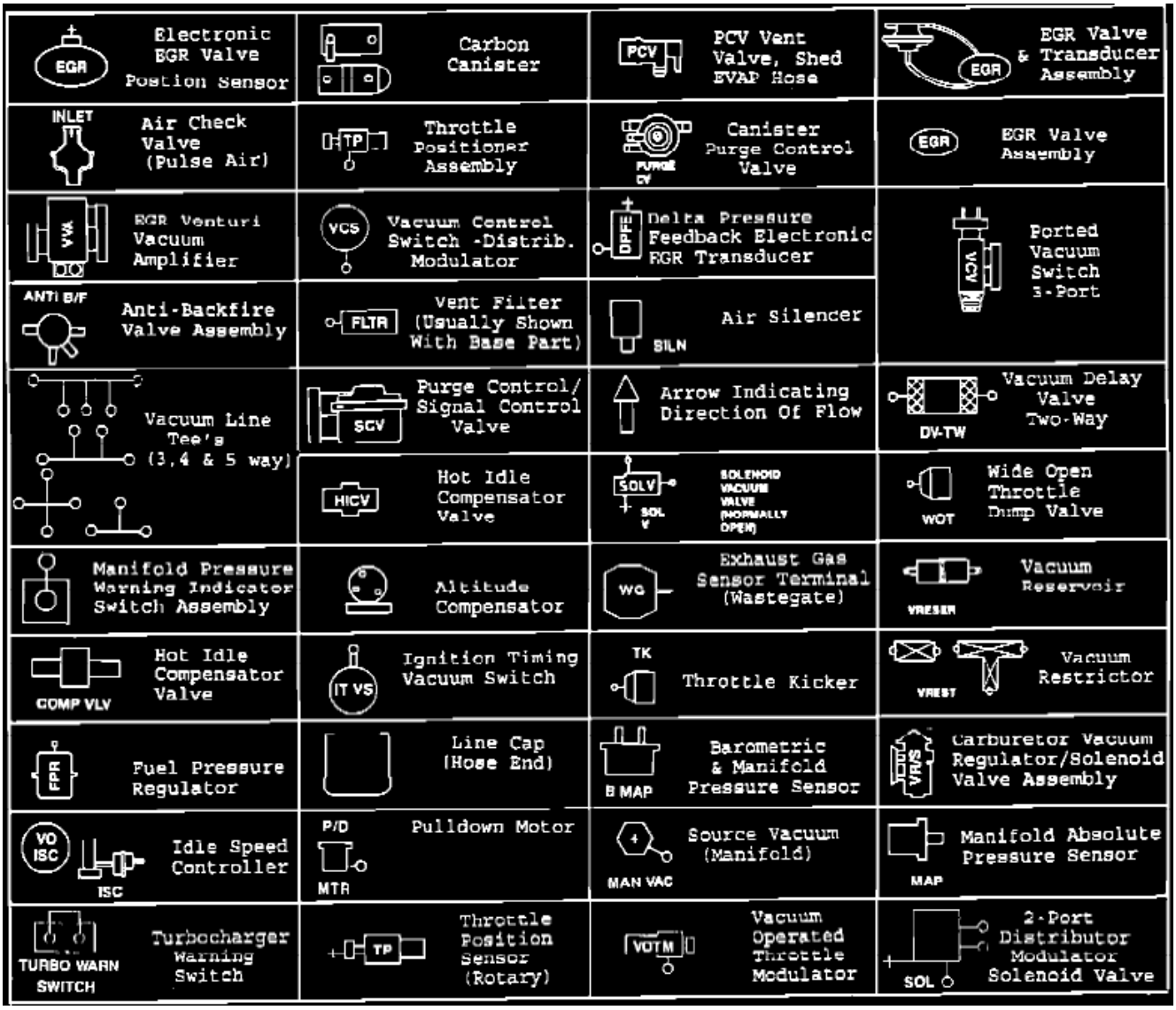


Headlamp Dimmer Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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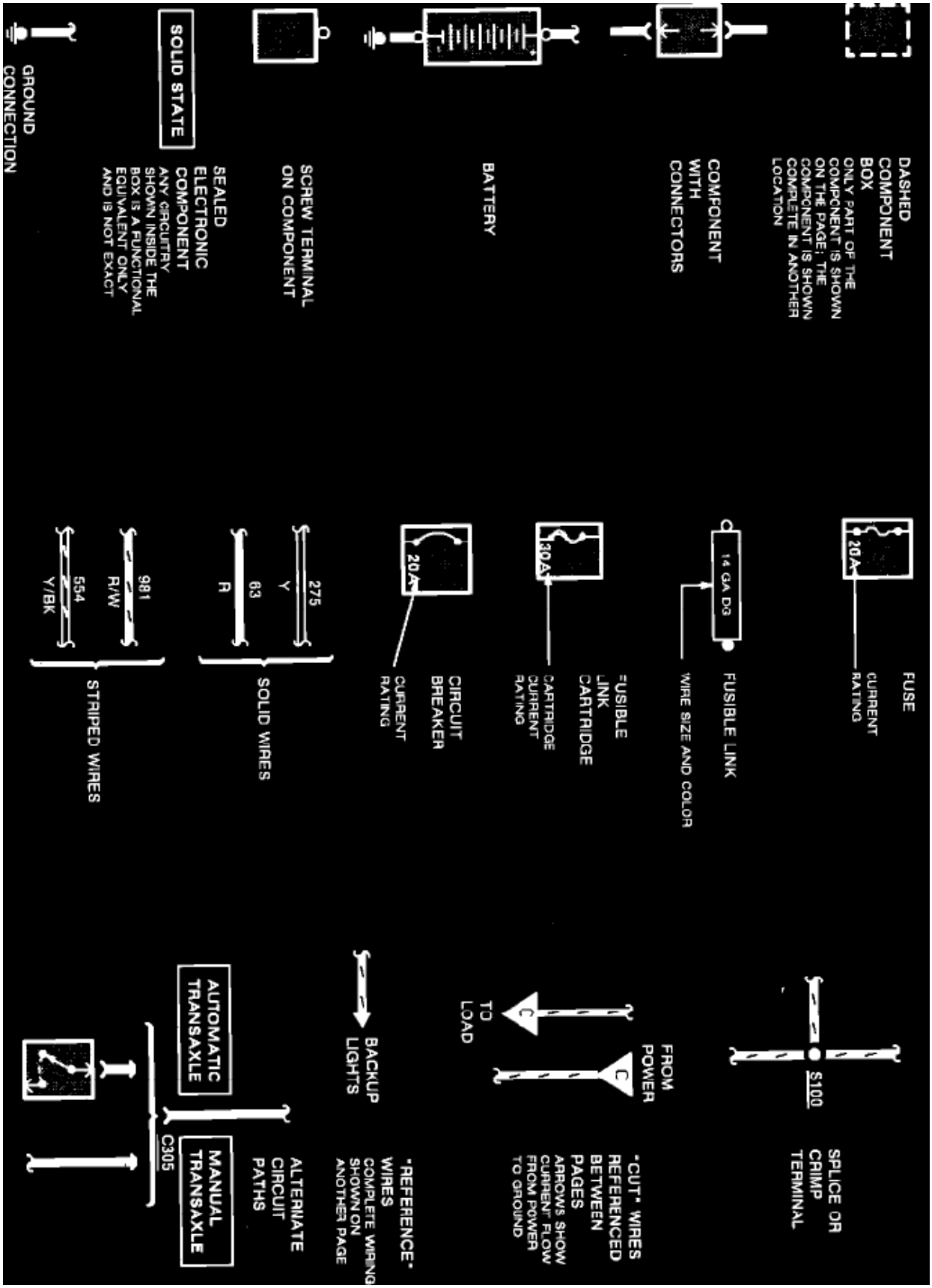
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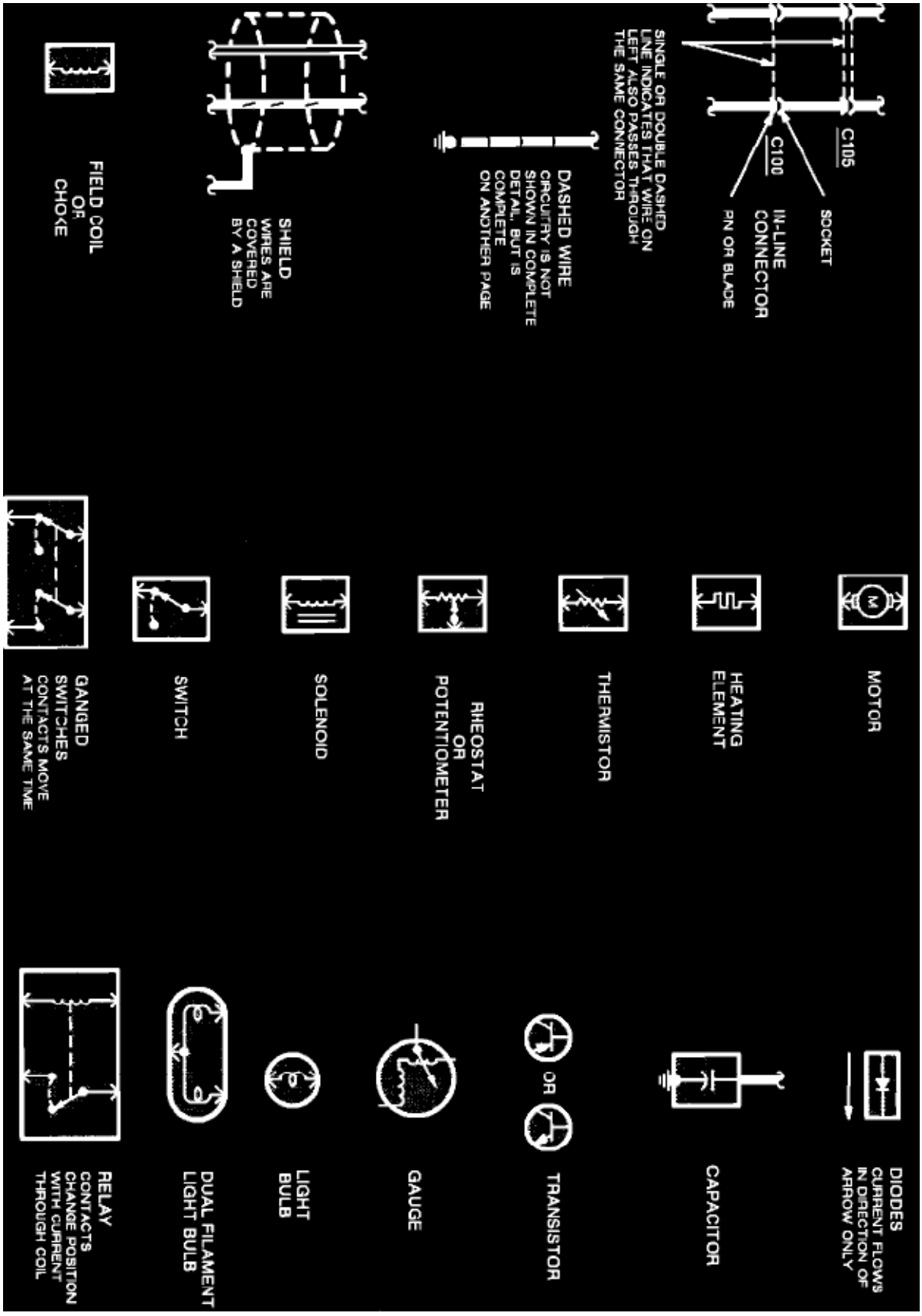
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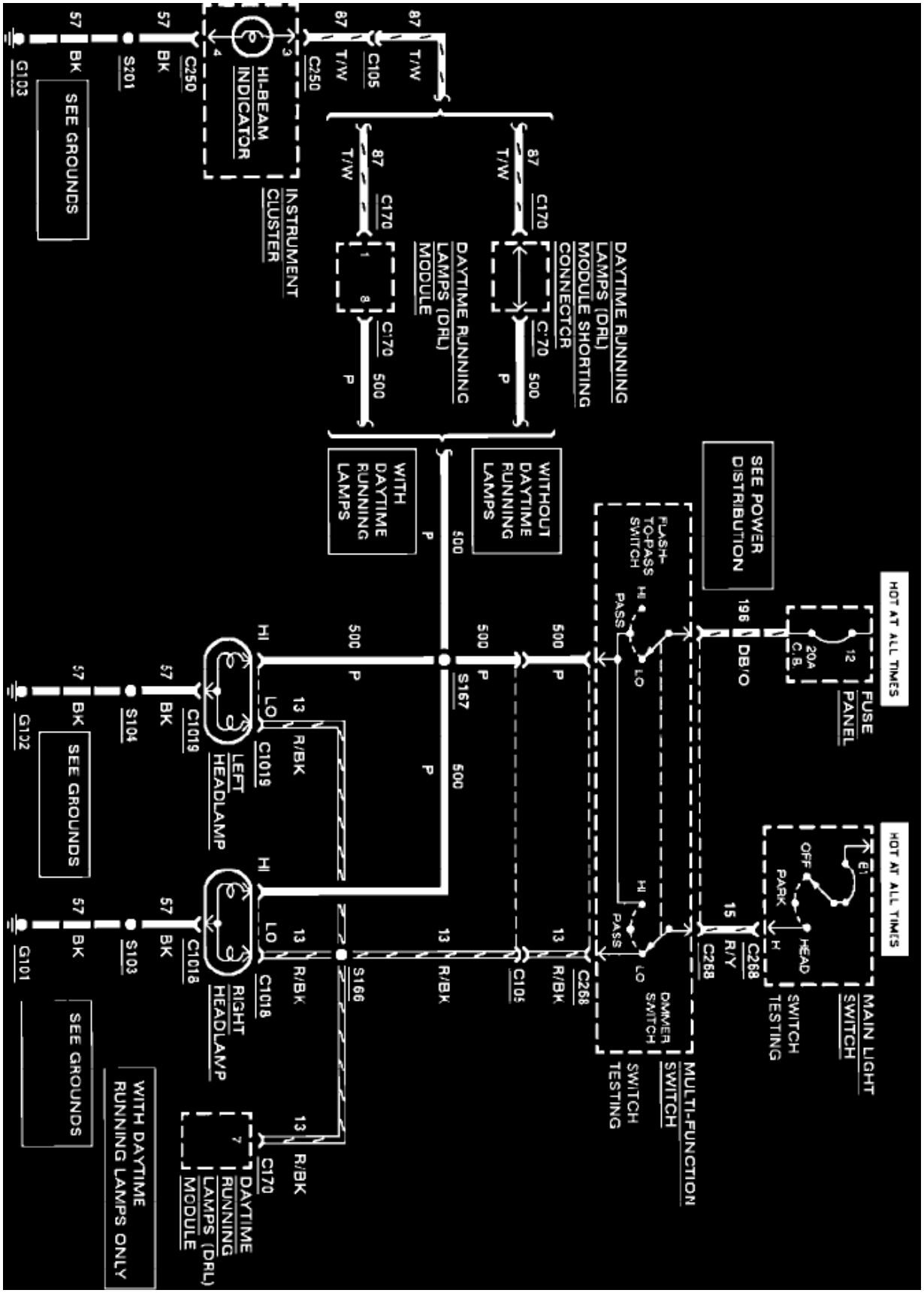
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196
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E1
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PARK
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HI
PASS
LO
DIMMER SWITCH
MULTI-FUNCTION SWITCH
SWITCH TESTING
DAYTIME RUNNING LAMPS (DRL) MODULE SHORTING CONNECTOR
C170
87
T/W
P
500
DAYTIME RUNNING LAMPS (DRL) MODULE
WITH DAYTIME RUNNING LAMPS
WITHOUT DAYTIME RUNNING LAMPS
C105
S167
S166
13
R/BK
INSTRUMENT CLUSTER
HI-BEAM INDICATOR
C250
S201
57
BK
G103
SEE GROUNDS
LEFT HEADLAMP
C1019
S104
G122
RIGHT HEADLAMP
C1018
S103
G101
WITH DAYTIME RUNNING LAMPS ONLY

Headlamps

Headlamp Dimmer Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

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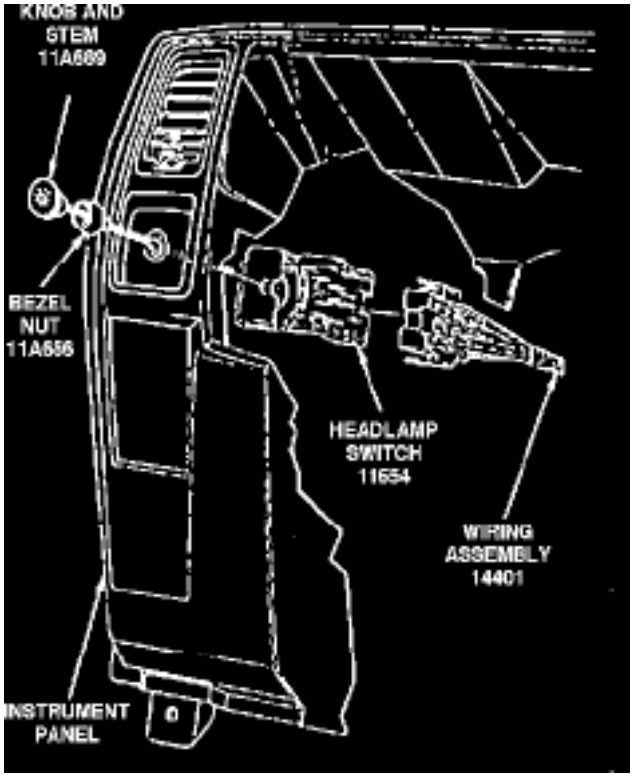


Headlamp Switch: Service and Repair

Fig. 11 Headlamp Switch Replacement.

1. Disconnect battery ground cable, remove ash tray assembly and two finish panel retaining screws, then the finish panel (snaps off).

2. On Bronco II or Explorer models, remove rear window wash/wipe and heated backlit switch assembly (snaps out).

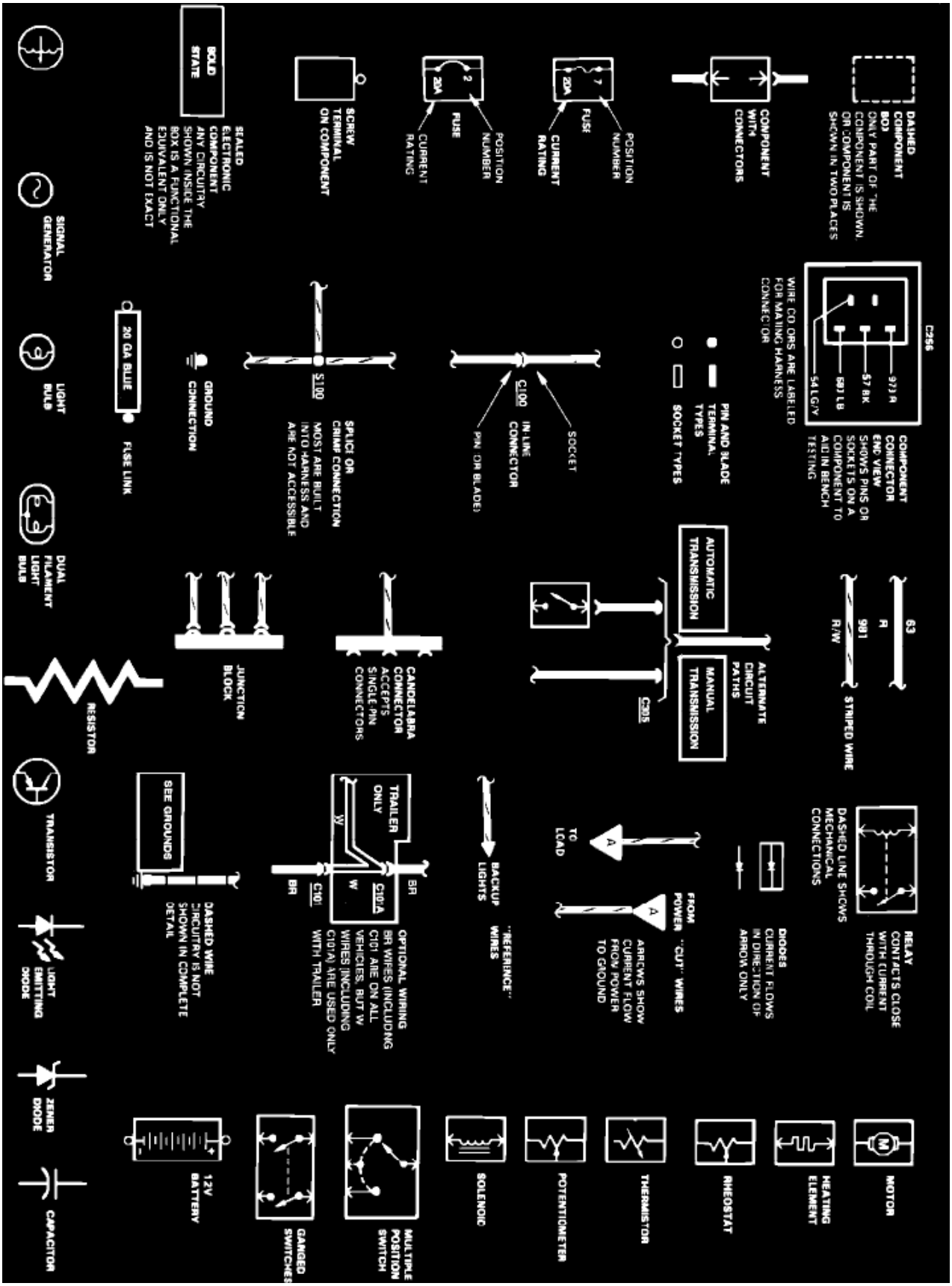
3. On Ranger models, remove storage bin (snaps out).

4. On all models, pull headlamp switch knob to ON position, then depress shaft release button on switch and remove knob and shaft assembly, Fig. 11.

5. Remove bezel nut, pull switch down through opening, disconnect electrical connector, then remove switch.

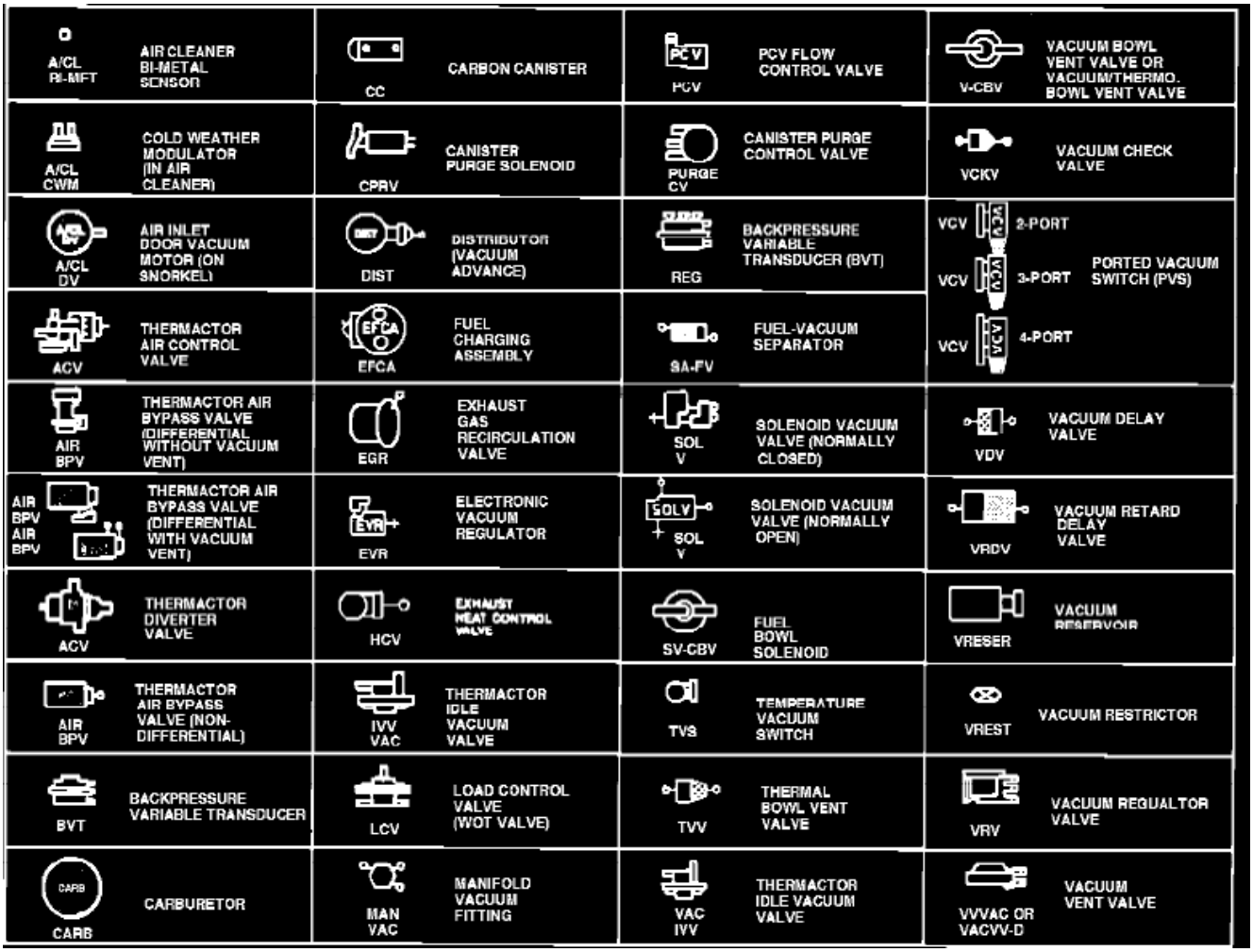
6. Reverse procedure to install.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Sensors and Switches - Lighting and Horns > Turn Signal Switch > Component Information > Diagrams > Diagram Information and Instructions

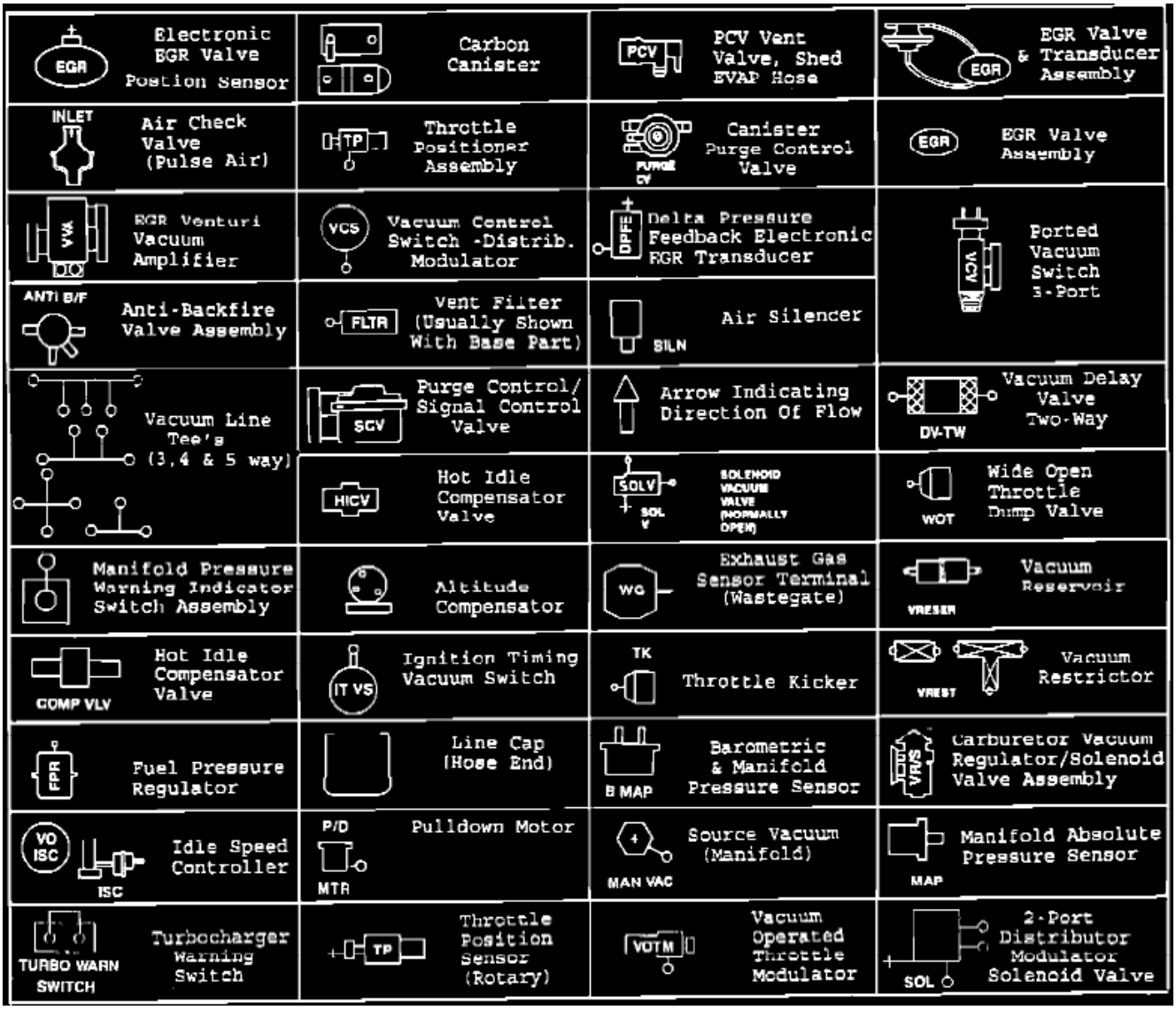


Turn Signal Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols

DASHED COMPONENT BOX
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30A
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63
R
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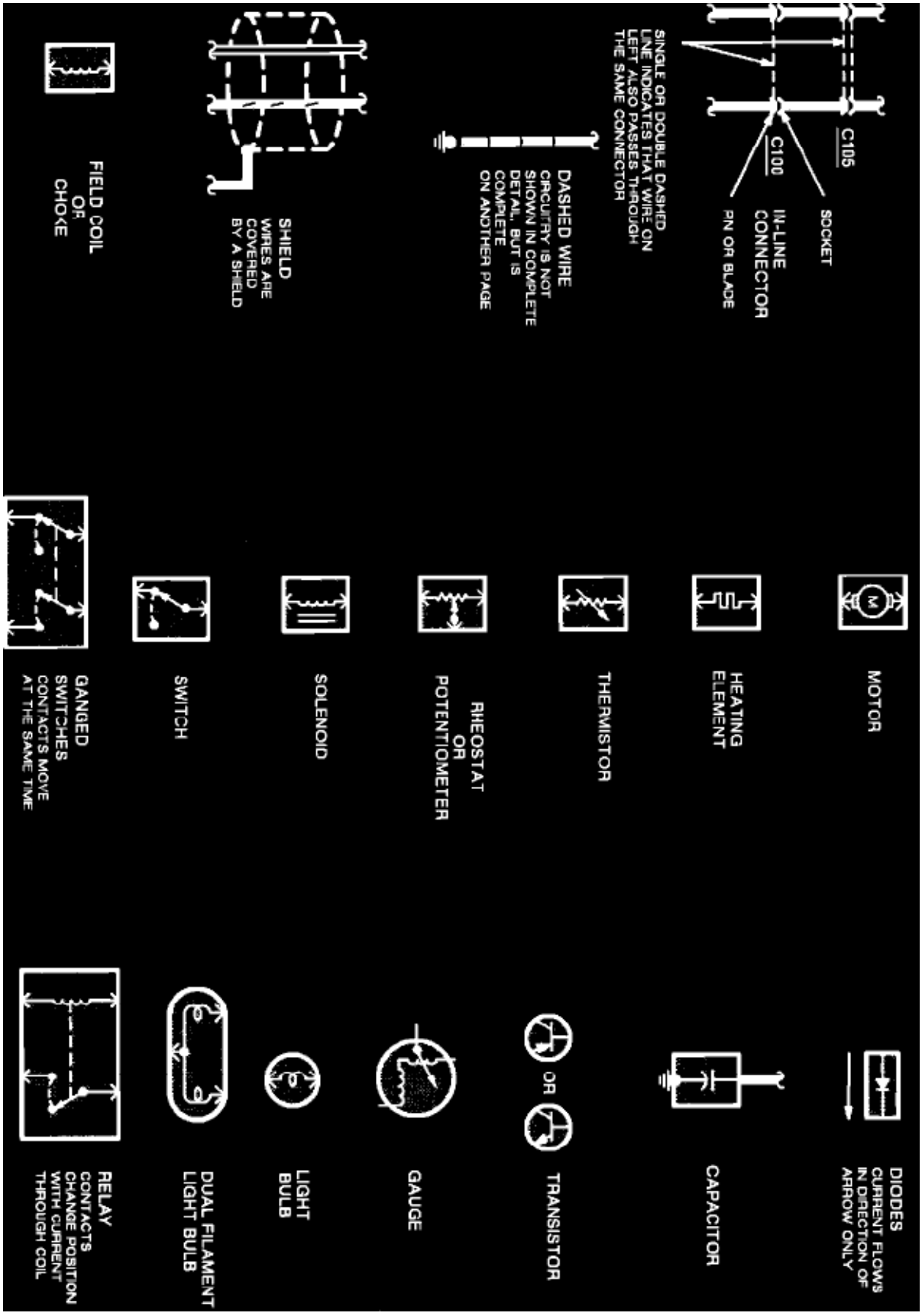
C305

Electrical Symbols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Wire Color Code Identification

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For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

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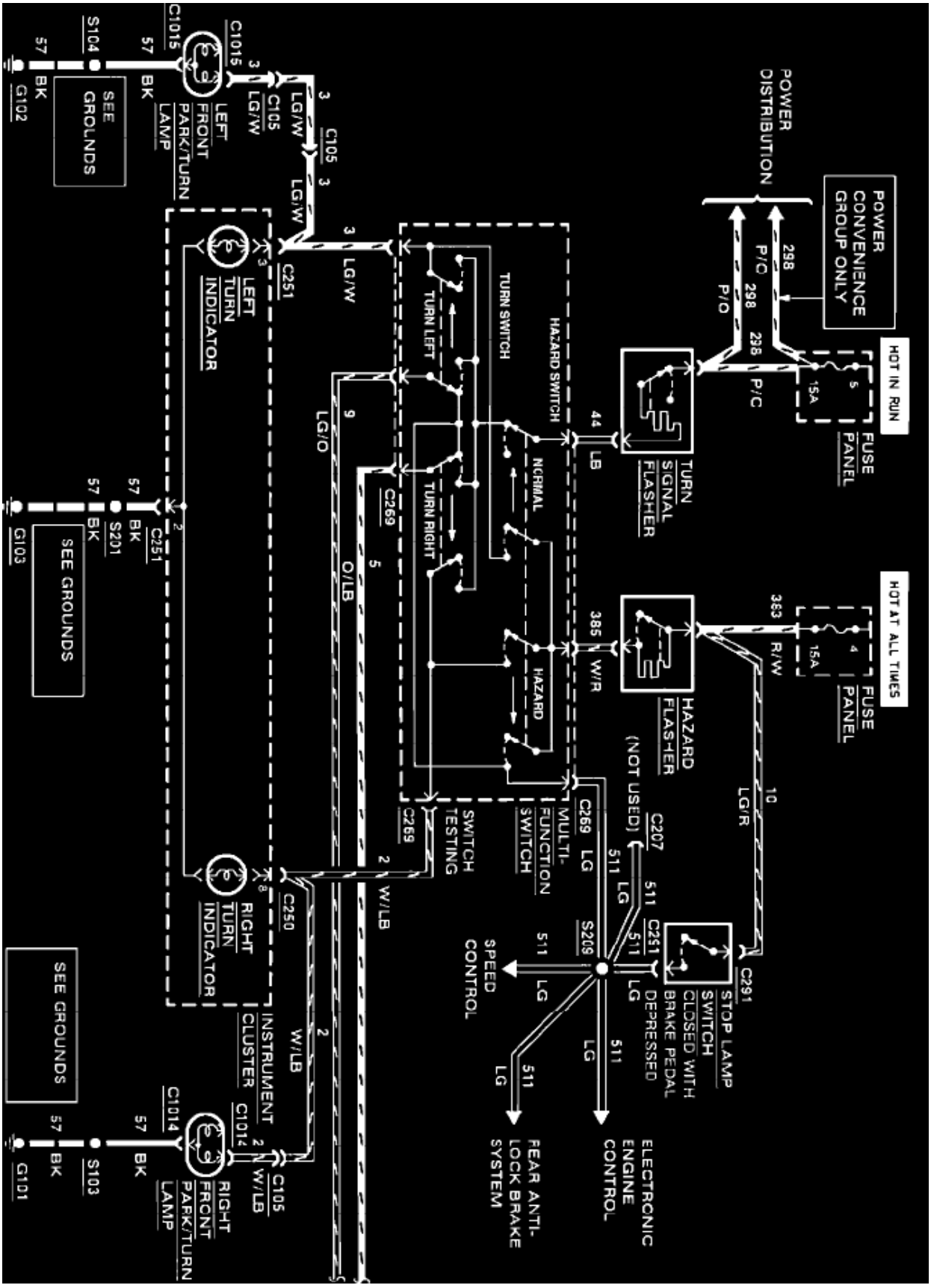
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STOP LAMP SWITCH
CLOSED WITH BRAKE PEDAL DEPRESSED
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INSTRUMENT CLUSTER
SEE GROUNDS
SEE GRDLNDS
298 P/C
236 P/C
P/O
15A
383 R/W
385 W/R
44 LB
LG/R
LG/W
LG/O
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W/LB
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C269
C250
C207
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G102
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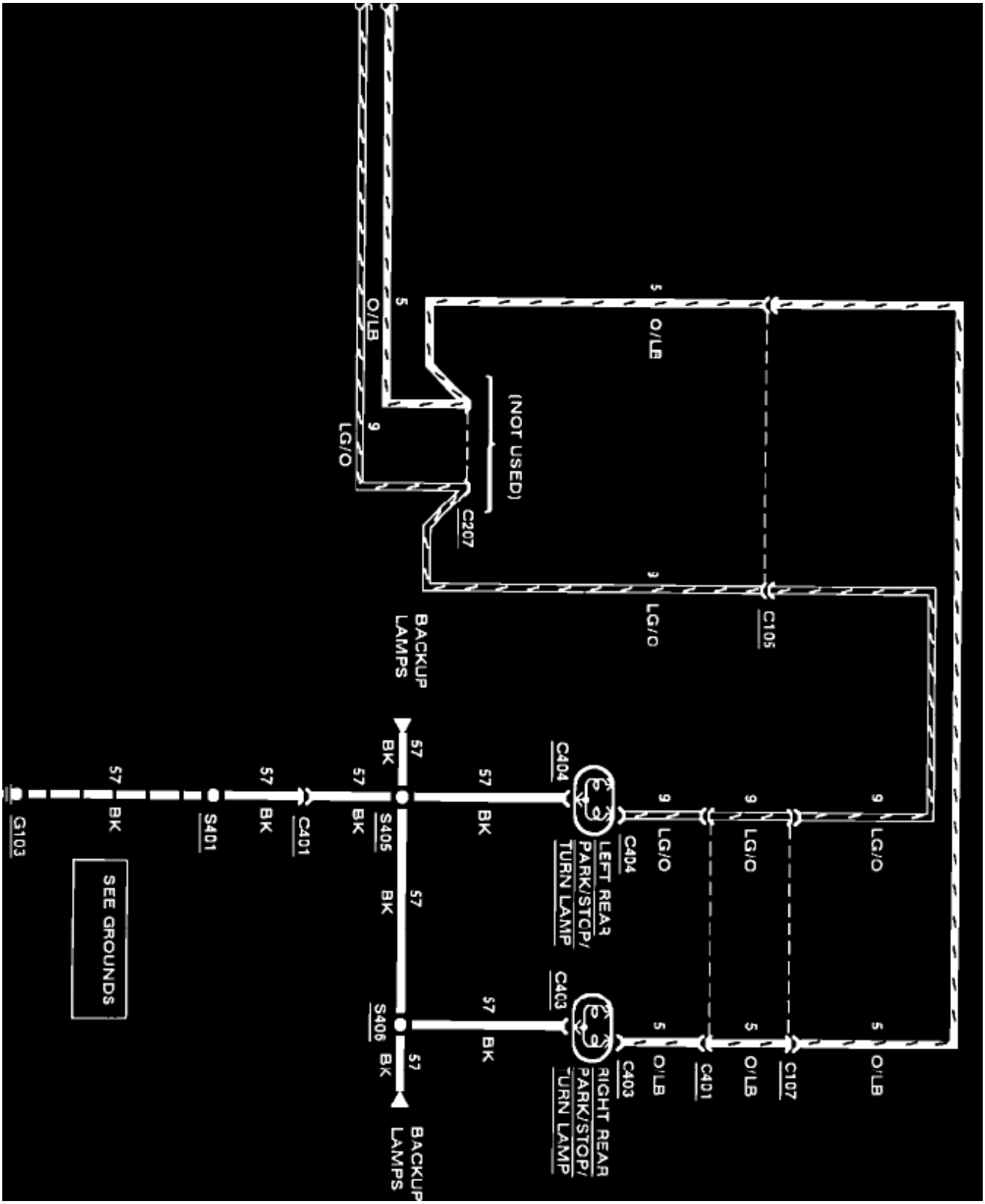
G101
C1015
C1014

Turn Signal Switch: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Turn Signal Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

10. Check multi-function switch and steering column for proper operation.

Old Service Part Number	New Service Part Number
F6TZ-15702-AA E7DZ-15702-A	1U5Z-15702-AA 1U5Z-15702-AA

PART NUMBER	PART NAME
1U5Z-15702-AA	27 degree Mechanical Hood Lamp Switch

Underhood Lamp Switch: Technical Service Bulletins Hood Lamp Switch - Revised

Article No. 01-21-6

10/29/01

ELECTRICAL - REVISED MECHANICAL HOOD LAMP SWITCH TO REPLACE OLD STYLE MERCURY HOOD LAMP SWITCH

FORD: 1987-1995 TAURUS 1988-1991 CROWN VICTORIA 1989 THUNDERBIRD 1989-1996 MUSTANG 1994-1996 THUNDERBIRD 1990 BRONCO II 1990-1996 RANGER 1991-1996 BRONCO 1994-2001 EXPLORER 1997-2001 F-150 2000-2001 EXCURSION 2002 EXPEDITION

LINCOLN: 1989-1994 CONTINENTAL 1990-1992 MARK VII 1990-1996 TOWN CAR 1993-1995 MARK VIII 2002 NAVIGATOR

MERCURY: 1987-1995 SABLE 1988-1991 GRAND MARQUIS 1989 COUGAR 1994-1996 COUGAR 1997-2001 MOUNTAINEER

ISSUE

This article is to provide information on replacement hood lamp switches. The 27 degree Mercury style hood switches will no longer be available. Replacement 27 degree Mechanical switches will be available as a service replacement.

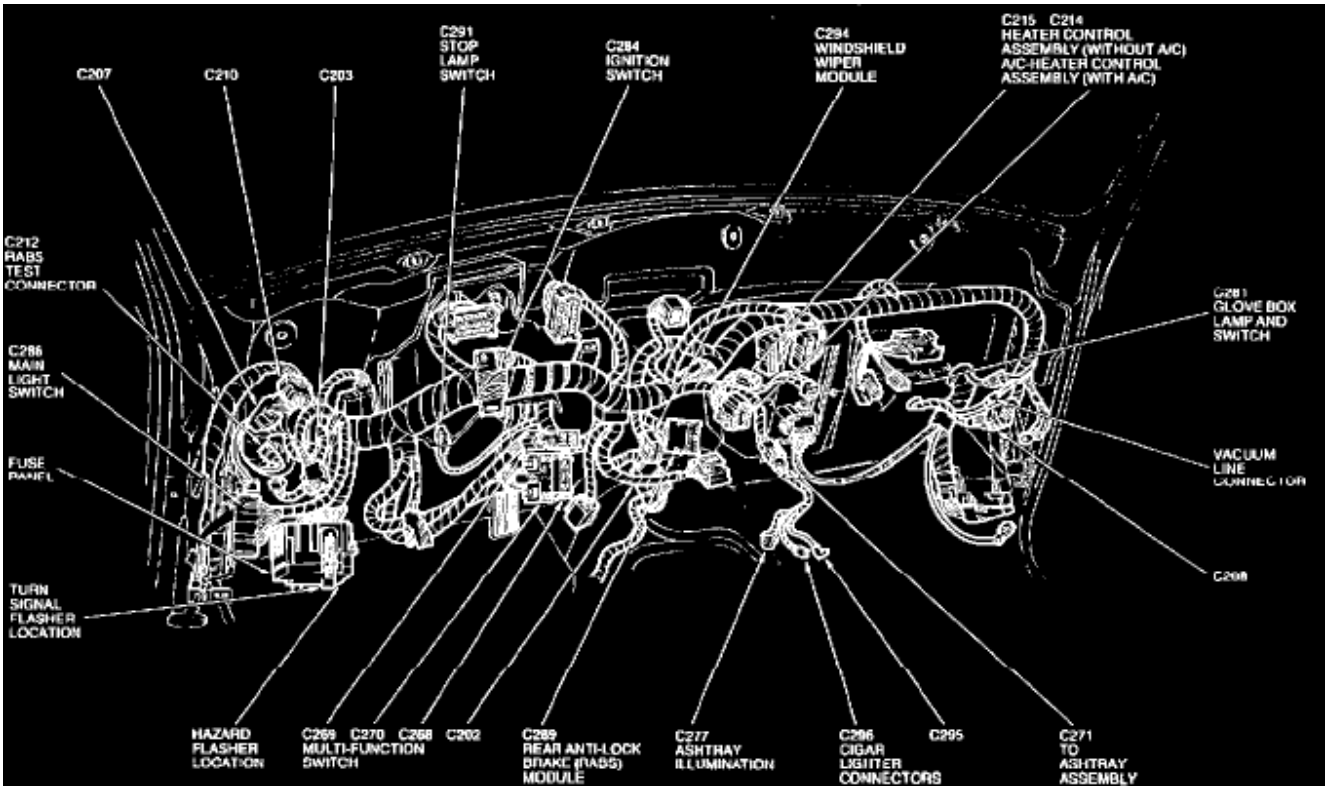
ACTION

For vehicles requiring hood lamp switch replacement, replace the 27 degree Mercury switch with new 27 degree Mechanical switch. Replace hood lamp switch per the appropriate model year Workshop Manual as needed.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 201000, 201200

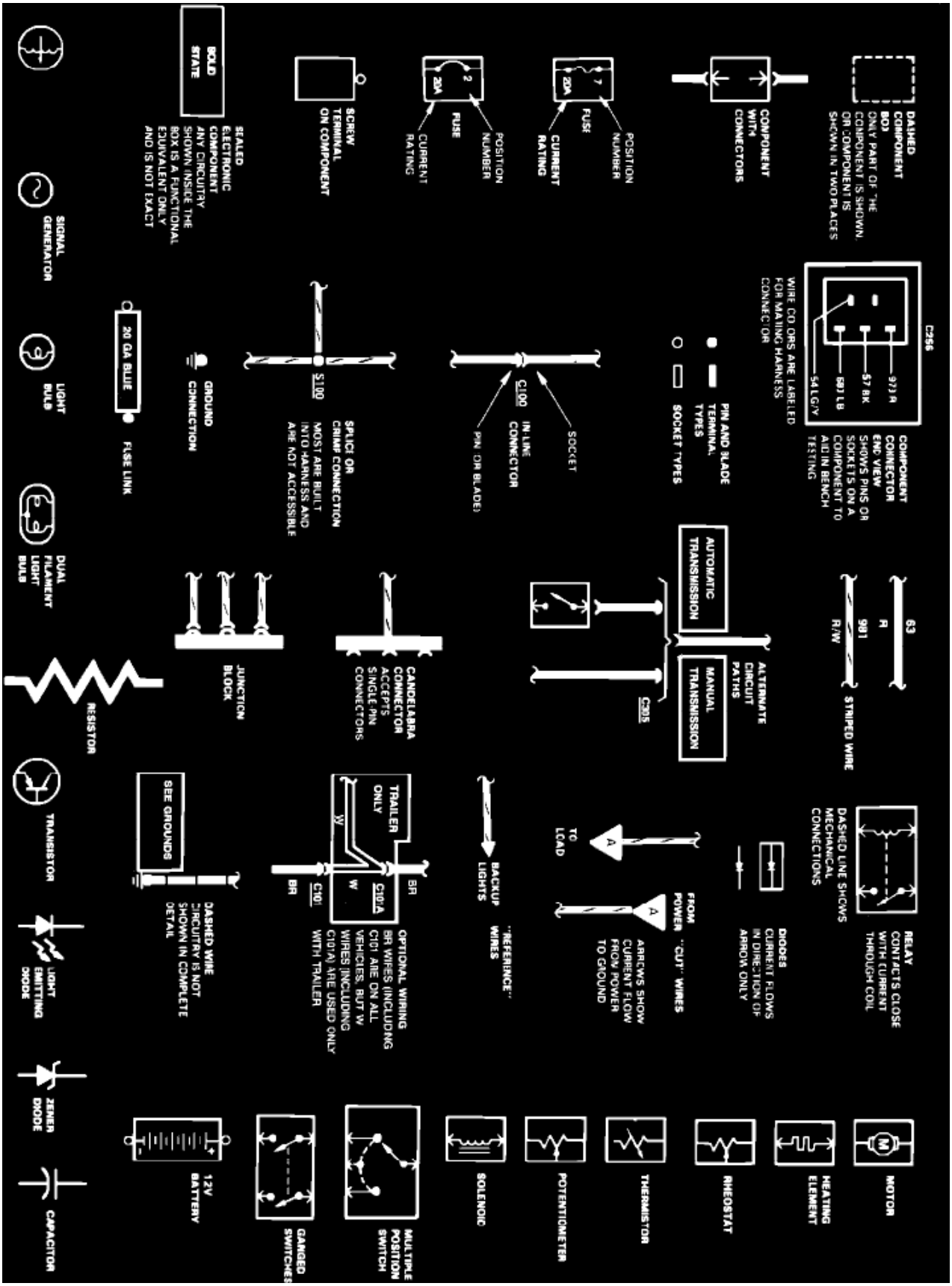


Turn Signal Flasher: Locations

I/P Components

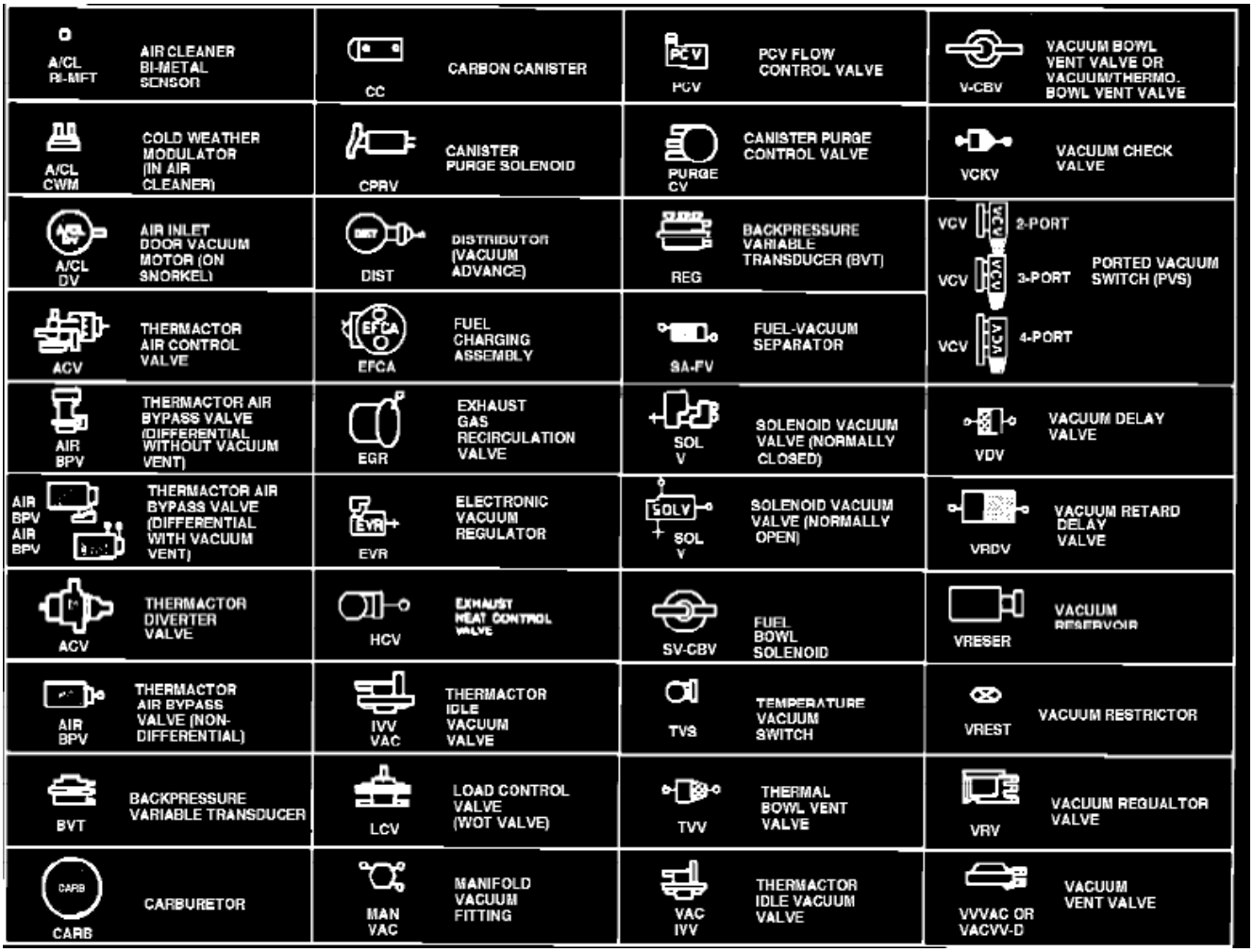
Behind LH Side Of I/P, On Fuse Panel

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Turn Signals > Turn Signal Lamp > Component Information > Diagrams > Diagram Information and Instructions

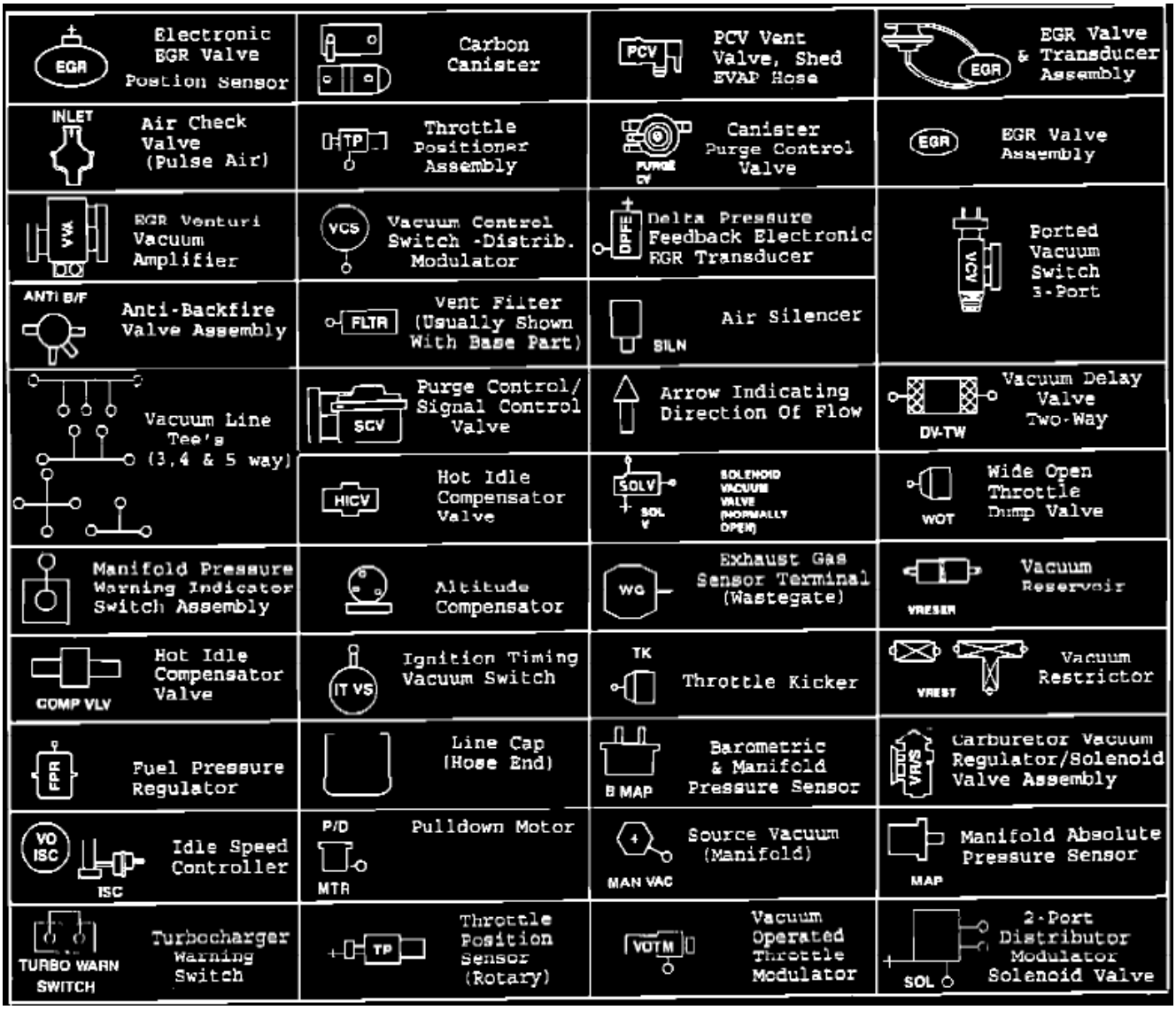


Turn Signal Lamp: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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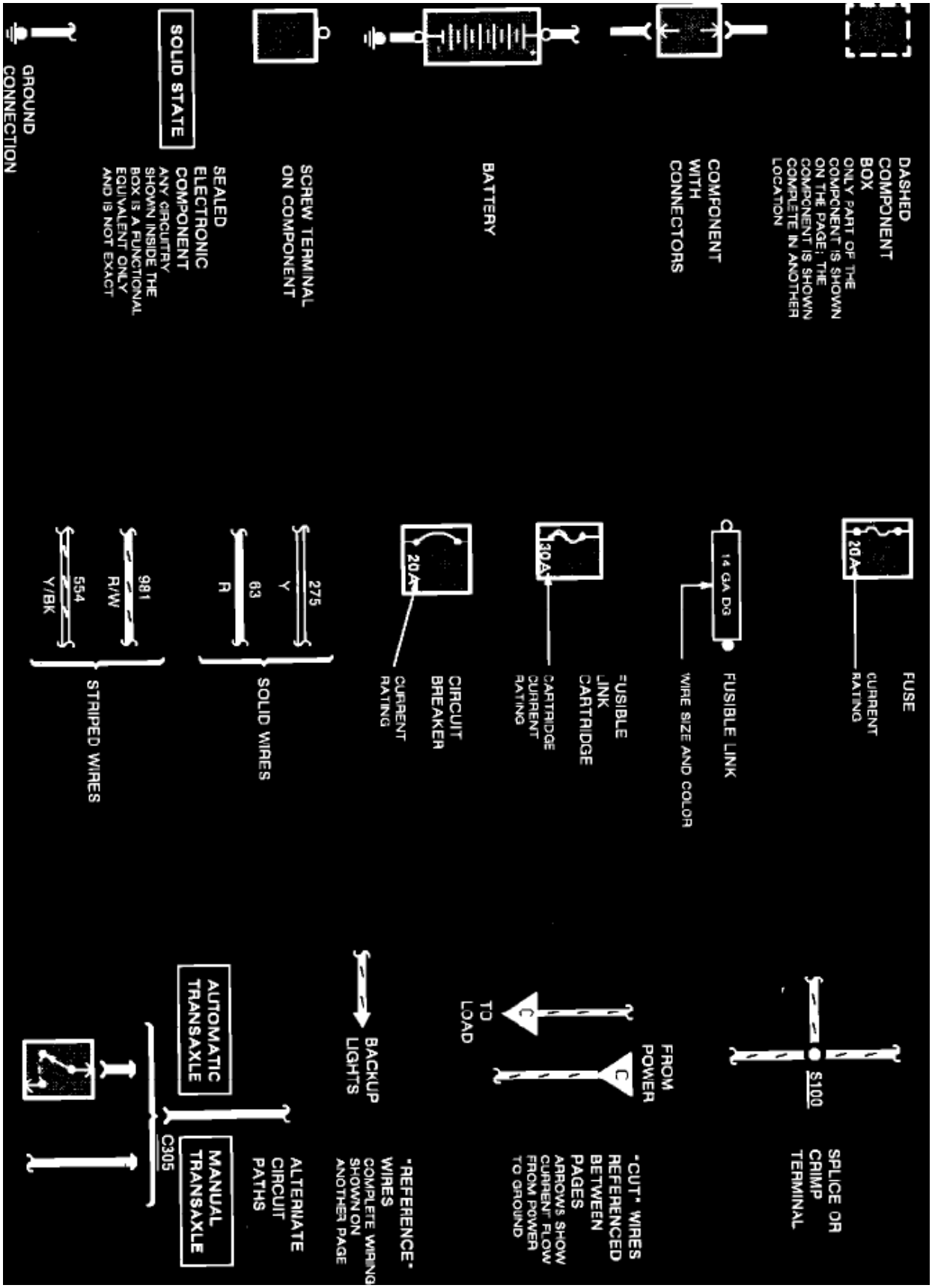
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C305
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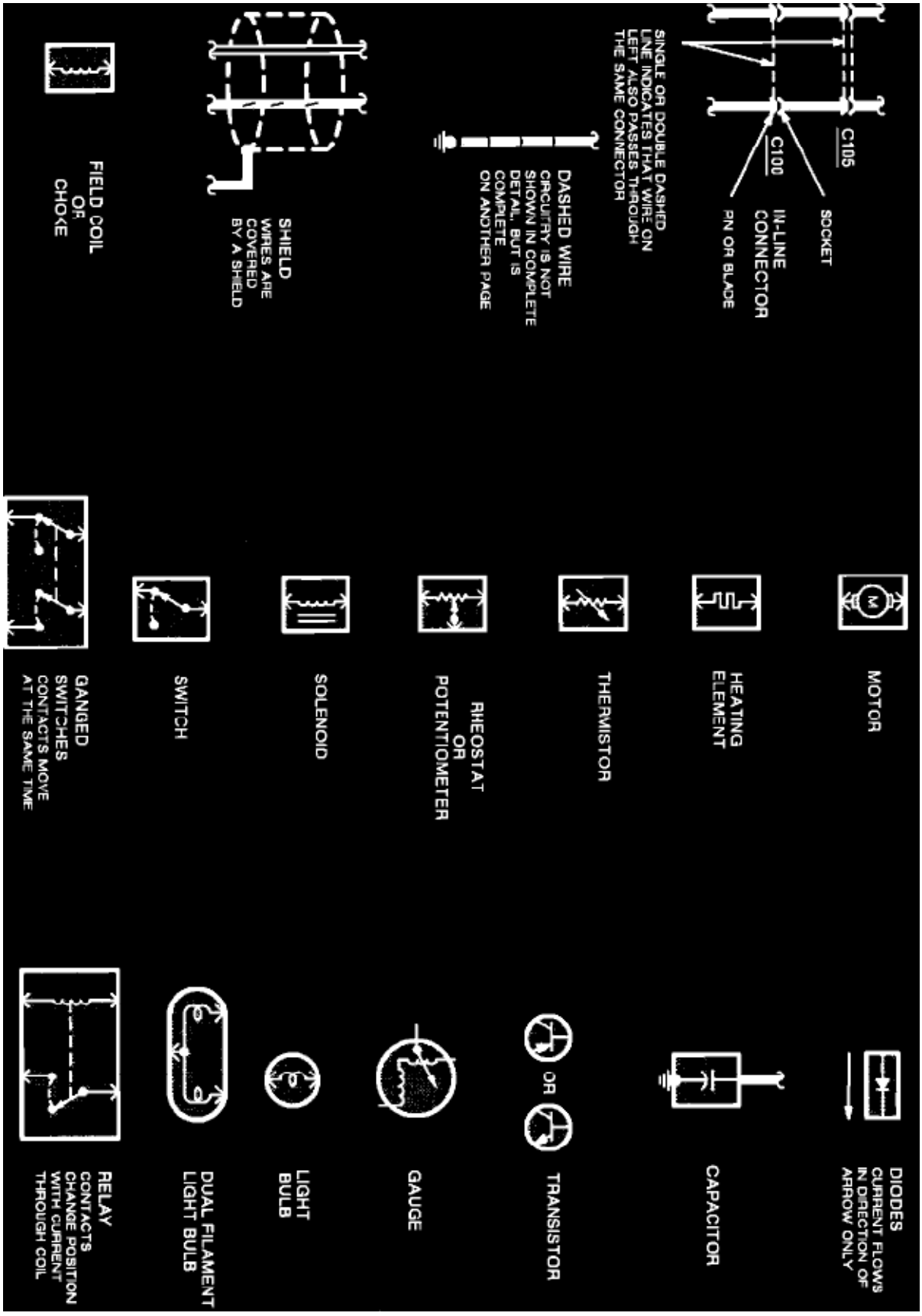
Electrical Symbols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Electrical Symbols

Wire Color Code Identification

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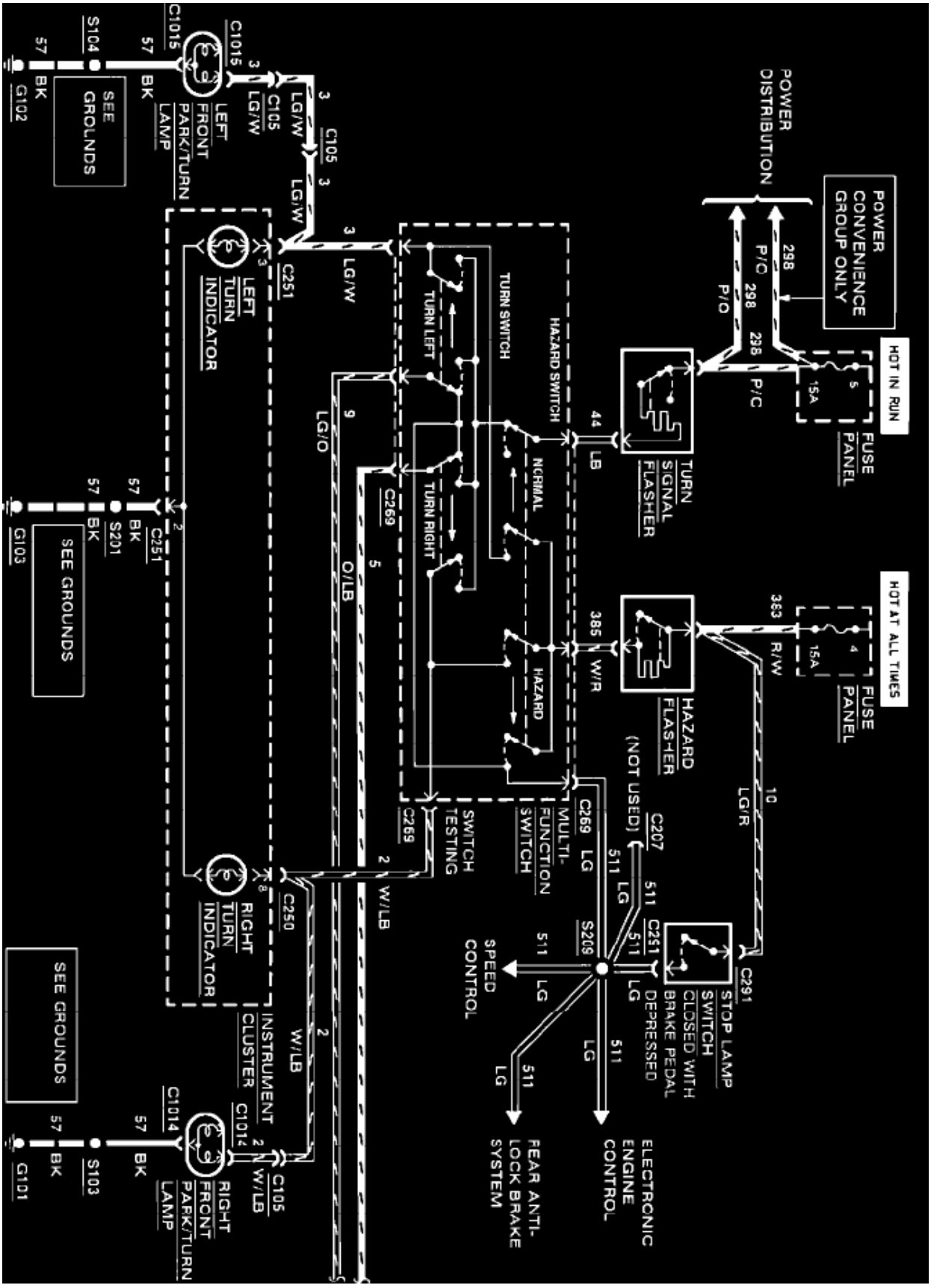
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STOP LAMP SWITCH
CLOSED WITH BRAKE PEDAL DEPRESSED
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P/C
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15A
5
4
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LB
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R/W
385
W/R
10
LG/R
511
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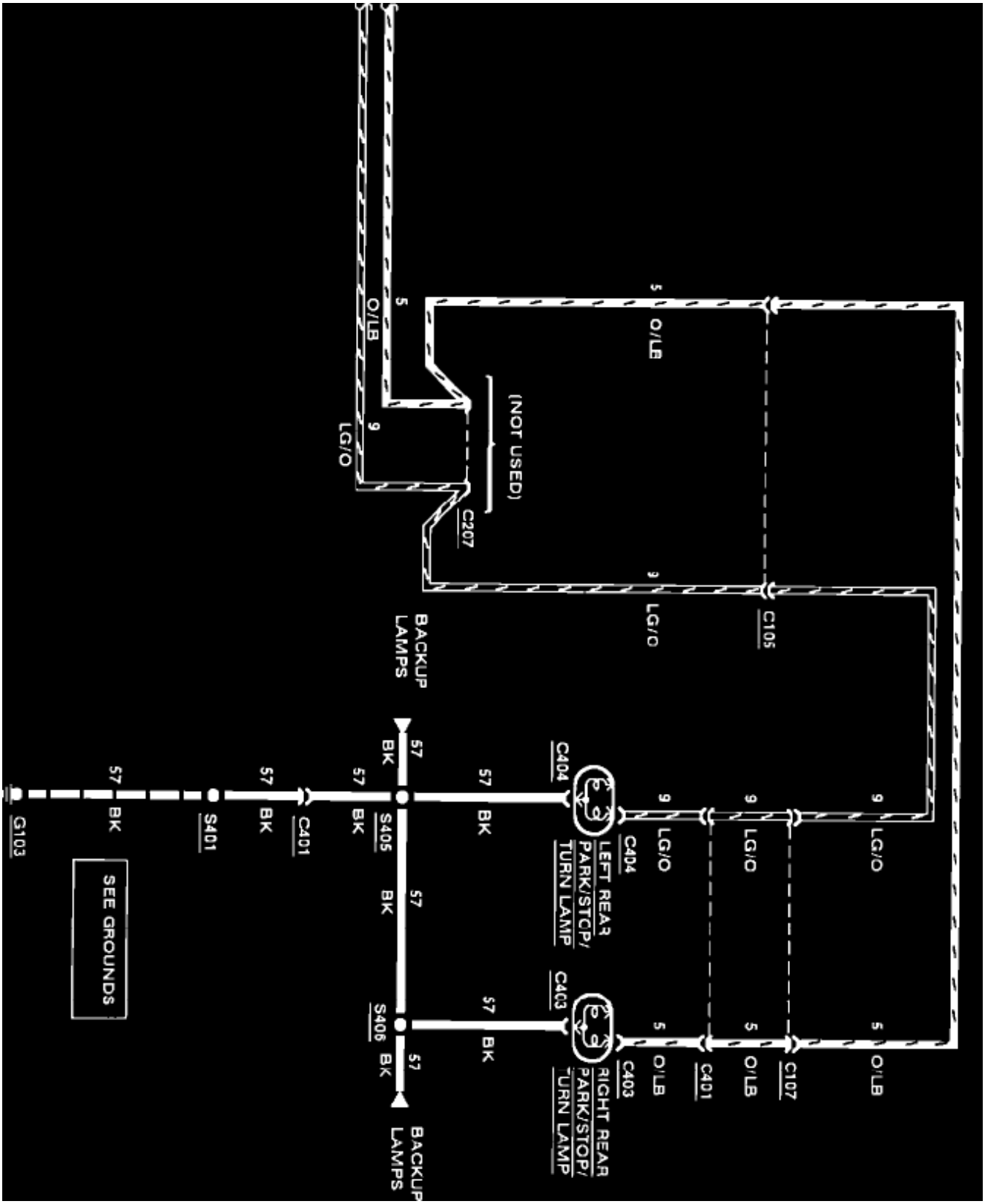
2
W/LB
3
LG/W
57
BK

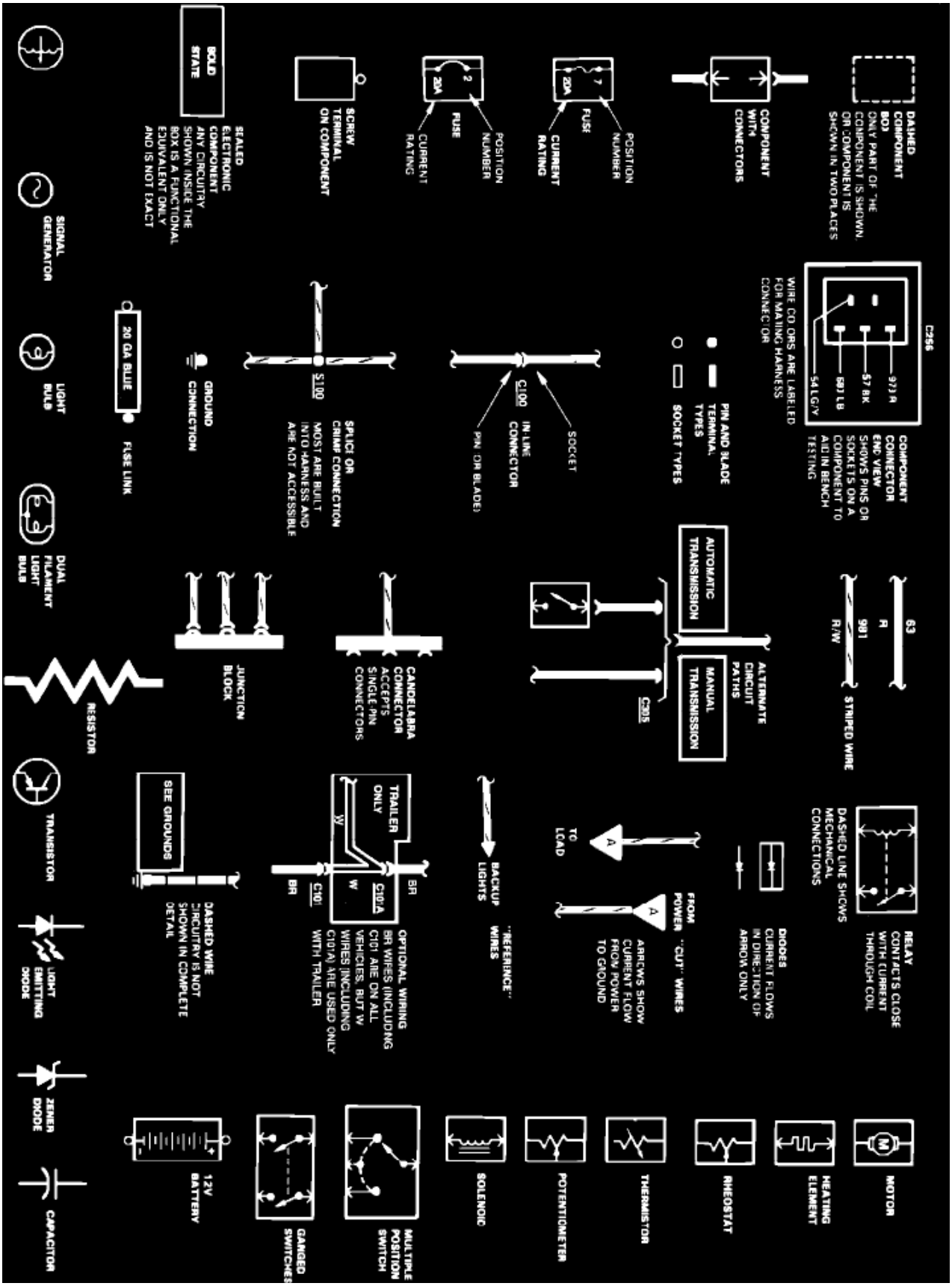
Turn Signal Lamp: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Lighting and Horns > Turn Signals > Turn Signal Switch > Component Information > Diagrams > Diagram Information and Instructions



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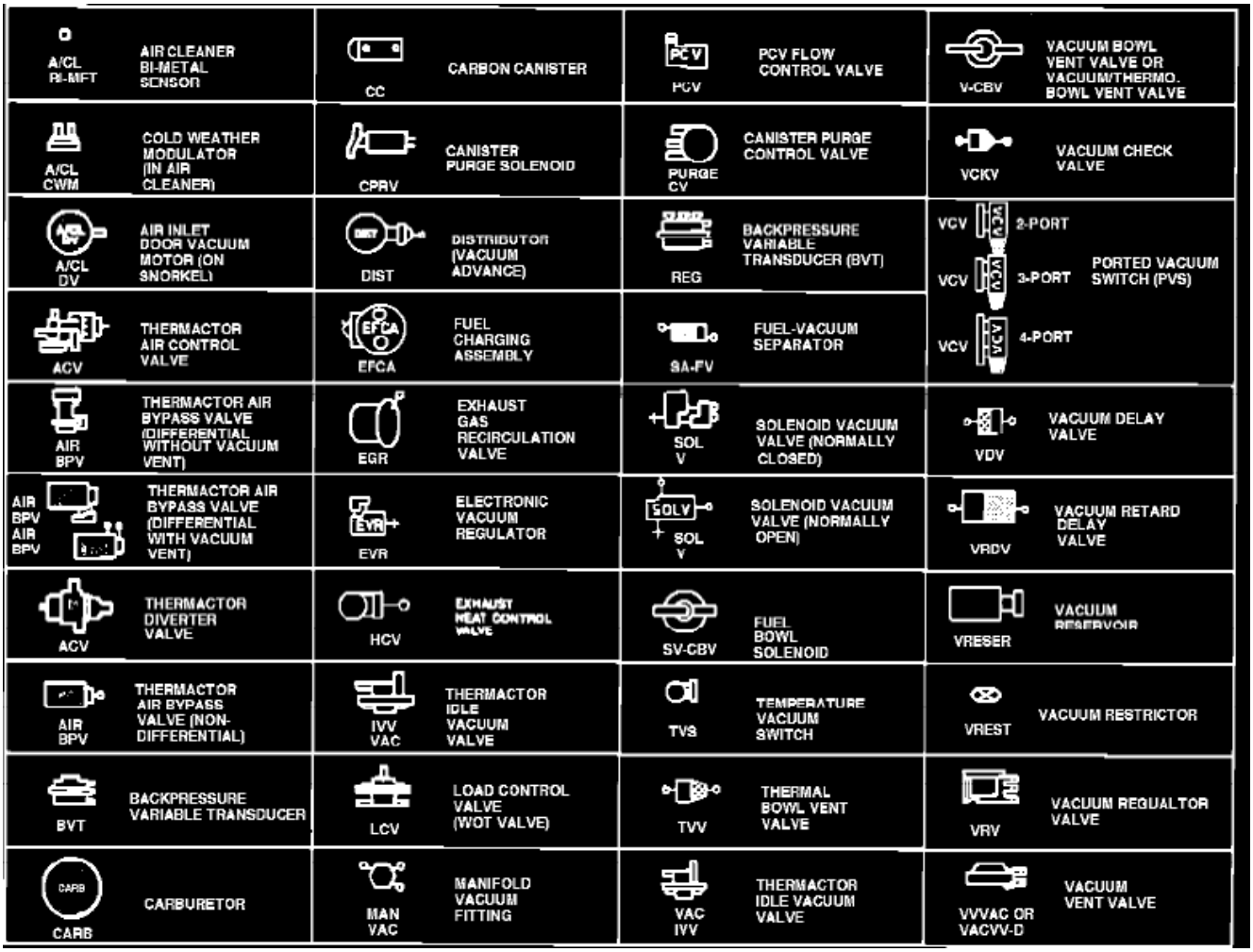

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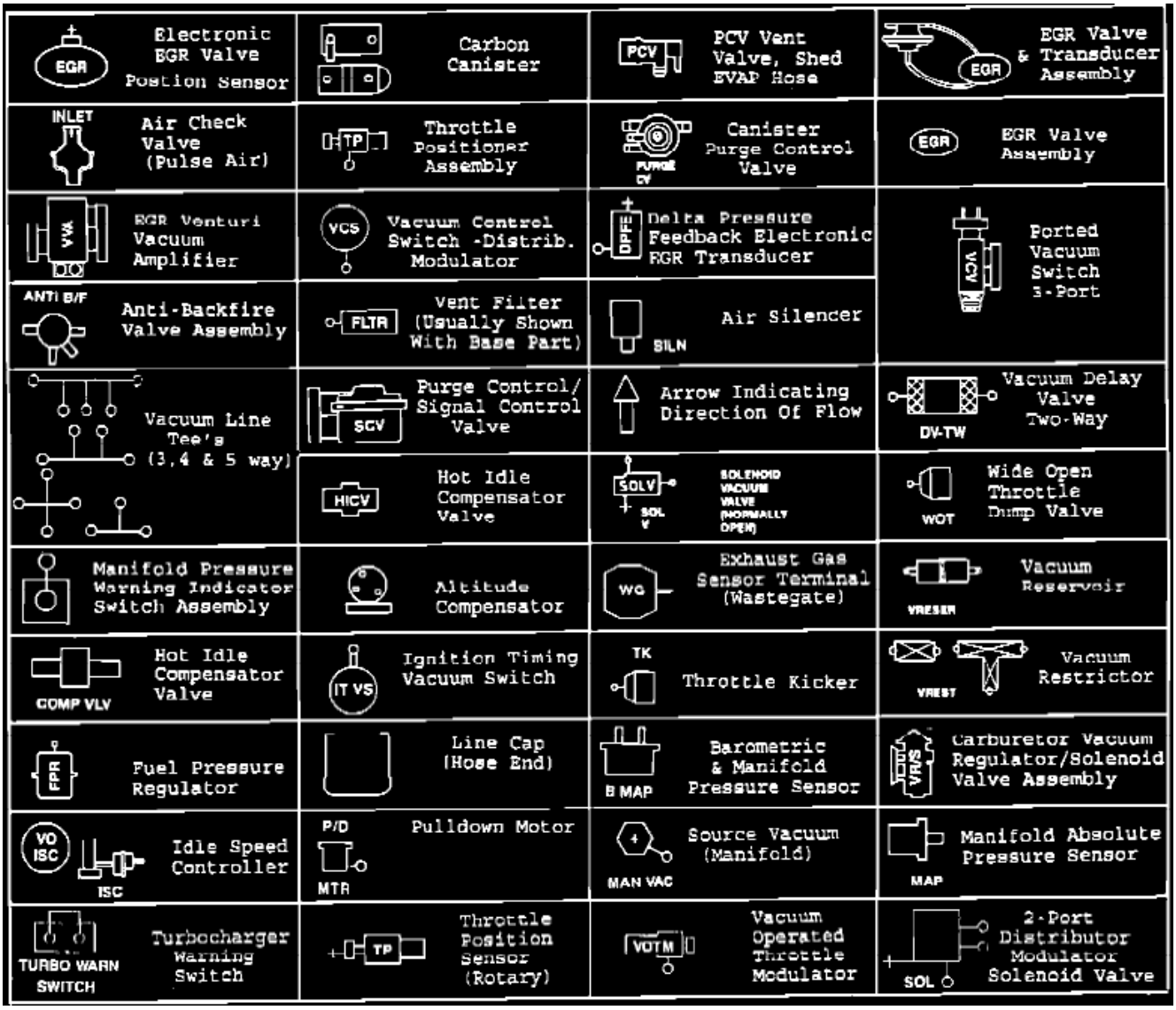

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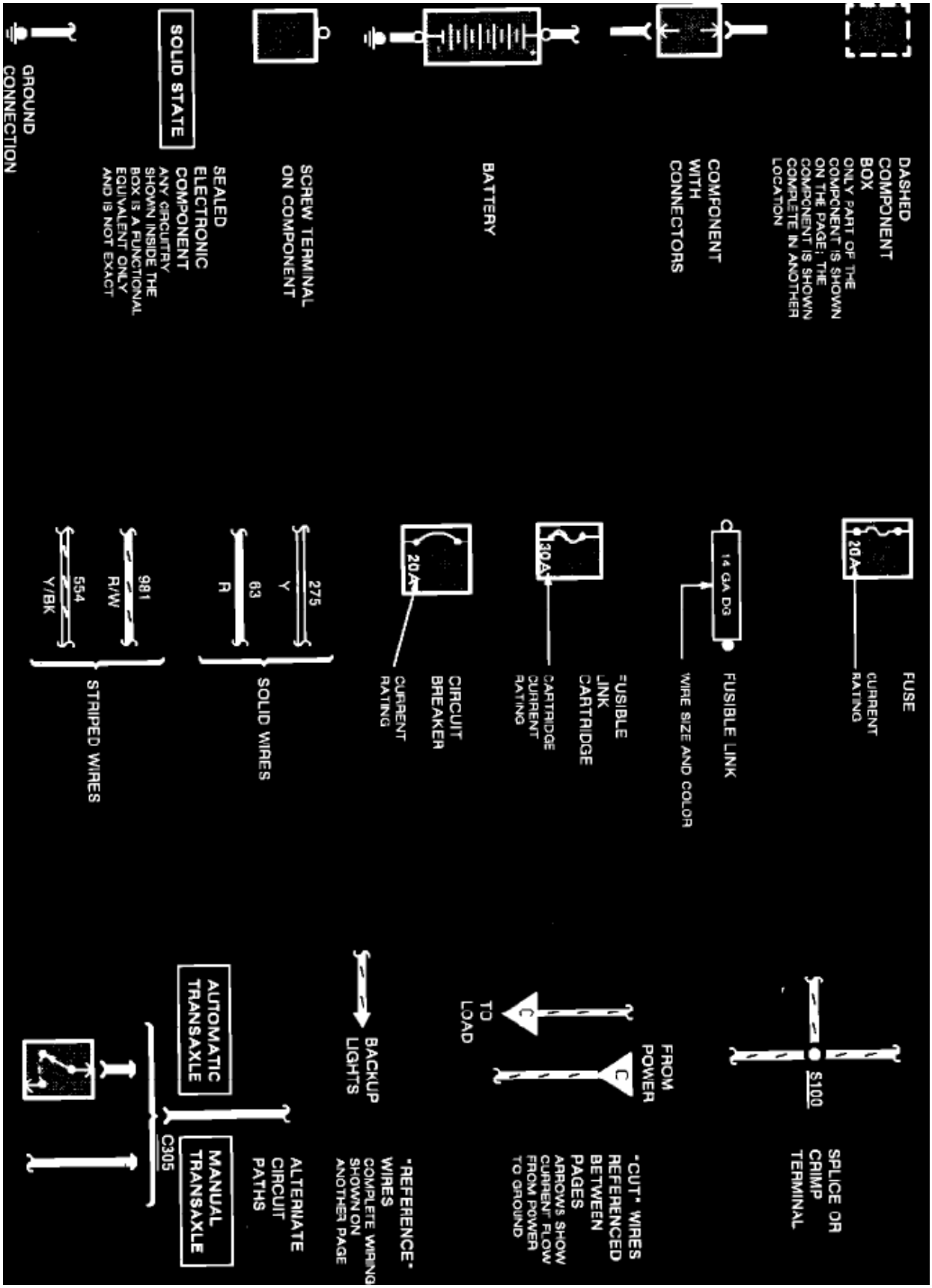
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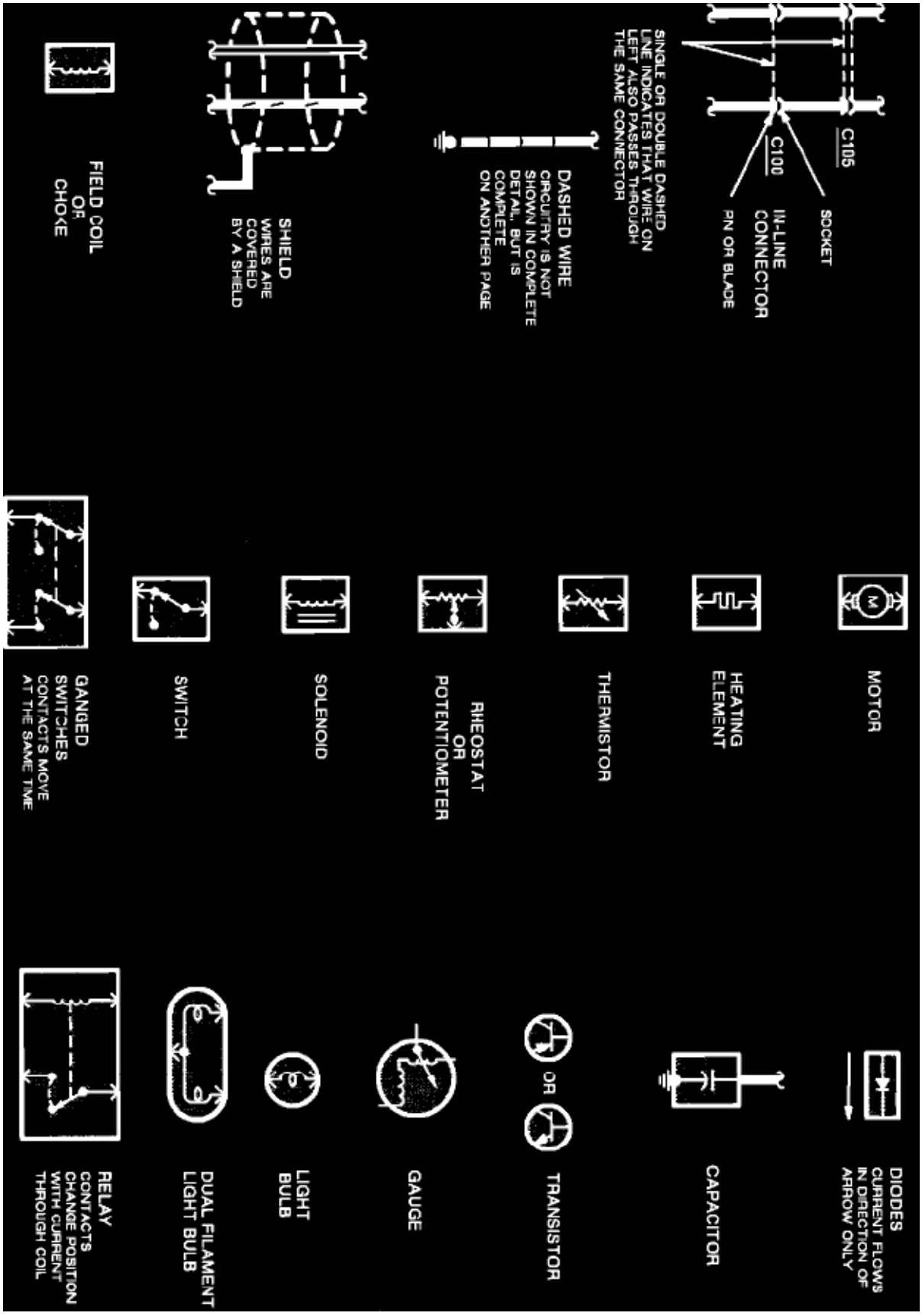
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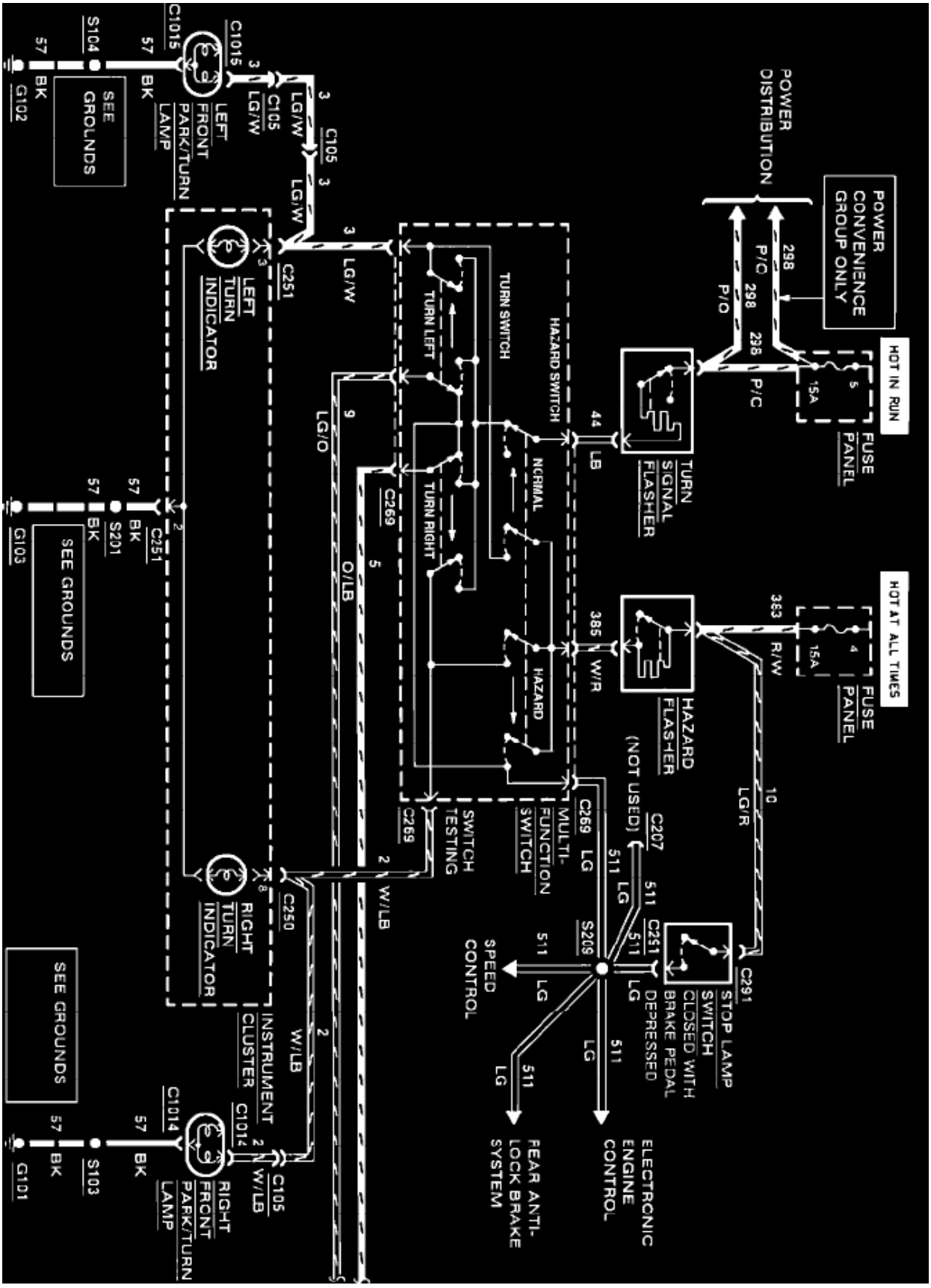
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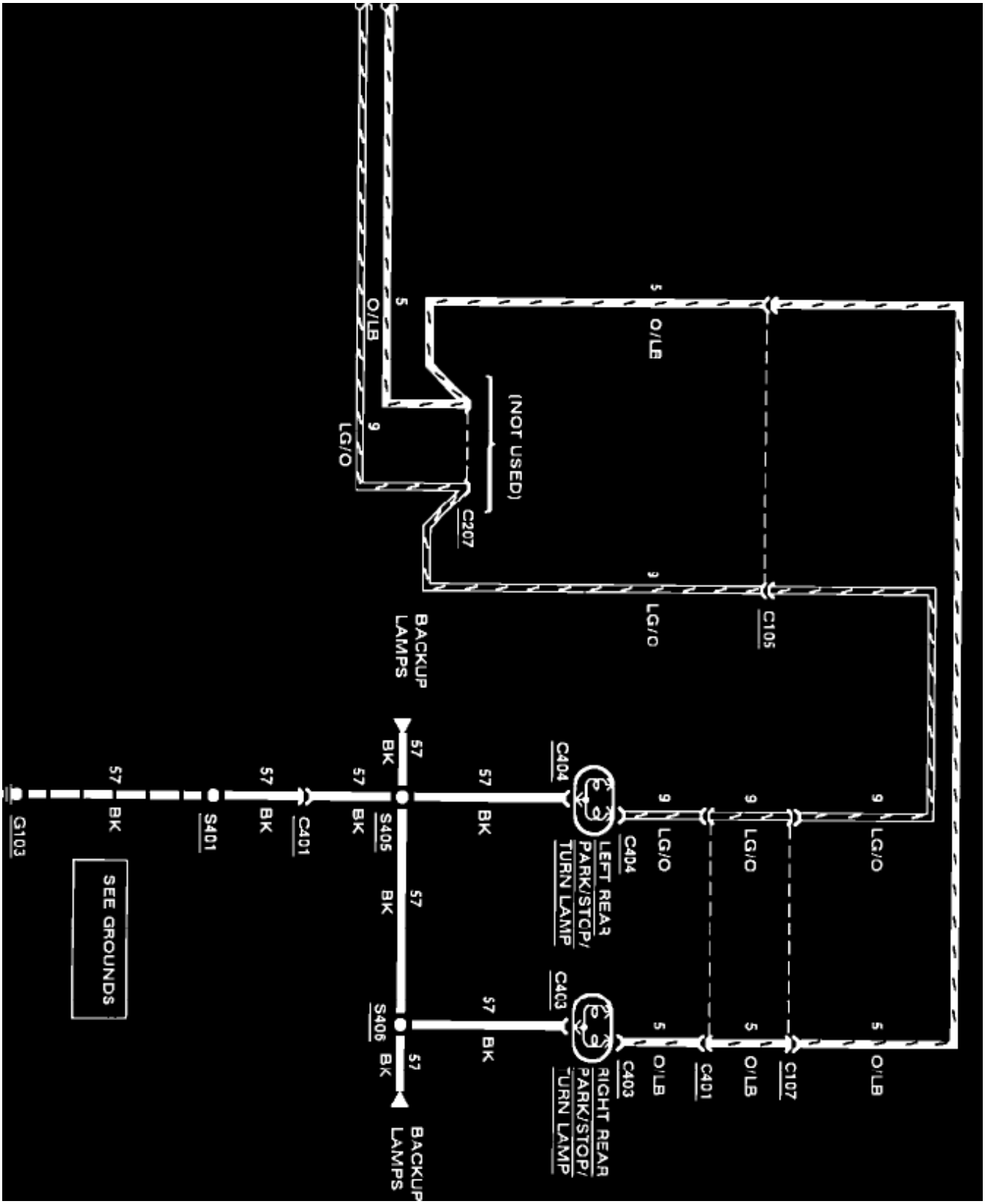
Turn Signal Switch: Electrical Diagrams

Turn/Stop/Hazard Lamps



Turn/Stop/Hazard Lamps

Turn Signal Switch: Service and Repair

REMOVAL

1. Disconnect battery ground cable.

2. On models with tilt steering, remove tilt lever, then the steering column collar by pressing on collar from top and bottom while removing.

3. On all models, remove lower dash panel trim cover, then the column shroud retaining screws from bottom of column shroud.

4. Remove bottom half of shroud by pulling shroud down and toward rear of vehicle. Move shift lever as required to ease shroud removal on models with automatic transmission.

5. Lift top half of shroud from column.

6. Remove two switch attaching screws, then disconnect switch from casting.

7. Disconnect three electrical connectors, using care not to damage locking tabs. Use care not to damage selector indicator cable on models with automatic transmission.

INSTALLATION

1. Install three electrical connectors, ensuring they are fully engaged. Wiring for switch is routed under selector indicator cable on models with automatic transmission.

2. Align switch mounting holes with holes in steering column casting, then install screws and torque to 18-27 inch lbs.

3.

On models with automatic transmission, verify that selector indicator is adjusted properly.

4.

On all models, position top half of steering column shroud onto column so that screw moldings on shroud seat in mounting bores in column. Place shift lever in lowest position to aid assembly on vehicles with automatic transmission.

5. Install bottom half of shroud by sliding guides in bottom half of shroud into tabs in top half.

6. Install shroud retaining screws and torque to 18.5-25.6 inch lbs.

7. On models with tilt steering, install steering column collar by pressing on top and bottom while installing on column.

8. Install tilt lever and torque to 2.2-3.6 ft. lbs.

9. On all models, install lower dash panel trim cover, then connect battery ground cable.

10. Check multi-function switch and steering column for proper operation.

Old Service Part Number	New Service Part Number
F6TZ-15702-AA E7DZ-15702-A	1U5Z-15702-AA 1U5Z-15702-AA

PART NUMBER	PART NAME
1U5Z-15702-AA	27 degree Mechanical Hood Lamp Switch

Underhood Lamp Switch: Technical Service Bulletins Hood Lamp Switch - Revised

Article No. 01-21-6

10/29/01

ELECTRICAL - REVISED MECHANICAL HOOD LAMP SWITCH TO REPLACE OLD STYLE MERCURY HOOD LAMP SWITCH

FORD: 1987-1995 TAURUS 1988-1991 CROWN VICTORIA 1989 THUNDERBIRD 1989-1996 MUSTANG 1994-1996 THUNDERBIRD 1990 BRONCO II 1990-1996 RANGER 1991-1996 BRONCO 1994-2001 EXPLORER 1997-2001 F-150 2000-2001 EXCURSION 2002 EXPEDITION

LINCOLN: 1989-1994 CONTINENTAL 1990-1992 MARK VII 1990-1996 TOWN CAR 1993-1995 MARK VIII 2002 NAVIGATOR

MERCURY: 1987-1995 SABLE 1988-1991 GRAND MARQUIS 1989 COUGAR 1994-1996 COUGAR 1997-2001 MOUNTAINEER

ISSUE

This article is to provide information on replacement hood lamp switches. The 27 degree Mercury style hood switches will no longer be available. Replacement 27 degree Mechanical switches will be available as a service replacement.

ACTION

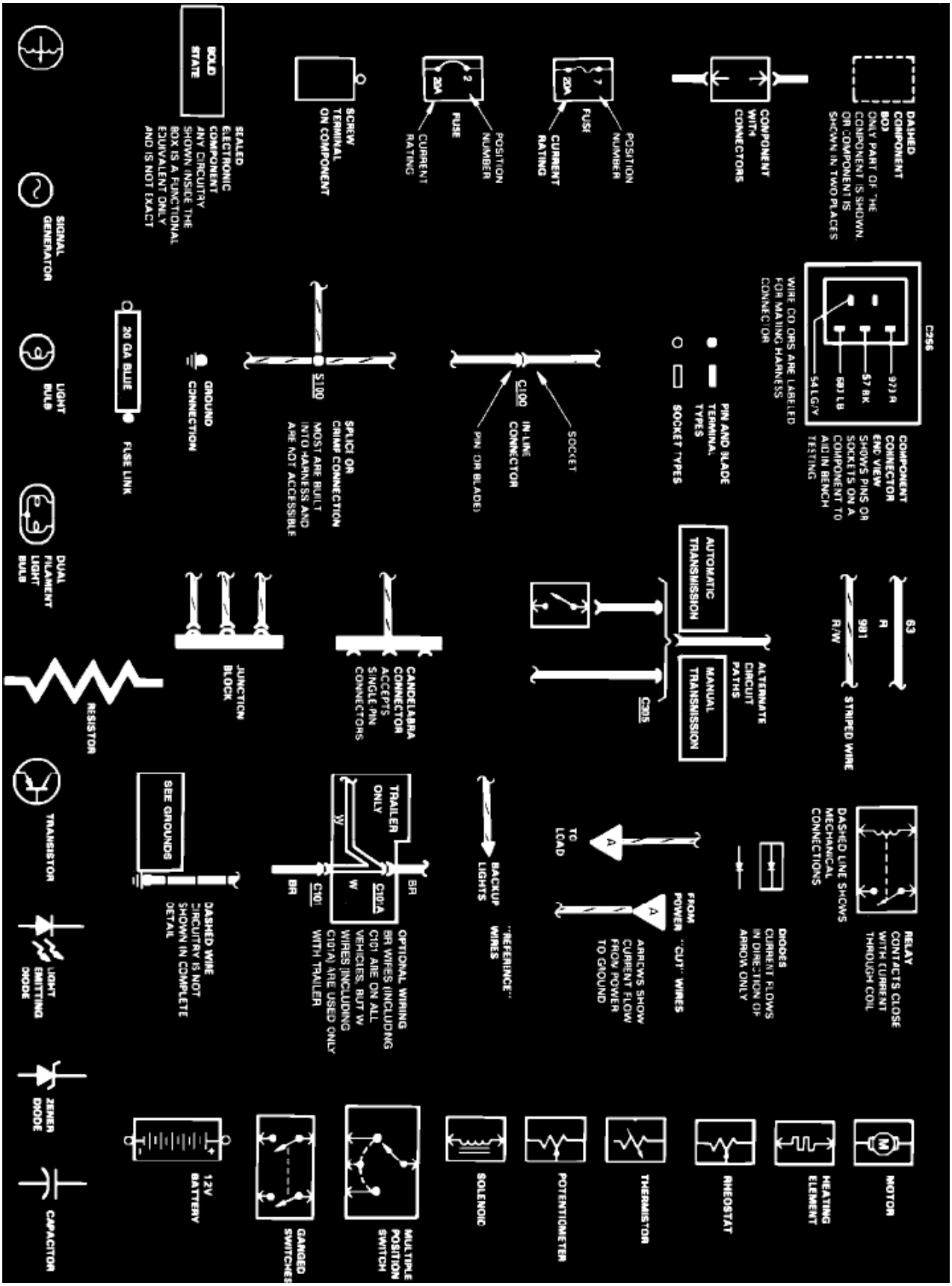
For vehicles requiring hood lamp switch replacement, replace the 27 degree Mercury switch with new 27 degree Mechanical switch. Replace hood lamp switch per the appropriate model year Workshop Manual as needed.

Parts Block

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY

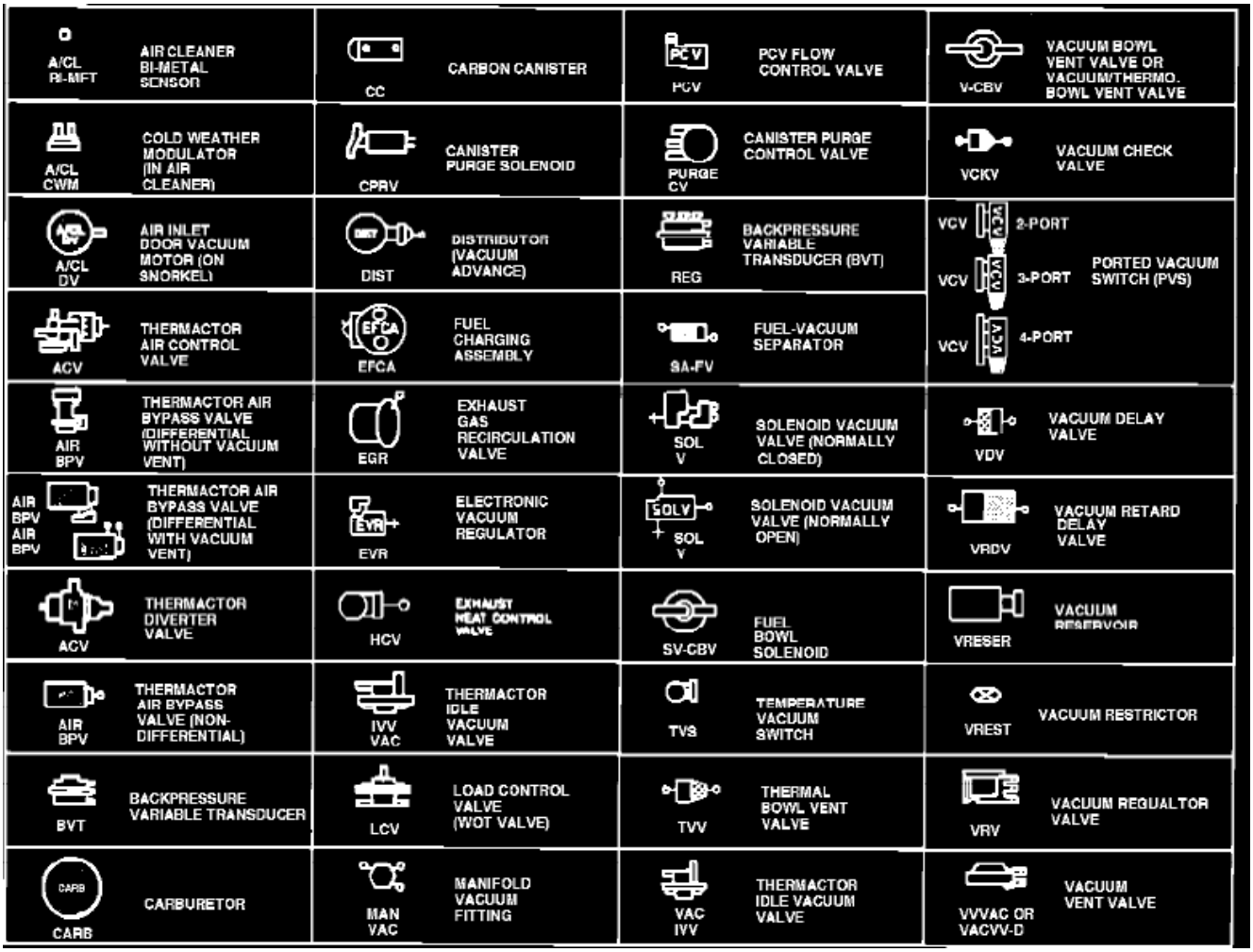
OASIS CODES: 201000, 201200

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Windows and Glass > Relays and Modules - Windows and Glass > Power Window Relay > Component Information > Diagrams > Diagram Information and Instructions

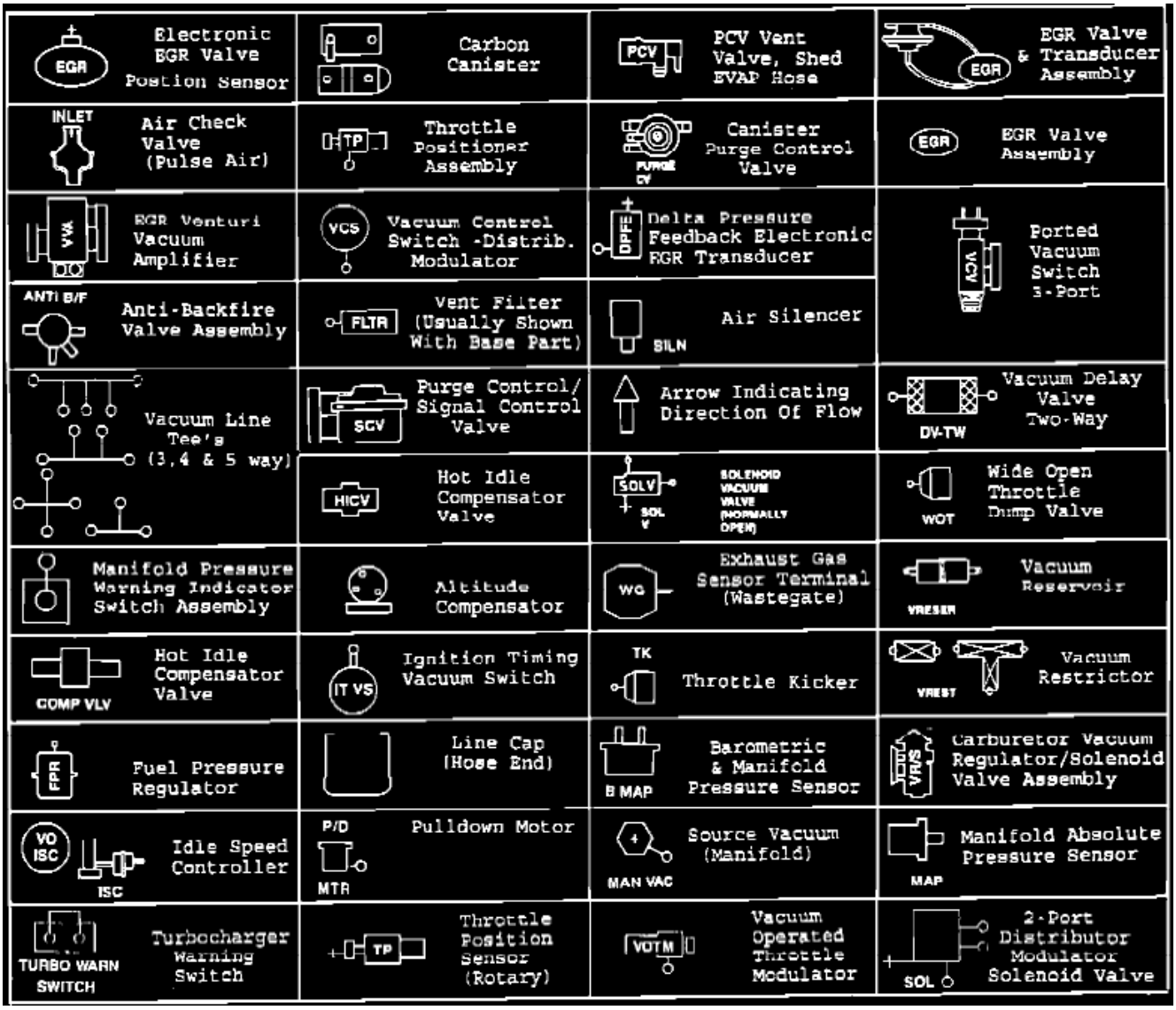


Power Window Relay: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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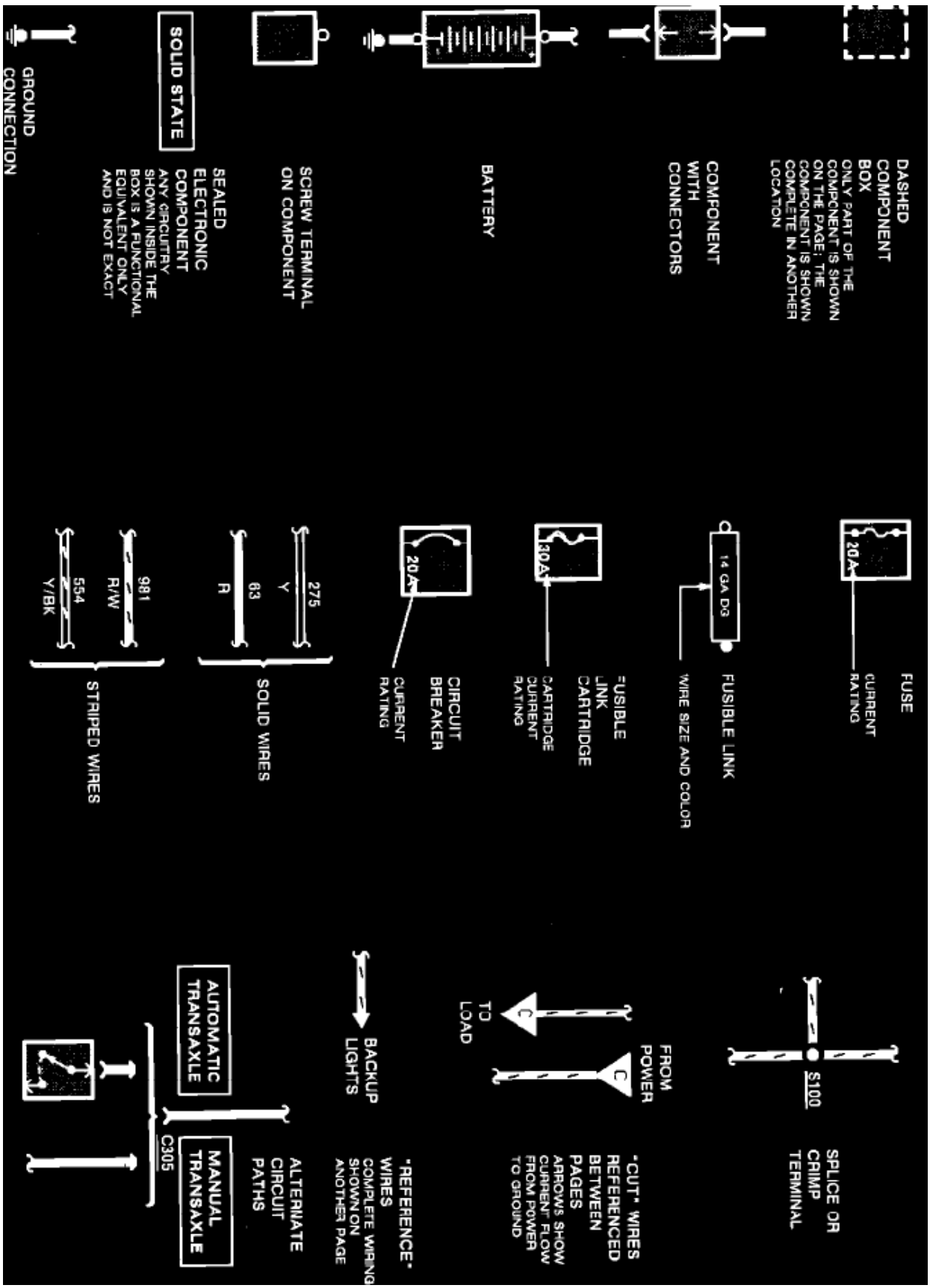
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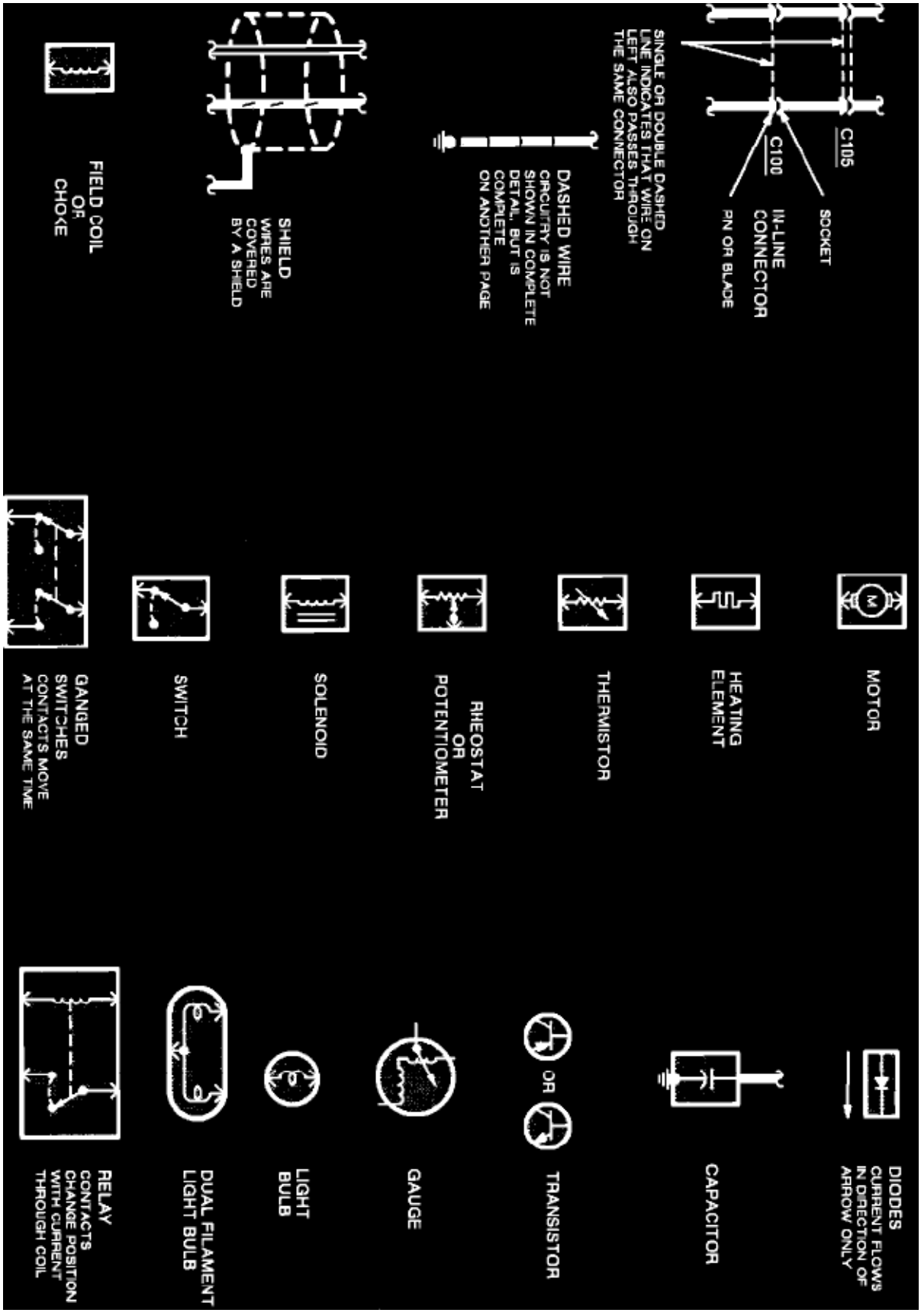
Electrical Symbols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Electrical Symbols

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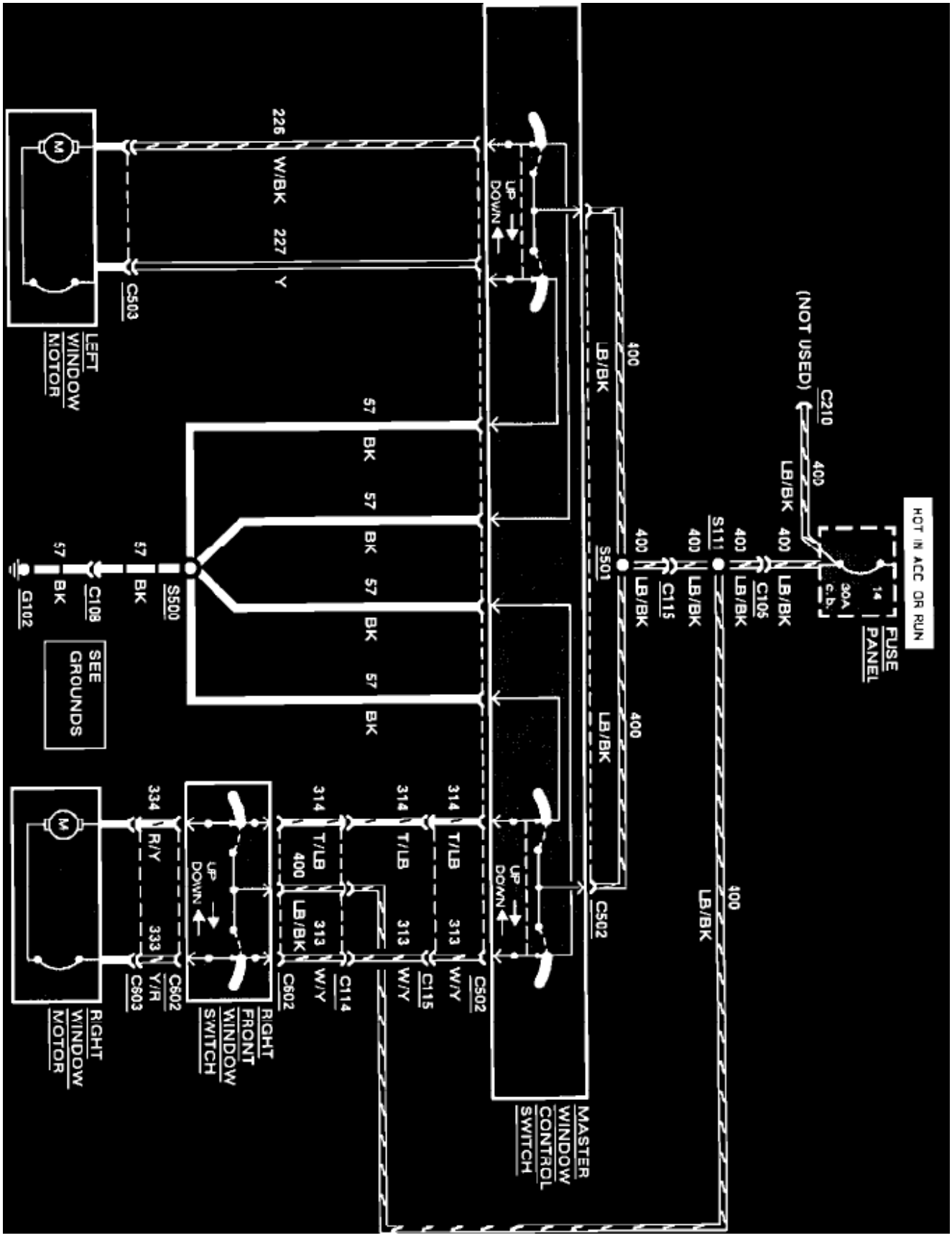
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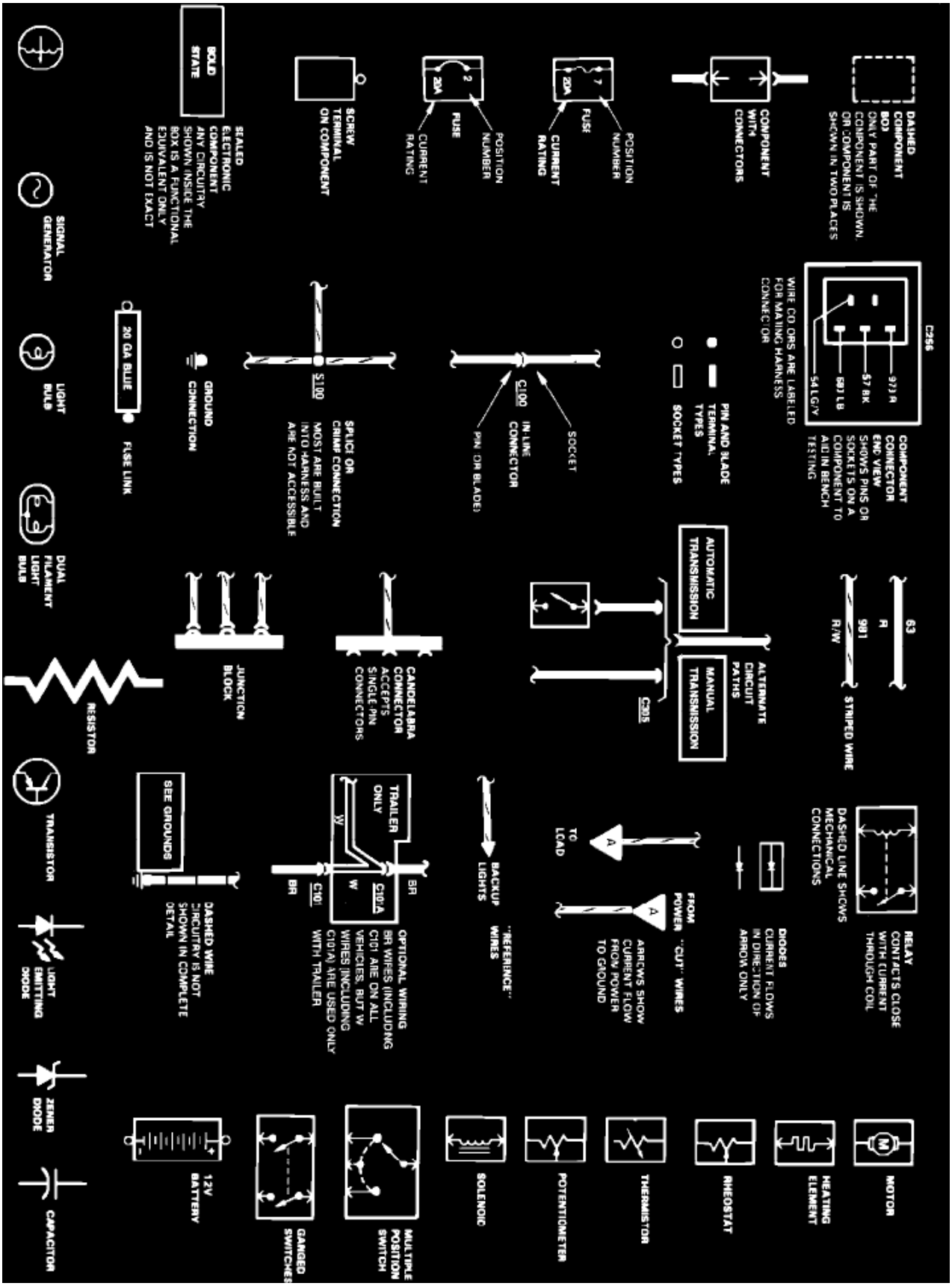
Power Windows

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Windows and Glass > Sensors and Switches - Windows and Glass > Power Window Switch > Component Information > Diagrams > Diagram Information and Instructions



Power Window Switch: Diagram Information and Instructions

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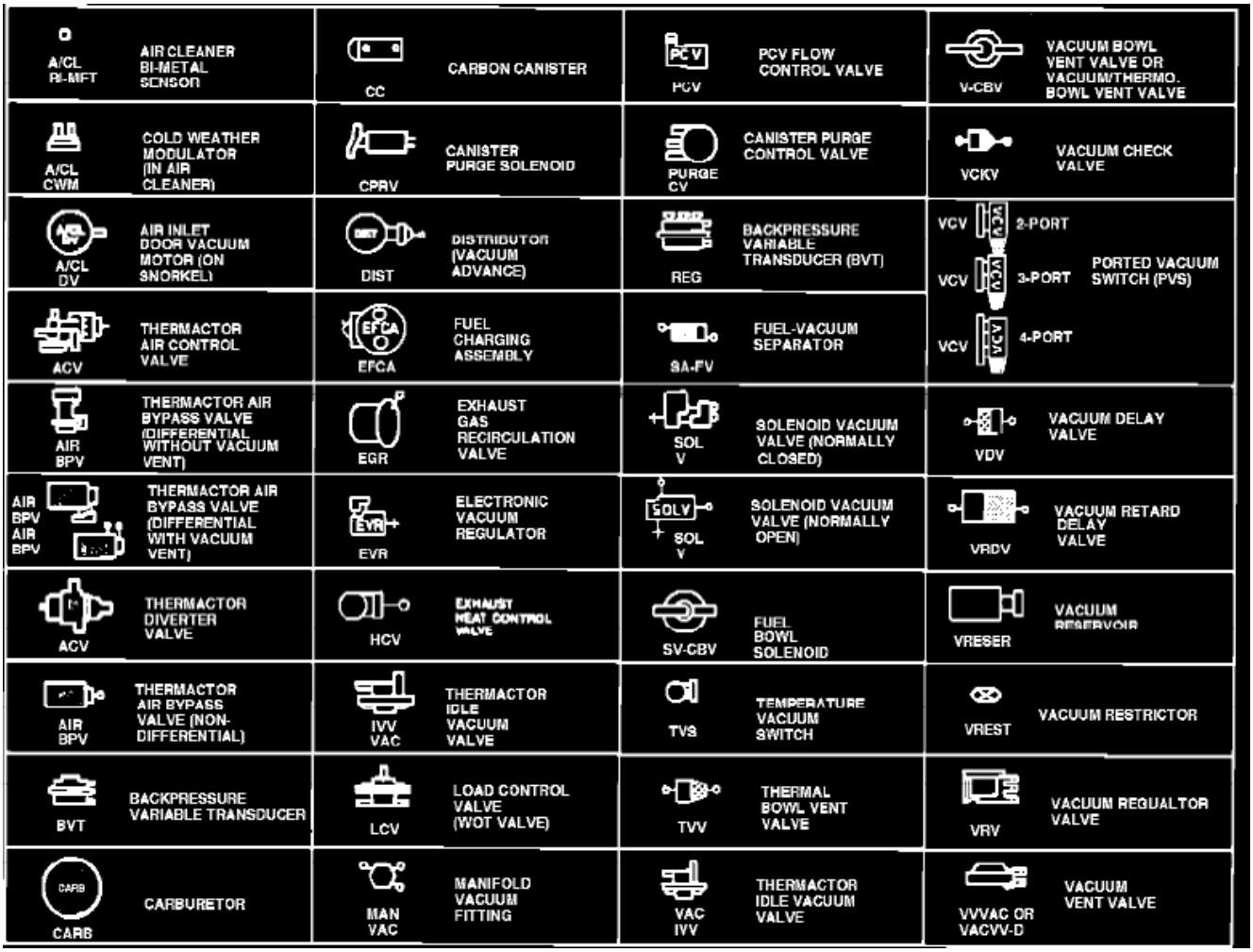

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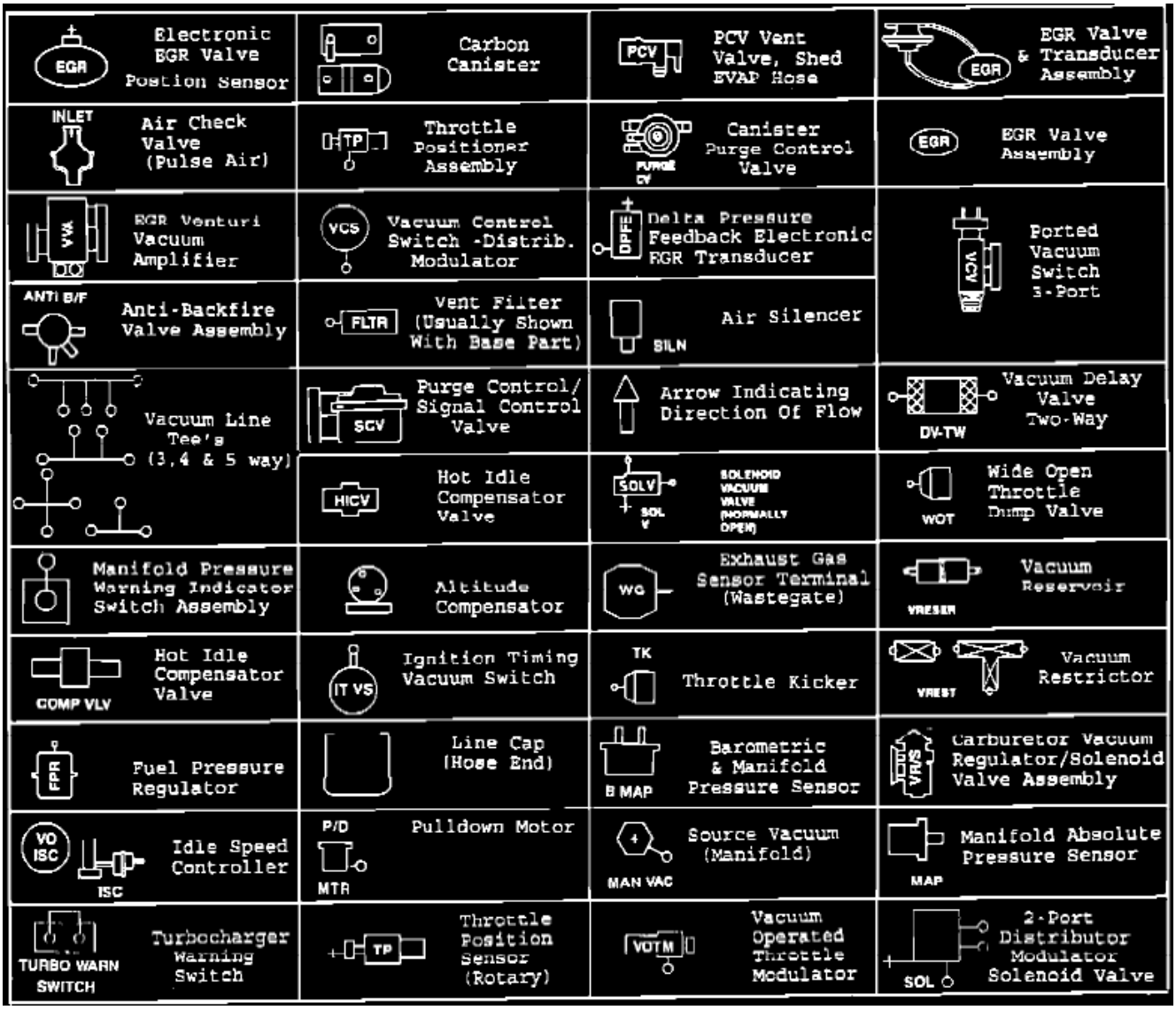

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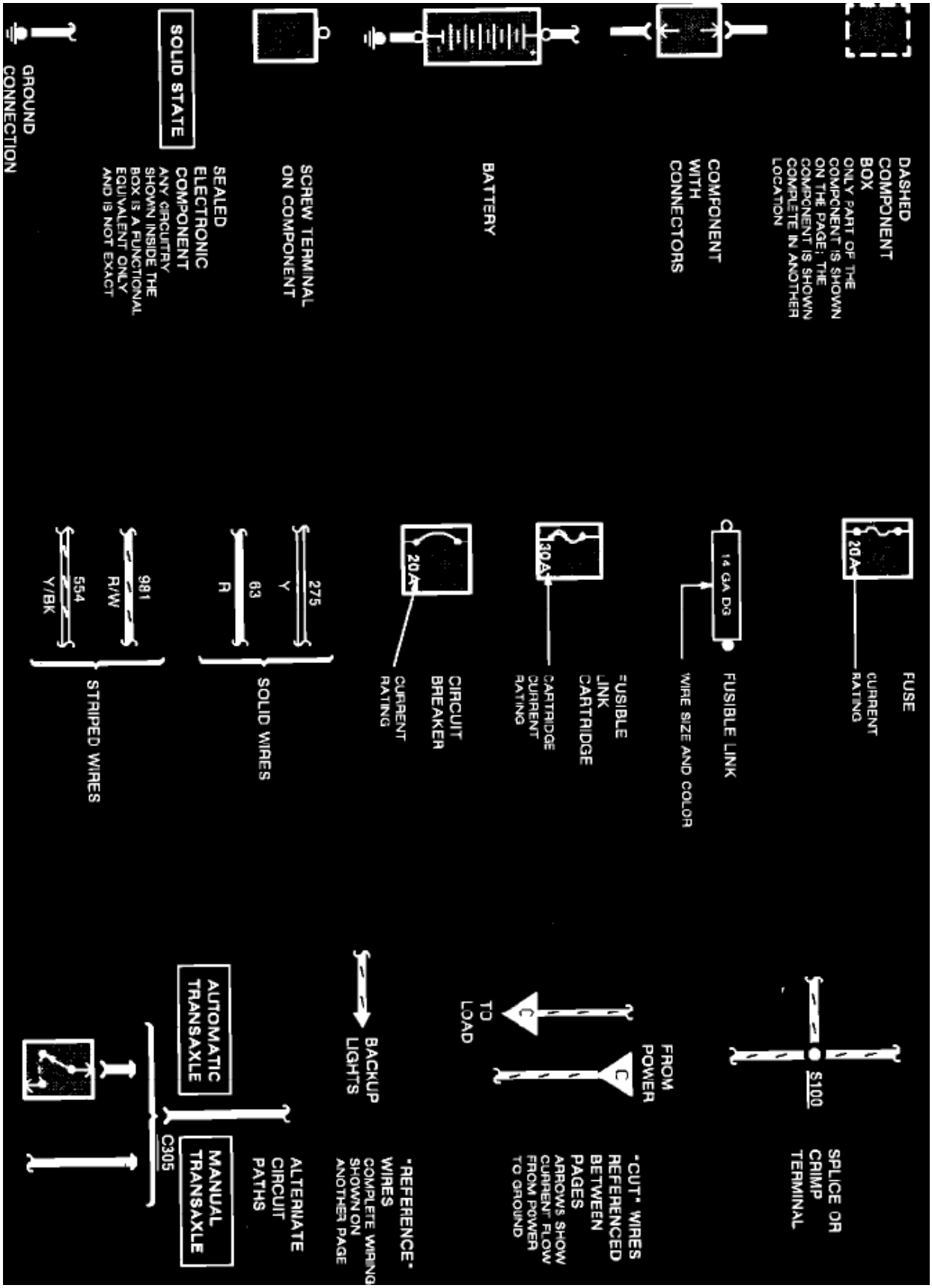
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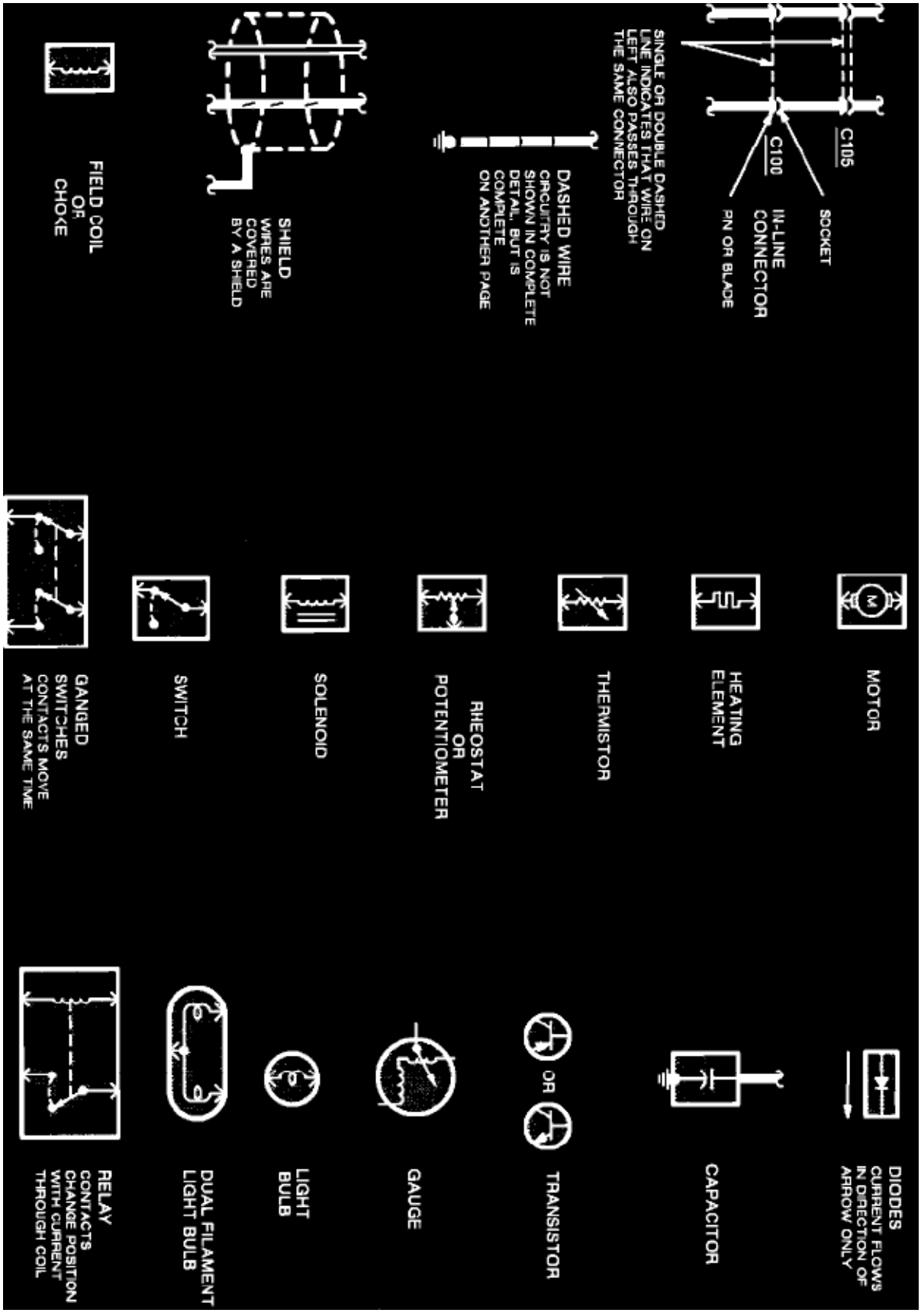
Electrical Symbols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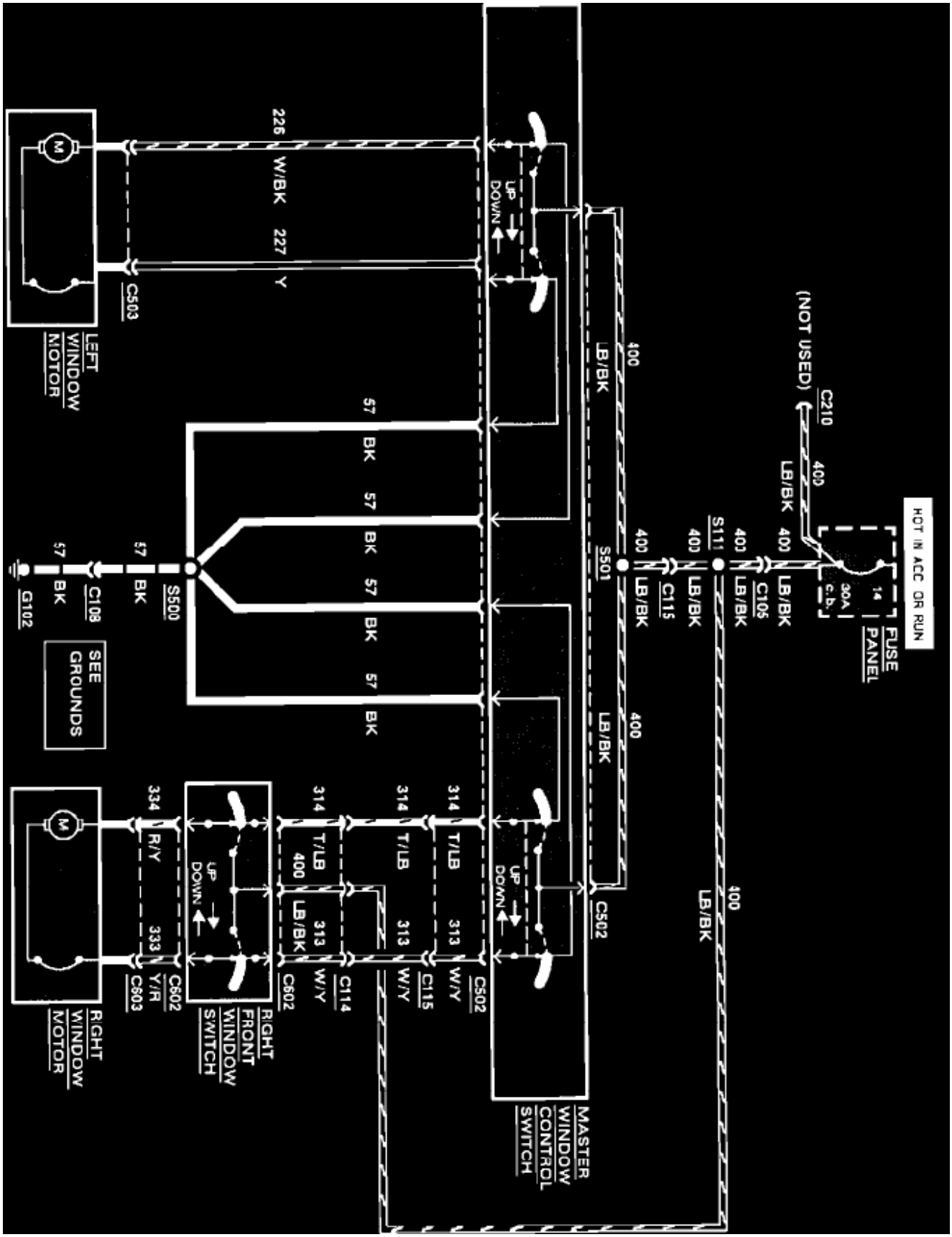
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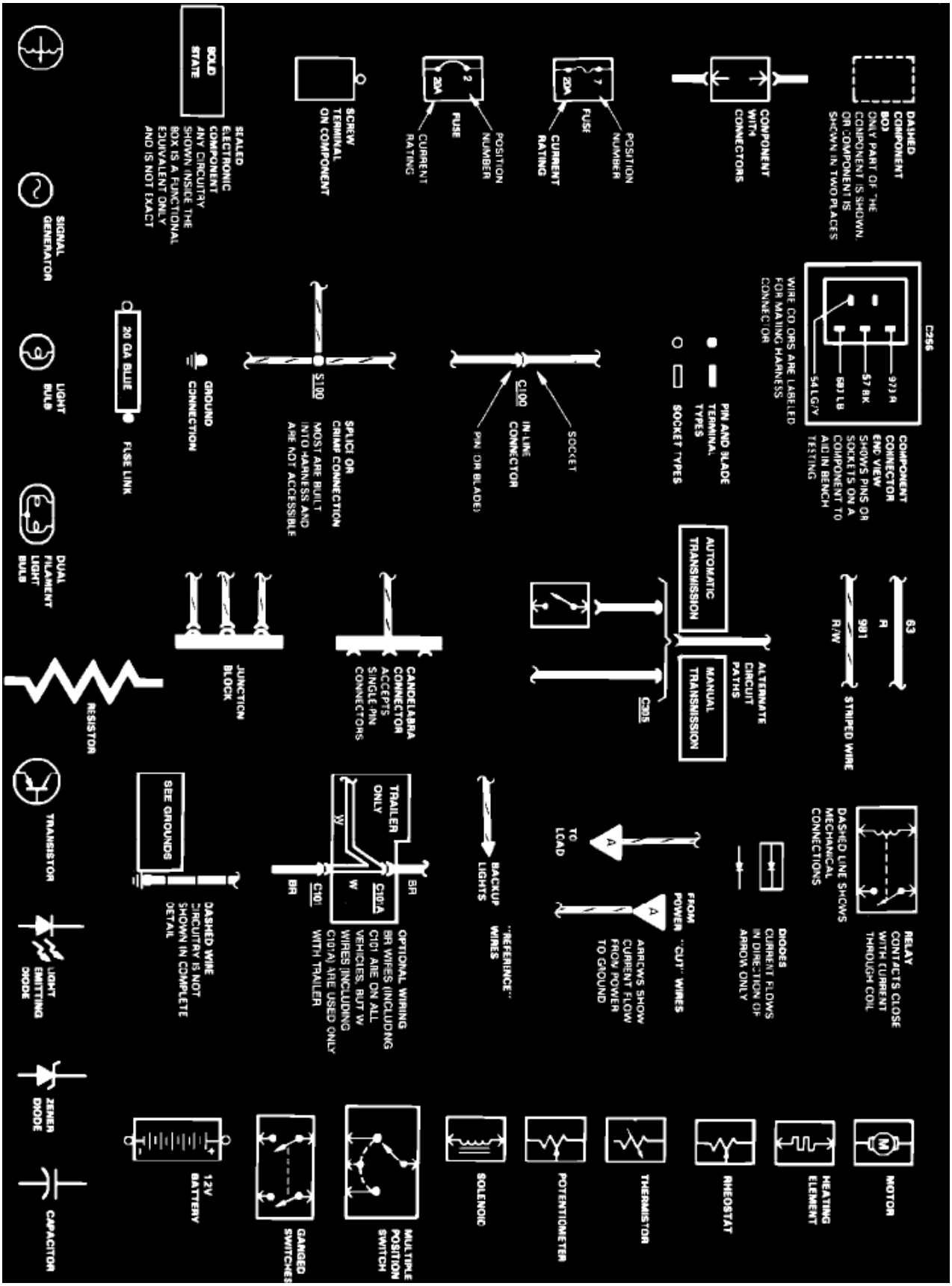
Power Windows

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Windows and Glass > Windows > Power Window Circuit Breaker > Component Information > Diagrams > Diagram Information and Instructions



Power Window Circuit Breaker: Diagram Information and Instructions

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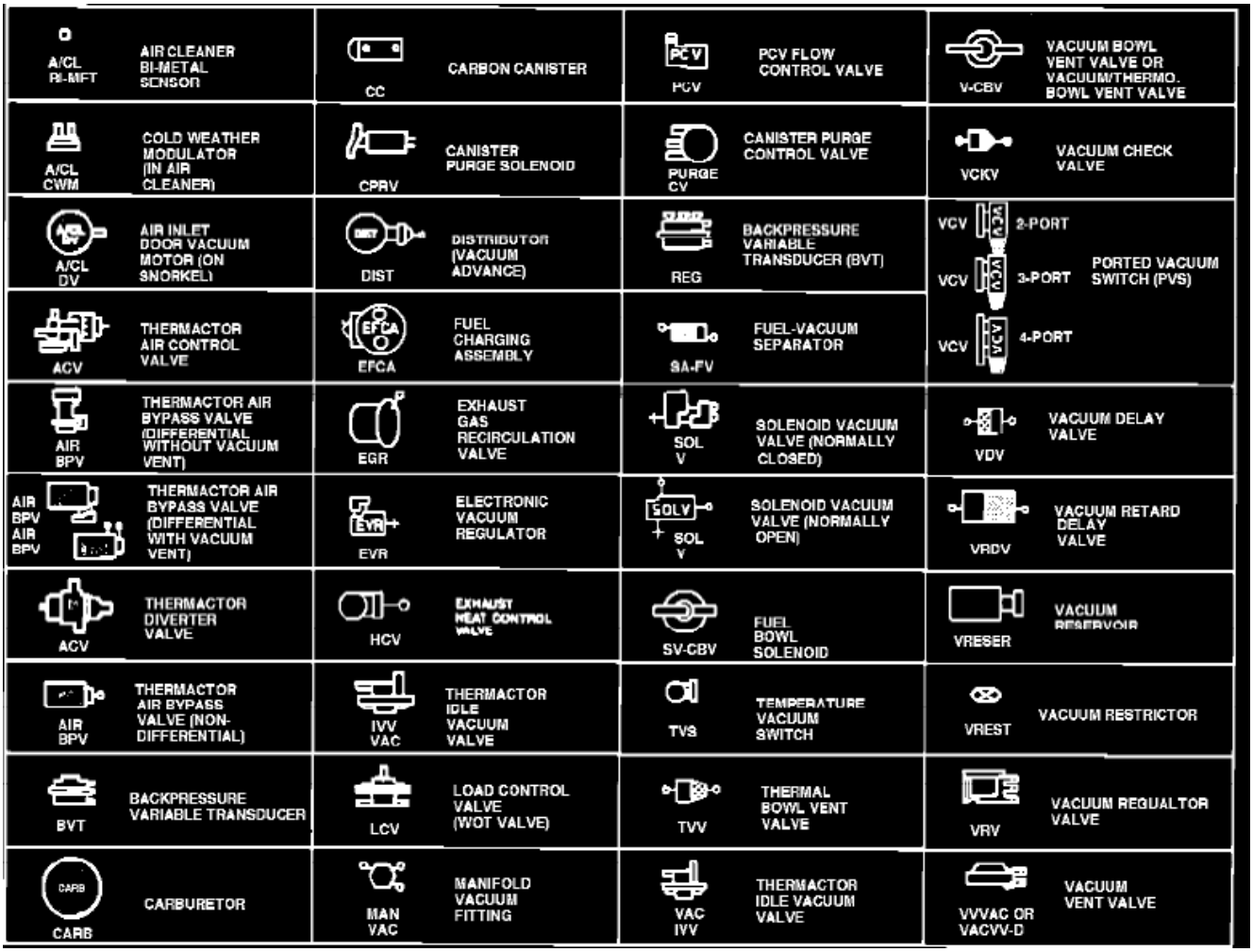

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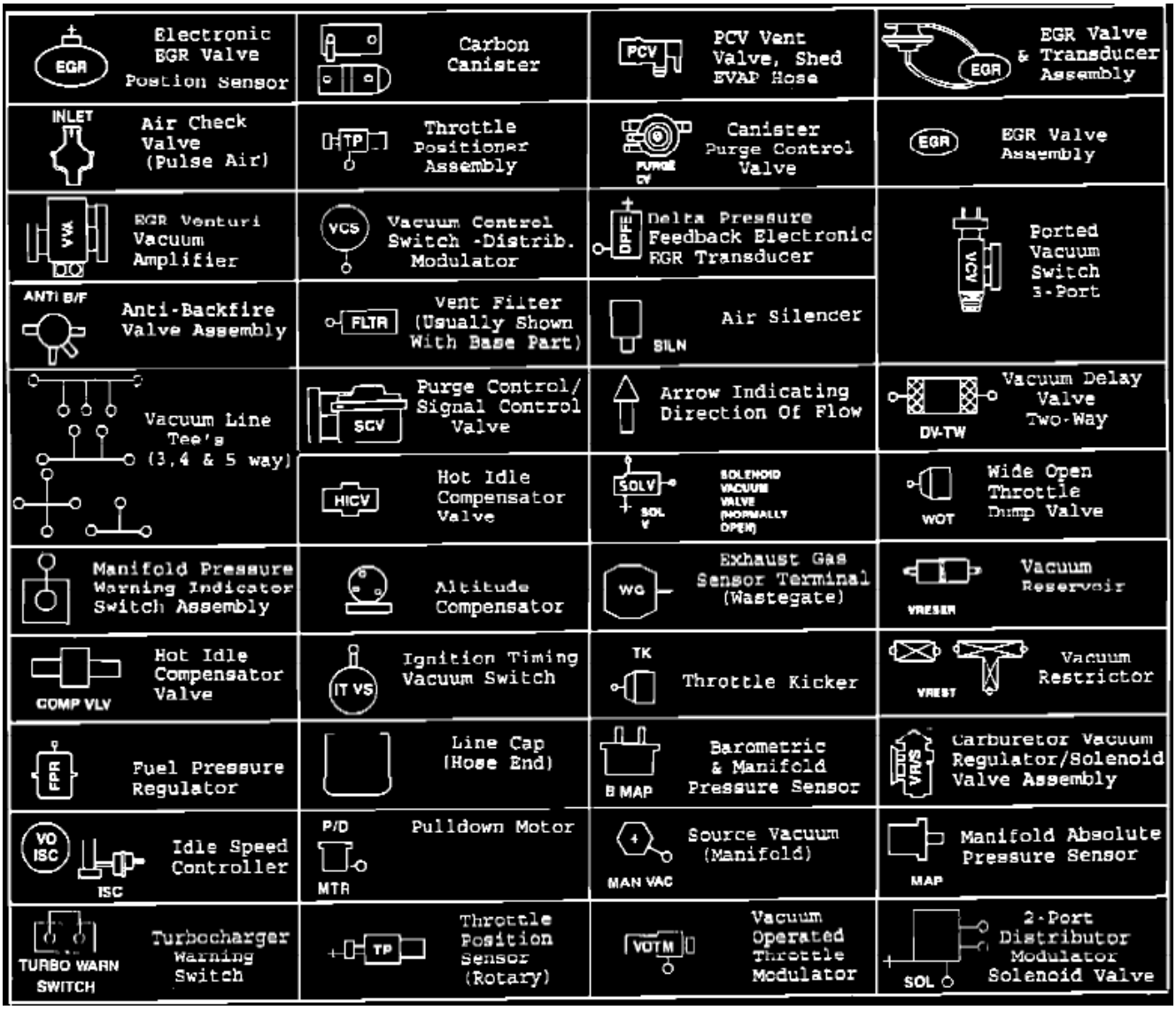

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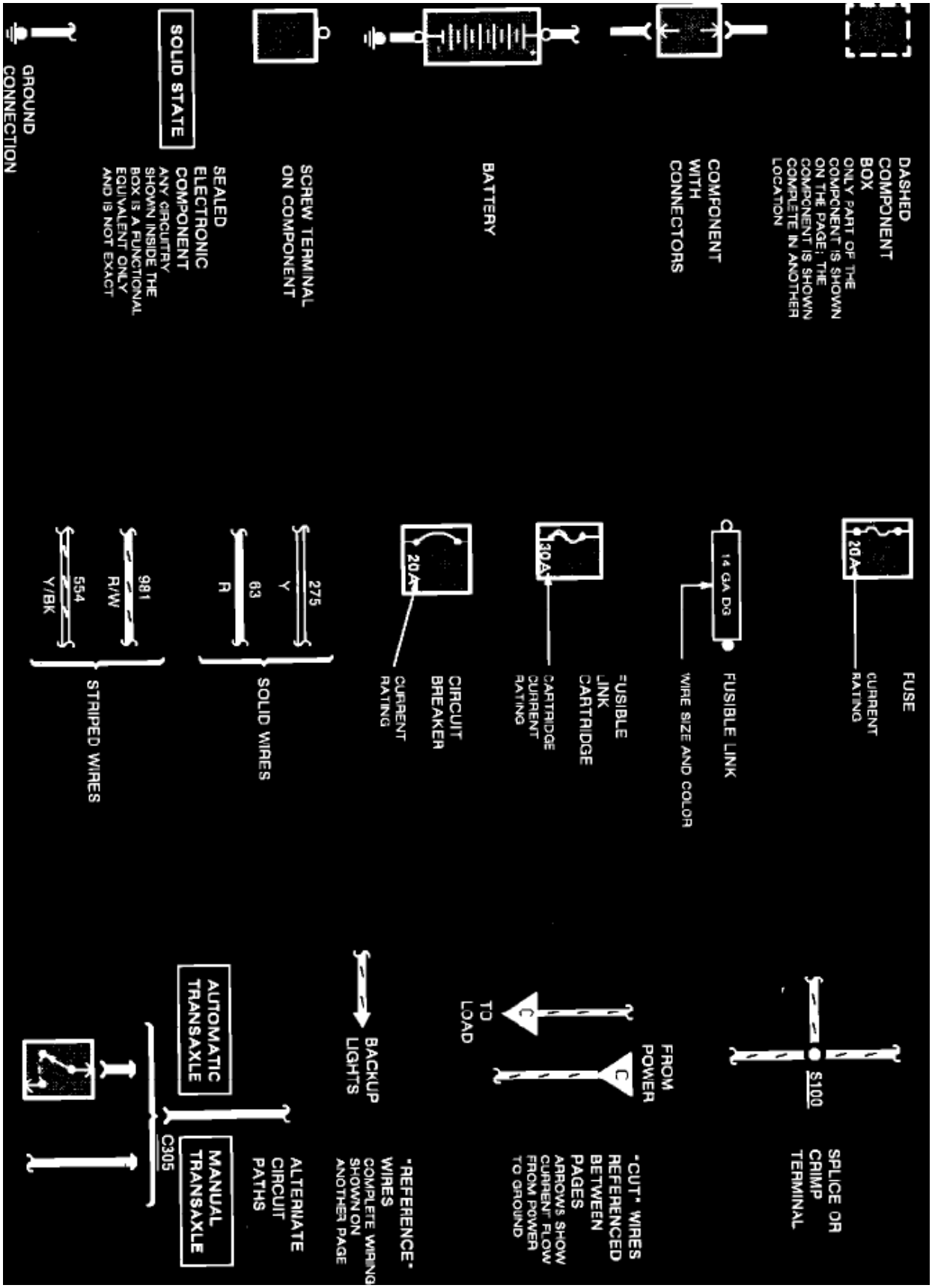
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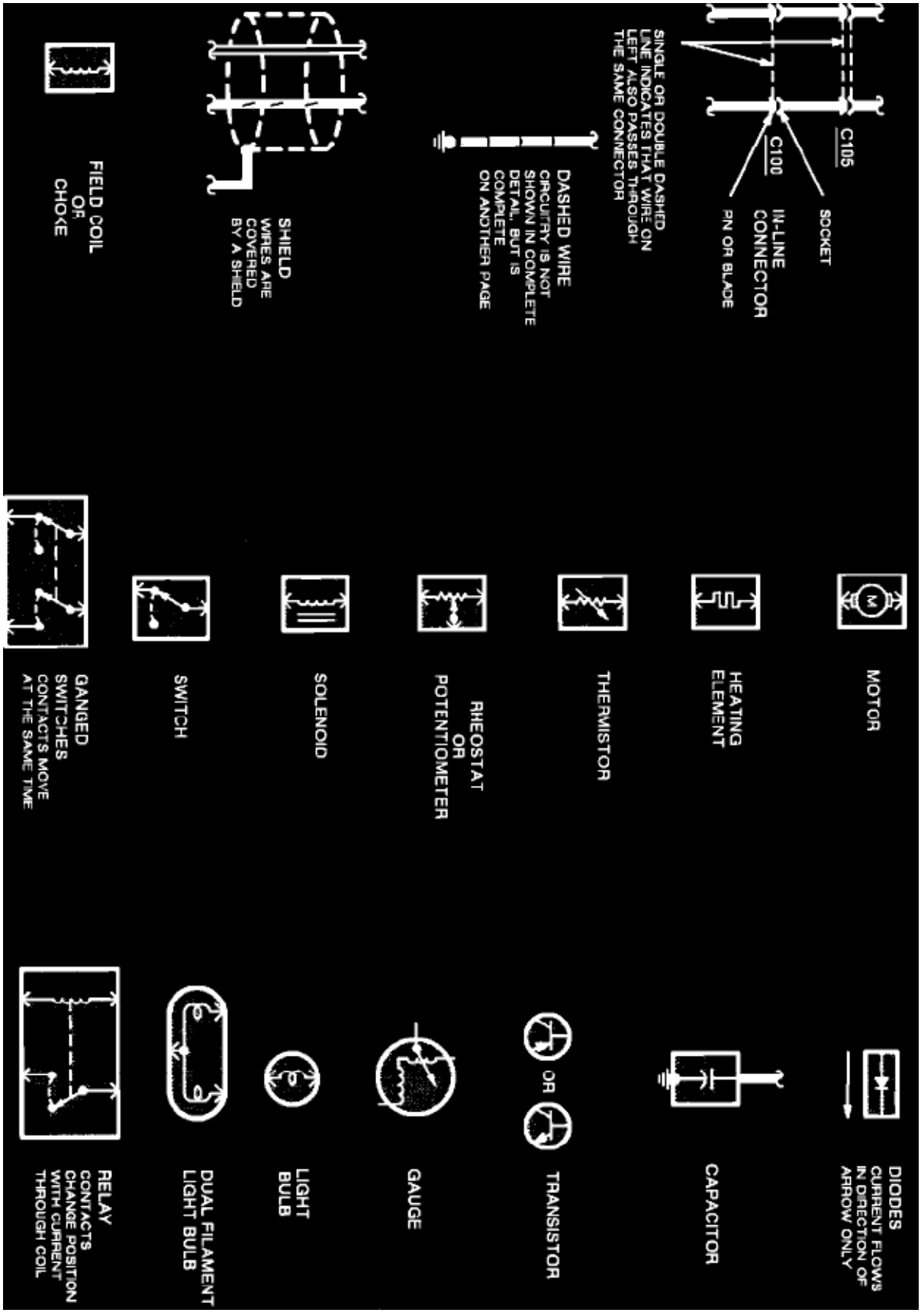
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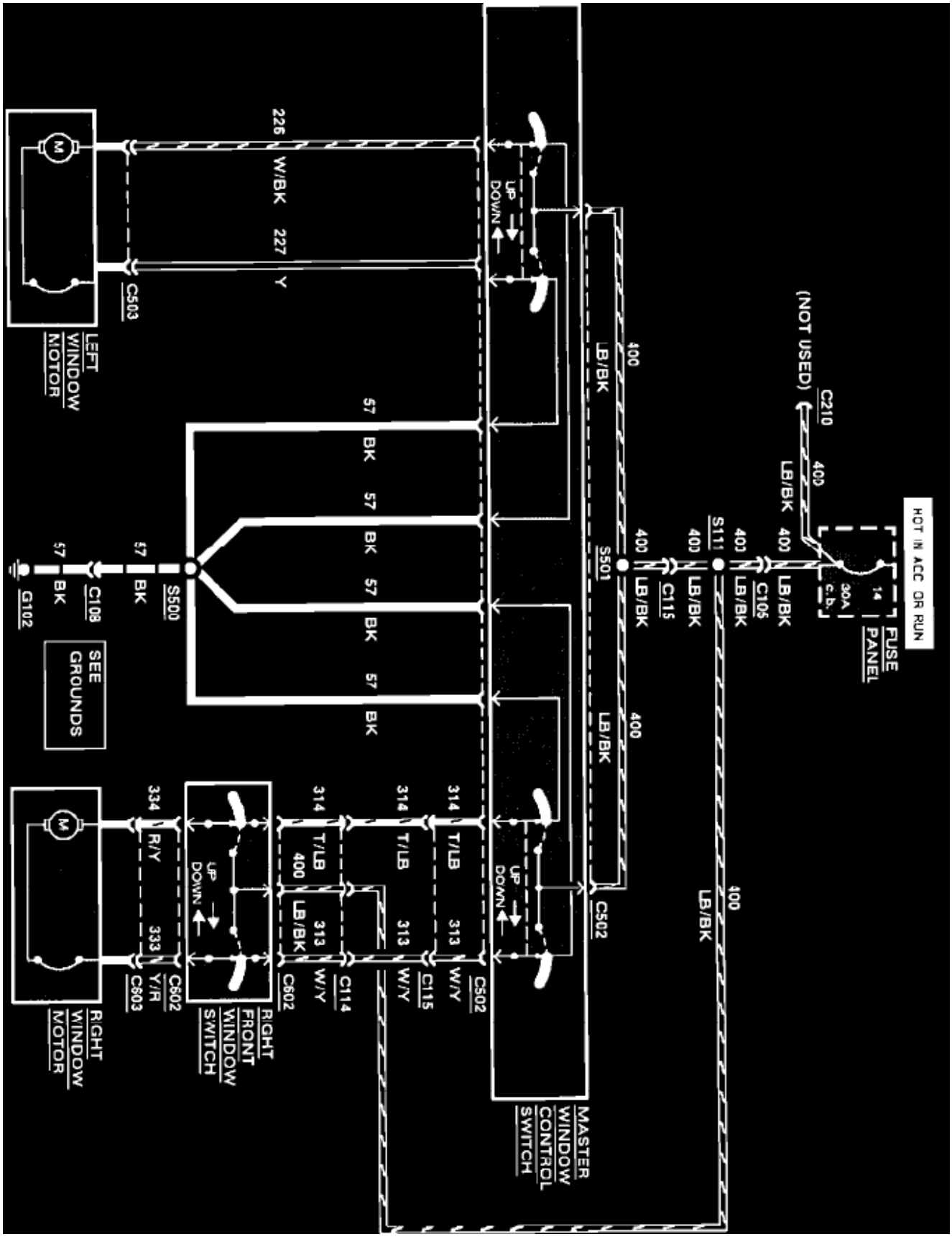
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Power Windows

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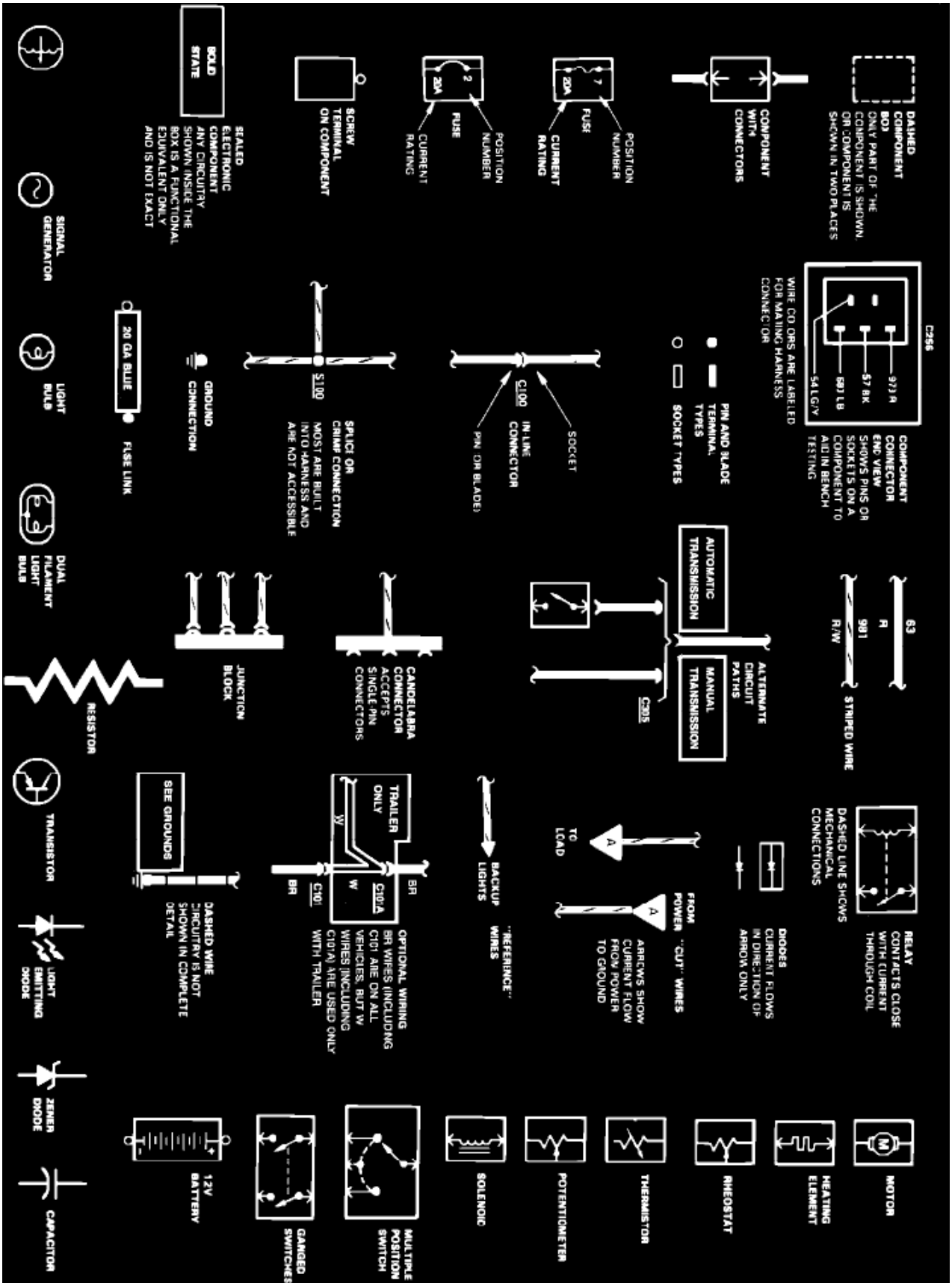

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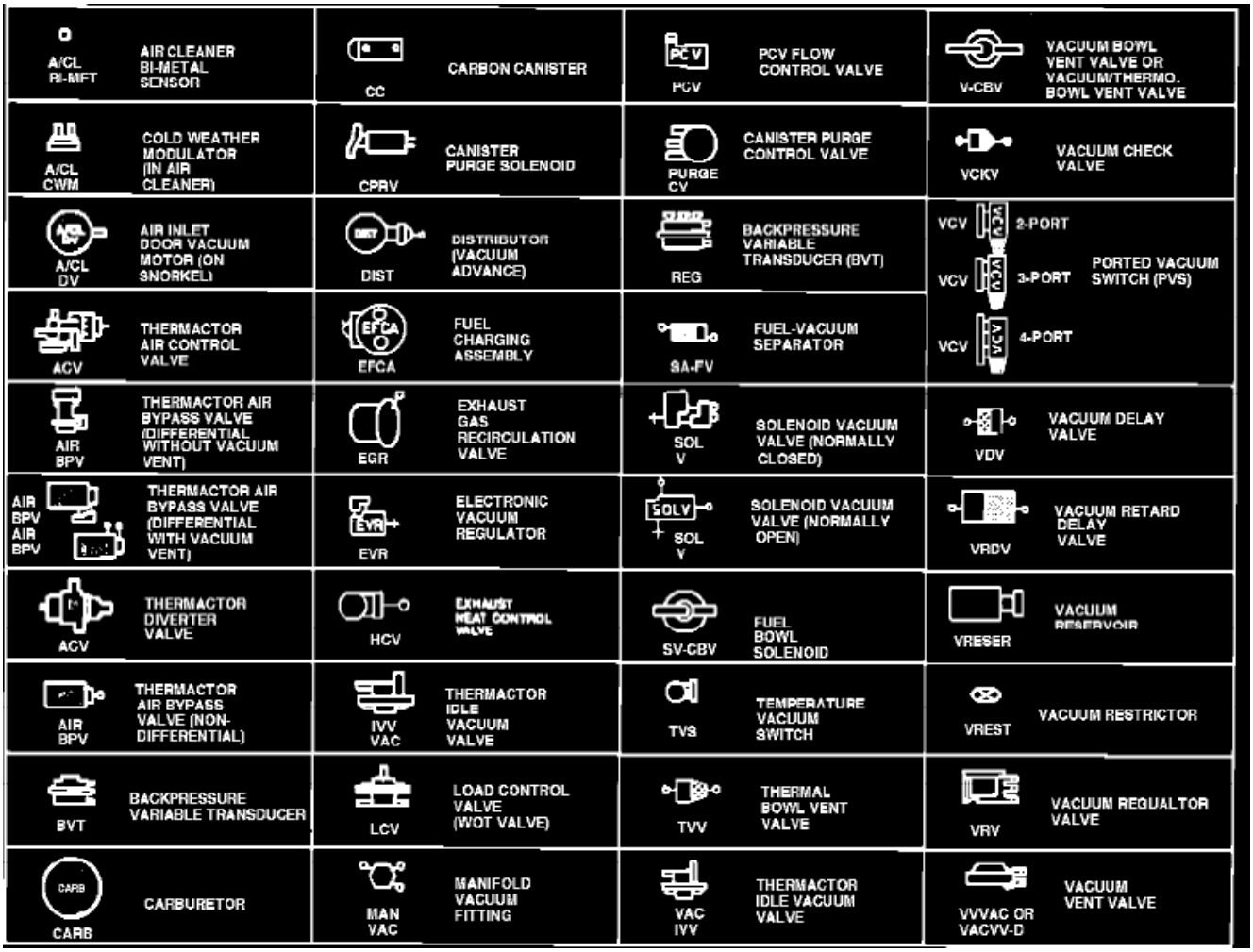

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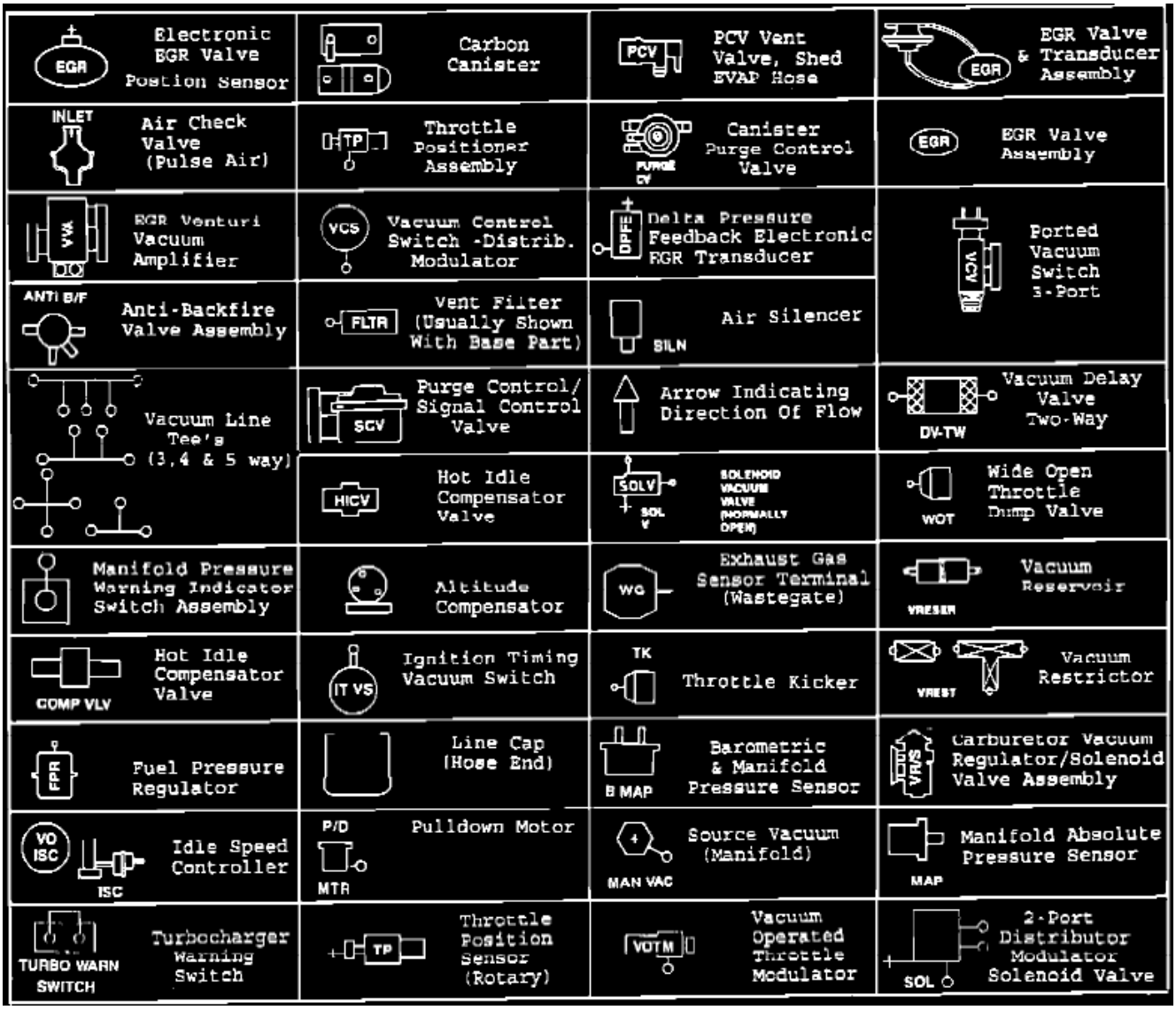

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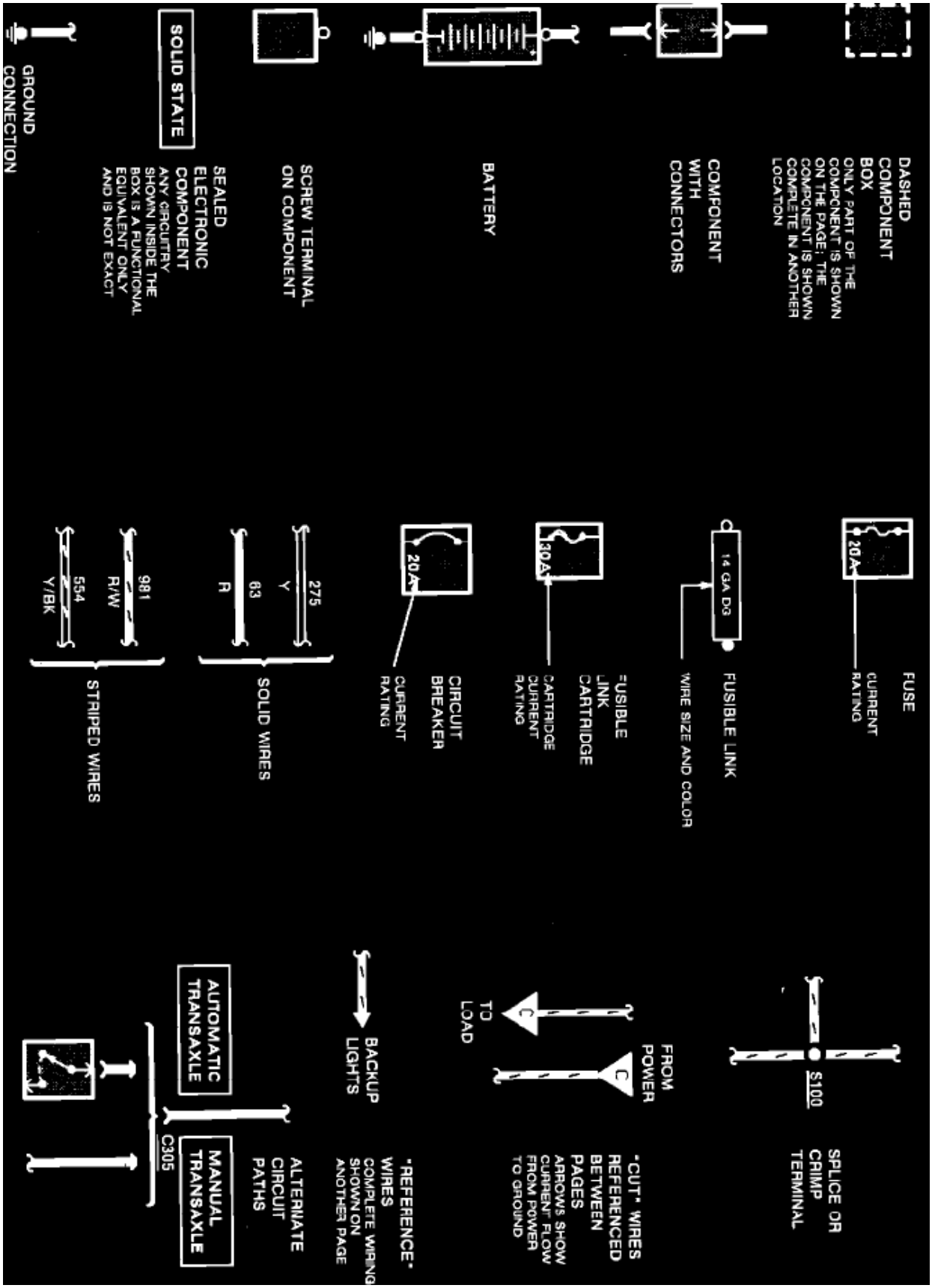
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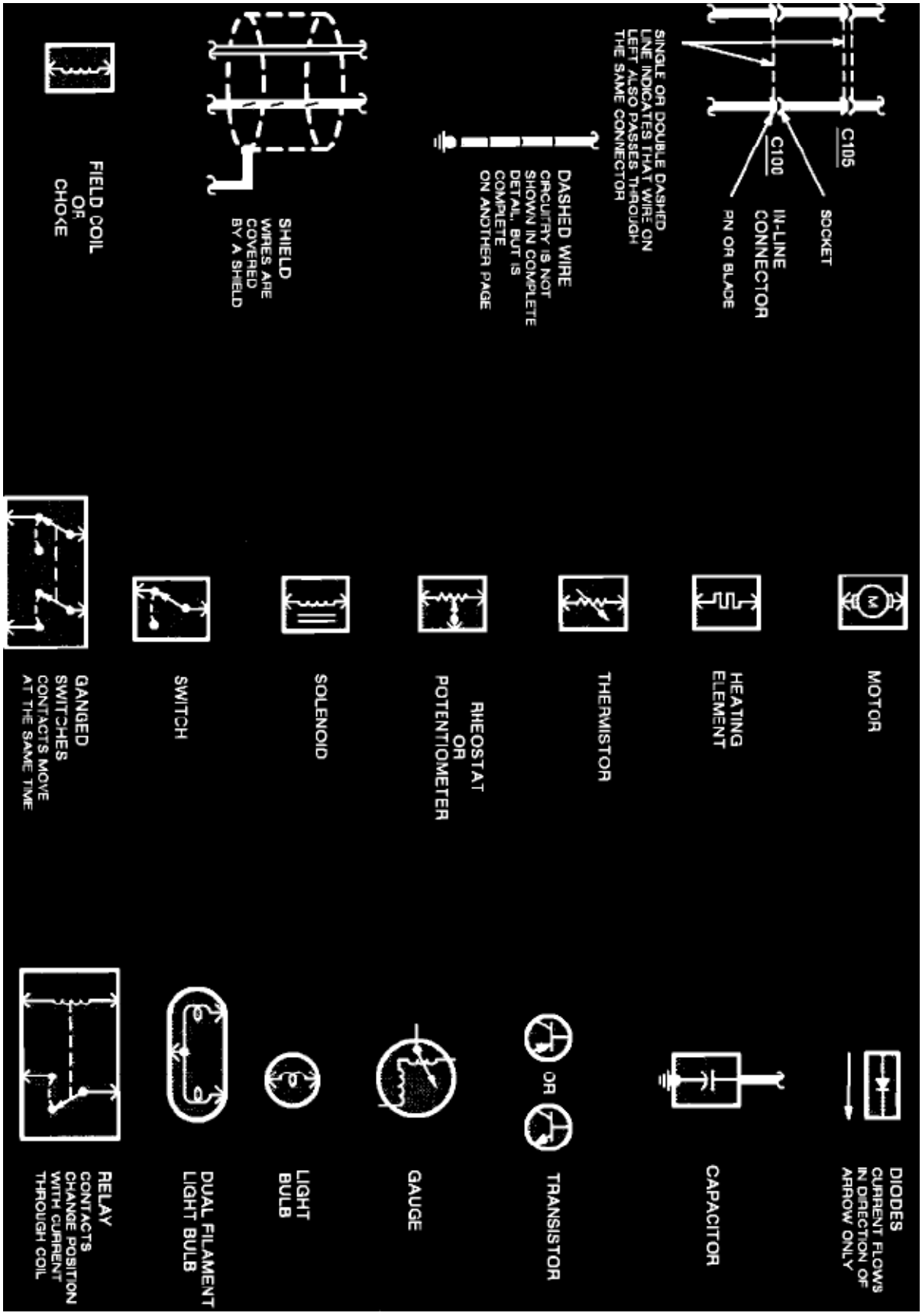
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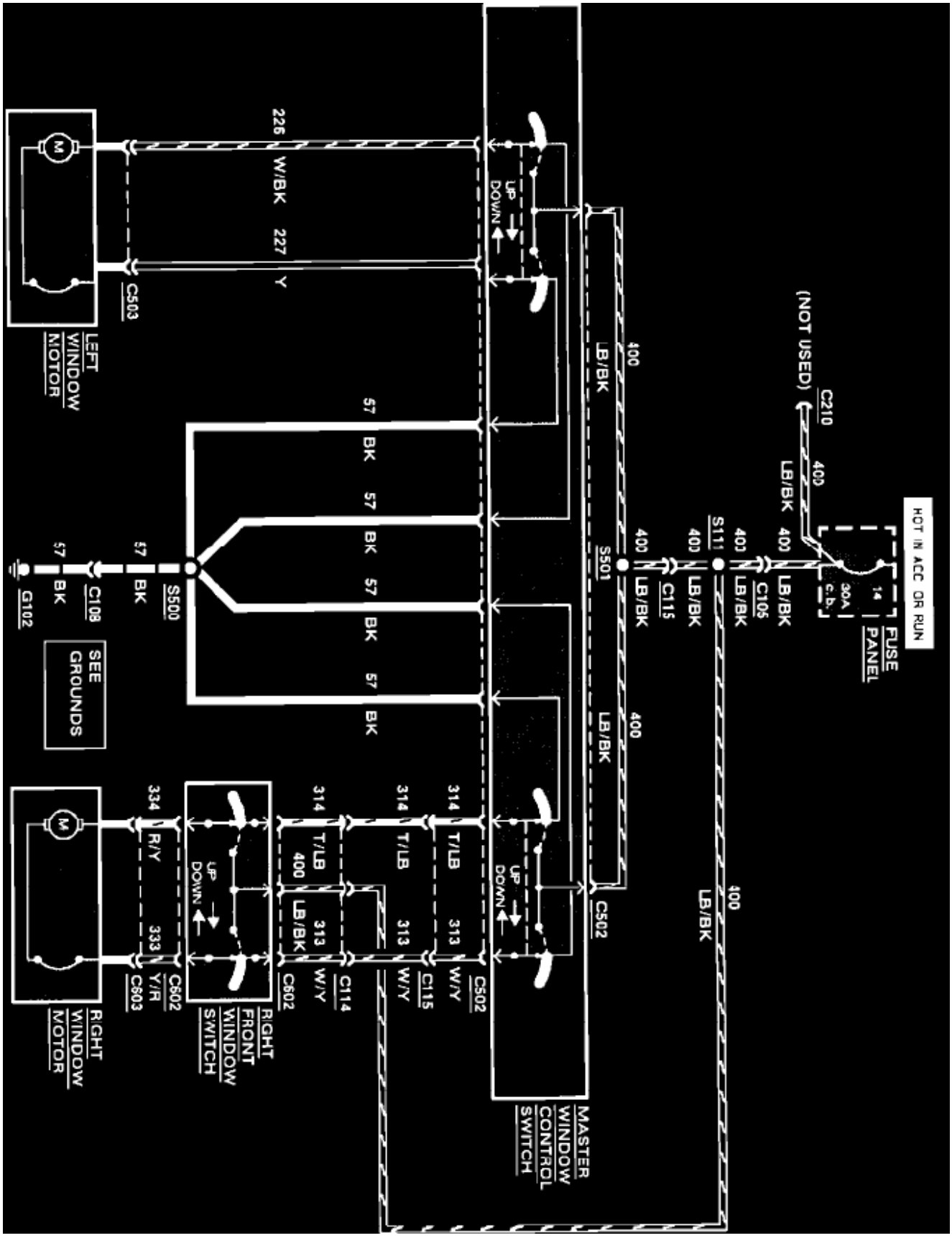
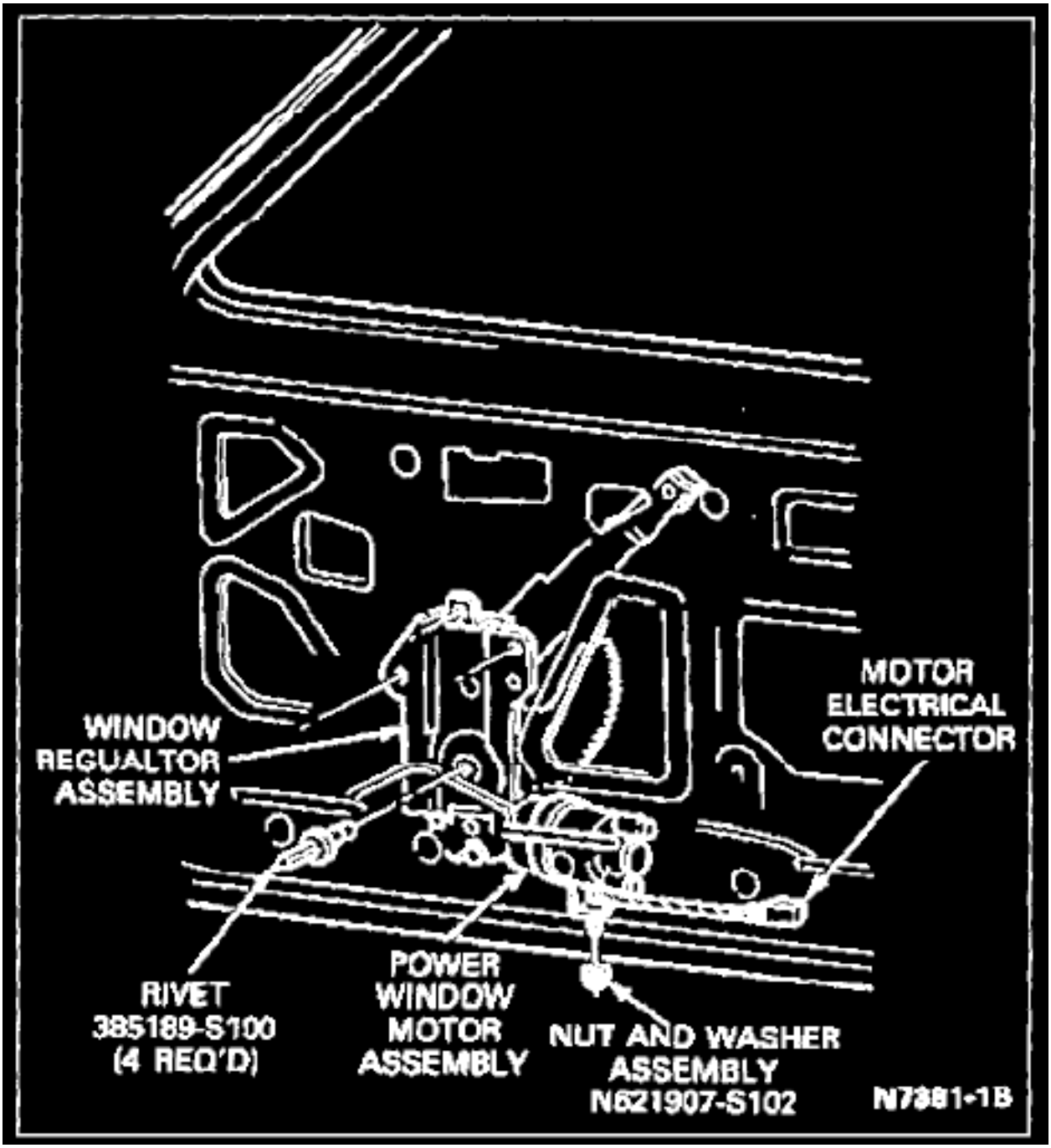

HOT IN ACC OR RUN
FUSE PANEL
14
30A C.B.
C210
(NOT USED)
400
LB/BK
C105
S111
C115
S501
C502
MASTER WINDOW CONTROL SWITCH
UP
DOWN
226 W/BK
227 Y
C503
LEFT WINDOW MOTOR
57 BK
S500
C108
G102
SEE GROUNDS
314 T/LB
313 W/Y
334 R/Y
333 Y/R
C602
C603
RIGHT FRONT WINDOW S'WITCH
RIGHT WINDOW MOTOR

Power Windows



Power Window Motor: Service and Repair

Removal

1. Disconnect battery ground cable.

NOTE: On vehicles equipped with EEC, when the battery has been disconnected and reconnected, some abnormal drive symptoms may occur while the EEC processor relearns its adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn the strategy.

2. Remove door trim panel and watershield. See: Body and Frame/Doors, Hood and Trunk/Doors

3. Disconnect power window motor wire from wire harness connector.

4. Remove motor and regulator assembly.

5. Remove motor and drive from regulator (three retaining screws).

Installation

1. Install new motor and drive assembly to regulator. Tighten motor retaining screws to 5.6-9.6 N-m (50-84 in-lb).

2. Install motor and regulator assembly in door.

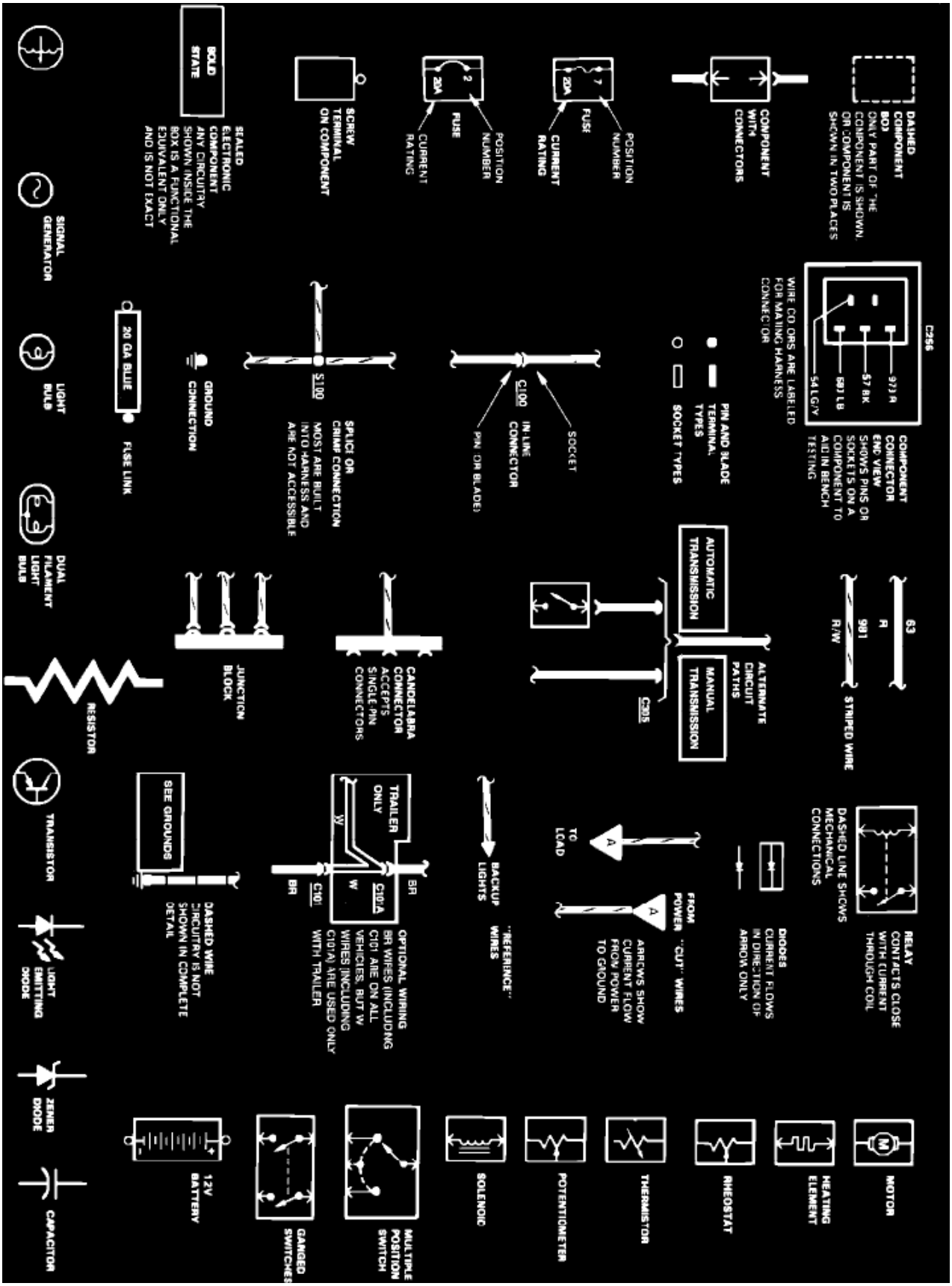
3. Connect power window motor wiring, and battery ground cable.

4. Check window operation.

5. Make sure door drain holes are open.

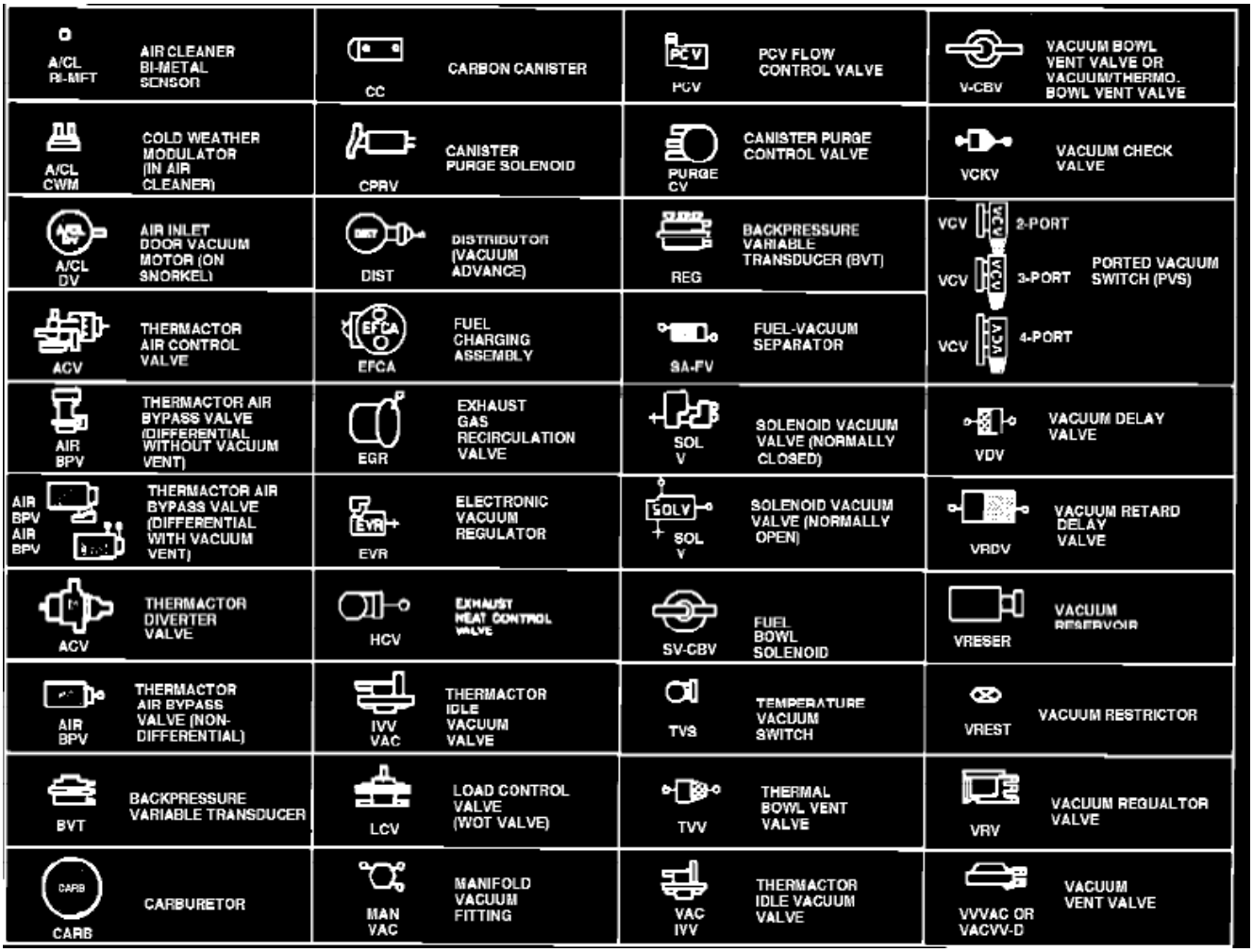
6. Install watershield and trim panel. See: Body and Frame/Doors, Hood and Trunk/Doors

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Windows and Glass > Windows > Power Window Relay > Component Information > Diagrams > Diagram Information and Instructions

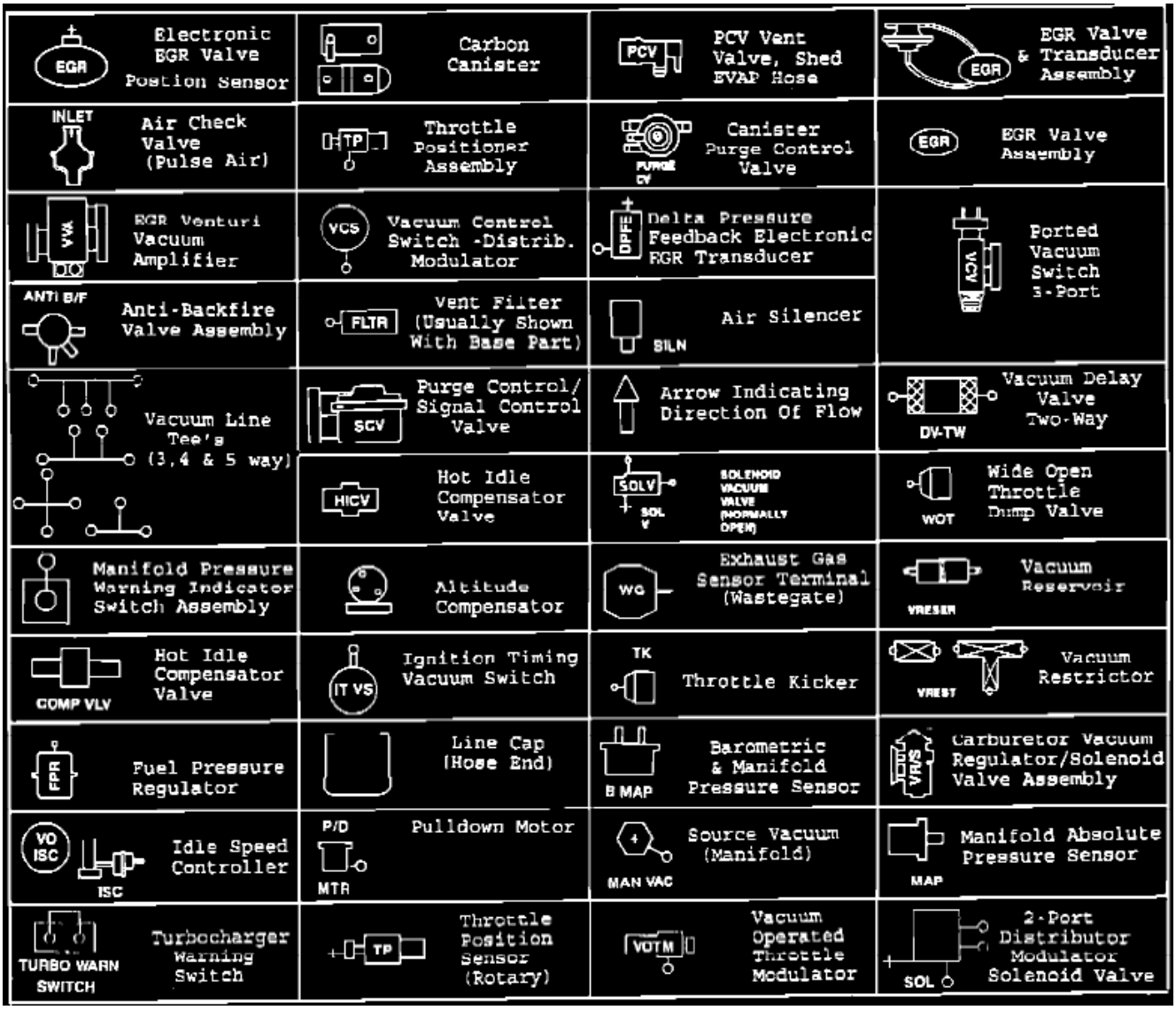


Power Window Relay: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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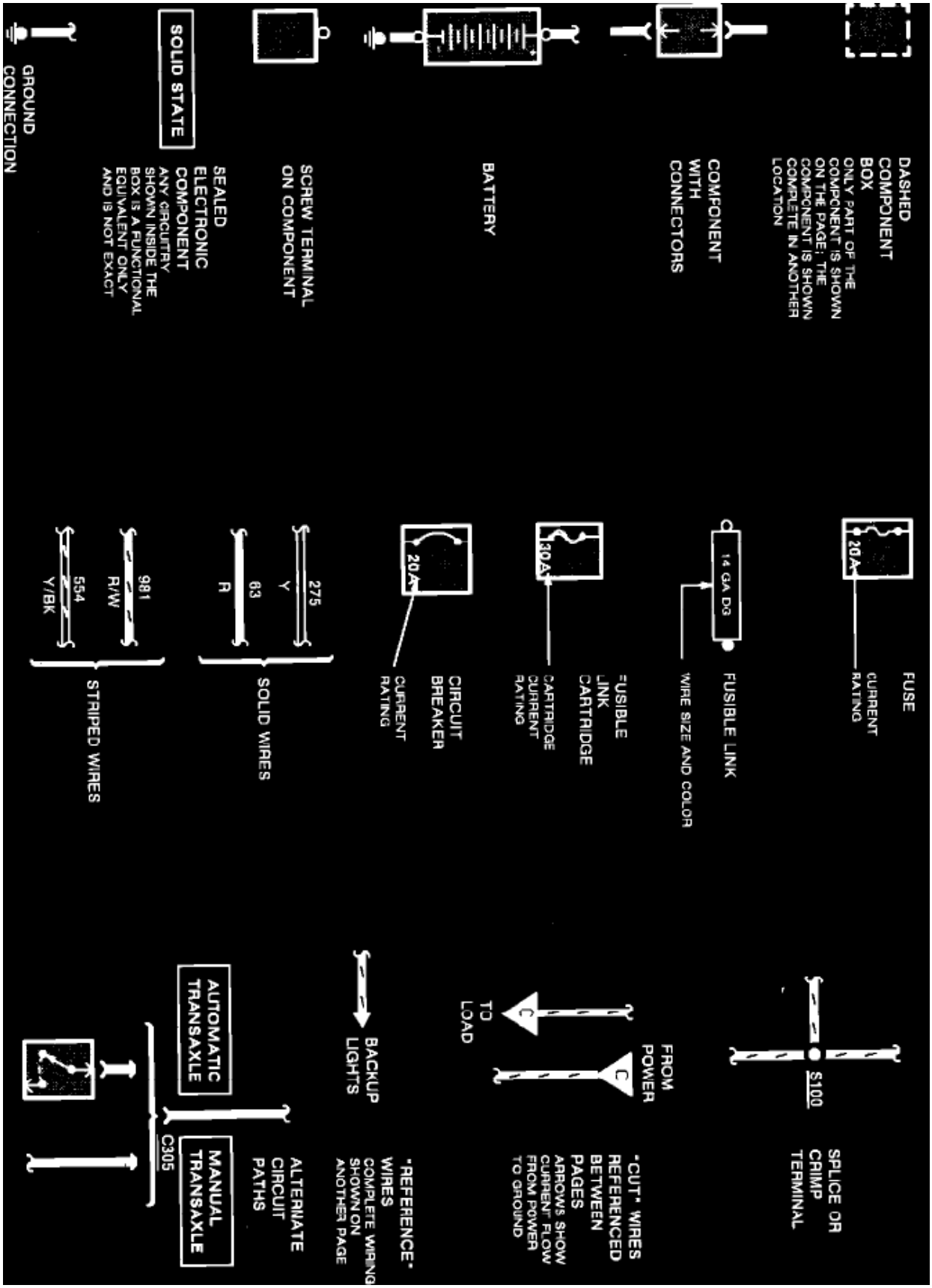
DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
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SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
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SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
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C
TO LOAD
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ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
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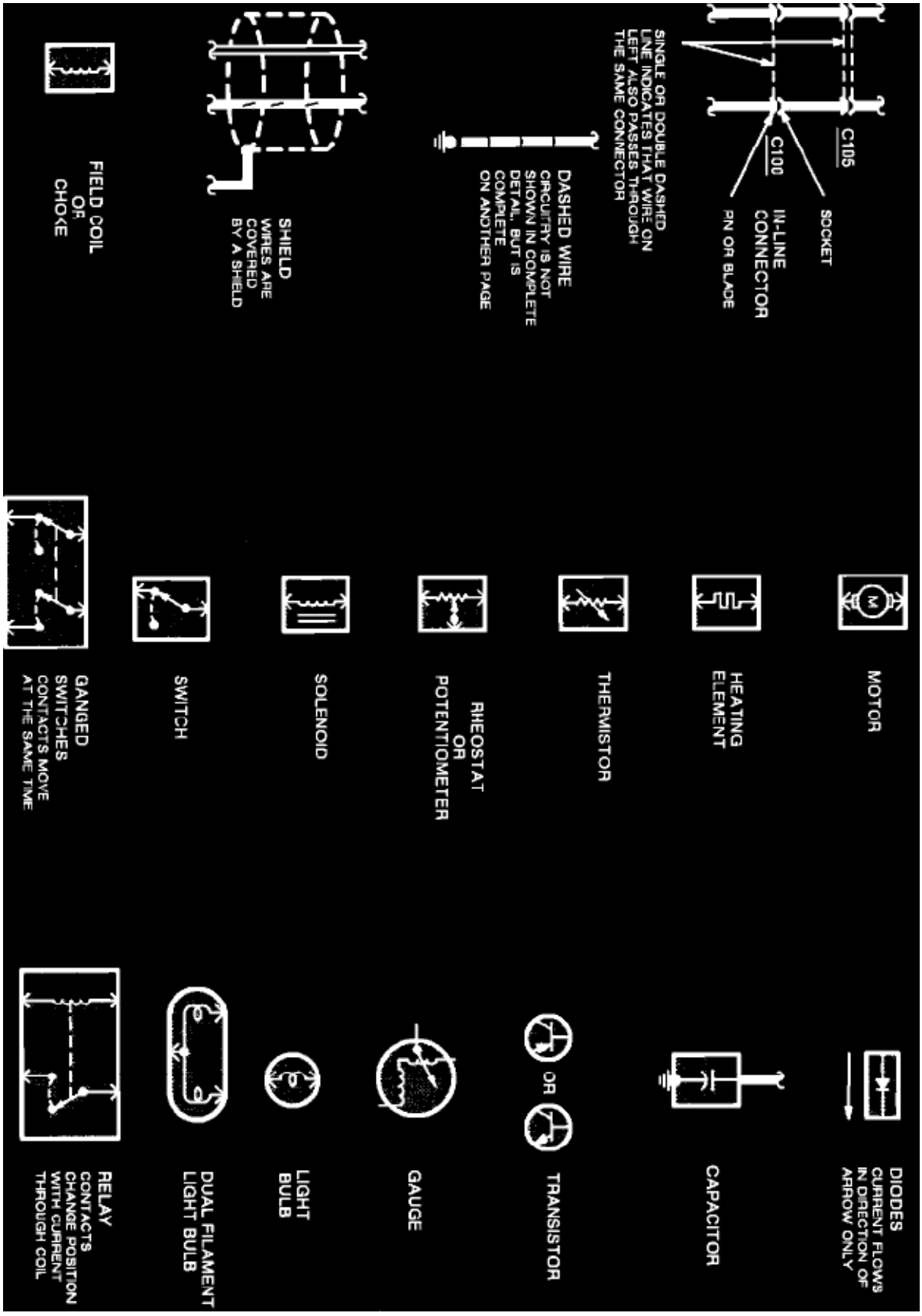
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

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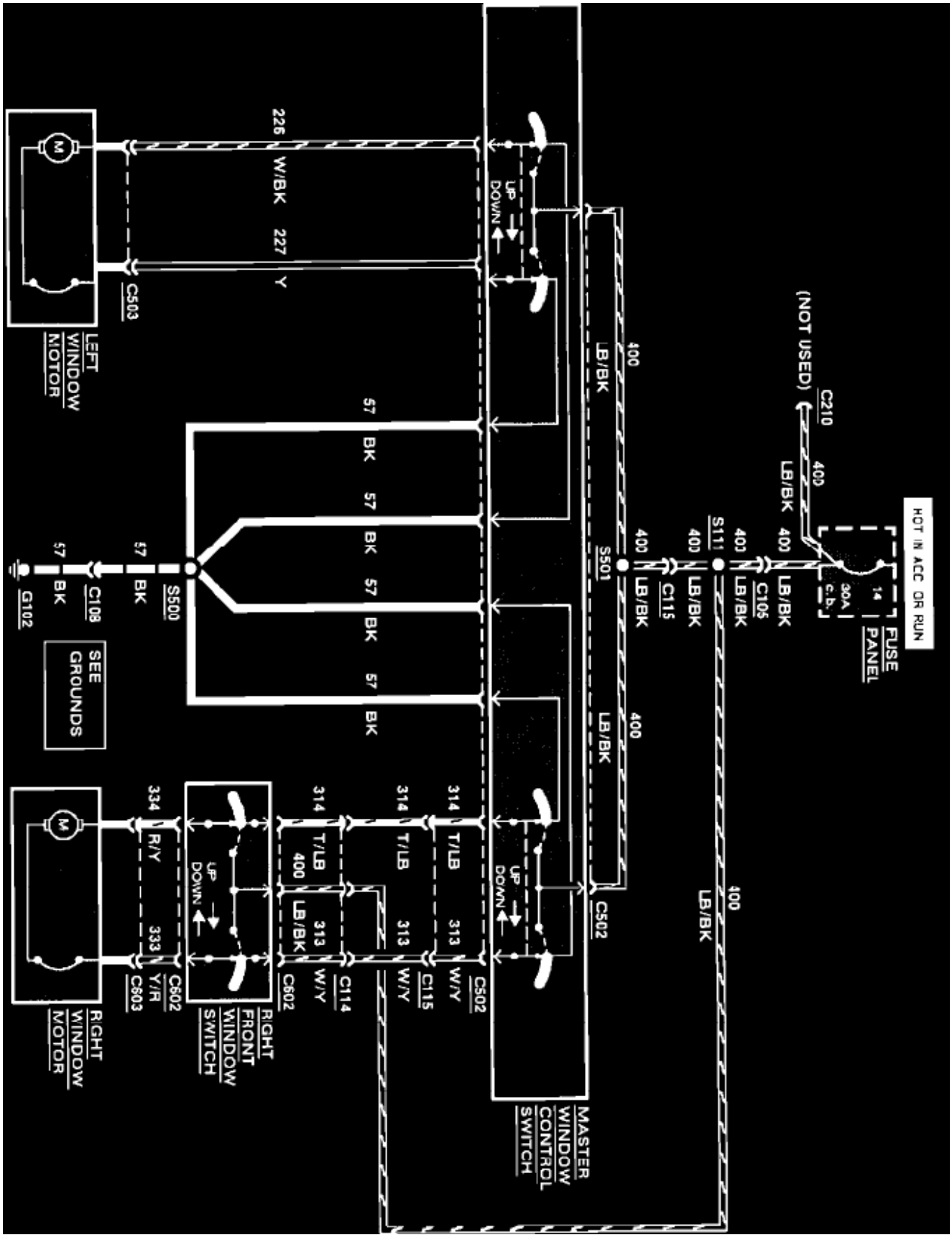
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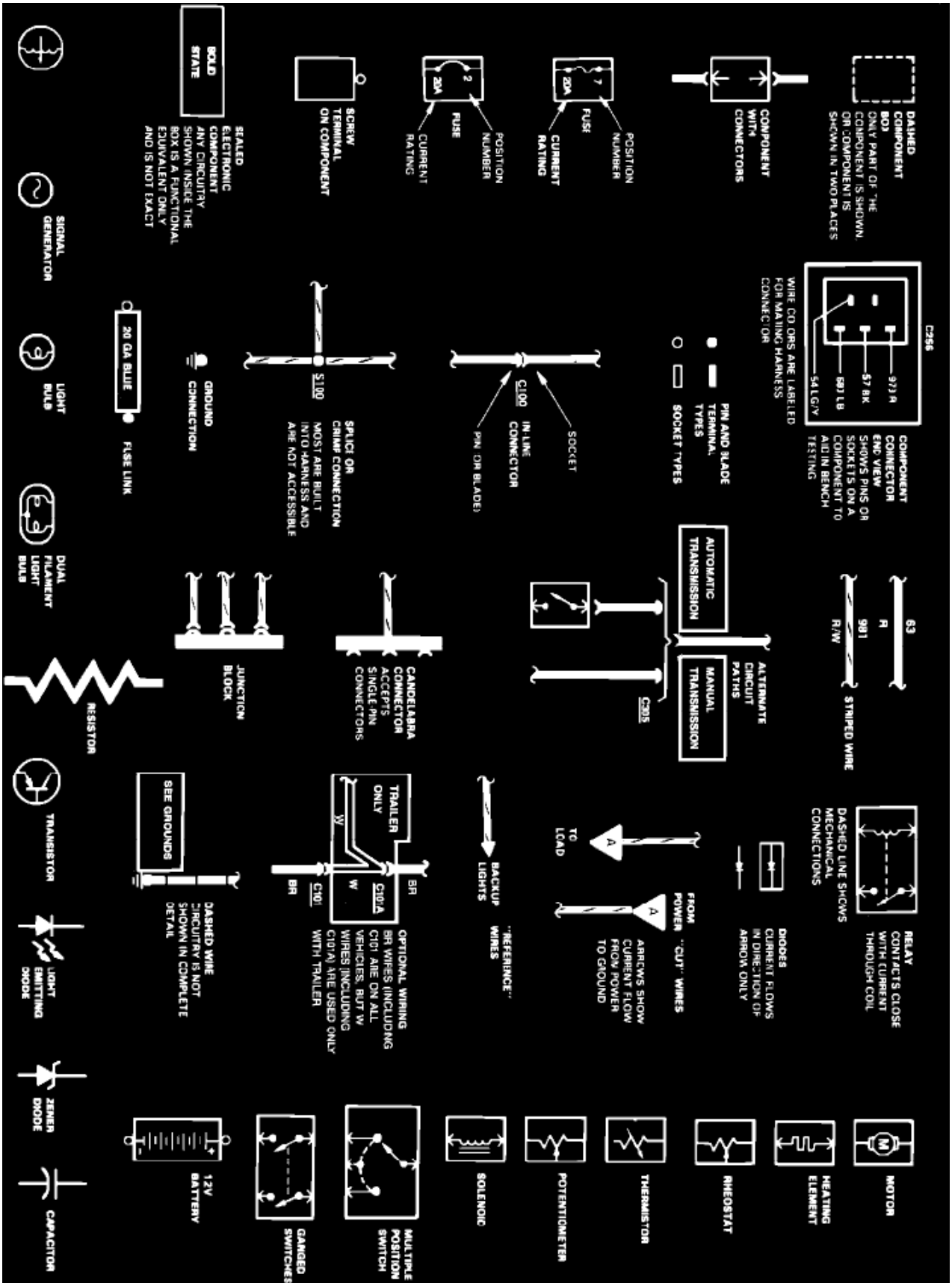
Power Windows

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Windows and Glass > Windows > Power Window Switch > Component Information > Diagrams > Diagram Information and Instructions



Power Window Switch: Diagram Information and Instructions

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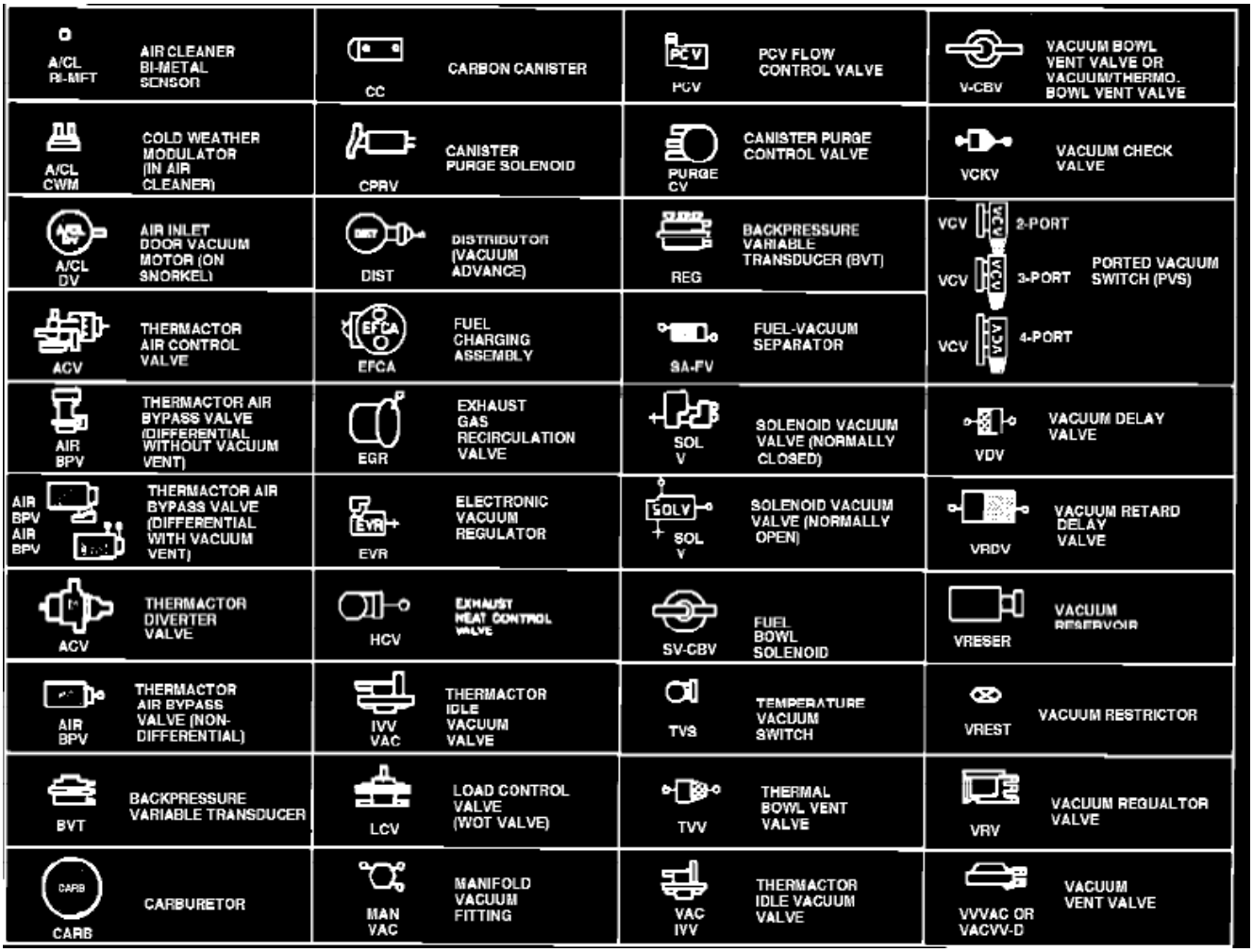

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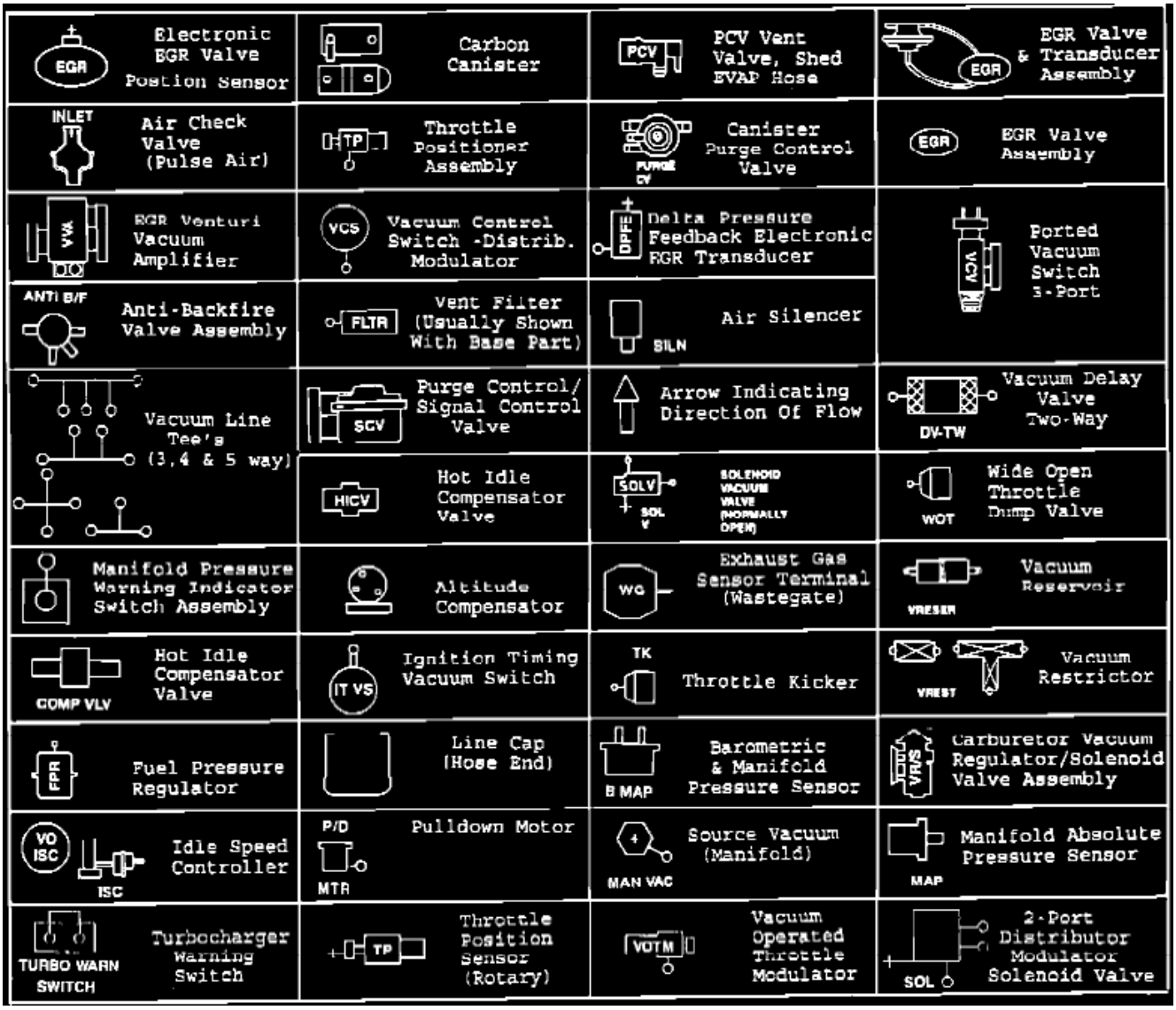

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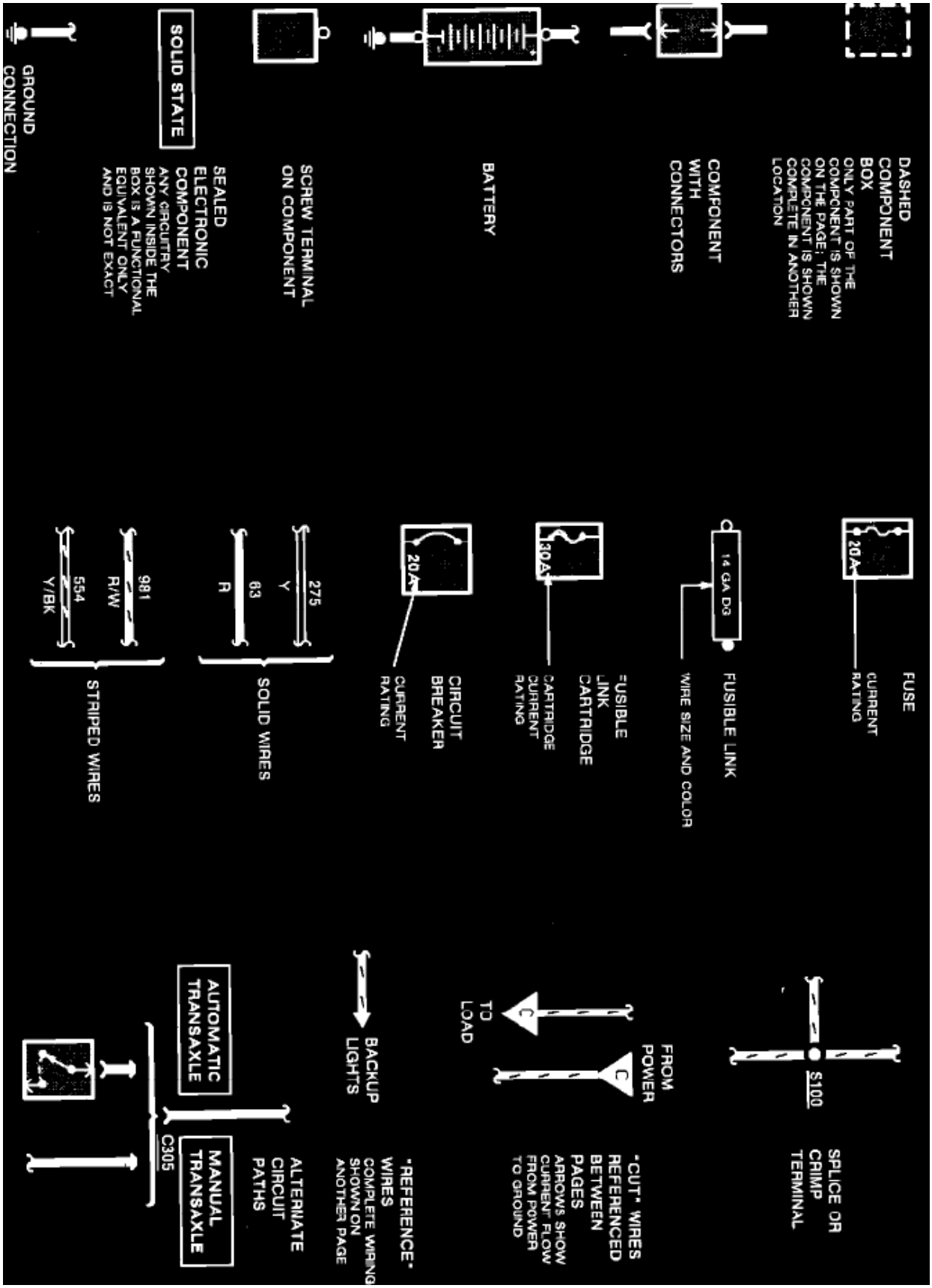
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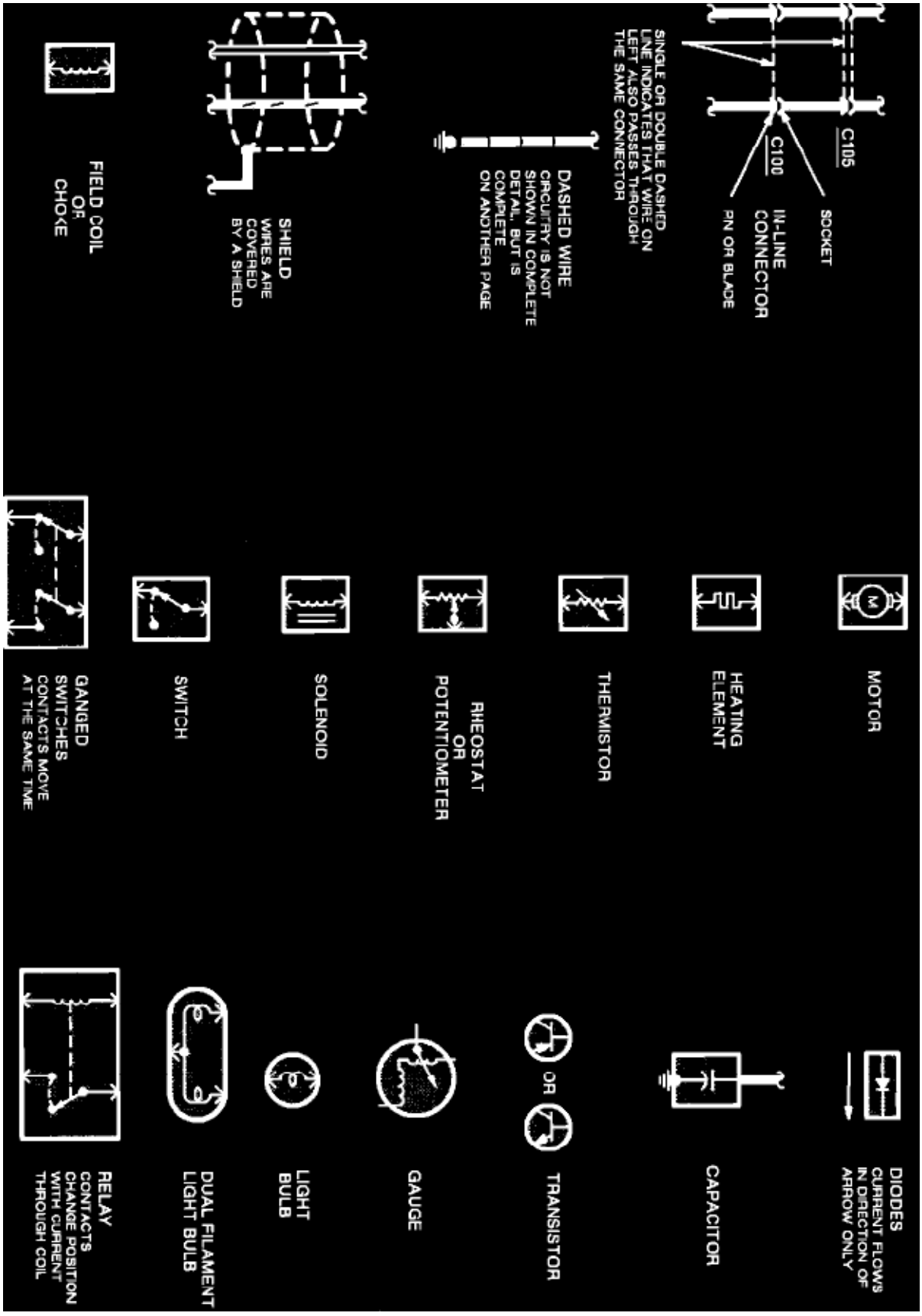
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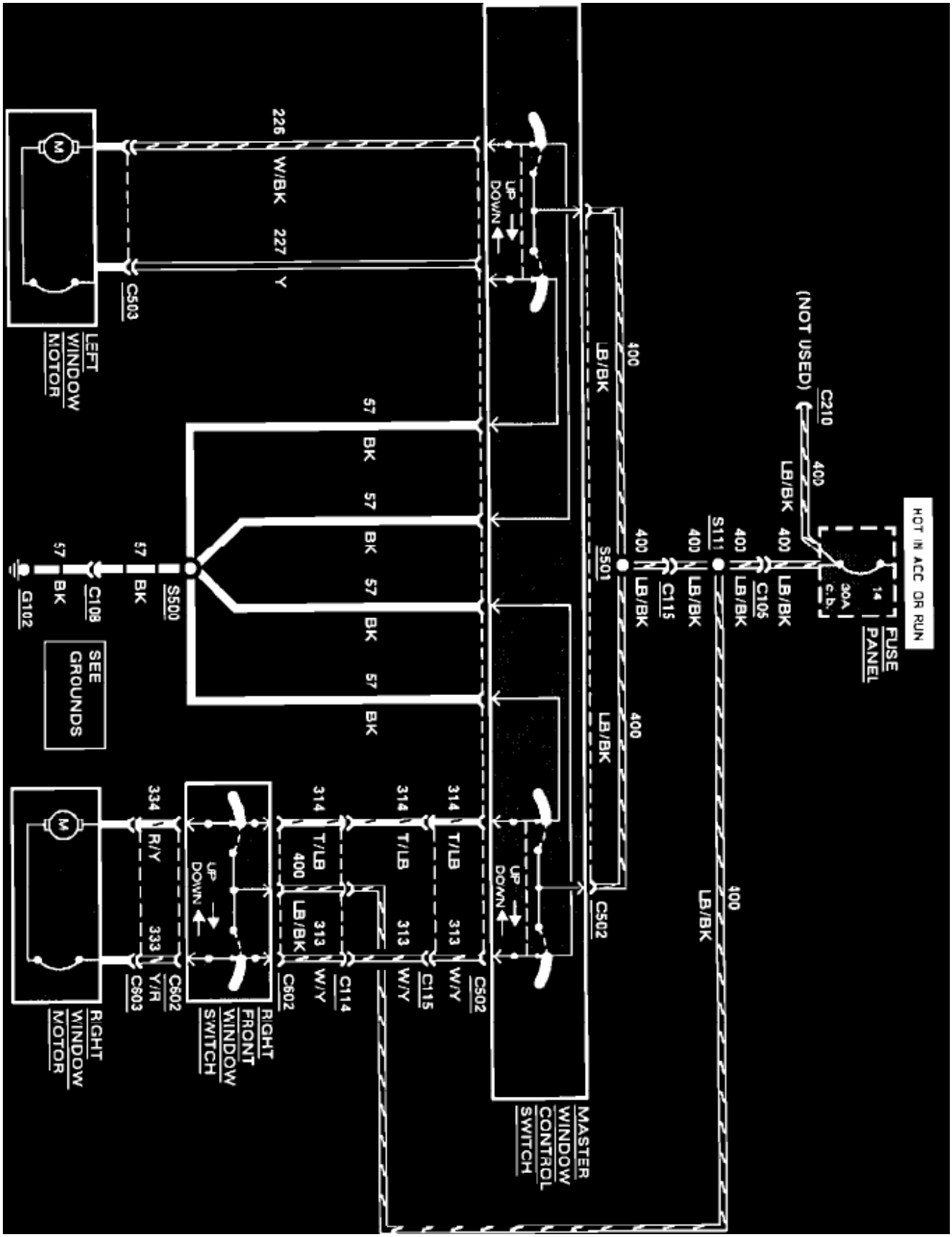
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Power Windows

Window Glass: Technical Service Bulletins Windshield/Interior Glass - Fog/Film

Article No. 96-22-1

10/21/96

WINDSHIELD AND INTERIOR GLASS - FOG/FILM

FORD:

1984-86 LTD 1984-88 EXP 1984-94 TEMPO 1984-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

LINCOLN-MERCURY:

1984-86 MARQUIS 1984-87 LN7, LYNX 1984-92 MARK VII 1984-94 TOPAZ 1984-97 CONTINENTAL, COUGAR, GRAND MARQUIS, TOWN CAR 1986-97 SABLE 1987-89 TRACER 1991-94 CAPRI 1991-97 TRACER 1993-97 MARK VIII 1995-97 MYSTIQUE

MERKUR:

1985-89 XR4TI 1988-90 SCORPIO

LIGHT TRUCK:

1984-97 F-150-350 SERIES 1986-90 BRONCO II 1986-96 BRONCO 1986-97 AEROSTAR, ECONOLINE, RANGER 1988-97 F SUPER DUTY 1991-97 EXPLORER 1993-97 VILLAGER 1995-97 WINDSTAR

This TSB article is being republished in its entirety to update the model years.

ISSUE: Customers with concerns of glass fogging (film) and with the chemicals that cause this fog can be advised that Ford Motor Company has extensively tested this material and found that it is not a health hazard. The film is caused by some of the chemicals used during the manufacture of the interior trim.

ACTION: At the present time, there is no known field fix to prevent the window fogging, however, glass cleaner such as Ford Glass Cleaner (E4AZ-19C507-AA) has been found to be the best for film removal.

PART NUMBER PART NAME

E4AZ-19C507-AA Ford Glass cleaner

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 86-13-6

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 102000, 107000

Window Glass: Technical Service Bulletins Glass - Iridescence or Mottling In Tempered Glass

Article No. 93-21-1

10/13/93

GLASS - "IRIDESCENCE" OR "MOTTLING" IN TEMPERED GLASS

FORD: 1984-94 CROWN VICTORIA, ESCORT, MUSTANG, TEMPO, THUNDERBIRD 1986-88 EXP 1986-94 TAURUS 1989-93 FESTIVA

LINCOLN-MERCURY: 1984-86 CAPRI 1984-87 LYNX 1984-92 MARK VII 1984-94 COUGAR, GRAND MARQUIS, TOPAZ, TOWN CAR 1986-94 SABLE 1988-89 TRACER 1988-94 CONTINENTAL 1991-94 CAPRI, TRACER 1993-94 MARK VIII

LIGHT TRUCK: 1984-90 BRONCO II 1984-94 ECONOLINE, F-150-350 SERIES, RANGER 1986-94 AEROSTAR 1991-94 EXPLORER 1993-94 VILLAGER

ISSUE: Vehicles may exhibit iridescent spots or "mottling" in tempered glass under some lighting conditions. This condition is caused by the tempering process.

ACTION: Explain to customers that "iridescence" or "mottling" of tempered glass is a normal condition and that glass replacement is neither warranted nor necessarily effective in resolving the condition.

DESCRIPTION OF CONDITION

The somewhat iridescent grayish or blueish and fairly geometric spots detected in side and rear window tempered glass are characteristic of tempered glass.

The mottled appearance is noted only under certain conditions of lighting. The occurrence of mottling does not affect glass quality or durability and cannot be reduced by scouring the glass surface.

The boldness of the mottled pattern in a given glass may vary, depending upon lighting conditions, but may appear intensified if viewed through polarized sunglasses.

CAUSES OF CONDITION

Atmospheric dust and other angular reflections can cause changes in the polarized properties of natural light. This polarization, combined with the light polarizing properties imparted to tempered glass by the forces of tension and compression (during the tempering process), cause the iridescent or mottled appearance.

These are the same forces of compression and tension which make tempered glass so remarkably strong. Windshields, which are annealed rather than tempered, do not exhibit iridescence.

OTHER APPLICABLE ARTICLES: 83-16-4 WARRANTY STATUS: INFORMATION ONLY OASIS CODES: 102000

Window Regulator: Technical Service Bulletins Power Window Regulator - Counterbalance Spring

Article No. 91-19-5 09/18/91

WINDOW - POWER - REGULATOR COUNTERBALANCE SPRING - REMOVAL AND INSTALLATION PROCEDURES - (FRONT DOORS ONLY ON LIGHT TRUCKS)

FORD: 1983-85 EXP 1983-90 ESCORT 1983-91 CROWN VICTORIA, MUSTANG, THUNDERBIRD 1984-91 TEMPO 1986-91 TAURUS

LINCOLN-MERCURY: 1983 LN7 1983-86 CAPRI 1983-87 LYNX 1983-91 COUGAR, GRAND MARQUIS, TOWN CAR 1984-91 TOPAZ 1986-91 SABLE

LIGHT TRUCK: 1990-91 RANGER 1991 EXPLORER

ISSUE: A removal and installation procedure has been developed for replacing the power window regulator counterbalance spring. This procedure is not published in the Car or Light Truck Shop Manuals.

ACTION: If service is required, use the following removal and installation procedure to replace the power window regulator counterbalance spring.

REMOVAL

WARNING: COUNTERBALANCE SPRINGS IMPROPERLY REMOVED CAN CAUSE INJURY. BE SURE TO USE THE FOLLOWING PROCEDURE TO MINIMIZE THE RISK.

1. Remove the regulator assembly from the door per the appropriate service manual instructions.

2. Place the regulator in the full-up position, if possible, to partially relieve the spring load.

3. Clamp the regulator so that no rotational movement is possible.

4. Note position of spring center bar relative to slotted pivot pin for reassembly later.

WARNING: THE COUNTERBALANCE SPRING IS PRE-TORQUED, CAREFUL HANDLING IS REQUIRED TO MINIMIZE RISK OF PERSONAL INJURY.

5. Using "Vicegrips" (or an equivalent tool) proceed as follows:

a. Grip the counterbalance spring hook at the retaining pin.

b. Carefully lift high enough to clear the pin.

c. Allow the spring to unwind to a free position, about 1/3 to 1/2 turn.

6. Remove the motor from the mounting plate. Regulator can now be discarded.

INSTALLATION

1. Place the regulator in the full-up position to ease assembly.

2. Reattach the motor to the mounting plate and clamp the regulator so that no rotational movement is allowed.

3. Place the spring center bar on the slotted pivot pin as noted in Step 4 of the removal procedure.

4. With "Vicegrips" (or an equivalent tool) on the spring hook, carefully wind the spring to the retainer pin. Make sure that the spring is properly seated below the pin shoulder.

WARNING: THE SPRING MAY CAUSE INJURY IF NOT PROPERLY SEATED BELOW THE SHOULDER ON THE RETAINING PIN BECAUSE THE SPRING COULD SLIP OFF THE PIN.

5. Cycle the regulator making sure the spring coils constrict as the window glass travels down. This insures that the coil is in the proper position.

6. Replace the regulator in the door per the Shop Manual instructions.

OTHER APPLICABLE ARTICLES: NONE WARRANTY STATUS: INFORMATION ONLY OASIS CODES:

102000, 190000, 205000, 290000

Windshield: Technical Service Bulletins Windshield/Interior Glass - Fog/Film

Article No. 96-22-1

10/21/96

WINDSHIELD AND INTERIOR GLASS - FOG/FILM

FORD:

1984-86 LTD 1984-88 EXP 1984-94 TEMPO 1984-97 CROWN VICTORIA, ESCORT, MUSTANG, THUNDERBIRD 1986-97 TAURUS 1988-93 FESTIVA 1989-97 PROBE 1994-97 ASPIRE 1995-97 CONTOUR

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This TSB article is being republished in its entirety to update the model years.

ISSUE: Customers with concerns of glass fogging (film) and with the chemicals that cause this fog can be advised that Ford Motor Company has extensively tested this material and found that it is not a health hazard. The film is caused by some of the chemicals used during the manufacture of the interior trim.

ACTION: At the present time, there is no known field fix to prevent the window fogging, however, glass cleaner such as Ford Glass Cleaner (E4AZ-19C507-AA) has been found to be the best for film removal.

PART NUMBER PART NAME

E4AZ-19C507-AA Ford Glass cleaner

OTHER APPLICABLE ARTICLES: NONE

SUPERSEDES: 86-13-6

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 102000, 107000

Windshield: Technical Service Bulletins Windshield - Material Usage Procedure

Article No. 95-12-1

06/19/95

GLASS - WINDSHIELD - URETHANE MOUNTED GLASS MATERIAL USAGE PROCEDURE - SERVICE TIP.

FORD 1981-95 ESCORT 1983-95 THUNDERBIRD 1984-94 TEMPO 1986-95 TAURUS 1988-93 FESTIVA 1989-95 PROBE 1990-95 CROWN VICTORIA 1995-95 ASPIRE 1995 CONTOUR, MUSTANG

LINCOLN-MERCURY 1982-95 CONTINENTAL 1983-95 COUGAR 1984-94 TOPAZ 1986-95 SABLE 1987-89 TRACER 1990-95 GRAND MARQUIS, TOWN CAR 1991-95 TRACER 1993-95 MARK VIII 1995 MYSTIQUE

LIGHT TRUCK 1983-95 RANGER 1984-90 BRONCO II 1986-95 AEROSTAR 1987-95 BRONCO, F-150-350 SERIES, F-47 1992-95 ECONOLINE 1993-95 VILLAGER 1995 WINDSTAR

ISSUE: Essex windshield replacement products have a limited shelf life. Products should be discarded if they have exceeded their shelf life.

ACTION: Refer to the following text to decode the manufacturing (batch) date from the container. Also, refer to the Service Procedure for proper installation procedures.

HOW TO READ ESSEX BATCH NUMBERS

Example: JL158601AA

Year: J Month: L Day: 15 Essex ARG: 8601 Batch: AA

This batch was made December 15, 1995 at the Essex plant, batch sequence AA.

Monthly Code Guide:

^ A - January ^ B - February ^ C - March ^ D - April

^ E - May ^ F - June ^ G - July ^ H - August ^ I - September ^ J - October ^ K - November ^ L - December

Year Code Guide:

^ J - 1995 ^ K - 1996 ^ L - 1997 ^ M - 1998

URETHANE MOUNTED GLASS MATERIAL

USAGE PROCEDURE

REMOVAL

1. If necessary, remove the windshield wiper mounting arm, pivot shafts and leaf screen along cowl. Remove the inside rear view mirror, all windshield garnish mouldings, A-pillar mouldings and lower headliner.

2. Use Rotunda Interior Cut-Out Knife (164-R2450 or 164-R2451) or equivalent to cut urethane. Refer to the manufacturer's instructions when using tool.

CAUTION:

USE CARE WHEN CUTTING THROUGH SEAL TO AVOID DAMAGE TO THE INSTRUMENT PANEL, REAR PACKAGE TRAY, HEADLINER OR INTERIOR TRIM.

3. Remove glass from vehicle using a suitable glass removal tool.

INSTALLATION

1. Trim the urethane left on the flange with a utility knife or razor blade until the surface is smooth and free of cuts. Even up the urethane remaining on the pinch weld so it is all at the same level (approximately 1/16" or 1.6 mm).

2. Apply Essex Urethane Pinchweld Primer U-413 to any sheet metal that has been exposed along the pinch weld. Let dry for a minimum of 6-10 minutes before proceeding. Do not apply primer to existing urethane bead.

3. Properly align glass to body. Place the glass in the opening and center it from top to bottom and side to side with about equal clearance on all sides. Using masking tape or crayon, make alignment points on each of the four (4) sides of the glass and body.

4. Remove the windshield from the vehicle and place it inside up, on a low stable work surface.

5. Clean the glass with a non-alcohol based glass cleaner such as Essex Glass And Surface Cleaner GC-800.

6. Install rear view mirror bracket. Refer to the appropriate Service Manual for installation details.

7. Apply two (2) coats of Urethane Glass Prep U-401 to inner edge of the windshield. Wipe off material immediately after each application.

NOTE:

WIPE OFF URETHANE GLASS PREP U-401 IMMEDIATELY AFTER EACH APPLICATION.

8. Apply Essex Primer U-402 to the same glass area as U-401. Allow to dry 5 minutes.

9. Install foam dam tape on pinch weld, if required.

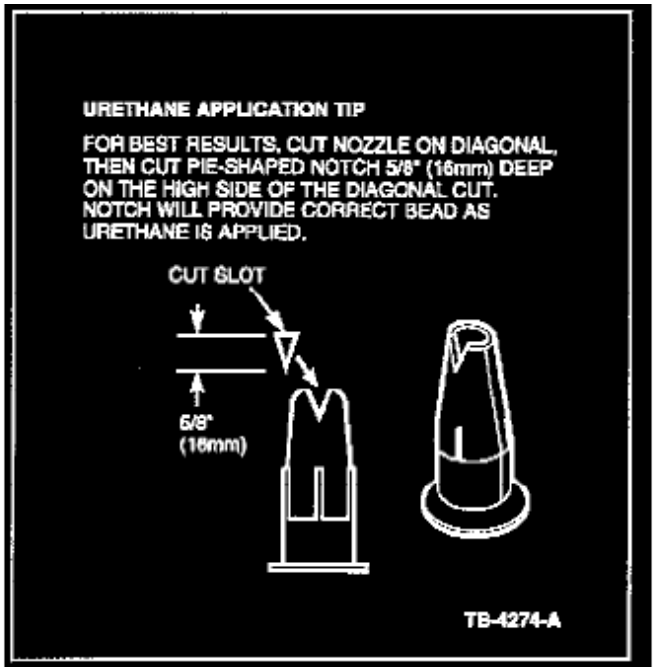


Figure 1

ESSEX URETHANE GLASS INSTALLATION PRODUCTS			
Product	**Package Size**	**Essex Part Number**	**Shelf Life**
Essex Urethane Glass Prep	4 Fl. Oz.	U-401	6 Months
Essex Urethane Glass Primer	4 Fl. Oz.	U-402	6 Months
Essex Urethane Pinch Weld Primer	4 Fl. Oz.	U-413	6 Months
Essex Urethane Auto Glass Adhesive	10.5 Oz.	U-400HV	9 Months
Norton Foam Dam Tape	20' Roll	NFD-3229	
Essex Glass And Surface Cleaner	22 Oz.	GC-800	

10. Cut the nozzle of the Essex Urethane Auto Glass Adhesive U-4OOHV (Figure 1) and apply a triangular bead of urethane 5/8" (16 mm) by 3/8" (9 mm) wide around the perimeter of the pinch weld.

11. Install the glass into the opening taking care to align the marks previously designated. Press glass into place until full contact is made with urethane adhesive. Glass must be installed before urethane skins over.

NOTE:

BEFORE INSTALLING GLASS, OPEN THE WINDOWS TO PREVENT THE GLASS FROM BEING PUSHED OUT BY AIR PRESSURE IF A DOOR IS CLOSED.

12. If necessary, reinstall all mouldings and trim previously removed.

CAUTION:

WHEN REPLACING URETHANE INSTALLED GLASS, THE VEHICLE SHOULD NOT BE DRIVEN UNTIL THE URETHANE HAS CURED. THIS WILL PREVENT THE GLASS FROM BEING JARRED OUT OF POSITION AND HELP ENSURE APPROPRIATE WINDSHIELD RETENTION TO MEET SAFETY AND STRUCTURAL REQUIREMENTS.

NOTE:

USE ONLY URETHANE FOR SERVICE OF AIR AND WATER LEAKS ON URETHANE INSTALLED GLASS.

These products are required for urethane mounted glass replacement:

To locate the nearest distributor of Essex glass replacement products, contact the following locations:

For North America or other:

^ Essex ARG

^ 555 Gaddis Blvd.

^ Dayton, Ohio 45403

^ Phone Within North America: (800) 453-3779

^ Phone Outside North America: (513) 254-1550

^ Fax: (513) 254-3779

For Europe:

^ Gurit-Essex AG

^ CH-8807 Freienbach

^ Phone: (055) 471121

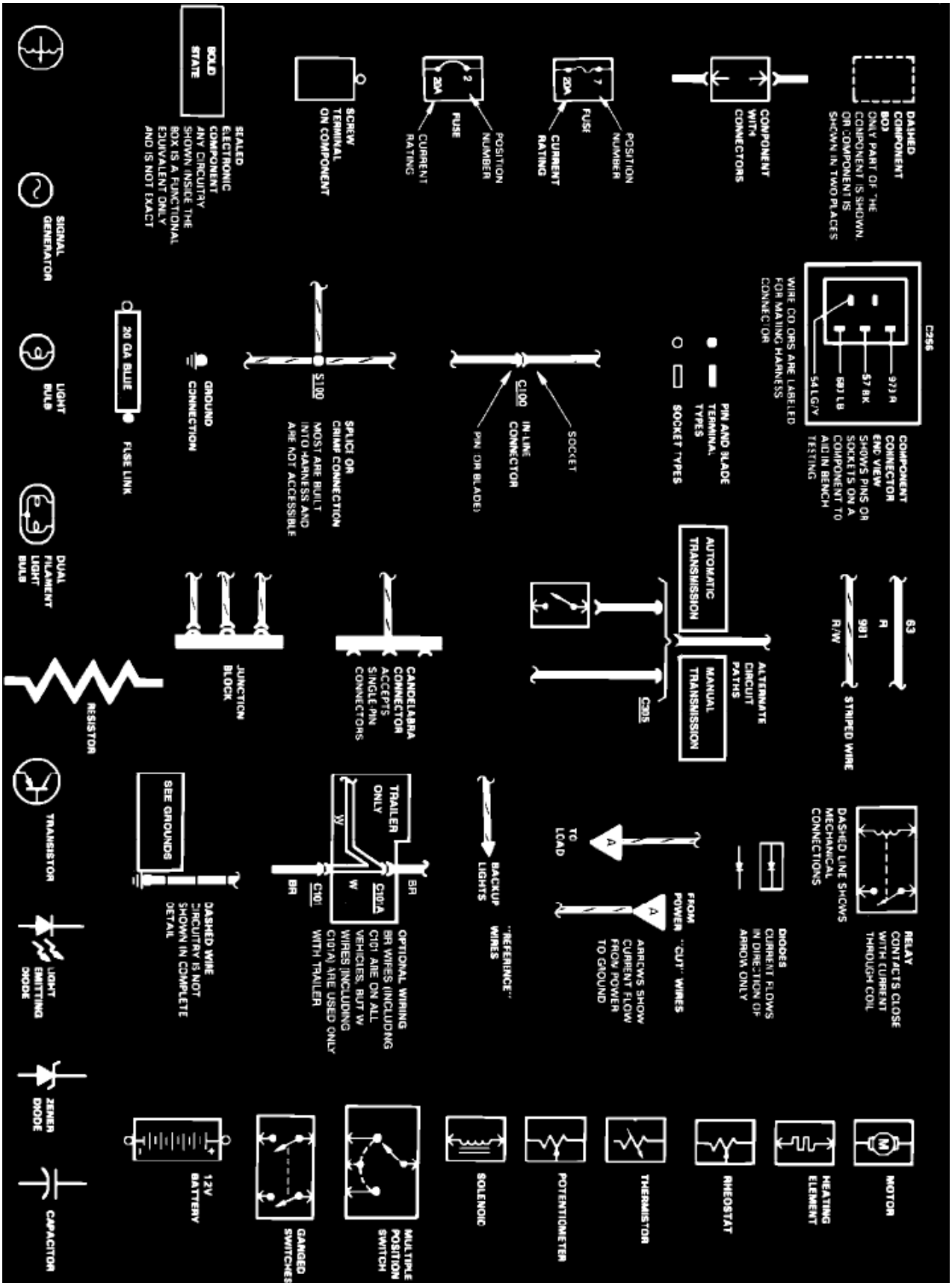
^ Fax: (055) 486738

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY

OASIS CODES: 102000

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Relays and Modules - Wiper and Washer Systems > Windshield Washer Relay > Component Information > Diagrams > Diagram Information and Instructions



Windshield Washer Relay: Diagram Information and Instructions

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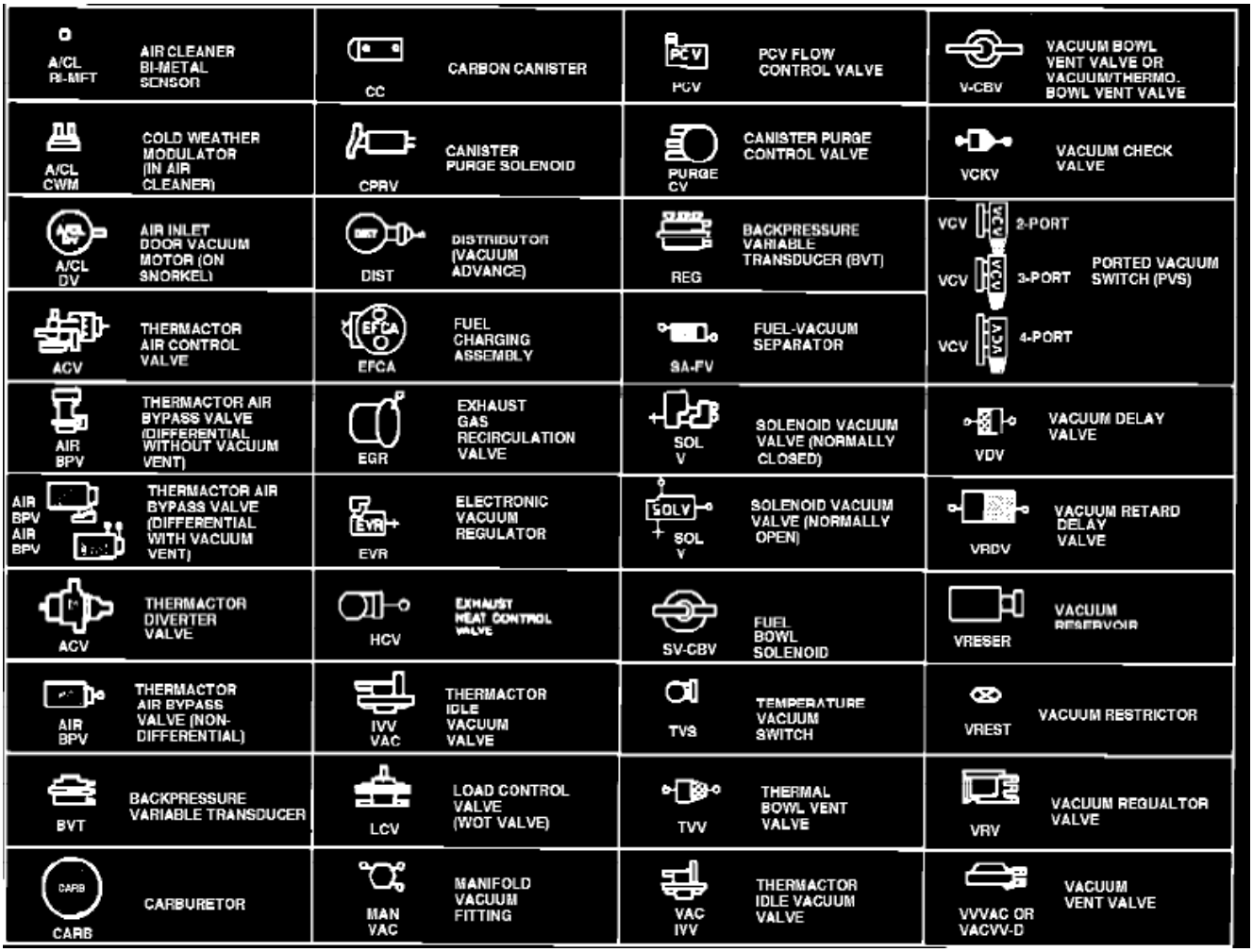
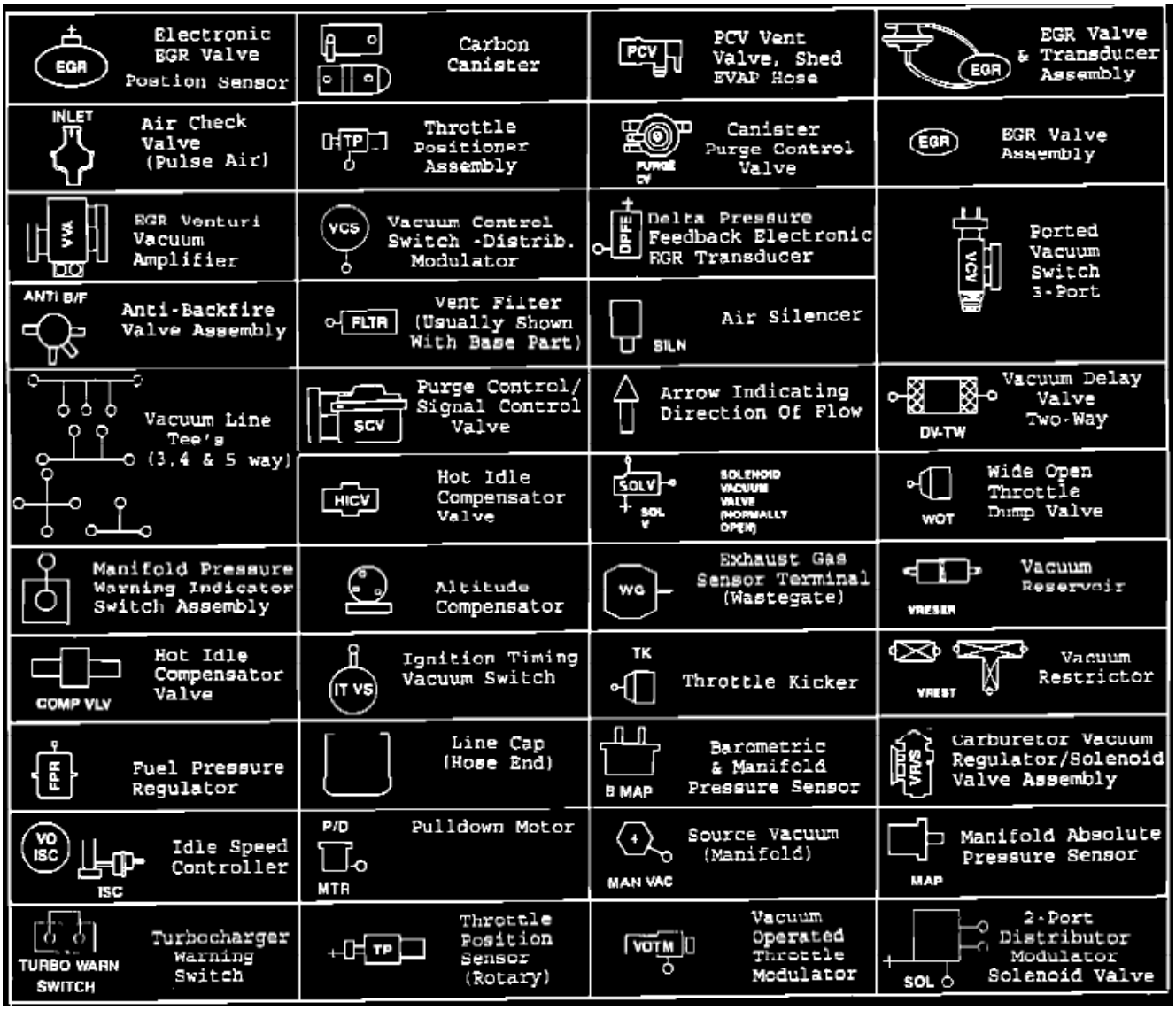


Vacuum And Vapor Hose Schematic Symbols



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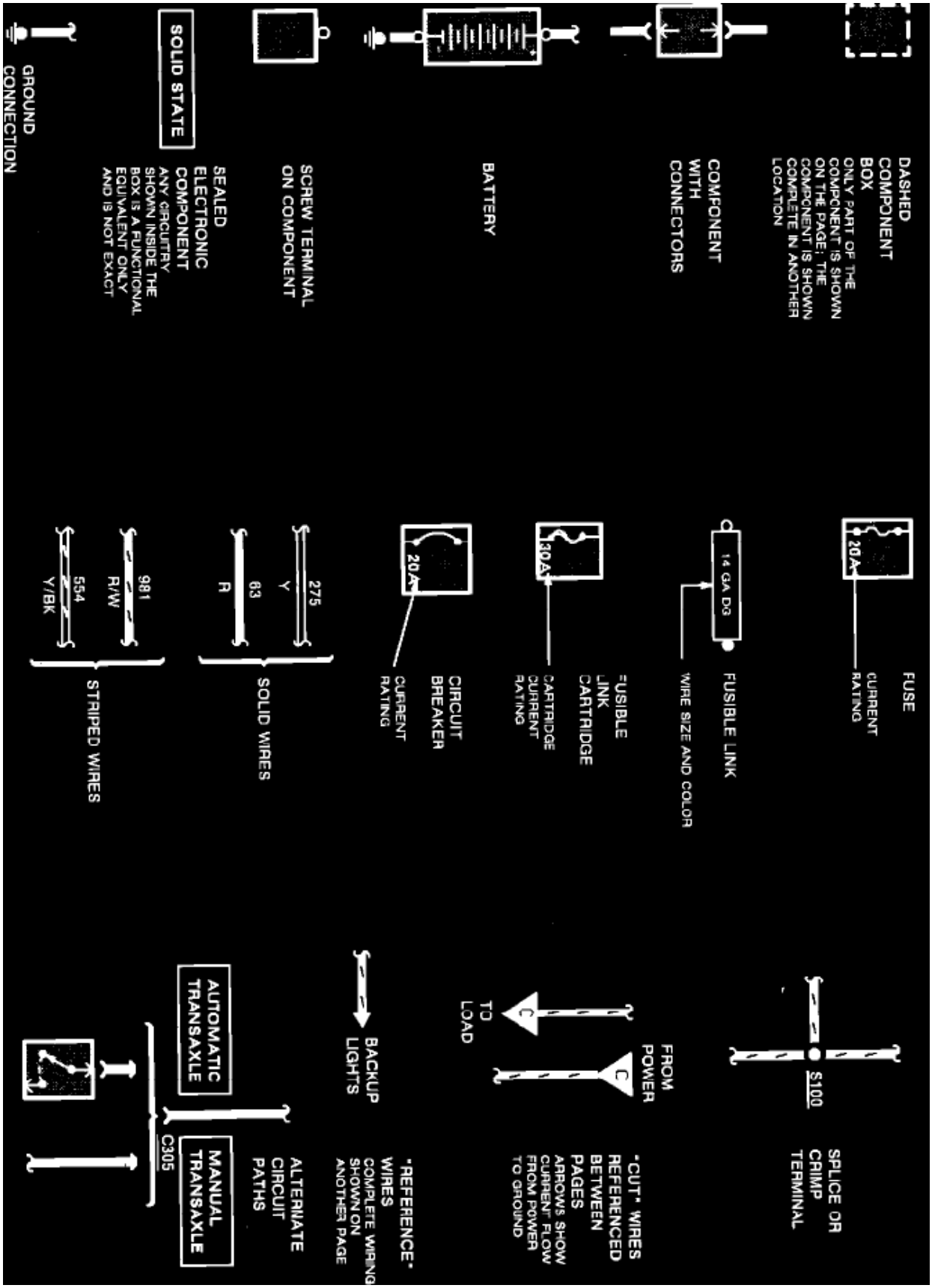
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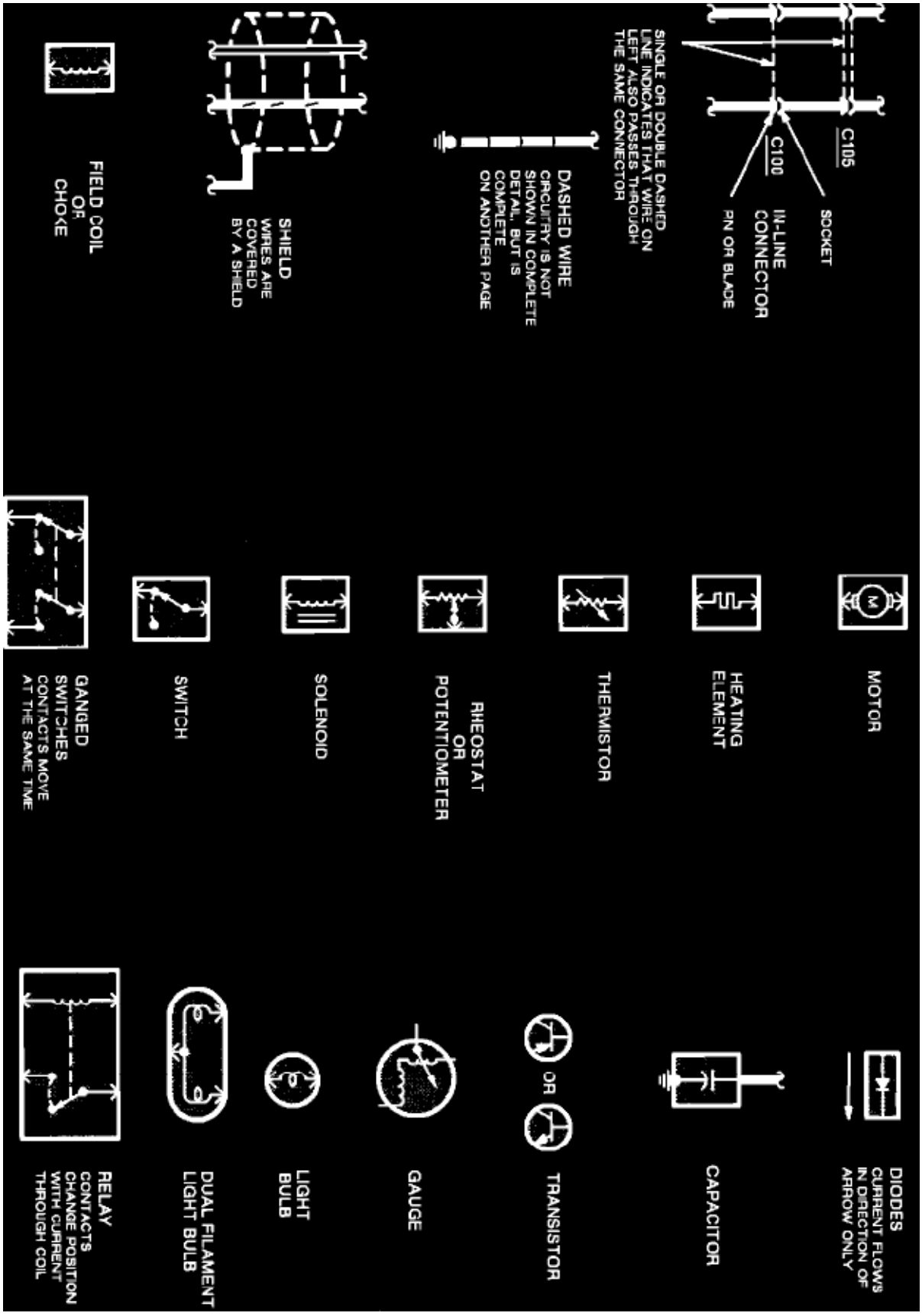
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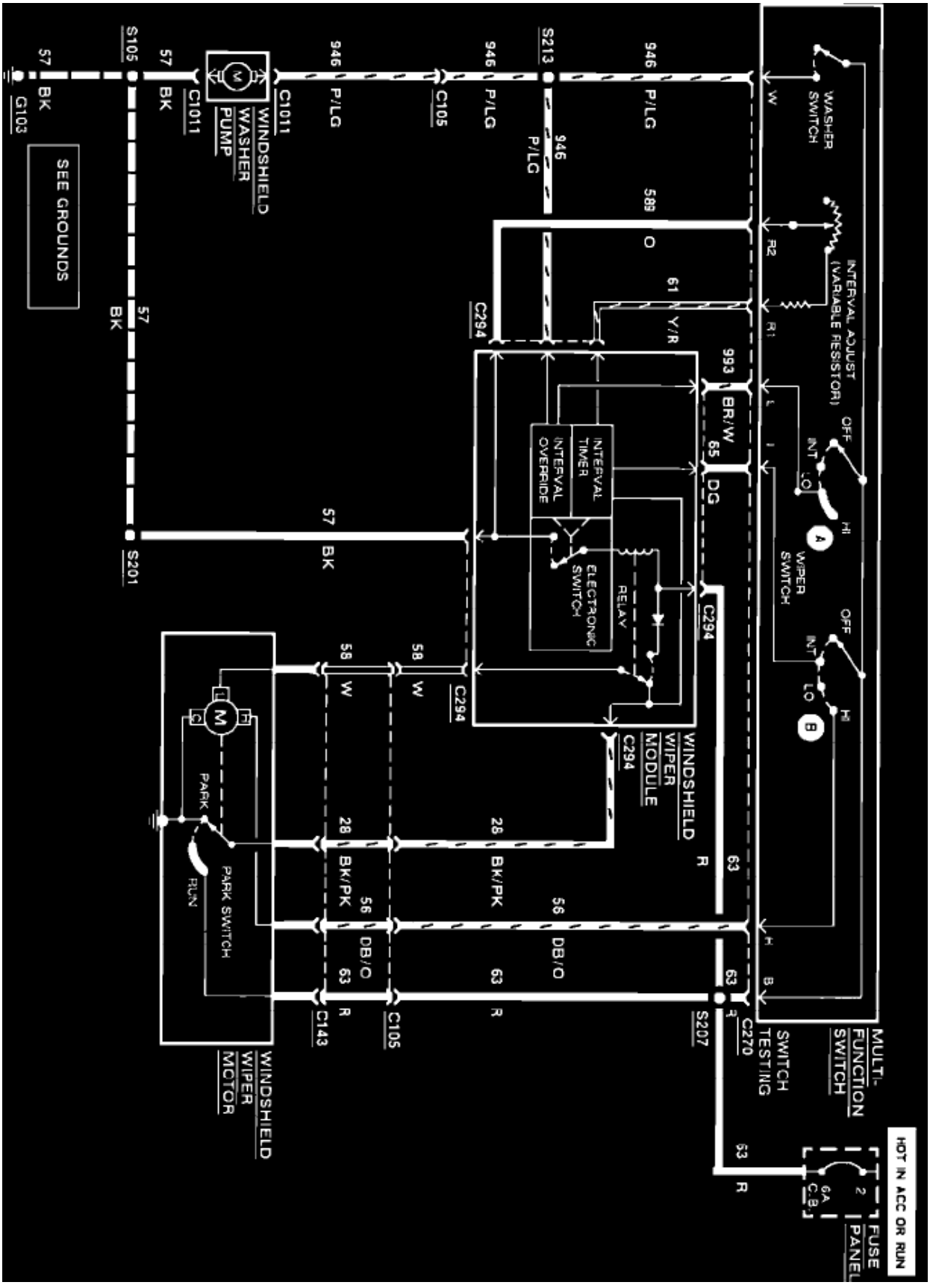
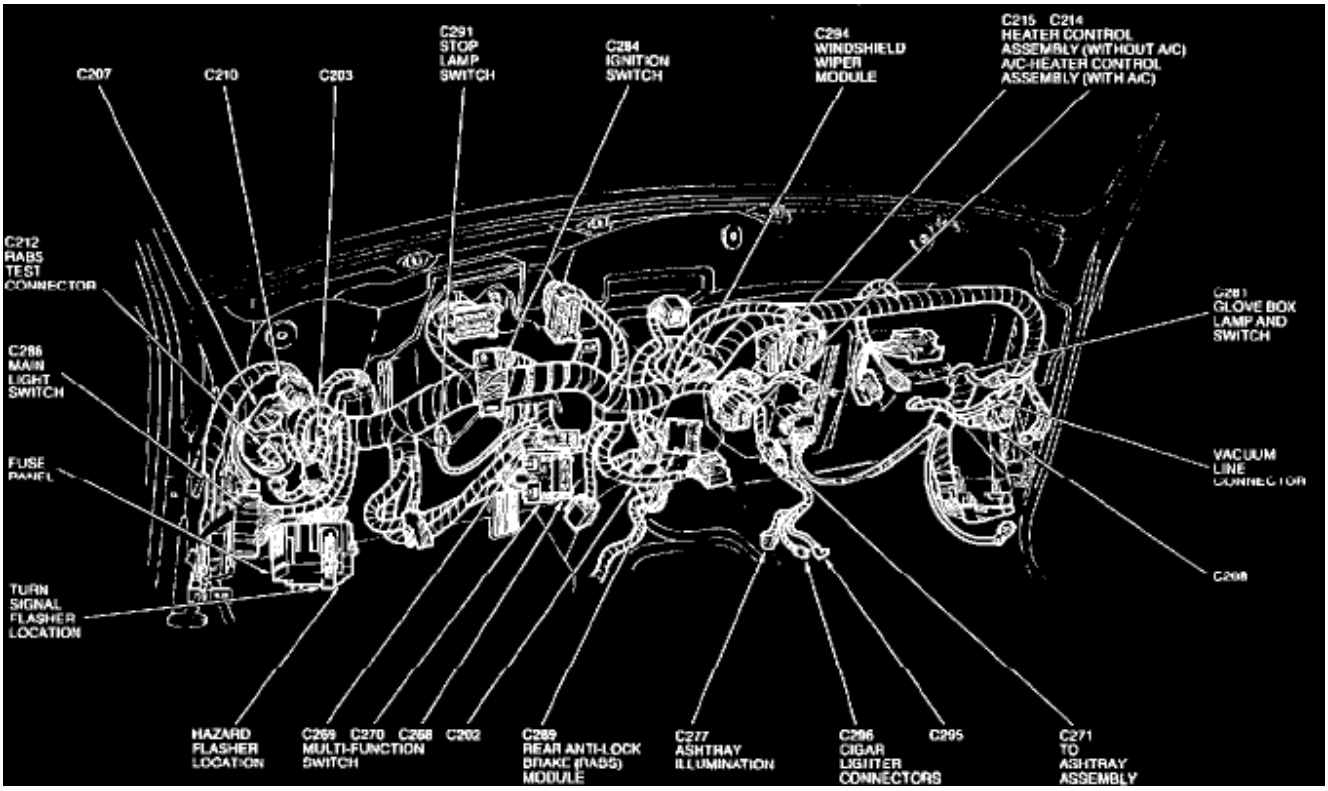


Wiper/Washer



Wiper Control Module: Locations

I/P Components

Behind Center Of I/P, LH Side Of Ashtray Assembly

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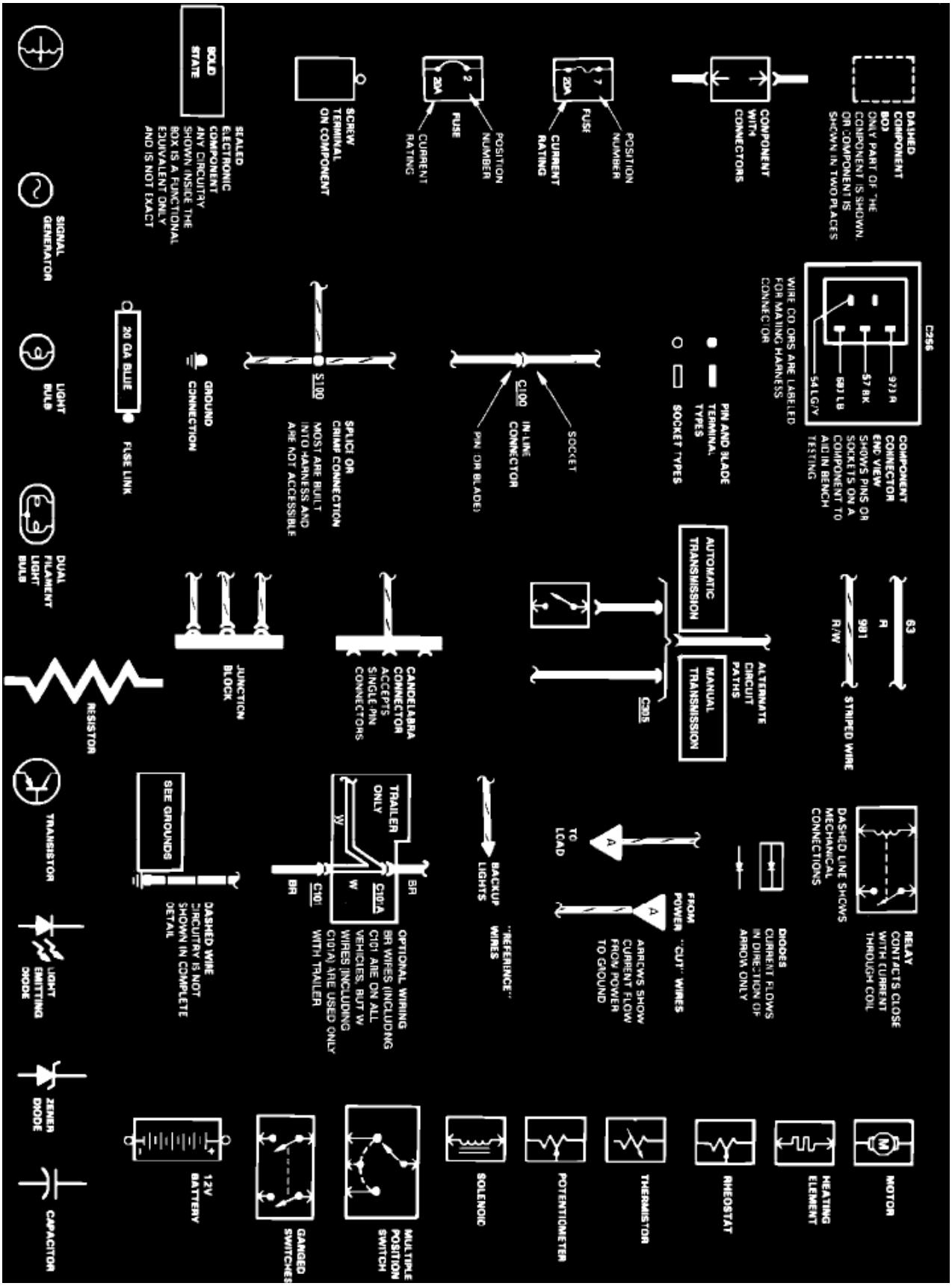

Wiper Relay: Diagram Information and Instructions

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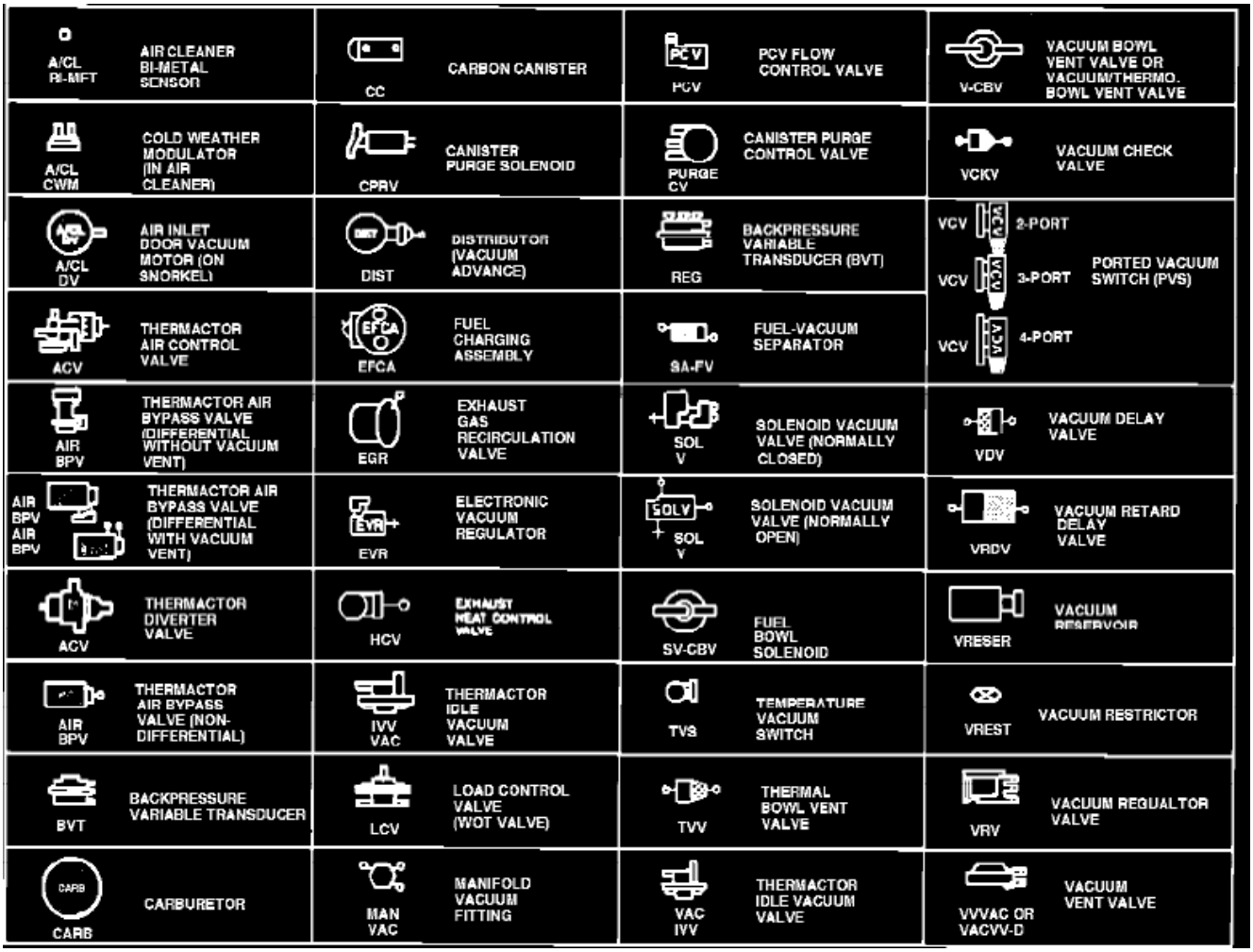

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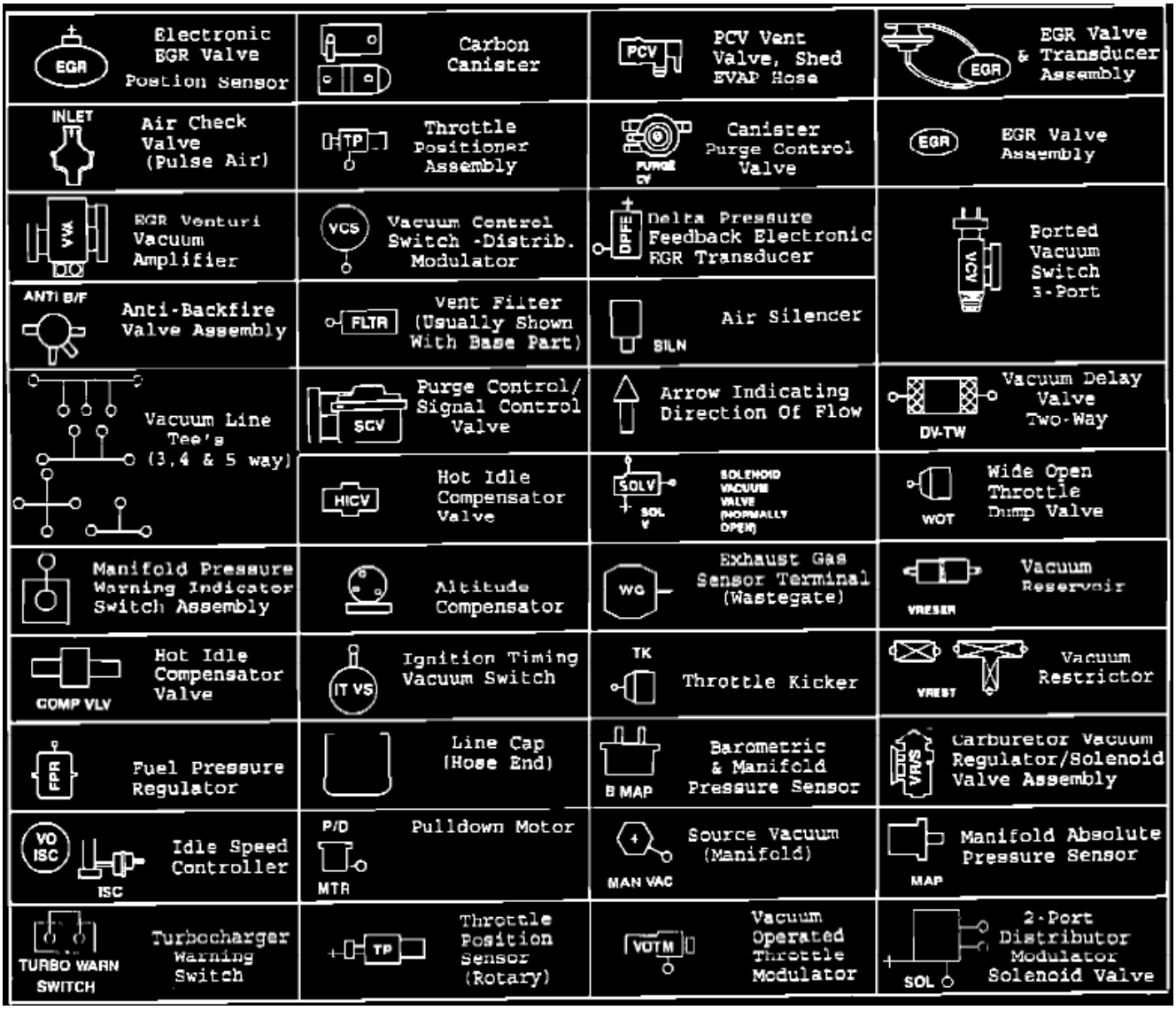

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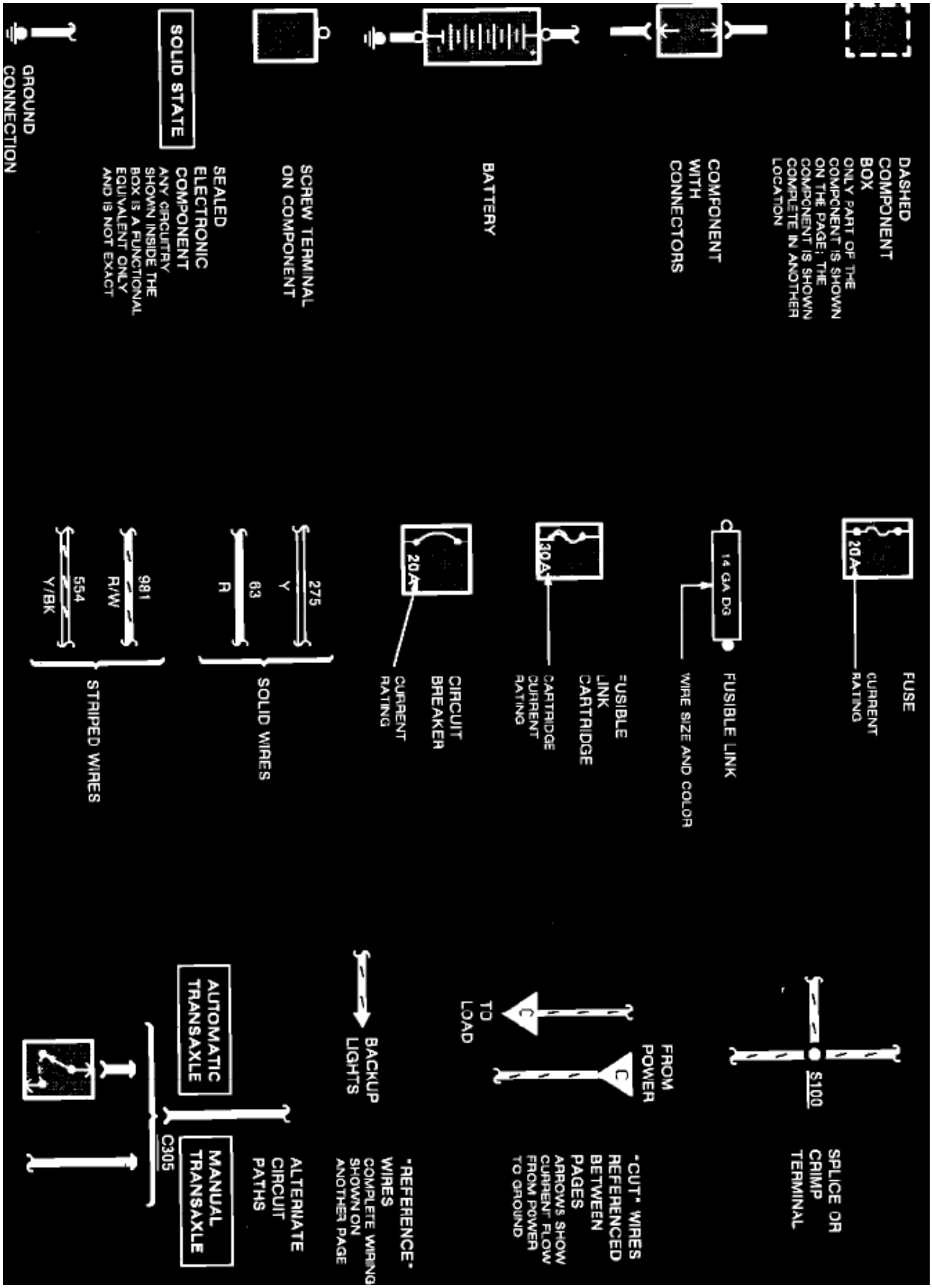
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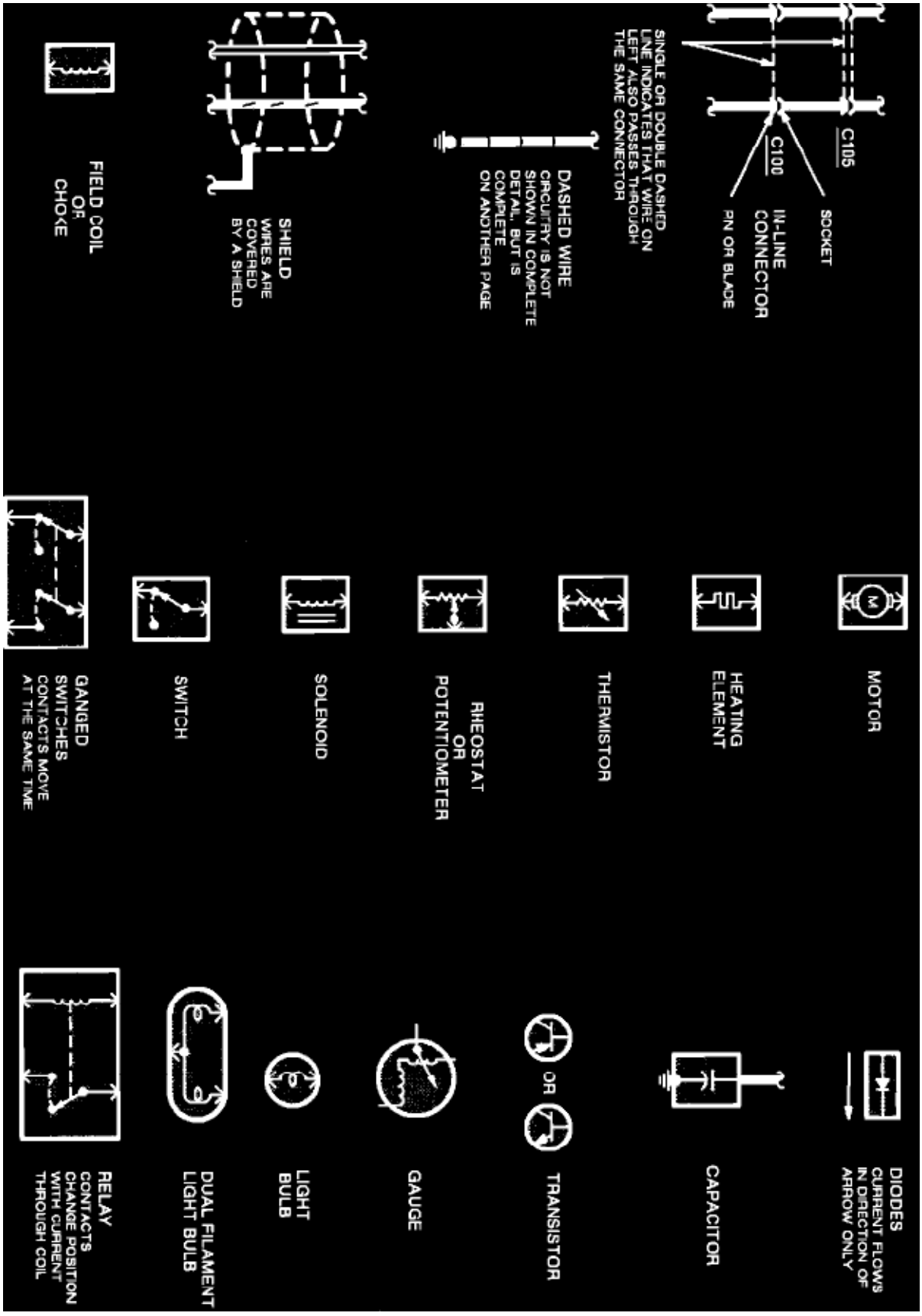
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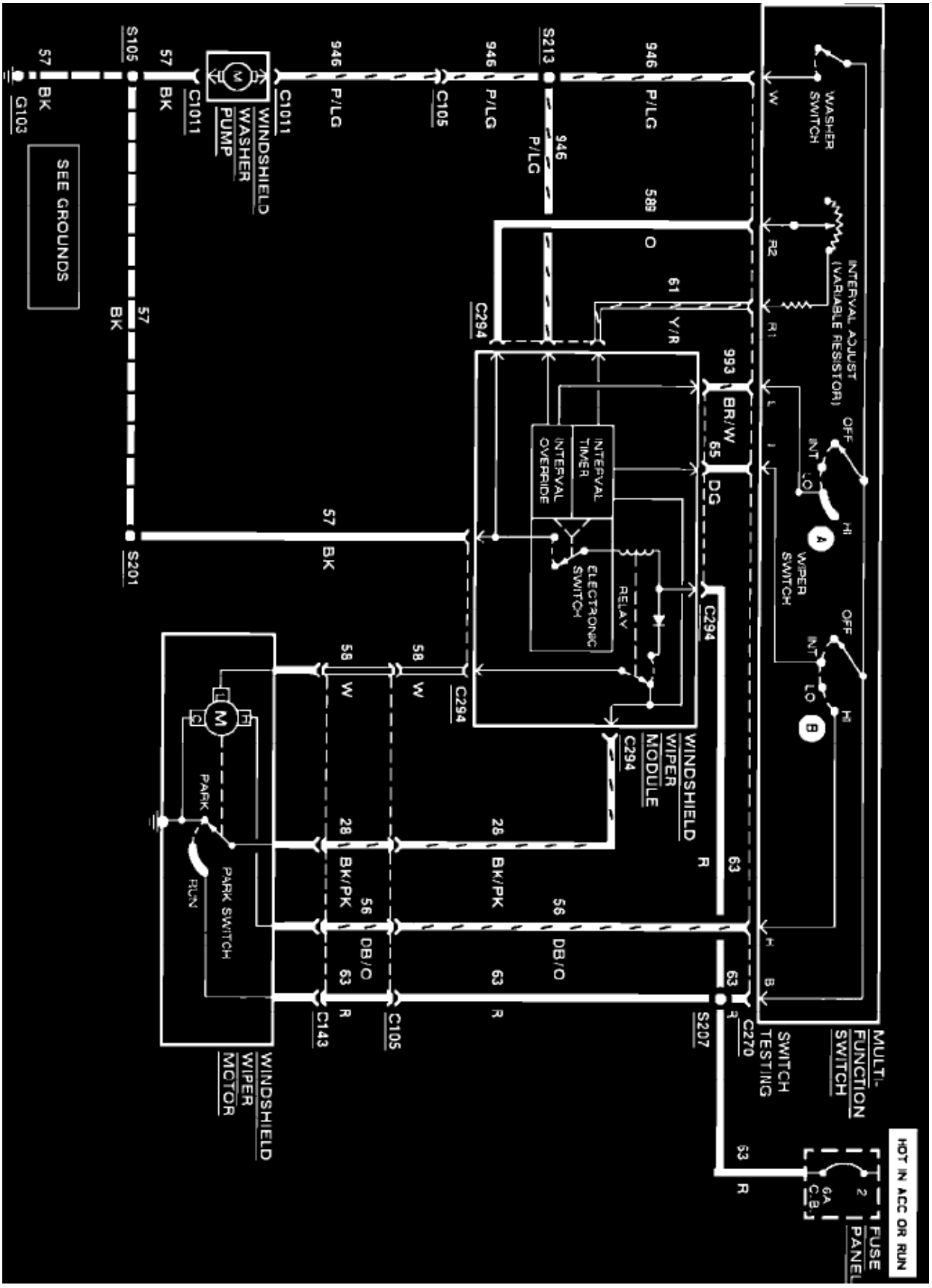
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C294
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C143
C105
C1011
WINDSHIELD WASHER PUMP
PARK
PARK SWITCH
RUN
S213
S105
S201
G103
SEE GROUNDS
946 P/LG
589 O
61 Y/R
993 BR/W
65 DG
63 R
56 DB/O
28 BK/PK
58 W
57 BK

Wiper/Washer

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
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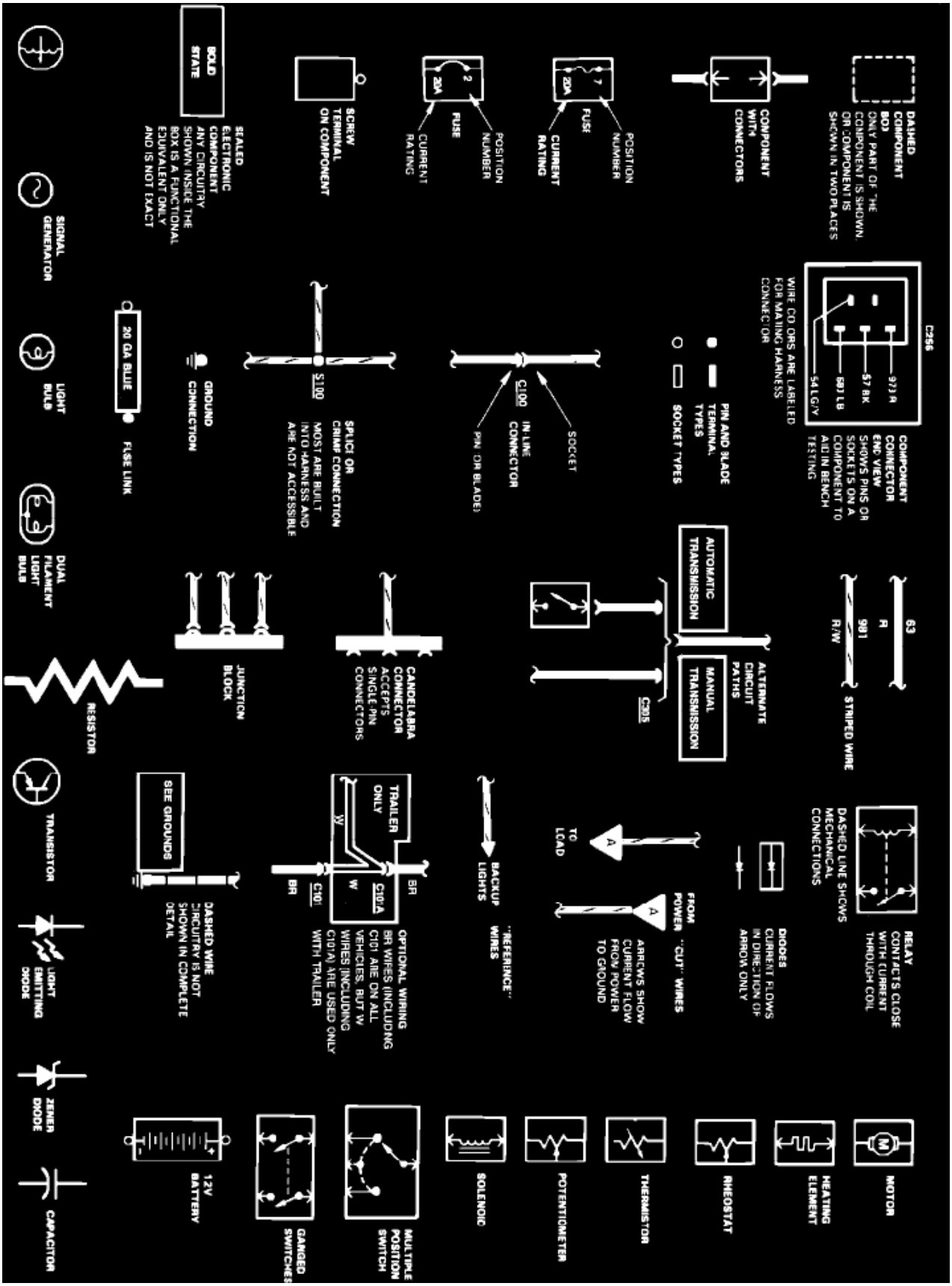

Windshield Washer Switch: Diagram Information and Instructions

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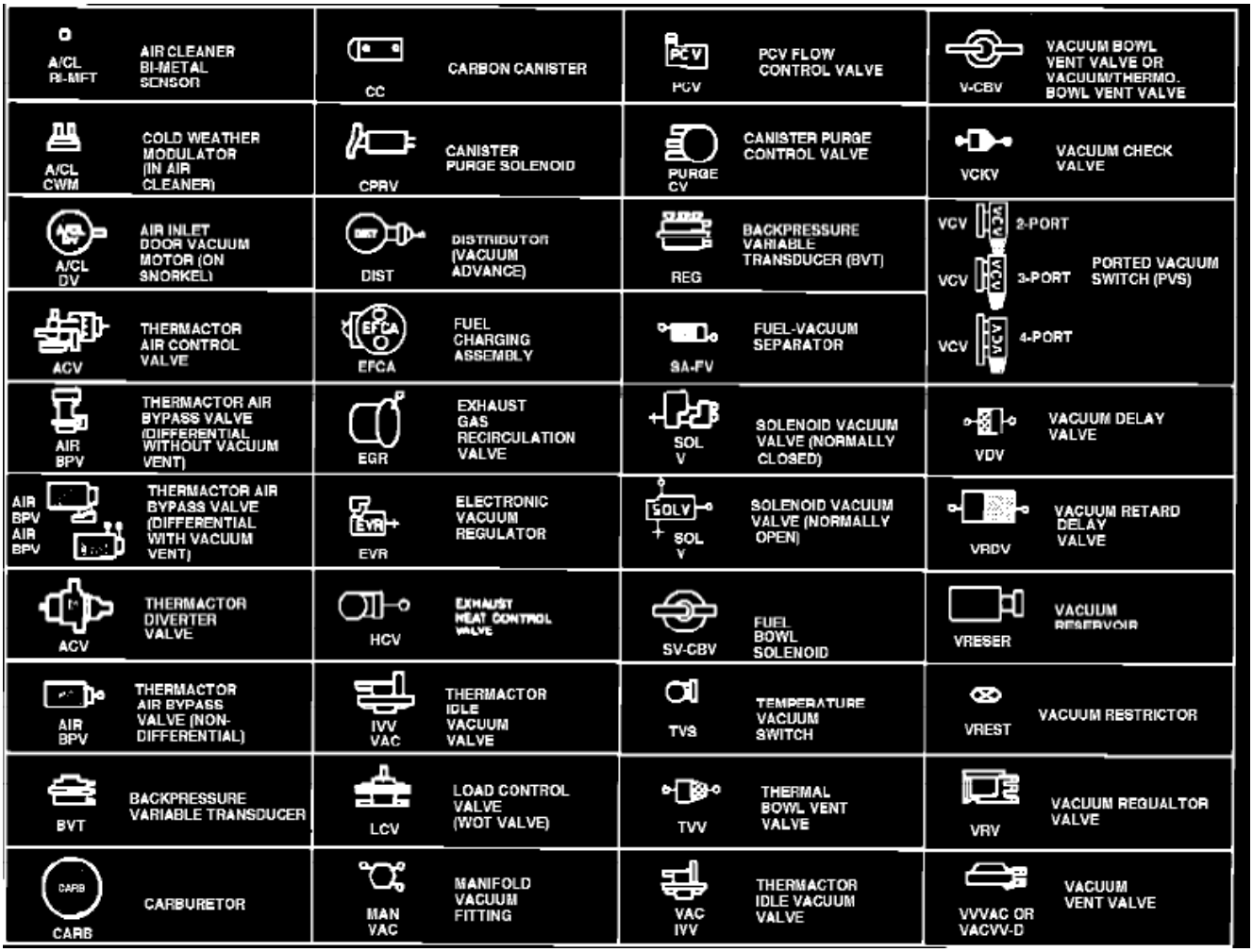

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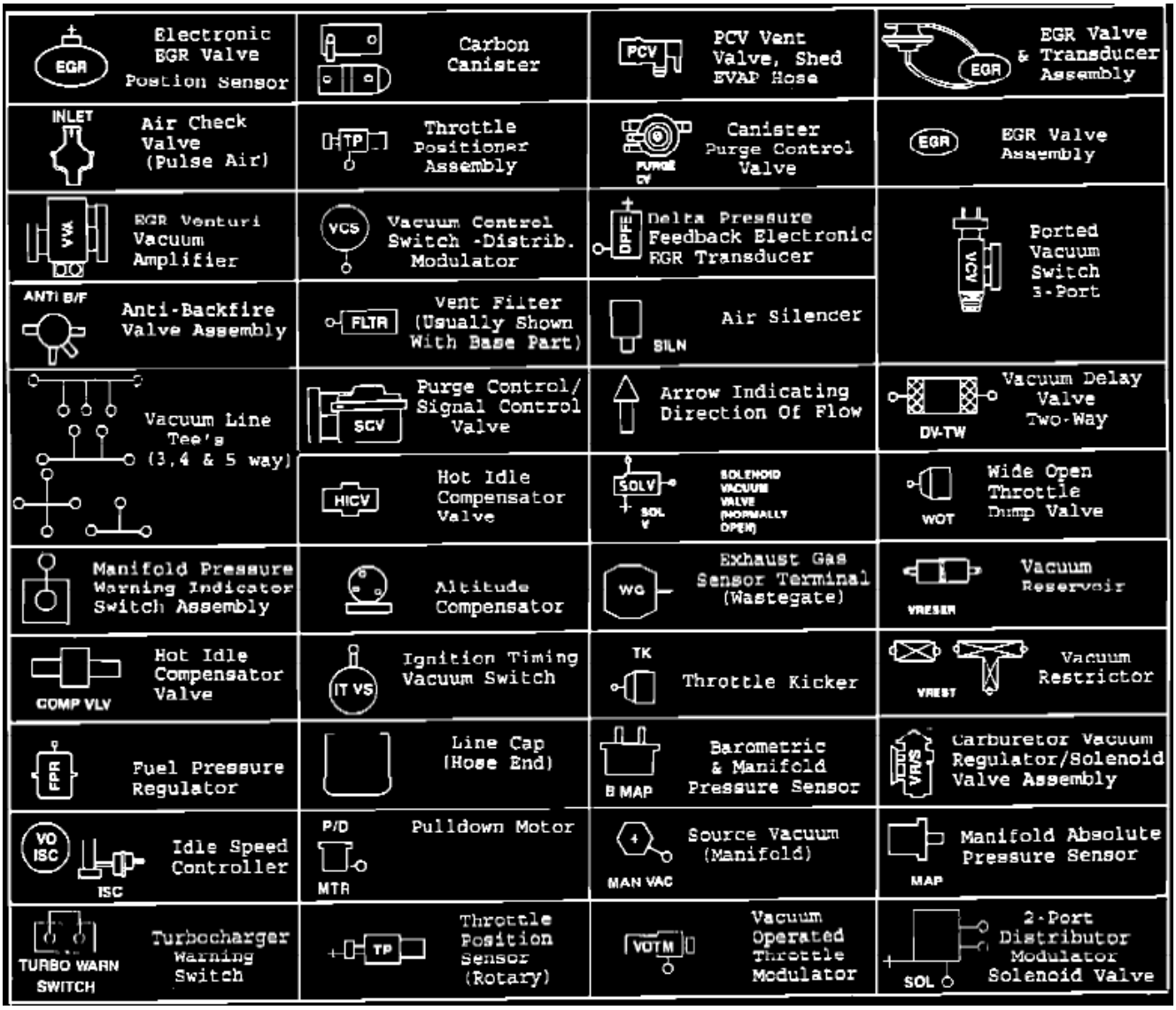

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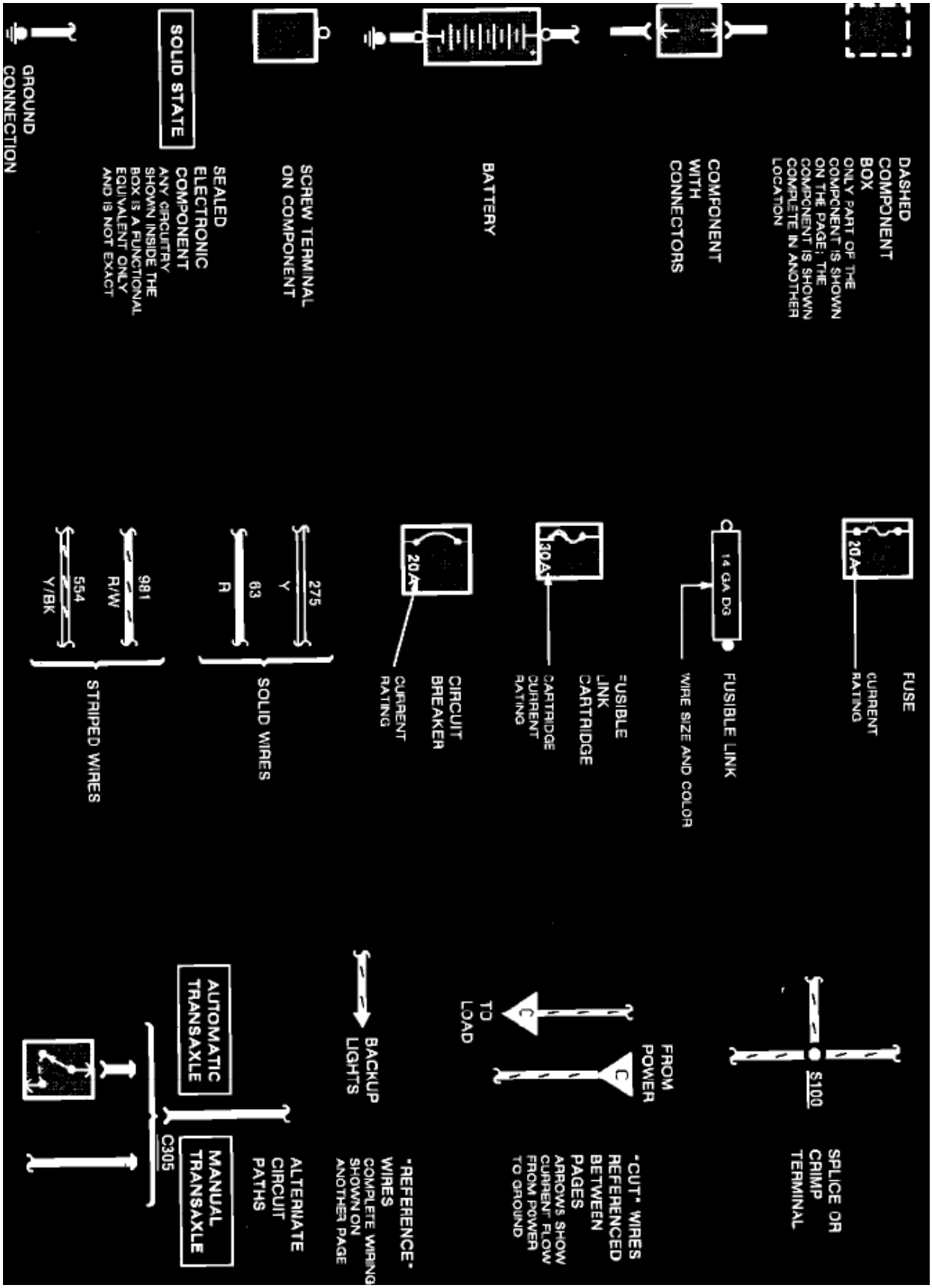
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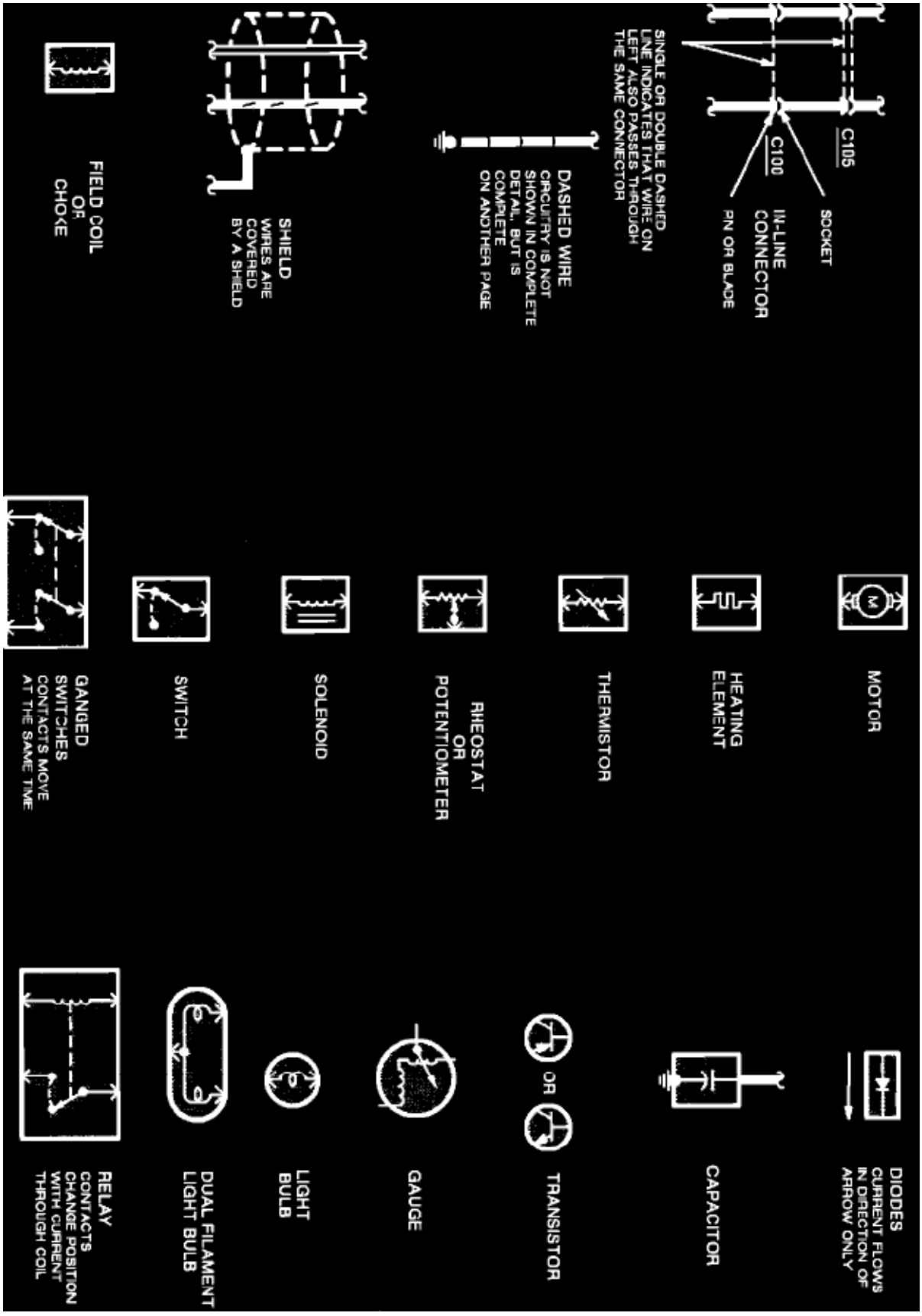
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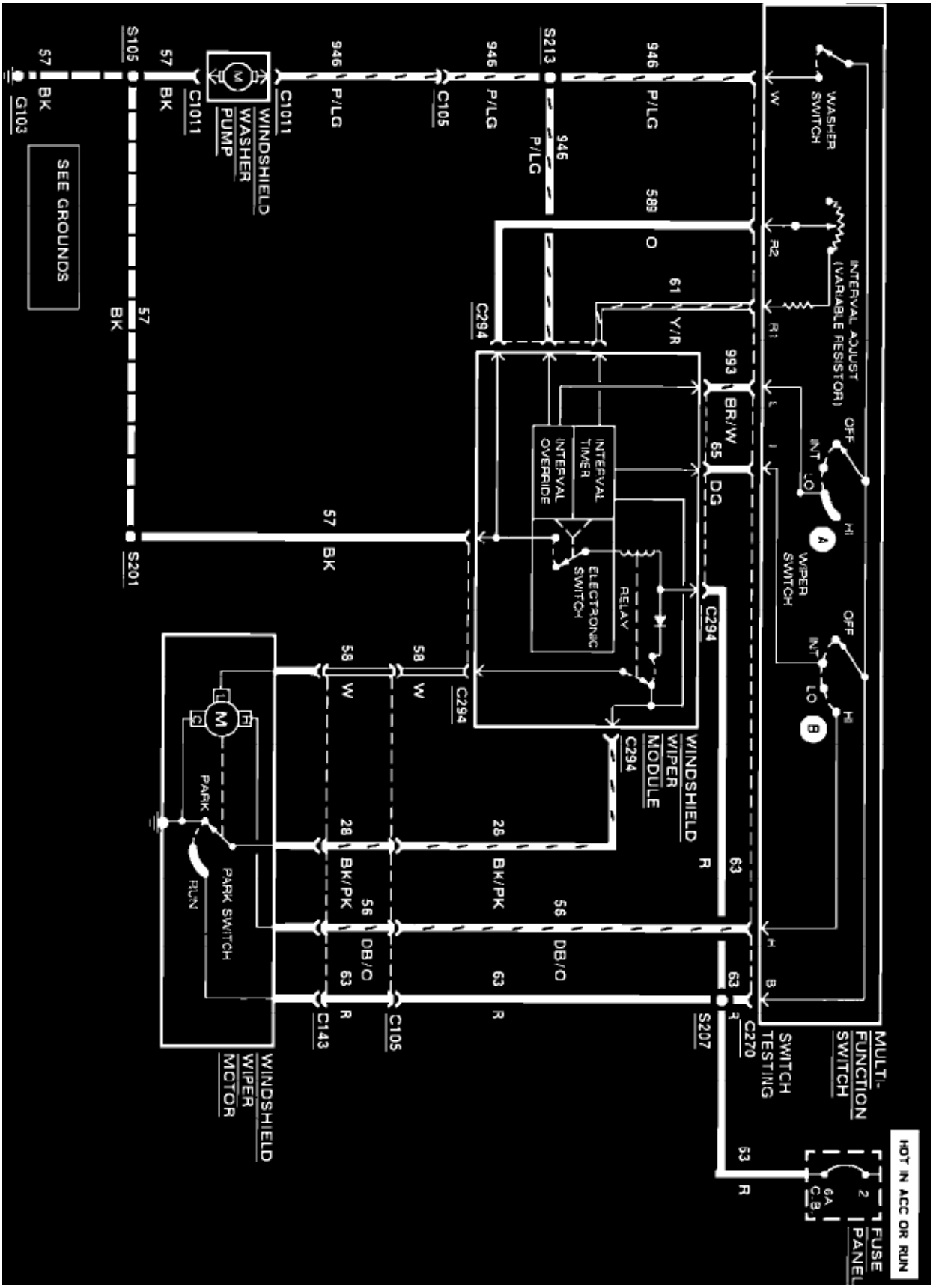
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Wiper/Washer

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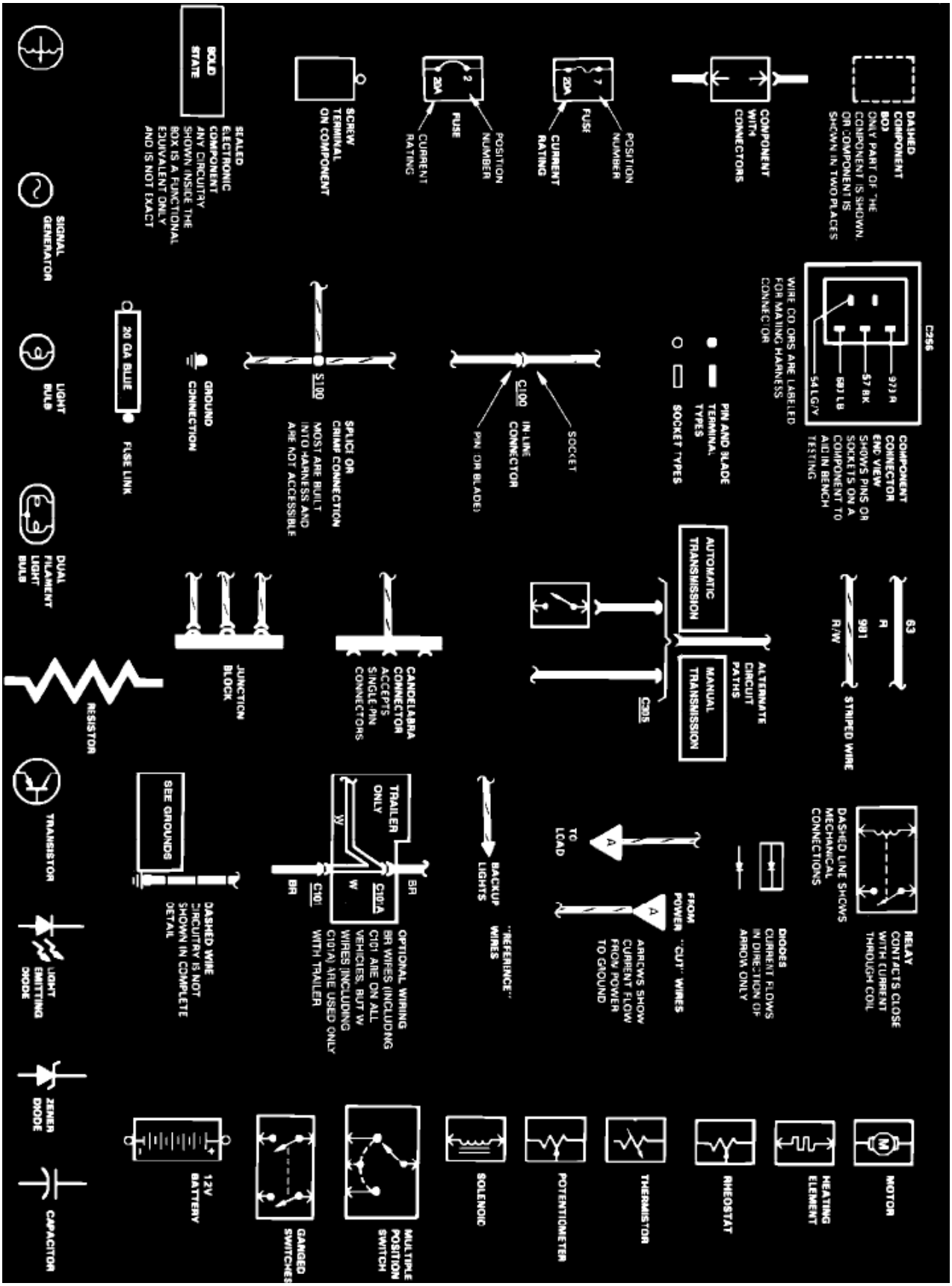

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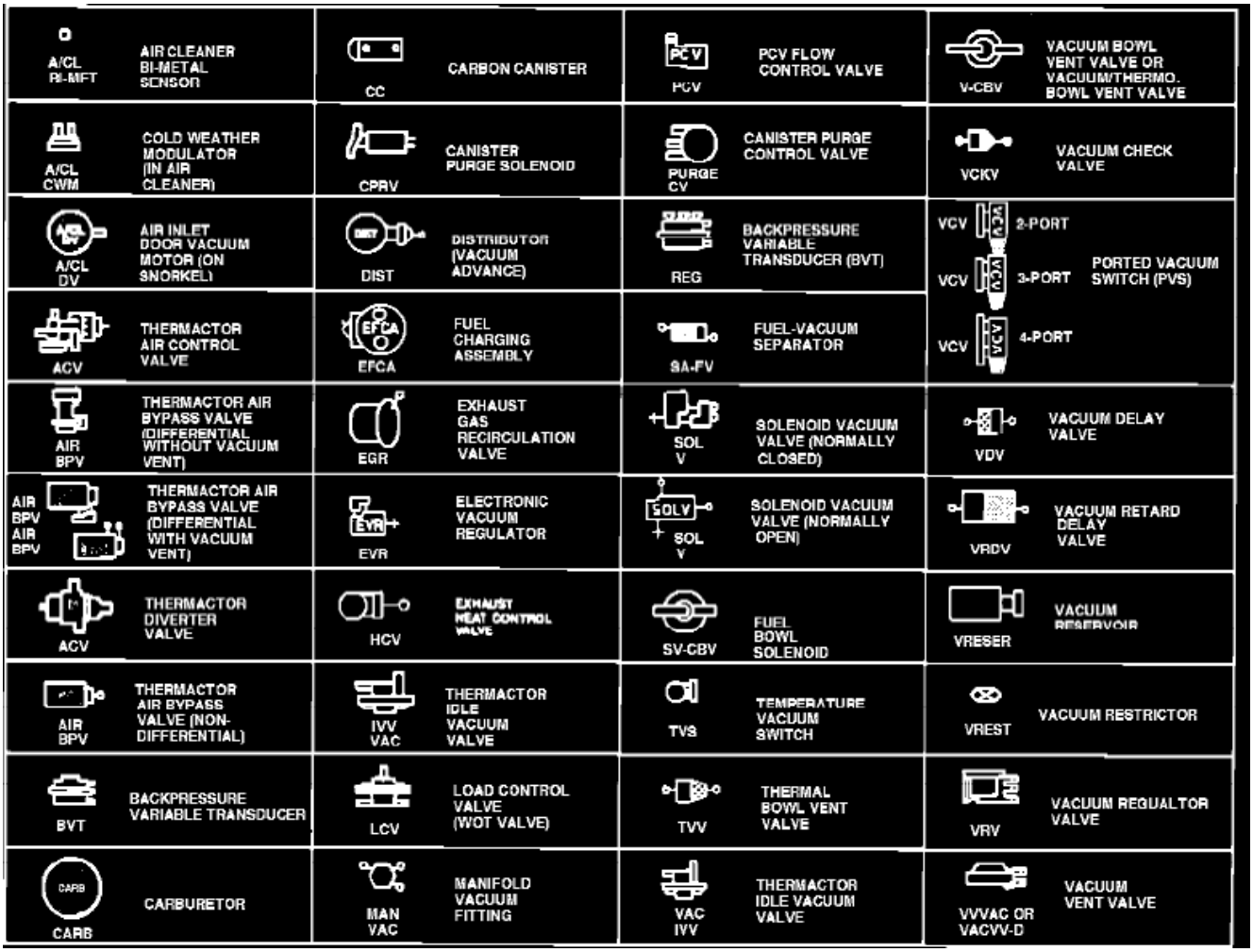

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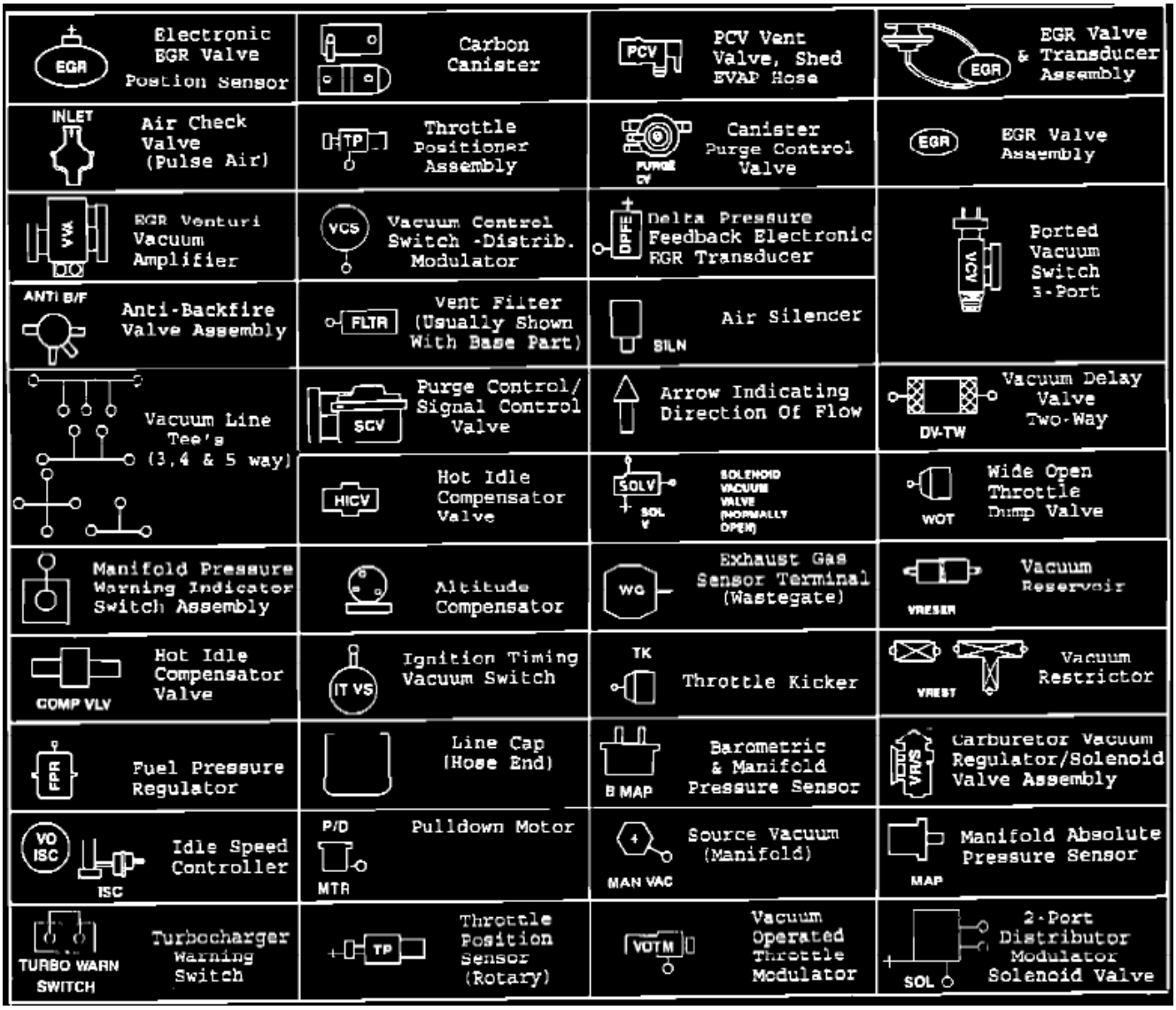

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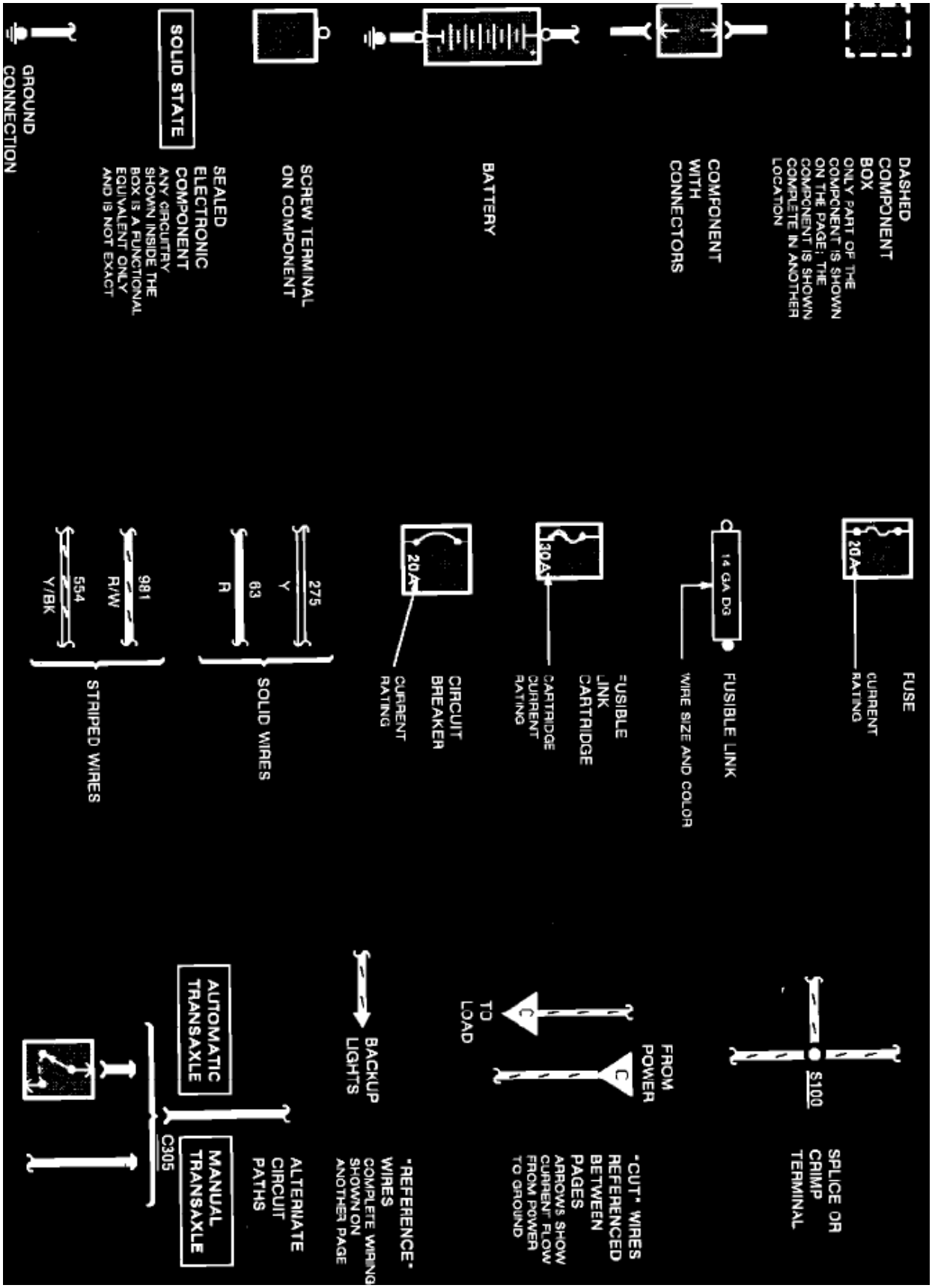
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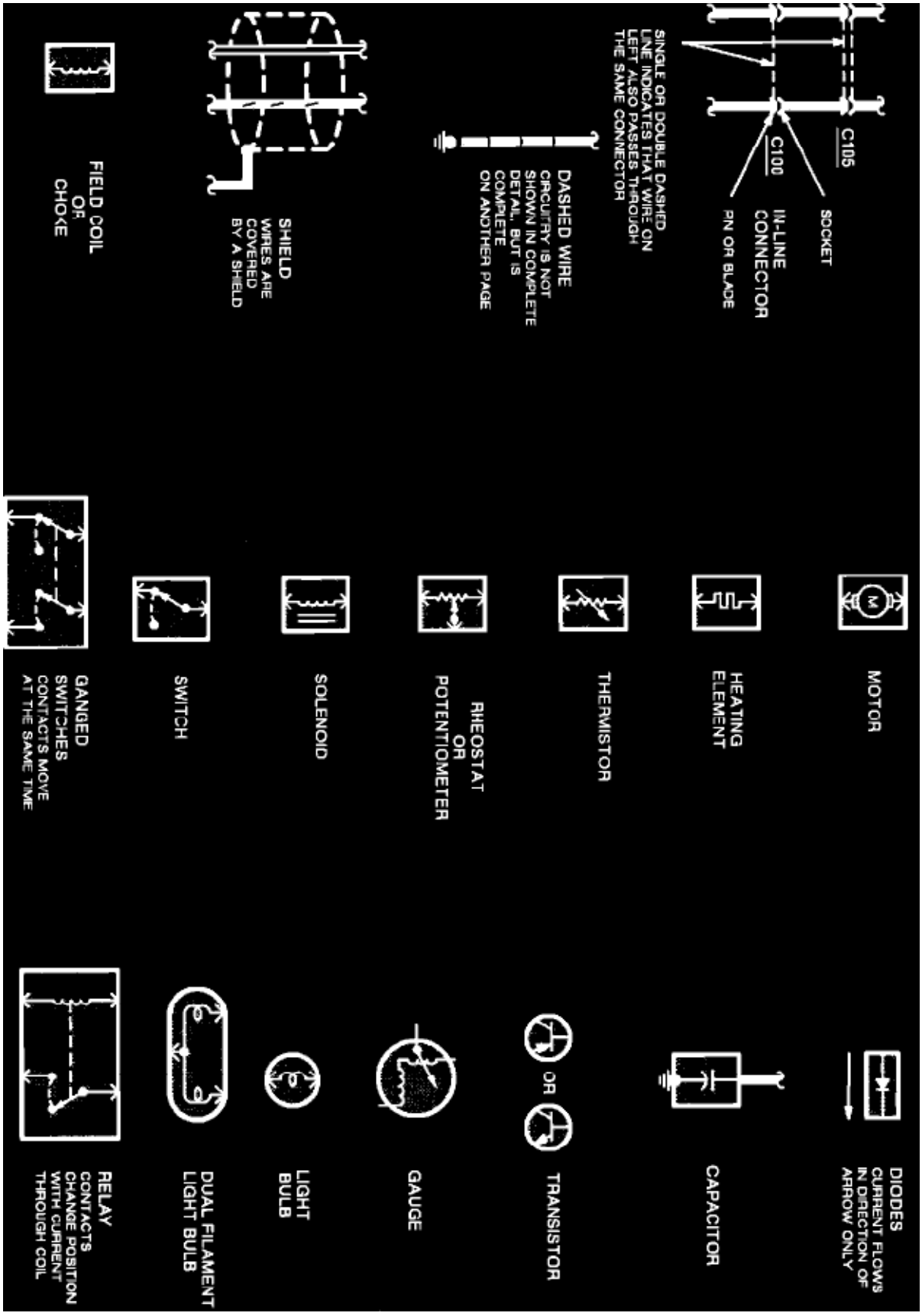
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For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

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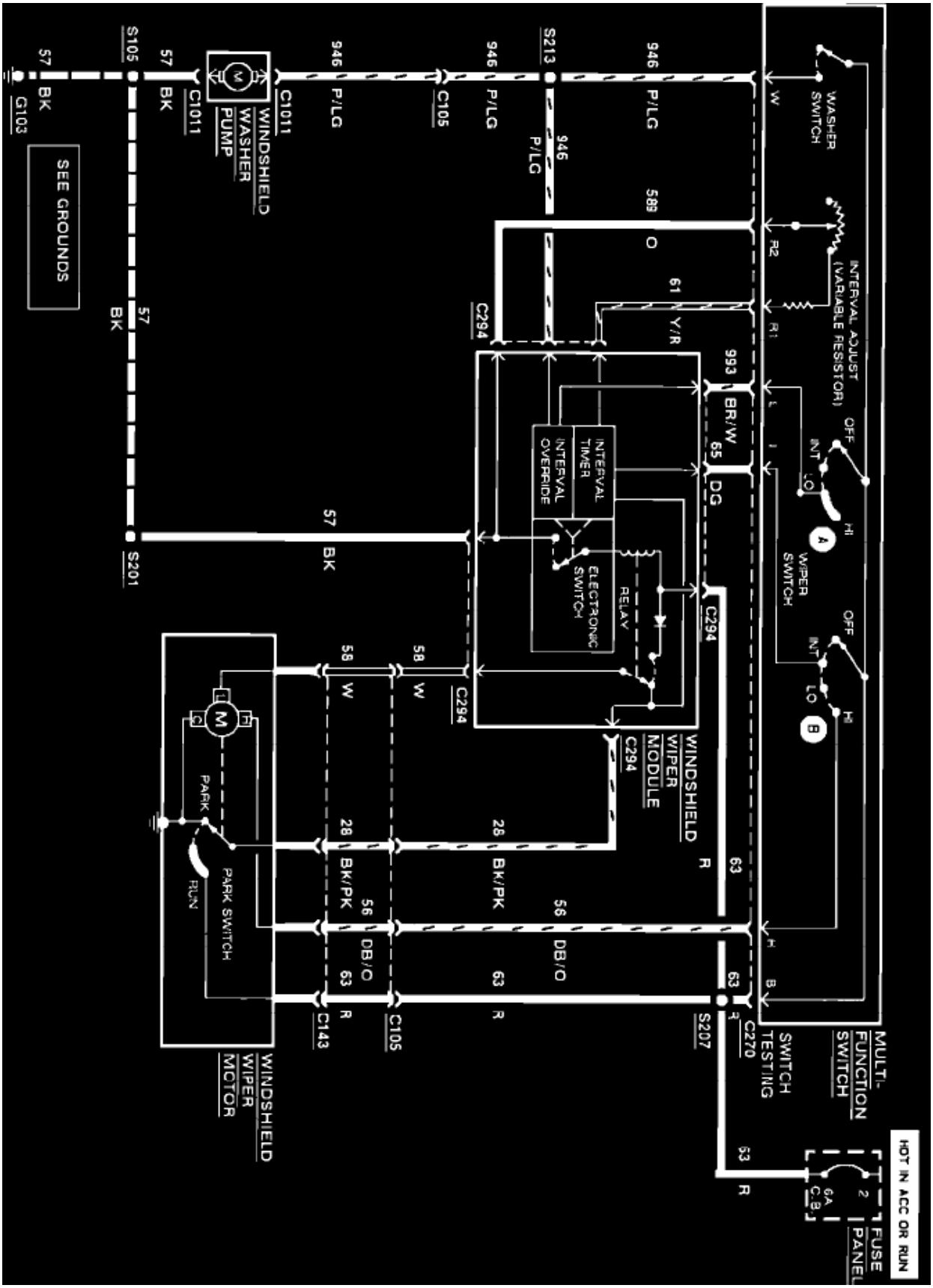
HOT IN ACC OR RUN
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2
6A C.B.
MULTI-FUNCTION SWITCH
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C270
S207
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993 BR/W
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56 BK/PK
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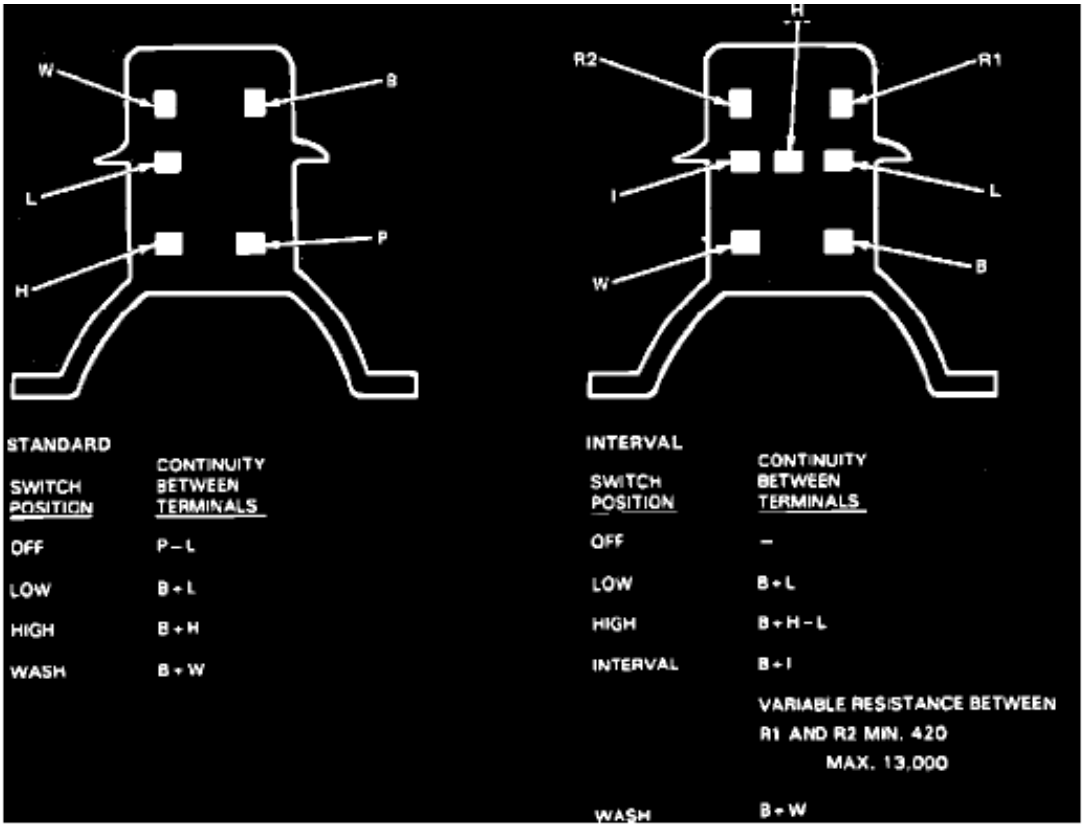
28 BK/PK
57 BK

Wiper/Washer

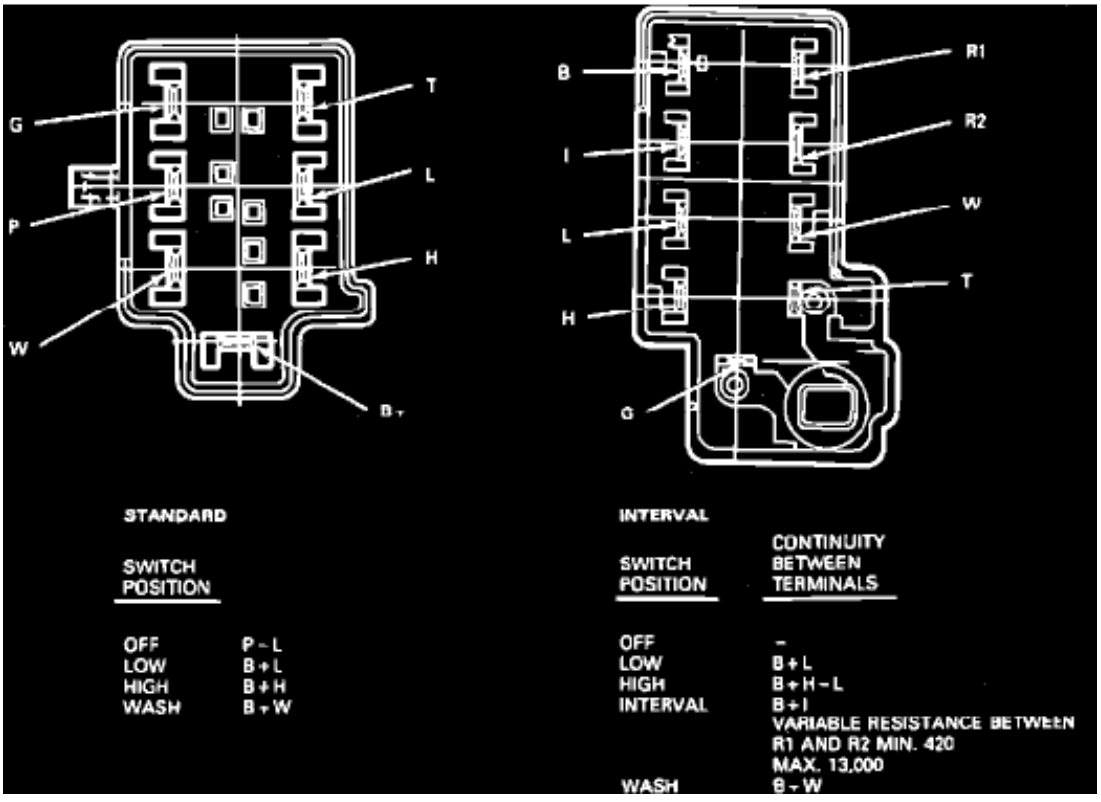


STANDARD

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
OFF	P – L
LOW	B + L
HIGH	B + H
WASH	B + W

INTERVAL

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
OFF	–
LOW	B + L
HIGH	B + H – L
INTERVAL	B + I
	VARIABLE RESISTANCE BETWEEN R1 AND R2 MIN. 420 MAX. 13,000
WASH	B + W



STANDARD

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INTERVAL

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HIGH	B + H – L
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WASH	B + W

Wiper Switch: Testing and Inspection

Fig. 5 Wiper Switch Continuity Test. 1988 Bronco II & Ranger

Fig. 6 Wiper Switch Continuity Test. Except 88 Bronco II & Ranger

1. Check continuity between switch terminals, Figs 5 and 6.

2. To detect marginal operation of switch, move switch lever while each reading is being taken.

3. If switch does not show continuity or if poor continuity exists at any switch position, replace switch.

Wiper Switch: Service and Repair Rear Wiper Switch

1. Disconnect battery ground cable, then remove ashtray and instrument cluster trim panel.

2. Remove switch mounting bezel containing switches, then disconnect switch electrical connector and remove switch.

3. Reverse procedure to install, checking wiper operation.

Wiper Switch: Service and Repair Windshield Wiper Switch

REMOVAL

1. Disconnect battery ground cable (two ground cables on diesel engines).

2. On models with tilt steering, remove upper extension shroud by squeezing at six and twelve o'clock positions and popping free of retaining plate at three o'clock position.

3. On all models, remove steering column shroud halves.

4. Remove turn signal switch lever by grasping and using a twisting and pulling motion while pulling lever straight out from switch.

5. Peel back foam shield from switch, then disconnect electrical connectors.

6. Remove two switch attaching screws, then the switch.

INSTALLATION

1. Align switch mounting holes with holes in lock cylinder housing, then install screws and torque to 18-26 inch lbs.

2. Adhere foam shield to switch, then install switch lever by aligning key on lever with keyway in switch and pushing lever in until fully engaged.

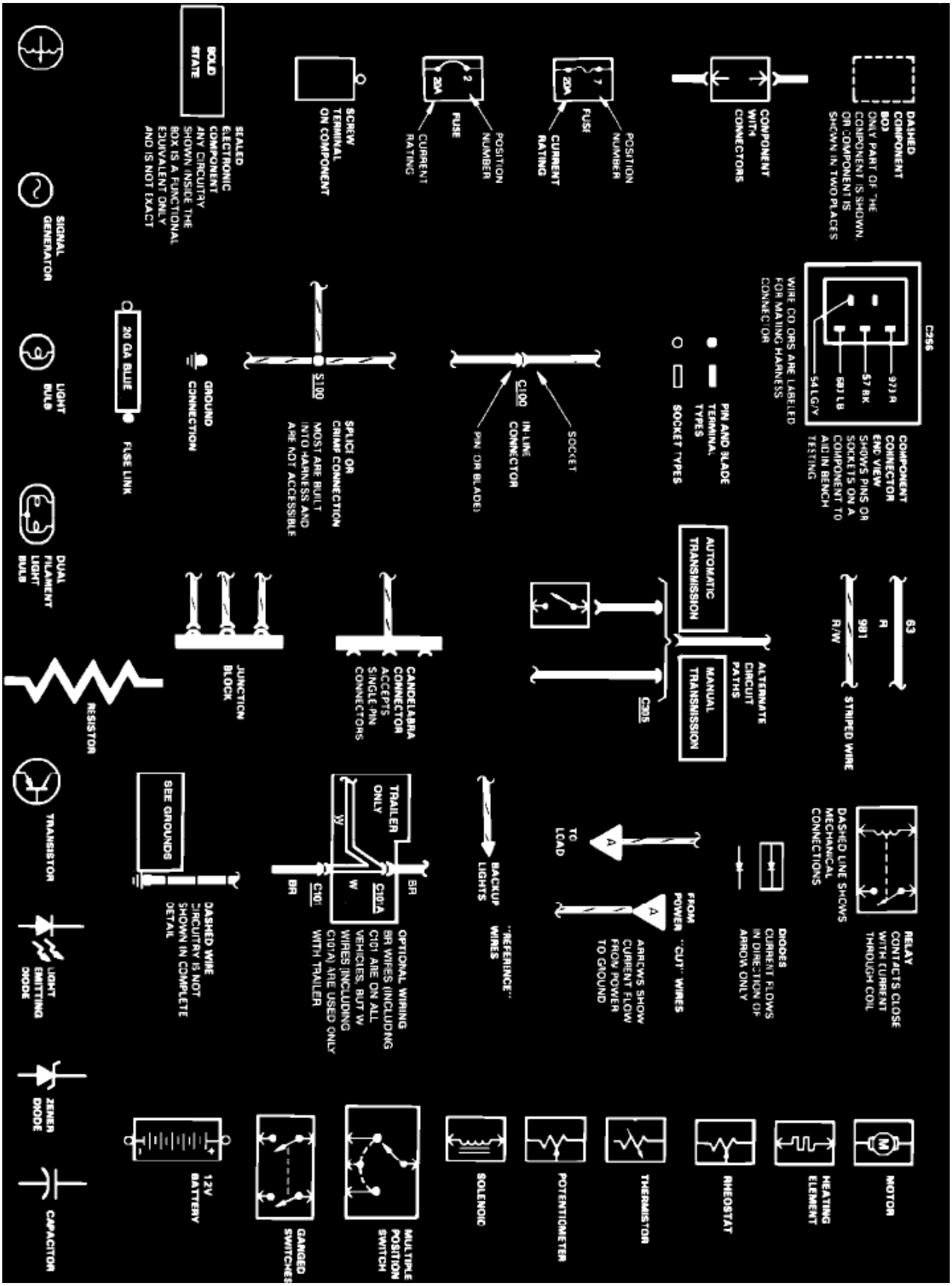
3. Connect electrical connectors, then install steering column shroud halves.

4. On models with tilt steering, install upper extension shroud.

5.

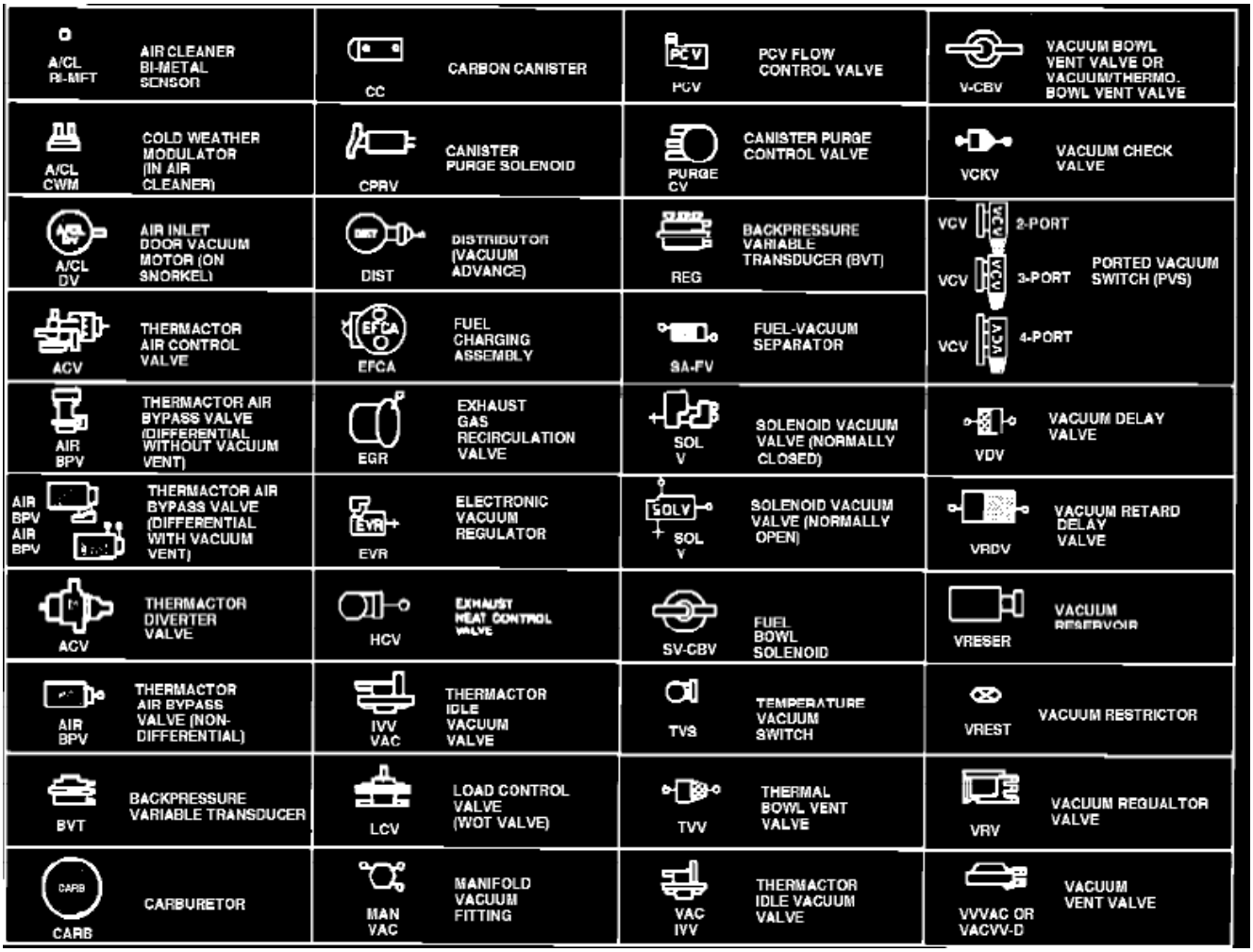
On all models, connect battery ground cable.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Windshield Washer Motor > Component Information > Diagrams > Diagram Information and Instructions

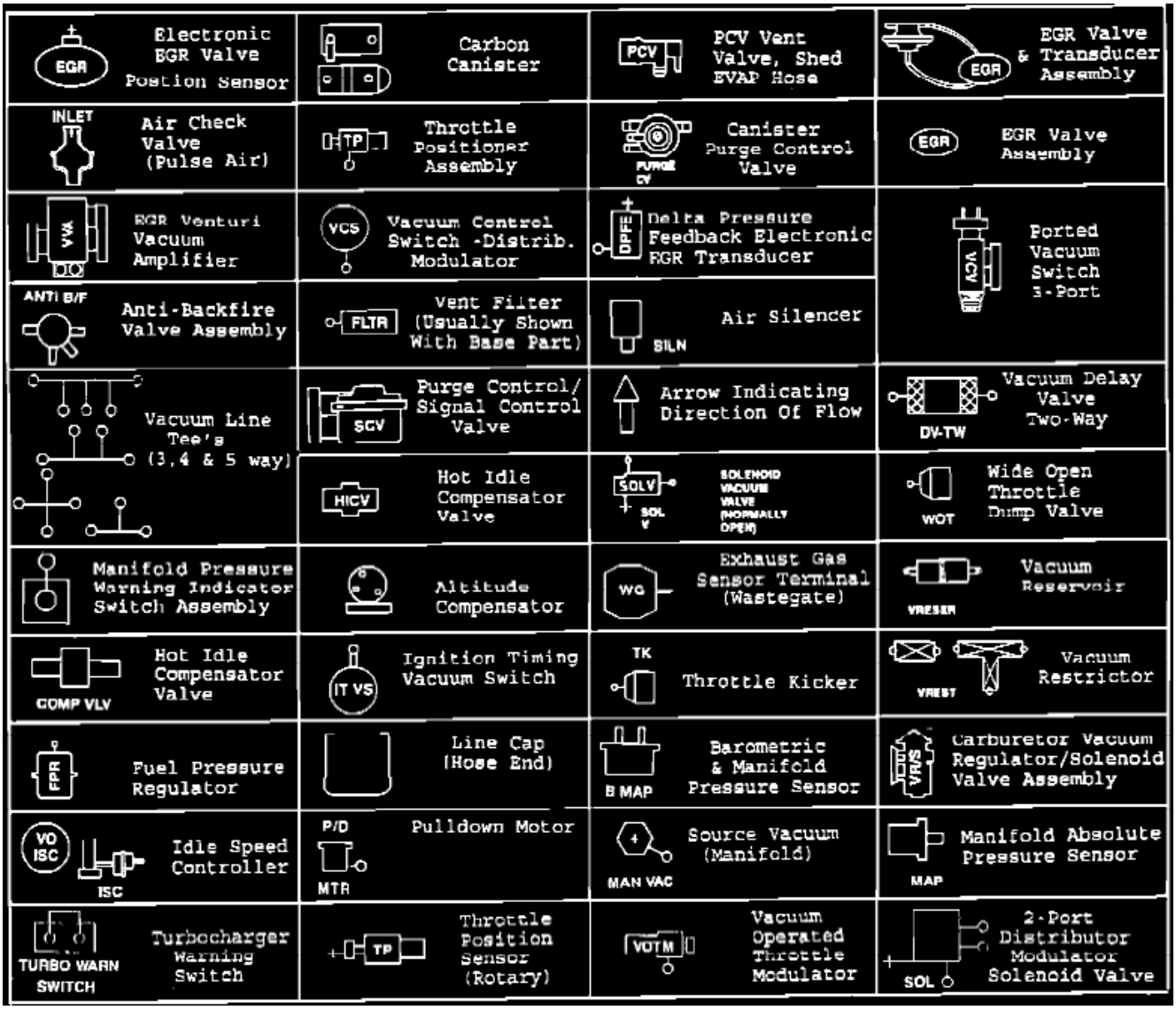


Windshield Washer Motor: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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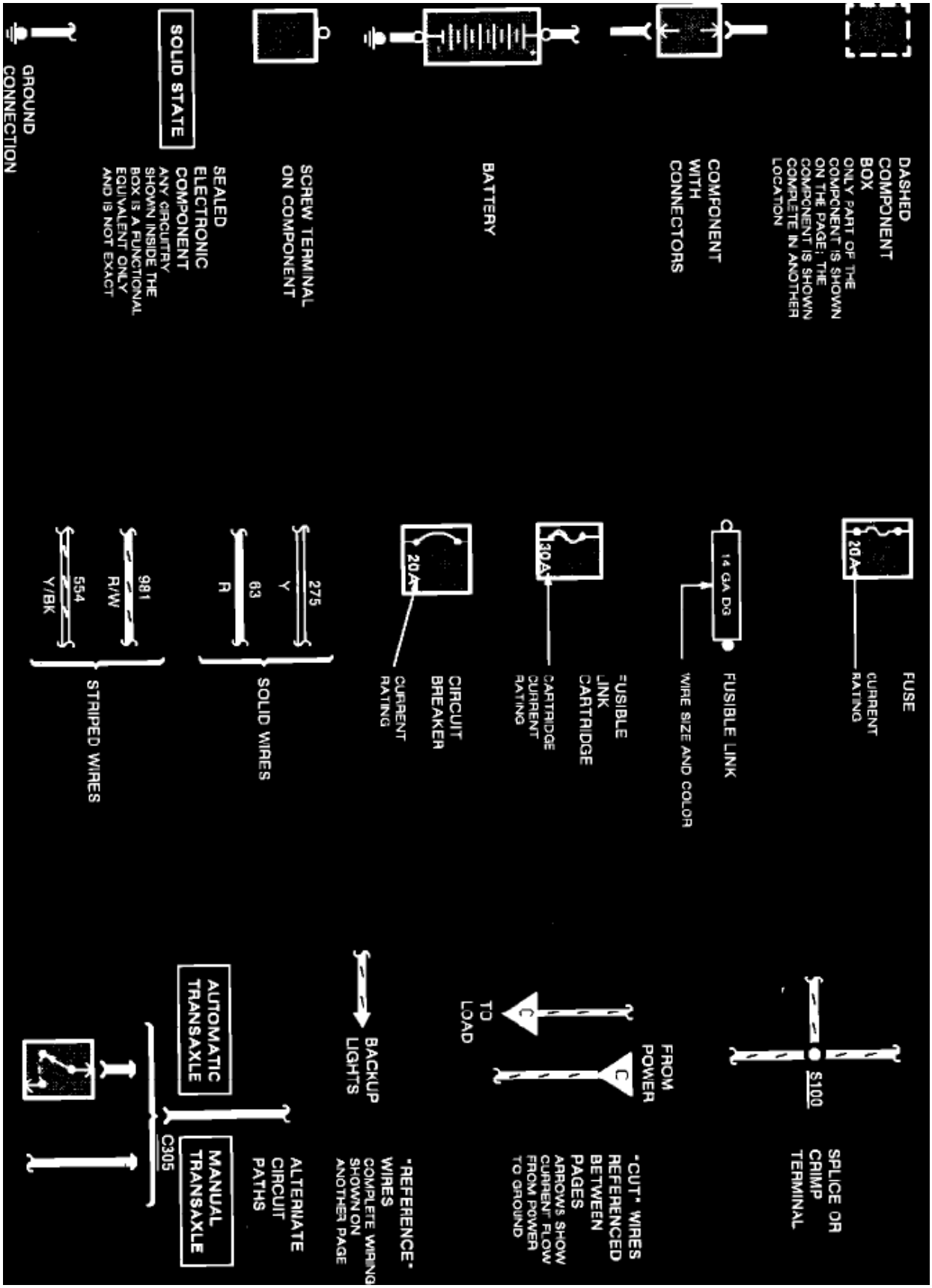
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GROUND CONNECTION
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14 GA DG
WIRE SIZE AND COLOR
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30A
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CIRCUIT BREAKER
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CURRENT RATING
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R
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STRIPED WIRES
S100
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C
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TO LOAD
BACKUP LIGHTS
"REFERENCE" WIRES
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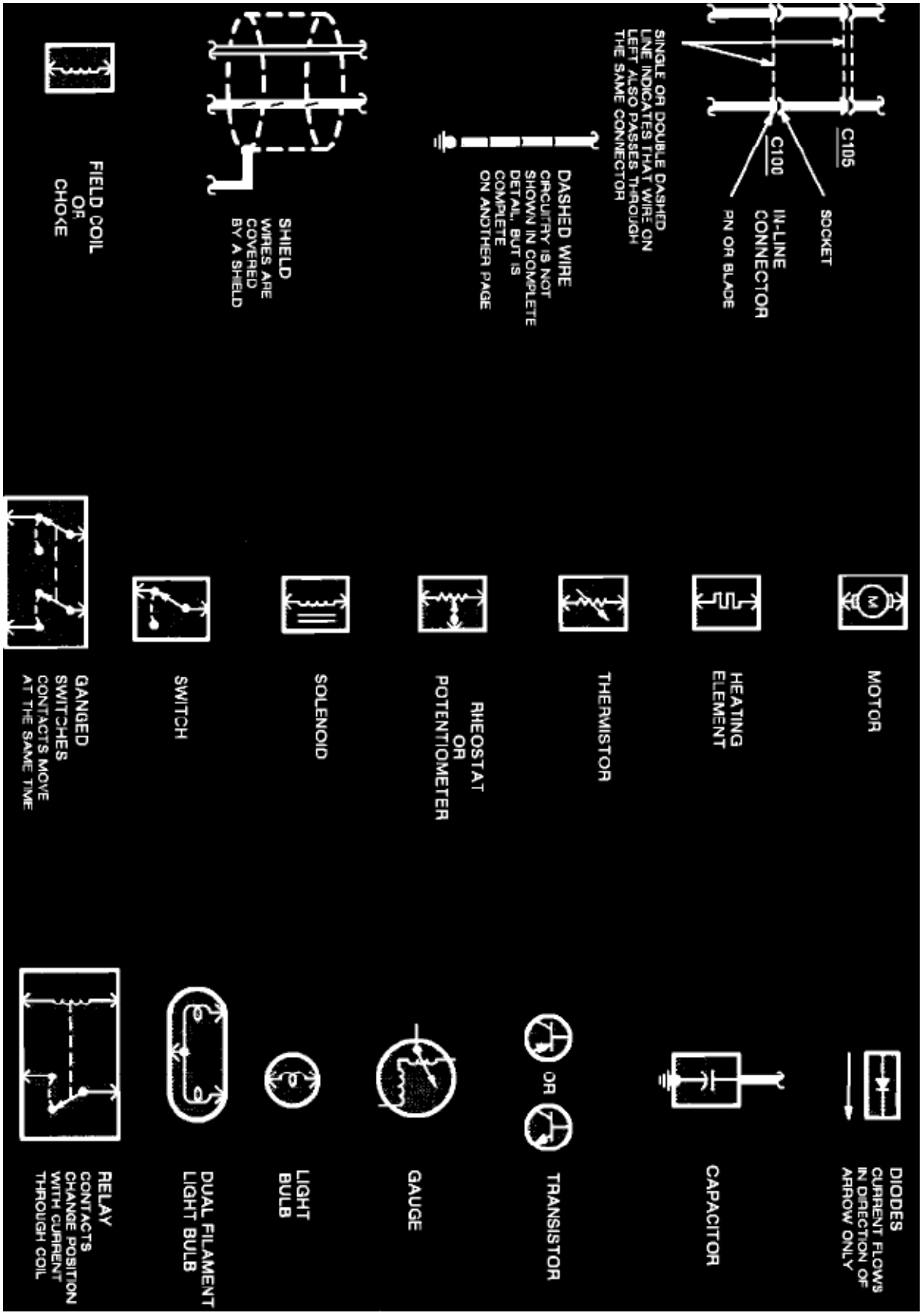
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols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HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
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Electrical Symbols

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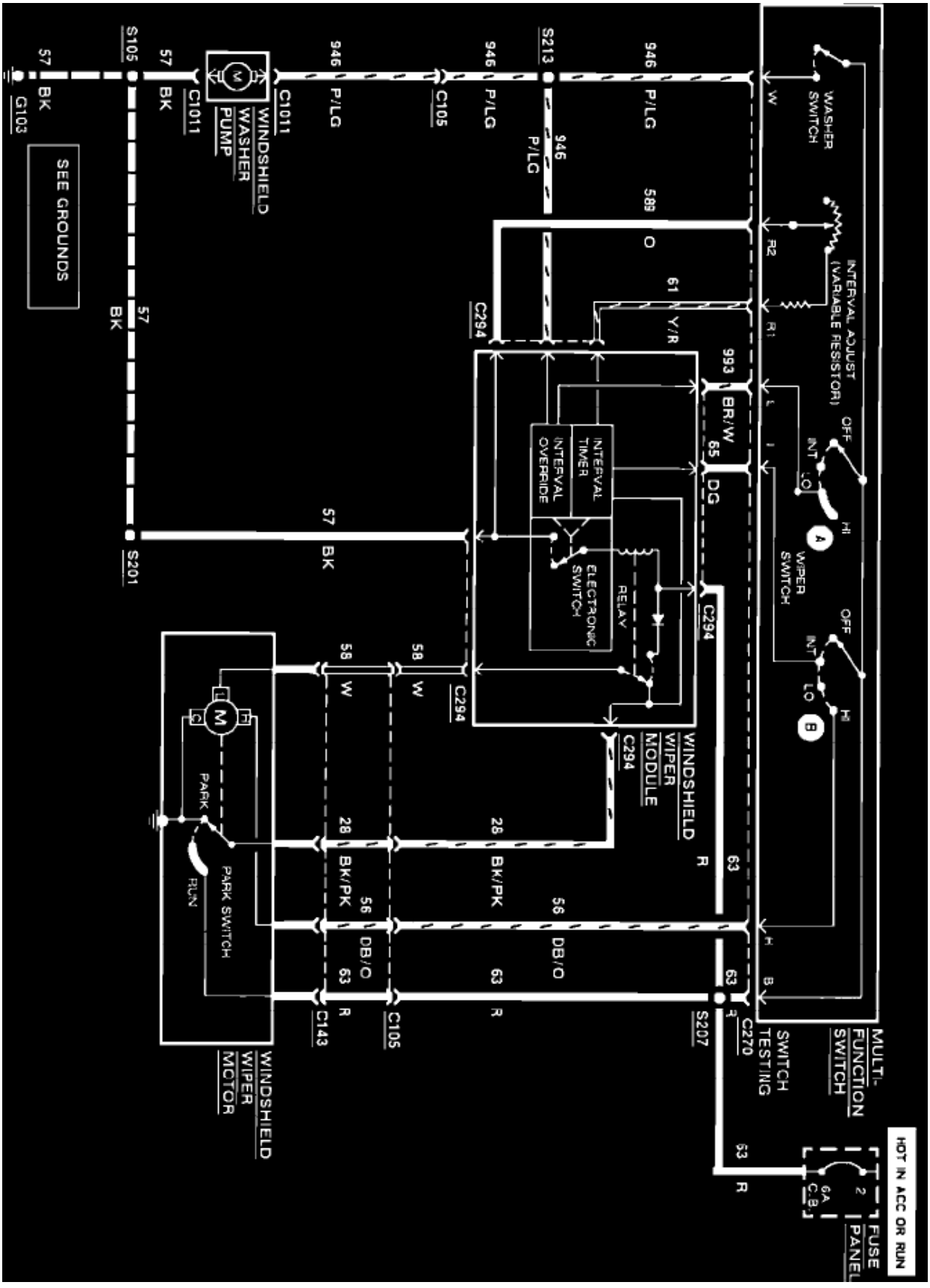
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RUN
PARK SWITCH

Wiper/Washer

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
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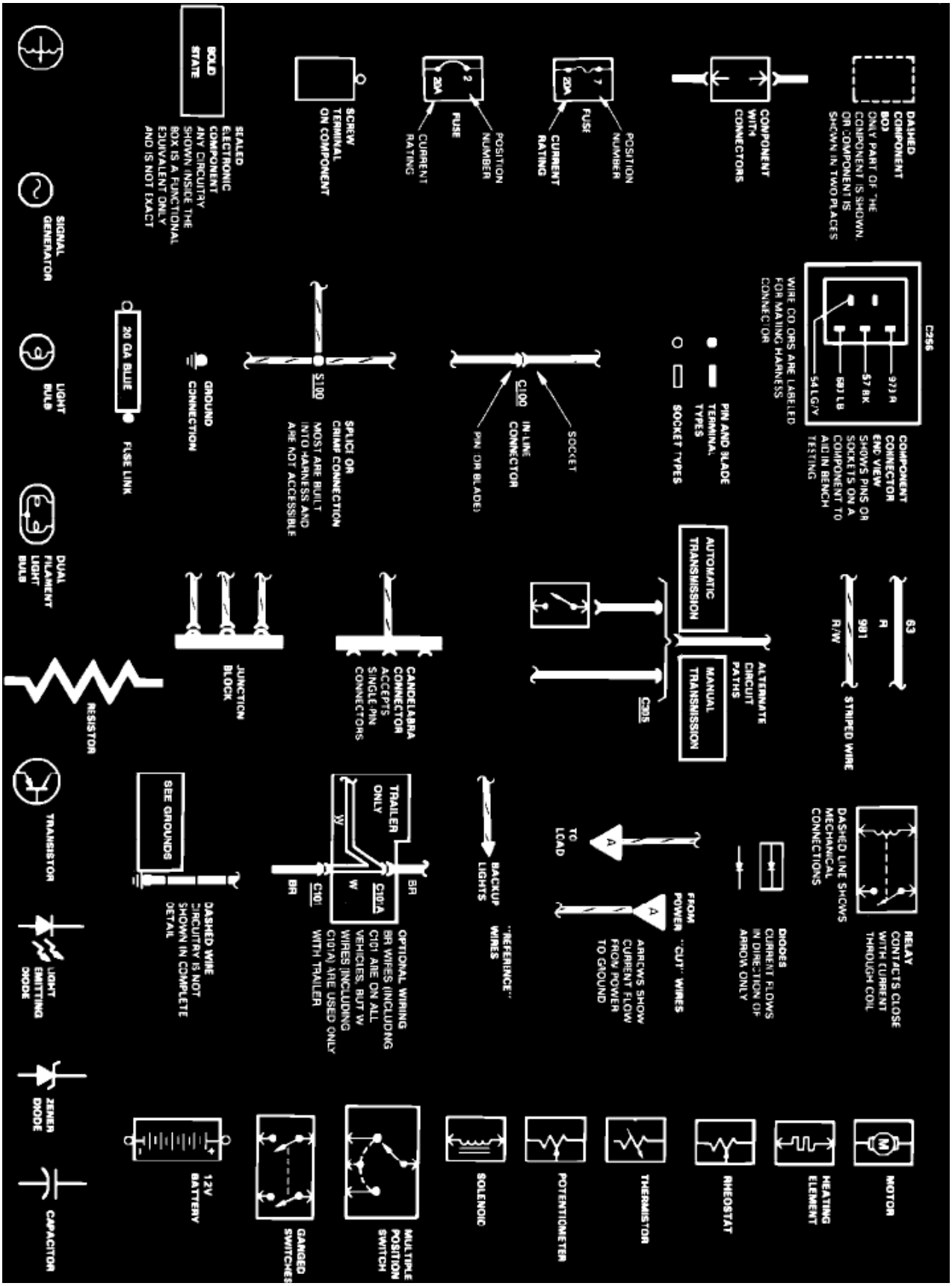
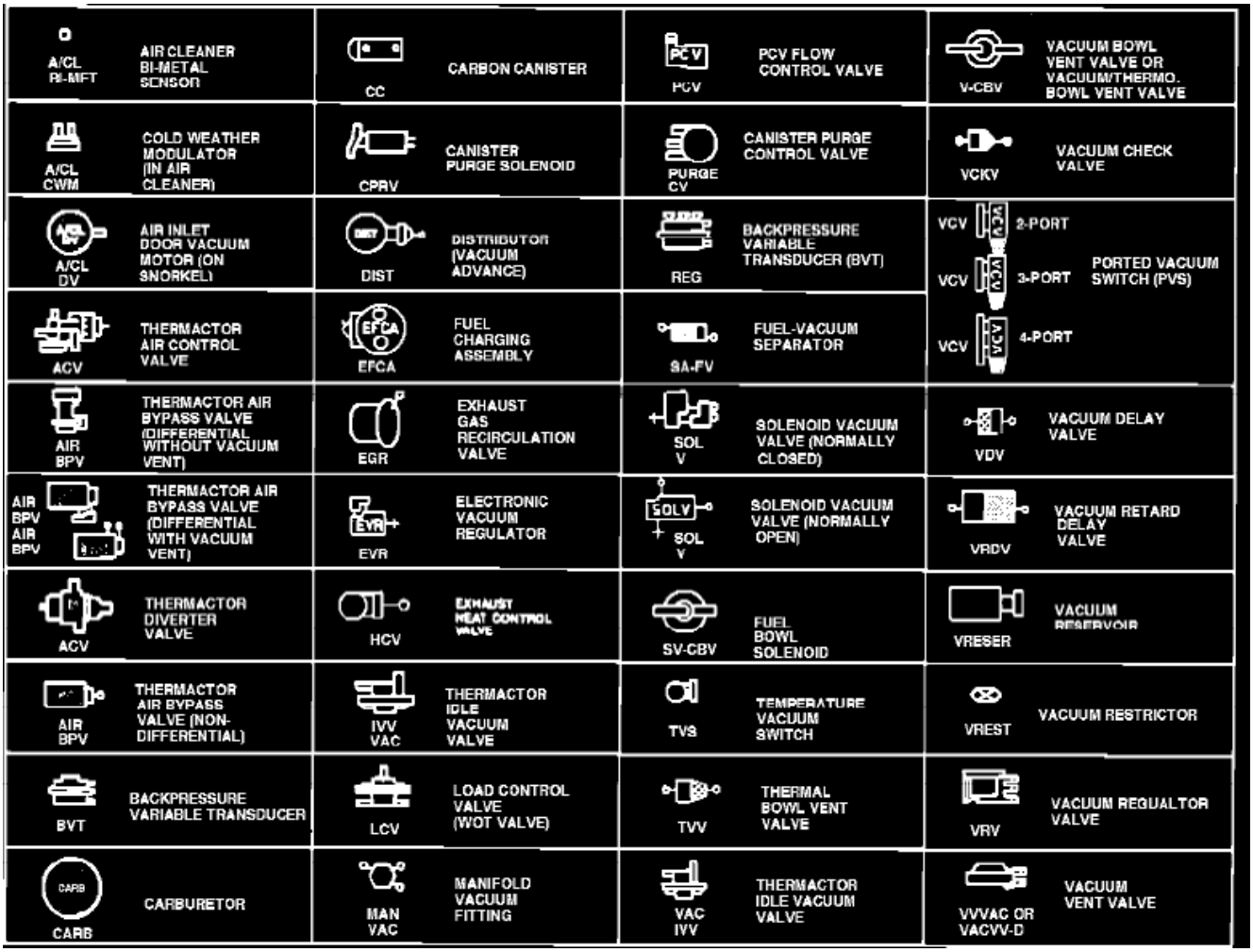
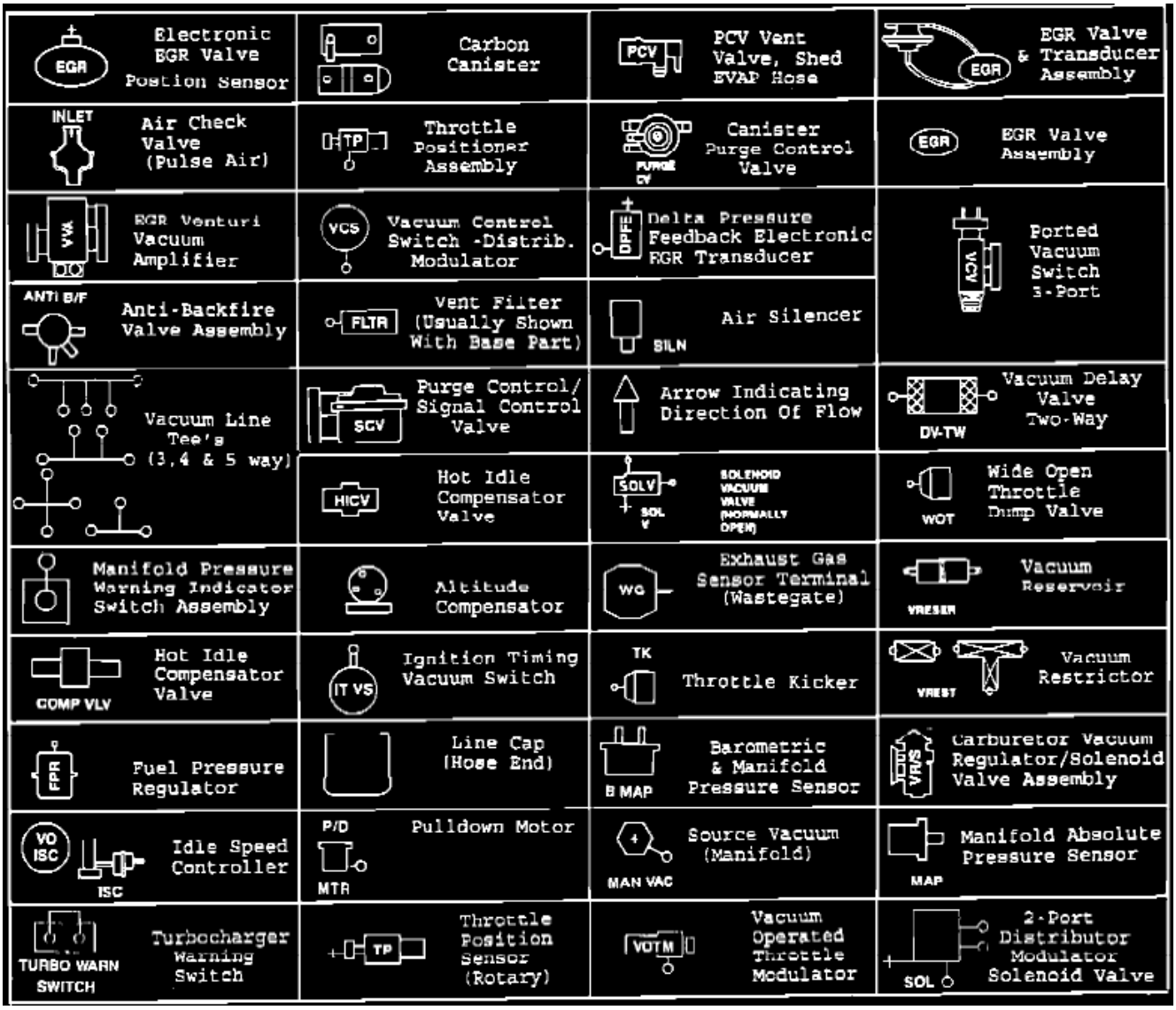


Windshield Washer Pump: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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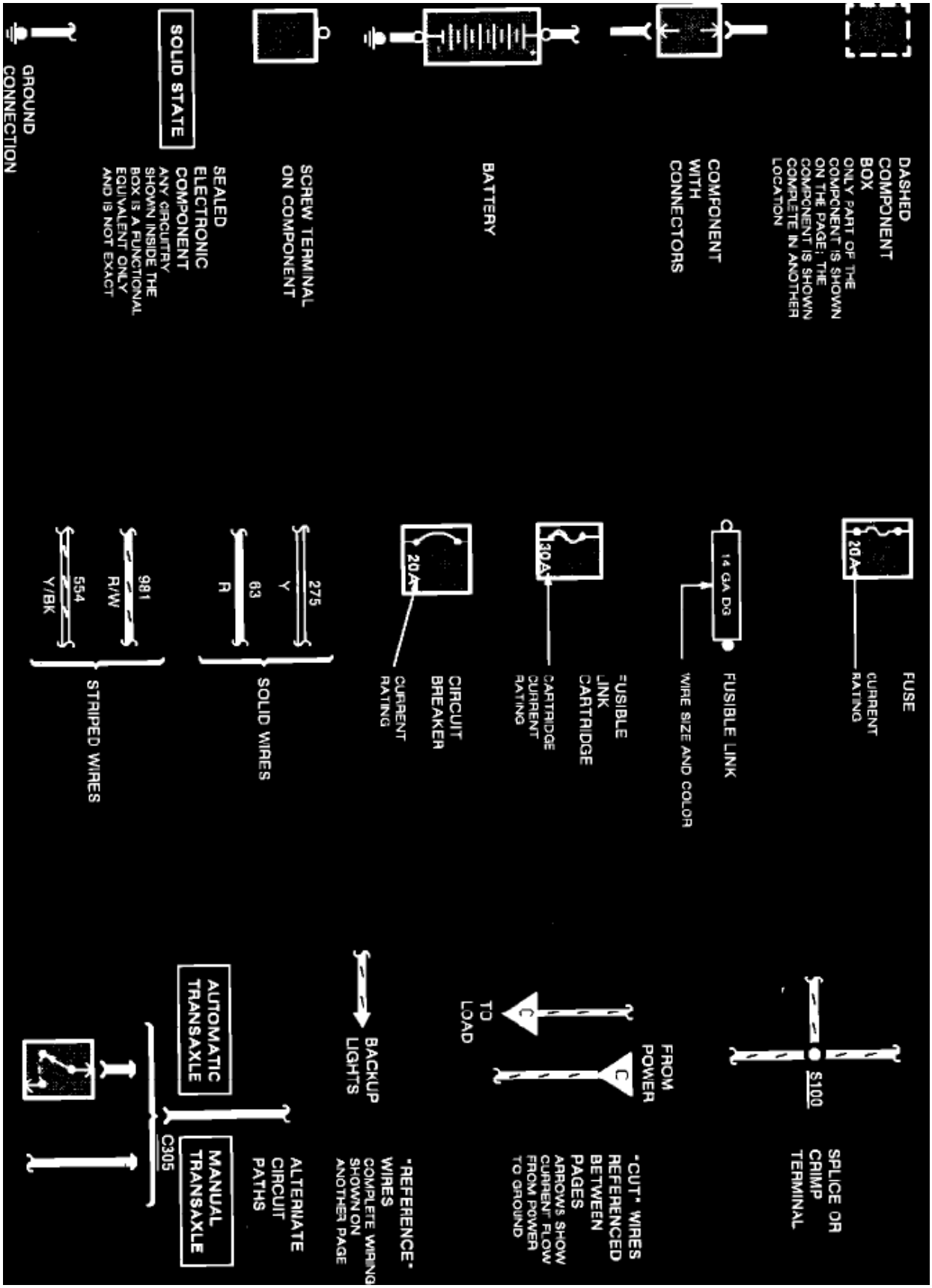
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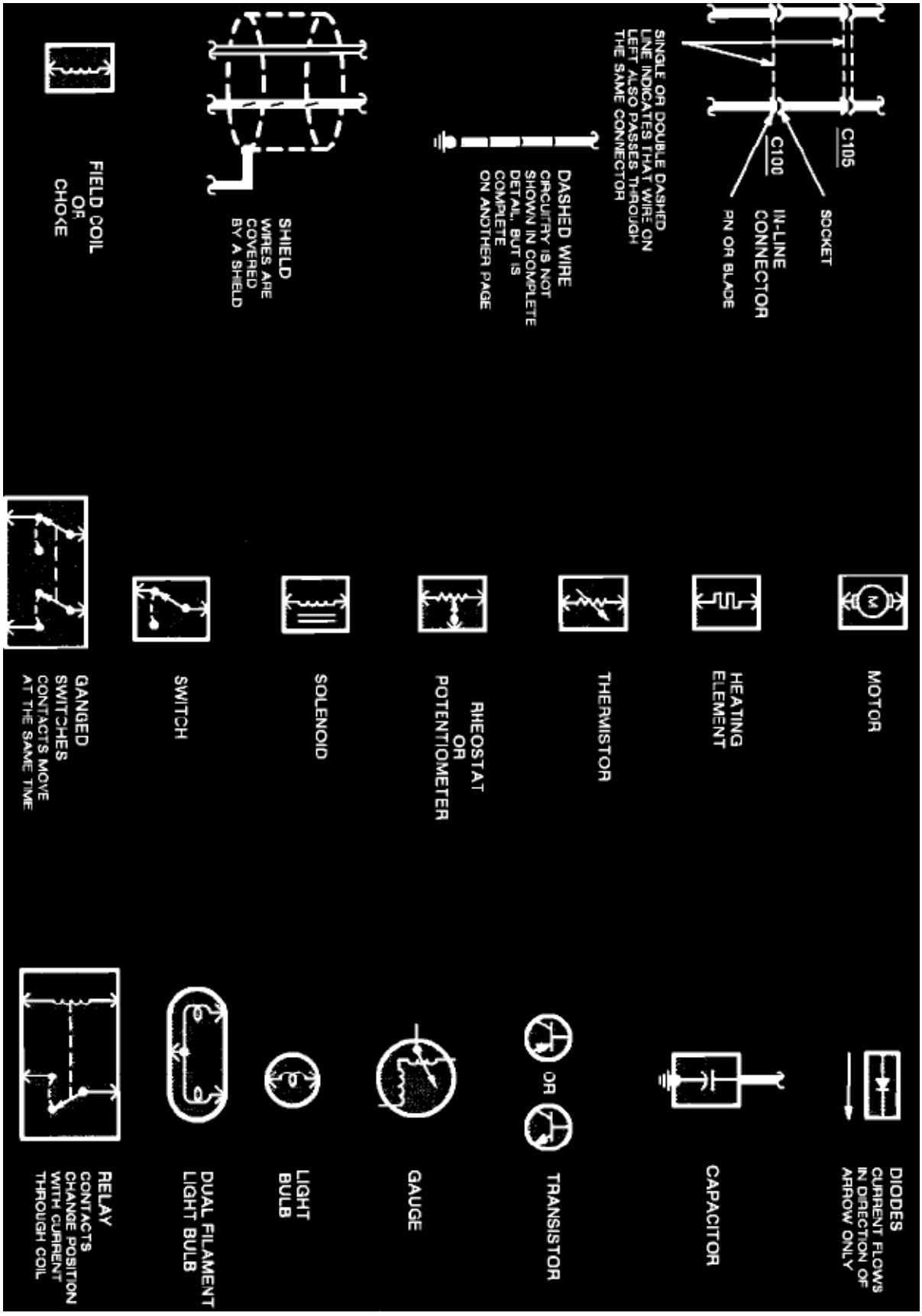
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Electrical Symbols

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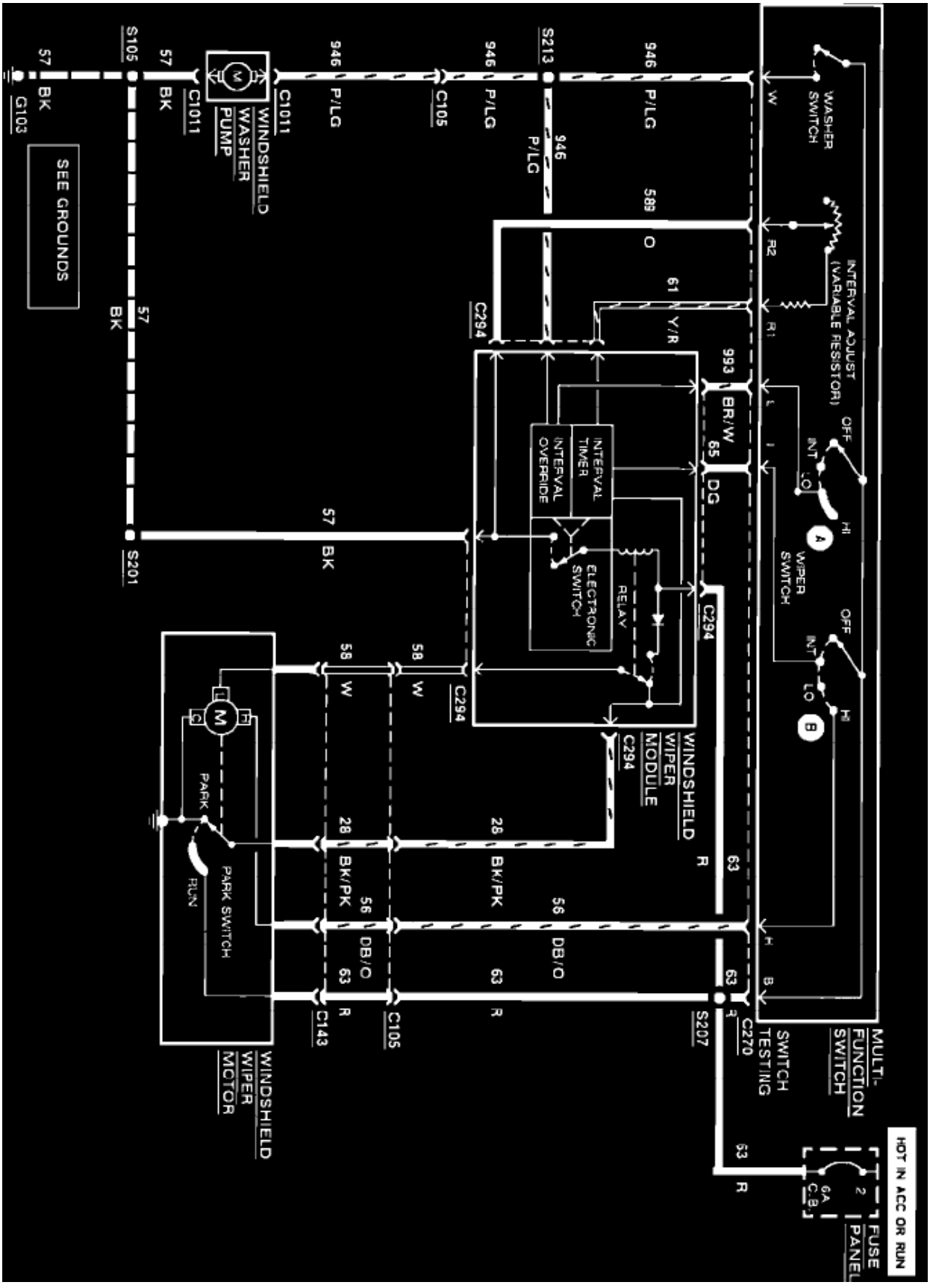
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Wiper/Washer

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
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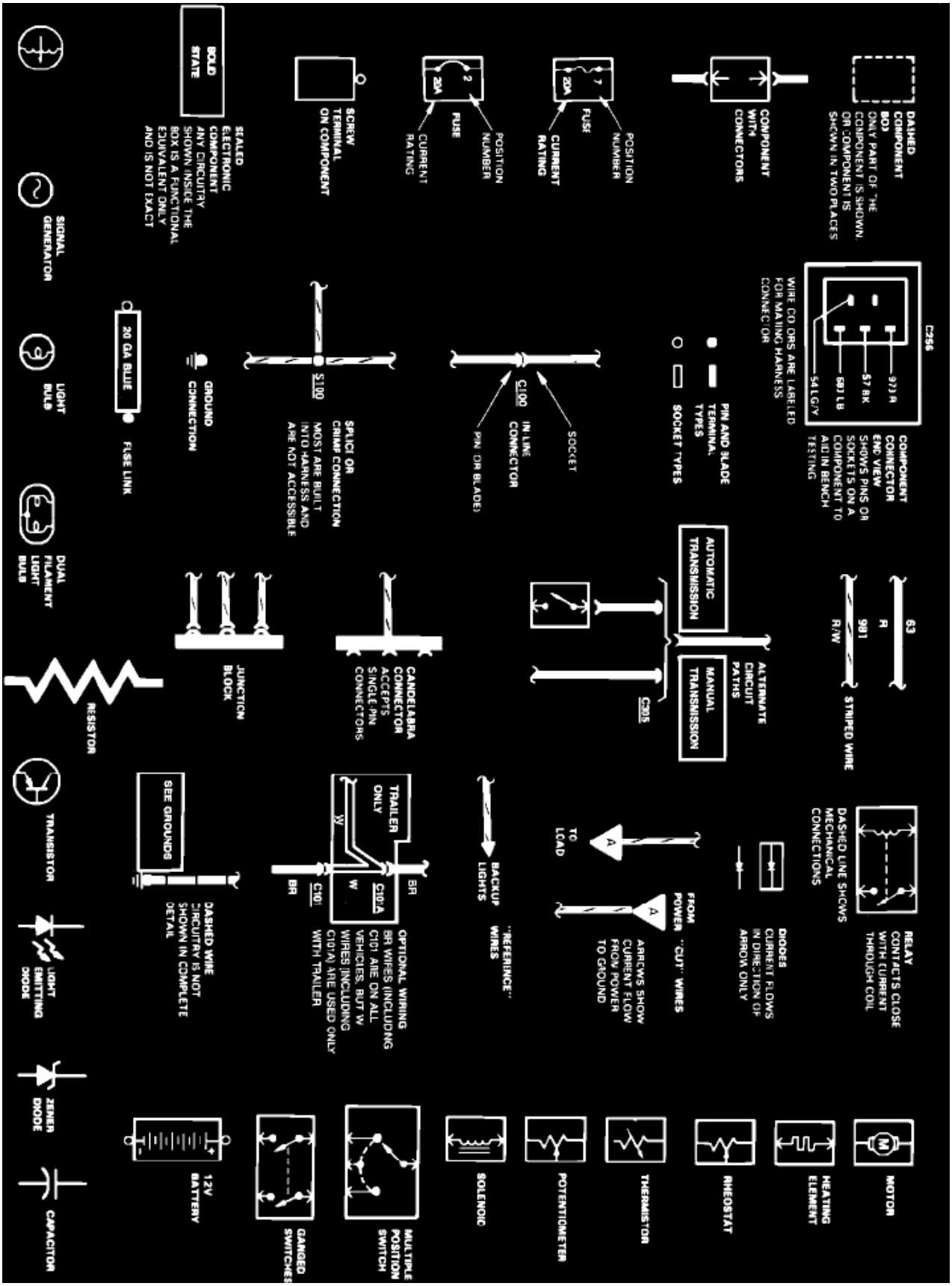

Windshield Washer Relay: Diagram Information and Instructions

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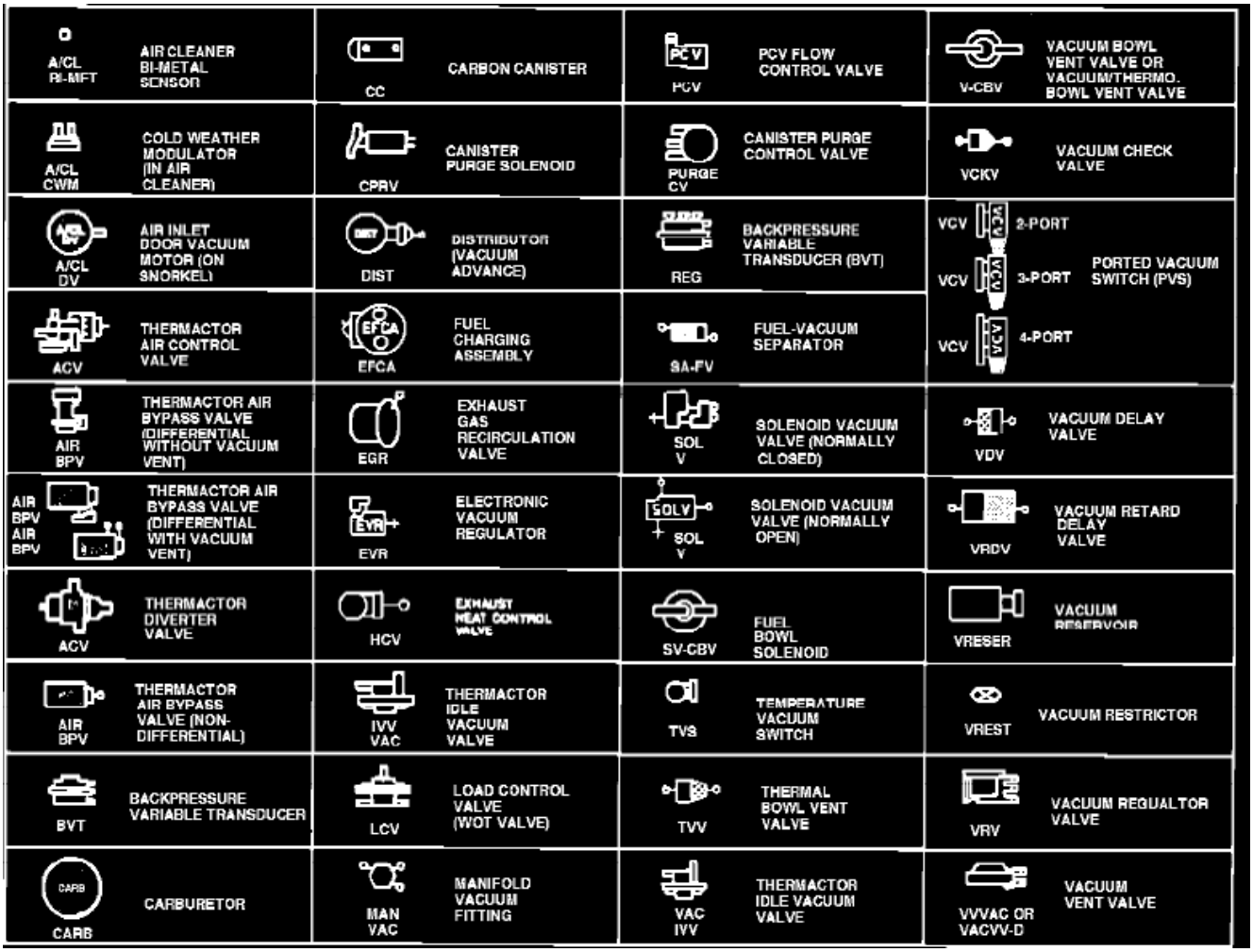

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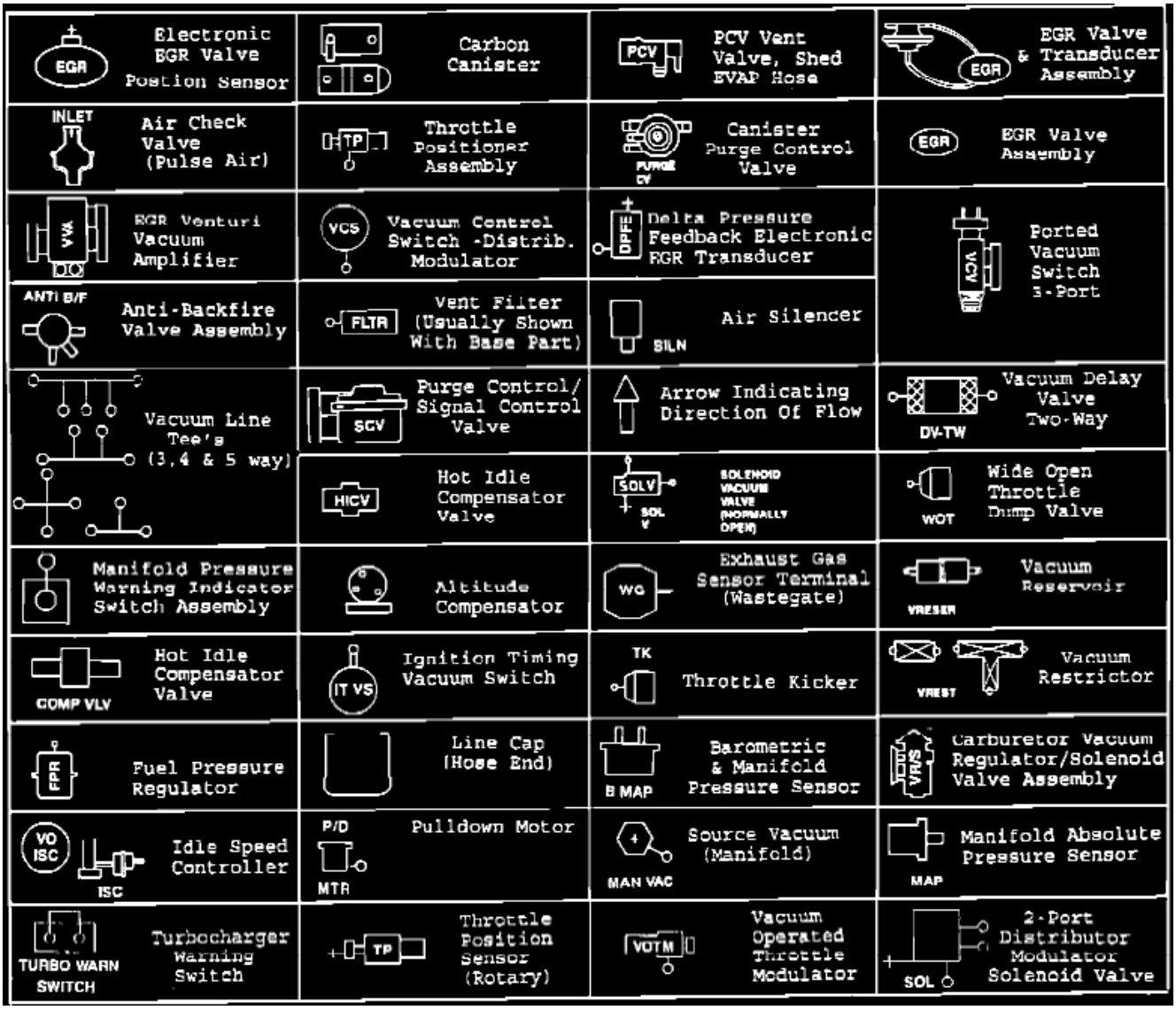

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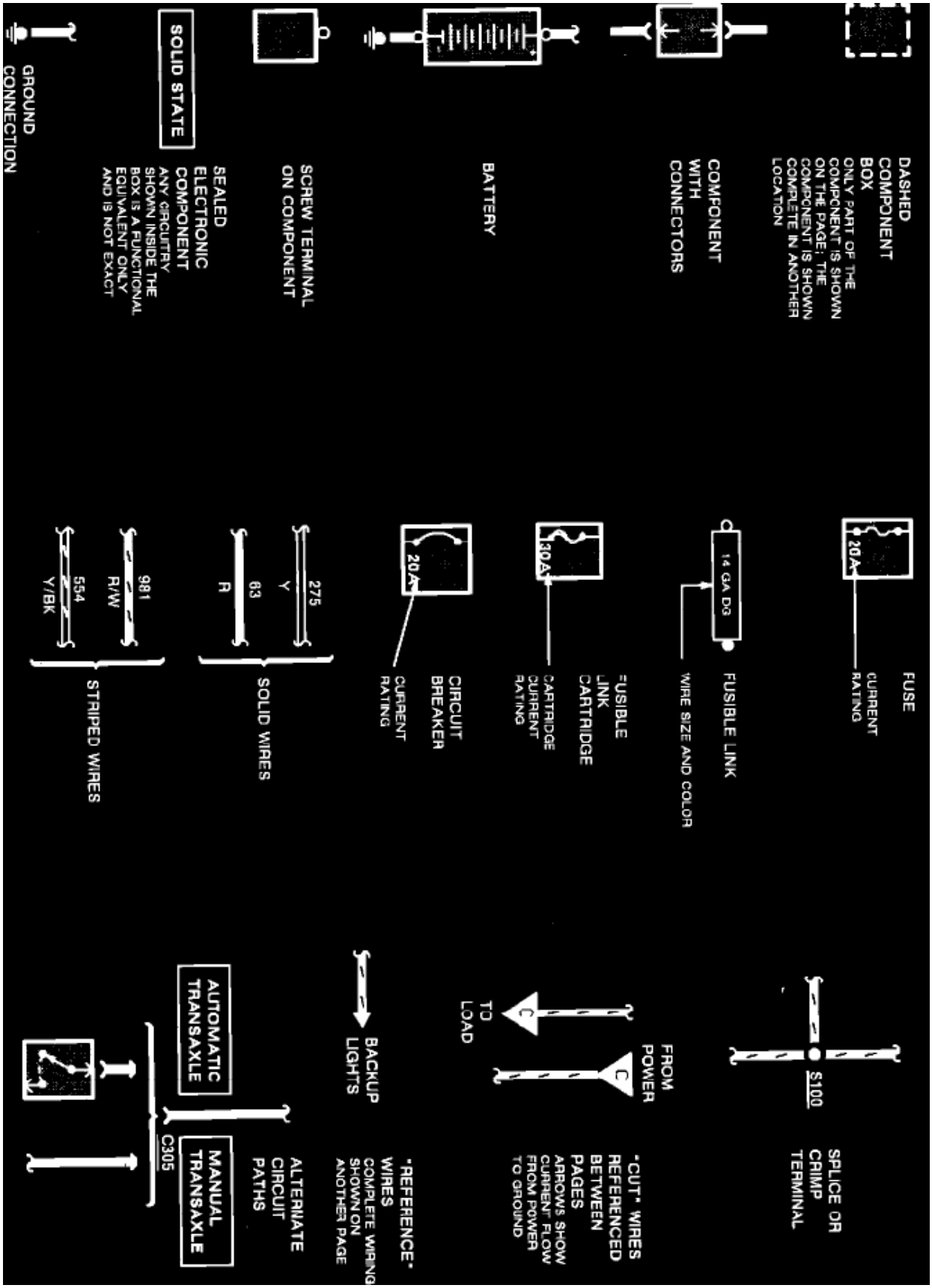
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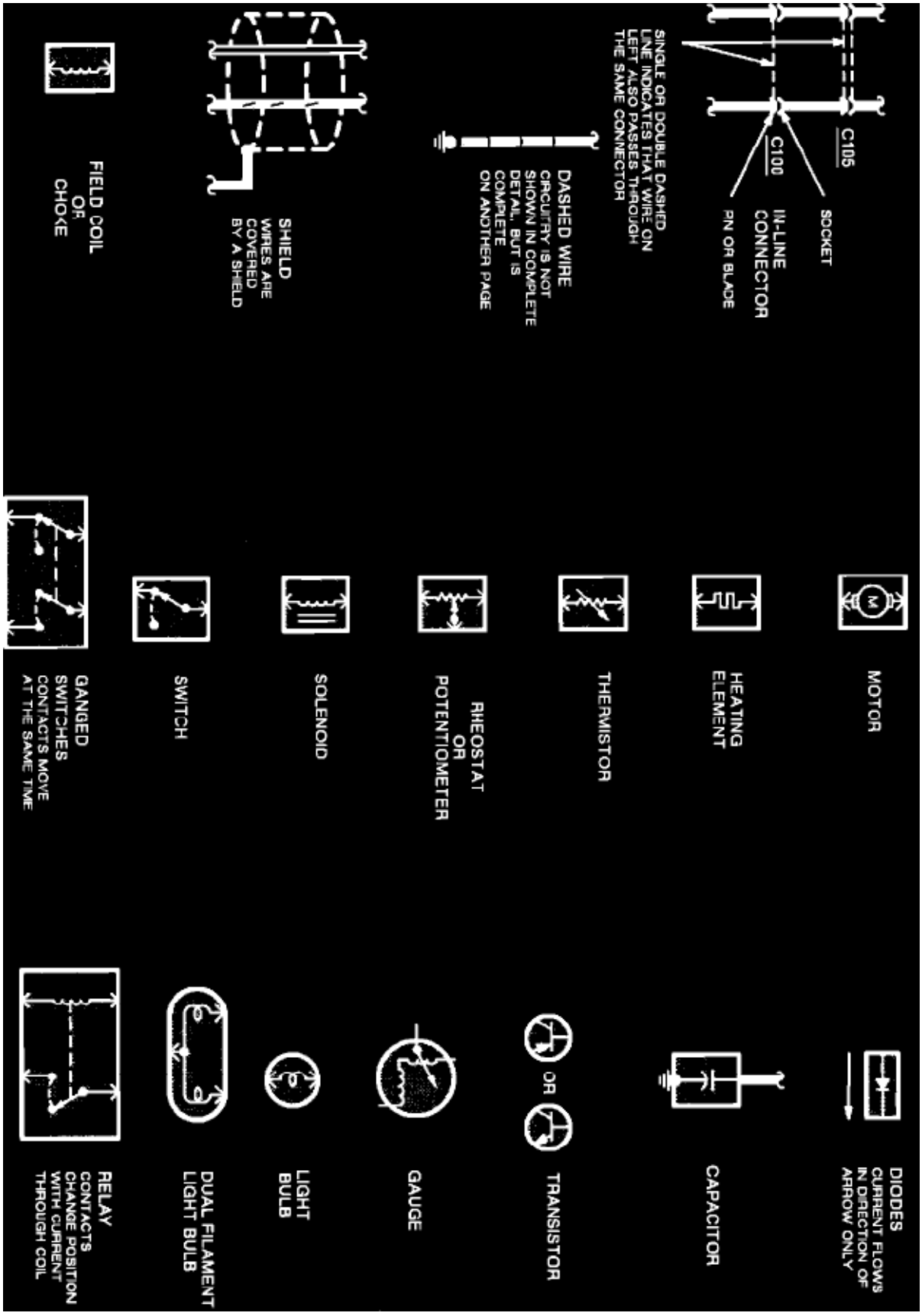
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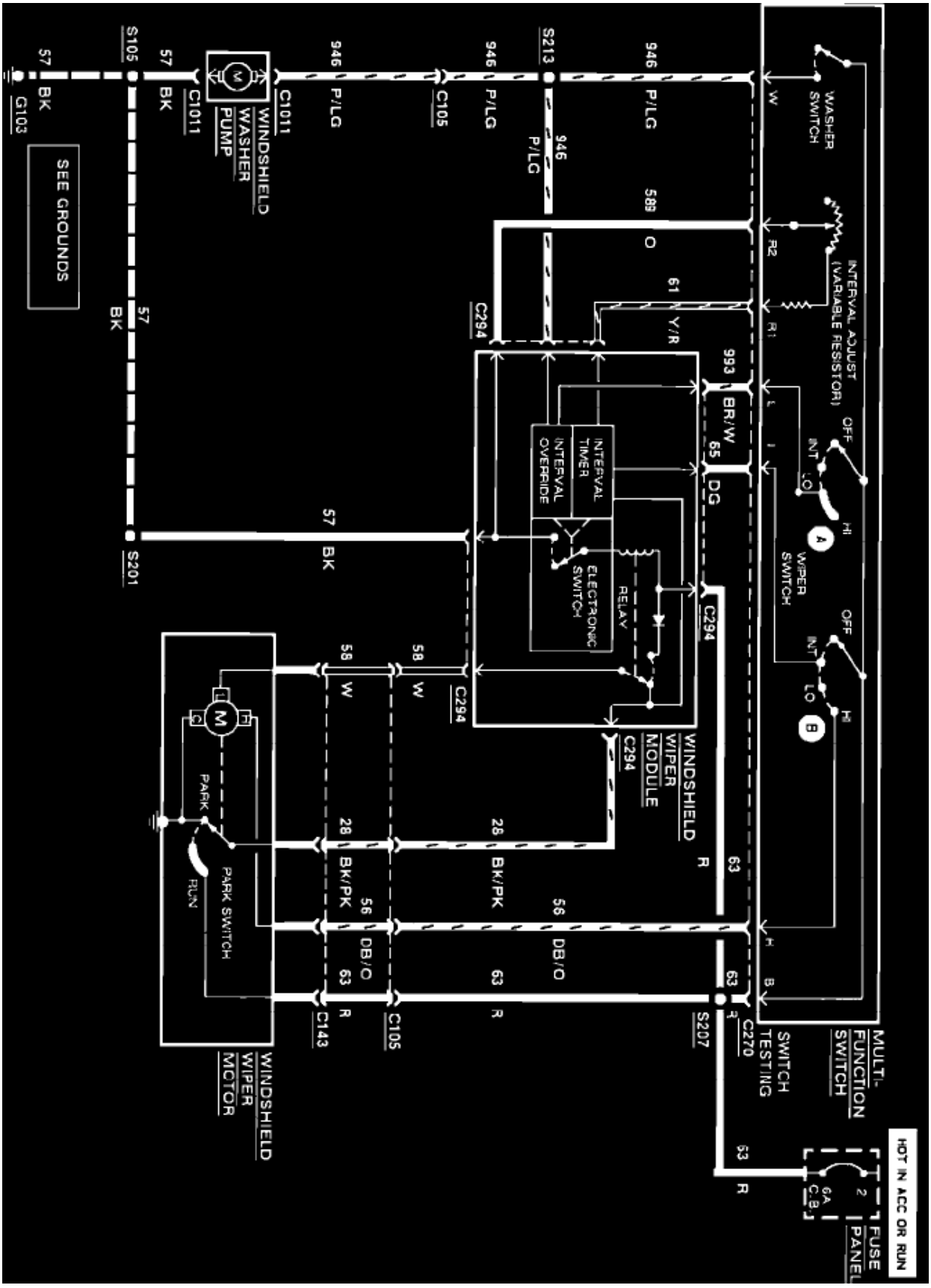
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Wiper/Washer

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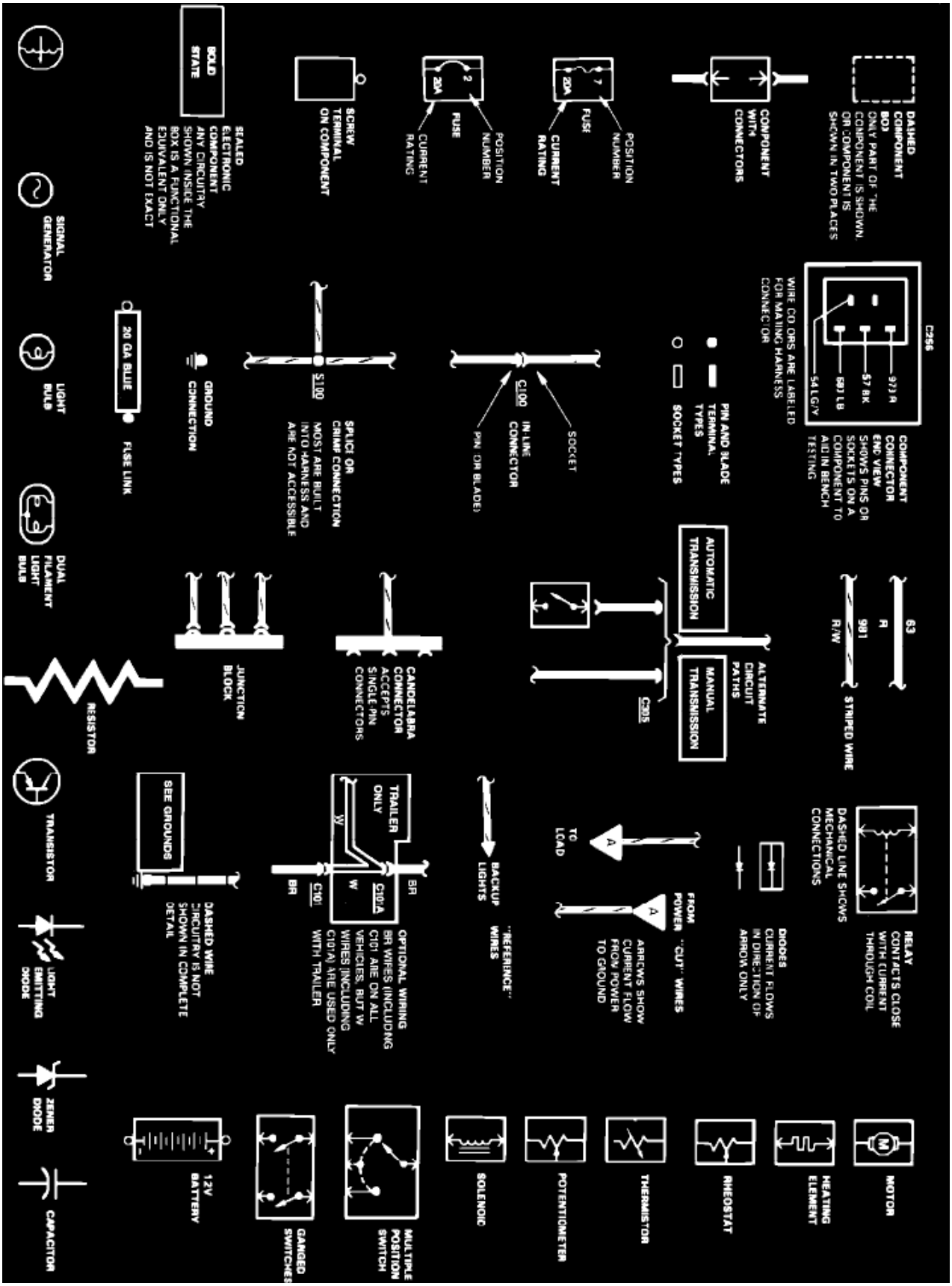

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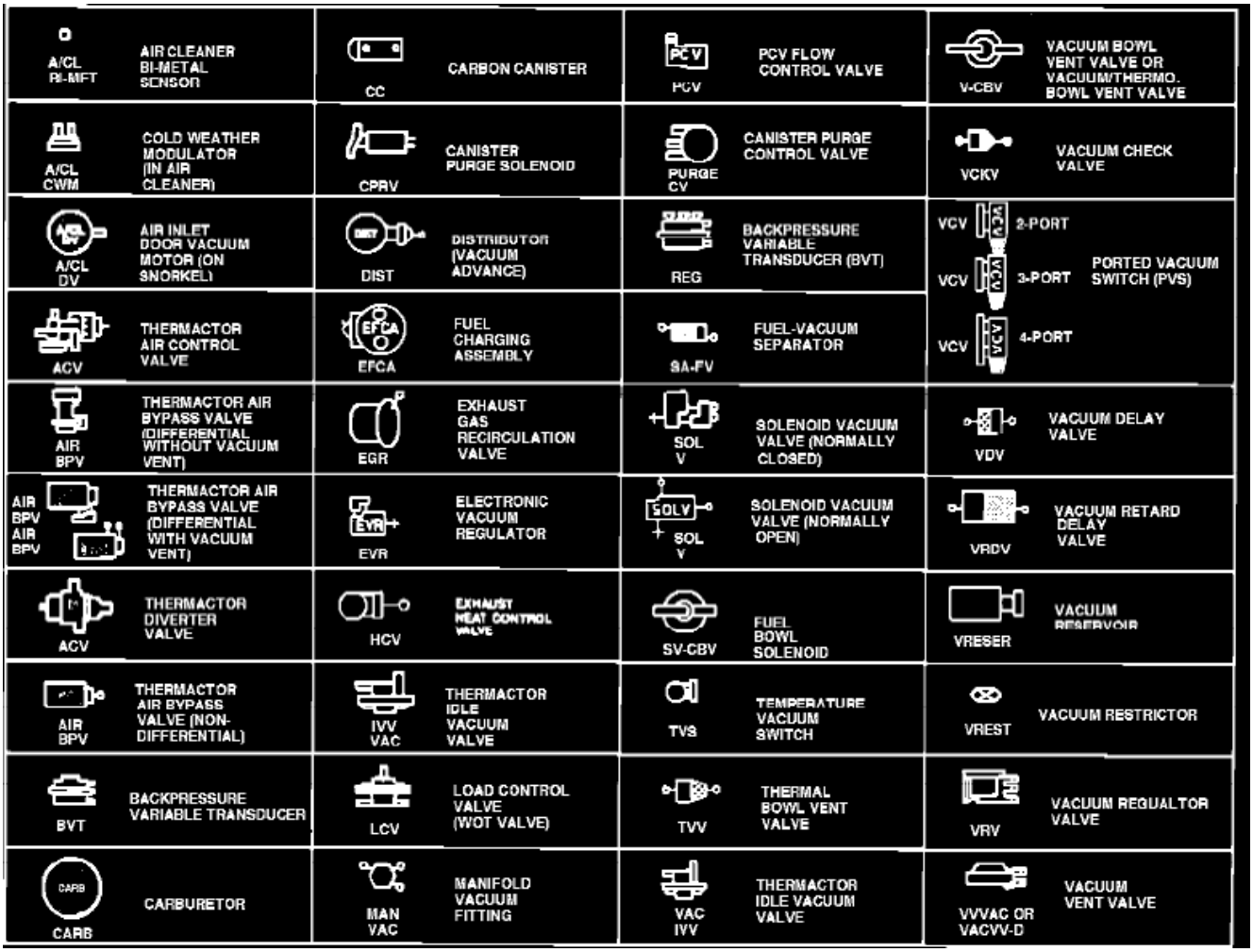

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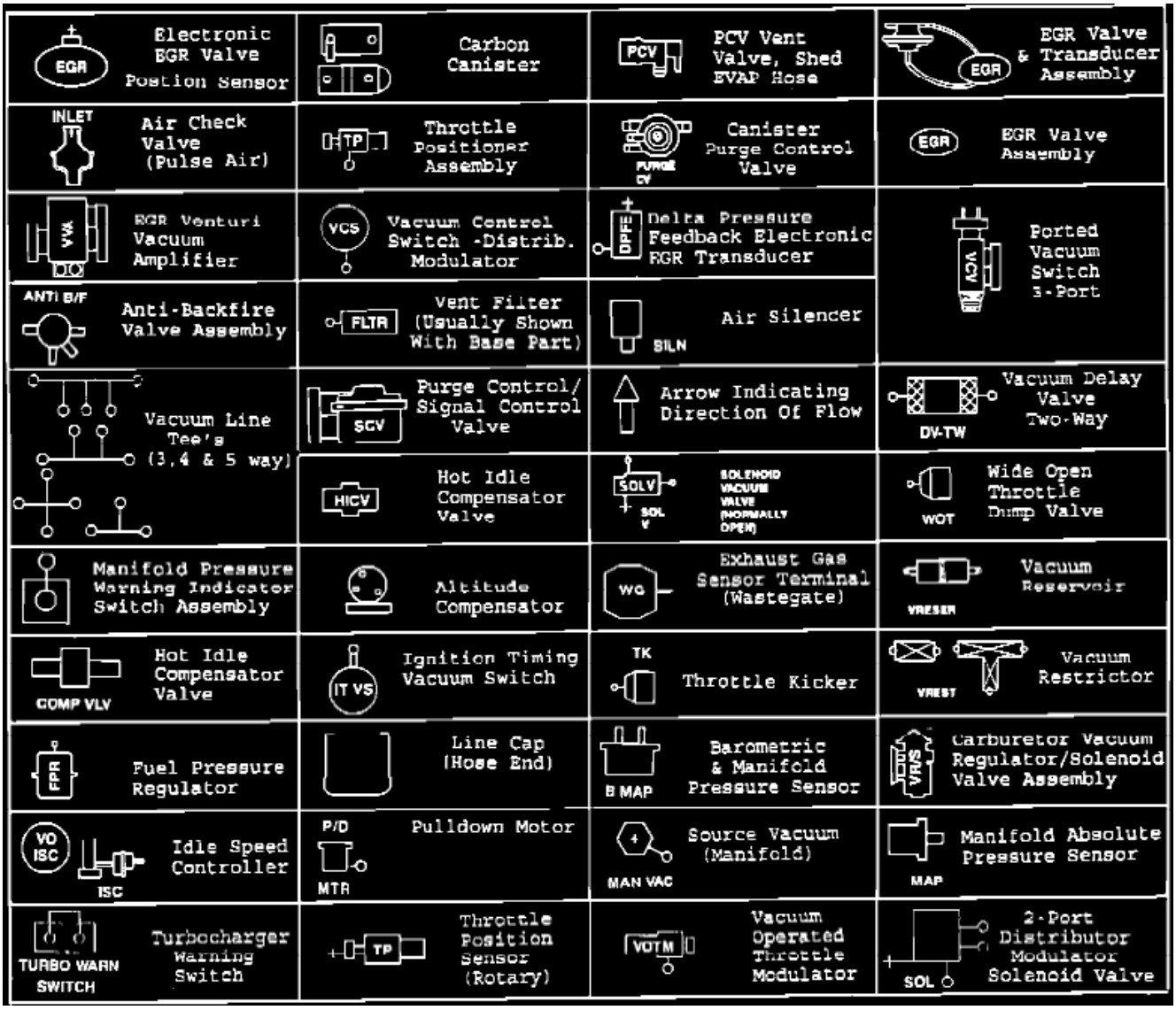
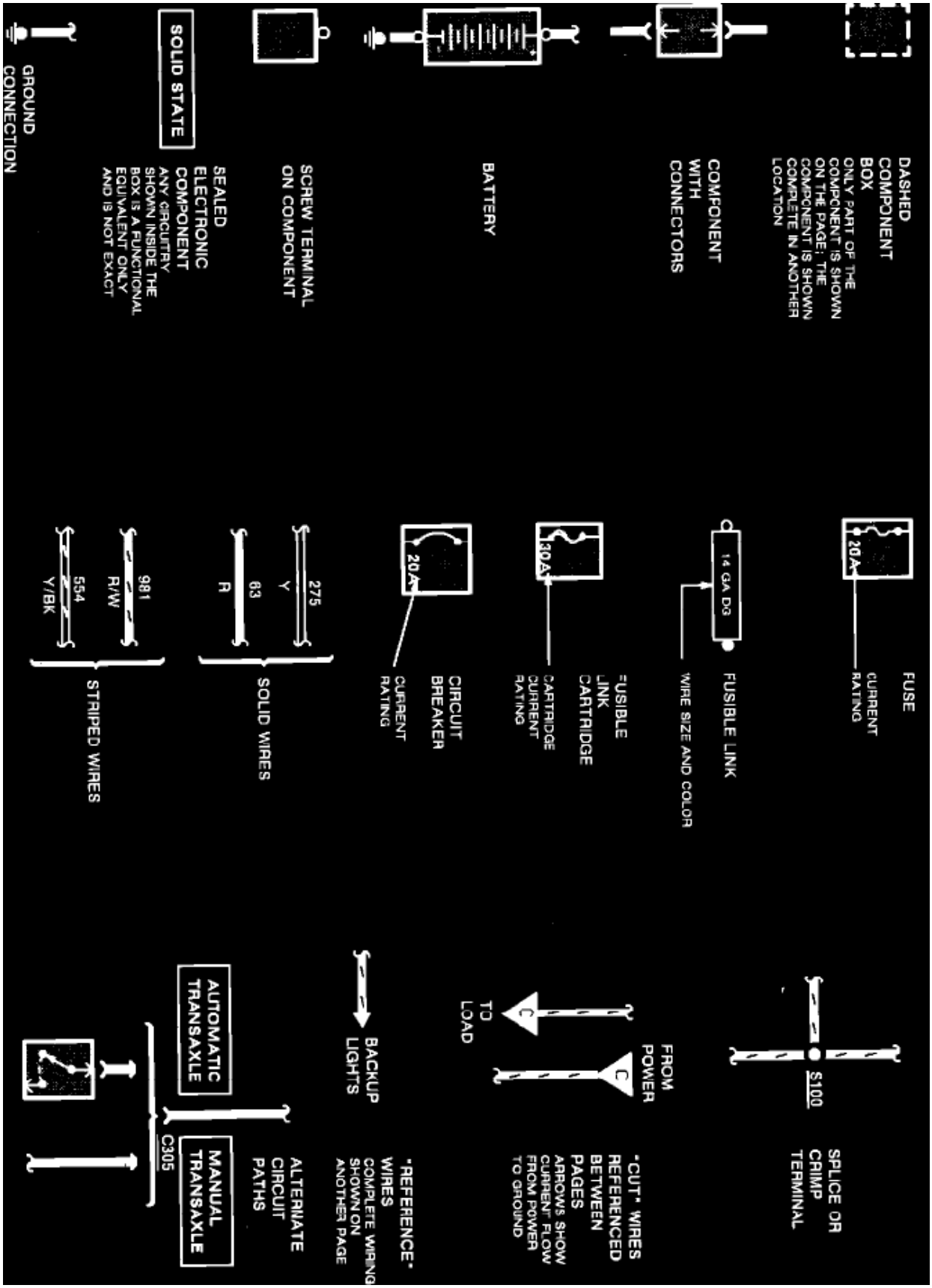
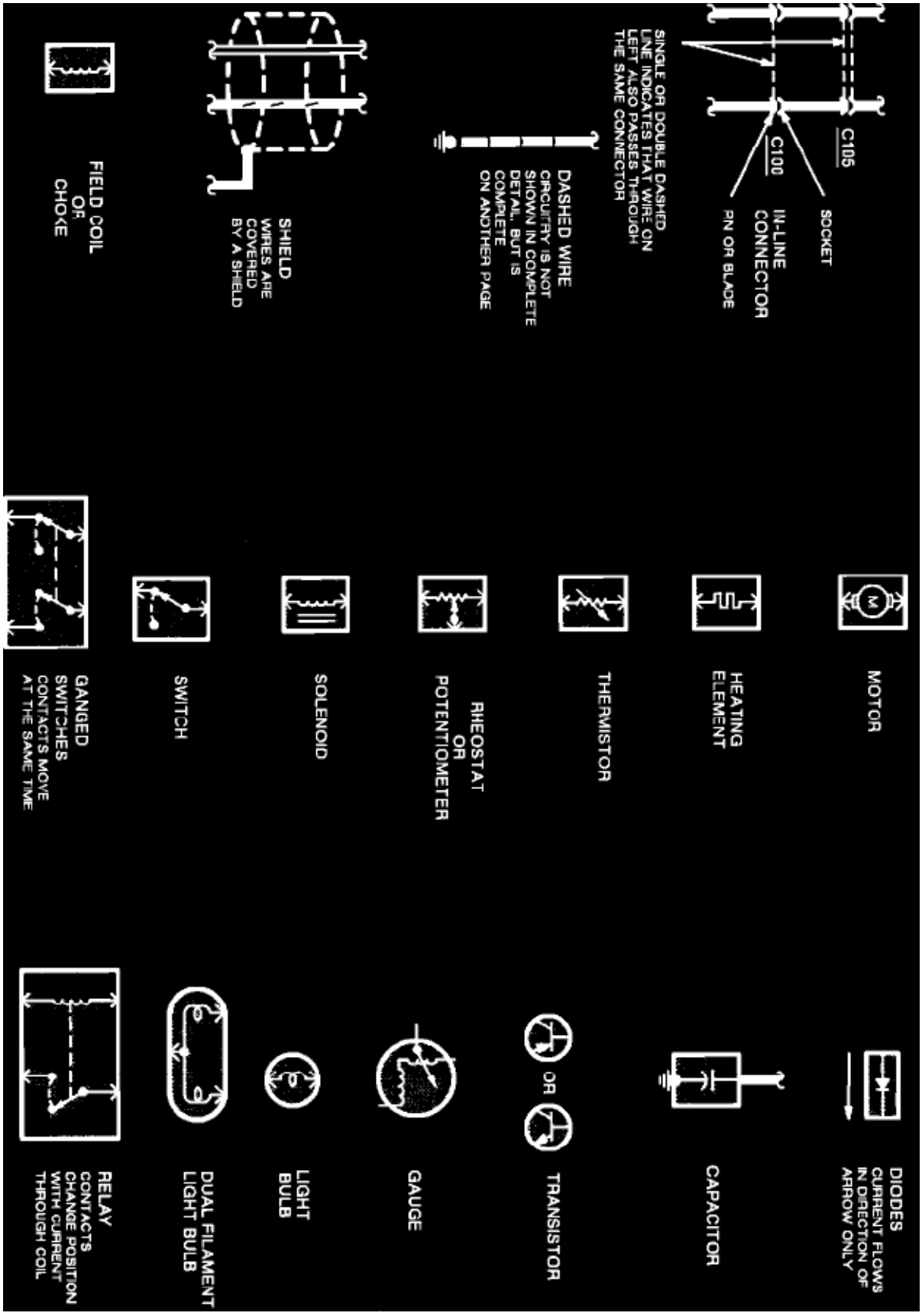


Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
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MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

BR: Brown DB: Dark Blue DG: Dark Green GR: Green GY: Gray LB: Light Blue LG: Light Green N: Natural

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PK: Pink R: Red

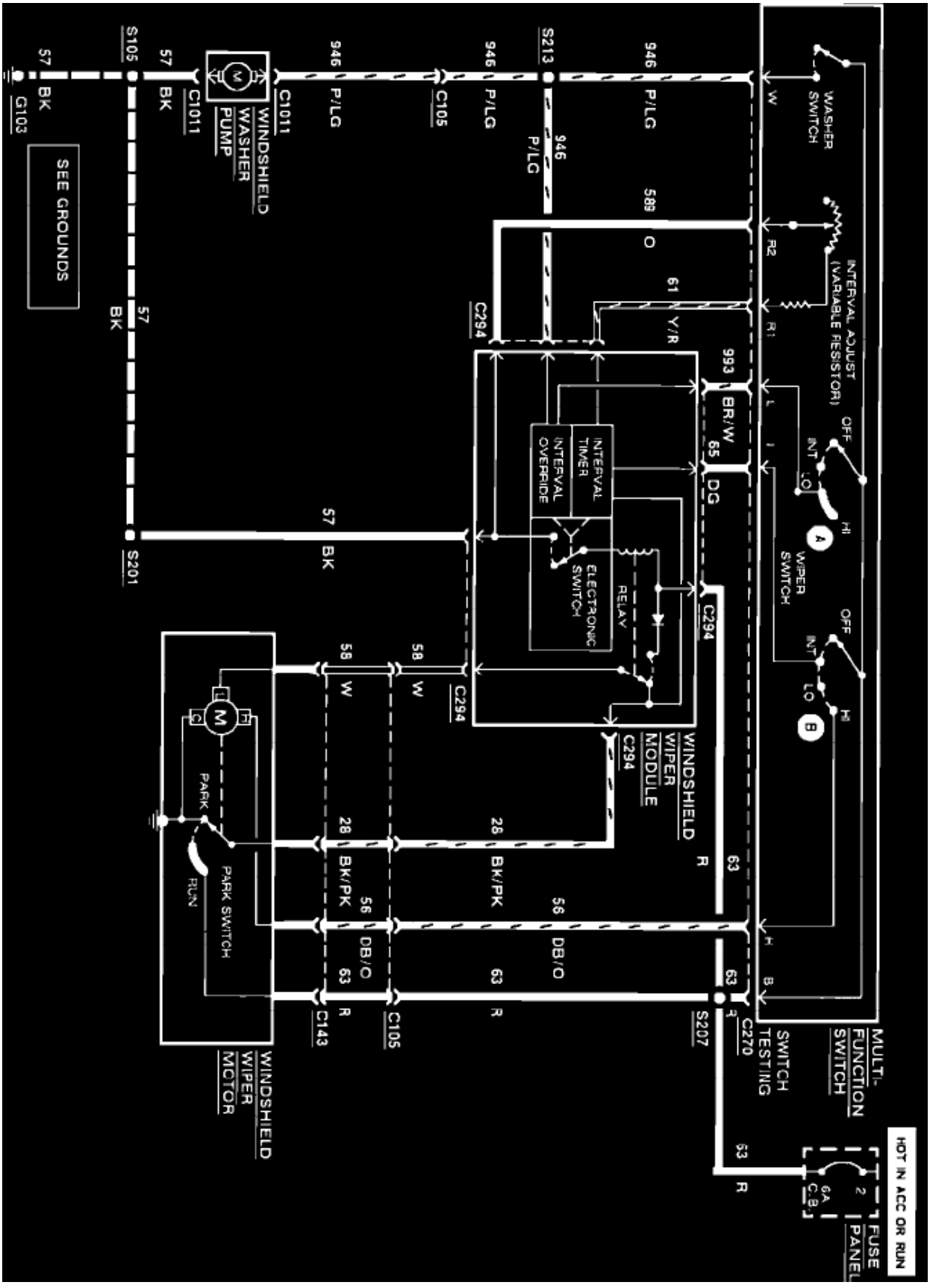
P: Purple

T: Tan

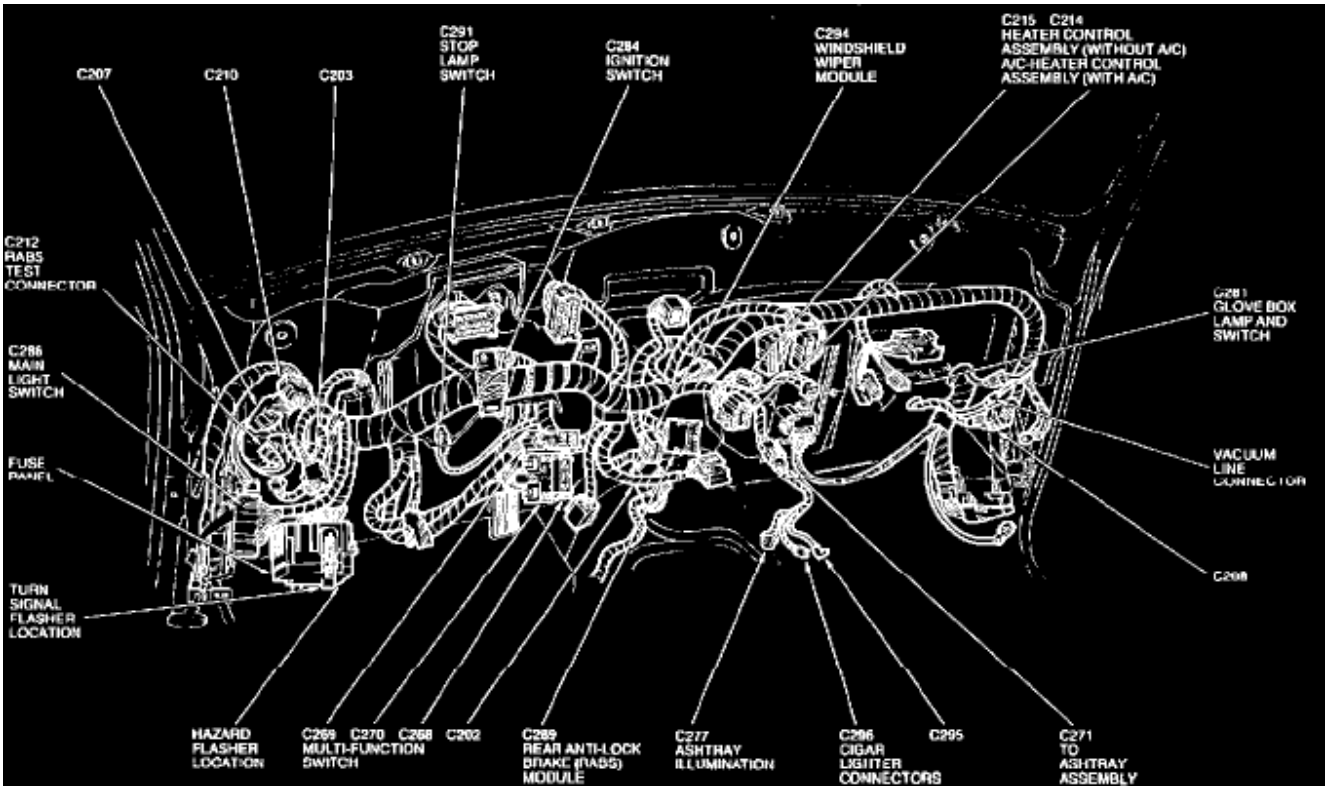
V: Violet

W: White

Y: Yellow


HOT IN ACC OR RUN
FUSE PANEL
2
6A C.B.
MULTI-FUNCTION SWITCH
SWITCH TESTING
C270
S207
WASHER SWITCH
INTERVAL ADJUST (VARIABLE RESISTOR)
WIPER SWITCH
OFF
INT
LO
HI
W
R2
R1
L
I
B
53
63
R
946
P/LG
589
O
61
Y/R
993
BR/W
65
DG
C294
INTERVAL TIMER
INTERVAL OVERRIDE
ELECTRONIC SWITCH
RELAY
WINDSHIELD WIPER MODULE
C294
S213
C105
C1011
WINDSHIELD WASHER PUMP
S105
S201
57
BK
G103
SEE GROUNDS
58
W
28
BK/PK
56
DB/O
C143
WINDSHIELD WIPER MOTOR
PARK
RUN
PARK SWITCH

Wiper/Washer



Wiper Control Module: Locations

I/P Components

Behind Center Of I/P, LH Side Of Ashtray Assembly

Wiper Gear Box: Service and Repair

REMOVAL

1. Cycle windshield wipers until they are in straight up position, then turn ignition switch to Off position.

2. Disconnect battery ground cable (two ground cables on diesel engines), then the wiper motor electrical connector.

3. Remove righthand wiper arm and blade assembly, then the righthand pivot nut and allow linkage to drop into cowl.

4. Remove linkage access cover from righthand side of dash panel.

5. Release wiper motor retaining clip, then slide clip back until it clears nib on crank pin, and remove the clip. The wiper motor retaining clip can be reached through the access cover opening.

6. Remove wiper linkage from motor crank pin.

7. Slide righthand pivot shaft and linkage assembly out through right hand access cover opening.

8. Remove lefthand wiper arm and blade assembly.

9. Remove lefthand linkage access cover and pivot nut, then lower linkage and slide out through access cover opening. Lefthand and righthand pivot and linkage assemblies are serviced separately.

INSTALLATION

1. Install clip onto lefthand linkage, ensuring clip is fully seated. Do not install linkage on motor crank pin, then attempt to install clip.

2. Slide lefthand pivot shaft and linkage assembly through lefthand access opening, positioning pivot shaft in place.

3. Install lefthand pivot shaft nut and torque to 88-110 ft. lbs.

4. Install lefthand linkage cover.

5. Slide righthand pivot shaft and linkage assembly through righthand access opening, positioning pivot shaft in place.

6. Connect wiper motor electrical connector, then install clip onto righthand linkage, ensuring clip is fully seated. Do not install linkage on motor crank pin, then attempt to install clip.

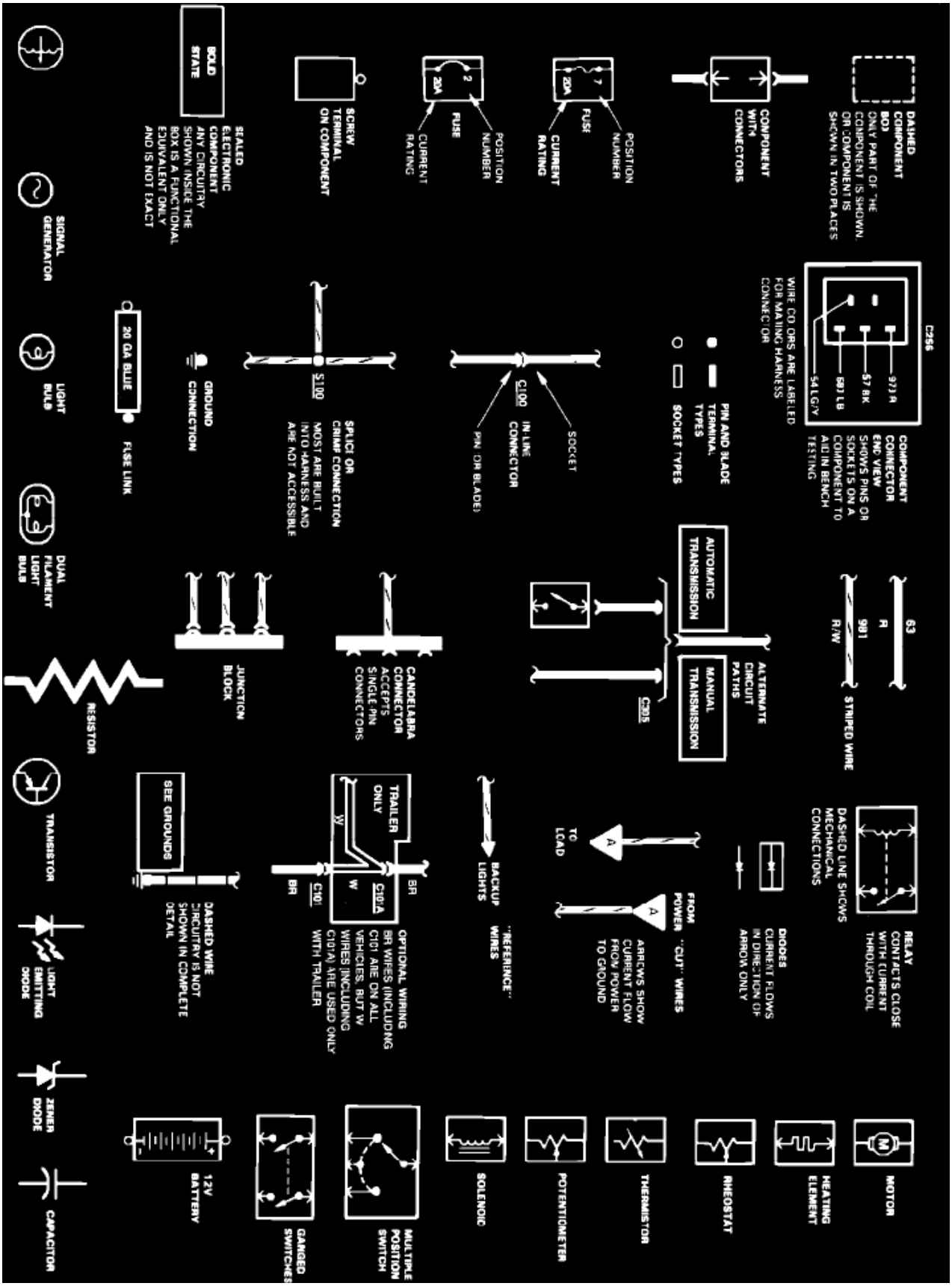
7. Install lefthand linkage onto motor crank pin, then the righthand linkage onto crank pin, pulling linkage onto pin until it snaps into place. Clip is properly installed if nib is protruding through center of clip.

8. Install righthand wiper pivot shaft and nut and torque to 84-110 inch lbs.

9. Connect battery ground cable (two ground cables on diesel engines), turn ignition switch to On position, turn wiper switch Off so wiper motor will park, then turn ignition switch to Off position.

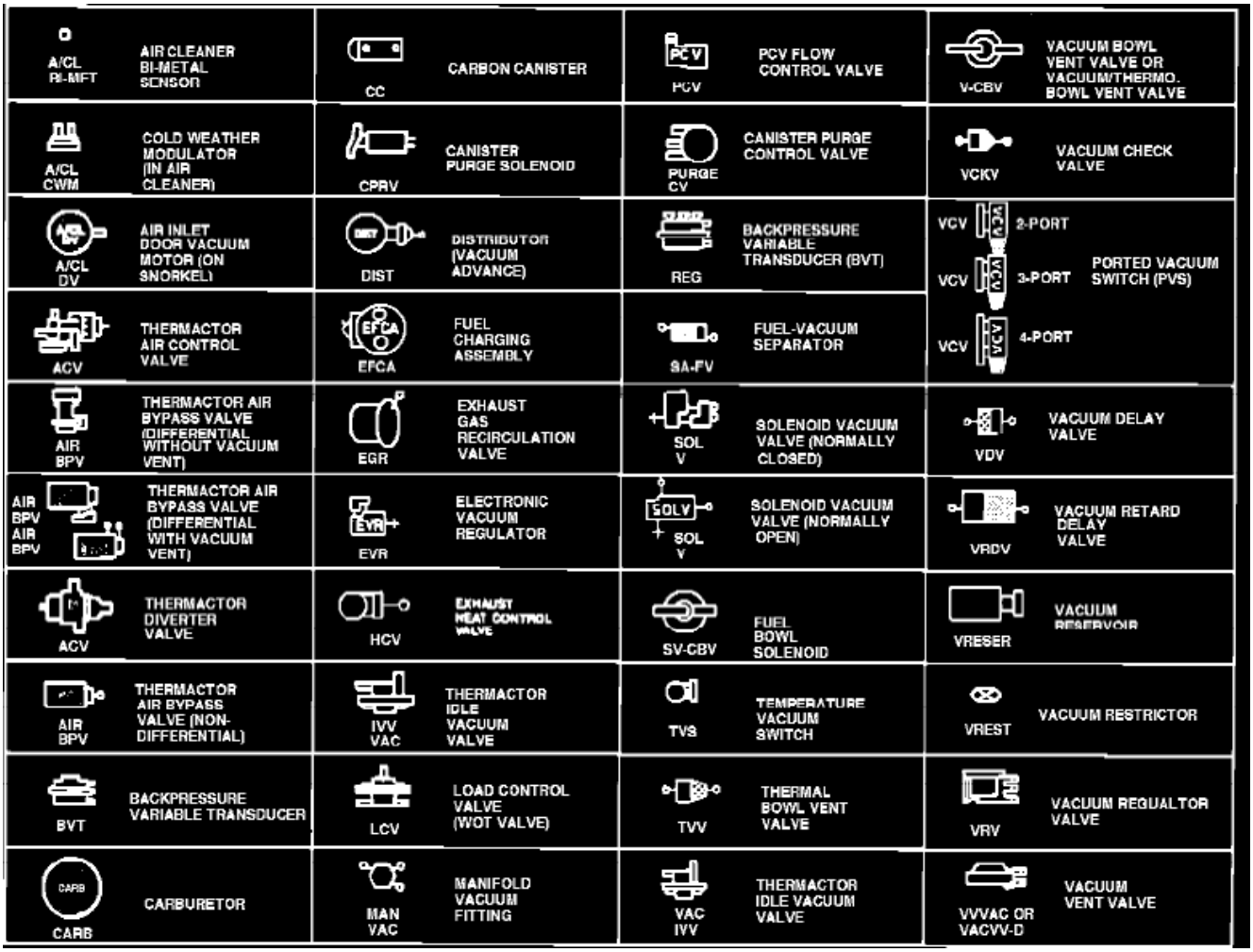
10. Install righthand linkage access cover, then the right and lefthand wiper blade and arm assemblies and check for proper operation.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Wiper Motor > Component Information > Diagrams > Diagram Information and Instructions

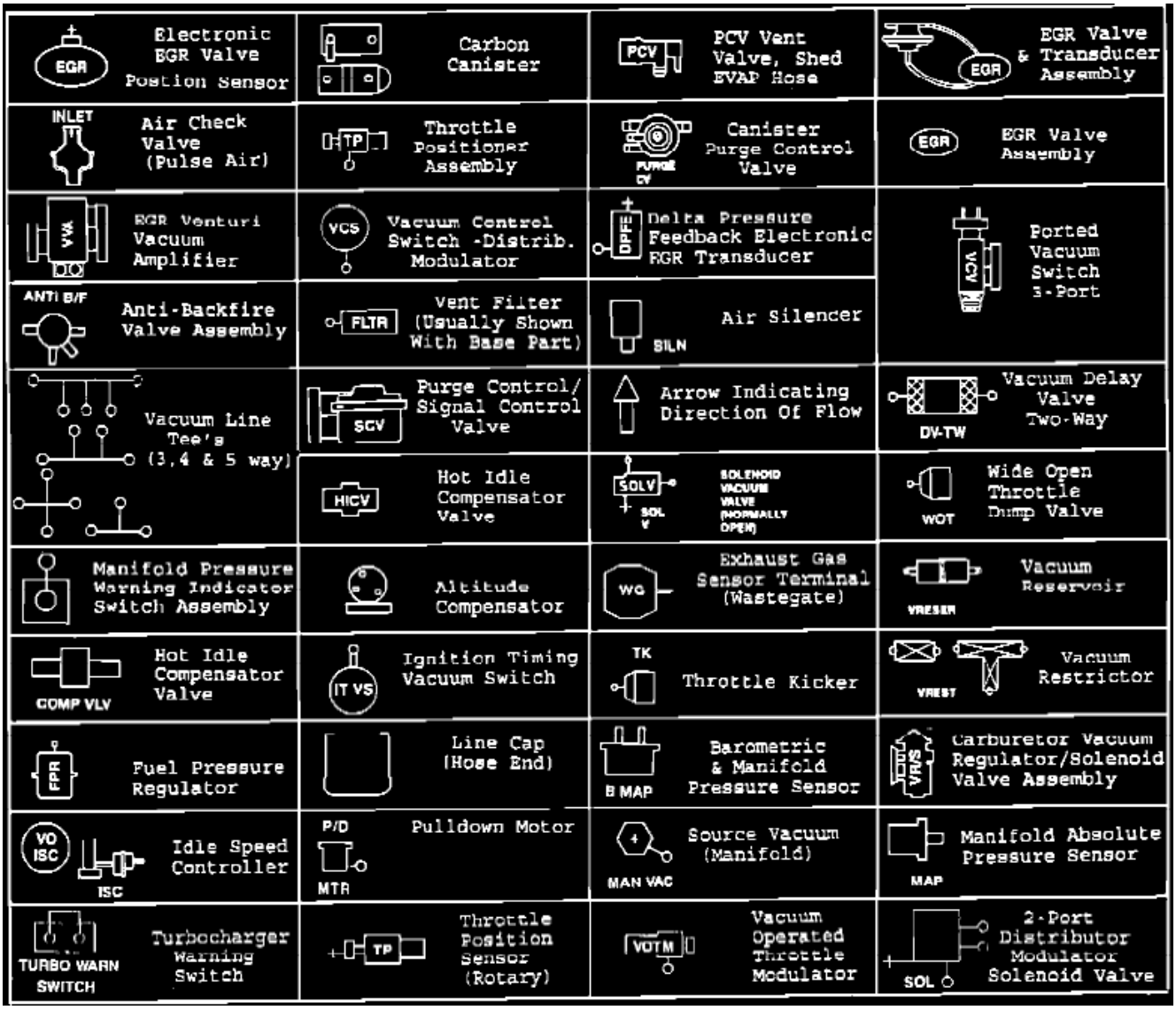


Wiper Motor: Diagram Information and Instructions

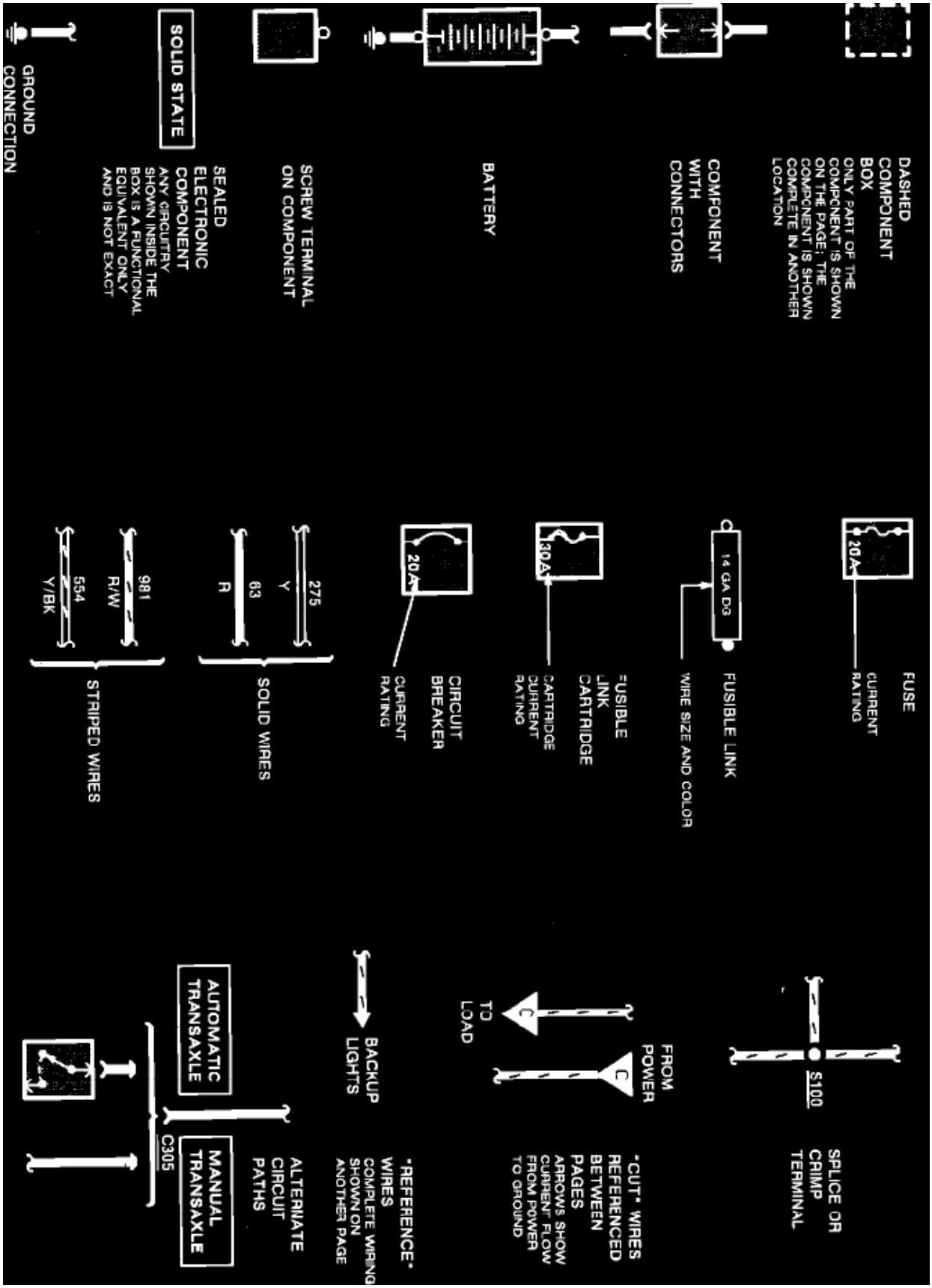
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
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SCREW TERMINAL ON COMPONENT
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SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
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R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
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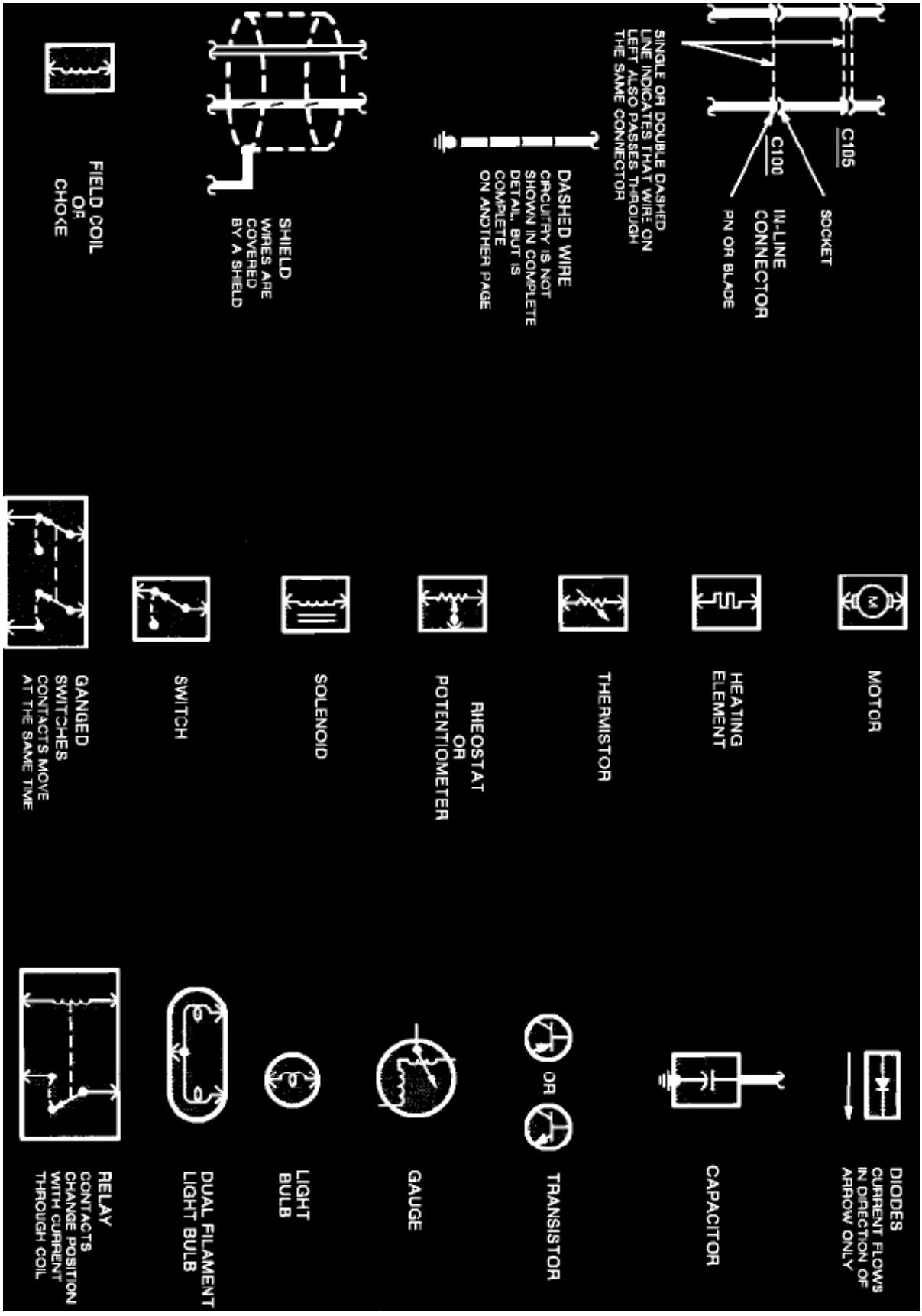
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
SOCKET
C100
IN-LINE CONNECTOR
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DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
SWITCH
SOLENOID
RHEOSTAT OR POTENTIOMETER
THERMISTOR
HEATING ELEMENT
MOTOR
DIODES
CURRENT FLOWS IN DIRECTION OF ARROW ONLY
CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

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V: Violet

W: White

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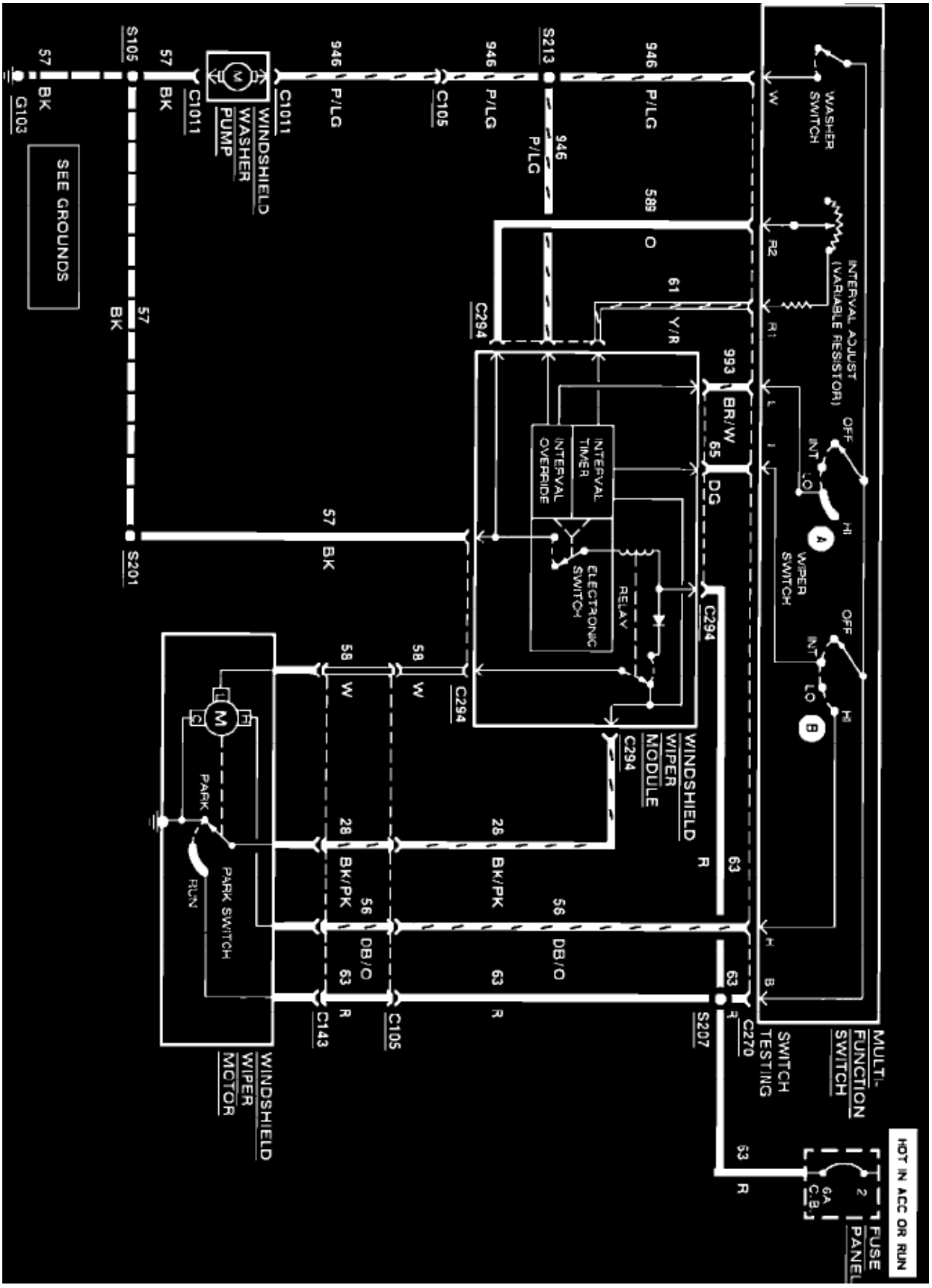
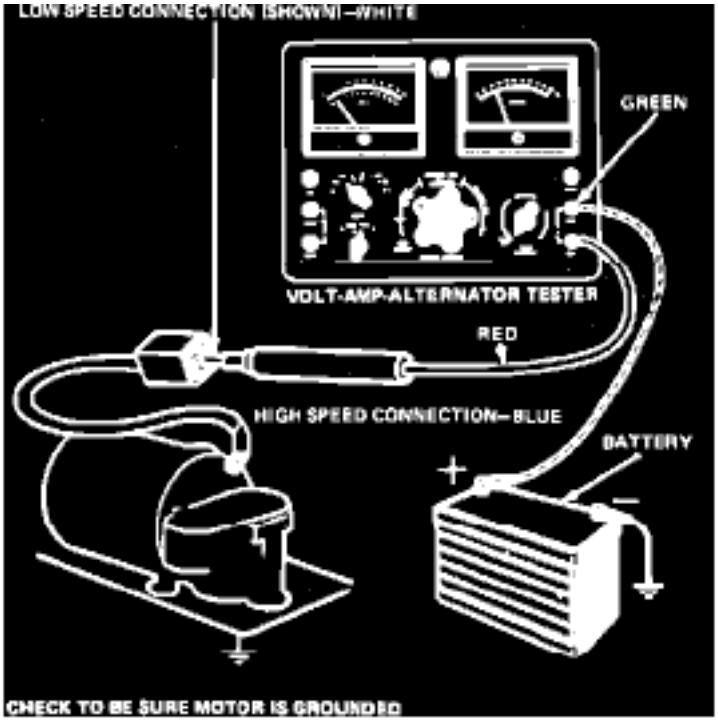
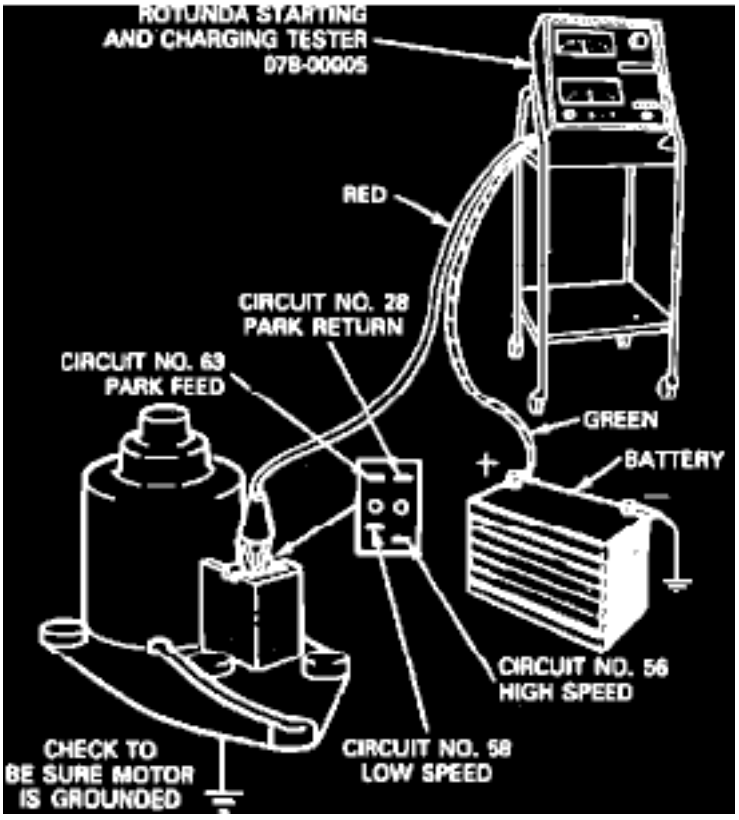
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Wiper Motor > Component Information > Diagrams > Diagram Information and Instructions > Page 7772



Wiper/Washer


LOW SPEED CONNECTION (SHOWN)—WHITE
GREEN
VOLT-AMP-ALTERNATOR TESTER
RED
HIGH SPEED CONNECTION—BLUE
BATTERY
+
—
CHECK TO BE SURE MOTOR IS GROUNDED


ROTUNDA STARTING AND CHARGING TESTER 078-00005
RED
CIRCUIT NO. 28 PARK RETURN
CIRCUIT NO. 69 PARK FEED
GREEN
BATTERY
+
—
CIRCUIT NO. 56 HIGH SPEED
CHECK TO BE SURE MOTOR IS GROUNDED
CIRCUIT NO. 58 LOW SPEED

Wiper Motor: Testing and Inspection

Fig. 3 Wiper Motor Current Draw Test. Except Aerostar

Fig. 4 Wiper Motor Current Draw Test. Aerostar

1. Disconnect positive battery cable.

2. Disconnect linkage from motor and the electrical connector.

3. Connect green lead from multimeter to battery positive post, Fig. 3 and 4.

4. Connect positive lead of tester first to low speed connection and then to high speed connection at electrical connector. Current draw should not exceed 3 amps.

Wiper Motor: Service and Repair Front Wiper Motor

REMOVAL

1. Cycle windshield wipers until they are in straight up position, then turn ignition switch to Off position.

2. Disconnect battery ground cable (two ground cables on diesel engines), then the wiper motor electrical connector.

3. Remove righthand wiper arm and blade assembly, then the righthand pivot nut and allow linkage to drop into cowl.

4. Remove linkage access cover from righthand side of dash panel.

5. Release wiper motor retaining clip, then slide clip back until it clears nib on crank pin, and remove the clip. The wiper motor retaining clip can be reached through the access cover opening.

6. Remove wiper linkage from motor crank pin.

7. Remove motor attaching screws and the motor.

INSTALLATION

1. Install wiper motor and torque attaching screws to 60-85 inch lbs.

2. Connect wiper motor electrical connector, then install clip onto righthand linkage, ensuring clip is fully seated. Do not install linkage on motor crank pin, then attempt to install clip.

3. Install lefthand linkage onto motor crank pin, then the righthand linkage onto crank pin, pulling linkage onto pin until it snaps into place. Clip is properly installed if nib is protruding through center of clip.

4. Install righthand wiper pivot shaft and nut and torque to 84-110 inch lbs.

5. Connect battery ground cable (two ground cables on diesel engines), turn ignition switch to On position, turn wiper switch Off so wiper motor will park, then turn ignition switch to Off position.

6. Install righthand linkage access cover, then the righthand wiper blade and arm assembly and check for proper operation.

Wiper Motor: Service and Repair Rear Wiper Motor

REMOVAL

1. Disconnect battery ground cable, then remove wiper arm and blade assembly.

2. Remove liftgate inner trim panel, then the motor bracket attaching screw.

3. Pull motor assembly out of rubber grommet, disconnect motor electrical connector and disengage wiring locator pins, then remove motor assembly.

INSTALLATION

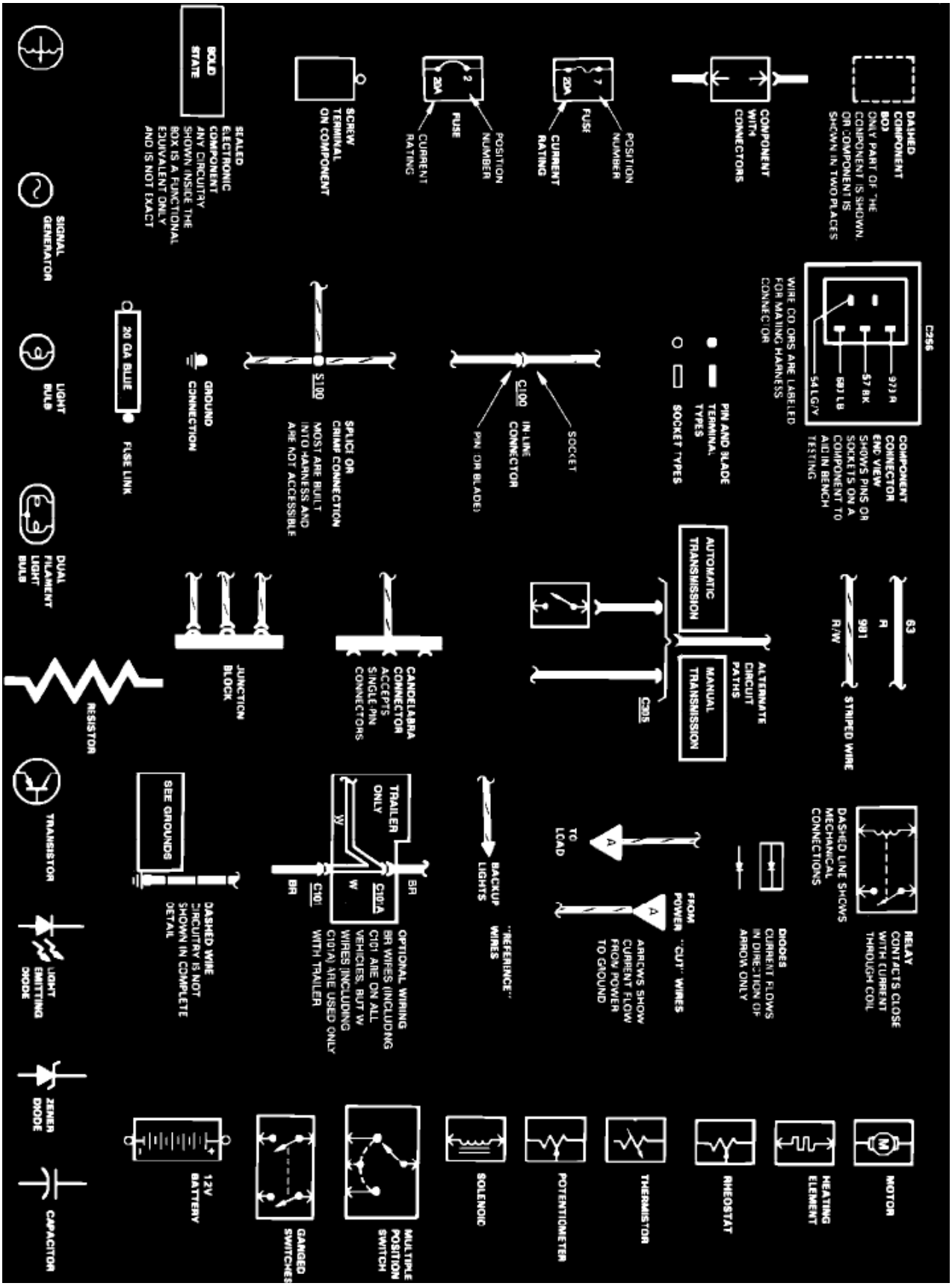
1. Position motor in liftgate rubber grommet and install attaching screws.

2. Connect motor electrical connector and install wiring locator pins.

3. Install wiper arm and blade assembly, then connect battery ground cable, and check for proper operation of wiper.

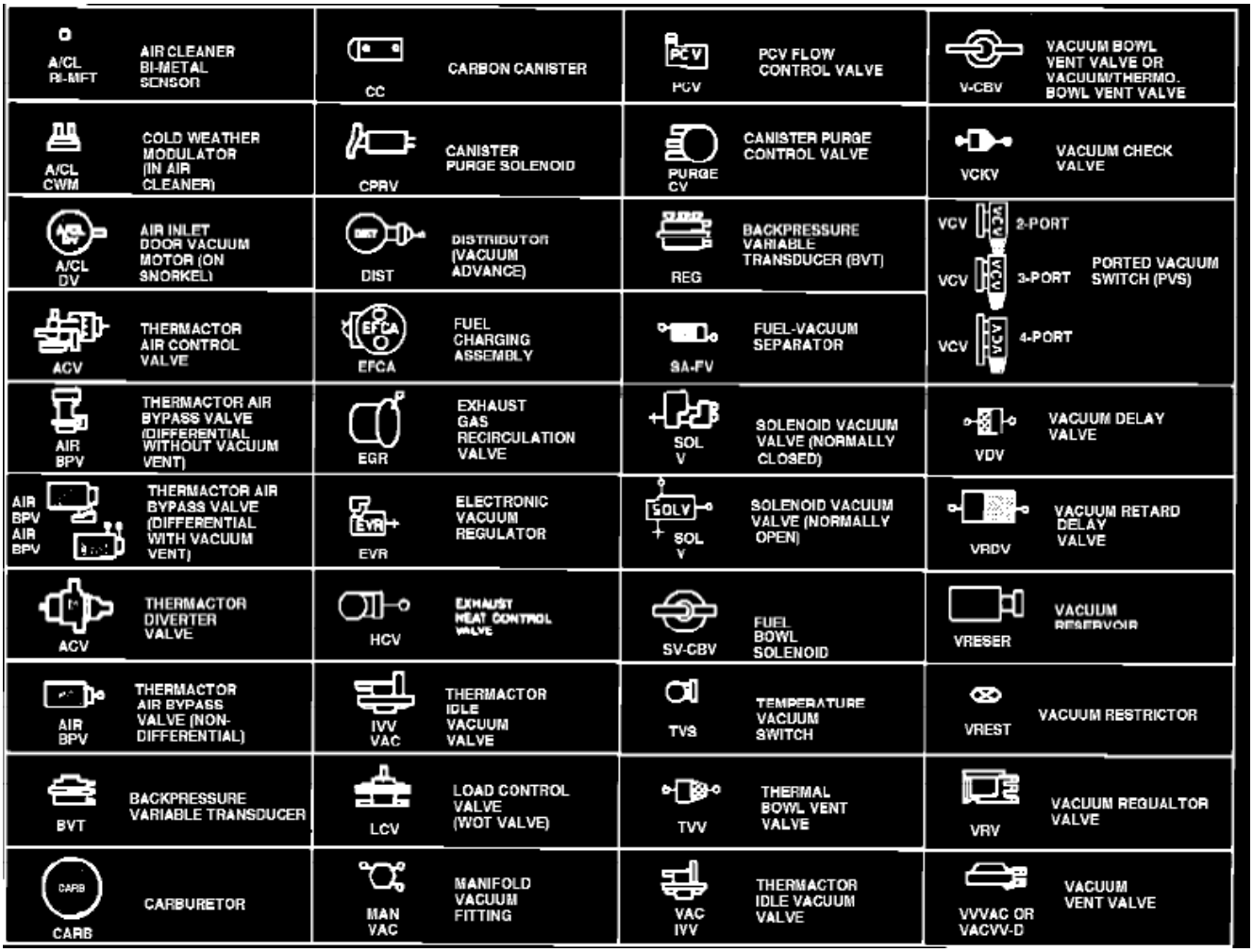
4. Install liftgate inner trim panel.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Interval Governor <--> [Wiper Motor Timer] > Component Information > Diagrams > Diagram Information and Instructions

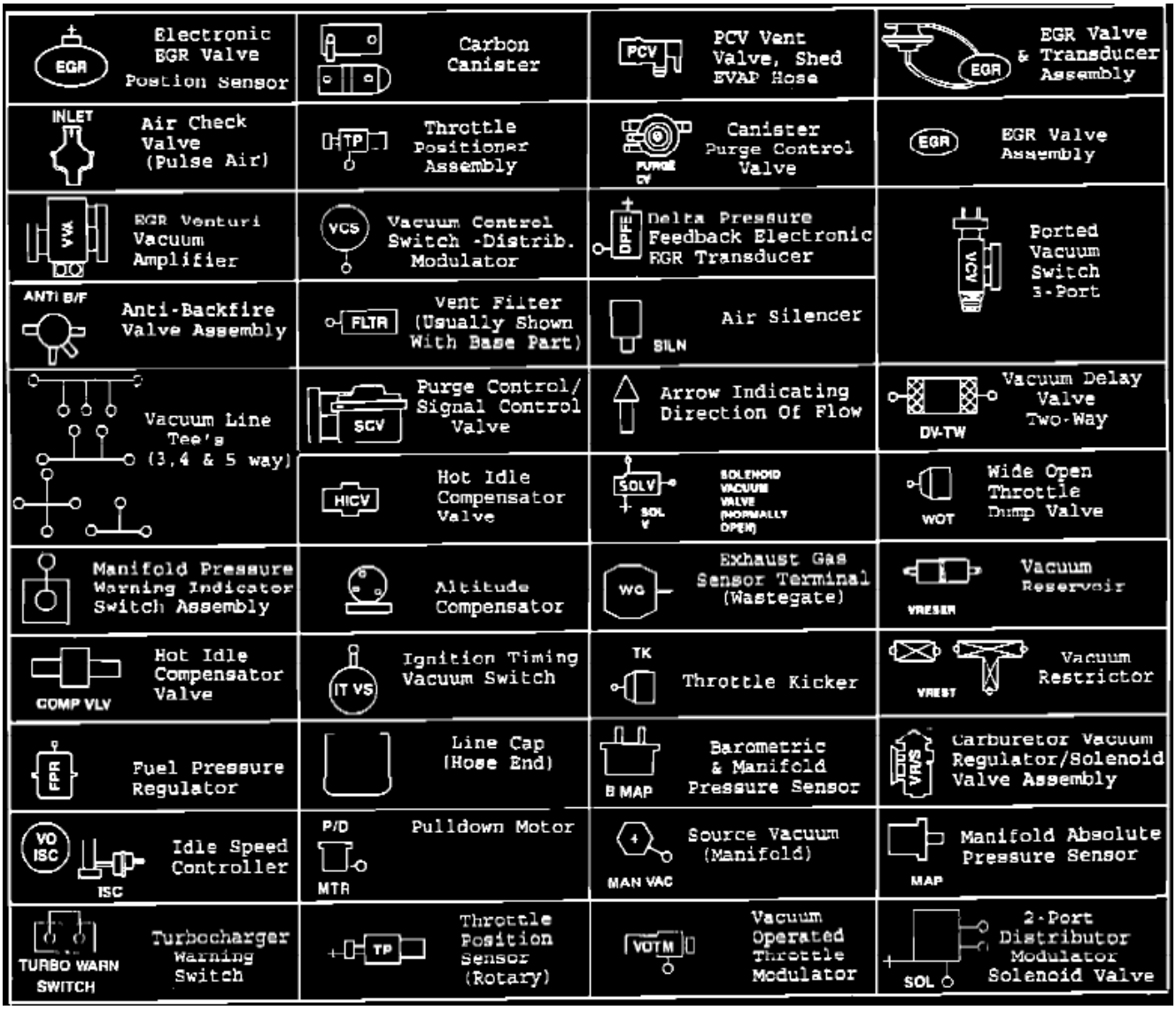


Interval Governor: Diagram Information and Instructions

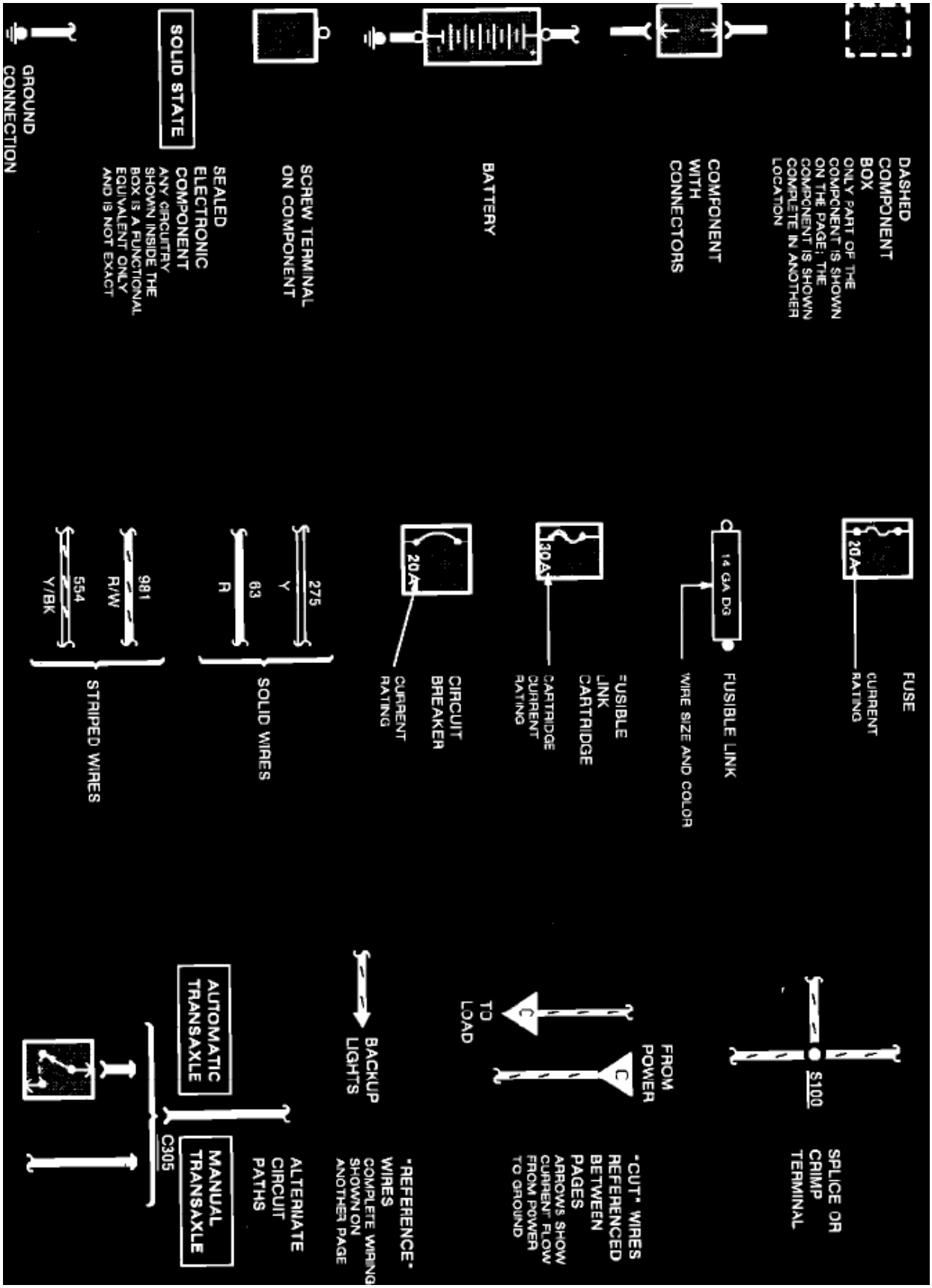
Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



Vacuum And Vapor Hose Schematic Symbols


DASHED COMPONENT BOX
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AUTOMATIC TRANSAXLE
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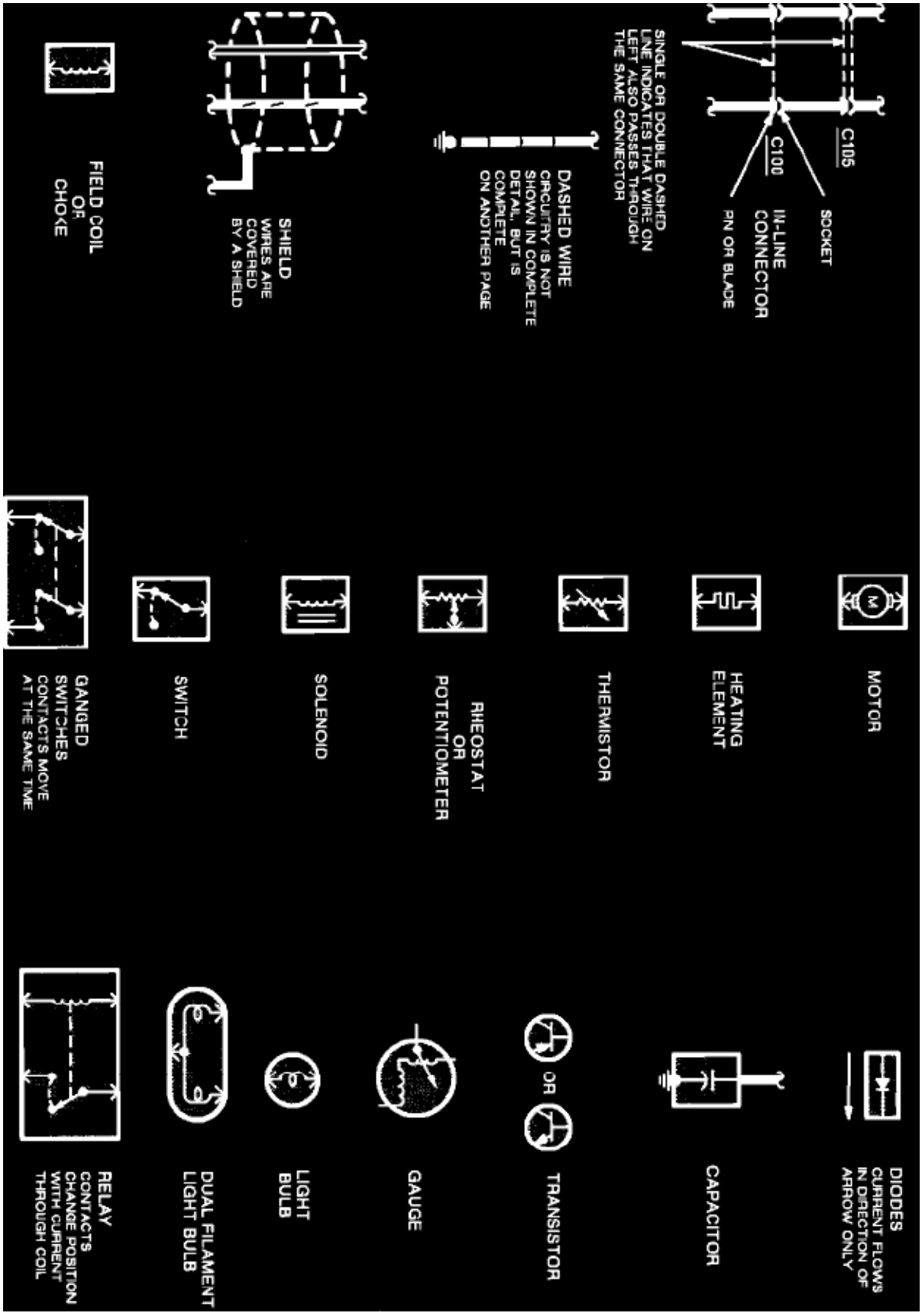
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
SOCKET
C100
IN-LINE CONNECTOR
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DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

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P: Purple

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W: White

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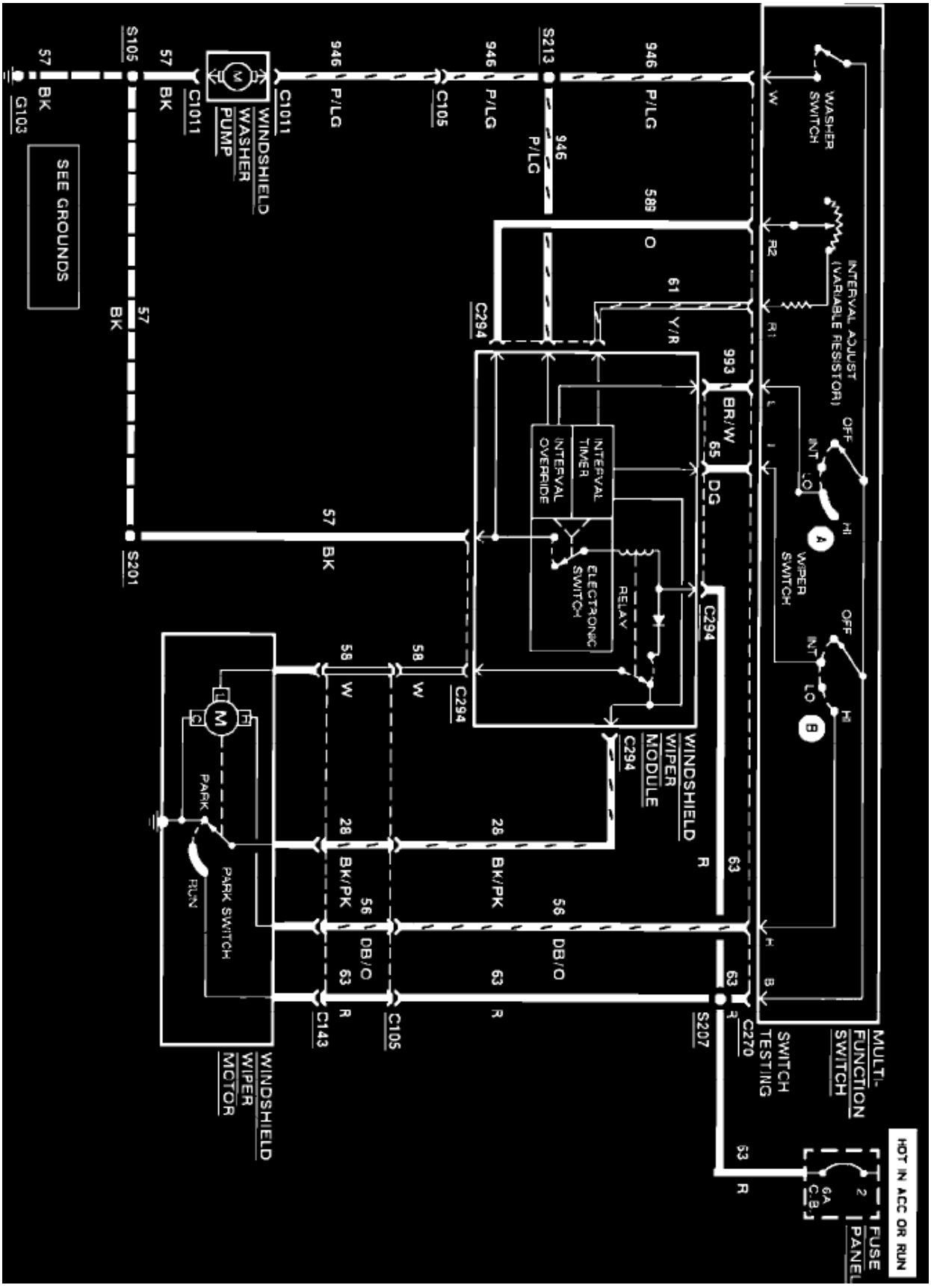
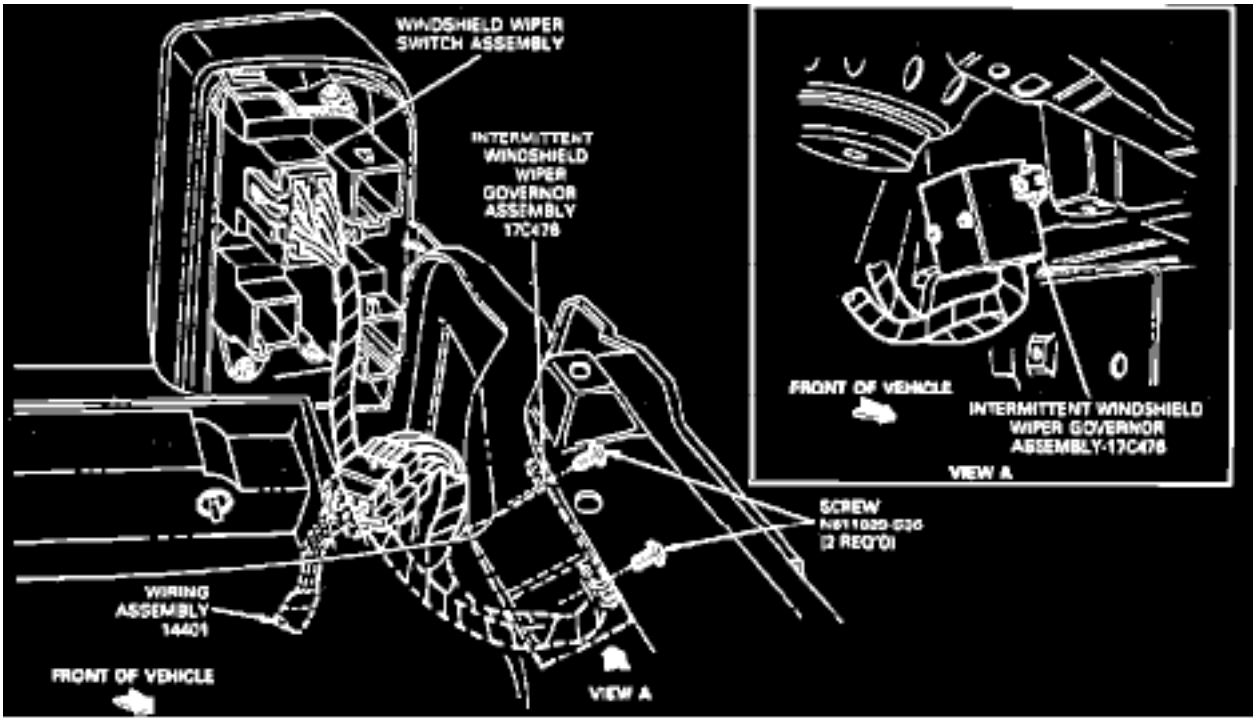
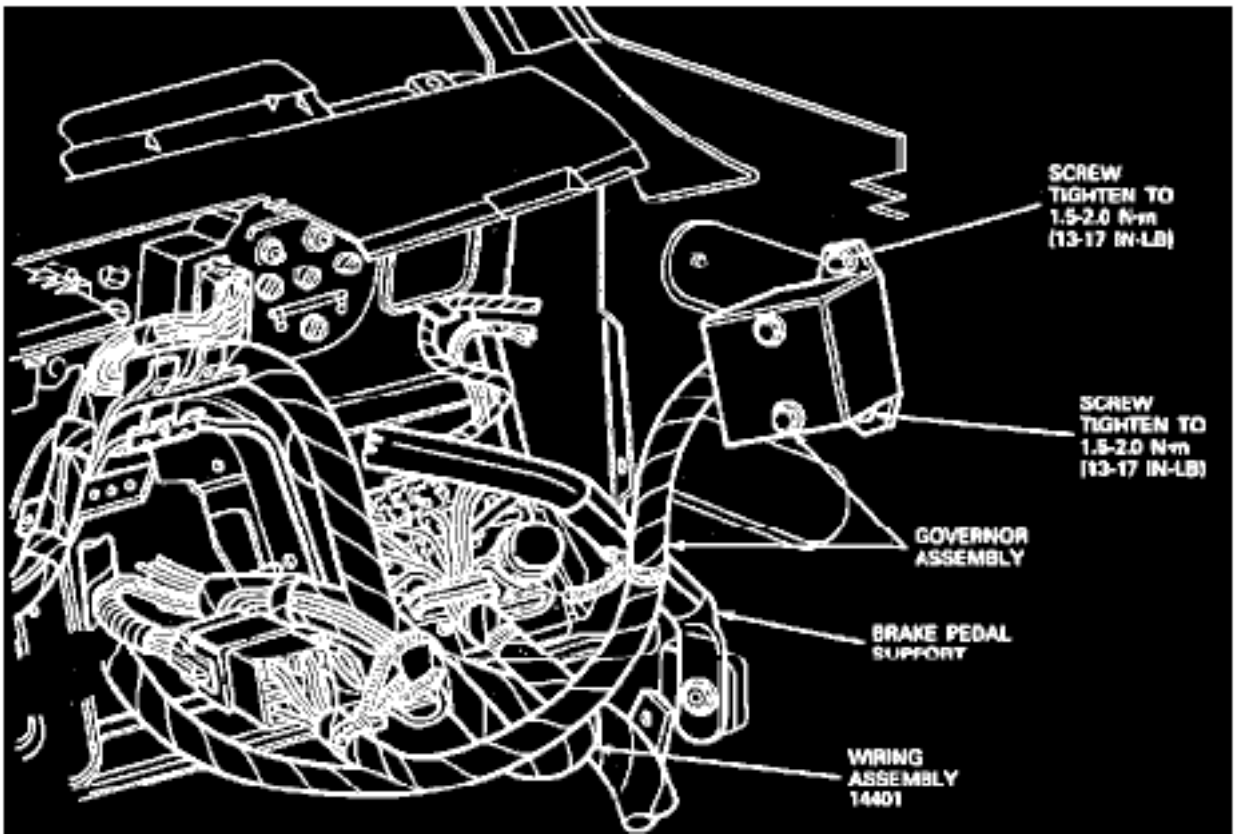

HOT IN ACC OR RUN
FUSE PANEL
6A C.B.
MULTI-FUNCTION SWITCH
SWITCH TESTING
C270
S207
WASHER SWITCH
INTERVAL ADJUST (VARIABLE RESISTOR)
WIPER SWITCH
OFF
INT
LO
HI
WINDSHIELD WIPER MODULE
C294
INTERVAL TIMER
INTERVAL OVERRIDE
ELECTRONIC SWITCH
RELAY
WINDSHIELD WASHER PUMP
C1011
WINDSHIELD WIPER MOTOR
C143
C105
PARK
RUN
PARK SWITCH
S213
S105
S201
G103
SEE GROUNDS
946 P/LG
589 O
61 Y/R
993 BR/W
65 DG
63 R
58 W
28 BK/PK
56 DB/O
57 BK

Wiper/Washer


WINDSHIELD WIPER SWITCH ASSEMBLY
INTERMITTENT WINDSHIELD WIPER GOVERNOR ASSEMBLY 17C478
SCREW
(2 REQ'D)
WIRING ASSEMBLY 14401
FRONT OF VEHICLE
VIEW A
FRONT OF VEHICLE
INTERMITTENT WINDSHIELD WIPER GOVERNOR ASSEMBLY-17C478
VIEW A


SCREW TIGHTEN TO 1.5-2.0 N·m (13-17 IN-LB)
SCREW TIGHTEN TO 1.5-2.0 N·m (13-17 IN-LB)
GOVERNOR ASSEMBLY
BRAKE PEDAL SUPPORT
WIRING ASSEMBLY 14401

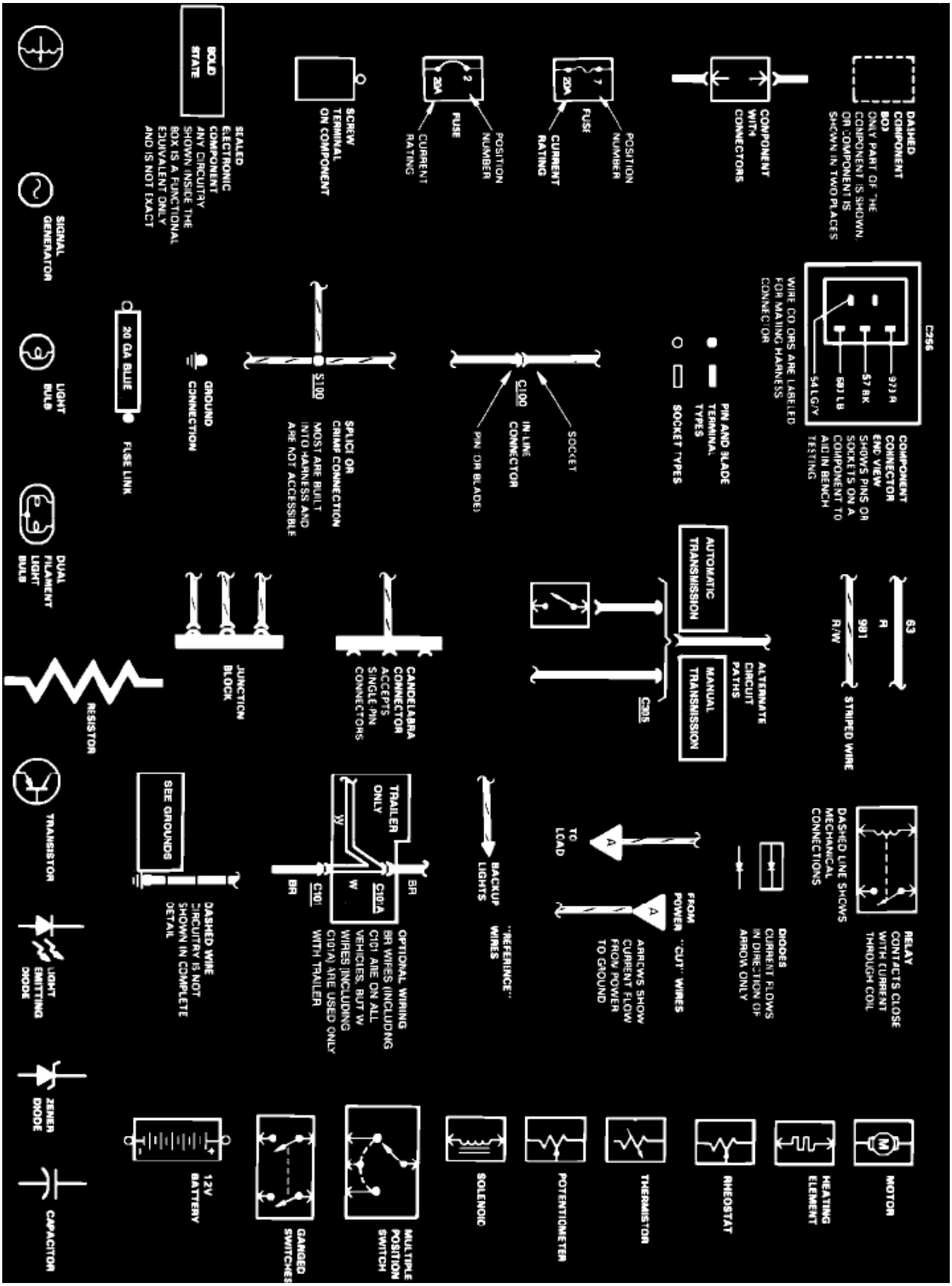
Interval Governor: Testing and Inspection

Fig. 9 Wiper Interval Governor Location. Aerostar

Fig. 10 Wiper Interval Governor Location. Bronco II, Explorer & Ranger

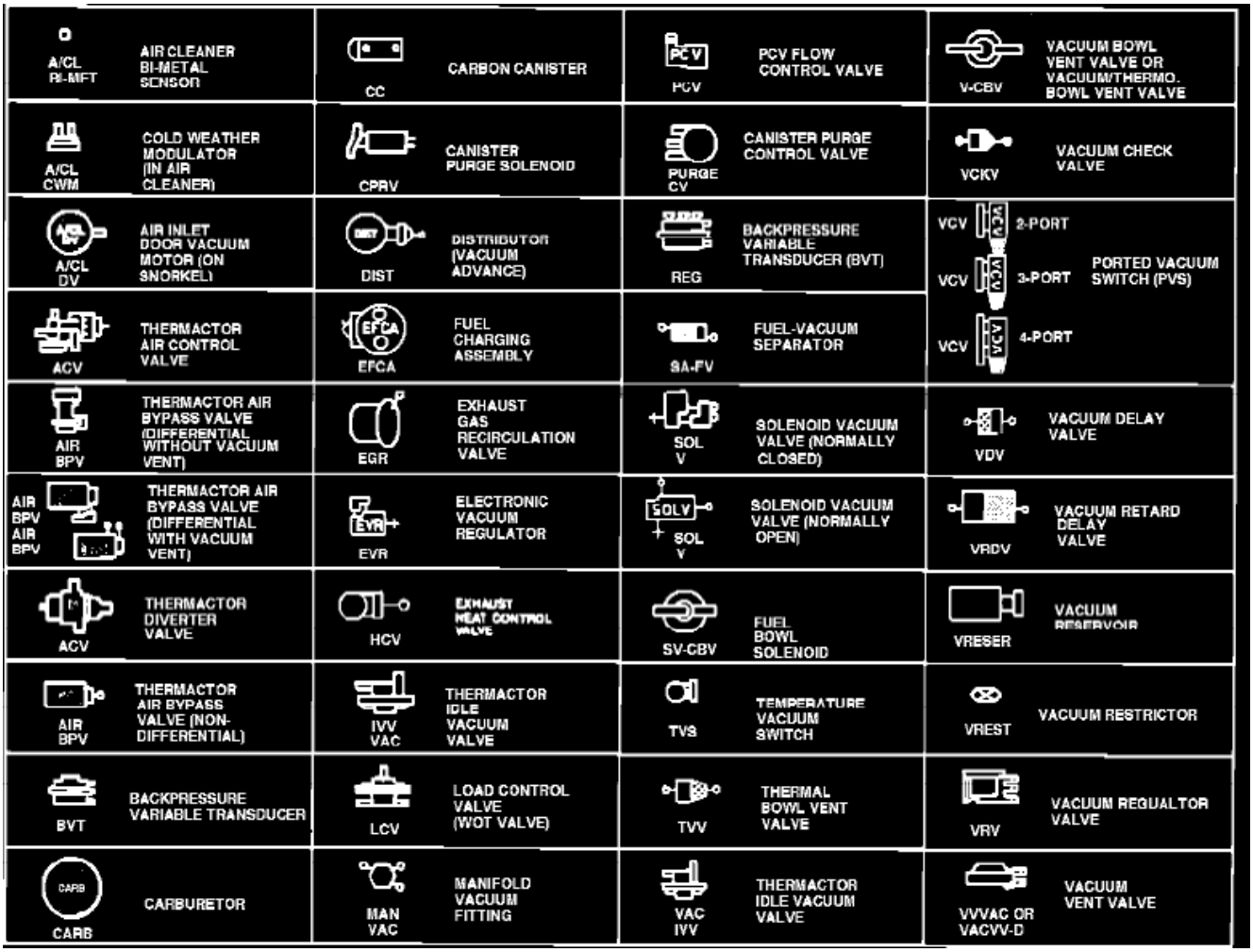
If interval operation is unsatisfactory, first test motor current draw, the control switch and all connecting wires for continuity. If the motor, switch and connecting wires are good, replace the electronic governor, Figs. 9 and 10.

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Wiper Relay > Component Information > Diagrams > Diagram Information and Instructions

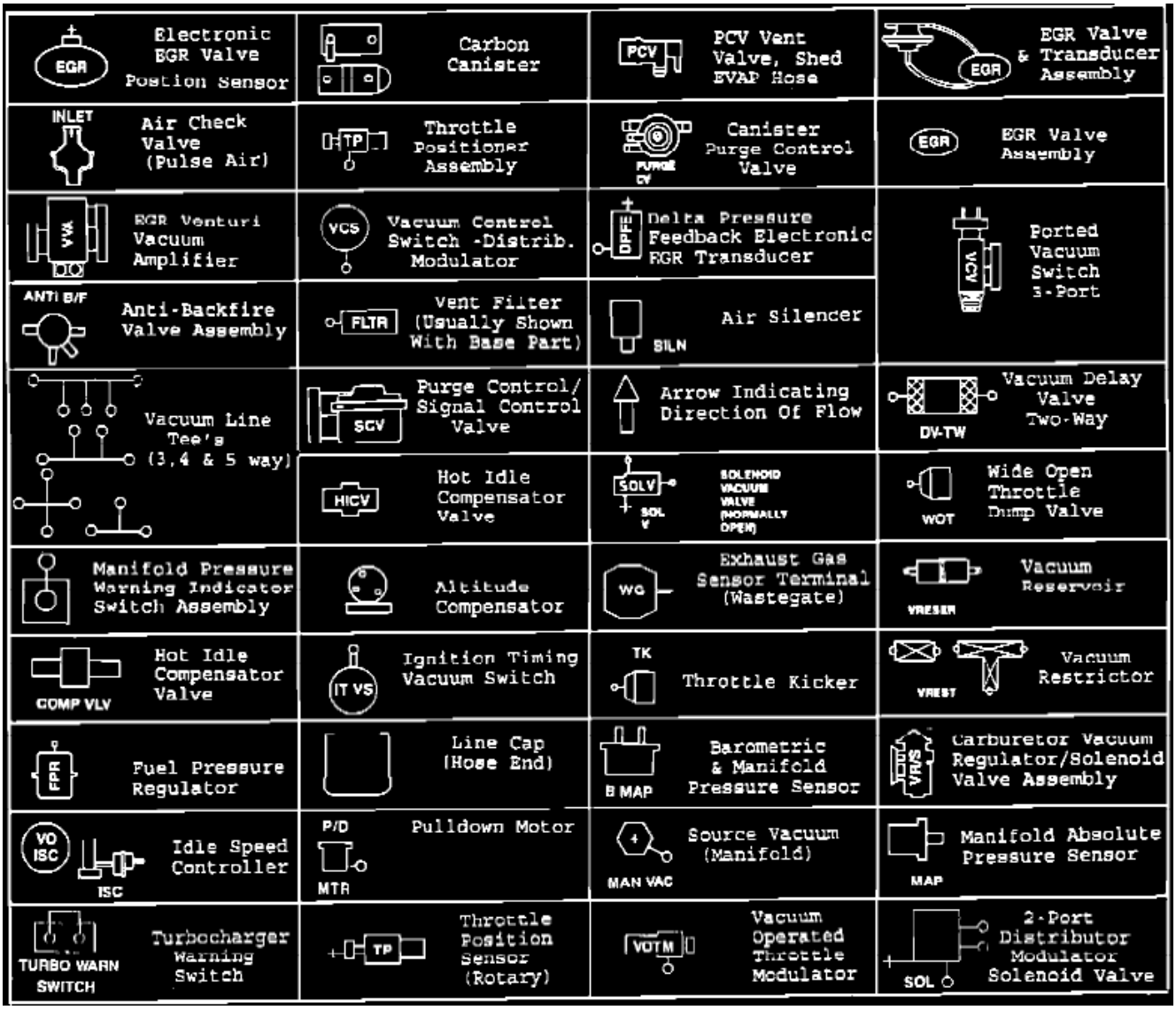


Wiper Relay: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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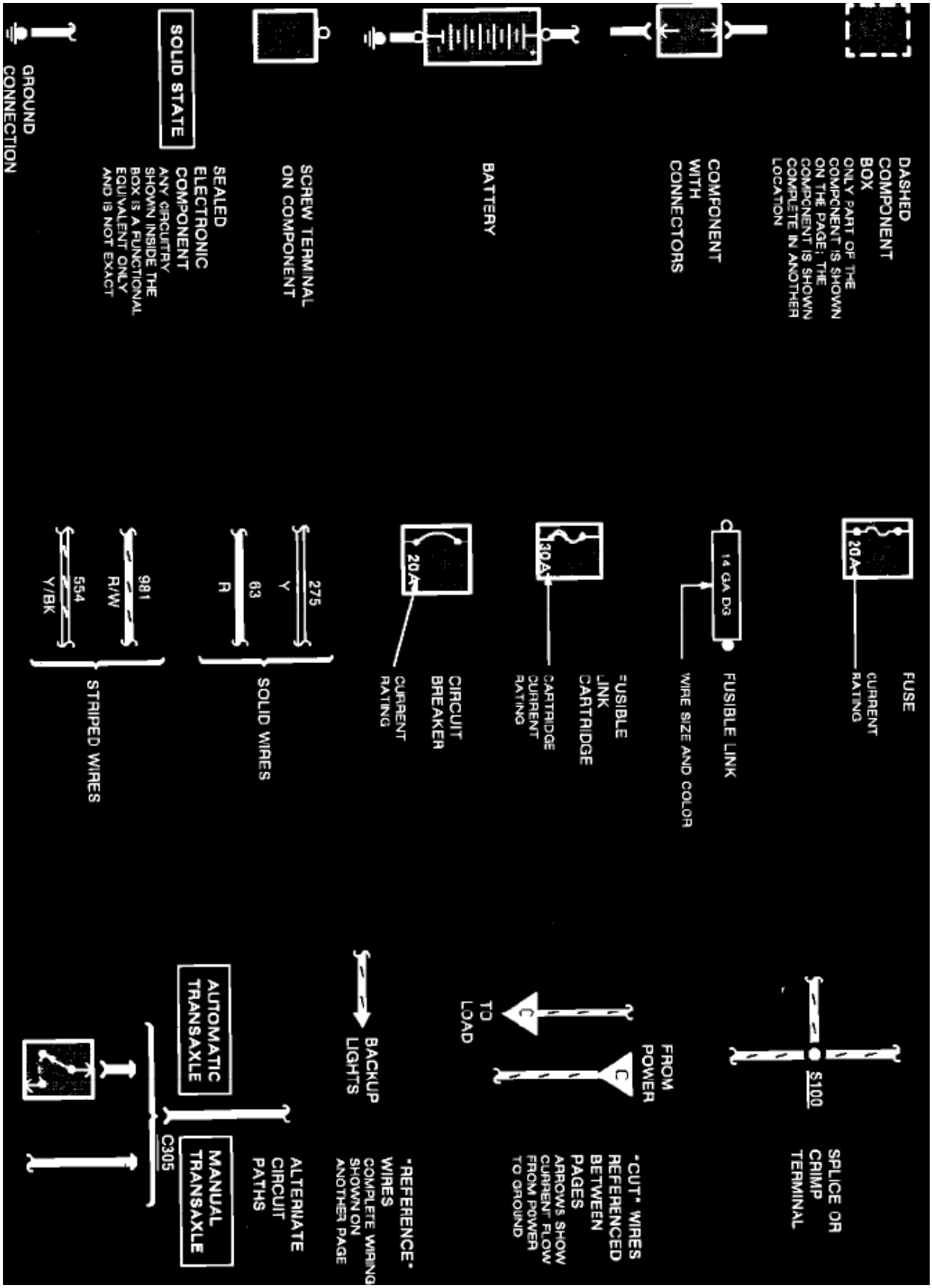
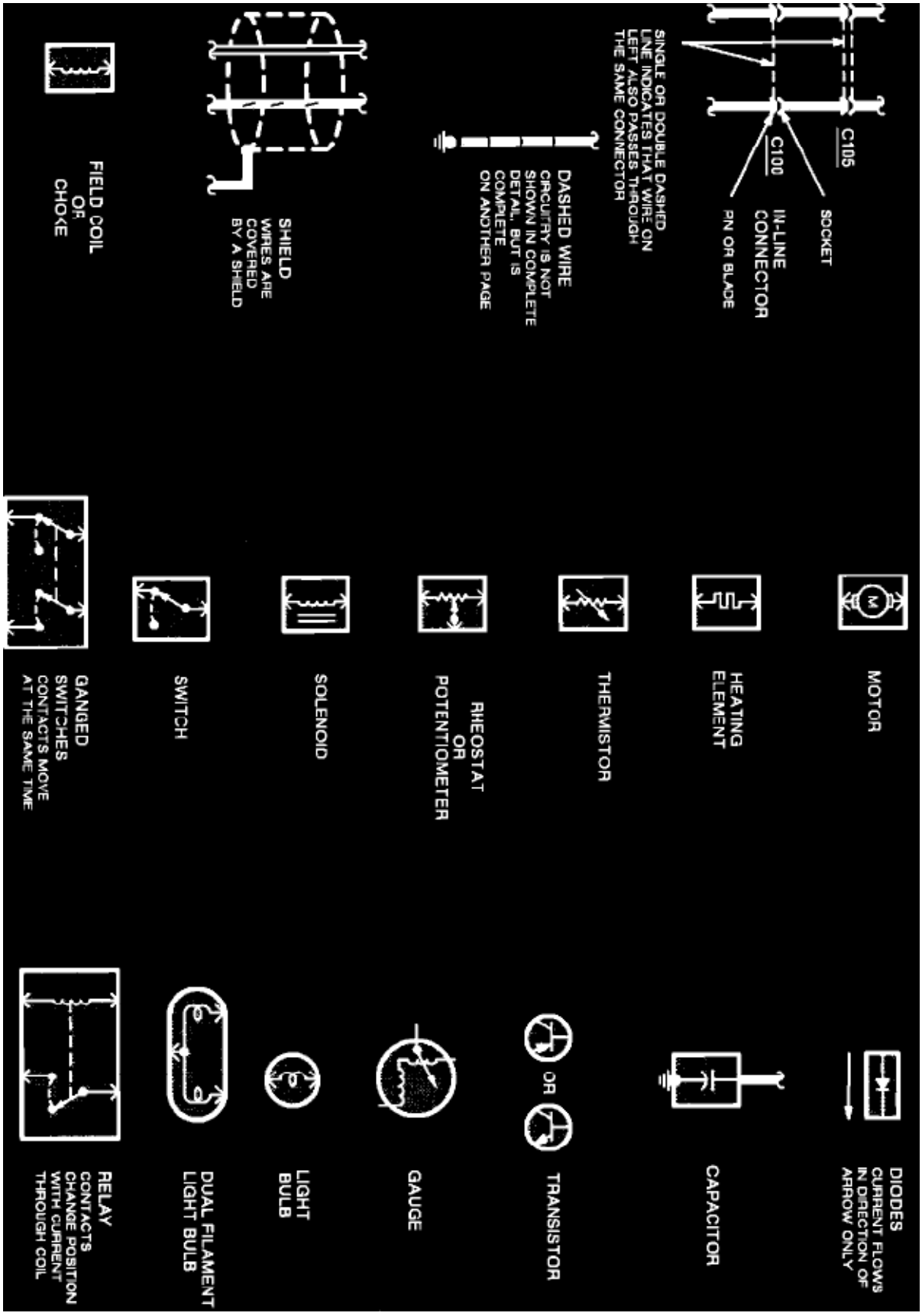

DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION
COMPONENT WITH CONNECTORS
BATTERY
SCREW TERMINAL ON COMPONENT
SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY AND IS NOT EXACT
SOLID STATE
GROUND CONNECTION
FUSE
20A
CURRENT RATING
FUSIBLE LINK
14 GA DG
WIRE SIZE AND COLOR
FUSIBLE LINK CARTRIDGE
30A
CARTRIDGE CURRENT RATING
CIRCUIT BREAKER
20A
CURRENT RATING
275
Y
63
R
SOLID WIRES
981
R/W
554
Y/BK
STRIPED WIRES
SPLICE OR CRIMP TERMINAL
S100
FROM POWER
C
TO LOAD
"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND
BACKUP LIGHTS
"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE
AUTOMATIC TRANSAXLE
MANUAL TRANSAXLE
C305
ALTERNATE CIRCUIT PATHS

Electrical Symbols


C105
C100
SOCKET
IN-LINE CONNECTOR
PIN OR BLADE
SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR
DASHED WIRE
CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE
SHIELD
WIRES ARE COVERED BY A SHIELD
FIELD COIL OR CHOKE
MOTOR
HEATING ELEMENT
THERMISTOR
RHEOSTAT OR POTENTIOMETER
SOLENOID
SWITCH
GANGED SWITCHES
CONTACTS MOVE AT THE SAME TIME
DIODES
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CAPACITOR
OR
TRANSISTOR
GAUGE
LIGHT BULB
DUAL FILAMENT LIGHT BULB
RELAY
CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

Electrical Symbols

Wire Color Code Identification

NOTE: Whenever a wire is labeled with two colors; the first color listed is the basic color of the wire, and the second color is the tracer marking of the wire. If the second color is followed by by a D, the tracer is dots. If the second color is followed by an H, the tracer is hash marks.

For example: BR/O is a brown wire with an orange stripe, R/Y D is a red wire with yellow dots and BK/W H is a black wire with white hash marks.

BL: Blue BK: Black

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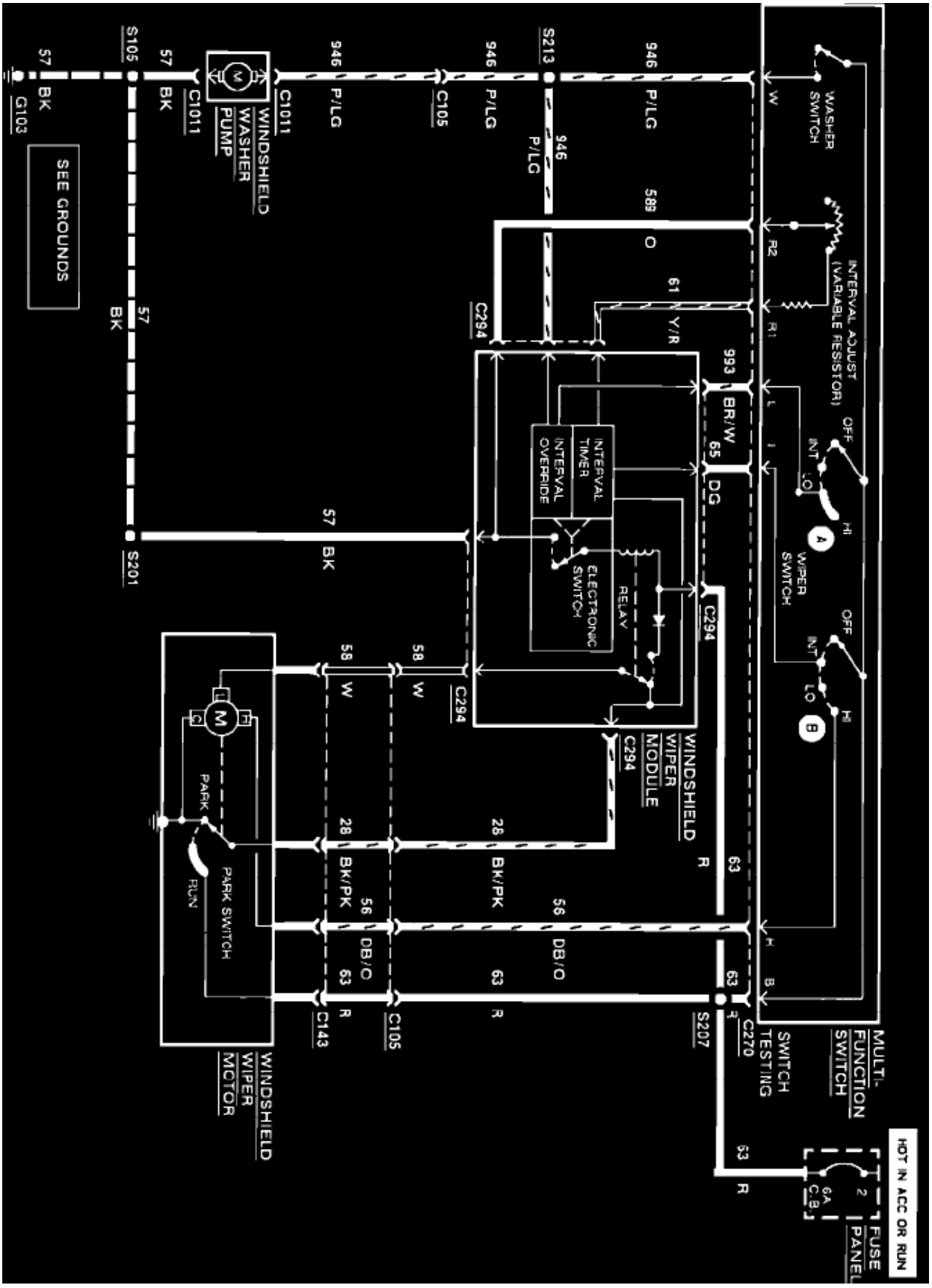
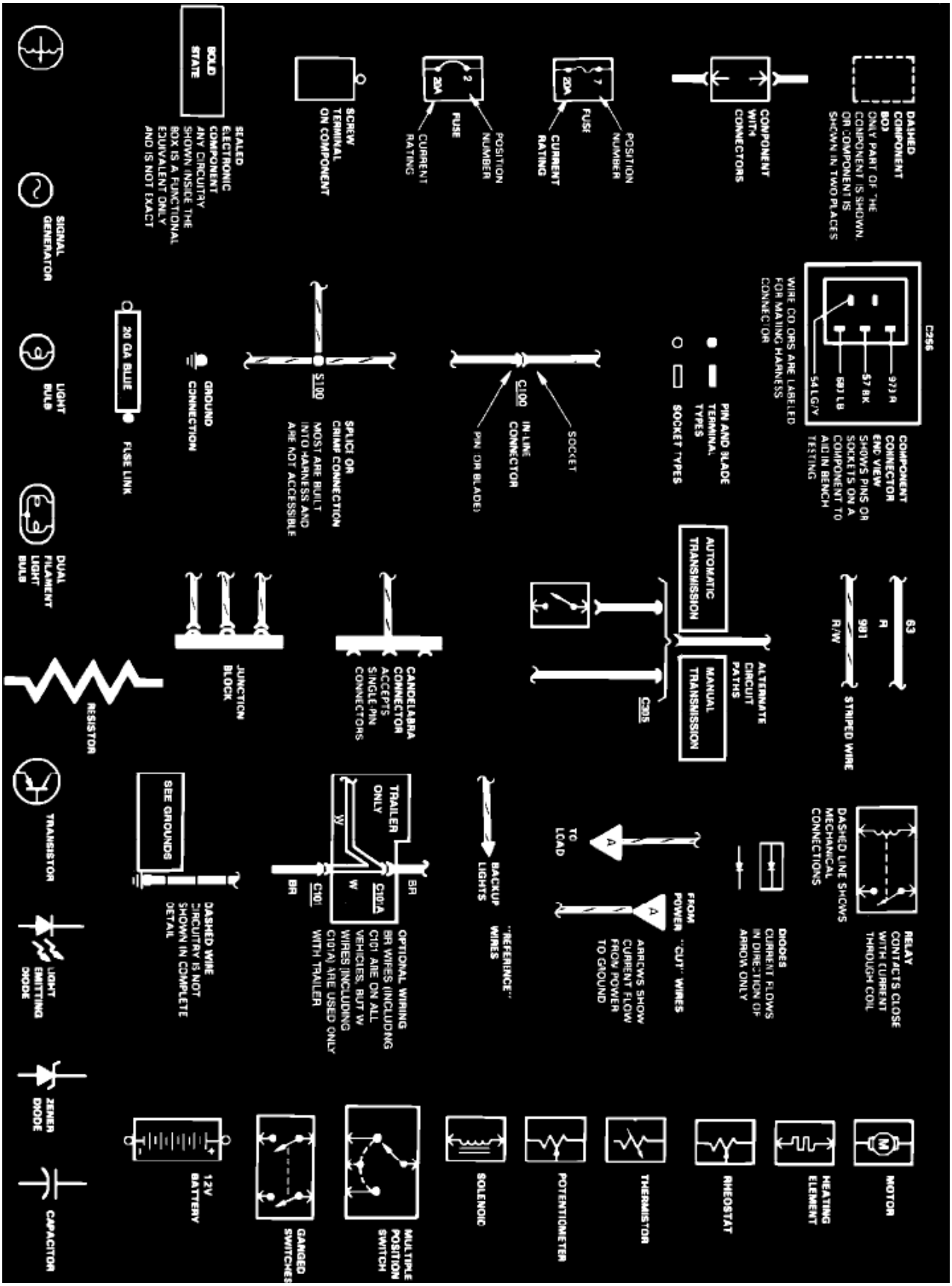
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Wiper Relay > Component Information > Diagrams > Diagram Information and Instructions > Page 7797



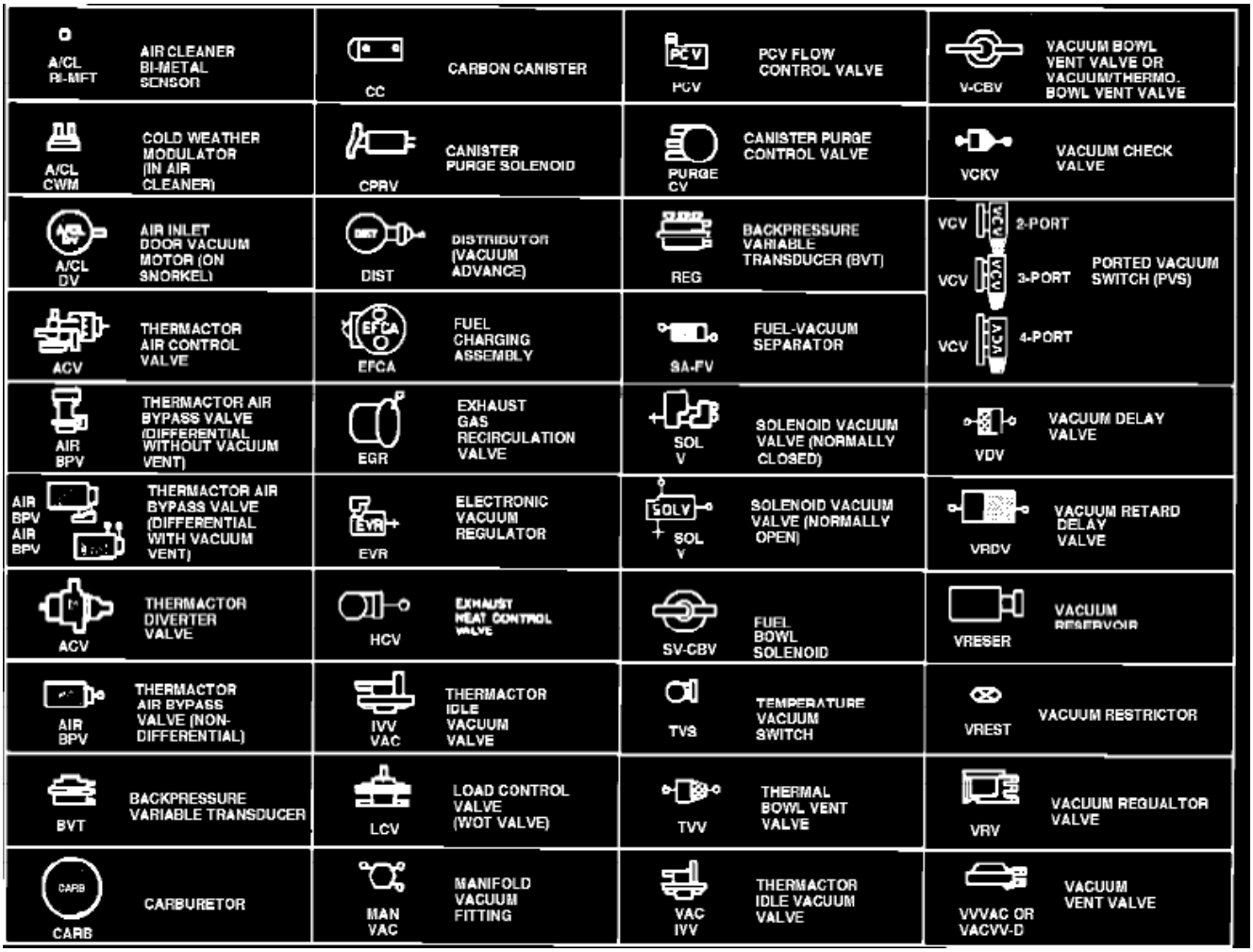
Wiper/Washer

Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Wiper Switch > Component Information > Diagrams > Diagram Information and Instructions

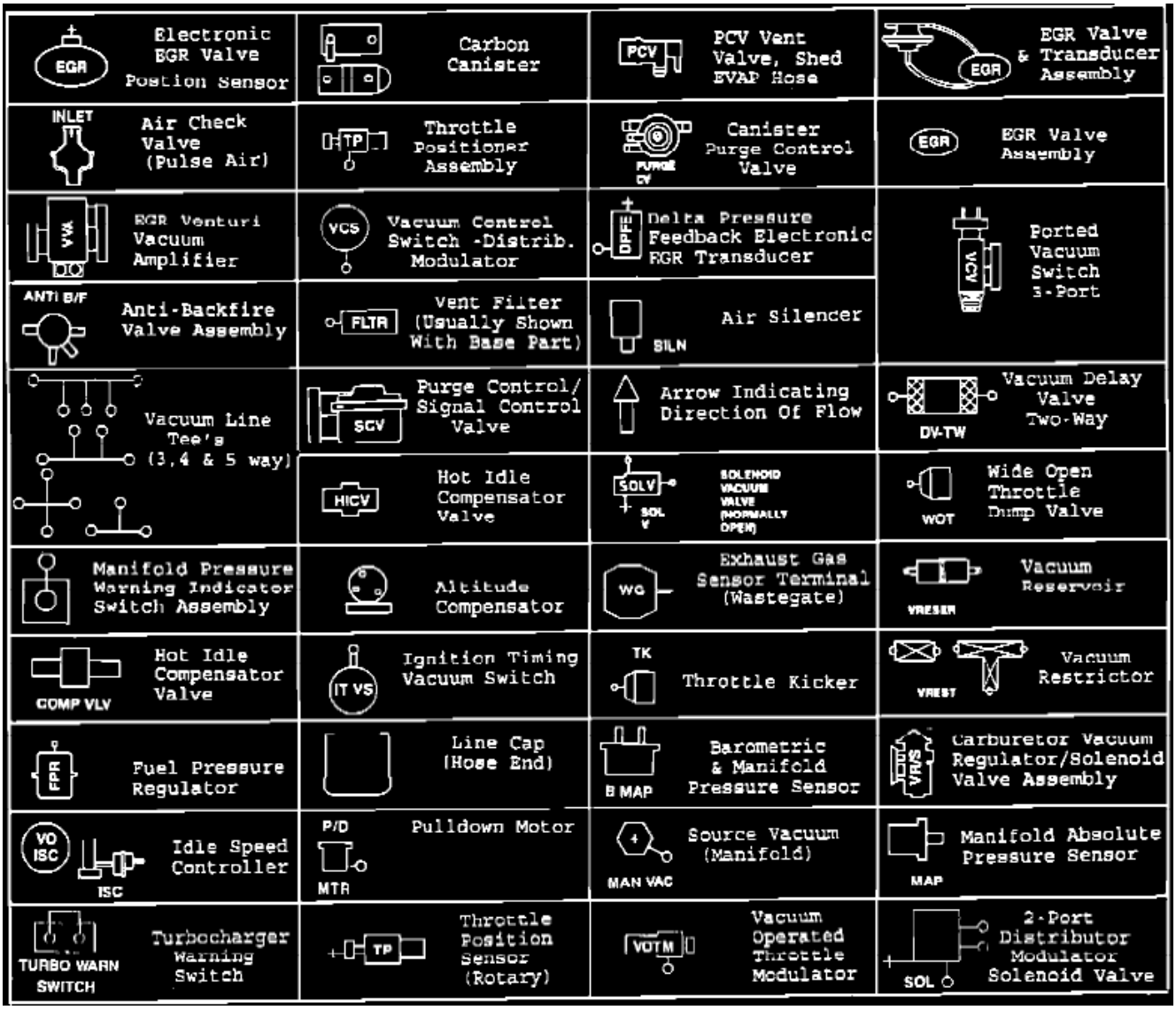


Wiper Switch: Diagram Information and Instructions

Symbol Identification



Vacuum And Vapor Hose Schematic Symbols



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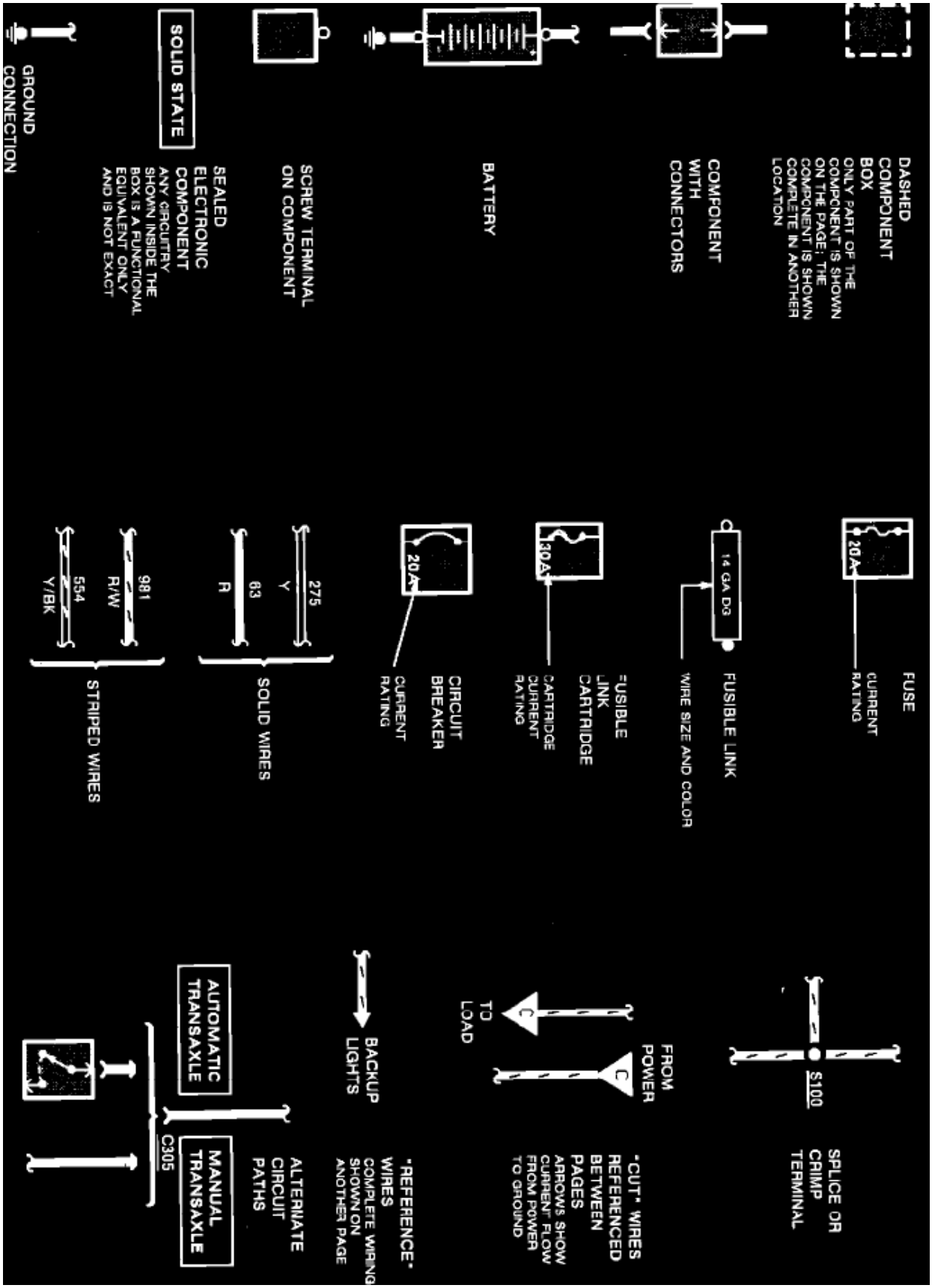
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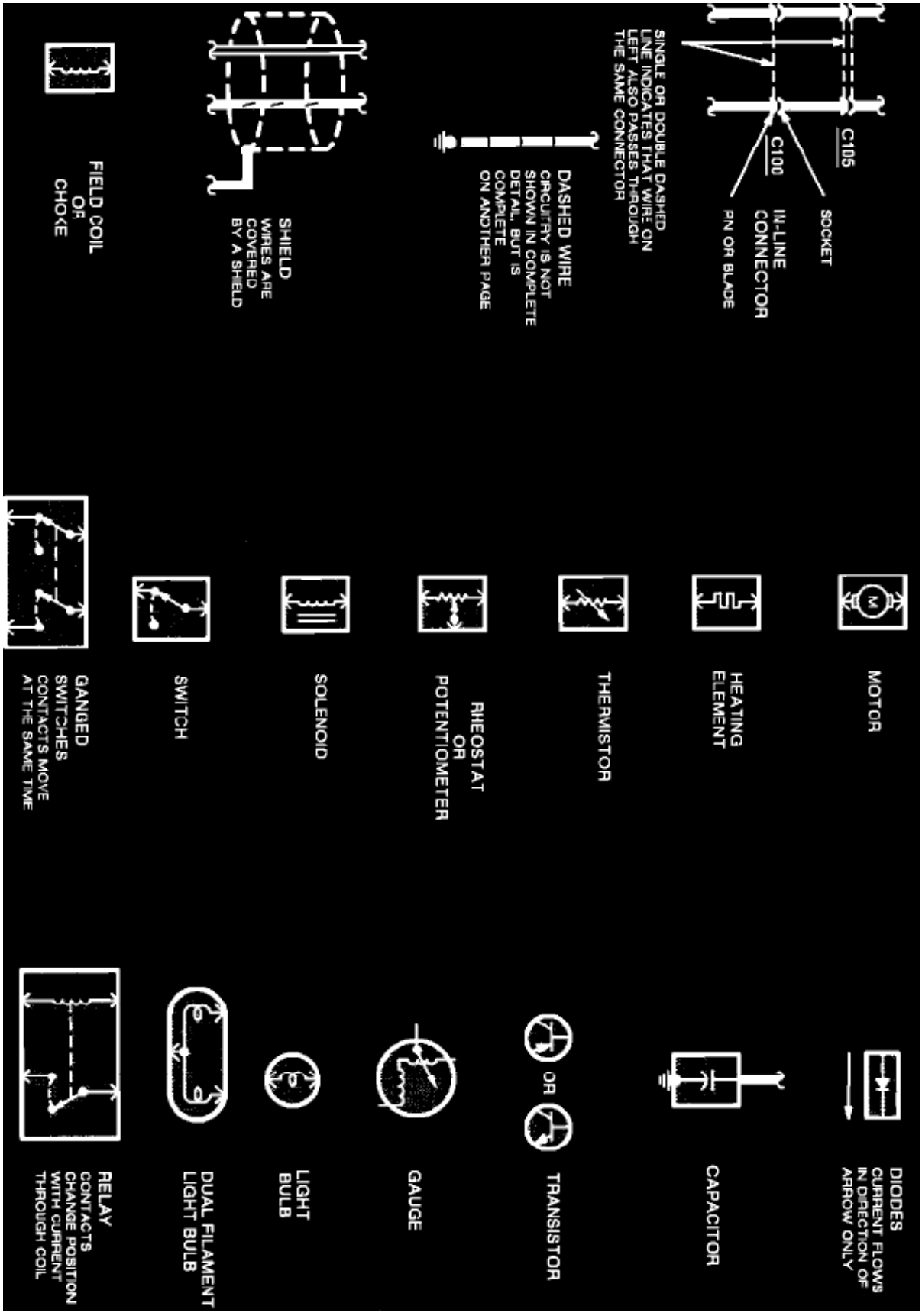
Electrical Symbols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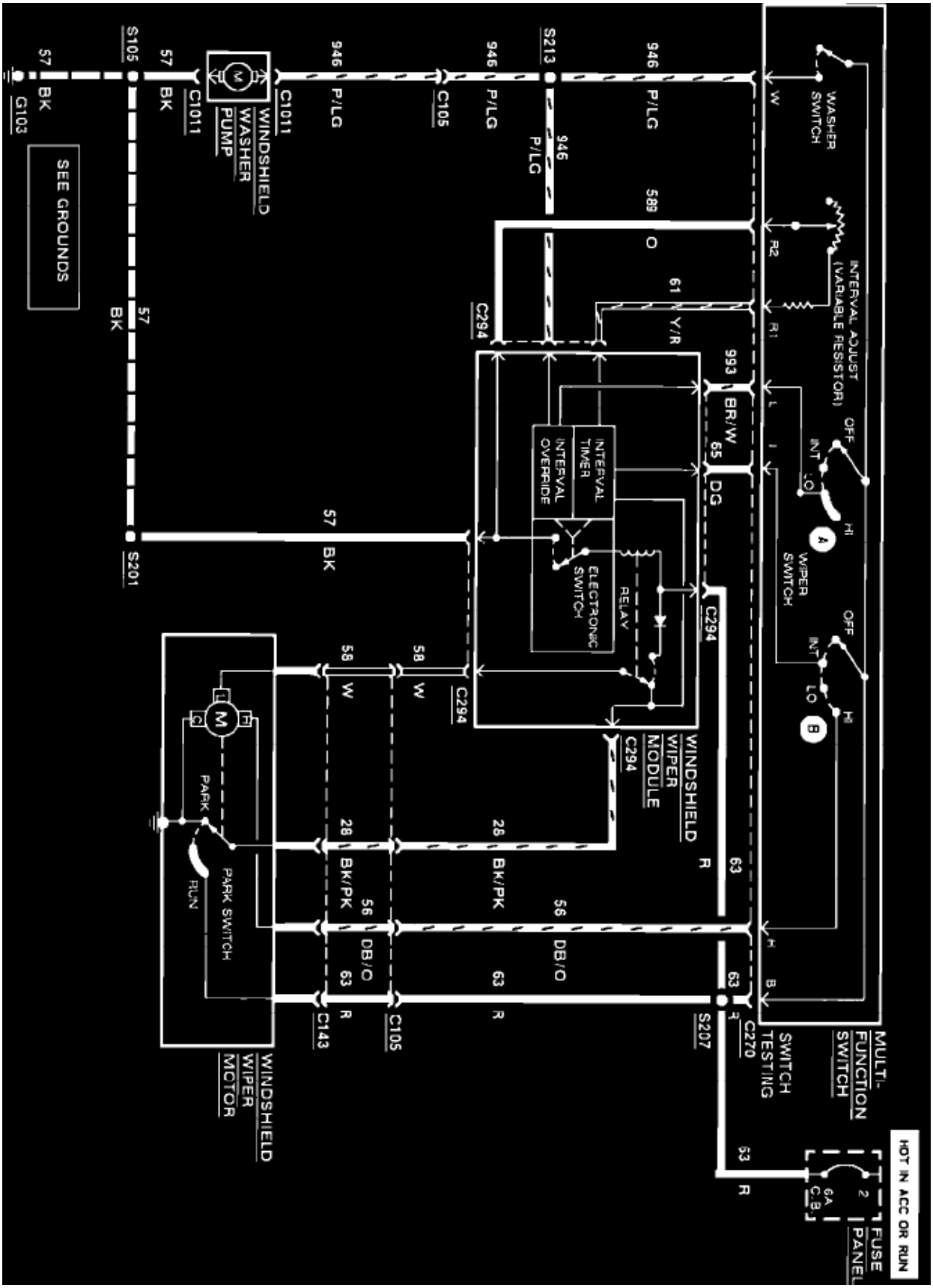
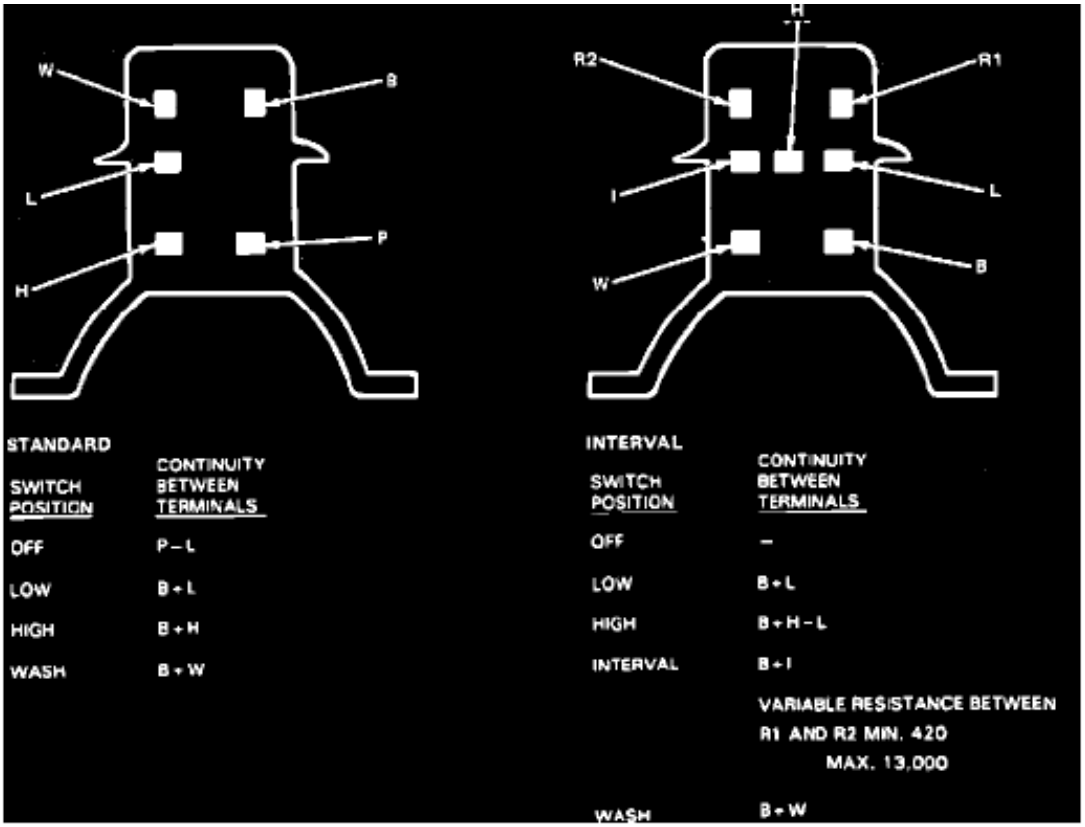
Ford Ranger 4wd Workshop Manual (V6-245 4.0L (1991))
Ford Workshop Manuals > Wiper and Washer Systems > Wiper Switch > Component Information > Diagrams > Diagram Information and Instructions > Page 7807



Wiper/Washer

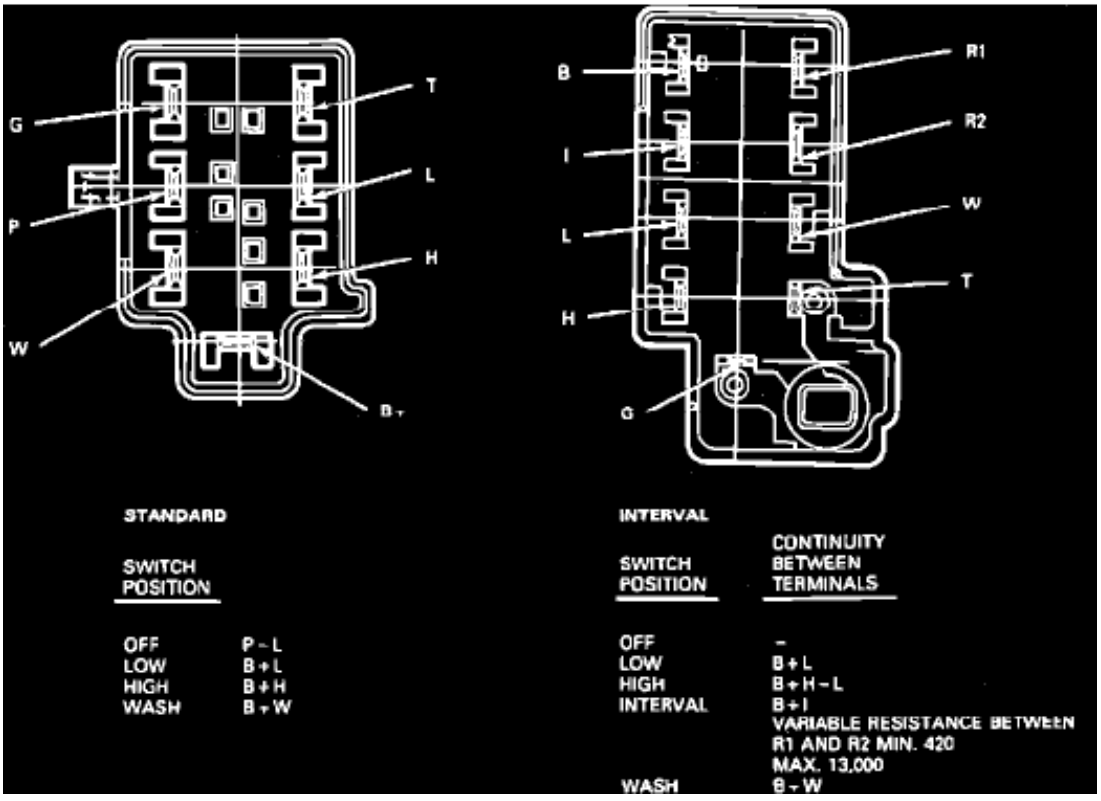


STANDARD

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
OFF	P – L
LOW	B + L
HIGH	B + H
WASH	B + W

INTERVAL

SWITCH POSITION	CONTINUITY BETWEEN TERMINALS
OFF	–
LOW	B + L
HIGH	B + H – L
INTERVAL	B + I
	VARIABLE RESISTANCE BETWEEN R1 AND R2 MIN. 420 MAX. 13,000
WASH	B + W



STANDARD

SWITCH POSITION	
OFF	P – L
LOW	B + L
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WASH	B + W

Wiper Switch: Testing and Inspection

Fig. 5 Wiper Switch Continuity Test. 1988 Bronco II & Ranger

Fig. 6 Wiper Switch Continuity Test. Except 88 Bronco II & Ranger

1. Check continuity between switch terminals, Figs 5 and 6.

2. To detect marginal operation of switch, move switch lever while each reading is being taken.

3. If switch does not show continuity or if poor continuity exists at any switch position, replace switch.

Wiper Switch: Service and Repair Rear Wiper Switch

1. Disconnect battery ground cable, then remove ashtray and instrument cluster trim panel.

2. Remove switch mounting bezel containing switches, then disconnect switch electrical connector and remove switch.

3. Reverse procedure to install, checking wiper operation.